

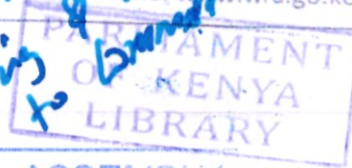


DLPS
Please deal-
Goli
29/10/21

WATER RESOURCES AUTHORITY

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Ref : WRA/8/7 (46)
Date : 26th October, 2021

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Haile Selassie Avenue
NAIROBI

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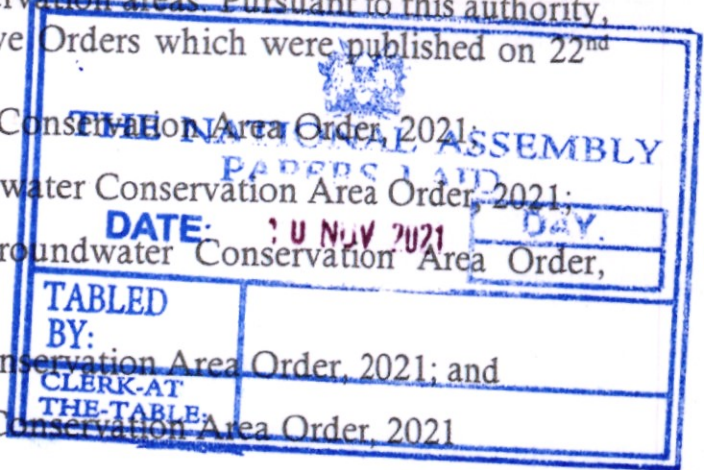


REQUEST TO TABLE STATUTORY INSTRUMENTS BEFORE THE NATIONAL ASSEMBLY

The Water Resources Authority is established under the Water Act, 2016 (hereinafter, "the Act") and designated as an agent of the national government responsible for regulating the management and use of water resources in Kenya.

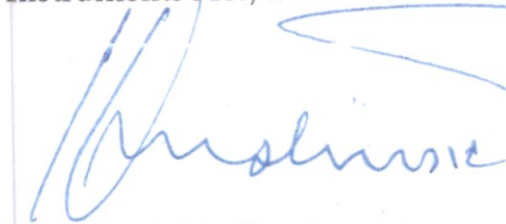
Pursuant to the provisions of Sections 22 and 23 of the Act, the Authority is empowered to declare, through publication in the *Gazette*, certain areas as catchment areas or groundwater conservation areas. Pursuant to this authority, WRA has developed the following five Orders which were published on 22nd October, 2021:

1. Amu Sand-dunes Groundwater Conservation Area Order, 2021;
2. Kikuyu Springs Aquifer Groundwater Conservation Area Order, 2021;
3. Dik Dik Gardens Wetland Groundwater Conservation Area Order, 2021;
4. Ngarelen Springs Catchment Conservation Area Order, 2021; and
5. Lake Kenyatta Sub-Catchment Conservation Area Order, 2021



The purpose of this letter is to request you to table the aforesaid Statutory Instruments comprising *Legal Notices 206, 207, 208, 209 and 210* respectively,

before the National Assembly in compliance with Section 11 of the Statutory Instruments Act, 2013.



Mohamed M. Shurie
CHIEF EXECUTIVE OFFICER

Cc.

Sicily K. Kariuki (Mrs.), EGH
Cabinet Secretary
Ministry of Water, Sanitation and Irrigation
Maji House
NAIROBI

Principal Secretary
State Department of Water Services
Ministry of Water and Sanitation
Maji House
NAIROBI

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THE KENYA GAZETTE

Published by Authority of the Republic of Kenya

(Registered as a Newspaper at the G.P.O.)

Vol. CXXIII—No. 215

NAIROBI, 22nd October, 2021

Price Sh. 60

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LEGAL NOTICE NO. 206

THE WATER ACT

(No. 43 of 2016)

IN EXERCISE of the powers conferred by section 23 of the Water Act, 2016, the Water Resources Authority makes the following Order —

THE DIK DIK GARDENS WETLAND CONSERVATION AREA
ORDER, 2021

1. This Order may be referred to as the Dik Dik Gardens Wetland Conservation Area Order, 2021.

Citation.

2. In this Order, unless the context otherwise requires —

Interpretation.

“Act” means the Water Act, 2016;

“Authority” means Water Resources Authority established under section 11 of the Act;

No. 43 of 2016

“Dik Dik Gardens Wetland Conservation Area” means the area demarcated as hydrogeological system controlling groundwater flow within and around the Dik Dik Gardens area in Kileleshwa as illustrated with the blue thick line in the First Schedule;

“Dik Dik Gardens Wetland Conservation Riparian Area” means all that land and water enclosed within thirty metres from the highest recorded tide or sea level of the Dik Dik Gardens Wetland Conservation Area; and

“Dik Dik Gardens Wetland (Conservation Area) Management Guidelines” means the management and conservation guidelines developed by the Authority in respect of Dik Dik Gardens Wetland Conservation Area and set out in the Second Schedule.

3. This Order shall apply to the use of water and land of the Dik Dik Gardens Wetland Conservation Area.

Application of Order.

4. The Dik Dik Gardens Wetland Conservation Area is hereby declared to be a Wetland Conservation Area for the purposes of the Act.

Declaration of Catchment Conservation Area.

5. The Dik Dik Gardens Wetland (Conservation Area) Management Guidelines under the Second Schedule shall come into effect upon publication of this Order and shall be the basis for conservation of the groundwater resources within the Dik Dik Gardens Wetland Conservation Area.

Management Guidelines.

6. (1) The Authority shall place signboards and beacons in or near the Dik Dik Gardens Wetland Conservation Area or in appropriate public places frequented by land and water users and at the Authority’s

Public Notices.

offices, displaying up-to-date information about the condition of the water resources of Dik Dik Gardens Wetland Conservation Area

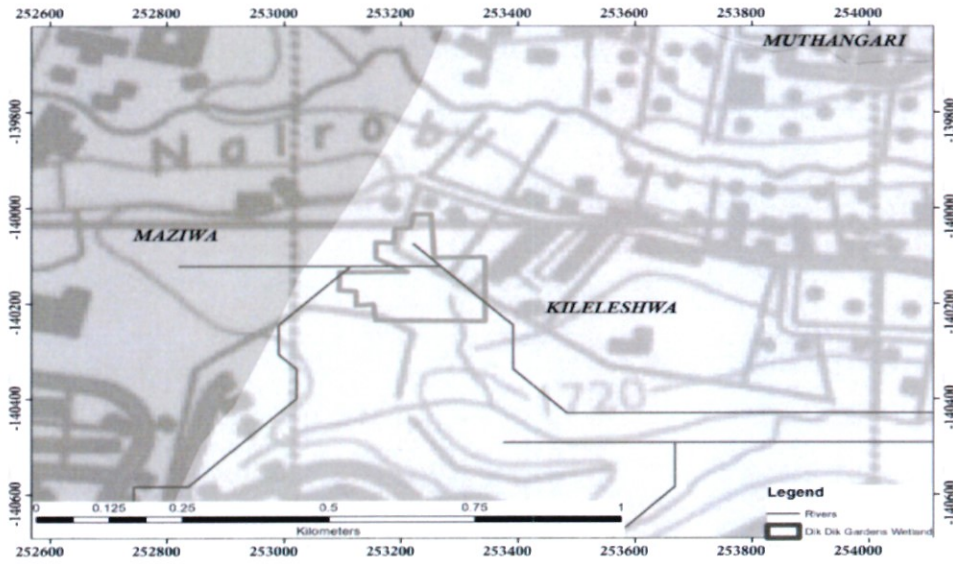
(2) The public notices shall contain information regarding the action required of water or land users to conserve and protect the water resources of the Dik Dik Gardens Wetland Conservation Area

7 Any person who contravenes this Order commits an offence and is liable upon conviction to a fine of one hundred thousand shillings or imprisonment for a term not exceeding one year, or both such fine and imprisonment

Offences

FIRST SCHEDULE (p. 2)

DIK DIK GARDENS WETLAND CONSERVATION AREA



SECOND SCHEDULE (p. 5)

THE DIK DIK GARDENS WETLAND (CONSERVATION AREA) MANAGEMENT
GUIDELINES*Accounting for every Drop!*

Water Resources Authority

*Athi Basin Area*THE DIK DIK GARDENS WETLAND (CONSERVATION AREA) MANAGEMENT
GUIDELINES*Acknowledgement*

The Water Resources Authority, Athi Basin Area (ABA) wishes to acknowledge all the stakeholders who participated in the preparation of this document.

We wish in particular to sincerely thank the Management Committee and the community members within Kirichwa Water Resources Users Association (KWRUA) for their invaluable inputs.

We also wish to thank the National Government and County Government Administration in Westlands Sub County, especially the Deputy County Commissioner, Assistant County Commissioner and the Kilimani location Chief, for their support in sensitizing and mobilizing the area community.

We acknowledge the inputs from other Government Departments and community members, especially Dik Dik Gardens Residents Association members for their self-driven concerns.

Last but not least we wish to sincerely thank the staff of Nairobi Sub Region and Athi Basin Regional Office for their tireless effort in ensuring the successful development of the document.

To all we say thank you.

Regional Manager,
Athi Basin Area–Machakos.

Acronyms

AEZ	Agro-Ecological Zone
CMS	Catchment Management Strategy
ABA	Athi Basin Area
KFS	Kenya Forest Service
KiWRUA	Kirichwa Water Resources Users Association
m a s l	Meters Above Sea Level
MoA	Ministry of Agriculture
MoL	Ministry of Lands
NGAO	National Government Administration Officers
NLC	National Land Commission
NEMA Authority	National Environment Management
RGS	Regular Gauging Station
SoK	Survey of Kenya
ToR	Terms of Reference
WDC	WRUA Development Cycle
WRM	Water Resources Management
WRA	Water Resources Authority
WRUA	Water Resources Users Association

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Acronyms

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1 Introduction and Background Information

1.1 Introduction

A catchment area is defined as the land from which water naturally flows into a water course. The status and conditions of a catchment determines the reliability, quantity and quality of its water yields. A catchment area acts like a water storage facility where during the rains, the vegetation cover allows the water ample time to percolate deep down and move as a sub-surface flow to recharge the rivers, springs and ground water storage in both shallow and deep aquifers. This sub-surface flow is slow resulting in rivers from a well maintained catchment having higher base flows even during the dry season as well as good water yield from boreholes in the vicinity. In poorly maintained and degraded catchment, the rainfall results in the rapid surface run-off which is channelled into the river courses, resulting in flash-floods and high volumes of suspended solids. Since there is little storage in such a catchment, the rivers originating from such catchment will not be able to sustain their base flows during the dry season.

Catchment areas are thus a vital component in water resource management and they should be formally delineated, gazetted, protected from encroachment and pollution and managed sustainably to maintain their ecological integrity.

1.1.1 Legal Framework for Catchment Protection:

Because of its nature, environmental management and protection in general and catchment protection and management in particular falls within the mandate of many institutions. Catchment protection is therefore, a cross-cutting issue which is spread over several laws, which have a bearing on the environment and/or natural resources management. These legislations include:

i). Constitution of Kenya.

Article 66 deals with land and provides that the State may regulate the use of any land, or any interest in or right over any land, in the public interest.

Article 69 deals with the environment and natural resources including the sustainable exploitation, utilisation, management and conservation and the equitable sharing of the accruing benefits. It is also the duty of every person to cooperate with State organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources.

Article 70 deals with the enforcement of environmental rights by any person.

ii). Water Act 2016

Section 22 provides that where the Authority is satisfied that special measures are necessary to protect catchment area or part thereof, it may, with the approval of the Minister, by order published in the Gazette declare such an area to be a protected area.

The Authority may impose such requirements, and regulate or prohibit such conduct or activities, in or in relation to a protected area that the Authority may think necessary to impose, regulate or prohibit for the protection of the area and its water resources.

Under Sections 23 of the Act, the Authority may identify a catchment area, part of a catchment area or water resource to be identified as areas to be Protected or designated as Groundwater Conservation Areas if the Authority is satisfied that doing so is necessary

for the protection of the water resource and its multiple uses. The Authority shall, in conjunction with relevant institutions and stakeholders, establish management rules or plans that shall apply to each Protected Area or Groundwater Conservation Area.

iii). Water Resources Management Rules 2007

Part IX section 116 - 120 provides for the determination of the riparian land, which as defined in Part I of these rules does not imply a change of ownership but imposes management controls on land use for water resource quality as defined in these rules.

This part deals extensively with the management of the riparian land including its management, activities that are allowed or proscribed within the riparian land.

The Authority shall undertake Public Consultation with respect to the establishment of areas to be Protected or designated as Groundwater Conservation Areas and the management rules or plans that shall apply with respect to these Areas.

iv) The Agriculture (Basic Land Usage) Rules No 6 of—

Part – of the rules provide for the protection of water course. Any person who, except with written permission of an authorised officer, cultivates or destroys the soil, or cuts down any vegetation or depastures any livestock, on any land lying within 2 metres of a water course, or, in any case of a water course more than 2 metres wide, within a distance equal to the width of that watercourse to a maximum of 30 metres, shall be guilty of an offence.

v). The Forest Act 2005

Section 26 states that upon the recommendation of the board, the Minister may, by order published in gazette, declare any local authority forest or private forest, which in the opinion of the board is mismanaged or neglected, to be a provisional forest.

The declaration envisaged under this section shall only be made where the forest is

- An important catchment area or a source of water springs;
- Is rich in biodiversity or contains rare, threatened or endangered species,
- Is of cultural or scientific significance, or
- Supports an important industry or is a source of livelihood for the surrounding communities, and
- The owner has failed to undertake specific silvicultural practices to improve the forest, or is unable to undertake the specified practice as directed by the Director of Kenya Forest Service.

vi) Survey Act (Survey Regulations)

Part XII sections 110 – 114 deals with the survey of Government Land. Specifically, section 111 deals with the aspect of riparian land as it relates to the rivers.

On all tidal rivers a reservation of not less than 30 metres in width above high-water mark shall be made for Government purposes. However, the Minister may direct that the width of this reservation shall be less than 30 metres in special cases.

vii). *Relevant Sustainable Development Goals (SDGs)*

The sustainable Development Goals have the following targets, among others—

Target 6b .Support and strengthen the participation of local communities in improving water and sanitation management

Target 6.3 - By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

Target 6.6: By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes

1.1.2 Background information on *Dik Dik Gardens Wetland*:

The Dik Dik Catchment (herein after referred to as the “wetland”) is located within Kileleshwa sub location of Kilimani location within Nairobi City County. The land under consideration measures approximately 7 acres (2.8 hectares), and had been sub divided into 17 plots and issued with Land Reference Numbers: 209/11609/1, 209/11609/2, 209/11609/3, 209/11609/4, 209/11609/5, 209/11609/6, 209/11609/7, 209/11609/8, 209/11609/9, 209/11609/10, 209/11609/11, 209/11609/, 209/11609/, 209/11609/13, 209/11609/14. The wetland is not spread over all the plots and its boundaries will be surveyed and demarcated.

The area lies within the 3BA sub basin and is part of the Nairobi river sub drainage. The land under question is in the form of a basin-like depression with an outlet to the south-east into Kirichwa Ndogo River. The major parts of three plots have wetland-like features with a very shallow water table and evidence of water coming onto the surface and flowing in a south-easterly direction to drain into the Kirichwa Ndogo River approximately 500 meters downstream of the wetland. An analysis of the drainage system in the neighbourhood confirmed the area is one of the main sources of Kirichwa Ndogo River, a tributary of Nairobi River.

1.1.3 Rationale for Catchment Protection through Gazettement;

Dik Dik Gardens wetland constitutes one of the main sources of water for Kirichwa Ndogo River. The wetland is threatened with destruction after it was surveyed and demarcated into plots whose owners hold Title Deeds for it and intend to develop structures on them. Initially, the area had been set aside for public use as a water catchment but was later alienated as private land. The Dik Dik Gardens community has consistently complained about ongoing destruction resulting in diminishing water flows and environmental degradation. The complaints have been addressed by WRA, Judiciary, Ministry of Tourism and Wildlife, and other stakeholders within the catchment without success mainly because the land owners has title deeds. To ensure proper conservation and protection of the wetland, WRA, community and other key stake-holders recognised the need for Gazettement of the land. In this regard, a stakeholders’ meeting was convened on 02/02/2021 to build consensus on the way forward. The Dik Dik Gardens community has expressed their willingness and intentions to have the wetland protected and conserved a top priority in order to assure the riparian community and other stakeholders of adequate and sustainable water resource availability.

ABA's CMS (2014 - 2022) has recognised the need to protect the wetlands and increase their environmental functions. This will be achieved through the implementation of the following strategies:

- Sensitization of the local community on the need to protect the wetland to ensure environmental sustainability,
- Development of an action plan to protect the catchment and their rehabilitation,
- Participatory mapping of the protection zones around the wetlands with the community,
- Apply the law to protect wetland (enforcement for wetlands/riparian/springs protection).

In addition, Part XI of WRM Rules section 123 - 125 sets out the process and procedure for the identification of an area as a protected or groundwater conservation area. This is the procedure used in coming up with this Gazettement document for the Dik Dik Gardens wetland.

1.2 Location and size of area to be gazetted

The area identified for Gazettement is commonly known as Dik Dik Gardens wetland. It is located in Kileleshwa sub location of Kilimani location, Westlands Sub County, Nairobi City County and within the 3BA sub basin of Athi Basin Area. The land area to be protected is approximately 7 acres (2.8 Hectares). The boundaries of the wetland will be demarcated and beacons placed in line with the pegging carried out by Water Resources Authority.

1.2.1 Watershed area.

The area that contributes surface run-off into the wetlands has been delineated through the use of ArcSWAT software. The area measures 0.028 square kilometres (2.8 hectares) out of the 5.3 km² catchment area of the Kirichwa Ndogo River as shown in Fig 1 below.



Fig.1. Location of Dik Dik Gardens Wetland catchment within Kirichwa Ndogo river catchment

Physiography, climate and rainfall.

a) Physiography

The Kirichwa Ndogo river catchment area elevation ranges from a low of 1714 m a s l near the river's confluence with Kirichwa Kubwa River to a high of 1807 m a s l to the south west of the catchment. The catchment is leaf shaped and extends upstream in north easterly direction with a length of 4.7 kilometres (see the map above).

The slope ranges between 1.2% to 8% with the steeper slopes found on the upstream part of the catchment. The catchment drains in a north-easterly direction, where it joins with the Kirichwa Kubwa River at the foot of the sub-catchment.

b) Climate

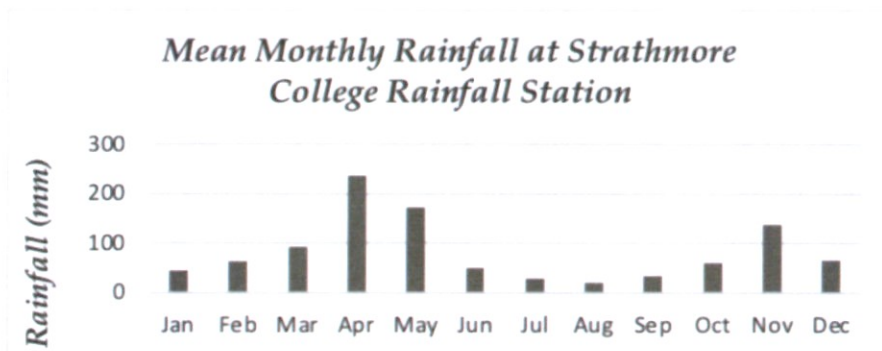
The mean monthly temperatures range between a low of 16.7°C in July to a high of 20.7°C in March.

The Kirichwa Ndogo sub catchment lies within the agro ecological zones (AEZ) IV UM. In general the area is characterized by moderate rainfall with annual rainfall of 1002.3 mm (Strathmore College Rainfall Station No. 9136199). April to June and October to December are wet or rainy seasons with maximas occurring in April and November respectively and with continental rains which are low occurring in between the two maximas. The table and figure below represent the mean monthly rainfall at Strathmore College Rainfall station.

Table 1 Mean Monthly Rainfall at Strathmore College Rainfall Station

<i>Month</i>	<i>Jan</i>	<i>Feb</i>	<i>Mar</i>	<i>Apr</i>	<i>May</i>	<i>Jun</i>	<i>Jul</i>	<i>Aug</i>	<i>Sep</i>	<i>Oct</i>	<i>Nov</i>	<i>Dec</i>	<i>Total</i>
<i>Rainfall (mm)</i>	44.3	64.1	92.5	236.9	171.5	49.8	28.2	20.2	32.2	61.4	137	64.2	1002.3

Mean Monthly Rainfall at Strathmore College Rainfall Station



c) *Vegetation;!*

The Kirichwa Ndogo catchment in which the Dik Dik Gardens wetland catchment lies exhibits is within a settled area with changed vegetation.

d) *Current land use and its adverse impacts,*

The Kirichwa Ndogo sub catchment is within the jurisdiction of Nairobi City County in an urban setting. The main land use in the area is low density residential housing area but with upcoming high density commercial cum residential buildings. The construction of buildings and an increase in the impermeable surfaces has resulted in an increased surface run-off which ends up in the wetlands as well as into the rivers channels. The run-off carries pollutants from the surface as well as sediments which are deposited in the wetland thus affecting its functions as well as water quality.

Mushrooming of these structures will impact negatively on the ecosystem health of the wetland which will eventually result into its death and subsequent loss of ecosystem services.

2 *Current Situation Analysis*

2.1 *The vulnerability of the water resource*

Kirichwa Ndogo River has a Regular Gauging Station 3BA41 located at coordinates E036.800000, S01.272778 (37M 0255194.5, 9859215) at an elevation of 1705 m.a.s.l and approximately 2.4 km downstream of the Dik Dik Gardens wetland but the station has no available daily water levels or discharge data.

In terms of geology, the area is covered by the Kerichwa Valley Tuffs which are well exposed in the Kirichwa Ndogo stream that flows through the area (Gregory, 1921p 164) and were designated by Shackleton (1945) to include a group of trachytic tuffs and agglomerates in the Nairobi area younger than the Nairobi Trachyte. These tuffs overlie the Nairobi Trachyte.

The ground water system feeds into the surface drainage system of the Kirichwa Ndogo River through the numerous springs that exist in the area.

The encroachment on the Dik Dik Gardens wetland riparian and catchment land through construction of buildings and the planting of exotic tree species has resulted into reduced recharge into the ground, lowering of the water table and a decrease in the discharge of the Kirichwa Ndogo River.

In order to have a clear understanding of the water resources availability in the Kirichwa Ndogo catchment, the available data has been used and collated with the existing daily discharge data of rated gauging stations within the 3BA sub basin. Kirichwa Ndogo river has a sub catchment area of 5.3 km² compared to the catchment area of the RGS 3BA29 of 56.5 km². The RGS 3BA29 has daily discharge data from 1961 and this has been used to estimate the probable surface water availability for the Kirichwa Ndogo river.

According to the correlation between Kirichwa Ndogo and Nairobi river sub-catchments, the following scenario on surface water availability emerges:

Surface water availability for Kirichwa Ndogo river

Probability of non-exceedance	Probability of exceedance	Flow	Flow	Available for allocation	Days	Total volume	Volume per year
%	%	m ³ /s	m ³ /day	m ³ /d	nos	Million m ³	Million m ³
99%	1%	2.358	203,770		3.65	0.74	9.5
95%	5%	0.685	59,181		18.25	1.08	8.7
90%	10%	0.324	27,953		36.50	1.02	7.6
85%	15%	0.200	17,247		54.75	0.94	6.6
80%	20%	0.120	10,350		73.00	0.76	5.7
75%	25%	0.084	7,254		91.25	0.66	4.9
70%	30%	0.055	4,725		109.50	0.52	4.3
65%	35%	0.039	3,388		127.75	0.43	3.7
60%	40%	0.030	2,561		146.00	0.37	3.3
55%	45%	0.025	2,196		164.25	0.36	2.9
50%	50%	0.021	1,848	1,037	182.50	0.34	2.6
45%	55%	0.018	1,597		200.75	0.32	2.2
40%	60%	0.016	1,362		219.00	0.30	1.9
35%	65%	0.014	1,248		237.25	0.30	1.6
30%	70%	0.012	1,037		255.50	0.27	1.3
25%	75%	0.011	940		273.75	0.26	1.1
20%	80%	0.009	810	421	292.00	0.24	0.8
15%	85%	0.008	681		310.25	0.21	0.6
10%	90%	0.006	527		328.50	0.17	0.3
5%	95%	0.005	389	0.000	346.75	0.13	0.2
1%	99%	0.001	105		361.35	0.04	0.0

2.2 *The water resource quality objectives and the current status of the water resource*

According to the ABA CMS (2014 - 2022) Kirichwa Ndogo sub-catchment can be classified as of high Commercial importance. The area has predominantly urban and/or industrial agglomeration areas including their peripheral areas, which could be commercial. This category targets at ensuring quality of water resources to develop economy and prosperity in urban areas/industrial centres.

Sustainable water resources management in the sub catchment will focus on cooperation with the commercial stakeholders, hence the need to have the interests of residents, industrialists and business community safeguarded.

2.3 The class of the water resource

The Kirichwa Ndogo sub-catchment can be classified as "Alert" as the available water is at times not of adequate quality to meet the demand. The water is of relatively good quality in the upper parts of the river but deteriorates as the river flows downstream due to pollution.

2.4 Land uses and their potential impact on the water resources

2.4.1 Human settlement

Kirichwa Ndogo river sub catchment is located within an area with predominantly formal low to medium density human settlement. Due to the development pressure, more high-rise buildings are coming up, replacing the existing single family units. This will put more pressure on the existing infrastructures and utilities, including water and sewerage services. This will have a major adverse impact on the water quality as it has been observed that where the sewerage infrastructure is not developed in pace with other developments, sewer leaks and bursts have resulted from the overwhelmed lines, polluting the water resources.

The development of more buildings will also result in an increase in the paved surfaces which are impermeable. This will generate more surface run-off resulting in water pollution and flooding as the existing storm water facilities may be inadequate to evacuate the resultant run-off.

2.4.2 Exotic Species of Plants

There exist numerous exotic species of trees which are unsuitable in a water catchment area, especially near wetland, which include the eucalyptus trees.

3 Measures for Conservation and Rehabilitation of the area

3.1 Proscribed Activities.

According to the relevant legal framework as discussed in Sub-Section 1.1.1 above, protected areas can be used by the neighbouring community in a sustainable manner. The activities to be undertaken within the protected area are those with zero impact on its ecological status and integrity. The following activities are specifically proscribed in a protected area:

- i) Tillage or cultivation
- ii) Clearing of indigenous trees or vegetation
- iii). Building of permanent structures (especially boreholes and houses)
- iv) Disposal of any form of waste
- v) Excavation of soil or development of quarries
- vi). Planting of exotic species that may have adverse effect to the water resource

3.2 Conservation Plan

The objective of the conservation plan is to protect the long term environmental sustainability of the catchment for enhanced water resources yield and maintain its ecological functions in terms of flora and fauna. This will be achieved through

- *Demarcate the wetland and its riparian zone and fence it off.*

- Gazette the Dik Dik Gardens Wetland as a protected water catchment area;
- Enforce the Dik Dik Gardens wetland guidelines;

Activity	Sub-activity	Time frame	Cost	Responsibility
Demarcate the wetland and its riparian zone	Undertake cadastral survey of the area and place beacons along the boundary	1 Month	750,000	WRA, SoK
	Develop the PDP for the demarcated wetland area	1 month	1,000,000	NCC, MoLS, WRA
	Liaise with NLC for the revocation of any privately held title deeds and acquire a title deed (in trust) for the wetland	3 Months	500,000	WRA, NLC
	Fence off the demarcated area	1 Month	3,000,000	WRA, KiWRUA
	Place signs and notices to warn the public that this is a protected area	Continuous	250,000	WRA, KiWRUA
Gazette the Dik Dik Gardens Wetland as a protected water catchment area	Assess the status of Dik Dik Gardens Wetland	1 month	300,000	WRA
	Create awareness on the status of the wetland	Continuous	500,000	WRA, WRUA
	Develop guidelines and conservation plan through stakeholders engagement	2020	2,500,000	WRA with all stakeholders
	Submit gazette instrument to the Cabinet Secretary in charge of water	2020	200,000	WRA
Enforce the Dik Dik Gardens wetland guidelines	Create awareness to stakeholders the wetland guidelines and conservation plan	2021	500,000	WRA
	Enforce Dik Dik Gardens wetland protected area guidelines, management plan and relevant legislations	continuous	0	WRA, National Govt
<i>Sub Total</i>			<i>9,500,000</i>	

3.3 Rehabilitation Plan

The objective of the rehabilitation plan is to ensure the wetland achieves its optimal performance level. This will be achieved through

- *Removal of all inappropriate/invasive species of plants,*
- *Re-vegetation of the wetland with water friendly/native species of trees and vegetation.*

Activity	Sub-activity	Time frame	Cost	Responsibility
Removal of all inappropriate/invasive species of plants	Identify and remove inappropriate and invasive tree species from the wetland	3 months	300,000	WRA, KFS, NGAO, KiWRUA
	Exotic species control	Continuous	200,000	WRA, KiWRUA
Re-vegetation of the wetland with water friendly/native species of trees and vegetation	Establish indigenous plants nursery	Continuous	2,000,000	KiWRUA, WRA
	Grow live fence on the boundary of the wetland	Continuous	1,000,000	WRA, KFS, KiWRUA
	Planting and growing of propagated seedlings (Watering and tending)	1 year	540,000	KiWRUA
Sub Total			4,040,000	

3.4 Catchment and Water Resources Monitoring

The objective of the monitoring plan is to collect and analyse Dik Dik Gardens wetland catchment and water resources data to provide information on water discharge, water quality and catchment health as a response to human activities within the neighbourhood. This will be achieved through

- *Re-establish the regular gauging station 3BA41 on Kirichwa Ndogo river to monitor water quantity and quality,*
- *Establish a full hydro-meteorological station within the Kirichwa Ndogo river sub-catchment to monitor precipitation, evaporation, humidity and temperature.*

Activity	Sub-activity	Time frame	Cost	Responsibility
Re-establish RGS3BA41 on Kirichwa Ndogo river	Identify an appropriate site and install station	3 months	200,000	WRA
	Identify, train and engage a gauge reader	Continuous	600,000	WRA, KiWRUA
Establish a full hydro-	Identify an appropriate site to install station	Continuous	0	KiWRUA, WRA

meteorological station	Procure, install and commission the equipment	Continuous	1,000,000	WRA
	Collect and analyse hydromet data	Continuous	0	WRA
Sub Total			1,800,000	

3.5 Establishment and operationalization of management structure

The objective of the management structure is to ensure that the Dik Dik Gardens wetland catchment protected area is managed in a sustainable manner with the involvement of all stakeholders under the leadership and coordination of WRA - ABA. This will be achieved through:

- *Setting up the management structure with defined ToRs and mandates;*

Activity	Sub-activity	Time frame	Cost	Responsibility
Setting up the management structure	Appoint 1No. Member from each of the following stakeholders:	3 months	300,000	WRA
	<ol style="list-style-type: none"> 1. Kenya Forest Service 2. Public Health Department, Nairobi City County; 3. National Government Administration in Nairobi City County; 4. National Environmental Management Authority; 5. Ministry of Agriculture; 6. The Kirichwa WRUA; 7. Dik Dik Gardens Residents Association 			
	Terms of References (ToR) will include but not limited to:	Continuous	0	WRA, KiWRUA
	<ul style="list-style-type: none"> ▪ To manage the 			

	<p>catchment prudently on behalf of other stakeholders</p> <ul style="list-style-type: none"> ▪ To submit quarterly reports to WRA - ABA on all planned and implemented activities, ▪ To develop by - laws and submit a copy to WRA – ABA for approval before implementation 			
	<p>Mandate and responsibilities</p> <ul style="list-style-type: none"> ▪ Promote the conservation and protection of the catchment ▪ Promote equitable distribution of the resources within the catchment ▪ Promote socio-economic and environmental sustainability of the catchment 	Continuous	0	KiWRUA, WRA
	<p>The sources of funds for the committee may include</p> <ul style="list-style-type: none"> ▪ Bee keeping ▪ Tree Nursery; ▪ Eco-tourism, ▪ Well-wishers/Donors ▪ WRA/WRUA - (WDC) 	Continuous	5,000,000	WRA
Sub Total			5,300,000	

WRA as the agent of the National Government in the regulation of use and management of water resources, will be the Coordinator of the committee. The members appointed to the Management Committee will serve on honorary basis as this will be a non-profit, non-commercial venture. The Committee will be required to solicit for

funding from well-wishers and other sources to supplement the income that may be derived from activities permitted in a protected area.

The following are the proposed linkages between various stakeholders. The arrows indicate the direction of flow of information. The dotted lines indicate WRUA can also communicate directly to communities and vice versa.

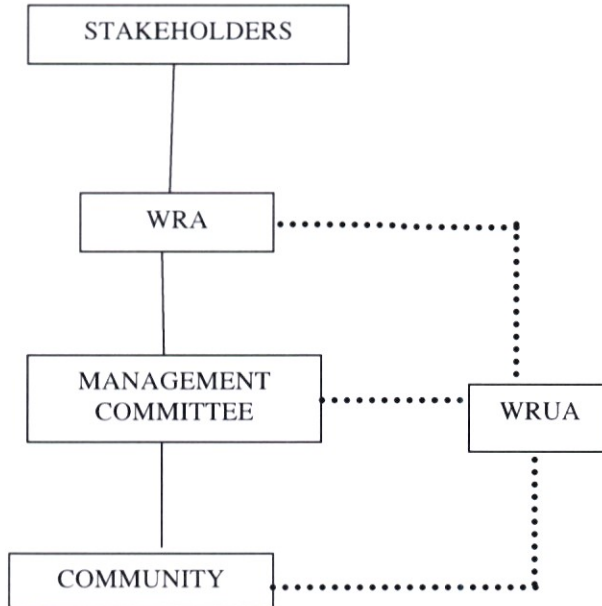


Fig.2. Reporting Linkages for the Management Committee

4 Monitoring and Evaluation Matrix

The following matrix will be used for Monitoring and Evaluation to capture detail of the progress of implementation of the planned activities.

Table.2. Monitoring and Evaluation template

Activities	Implementation Schedule		Status (% completion)	Planned Cost Ksh.	Total expenditure to date	Source of funds	Output	Comments
	Start date	End date						

Made on the 31th August, 2021.

MOHAMED M. SHURIE,
Chief Executive Officer,
Water Resources Authority.

LEGAL NOTICE NO 207

THE WATER ACT

(No 43 of 2016)

THE NGARELEN SPRINGS CATCHMENT CONSERVATION
AREA ORDER, 2021

IN EXERCISE of the powers conferred under section 23 of the Water Act, 2016, the Water Resources Authority hereby makes the following order —

THE NGARELEN SPRINGS CATCHMENT CONSERVATION
AREA ORDER, 2021

8 This Order may be referred to as the Ngarelen Springs Catchment Conservation Area Order, 2021 Citation

9 In this Order, unless the context otherwise requires—

Interpretation
No 43 of 2016

“Act” means the Water Act,

“Authority” means Water Resources Authority established under section 11 of the Act,

“Ngarelen Springs Catchment Conservation Area” means the area demarcated as hydrogeological system controlling groundwater flow within and around the Ngarelen Springs as illustrated with blue thick line in the First Schedule,

“Ngarelen Springs Catchment Conservation Protection Guidelines” means the management and conservation guidelines developed by the Authority in respect of Ngarelen Springs Catchment Conservation Area and contained in the Second Schedule

“Ngarelen springs catchment conservation Riparian Area” means all that land and water enclosed within 6 metres measured from the eye of the spring

10 This Order shall apply to the use of water and land of the Ngarelen Springs Catchment Conservation Area Application of Order

11 The Ngarelen Springs Catchment Conservation Area is hereby declared to be a Catchment Conservation Area for the purposes of the Act Declaration of Catchment Conservation Area

12 The Ngarelen Springs Catchment Management Guidelines shall come into effect immediately upon publication of this Order and shall be the basis for conservation of the water resources within the Ngarelen Springs Catchment Conservation Area Ngarelen Springs Catchment Consent Area management Guidelines

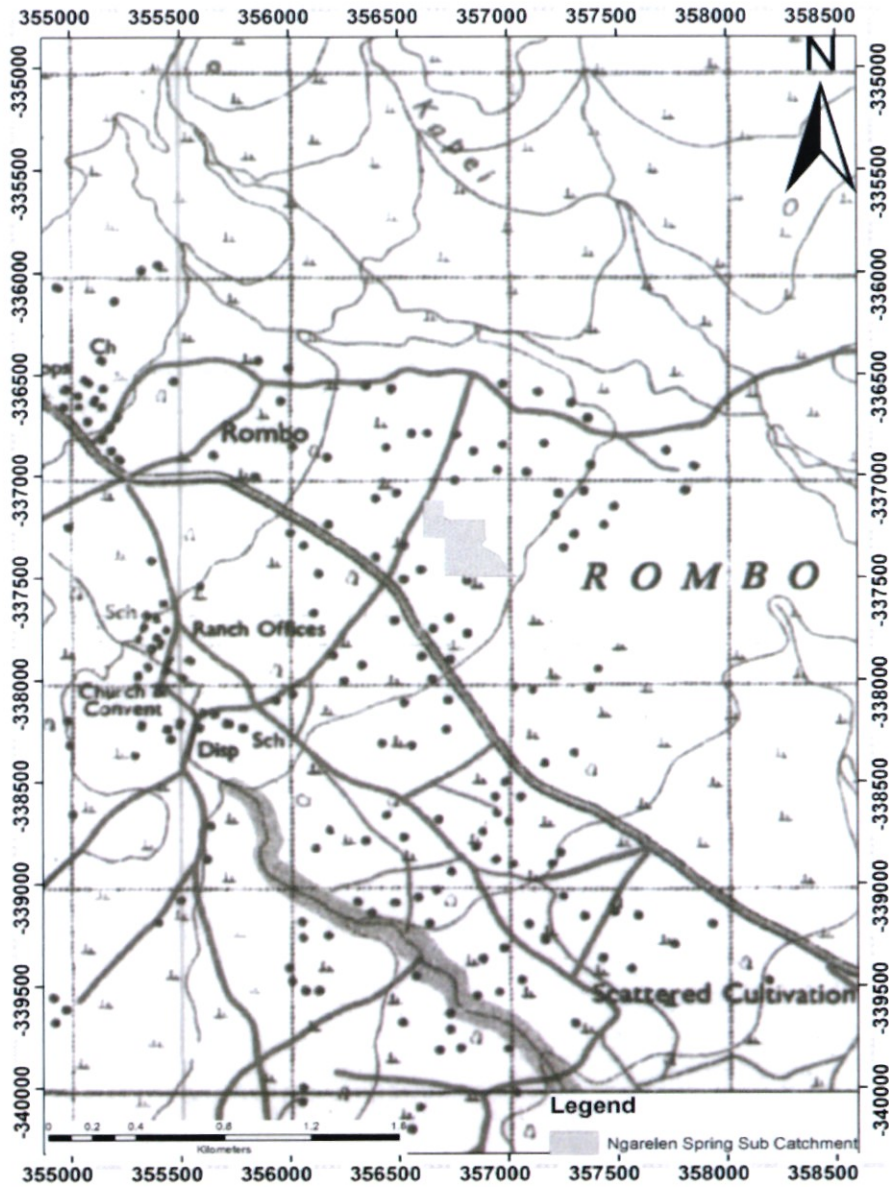
13 (1) The Authority shall place signboards and beacons in or near the Ngarelen Springs Catchment Conservation Area or in appropriate public places frequented by land and water users and at the Authority’s offices displaying up-to-date information about the condition of the water resources of the Ngarelen Springs Catchment Conservation Area Public Notices

(2) The public notices shall contain information regarding the action required of water or land users to conserve and protect the water resources of the Ngarelen Springs Catchment Conservation Area.

14. Any person who contravenes this Order and the provisions of the Ngarelen Springs Catchment Management Guidelines commits an offence and is liable upon conviction to a fine of one hundred thousand shillings or imprisonment for a term not exceeding one year, or both such fine and imprisonment.

Offences.

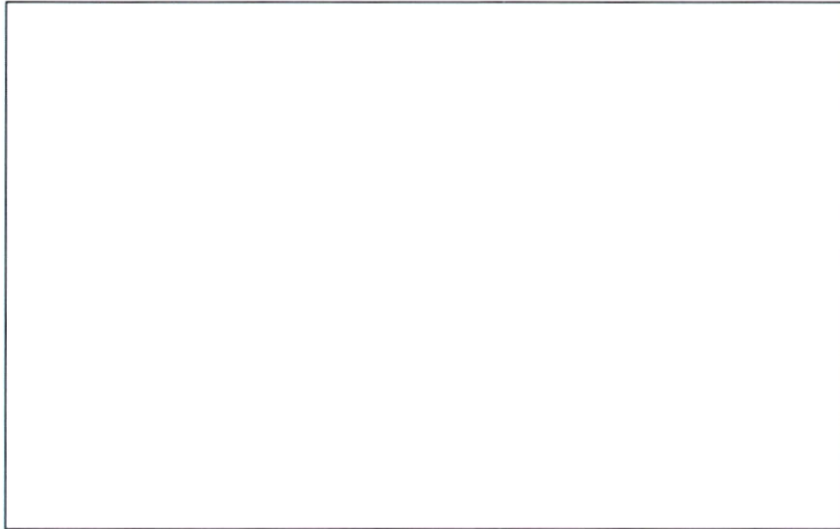
FIRST SCHEDULE
NGARELEN SPRINGS CATCHMENT CONSERVATION AREA



SECOND SCHEDULE (P. 5)
NGARELEN SPRINGS CATCHMENT CONSERVATION PROTECTION
GUIDELINES



Accounting for every Drop!



Foreword

Generally, the main problems and concerns relate to accommodating increasing water demands on the springs while maintaining and protecting the ability of the springs to support human and environmental needs in a sustainable manner. The unprotected catchment makes the springs highly vulnerable to contamination from sources such as, but not limited to effluent from solid waste, animal droppings, agro-chemicals used in farming and silt as a result of agricultural activities. Loss of vegetation cover over it may lead to higher evaporation rates compromising the spring's storage.

The Ngareleen Springs Catchment Protection Guidelines as presented encompasses four plans that are further expounded in the document to achieve the goals of sustainability of the Ngareleen springs catchment, Water Use Plan, Monitoring Plan, Springs Protection Plan, Conservation/Protection Plan and Monitoring Plan.

Acronyms

AEZ	-	Agro-Ecological Zone
CMS	-	Catchment Management Strategy
ACA	-	Athi Catchment Area
KFS	-	Kenya Forest Service
m.a.s.l	-	Meters Above Sea Level
MoA	-	Ministry of Agriculture
MoL	-	Ministry of Lands
NGAO	-	National Government Administration Officers
NLC	-	National Land Commission
NEMA	-	National Environment Management Authority
RGS	-	Regular Gauging Station
SoK	-	Survey of Kenya
ToR	-	Terms of Reference
WDC	-	WRUA Development Cycle
WRM	-	Water Resources Management
WRA	-	Water Resources Authority
WRUA	-	Water Resources Users Association

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Foreword

Acronyms

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*1.1 Introduction**1.2 Legal Background**1.3 Location and Size of Area to be gazetted*

2 Current Situation Analysis

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3 Measures for Conservation and Rehabilitation of the area

*3.1 Proscribed Activities,**3.2 Water Use Plan**3.3 Springs Protection Plan**3.4 Conservation/Protection Plan 1469**3.5 Monitoring Plan**3.6 Establishment and operationalization of management structure*

4 Monitoring and Evaluation Matrix

1. Introduction and Background Information

1.1 Introduction

A catchment area is defined as the land from which water naturally flows into a watercourse. The status and conditions of a catchment determines the reliability, quantity and quality of its water yields. A catchment area acts like a water storage facility where during the rains, the vegetation cover allows the water ample time to percolate deep down and move as a sub-surface flow to recharge the rivers, springs and ground water storage in both shallow and deep aquifers. This sub-surface flow is slow resulting in rivers from a well-maintained catchment having higher base flows even during the dry season as well as good water yield from boreholes in the vicinity. In poorly maintained and degraded catchment, the rainfall results in the rapid surface run-off, which is channelled into the river courses, resulting in flash floods and high volumes of suspended solids. Since there is little storage in such a catchment, the rivers originating from such catchment will not be able to sustain their base flows during the dry season. Catchment areas are thus a vital component in water resource management and they should be formally delineated, gazetted, protected from encroachment and pollution and managed sustainably to maintain their ecological integrity.

1.2 Legal Background

(i) Constitution of Kenya

COK 2010 Constitution of Kenya 2010 recognizes water as a human right and confers to every person the right to clean and safe water in adequate quantities in a clean and healthy environment. Consequently, water resources has drawn national attention where it has been recognized as being essential in making the country become industrialized in accordance to the Kenya's Vision 2030, a blue print for the national development agenda for Kenya.

Article 66 of the constitution deals with land and provides that the State may regulate the use of any land, or any interest in or right over any land, in the public interest.

Section 69 deals with the environment and natural resources including the sustainable exploitation, utilization, management and conservation and the equitable sharing of the accruing benefits. It is also the duty of every person to co-operate with State organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources.

(ii) Water Act, 2016

Section 22(1)

Provides that where the Authority is satisfied that in order to conserve a vulnerable water resource, special measures are necessary for the protection of catchment area or part thereof, it may, by order published in the Gazette declare such a catchment area to be a protected area.

Section 22(2)

Provides that the Authority may impose such requirements, or regulate or prohibit such conduct or activities, in or in relation to a protected area as the Authority may consider necessary to impose, regulate or prohibit for the protection of the catchment area and its water resources.

(iii) Water Resources Management Rules 2007

Part XI section 123-126 provides for protected areas and groundwater conservation areas including management guidelines related to a protected area or a ground water conservation area.

The Authority shall also undertake Public Consultation with respect to the establishment of areas to be Protected and the management rules or plans that shall apply with respect to these Areas.

Relevant Sustainable Development Goals (SDGs)

Target 6b .Support and strengthen the participation of local communities in improving water and sanitation management

Target 6.4: By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.

Target 6.6: By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, springs, rivers, aquifers and lakes

SDG 13: Target 13.1 -Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Target 13.3- Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning

Target 6.4 -By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity

Target 6.1-By 2030, achieve universal and equitable access to safe and affordable drinking water for all

1.3 Location and Size of Area to be gazetted

Rombo is sparsely populated and is entirely considered to be in a rural set up. The Ngarelen Springs mainly serve the residents of Rombo and Njukini sub locations in Rombo Location. The total population in the two sub locations is 10,728 people (KNBS Census Data). The springs are the sole source of water for the residents of the area for domestic use, livestock watering and subsistence and commercial irrigation. Due to livestock grazing and the residents drawing water directly from the springs, there has been degradation on the riparian areas. Currently the springs are tapped via intakes to support irrigation agriculture, which is the main economic mainstay of the community in Rombo. Encroachment of the spring's area for settlement and agricultural activities has led to the general degradation of the catchment area.

This proposal for the gazettelement of the Ngarelen Springs catchment area will entail clear delineation of the boundaries of the catchment and preparation of a catchment protection plan among other activities. This will prevent encroachment of the catchment area by the residents. The encroachment of the spring catchment area has paved way for settlement, grazing on the catchment and cutting down trees for charcoal burning. Prevention of further degradation of the springs catchment will guarantee enough and reliable water for both irrigation and domestic use throughout the year. This can be achieved through gazettelement of the catchment.

The Ngareleen Springs Catchment Conservation Protection Guidelines Goals are to ensure springs protection and conservation as well as sustainable use of the water resources.

Ngareleen Springs are located within Nalepo WRUA Sub Catchment in Rombo Location, Rombo Division of Loitoktok Sub County in Kajiado County, about five hundred (500) metres from Rombo Township. The spring forms parts of the tributary of Rombo and Tsavo Rivers and is part of the 3G Drainage Area. The spring catchment area of approximately 15 acres (60,703m²) is public land. However the land is not demarcated and there are individuals who have encroached into the land and put up structures and carried out agricultural activities. Livestock also regularly encroaches into the catchment when grazing and in need for water.

The springs are located as shown below.

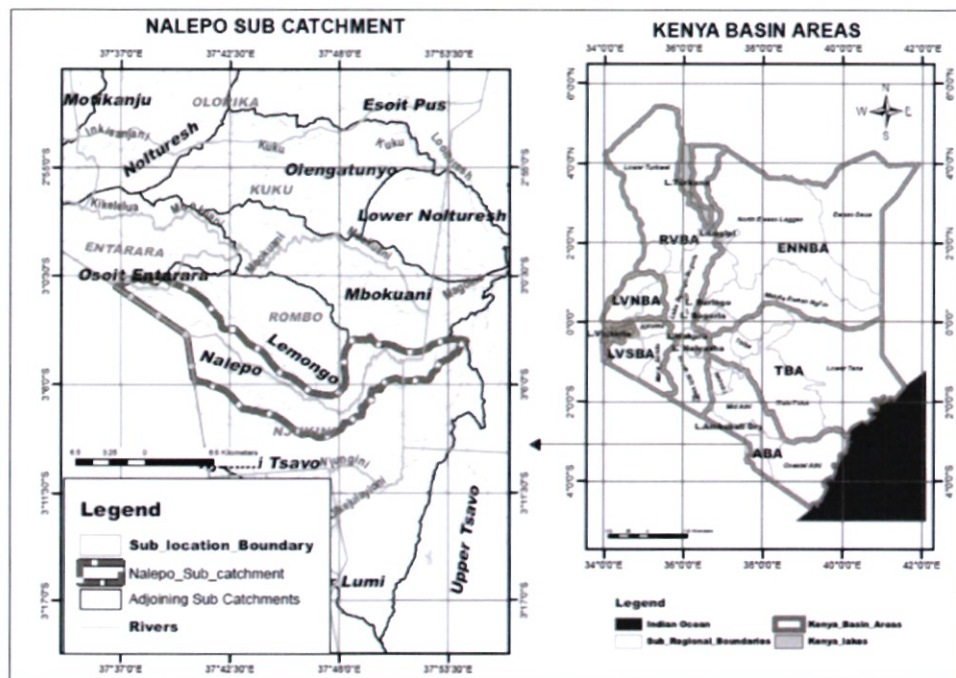


Fig.3. Location Map of Ngareleen Spring within Nalepo sub catchment

Due to degradation of the spring catchment, protection works was carried by Water Resources Authority in 2019. This involved the construction of a masonry wall around the spring eye, placement of gabions on the upstream of the spring and planting of suitable tree seedlings within the spring catchment. This resulted in an increase in the yield of the spring. Pollution of the source by livestock watering from the spring source has also been eliminated. Gazettement of the catchment will lead to further improvements. Prior to this, the average daily gauge height at RGS 3GA02 was 0.12 m. After the construction of the masonry wall, this figure has steadily increased to 0.20m. The final available discharge value available is 0.151 m³/s on 3rd May 2019.

To ensure proper conservation and protection of the Ngarelen Spring Catchment, WRA, community and other key stakeholders recognised the need for Gazettement of the land.

ACA's CMS (2014 - 2022) has recognised the need to protect the catchment areas and increase their environmental functions. This will be achieved through the implementation of the following strategies:

- Sensitization of the local community on the need to protect the catchment areas to ensure environmental sustainability;
- Development of an action plan to protect the catchment and their rehabilitation;
- Participatory mapping of the protection zones around the water catchments with the community;
- Apply the law to protect catchment areas (enforcement for wetlands/riparian/springs protection);

In addition, Part XI of WRM Rules, Rules 123 - 125 sets out the process and procedure for the identification of an area as a protected or groundwater conservation area. This procedure will be used in coming up with the Gazettement documents for the Ngarelen Springs Catchment.

Climate

The area belongs to the sub-tropical semi-arid climatic zone. The average annual temperature is 22.7°C, with the lowest in the months of July – August (20.4°C) and the highest in the month of March (24.9°C). The annual rain distribution shows two pronounced rainy seasons, namely the long rains from March to May and the short rains from November to December. The mean annual rainfall is about 526 mm. The highest mean monthly precipitation occurs in April (122.1 mm) and the lowest is in July (2.7mm).

Geology and Physiography

The soils of the area are primarily developed from undifferentiated volcanic rocks (predominantly pumice) of the Rombo series of the Tertiary age. Physiographically, the area forms part of the general and extensive piedmont plain, which extends from the foot slopes of Mt. Kilimanjaro, to the Pare Mountains in the South East. The area is generally flat (slope 1-2%) but is studded with numerous small parasitic cones (hills) and plugs, which rise above the general level of the plain.

Hydrology

Ngarelen Springs are among a number of springs in the sub catchment that flow into tributaries that form Rombo River and finally flow into Tsavo River.

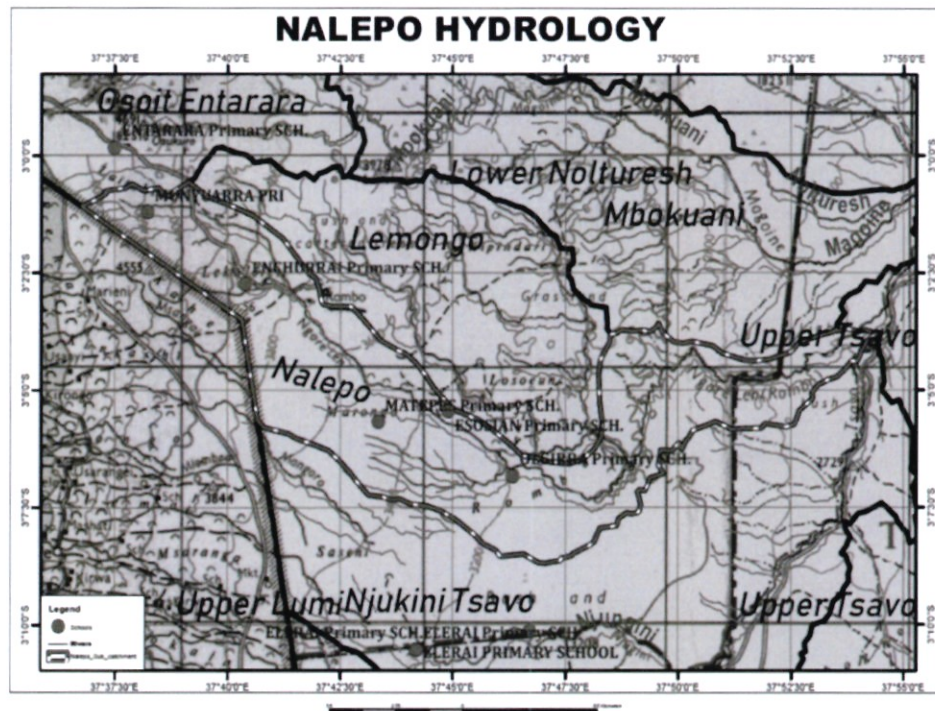


Fig.4.River Network

Vegetation

The natural vegetation of the area is mainly wooded, bushes, grassland with acacia tree bushes and shrubs and tall perennial grasses. However, irrigated agriculture has largely replaced this natural vegetation with smallholder maize, tomatoes, and onions among the crops grown.

Erosion in the catchment

A notable feature in the area is that owing to the relatively flat terrain that is mostly bare and the volcanic soils that are susceptible to erosion, several gullies have developed as the fast flowing water from the vast springs and Mt Kilimanjaro flow past the area. The soils in the sub catchment comprise of deep clay and clay whose depth is unknown. The upper and mid zones of the sub-catchment is dominated by deep clay. The lower section of the sub-catchment is characterized by clay of unknown depths

Indeed, the area upstream of Ngarelen Springs is characterized by a deep gully that was initially transporting loads of silt to the spring's area. For this reason, protective gabions were constructed on the upstream side of the spring with funds from WRA.

Springs water quality

The quality of water from Ngarelen springs can be described as good. According to analysis of water samples from the springs by the WRA Central Water Testing Laboratory in September 2019, the water was considered as chemically fit for domestic use. However, there is danger of contaminating the spring's waters due the human activities currently being undertaken within the catchment area, if intervention measures are not implemented immediately.

Catchment Issues/ Challenges

The main problems and concerns relate to accommodating increasing water demands on the springs while maintaining and protecting the ability of the springs to support human and environmental needs in a sustainable manner. The unprotected catchment makes the springs highly vulnerable to contamination from sources such as, but not limited to effluent from solid waste, animal droppings and silt as a result of agricultural activities. Loss of vegetation cover over it may lead to higher evaporation rates compromising the spring's storage.

Currently the main concerns affecting abstraction of water from the springs include:

- Depletion of fresh water resources
- Effects on water sources used by the local communities i.e. contamination.
- Effects on natural vegetation (forest cover) and agricultural land use.

Vegetation Clearing

The vegetation clearing causes direct exposure of springs to evaporation impacting on the springs yield. In addition, vegetation slows down the rain drops as they fall to the ground, giving more time for the water to infiltrate into the ground and recharge the springs. At the same time, the vegetation cover reduces the speed and hence impact of the raindrops as they hit the ground, which loosens the soils, causing erosion. The springs need to be re-vegetated and cutting of trees in the catchment area should be stopped forth with.

Climate Change

The vagaries of climate change like everywhere else has meant that there are more depressed rainfall than usual. The catchment area and the surrounding areas experience recurrent droughts leading to frequent water use conflicts among farmers and pastoralists who use water from the Ngarelen springs.

2. Current Situation Analysis

2.1 Vulnerability of the Water Resources

Ngarelen Springs have a Regular Gauging Station 3GA02 located at coordinates. Latitude E 037° 41' 35.5", Longitude S 03° 03' 07.7" at an elevation of 1157 m.a.s.l and approximately 500 m downstream of the spring. The daily water levels is available. The last discharge data available is from May 2019 (0.151m³/s).

In terms of geology the area comprises a series of volcanic layers associated with Mt. Kilimanjaro namely Kijabe-type basalts and dense olivine basalts.

Groundwater occurrence in this area can be described as poor, the dense basalts, Kijabe type basalts and melanocratic basalts are massive and not faulted, this implies porosity is poor and don't support storage of groundwater. However, the areas along River Rombo present good condition for groundwater occurrence, in addition the area east of the sub catchment indicates presence of old land surface contact point between gneiss and basalts which may have productive aquifer

Water Resources Quality Objectives and the Status of the Water Resource

According to the ACA CMS (2014 - 2022) Ngarelen Spring catchment area within the Nalepo sub-catchment can be classified as of medium Commercial importance. The

area is predominantly rural. Economic activities include farming, livestock keeping, wildlife, and tourism. This category targets at ensuring quality of water resources to develop economy and prosperity for the residents and all other stakeholders who use the water. Sustainable water resources management in the sub catchment will focus on cooperation with the all stakeholders, hence the need to have the interests of residents, small scale /large-scale farmers, pastoralists and wildlife safeguarded.

2.3 Class of the water resource

The Ngarelen Springs catchment is located within Nalepo sub catchment and can be classified as "Alert" since the available water is at times especially during the dry season of adequate quantity to meet the demands from the various competing uses. The water quality at the source and in the upstream areas is good, however it deteriorates as the stream flows downstream due to contamination from the grazing and agricultural activities.

2.4 Land Uses and their potential impact on water resources

With the influx of farming over the years, there have been significant land use changes. Large areas hitherto used as range lands were opened for farming thereby affecting land cover.

Nalepo sub catchment has witnessed extensive land use change since independence of Kenya in 1963. These changes represent the response of the population to local and exogenous opportunities and constraints. This area has experienced rapid and extensive land use change in response to a variety of economic, cultural, political, institutional and demographic processes. The community within sub catchment is changing from livestock keeping as their main livelihood activity to irrigated agriculture. This has caused severe environmental degradation (deforestation, encroachment of riparian land) leading to pollution of water sources by agro chemicals, liquid and solid wastes.

Poor methods of water use such as open canals and flooding have caused people to shift to new areas hence, more degradation of the sub catchment. The riverine vegetation along the river channels and/or near springs and other water sources has been cleared to give way to farmlands. These changes have intensified as a result of human population growth.

3. Measures for Conservation and Rehabilitation of the area

3.1 Proscribed Activities;

According to the relevant legal framework as discussed above, protected areas can be used by the neighboring community in a sustainable manner. The activities to be undertaken within the protected area are those with zero impact on its ecological status and integrity. The following activities are specifically proscribed in a protected area:

- vii).* Tillage or cultivation
- viii).* Clearing of indigenous trees or vegetation
- ix).* Building of permanent structures (especially boreholes and houses)
- x).* Disposal of any form of waste
- xi).* Excavation of soil or development of quarries
- xii).* Planting of exotic species that may have adverse effect to the water resource

3.2 Water Use Plan

The objective of this water use plan is to protect the long term water storage and supply capacity of the springs by controlling encroachment and degradation of the catchment

Actions

- Establish the water balance
- Develop water allocation plan for the Ngarelen springs
- Improve Water use efficiency (introduction of technologies)

<i>Activity</i>	<i>Sub-activity</i>	<i>Timeframe</i>	<i>Cost</i>	<i>Responsibility</i>
Establish the water balance	Assess demand and availability	2021	1,000,000	WRA, County Government, WRUA, KWS
Develop water allocation plan for the Ngarelen springs	Develop Water allocation Plan	2021	2,000,000	WRUA, WRA, KWS, County Government, Irrigation Canals
	Implement water allocation plan	continuous	5,000,000	WRA, WRUA, NEMA, County Government
	Enforce permit conditions	continuous	5,000,000	WRA, WRUA,
Enhance Water use efficiency (introduction of technologies)	Sensitization and model water use units – irrigation, domestic Demonstration on efficient water use technology	Continuous	8,000,000	WRA, WRUA, County Government
			21,000,000	

Springs Protection Plan

The objective of the protection plan is to protect Ngarelen springs by encouraging activities that enhance both water quality and quantity while discouraging activities that cause the spring's catchment to deteriorate

<i>Activity</i>	<i>Sub-activity</i>	<i>Timeframe</i>	<i>Cost</i>	<i>Responsibility</i>
Gazettement of GCA	Delineate & survey the spring's catchment area	2021	200,000	WRA, WRUA, Kajiado County Lands & Survey Team
	Develop the Part Development Plan for the spring catchment	2021	500,000	WRA, SoK, County Government of Kajiado

<i>Activity</i>	<i>Sub-activity</i>	<i>Timeframe</i>	<i>Cost</i>	<i>Responsibility</i>
	Create awareness on the status of the spring's catchment area.	Continuous	300,000	WRA, KWS, WRUA, NEMA, County Government, Irrigation Canals.
	Develop guidelines and conservation/protection plan through stakeholders engagement	2021	500,000	WRA with all stakeholders
	Submit gazette instrument to the AG	2021	500,000	WRA
Enforcement of Ngarelen springs catchment guidelines and other legislations	Enforce Ngarelen springs catchment guidelines, management plan and relevant legislations	continuous	5,000,000	WRA, County Govt, NEMA, KWS.
	Total		7,000,000	

Conservation/Protection Plan

The objective of the conservation plan is to maximize the yield of Ngarelen springs by promoting beneficial land and water management practices.

Actions

The conservation/protection plan proposes the following activities:

- Sensitization on catchment management
- Revegetation of the catchment area
 - Native Plant Propagation
 - Exotic species control
- Water storage enhancement to ease pressure on use of springs water
 - Rain water harvesting tanks
 - Water pans
- Regulating activities that may lead to pollution and destruction of the ecosystem (Charcoal burning, grazing, cultivation)
- Controlling abstraction limits and observing of safe yields
- Controlling encroachment and cancellation of illegal titles

<i>Activity</i>	<i>Sub-activity</i>	<i>Timeframe</i>	<i>Cost</i>	<i>Responsibility</i>
Re-vegetation of the	Establish native Plant Propagation	Continuous	2,000,000	WRUA, WRA, KFS

<i>Activity</i>	<i>Sub-activity</i>	<i>Timeframe</i>	<i>Cost</i>	<i>Responsibility</i>
catchment area	Grow live fence on the boundary of the catchment	Continuous	3,000,000	WRA, KFS, WRUA
	Planting and growing of propagated seedlings (Watering and tending)	Continuous	5,000,000	WRUA
	Exotic species control	Continuous	500,000	WRUA
Sub-Total			10,500,000	
Rain water storage enhancement	Installation of 20 10m ³ Rain water harvesting tanks in public institutions/public land	Continuous	4,000,000	WRA, County Government and WRUA
	Construction of 2No 10,000m ³ water pans	Continuous	10,000,000	WRA, County Government and WRUA
Sub-Total			14,000,000	
Restricting activities that may lead to pollution and destruction of the catchment	Public awareness creation	Annually	1,000,000	WRA, County Government, KWS, KFS, WRUA
	Controls/restrictions on charcoal burning, grazing, bathing & washing clothes near the springs	Continuous	300,000	WRA, County Govt, KWS, KFS, WRUA
	Enforcement	Quarterly	500,000	County Commissioner, KWS, WRA, KFS, NEMA, WRUA
Alternative livelihood activities	Promote bee keeping, poultry farming and butterfly keeping	Continuous	10,000,000	WRA, KWS, WRUA, Agriculture and livestock
Sub-Total			11,800,000	
Controlling encroachment and review of grants	Review legality of titles and resolving	Continuous	5,000,000	NLC, WRA, County Government
Sub-Total			5,000,000	
TOTAL			31,850,000	

3.5 Monitoring Plan

The objective of the monitoring plan is to collect water resources data and maintain a comprehensive database on the Ngarelen springs that provides information on water levels and quality of the spring's water.

Actions

- Establish a water quality and pollution control plan.
- Water sampling and analysis
- Establish a water resources database

<i>Action</i>	<i>Sub Activities</i>	<i>Time frame</i>	<i>Costs</i>	<i>Responsible</i>
Water sampling and analysis	Collecting samples and taking to the lab in NRB.	Continuous	200,000	WRA
	Conduct analysis of biological and physico-chemical parameters	Continuous	500,000	WRA
Capacity Building	Capacity building on data collection and monitoring	Continuous	1,000,000	stakeholders and WRA
	Total		5,700,000	

3.6 Establishment and operationalization of management structure

The objective of the management structure is to ensure that the Ngarelen Springs catchment protected area is managed in a sustainable manner with the involvement of all stakeholders under the leadership and coordination of WRA - ACA. This will be achieved through:

- *Setting up the management structure with defined ToRs and mandates;*

<i>Activity</i>	<i>Sub-activity</i>	<i>Timeframe</i>	<i>Cost</i>	<i>Responsibility</i>
Setting up the management structure	Appoint 1 No. Member from each of the following stakeholders: 8. Kenya Forest Service 9. National Environment Mgt Authority 10. National Government Administration in Kajiado South Sub County; 11. Kenya Wildlife Service;	3 months	250,000	WRA

Activity	Sub-activity	Timeframe	Cost	Responsibility
	2 Ministry of Agriculture, 3 Nalepo WRUA.			
	Terms of References (ToR) will include but not limited to <ul style="list-style-type: none"> ▪ To manage the catchment prudently on behalf of other stakeholders ▪ To submit quarterly reports to WRA - ACA on all planned and implemented activities , ▪ To develop by - laws and submit a copy to WRA – ACA for approval before implementation 	Continuous	0	WRA, Nalepo WRUA
	Mandate and responsibilities <ul style="list-style-type: none"> ▪ Promote the conservation and protection of the catchment ▪ Promote equitable distribution of the resources within the catchment ▪ Promote socio-economic and environmental sustainability of the catchment 	Continuous	0	Nalepo WRUA, WRA
	The sources of funds for the committee may include <ul style="list-style-type: none"> ▪ Bee keeping ▪ Tree Nursery, ▪ Eco-tourism, ▪ Well-wishers/Donors ▪ WRA/WRUA - (WDC) 	Continuous	5,000,000	WRA
Sub Total			5,250,000	

WRA as the agent of the National Government in the regulation of use and management of water resources, will be the Coordinator of the committee. The members

appointed to the Management Committee will serve on honorary basis as this will be a non-profit, non-commercial venture. The Committee will be required to solicit for funding from well-wishers and other sources to supplement the income that may be derived from activities permitted in a protected area.

The following are the proposed linkages between various stakeholders. The arrows indicate the direction of flow of information. The dotted lines indicate WRUA can also communicate directly to communities and vice versa.

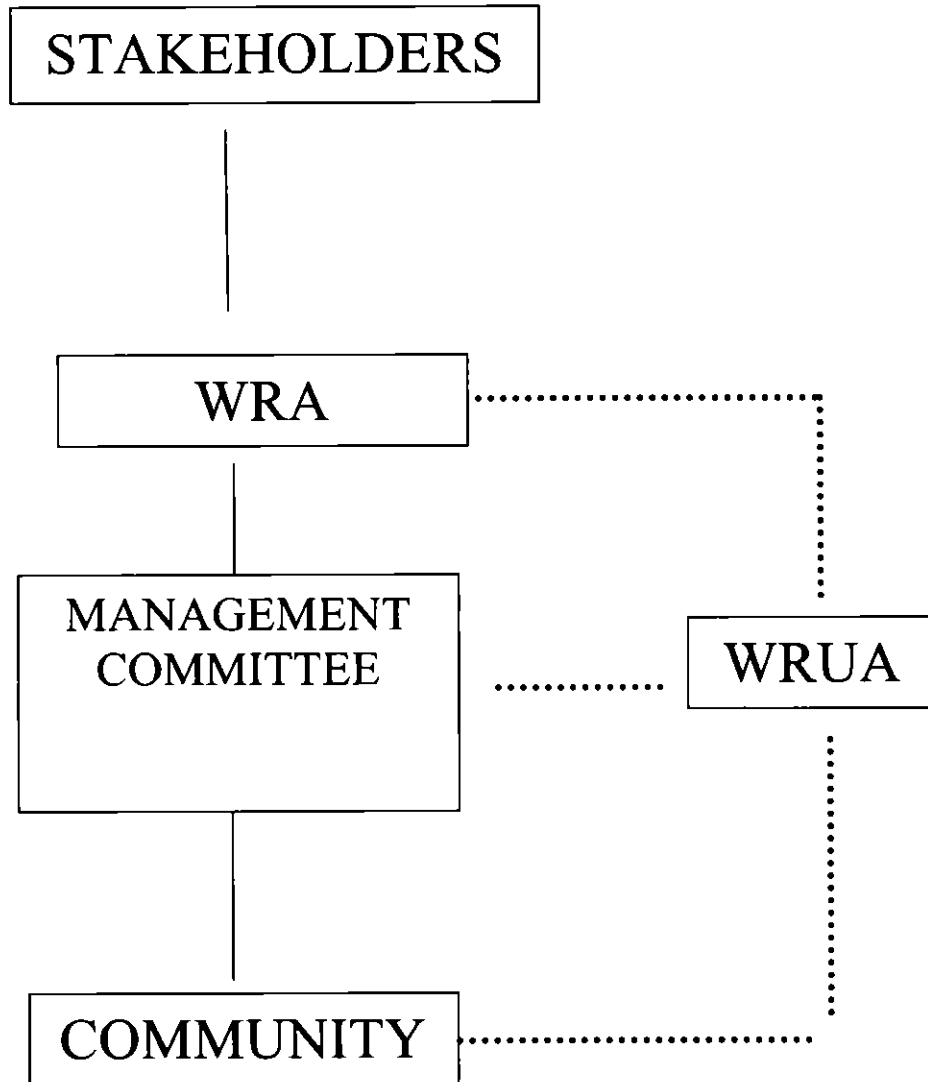


Fig 5 Reporting Linkages for the Management Committee

4. Monitoring and Evaluation Matrix

The following matrix will be used for Monitoring and Evaluation to capture detail of the progress of implementation of the planned activities.

Table 3. Monitoring and Evaluation template

Activities	Implementation Schedule		Status (% completion)	Planned Cost Ksh.	Total expenditure to date	Source of funds	Output	Comments
	start date	End date						

Dated the 3rd August, 2021.

MOHAMED M. SHURIE,
Chief Executive Officer,
Water Resources Authority.

LEGAL NOTICE NO. 208

THE WATER ACT

(No. 43 of 2016)

IN EXERCISE of the powers conferred by section 22 of the Water Act, 2016, the Water Resources Authority makes the following Order —

KIKUYU SPRINGS AQUIFER GROUNDWATER CONSERVATION AREA MANAGEMENT ORDER, 2021

1. This Order may be cited as the Kikuyu Springs Aquifer Groundwater Conservation Area Management Order, 2021.

Citation.

2. In this Order, unless the context otherwise requires —

Interpretation.

“Act” means the Water Act, 2016;

“Authority” means the Water Resources Authority established under section 11 of the Act;

‘aquifer’ means an underground geological formation able to store and yield water; and

“Kikuyu Springs Aquifer Groundwater Conservation Area Management Guidelines” means the protection and conservation guidelines as published by the Authority in respect of Kikuyu Springs Aquifer Groundwater Conservation Area.

3. (1) The Kikuyu Springs Aquifer Groundwater Conservation Area is declared to be a protected area for the purposes of the Act.

Declaration of Protected Area.

(2) The boundary for the Kikuyu Springs Aquifer Groundwater Conservation Area is as set out in the First Schedule.

4 The Kikuyu Springs Aquifer Groundwater Conservation Area Management Guidelines under the Second Schedule shall come into effect upon publication of this Order and shall be the basis for conservation of the water resources within the Kikuyu Springs Aquifer Groundwater Conservation Area

Management
Guidelines

5 (1) The Authority shall place signboards and beacons in or near the water resource or in appropriate public places frequented by water users and at the Authority's offices to display up-to-date information about the condition of the water resources of the Kikuyu Springs Aquifer Groundwater Conservation Area.

Public Notices

(2) The public notices shall contain information regarding the action required of water users to conserve and protect the water resources of the protected area

6 Any person who contravenes this Order commits an offence and is liable upon conviction to a fine of one hundred thousand shillings or imprisonment for a term not exceeding one year, or both such fine and imprisonment

Public Notices

FIRST SCHEDULE (p 3(2))

BOUNDARY FOR THE KIKUYU SPRINGS GROUNDWATER CONSERVATION
AREA BOUNDARY

BOUNDARY	SPECIFIC POSITION OF THE BOUNDARY	UTM X	UTM Y
NORTHERN	NORTH TOP SIDE	237300	9888500
NORTHERN	NORTH EASTERN	237000	9888400
WESTERN	NORTH WEST(UPPER SIDE) Western Boundary	235500	9886700
WESTERN	Middle West	235600	9882700
WESTERN	Middle West(Near Bibirioni)	235500	9881000
WESTERN	On E430 Road(Western Boundary	234600	9879300
WESTERN	On A104 Road(200m after Ngenia Road and A 104 Junction	234700	9879300
SOUTHERN	A104 (Southern Boundary)	236500	9874700
SOUTHERN	D 407	238000	9874800
EASTERN	Tunnel(Eastern Boundary) Headwaters of Ithanji River	238000	9875800
EASTERN	Half kilometer from Limuru Town- Headwaters of Tigonj River	238200	9877000
EASTERN		238500	9879200
EASTERN		238700	9881500
EASTERN		239300	9883200
EASTERN	UPLANDS TOWN IS ON THE WEST	239150	9884700
EASTERN		239100	9886800
EASTERN		239400	9887000

SECOND SCHEDULE (p. 4)



MINISTRY OF WATER AND SANITATION



WATER RESOURCES AUTHORITY

MANAGEMENT GUIDELINES FOR KIKUYU SPRINGS AQUIFER
GROUNDWATER CONSERVATION AREA

This document was prepared through a consultative process involving area Water Resource Users Associations (WRUA), Members of Parliament, the County Government of Kiambu and other stakeholders, spearheaded by WRA under the stewardship of Dan Odero, Consulting Hydrogeologist

Contents**LIST OF ACRONYMS****PREAMBLE****1 OBJECTIVE****2 MANAGEMENT GUIDELINES****2 1 Abstraction Limits****2 1 1 Maximum allowable production****2 1 2 Exclusions and exemptions****2 1 3 Transfer of groundwater out of the GCA****2 2 Borehole Siting in GCA****2 3 Borehole Construction****2 3 1 Spacing requirements****2 3 2 Sanitary seal****2 3 3 Unsuccessful boreholes****2 4 Pollution Control****3 EXEMPT AND PROHIBITED ACTIVITIES****3 1 Exempt Activities****3 2 Prohibited Activities****3 3 Enforcement****4 GROUNDWATER CONSERVATION MEASURES****4 1 Conservation activities****4 2 Conservation plan****4 3 Funding the Conservation plan**

LIST OF ACRONYMS

Abbreviation/Acronym	Meaning
GCA	Groundwater Conservation Area
WRA	Water Resources Authority
WRMA	Water Resources Management Authority
WRM Rules, 2007	Water Resources Management Rules, 2007
NEMA	National Environment Management Authority

**KIKUYU SPRINGS AQUIFER GROUNDWATER CONSERVATION AREA
MANAGEMENT GUIDELINES**

PREAMBLE

The Water Resources Management Authority (WRMA) was established under the Water Act, 2002 as a State Corporation under the Ministry of Water and Irrigation. WRMA has been in existence since 2005 following its establishment. In order to harmonize functions and mandates as contemplated under the Constitution of Kenya, 2010, the Water Act, 2016 was established and operationalized.

Water Resources Authority (WRA) is established under Section 11 of the Water Act, 2016. Pursuant to Section 6 of the Act, the Authority is an agent of the National Government responsible for regulating the management and use of water resources. WRA was operationalized on 21st of April, 2017 vide Gazette Notice No. 59.

These management guidelines were prepared by the Water Resources Authority after extensive stakeholder consultations from the Groundwater Conservation Area (GCA), including water users, area Members of Parliament, Members of County Assembly and other institutions. The GCA is established in accordance with the Water Act (2016) Section 23(2) and the Water Resources Management Rules, 2007 (with amendments in 2012).

The Water Resources Management Rules, 2007 outline the process of identifying areas to be designated as groundwater protection and conservation areas. Part XI Rule 123(1) states that:

Pursuant to Sections 23(1) and (2) of the Water Act, 2016, where the Authority is satisfied that in any area special measures for the conservation of groundwater are necessary in the public interest it may declare the area to be a groundwater conservation area. The Authority may also impose such requirements or prohibit such conduct or activities in relation to a groundwater conservation area as it may consider necessary for the conservation of the groundwater.

Part D of the Sixth Schedule of the Water Resources Management Rules 2007 sets out the contents of management rules or plans related to a protected area or groundwater conservation area and may include:

- (a) Procedures to be applied for the management of the Protected Area or Groundwater Conservation Area;
- (b) Prohibited activities;
- (c) Any measures required to be undertaken for water resource conservation and protection;
- (d) The timeframe for implementation of required measures;
- (e) Any other conditions that the Authority may consider relevant

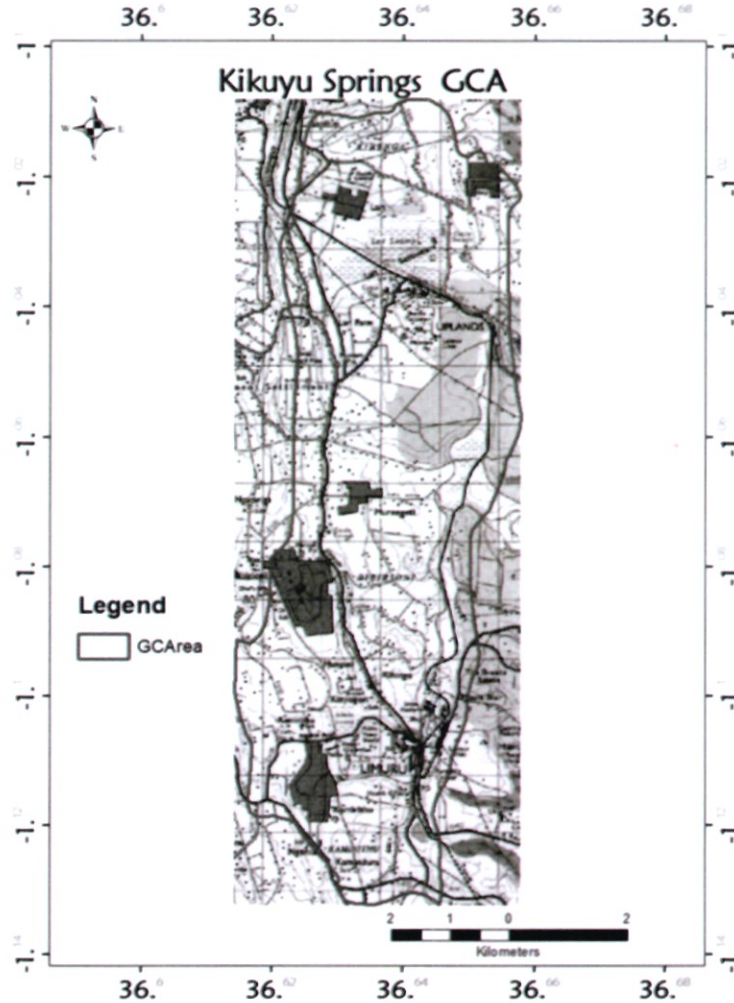
This document presents the management procedures and prohibited activities in the Kikuyu Springs Aquifer GCA.

Extent of the Groundwater Conservation Area

For ease of identification of boundaries, the southern edge of the GCA is to run west from the railway tunnel south of Limuru along the road D407 and then join road A104 near Kamandura Primary School, leave road A104 to join D409 (Ngenia Road) then cross to E430 before Kamirithu. It then leaves E430 and turns north along the top

of the escarpment east of Ngarariga Primary School. At Kirenga the boundary turns east along the road heading to Bathi River.

The boundary then turns southwards along the watershed to Githirioni where it runs on the escarpment along the railway line past Uplands all the way down through Limuru and joins back on Road D407 at the end of the railway tunnel (Map 1).



Map 1. Groundwater Conservation Area (GCA) for the Kikuyu Springs Aquifer

OBJECTIVE

The objective of the GCA guidelines is to provide a framework under which groundwater use within the conservation area will be undertaken in a manner such that the desired future condition of the resource is fulfilled.

The desired future condition is derived from the current status. According to the Kikuyu Springs Aquifer Study Report, as of 2012 up to 68% of the annual catchment recharge was abstracted annually. This is more than the 25% tested yield from each borehole into the aquifer in the Water Allocation Guidelines published by WRA for safe yield and way over the 10% of mean annual recharge sustainable groundwater yield adopted for the National Water Master Plan 2030. Fortunately, subsurface inflow from outside the catchment provides an estimated 4.1 - 5.6 MCM, which, if added to the annual recharge reduces the proportion of abstraction to between 48 and 52% of the total aquifer recharge.

These data make it clear that the aquifer is on the verge of overexploitation and certainly under pressure. This rate of abstraction and its increase is not sustainable in the long run. The effect of the increasing abstraction is seen in the deteriorating water quality as exemplified by time series data that show increasing mineralization of groundwater with time, on a linear trend. It is indicated that this state of affairs is not unique to the Kikuyu Springs aquifer: the Nairobi Aquifer Suite as a whole is under threat of over-abstraction.

The desired future condition must provide a balance between the highest practicable level of groundwater production and the conservation, preservation, protection, recharging, and prevention of waste of groundwater in the Conservation area.

Consequently, the desired future condition of the GCA is summed as follows:

- Groundwater quality remains potable by Kenyan Standards (KEBS: KS 05-459: Part 1: 1996);
- Annual renewable groundwater recharge is sustained at or over the year 2012 level, subject to climate change effects;
- Annual groundwater abstraction does not exceed 70% of the total aquifer recharge.
- Artesian pressure is maintained at a level that can sustain Ondiri Swamp and Kikuyu Springs.
- Other groundwater dependent ecosystems, here identified as wetlands, are protected.

To achieve these targets, guidelines on the following aspects of groundwater use and conservation are required:

- a). Abstraction limits;
- b). Water use prioritization;
- c). Borehole construction;
- d). Groundwater recharge;
- e). Groundwater monitoring;
- f). Water allocation;
- g). Pollution control;
- h). Enforcement.

1. MANAGEMENT GUIDELINES

2.1 Abstraction Limits

2.1.1 Maximum allowable production

To minimize as far as practicable the drawdown of the water table and the reduction of artesian pressure, to prevent interference between boreholes, to prevent degradation of water quality, to address the potential loss of opportunity to drill a new borehole because of spacing requirements, and to prevent waste the following guidelines shall apply in the GCA to regulate the production of groundwater.

(a) Availability goal

The Water Allocation Guidelines provide for 25% of the tested yield over a 24 hr period, or 60% of the tested yield over a 10-hour period as the maximum allowable production as a general WRM rule. This shall continue to apply in the GCA as it does in all groundwater systems.

(b) Permitting goal

To minimize wastage and diversion of water to other uses, and to address the potential loss of opportunity to access groundwater, the permitting goal is to match the permitted amount with the applied use. Therefore permitted amounts will be based on the per capita water requirements set out in the Design Manual as reproduced in the Water Allocation Guidelines.

Based on these standards, the maximum permitted amount for domestic use for example is 1.5 m³/ day for a household of 6. In the typical situation, domestic permits are up to 10 m³/ day which is not utilized in full or is diverted to other uses, thereby denying other users access to their water rights. WRA shall therefore make reasonable effort to not grant permit applications for more water production than is actually needed for beneficial use.

(c) Reconciliation of water use

Water use charges that apply will be reconciled with the production against the permitted limit. Where actual water use consistently falls to 40% or less of permitted amount for one year, WRA is at liberty to review the permitted amount downwards.

Where the abstraction is consistently at least 105% or more of the permitted amount for one year the water user will, along with infringement penalties specified in the WRM Rules, be subject to specific penalties that shall apply to Groundwater Conservation Areas as shall be specified in the WRM Rules.

1.1.2 Exclusions and exemptions

(a) Historic use

Historic or existing groundwater use in the GCA before the effective date of the GCA management guidelines shall be preserved, to the maximum extent practicable, consistent with WRM Rules. Historic use of groundwater may only be preserved for the actual use of the water from the Kikuyu Spring Aquifer, and cannot be transferred to a different use and may not be withdrawn from a different aquifer. Therefore, changes in abstraction and use of groundwater under a historic use operating permit may not be made without prior approval of WRA, and such changes will jeopardize the historic use preservation. Evidence of historic use must be presented to WRA before such use may be preserved. Whenever preserved, such use will be regularized by WRA to reflect the new situation under the GCA guidelines.

1.1.3 Transfer of groundwater out of the GCA

(a) Permit required

Groundwater produced from a borehole within the GCA may not be transported outside the GCA boundaries unless the operator has been issued a transfer permit under Rule 48 of WRM rules 2007. This is to ensure that any water in the aquifer should be used within the conservation area.

(b) Applicability

- i. A person proposing to transport groundwater out of the GCA must obtain a transfer permit, in addition to an abstraction permit for a new borehole, or a transfer permit for an existing one to transfer groundwater out of the GCA.
- ii. A transfer permit for the transportation of water outside the GCA is not required for the transportation of groundwater that is part of a manufactured product, or the groundwater is to be used on property that straddles the GCA boundary line, or the groundwater is used within the existing contiguous service area of an existing retail public utility that straddles the GCA boundary line.

2.2 Borehole Siting in GCA

Siting of boreholes in the GCA shall be subject to all provisions of the Codes of Practice for Borehole Siting, with particular regard to Environmental Considerations (Section 5.2). Further to this, particular emphasis shall be laid to investigation methods (5.4), which shall include an exhaustive inventory of existing data, including all existing groundwater abstraction in the neighborhood of the current application without exception. The investigating geologist/ hydrogeologist shall demonstrate in the report that this has been exhaustively done for the Technical Evaluation Committee to consider granting the authorisation to drill.

Conditions for drilling the borehole, including limits to abstraction and mandatory borehole design considerations shall be stated by the siting geologist/hydrogeologist in his/her recommendations.

In the case of new developments from Kikuyu Springs Groundwater Conservation Area, the geologist/hydrogeologist's report will include water balance before and after the proposed development.

- (a) An application for major development within the GCA shall be accompanied by an environmental impact study that demonstrates that the quality and quantity of groundwater in the GCA and the recharge function of the area will be protected, improved or restored.
- (b) Groundwater use applications that promote storm water management and infiltration will be given priority in granting of authorisations to drill within the GCA. Such plans shall be subject to approval so that they do not pose groundwater contamination risk.

2.3 Borehole Construction

These guidelines are complementary to the Codes of Practice for Construction of Boreholes and should be read in conjunction with the following documents:

- The Water Resources Management Rules, 2007

- The Code of Practice for the Siting of Boreholes
- The Code of Practice for the Supervision of Construction of Boreholes
- The Code of Practice for the Test Pumping of Boreholes
- The Water Allocation Guidelines (2010)

2.3.1 Spacing requirements

- (a) To minimize as far as practicable the drawdown of the water table and the reduction of artesian pressure, to prevent interference between boreholes and to prevent degradation of water quality the Water Resources Management Authority will enforce spacing requirements on all new boreholes in the GCA. These will be in accordance with the spacing guidelines outlined in the Section 4.4 of the Water Allocation Guidelines (2010).
- (b) Spacing requirements in the GCA do not apply to manually-dug large diameter wells abstracted by windlass or such traditional systems.
- (c) In the case of a municipal well field, WRA may waive the spacing requirements on the well field if the applicant submits adequate evidence showing that the increased cone of depression caused by the well field will not increase the impact on nearby existing wells. This calls for, *inter alia*, appropriately designed pumping tests and well field layout design.

2.3.2 Sanitary seal

The minimum depth of the sanitary seal in boreholes in the GCA shall be 6 metres; the area is a high-recharge area that has high linear transmissivity along the numerous fault zones. It also has thick soils that may be subject to piping thereby increasing the risk for groundwater contamination.

2.3.3 Unsuccessful boreholes

Abandoning of unsuccessful boreholes shall be in accordance with the Codes of Practice for Borehole Construction. In addition to backfilling, an abandoned borehole in the GCA shall be sealed in the top 6 metres to ground level with bentonite.

2.4 Pollution Control

These guidelines shall be read in conjunction with the provisions of the Water Act, 2016, WRM Rules, 2007 and such other subsidiary legislations as may be put in place from time to time in respect to Water Quality and Pollution Control.

Due to the need to prevent pollution in the GCA, upon inspection, WRA may provide notice to affected parties and issue orders to prevent pollution. If WRA determines that an emergency situation exists, a temporary order to prohibit pollution and protect public health, safety and welfare shall be issued without notice. The order shall continue in effect for the lesser of fifteen (15) days or until tests are done.

2. EXEMPT AND PROHIBITED ACTIVITIES

3.1 Exempt Activities

The following activities are exempt from the GCA requirements:

1. All residential uses and activities;
2. Other uses not listed as prohibited;

3 Activities already permitted and regulated by the Water Resources Management Rules (e.g. historic water use)

3.2 Prohibited Activities

The following activities are considered high-impact uses due to the probability and/or potential magnitude of their adverse effects on groundwater and shall be prohibited in the GCA

- A Landfills.
- B Large capacity septic systems (serving multiple dwellings or non-residential establishment of 20 or more persons per day), examples include apartment buildings, schools, religious institutions, office, industrial and commercial buildings, shopping malls, train and bus stations, hotels & restaurants, casinos,
- C Commercial activities that are not connected to an available sanitary sewer system,
- D Agricultural drainage wells (receive irrigation tail waters, other field drainage, animal yard, feedlot, or dairy runoff),
- E Untreated sewage waste disposal wells,
- F Cesspools (serving multiple dwelling or institutions, or other devices that receive wastes and which must have an open bottom and sometimes have perforated sides). note that many 'septic' tanks are actually cesspools due to design,
- G Industrial process water and disposal wells,
- H Motor vehicle waste disposal wells (surface effluent from service stations),
- I Surface mining operations
- J Activities that would significantly reduce the recharge to aquifers,
- K Radioactive waste disposal sites,

3.3 Enforcement

The enforcement of management guidelines and prohibitions shall be in accordance with provisions of the Water Resources Management Rules 2007 as established by the Water Act 2002

These shall include, *inter alia*, PART VIII - Water Use Charges, entails and additional five per cent to the water use charges

The itemized prohibited activities shall be notified to the National Environment Management Authority (NEMA), the physical planning department and the public works department in each county affected by the GCA through the gazette notice

3 GROUNDWATER CONSERVATION MEASURES

4.1 Conservation activities

The following activities will be undertaken to roll out the conservation plan post-gazettement —

- 1 Public awareness campaigns following Gazettement of the GCA

2. Reconciliation of the water permit database for the GCA with the actual abstraction points to ensure all existing groundwater abstractions are authorized.
3. Reconciliation of water use with the permit database to capture the actual abstraction against the permitted abstraction.
4. Review of permits to equitably match water needs with the permitted abstraction. A moratorium shall be declared for those found to be over-abtracting and their permits regularized to reflect the actual abstraction conditions, as long as the reviewed water use limit has been assessed positively and the permit revised accordingly.
5. Review of the (Technical Reports) contents of Hydrogeological Assessment Report for borehole siting in the GCA to include specific requirements for conservation areas. The revised rules will give reporting guidance to include definitions of the recharge/discharge conditions, identify groundwater/surface water interactions, characterize vulnerability to contamination, and provide a pre-to-post project water balance analysis and recommendation of appropriate mitigation measures.
6. Coordination with the County physical planning, agriculture, water, sanitation departments and NEMA to highlight GCA management guidelines and technical advice on County by-laws where required.
7. Installation of dedicated monitoring wells for the various aquifer levels in the GCA.
8. Enforcement of WRM Rules and GCA management guidelines.

4.2 Conservation plan

<i>Activity</i>	<i>Tool</i>	<i>Implementer</i>	<i>Stakeholders</i>	<i>Start Date</i>	<i>End Date</i>
Public awareness	Gazette Notice, GCA guidelines both full and abridged version	WRA Nairobi Sub-Region	WRA HQ, RO, Water Users, County of Kiambu	Upon gazettelement	3 months after
Reconciliation of water permit database	PDB, Borehole Database, field inventory (In case of incomplete database)	WRA Nairobi Sub-Region	WRA HQ, RO	Upon gazettelement	3 months after
Reconciliation of water use with permit database	Water use charges, abstraction survey	WRA Nairobi Sub-Region	WRA HQ, RO, Water Users	3 months after gazettelement	9 months after gazettelement
Review of existing permits	Abstraction survey data, Updated PDB	WRA Nairobi Sub-Region	WRA HQ, RO, Water Users	9 months after gazettelement	12 months after gazettelement
Review of Hydrogeological Report Contents in WRM Rules	GCA Management Guidelines, Legislative Amendment	Ministry of Water and Sanitation	WRA HQ, Consulting Hydrogeologists/ Geological Society of Kenya	Upon gazettelement	12 months after gazettelement
Coordination with the County physical planning, agriculture, water, sanitation departments and NEMA	GCA Management Guidelines, County by-laws	WRA Nairobi Sub-Region	WRA HQ, RO, County of Kiambu, NEMA	Ongoing process	Ongoing process
Installation of dedicated monitoring wells	Aquifer map, construction program	WRA Nairobi Sub-Region	WRA HQ, RO, Water Users	Upon gazettelement	24 months after gazettelement
Enforcement	Water Act 2016, WRM Rules, 2007, GCA management guidelines, Athi Basin Management	WRA Nairobi Sub-Region	WRA HQ, RO, Water Users, County of Kiambu	Upon Gazettelement	Ongoing process

<i>Activity</i>	<i>Tool</i>	<i>Implementer</i>	<i>Stakeholders</i>	<i>Start Date</i>	<i>End Date</i>
	Strategy, County by-laws, Environmental Management & Coordination Act 1999, Physical Planning Act				

4.3 Funding the Conservation plan

For the groundwater conservation plan to succeed, financial resources are required. WRA HQ has the sole responsibility of raising the resources through budgetary allocation from the Ministry of Water and Sanitation, own revenue and cooperation with stakeholders.

Made on the 31st August, 2021.

MOHAMED M SHURIE,
Chief Executive Officer,
Water Resources Authority

LEGAL NOTICE NO 209

THE WATER ACT

(No 43 of 2016)

IN EXERCISE of the powers conferred by section 23 of the Water Act, 2016, the Water Resources Authority makes the following Order —

THE LAKE KENYATTA SUB CATCHMENT CONSERVATION AREA ORDER, 2021

15 This Order may be referred to as the Lake Kenyatta Sub Catchment Conservation Area Order, 2021 Citation

16 In this Order, unless the context otherwise requires— Interpretation

“Act” means the Water Act, 2016 No 43 of 2016

“Authority” means Water Resources Authority established under Section 11 of the Water Act,

“Lake Kenyatta Sub Catchment Conservation Area” means the area demarcated as hydrogeological system controlling water flow within and around Lake Kenyatta as illustrated with blue thick line in the First Schedule,

“Lake Kenyatta Sub Catchment Conservation Riparian Area” means all that land and water enclosed within a minimum of 100 Metres and maximum 200 Metres measured from the highest water mark, and

“Lake Kenyatta Sub Catchment Conservation Protection Guidelines” means the management and conservation guidelines developed by the Authority in respect of Lake Kenyatta Sub Catchment Conservation Area and set out in the Second Schedule

17 This Order shall apply to the use of water and land of the Lake Kenyatta Sub Catchment Conservation Area

Application of Order

18 The Lake Kenyatta Sub Catchment Conservation Area is hereby declared to be a Catchment Conservation Area for the purposes of the Act

Declaration of Conservation Area

19 The Lake Kenyatta Sub Catchment Management Guidelines under the Second Schedule shall come into effect immediately upon publication of this Order in the Kenya Gazette and shall be the basis for conservation of the water resources within the Lake Kenyatta Sub Catchment Conservation Area

Management Guidelines

20 (1) The Authority shall place signboards and beacons in or near the Lake Kenyatta Sub Catchment Conservation Area or in appropriate public places frequented by land and water users and at the Authority’s offices, displaying up-to-date information about the condition of the water resources of the Lake Kenyatta Sub Catchment Conservation Area

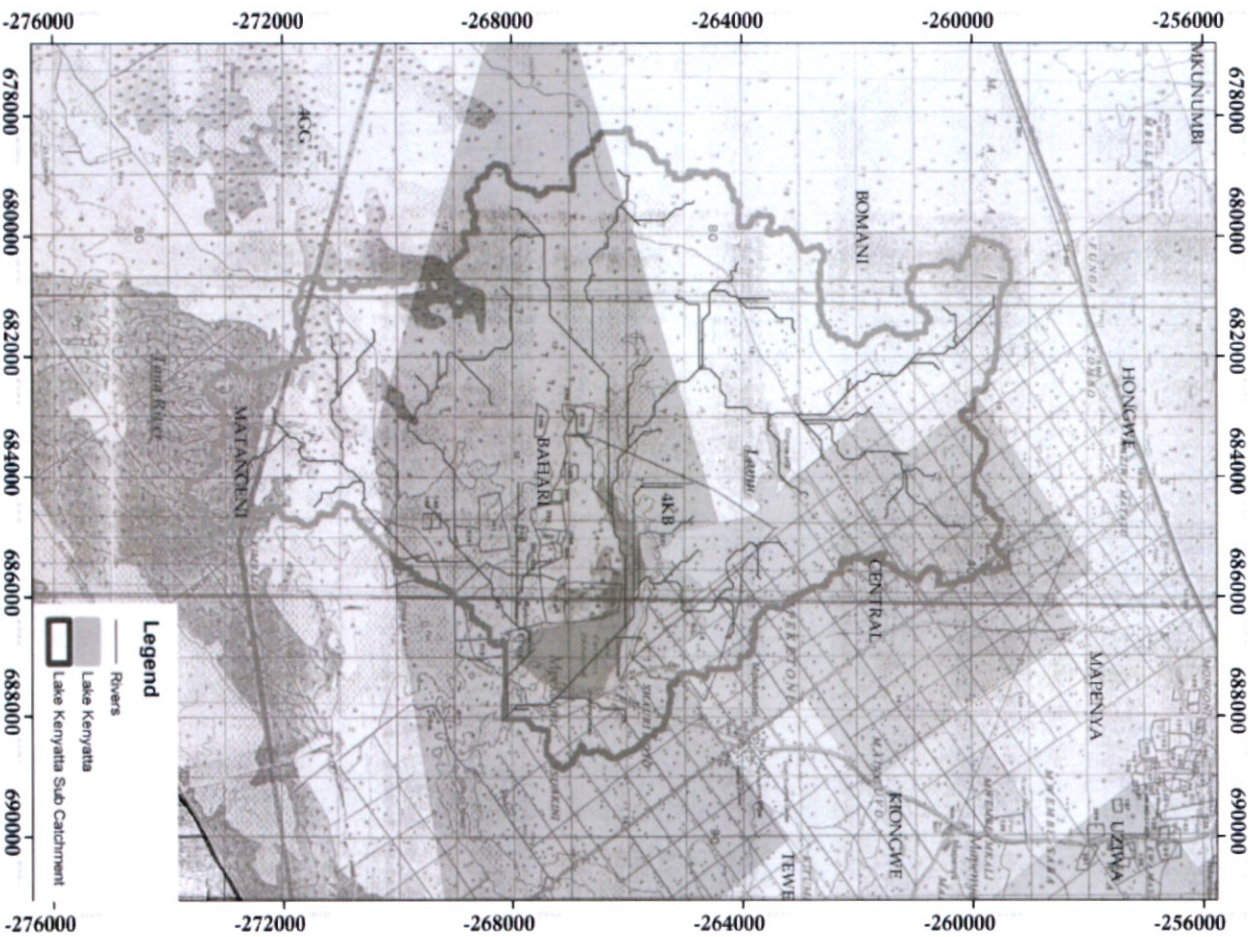
Public Notices

(2) The public notices shall contain information regarding the action required of water or land users to conserve and protect the water resources of the Lake Kenyatta Sub Catchment Conservation Area

21 Any person who contravenes this Order commits an offence and is liable upon conviction to a fine of One hundred thousand shillings or imprisonment for a term not exceeding one year, or both such fine and imprisonment.

Offences

FIRST SCHEDULE (p. 2)
LAKE KENYATTA SUB-CATCHMENT CONSERVATION AREA



SECOND SCHEDULE (p.5)
LAKE KENYATTA SUB CATCHMENT (CONSERVATION AREA)
MANAGEMENT GUIDELINES



Accounting for every Drop!

Water Resources Authority

Tana Catchment Area

LAKE KENYATTA SUB CATCHMENT (CONSERVATION AREA)
MANAGEMENT GUIDELINES

Acknowledgement

The Water Resources Authority, Tana Catchment Area (TCA) wishes to acknowledge all the stakeholders who participated in the preparation of this document.

We wish in particular to sincerely thank the Management Committee and the community members within Lake Kenyatta Water Resources Users Association (LaKWRUA) for their invaluable inputs.

We also wish to thank the National Government and County Government Administration in Lamu West Sub County, especially the Deputy County Commissioner, Assistant County Commissioner and the Chiefs, for their support in sensitizing and mobilizing the area community.

We acknowledge the inputs from other Government Departments and community members, for their self-driven concerns.

Last but not least we wish to sincerely thank the staff of Garissa Sub Region and Tana Catchment Regional Office for their tireless effort in ensuring the successful development of the document.

To all we say thank you.

Regional Manager

Tana Catchment Area - Embu

Acronyms

BMU	Beach Management Unit
CBOs	Community Based Organizations
CEO	County Environmental Officers
CFAs	Community Forest Associations
CSOs	Civil Society Organizations
DRSRS	Department of Resource Surveys and Remote Sensing
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
FD	Fisheries Development
GoK	Government of Kenya
ha	hectares
HWC	Human Wildlife Conflict
IBA	Important Bird Area
IBECA	Indigenous Biodiversity Environmental Conservation Association
ICRAF	World Agroforestry Centre
IGAs	Income Generating Activities
IMP	Integrated Management Plan
KARI	Kenya Agricultural Research Institute
KFS	Kenya Forest Service
M&E	Monitoring and Evaluation
M.C.N	Municipal Council of Mpeketoni
masl	Metres above sea level
mbgl	Metres below ground level
MEAs	Multilateral Environmental Agreements
mg/l	Milligram/litre
MoA	Department of Agriculture
MoCD	Department of Cooperative Development
MoE	Department of Education
MoEMR	Department of Environment and Natural Resources
MoGCSD	Department of Gender, Children and Social Development
MoH	Department of Health
MoL	Department of Labour
WRA	Water Resources Authority
WRUA	Water Resources Users Association

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Acronyms

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5 Introduction and Background Information

5.1 Introduction

A catchment area is defined as the land from which water naturally flows into a water course. The status and conditions of a catchment determines the reliability, quantity and quality of its water yields. A catchment area acts like a water storage facility where during the rains, the vegetation cover allows the water ample time to percolate deep down and move as a sub-surface flow to recharge the rivers, springs and ground water storage in both shallow and deep aquifers. This sub-surface flow is slow resulting in rivers from a well maintained catchment having higher base flows even during the dry season as well as good water yield from boreholes in the vicinity. In poorly maintained and degraded catchment, the rainfall results in the rapid surface run-off which is channelled into the river courses, resulting in flash-floods and high volumes of suspended solids. Since there is little storage in such a catchment, the rivers originating from such catchment will not be able to sustain their base flows during the dry season.

Catchment areas are thus a vital component in water resource management and they should be formally delineated, gazetted, protected from encroachment and pollution and managed sustainably to maintain their ecological integrity.

5.1.1 Legal Framework for Catchment Protection:

Because of its nature, environmental management and protection in general and catchment protection and management in particular falls within the mandate of various institutions. Catchment protection is therefore, a cross-cutting issue which is spread over several legislations, which have a bearing on the environment and/or natural resources management. These legislations include:

viii). Constitution of Kenya, 2010.

Article 62(3) of the Constitution vests these categories of public land on the National Government in trust for the people of Kenya- all rivers, lakes and other water bodies, the territorial sea, the exclusive economic zone, the sea bed, the continental shelf and any land between the high and low water marks. Article 66(1) further provides that the State may regulate the use of any land, or any interest in or right over any land, in the public interest.

Additionally, Article 69 obligates the State to ensure sustainable exploitation, utilisation, management and conservation of the environment and natural resources and the equitable sharing of the accruing benefits. It is also the duty of every person to cooperate with State organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources.

The Article 43(1) (d) of the Constitution guarantees every person the right to clean and safe water in adequate quantities. In order to ensure orderly delivery of this right, the Constitution has distributed water resources functions to the National Government under the Fourth Schedule. This is resultant from the provisions of Article 186 which classifies the functions assigned to each level of government as exclusive, concurrent or residual.

ix). Water Act 2016

Section 22 of the Act provides that where the Authority is satisfied that in order to conserve a vulnerable water resources, special measures are necessary to protect a

catchment area or part thereof, it may by order published in the Gazette declare such an area to be a protected area.

The Authority is empowered to impose such requirements, and regulate or prohibit such conduct or activities, in or in relation to a protected area that the Authority may consider necessary to impose, regulate or prohibit for the protection of the area and its water resources.

Under Sections 23 of the Act, where the Authority considers it necessary that special measures are necessary for the conservation of ground water are necessary in the public interest, it may by public order published in the Gazette, declare the area to be a groundwater conservation area and impose requirements or prohibit certain activities in relation to a groundwater conservation . The Authority, in conjunction with relevant institutions and stakeholders, establish management rules or plans that shall apply to each Protected Area or Groundwater Conservation Area.

x). Water Resources Management Rules 2007

Rule 124 and Part D of the Sixth Schedule to the Water Resources Management Rules 2007, sets out the contents of Management Plans related to a protected area to include:

- (i) Procedures to be applied for the management of the Protected Area or Groundwater Conservation Area;
- (ii) Prohibited activities;
- (iii) Any measures required to be undertaken for water resource conservation and protection;
- (iv) The timeframe for implementation of required measures;
- (v) Any other conditions that the Authority may consider relevant

Rules 116 to 120 of the Water Resources Management Rules 2007 provides for the determination of the riparian land, which as defined in Part I of these rules does not imply a change of ownership but imposes management controls on land use for water resource quality as defined in these rules.

This part deals extensively with the management of the riparian land including its management, activities that are allowed or proscribed within the riparian land.

The Authority shall undertake Public Consultation with respect to the establishment of areas to be Protected or designated as Groundwater Conservation Areas and the management rules or plans that shall apply with respect to these Areas.

5.1.2 Background information on *Lake Kenyatta catchment*:

Lake Kenyatta is a fresh water Lake found within Mpeketoni Division of Lamu West Sub County, Lamu County, located 60km to the south west of Lamu Island and 230 km north of Malindi town. The sub catchment covers an area of 496km². The sub catchment is under the management of Lake Kenyatta WRUA.

The sub catchment comprises of natural forest as well as the Lake Kenyatta settlement scheme, a resettlement programme initiated by the Government in the 1970's in an area with high agricultural potential.

Lake Kenyatta is partly fed by rainfall, sub-surface flow and occasionally receives water from Tana River during flood flows. Water is mainly abstracted through shallow wells

and boreholes and is used for domestic and agricultural purposes. Further, the Lake is considered a vital ground water recharge area which is important for sustaining the livelihoods of the community in the area.

5.1.3 Rationale for Catchment Protection through Gazettement;

Lake Kenyatta, one of Kenyan's oldest natural fresh water Lakes, began drying up in 2016, threatening human and wildlife populations that have for ages depended on it for water supply. Within a period of one month alone, 15 hippos died and their carcasses were spread on the drying Lake. The lake has run close to dry in recent years, and dried up completely in 1956 (National Environment Secretariat, 1985).

At some point, the Lake was completely dry and dotted with shells of millions of dead snails. The key contributor to the Lake drying up was increased human settlement around the Lake. The water ways which used to feed the Lake have been interfered with by human activity.

A management plan is therefore critical for the conservation and protection of Lake Kenyatta catchment area and the aquifers. This will tackle poor land use practices and restoration of the destroyed catchment area. The management plan will include a catchment investment plan for the sustainable management of the water resources.

TCA's CMS (2014 - 2022) recognised the need to protect the lake and increase its environmental functions. This is anticipated to be achieved through the implementation of the following strategies:

- Sensitization of the local community on the need to protect the wetland to ensure environmental sustainability;
- Development of an action plan to protect the catchment and their rehabilitation;
- Participatory mapping of the protection zones around the Lake with the community;
- Apply the law to protect wetland (enforcement for wetlands/riparian/springs protection);

In addition, Part XI of WRM Rules 2007, Rules 123 - 125 sets out the process and procedure for, the identification of an area as a protected or groundwater conservation area. This is the procedure used in coming up with this Gazettement document for the Lake Kenyatta Sub Catchment.

5.2 Location and size of area to be gazetted

The area identified for Gazettement is found within Mpeketoni division of Lamu West sub county, Lamu County, located 60km to the south west from Lamu Island and 230 km north of Malindi town. The sub catchment covers an area of 41km² and is within the 4KB-sub basin of Tana Basin Area.

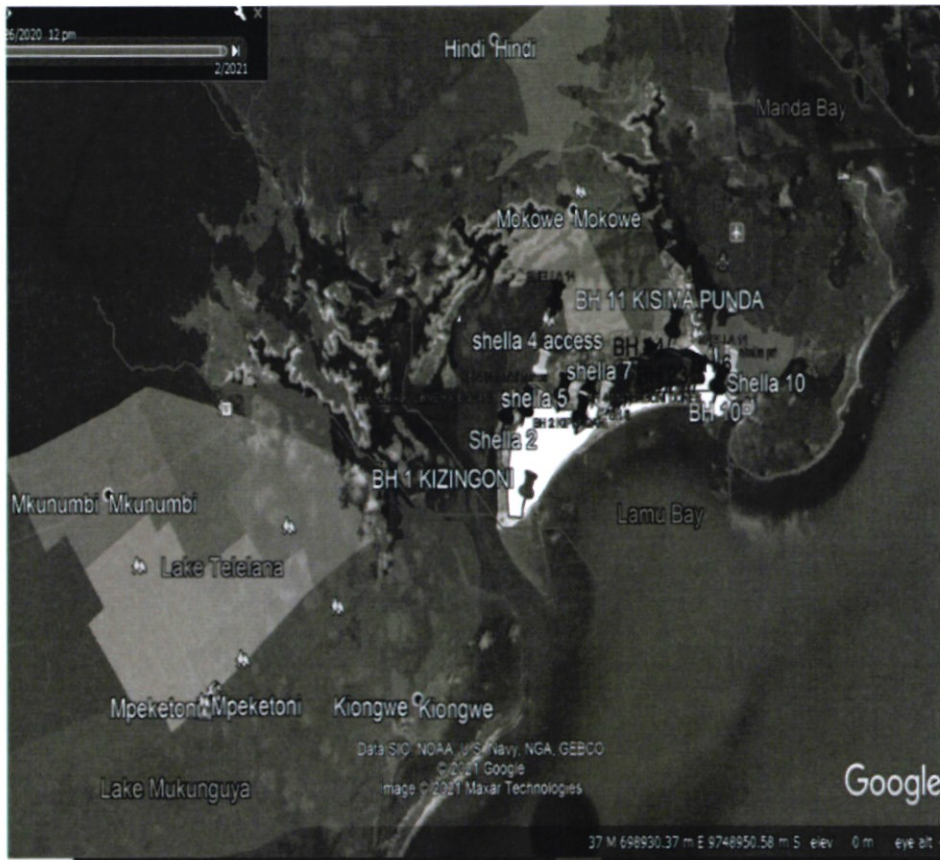


Figure 1: Location of Lake Kenyatta (Formerly Lake Mukunguya)

1.2.1 Watershed area;

Lake Kenyatta is partly fed by rainfall, sub-surface flow and occasionally receives water from Tana River during flood flows. The area that contributes surface run-off into the Lake has been delineated through the use of a GIS software. The area measures 413.5 square kilometres out of the 10,962.3 km² catchment area of the whole 4KB sub basin as shown in Fig 1 below

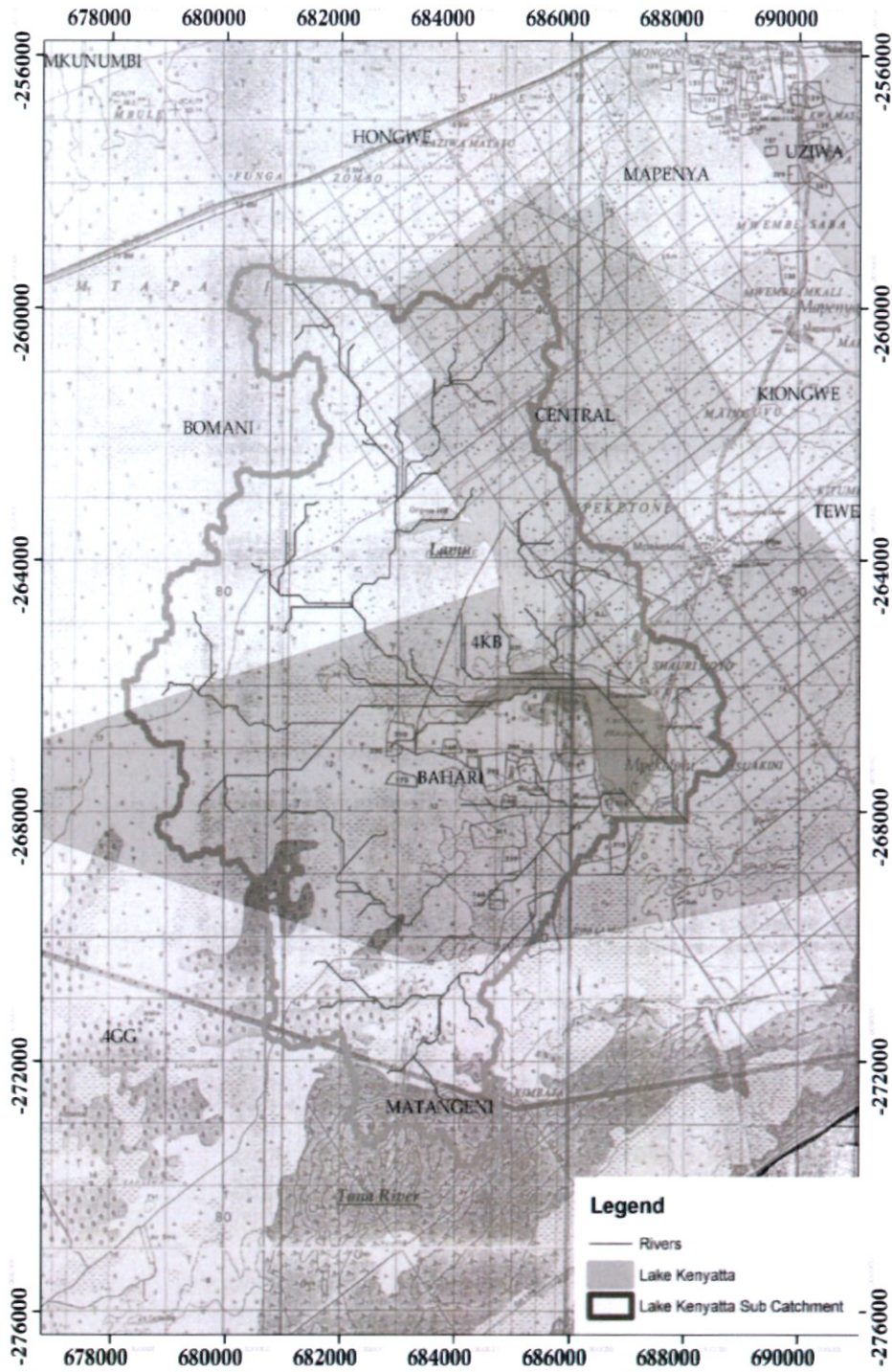


Fig. 2. Location of Lake Kenyatta sub catchment within 4KB sub basin

1.2.2 Physiography, climate and rainfall;

e) *Physiography*

Mpeketoni area is gently flat from 51ft asl to 5 ft asl towards the shore. Along the shore there is sand dune ranging from 15 meters asl to 45 meters asl. The chart below shows cross sectional topography of Mpeketoni area.



f) *Geology*

The Kenyan coastal environments are set in a passive continental margin, the evolution of which was initiated by the break-up of the mega continent Gondwanaland in the Lower Mesozoic. The initial opening of the Indian Ocean was preceded by doming, extensive faulting and down warping similar to that observed in the modern Great Rift Valley of East Africa. These tectonic movements formed a North-South trending depositional basin. During the Mesozoic, this basin was exposed to numerous marine incursions and by the Jurassic, purely marine conditions are thought to have existed.

Geology of the area reflects predominantly quaternary history of marine influence with numerous transgressions and regressions and associated sedimentary features. It is characterized by lagoonal deposits, Aeolian accumulation and fossil coral reefs, occasionally dissected by alluvial sediments.

g) *Hydrogeology*

Groundwater forms the main water supply source of fresh water under the Lake Kenyatta Water Users Association (LAKWUA) for Mpeketoni Town/settlement. The fresh water aquifer is mainly found in the fossil coral reefs which are present under most of the area. The aquifer is recharged by both deep rainwater percolation and inflow from Lake Kenyatta.

The lateral extent of the fresh water body has been found to be at least 10km², including fresh water below the Lake bottom and some below the southern western bank. The depth to the saline/freshwater interface varies between 20 and 40 metres below surface. The average thickness of the fresh water body is 20 metres. The fresh water aquifer is mainly found in the fossil coral reefs which are present under most of the area.

The boreholes depths range between 15-18 m depth. Ground Water Survey (K) LTD (1987, 1992) inferred that the depth to the saline/fresh water interface in Mpeketoni area varies between 20 and 40 metres below the surface. Within Mpeketoni and its surrounding areas, each household has a well. Most of these wells have motorized pumps.

h) Soils

The soils are composed of coral limestone overlain by a thin layer of loamy sandy soils.

The Red Loam Soils have the following characteristics:

- Fair organic matter content (humus) in top soil
- Well aerated soils which can hold water for the plants (little leaching)
- Roots do not penetrate so deeply into this soil as in the sandy soils (especially trees)
- Medium fertile soils which respond well to fertilizer applications (can hold nutrients well)
- Due to the high clay content, rain infiltrates the soil slowly (water logging). Heavy shows can cause local run-off
- Best soils for annual crops like cotton, maize, etc.

The humus of the top soil will disappear if no organic matter (plant residues, fallow crop, etc.) is added to the soil. This will lead to a hard, compacted soil surface which is difficult to cultivate when dry. The hard soil crust does not permit light showers to enter the soil and the water evaporates quickly on the surface. The soil loses its fertility if no organic matter is added.

The Sandy Soils

These have the following characteristics:

- Well-drained soils, sometimes excessively drained (leaching of nutrients)
- Low fertility, depending on the organic matter content of the top soil
- Soil (top layer) cannot hold water for the plants
- Soil is easy to cultivate

In most of these soils the clay content increases with increasing depth. That is of advantage for deep rooting plants like cotton or tree crops during dry spells or insufficient rain. The moisture is stored in or above the layer with the higher clay content and the deep rooting plants can extract water from there.

i) Hydrology

Lake Kenyatta Sub-Catchment falls under sub basin 4KB which is served by Mukuru River (seasonal), Lakes Kenyatta and Amu and numerous wetlands which include Pangani, Zebra, Majiglass and Witho.

Mukuru streams drains into Lake Kenyatta however, it has no monitoring station. To estimate the discharge empirical methods can be used to estimate the discharge. The Lake Kenyatta catchment is estimated at 41km² with an estimated annual rainfall of 1000 mm (1m).

Therefore, the annual discharge is:

Discharge=area*rainfall per/yr

Taking runoff as 10% of the total precipitation, then

$Q=41\text{km}^2*(1000 * 0.1) \text{ mm}*e$ where e=drainage coefficient

$$Q=41*10^6\text{m}^2*(1*0.1)\text{m}$$

$$Q=4.1\text{m}^3\text{ per/yr}$$

$$\text{Therefore, } Q \text{ per month} = 4.1\text{m}^3/12 = 0.342\text{m}^3/\text{Month}$$

j) Climate

Lake Kenyatta sub catchment area lies in the hot tropical region where the weather is influenced by the great monsoon winds of the Indian Ocean. Climate and weather systems on the Kenyan coast are dominated by the large scale pressure systems of the western Indian Ocean and the two distinct monsoon periods.

From November/December to early March, the Kenyan weather, particularly at the Coast, is dominated by the Northeast Monsoon (Kazikazi) which is comparatively dry. During March and April, the monsoon winds blow in an east to south-easterly direction (Kusi) with strong incursions of maritime air from the Indian Ocean bringing heavy rains. During the months of May, June, July and August, the South-easterly Monsoon influence gradually sets in and the weather becomes more stable with dull and comparatively cooler temperatures. Between September and November, the Northeast Monsoon gradually re-establishes itself and by December the northern influence is dominant once again.

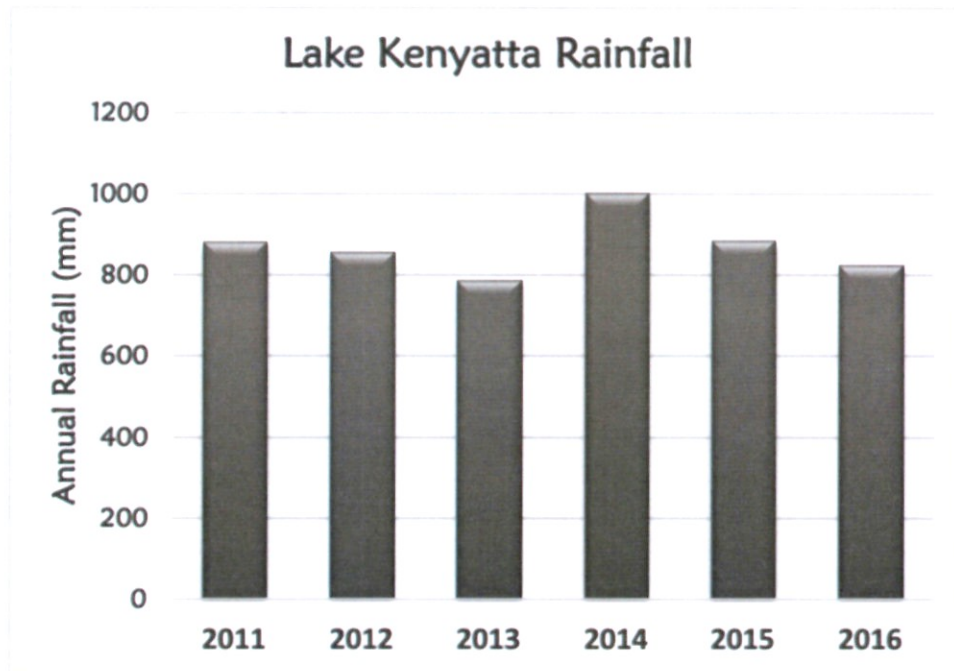
The area experiences bimodal rainfall pattern. The long rains come between late March and early June decreasing from August. Short rain occurs between October and November but decreases rapidly from December to February. Mean annual total rainfall ranges from 850- 1000 mm. Relative humidity is comparatively high all the year round, reaching its peak during the wet months of April to July. The mean minimum and maximum temperature are 22° and 30°c respectively with potential evaporation ranging between 2200 and 2400 mm/year (any rainfall station with data?)

Annual rainfall data for the station at Mpeketoni Agricultural Training Centre is shown in the figure below. As can be seen the annual rainfall amounts are generally lower than 1000 mm. The annual rainfall amounts generally depicts a declining trend. The year 2014 had slightly higher amounts than the rest of the years analysed.

The climate in the area is characterized by two rainy seasons and are distinct dry season from January to March.

The long rain (march/april-july/august) are followed by occasional coastal showers in august/September which become heavier during October and head to the short rains in November/December.

The average annual rainfall varies within the sub catchment between 1000-1100 mm/year in Mpeketoni area.



k) Current land use and its adverse impacts,

The land in the sub catchment is mainly used for farming and settlement purposes. In addition, agro forestry is in practice.

Subsistence farming include crops like maize, peas, sweet potatoes, cassava, tomatoes and Kales, cashew nuts, cotton, bananas, coconut, bixa, simsim, mangoes.

The forest coverage in the sub catchment is about 3% which is below the set national standard of 10%, composed of tree species.

The sub catchment is also characterized by urban settlement which highly depend on ground water exploitation for water supply for both domestic and irrigation purposes. This water supply is under threat of pollution from Sea water intrusion, tourism by-products, effluent from pit latrines, car washing as well as domestic washing.

Primary forests (coastal rainforests) covering present day Lamu west Sub County remained virtually intact until the Arabs, Portuguese, Germans and British arrived. Primary forests consist of mangroves along the coast and further inland, valuable indigenous tree species can be found, such as:

- *Azelia quanzensis* (Mbamba kofi)
- *Brachylaena hutchinsii* (Muhugu)
- *Chlorophora excels* (Mvule)
- *Dalbergia melanoxyton* (Mpingo).

Like other parts of the coast, that time the area was rich with indigeneous trees including fruit trees such as *Zizyphus mauritiana* (Mkunazi) and *Dialium orientale* (Mpepeta).

It is important to preserve the remnants of the indigenous forests and at the same time plant new trees and forests. All relevant departments and concerned institutions have to join forces and collaborate in creating awareness and training of students, local leaders and farmers on subjects such as:

- The dangers and consequences of deforestation
- Environmental conservation and tree planting and
- Protection of valuable indigenous trees and forests

6 *Current Situation Analysis*

6.1 *The vulnerability of the water resource*

Lake Kenyatta is partly fed by rainfall, sub-surface flow and occasionally receives water from Tana River during flood flows. Mukuru seasonal streams drains into Lake Kenyatta however, it has no monitoring station. The Lake is considered a vital ground water recharge area which is important for sustaining the livelihoods of the community in the area. Water is mainly abstracted through shallow wells and boreholes and is used for domestic and agricultural purposes.

There may be grounds for concern about over-abstraction in the Lake Kenyatta coral and sand aquifer, for abstraction of 1,411 m³/d from the aquifers. The aquifer lies close to sea level, and there is a potential risk of saltwater intrusion. The aquifer is typically 20 m thick, and the fresh-saltwater interface occurs at depths of 20 to 40 mbgl; static water levels fluctuate seasonally, but are typically <1 to three mamsl. Properly sited and constructed boreholes are capable of yields of 20 to 30 m³/hr for modest drawdowns (<1 m). Aquifer recharge is largely bank recharge from the seasonal Lake Kenyatta, which has run close to dry in recent years, and dried up completely in 1956 (National Environment Secretariat, 1985).

Lake Kenyatta aquifer is vulnerable to pollution, due to the high transmissivity of the coral limestone aquifer.

6.2 *The water resource quality objectives and the current status of the water resource*

Section 20 of the Water Act, 2016 requires the Authority to prescribe the criteria for classifying water resources for the purposes of determining water resources quality objectives for each class of water resource.

The Tana Basin plan developed by WRA in consultation with various stakeholders, Lake Kenyatta sub-catchment can be classified as of high economic and social importance. The area has predominantly urban settlement and/or Agricultural agglomeration areas. This category targets at ensuring quality of water resources to develop economy and prosperity in urban settlement areas/agricultural centres.

Sustainable water resources management in the sub catchment will focus on cooperation with the all stakeholders, hence the need to have the interests of residents, farmers and business community safeguarded.

6.3 *The class of the water resource*

The Lake Kenyatta sub-catchment can be classified as "Alarm" as the available water is at not of adequate quality to meet the demand. The lake Kenyatta aquifer is at the risk of pollution due encroachment of the catchment area and threat of salt water intrusion.

The table below shows the classification of the aquifer according to the Tana Basin plan.

Name	Geology/lithology	Area (km ²)	Depth range (m)	Yield potential (m ³ /day)	Dominant flow type(s)	Typical EC (μ S/cm)	Status
Lake Kenyatta	Fossilised coral limestone, with sand lenses and cavities overlaid by recent unconsolidated sands and sandy clays	22	<20	<86	Intergranular	<1 000	Alarm

6.4 Land uses and their potential impact on the water resources

The population of Mpeketoni town which is within the catchment area has been growing rapidly over the years. Being a commercial centre, people from other parts of the country have also been settling there in search of livelihood activities..

The potential impacts on the water resources as a result of human acts includes:

- a. Encroachment: People have encroached waterways, especially in the upper inlet and catchment along river Mukuru and also along the Lake shore;
- b. Overexploitation of available resources: The population in the area has been rapidly growing over the years. This leads to excessive pressure on available water resources and when abstraction from water wells exceed the recharge, sea water intrusion into the fresh water is experienced;
- c. Catchment degradation: Due to increased demand for sand as a building material, sand harvesting around the Lake and its catchment has increased. This affects the vegetation and loosens the soil leading to degradation of the Lake ecosystem;
- d. Soil Erosion: Following uncontrolled farming and other human activities, soil erosion leads to siltation of the Lake hence affecting its overall depth and water levels;
- e. Deforestation: The forest cover around the Lake, the immediate catchment areas as well as the wider catchment has been depleted due human activities. Forests have been cleared to give way for farmlands, settlements as well as charcoal burning and timber.
- f. Water Pollution: Due to excessive economic activities around the Lake, the water has been polluted. Fishermen do not have sanitation facilities within the Lake leading to open defecation. The farms in the surrounding area use agro-chemicals which eventually find their way into the Lake and leading to pollution. Other pollutants include solid waste that is washed into the Lake by runoff water during rains. There is evidence of loss of aquatic organisms. Shells of dead fresh water organisms are found all over the dry Lake floor.

7 Measures for Conservation and Rehabilitation of the area

Land within the Lake Kenyatta sub catchment and the feeder Mukuru River is legally owned by Government, local authorities and individuals and this in some instances limits the scope of conservation regimes that can be applied to the whole basin

7.1 Proscribed Activities.

According to the applicable legal framework as discussed in Sub-Section 1.1.1 above, protected areas can be used by the neighbouring community in a sustainable manner. The activities to be undertaken within the protected area are those with zero impact on its ecological status and integrity. The following activities are specifically proscribed in a protected area:

- xiii) Tillage or cultivation
- xiv). Clearing of indigenous trees or vegetation
- xv) Building of permanent structures (especially boreholes and houses)
- xvi) Disposal of any form of waste
- xvii). Excavation of soil or development of quarries
- xviii) Planting of exotic species that may have adverse effect to the water resource

7.2 Conservation Plan

The objective of the conservation plan is to protect the long term environmental sustainability of the catchment for enhanced water resources yield and maintain its ecological functions in terms of flora and fauna.

In the development of the management programmes, care has been taken to ensure that there are explicit and logical links between the vision statement, management objectives, and the management strategies to achieve the objectives. Each management programme is discussed in further detail in the following sections:

Goals

The overall goals of the management are to

- a) Ensure sustainable management and use of water resources within the sub-catchment while promoting equitable sharing of water resources
- b) Ensure the conservation of the catchment areas to improve on the water quantity and quality

Objectives

- i) To enhance implementation of existing regulations to protect the rights of all users
- ii) To promote water use efficiency that is hydrologically and economically beneficial to domestic, agricultural, and industrial water users and the environment
- iii) To identify funding sources to implement water conservation programs that help to enhance water resources

Activity	Sub-activity	Timeframe	Cost	Responsibility
Establish the water balance	Assess demand and availability	2021	1,000,000	WRA, County Government, WRUA, KWS
Develop water allocation plan for	Develop Water allocation Plan	2021	2,000,000	WRUA, WRA, KWS, County

Activity	Sub-activity	Timeframe	Cost	Responsibility
the Lake Kenyatta				Government,
	Implement water allocation plan	continuous	5,000,000	WRA, WRUA, NEMA, County Government
	Enforce permit conditions	continuous	5,000,000	WRA, WRUA,
Enhance Water use efficiency (introduction of technologies)	Sensitization and model water use units – irrigation, domestic Demonstration on efficient water use technology	Continuous	8,000,000	WRA, WRUA, County Government
			21,000,000	

7.3 Catchment Protection Plan

The objective of the protection plan is to protect Lake Kenyatta catchment by encouraging activities that enhance both water quality and quantity while discouraging activities that cause the catchment degradation and promoting beneficial land and water management practices.

Actions

- Sensitization on catchment management
- Revegetation of the catchment area
 - Native Plant Propagation
 - Exotic species control
- Water storage enhancement to ease pressure on use of springs water
 - Rain water harvesting tanks
 - Water pans
- Regulating activities that may lead to pollution and destruction of the ecosystem (Charcoal burning, grazing, cultivation)
- Controlling abstraction limits and observing of safe yields
- Controlling encroachment and cancellation of illegal titles

Activity	Sub-activity	Timeframe	Cost(Ksh)	Responsibility
Gazettement of Lake Kenyatta Catchment as a protected area	Delineate & survey the lake's catchment area.	2021	200,000	WRA, WRUA, Lamu County Lands & Survey Team
	Develop the Part Development Plan for the lake catchment	2021	500,000	WRA, SoK, County Government of

Activity	Sub-activity	Timeframe	Cost(Ksh)	Responsibility
				Lamu
	Create awareness on the status of the lake's catchment area	Continuous	300,000	WRA, KWS, WRUA, NEMA, County Government,
	Develop guidelines and conservation/protection plan through stakeholders engagement	2021	500,000	WRA with all stakeholders
	Submit gazette instrument to the AG	2021	500,000	WRA
Enforcement of Lake Kenyatta catchment guidelines and other legislations	Enforce Lake Kenyatta catchment guidelines, management plan and relevant legislations	continuous	5,000,000	WRA, County Govt, NEMA, KWS
Re-vegetation of the catchment area	Establish native Plant Propagation	Continuous	2,000,000	WRUA, WRA, KFS
	Grow live fence on the boundary of the catchment	Continuous	3,000,000	WRA, WRUA, KFS
	Planting and growing of propagated seedlings (Watering and tending)	Continuous	5,000,000	WRUA
	Exotic species control	Continuous	500,000	WRUA
Rain water storage enhancement	Installation of 20 10m ³ Rain water harvesting tanks in public institutions/public land	Continuous	4,000,000	WRA, County Government and WRUA
	Construction of 2No. 10,000m ³ water pans	Continuous	10,000,000	WRA, County Government and WRUA
Restricting activities that may lead to pollution and destruction of the catchment	Public awareness creation	Annually	1,000,000	WRA, County Government, KWS, KFS, WRUA
	Controls/restrictions on charcoal burning, grazing, bathing and farming near sensitive areas	Continuous	300,000	WRA, County Govt, KWS, KFS, WRUA
	Enforcement	Quarterly	500,000	County Commissioner, KWS, WRA, KFS, NEMA, WRUA

Activity	Sub-activity	Timeframe	Cost(Ksh)	Responsibility
Alternative livelihood activities	Promote bee keeping, poultry farming and butterfly keeping.	Continuous	10,000,000	WRA, KWS, WRUA, Agriculture and livestock
Controlling encroachment and review of grants	Review legality of titles and resolving	Continuous	5,000,000	NLC, WRA, County Government.
TOTAL			48,300,000	

7.4 Monitoring Plan

The objective of the monitoring plan is to collect water resources data and maintain a comprehensive database on the Ngarelen springs that provides information on water levels and quality of the spring's water.

Actions

- Establish a water quality and pollution control plan.
- Water sampling and analysis
- Establish a water resources database

Action	Sub Activities	Time frame	Costs	Responsible
Water sampling and analysis	Collecting water resources samples.	Continuous	200,000	WRA
	Conduct analysis of biological and physico-chemical parameters	Continuous	500,000	WRA
Capacity Building	Capacity building on data collection and monitoring	Continuous	1,000,000	stakeholders and WRA
Water resources monitoring	Install water level gauges	1 year	400,000	WRA, WRUA
	Total		2,100,000	

7.5 Establishment and operationalization of management structure

The objective of the management structure is to ensure that the Lake Kenyatta catchment protected area is managed in a sustainable manner with the involvement of all stakeholders under the leadership and coordination of WRA - TBA. This will be achieved through:

- Setting up the management structure with defined ToRs and mandates;

Activity	Sub-activity	Timeframe	Cost	Responsibility
Setting up the management structure	Appoint 1 No. Member from each of the following stakeholders:	3 months	250,000	WRA

Activity	Sub-activity	Timeframe	Cost	Responsibility
	14 Kenya Forest Service 15 National Environment Mgt Authority 16 National Government Administration in Kajado South Sub County, 17 Kenya Wildlife Service, 18 Ministry of Agriculture, 19 Lake Kenyatta WRUA.			
	Terms of References (ToR) will include but not limited to <ul style="list-style-type: none"> ▪ To manage the catchment prudently on behalf of other stakeholders ▪ To submit quarterly reports to WRA - ABA on all planned and implemented activities , ▪ To develop by - laws and submit a copy to WRA – ABA for approval before implementation 	Continuous	0	WRA, Nalepo WRUA
	Mandate and responsibilities <ul style="list-style-type: none"> ▪ Promote the conservation and protection of the catchment ▪ Promote equitable distribution of the resources within the catchment ▪ Promote socio-economic and environmental sustainability of the catchment 	Continuous	0	Lake Kenyatta WRUA, WRA
	The sources of funds for the committee may include <ul style="list-style-type: none"> ▪ Bee keeping ▪ Tree Nursery, ▪ Eco-tourism, ▪ Well-wishers/Donors ▪ WRA/WRUA - (WDC) 	Continuous	5,000,000	WRA
Sub Total			5,250,000	

WRA as the agent of the National Government in the regulation of use and management of water resources, will be the Coordinator of the committee. The members appointed to

the Management Committee will serve on honorary basis as this will be a non-profit, non-commercial venture. The Committee will be required to solicit for funding from well-wishers and other sources to supplement the income that may be derived from activities permitted in a protected area.

The following are the proposed linkages between various stakeholders. The arrows indicate the direction of flow of information. The dotted lines indicate WRUA can also communicate directly to communities and vice versa.

7.6 Catchment and Water Resources Monitoring

The objective of the monitoring plan is to collect and analyse Lake Kenyatta catchment and water resources data to provide information on water discharge, water quality and catchment health as a response to human activities within the neighbourhood. This will be achieved through:

The following are the proposed linkages between various stakeholders. The arrows indicate the direction of flow of information. The dotted lines indicate WRUA can also communicate directly to communities and vice versa.

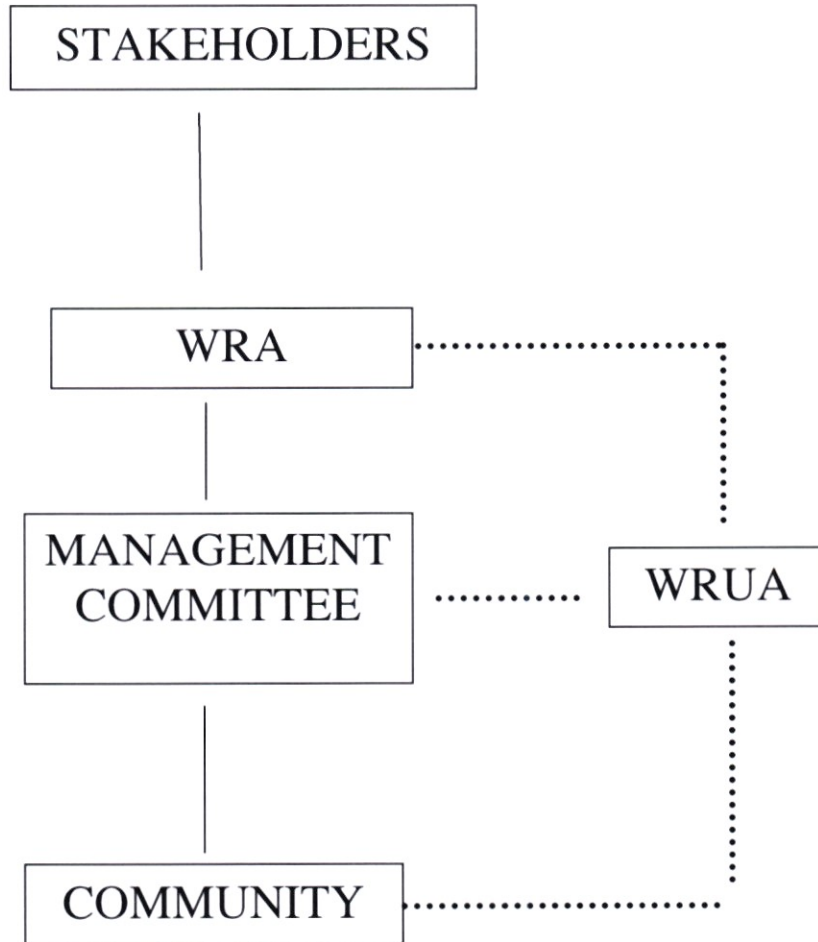


Fig.3.Reporting Linkages for the Management Committee

4 Monitoring and Evaluation Matrix

The following matrix will be used for Monitoring and Evaluation to capture detail of the progress of implementation of the planned activities

Table 4 Monitoring and Evaluation template

Activities	Implementation Schedule		Status (% completion)	Planned Cost Ksh	Total expenditure to date	Source of funds	Output	Comments
	start date	End date						

Made on the 31st August, 2021

MOHAMED M SHURIE,
Chief Executive Officer,
Water Resources Authority

LEGAL NOTICE NO 210

THE WATER ACT

(No 43 of 2016)

IN EXERCISE of the powers conferred by section 23 of the Water Act, 2016, the Water Resources Authority makes the following Order —

THE AMU SAND-DUNES GROUNDWATER CONSERVATION
AREA ORDER, 2021

22 This Order may be referred to as the Amu Sand-dunes Groundwater Conservation Area Order, 2021 Citation

23 In this Order, unless the context otherwise requires — Interpretation
No 43 of 2016

“Act” means the Water Act,

“Authority” means Water Resources Authority established under section 11 of the Water Act,

“Amu Sand-dunes Groundwater Conservation Area” means the area demarcated as hydrogeological system controlling groundwater flow within and around the Amu sand dunes as illustrated with blue thick line in the First Schedule,

“Amu Sand-dunes Groundwater Conservation Riparian Area” means all that land and water enclosed within 30 metres from the highest recorded tide or sea level of the Amu Sand-dunes Groundwater Conservation Area, and

“Amu Sand-dunes Groundwater Conservation Protection Guidelines” means the management and conservation guidelines

developed by the Authority in respect of Amu Sand-dunes Groundwater Conservation Area and contained in the Second Schedule.

24. This Order shall apply to the use of water and land of the Amu Sand-dunes Groundwater Conservation Area.

Application of Order.

25. The Amu Sand-dunes Groundwater Conservation Area is hereby declared to be a Groundwater Conservation Area for the purposes of the Act.

Declaration of Conservation Area.

26. The Amu Sand dunes aquifer Management Guidelines shall come into effect immediately upon publication of this Order and shall be the basis for conservation of the groundwater resources within the Amu Sand-dunes Groundwater Conservation Area.

Management Guidelines.

27. (1) The Authority shall place signboards and beacons in or near the Amu Sand-dunes Groundwater Conservation Area or in appropriate public places frequented by land and water users and at the Authority's offices; displaying up-to-date information about the condition of the water resources of the Amu Sand-dunes Groundwater Conservation Area .

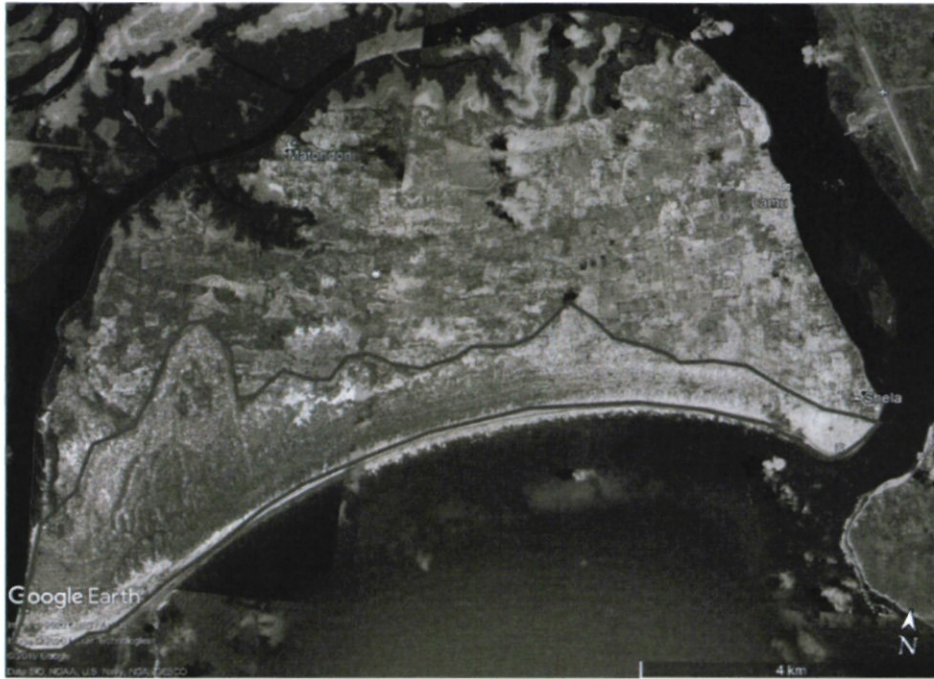
Public Notices.

(2) The public notices shall contain information regarding the action required of water or land users to conserve and protect the water resources of the Amu Sand-dunes Groundwater Conservation Area.

28. Any person who contravenes this Order and the provisions of the Amu Sand-dunes Management Guidelines commits an offence and is liable upon conviction to a fine of one hundred thousand shillings or imprisonment for a term not exceeding one year, or both such fine and imprisonment.

Offences.

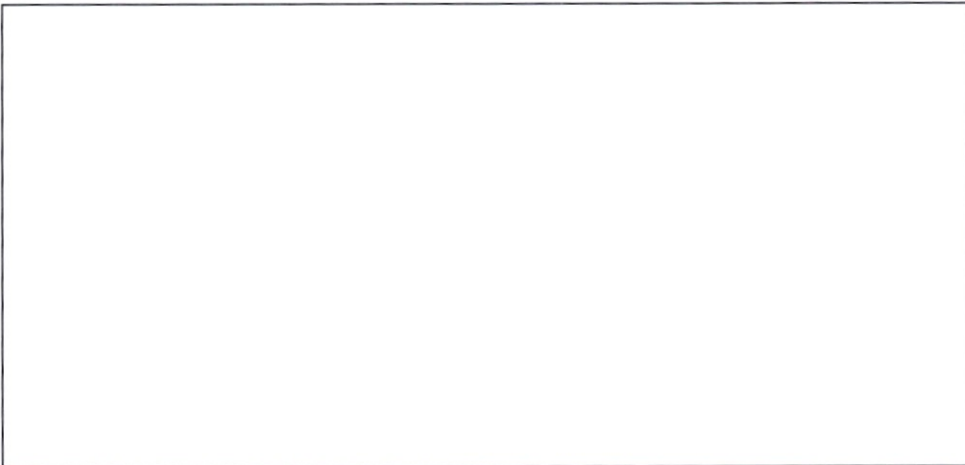
FIRST SCHEDULE
AMU SAND-DUNES GROUNDWATER CONSERVATION AREA



SECOND SCHEDULE

AMU GROUNDWATER (CONSERVATION AREA) MANAGEMENT GUIDELINES

**MINISTRY OF WATER AND
SANITATION**



This document was prepared through a consultative process involving area Water Resource Users Associations (WRUA), the County Government of Lamu and other stakeholders spearheaded by WRA

List of Abbreviations

GCA	Ground Water Conservation Area
LAWASCO	Lamu Water and Sewerage Company
NEMA	National Environmental Management Authority
NLC	National Land Commission
KEBS	Kenya Bureau of Standards
KFS	Kenya Forestry Services
KMA	Kenya Marine Agency
KMD	Kenya Meteorological Department
KNBS	Kenya National Bureau of Statistics
KPA	Kenya Ports Authority
KTB	Kenya Tourism Board
KTDC	Kenya Tea Development Corporation
KWS	Kenya Wildlife Services
NMK	National Museums of Kenya
SCMP	Sub Catchment Management Plan
WA	Water Act
WRA	Water Resources Authority
WRM	Water Resources Management
WRUA	Water Resources Users' Association
WWF	World Wide Fund

AMU SAND DUNES AQUIFER GROUNDWATER CONSERVATION AREA
MANAGEMENT GUIDELINES

PREAMBLE

These management guidelines were prepared by the Water Resources Authority after extensive stakeholder consultations for the proposed Amu Sand Dunes Aquifer Groundwater Conservation Area (GCA). The stakeholders include; National Government departments (National Museums of Kenya(NMK), Ministry of Interior and Coordination National Government, National Environmental Management Authority (NEMA), Kenya Forest Services (KFS), Kenya Wildlife Services (KWS), County Government of Lamu, AMU Water Resource Users Association (WRUA), Public, Amu Council of Elders and other institutions. The GCA is established in accordance with Fourth Schedule of the Water Act (2016) and the Water Resources Management Rules, 2007 and subsequent legislations.

The Water Resources Management Rules, 2007 outline the process of identifying areas to be designated as groundwater protection and conservation areas.

Section 23 of the Water Act, 2016, provides that where the Authority is satisfied that in any area special measures for the conservation of groundwater are necessary in the public interest, it may by order published in the Gazette, declare the area to be a groundwater conservation area. The Authority is also mandated to impose such requirements or prohibit such conduct or activities in relation to a groundwater conservation area as it may consider necessary for the conservation of the groundwater.

Accordingly, these Guidelines will come into operation upon publication in the *Gazette* or such other time as the publication shall prescribe.

Section 124 and Part D of the Sixth Schedule of the Water Resources Management Rules 2007, sets out the contents of management rules or plans related to a protected area or groundwater conservation area and may include:

1. *Procedures to be applied for the management of the Protected Area or Groundwater Conservation Area;*
2. *Prohibited activities;*
3. *Any measures required to be undertaken for water resource conservation and protection;*
4. *The timeframe for implementation of required measures;*
5. *Any other conditions that the Authority may consider relevant*

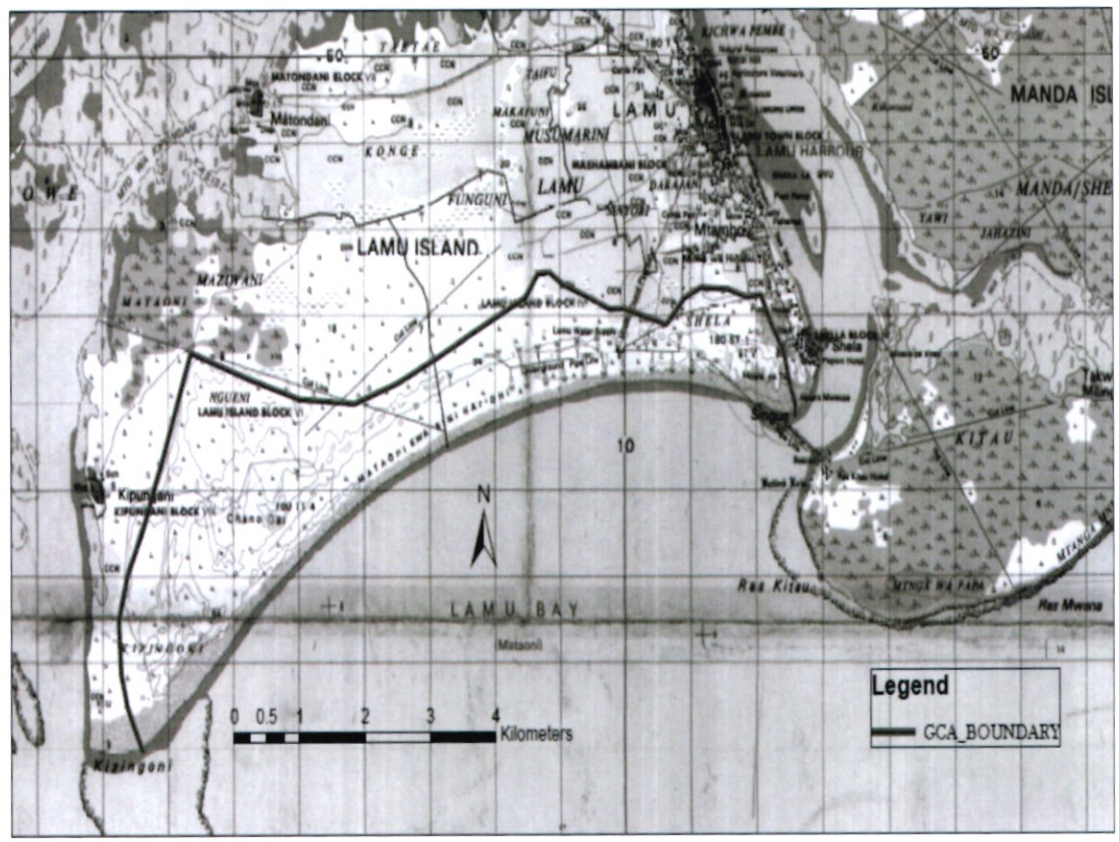
This document presents the proposed management procedures and prohibited activities in the Amu Sand Dunes Aquifer GCA.

Extent of the Amu GCA

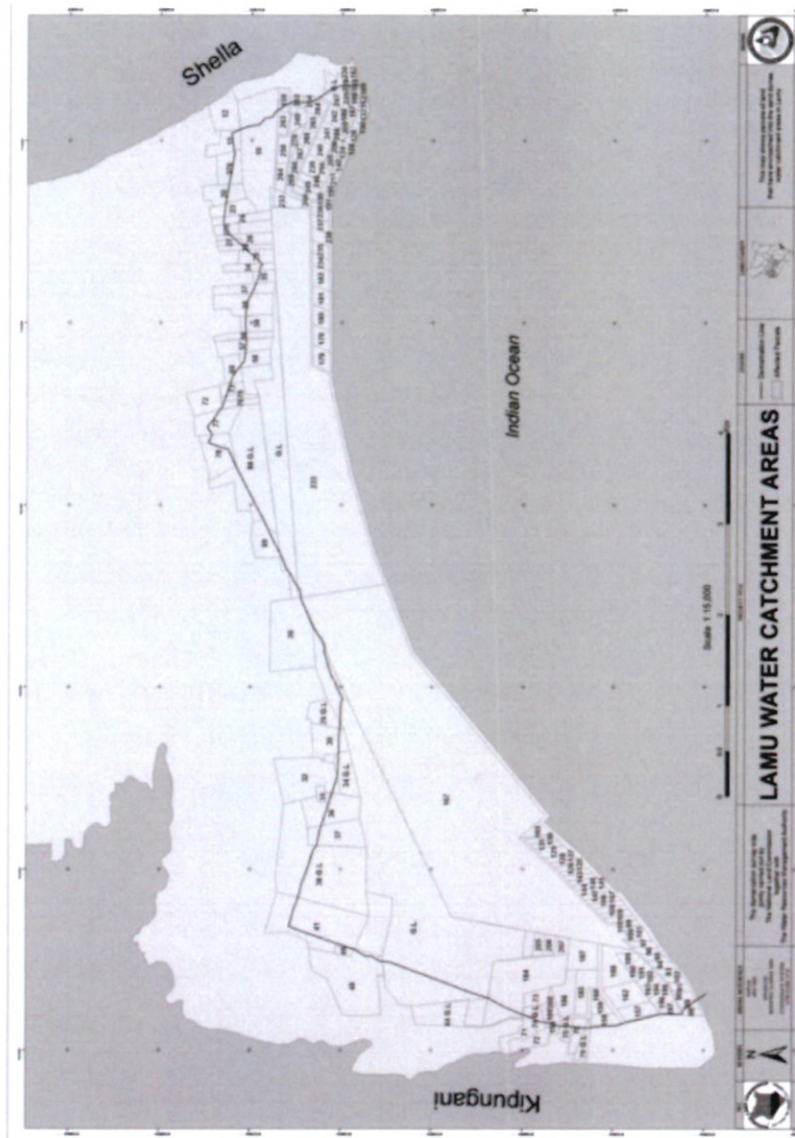
The Amu GCA lies approximately 2 kilometres south of Lamu town and stretches from Kizingoni area at the south western tip of the Island and terminates at Singue area that marks the south eastern edge of the Island near the Shella Village.

The area covered by the proposed GCA is approximately is 19.72 square Kilometres (Map 1a & 1b below)

AMU GROUNDWATER CONSERVATION AREA (GCA)



Map 1(a). Proposed Groundwater Conservation Area (GCA) for the Amu Sand Dunes Aquifer



Map 1(b). Proposed Groundwater Conservation Area (GCA) for the Amu Sand Dunes Aquifer

1 OBJECTIVE

Groundwater is and will continue to be a major source of water for the Amu Island, Lamu Archipelago as well as the Lamu mainland. However, it has been established through Lamu Island sand dunes aquifer mapping study that, more groundwater is being used than is being replenished through natural means. The study inferred that sea water intrusion, over abstraction, loss of vegetal cover and encroachment has created a threat to groundwater availability both in terms of quality and quantity.

To address this problem, the Water Act 2016 has provided a way for groundwater resources to be managed and protected through establishment of Ground Water Conservation Areas (GCAs) as provided for in Section 23 of the Act.

The objective of the GCA guidelines is to provide a framework under which ground water catchment areas and water resources use will be managed in a manner such that will ensure the groundwater resources is protected and conserved sustainably.

The desired future condition is derived from the current status of Amu sand dunes aquifer. According to Lamu Sand dunes water catchment Mapping Report (2008) and recent data from LAWASCO in 2017 the aquifer has been experiencing stress. It was found that several wells had turned saline and some had dried. This situation attests to the fact that more groundwater is being extracted at a higher rate than it is replenished.

The desired future condition must provide a balance between the highest practicable level of groundwater production and the conservation, preservation, protection, recharging and prevention of waste of groundwater in the Conservation area.

Consequently, the desired future condition of the GCA is summed as follows:

- 1 Groundwater quality remains potable by Kenyan Standards (KEBS KS 05-459 Part 1 1996),
- 2 Annual renewable groundwater recharge is sustained at or over the year 2017 level,
- 3 Mitigation measures are put in place to cope with climate change effects,
- 4 Annual groundwater abstraction does not exceed 70% of the total aquifer recharge,
- 5 Fresh water levels are sustained to wade of sea water intrusion and possibly reverse current intrusion,
- 6 Conjunctive water use is considered to cope with pressure emanating from population rise and other emerging developments,
- 7 Other groundwater dependent ecosystems, here identified as flora and fauna, are protected,

To achieve these targets, guidelines on the following aspects of groundwater use, protection and conservation are required:

- 1 Abstraction limits,
- 2 Water use prioritization and efficiency,
- 3 Borehole construction guidelines,
- 4 Groundwater recharge,
- 5 Groundwater monitoring,

6. Water allocation guidelines;
7. Conjunctive water use;
8. Pollution control;
9. Enforcement of AMU GCA guidelines and Water Act, 2016;
10. Catchment and Groundwater conservation;

2.1 Abstraction Limits

2.1.1 Maximum allowable production

To minimize as far as practicable the

1. Water levels decline does (not to go beyond 30% of the initial water column in the well),
2. Sea water intrusion into the freshwater zone ,
3. Deterioration of water quality within KEBS drinking water standard
4. potential loss of opportunity to construct a new well because of spacing requirements and over abstraction of ground water and
5. Groundwater resources waste

The following guidelines shall apply in the GCA to regulate the production of groundwater.

1. Availability goal

The Water Allocation Guidelines provide for 25% of the tested yield over a 24 hr period, or 60% of the tested yield over a 10-hour period as the maximum allowable production as a general WRM rule. This shall continue to apply in the GCA as it does in all groundwater systems.

2. Permitting goal

Right to access clean and safe water equitably is a constitutional requirement (COK 2010 article 43d) administered through permitting ensuring reserve is not violated.

The goal is to ensure available water resources are allocated in a manner that reserve is addressed and water use is prioritized for current and future domestic purposes.

To minimize wastage and to address the potential loss of opportunity to access groundwater, the permitting goal will also endeavour to match the permitted amount with the applied use. Therefore permitted amounts will be based on the per capita water requirements set out in the Design Manual as reproduced in the Water Allocation Guidelines.

WRA shall therefore make reasonable effort not to grant permit applications for more water production than is actually needed for beneficial use as will be defined within the Amu Sand dunes Water allocation Plan. The Water Allocation Plan shall be developed and will define distances between wells/ boreholes and abstraction limits.

Further in Amu GCA no well shall be operated without obtaining necessary permits from Water Resources Authority in consultation with AMU WRUA as set out in the WRM Rules 2007 and Water Act 2016.

Permitted use of groundwater will however be reviewed to ensure safe yield is sustainably maintained. Therefore, changes in abstraction and use of groundwater under a current use operating permit may not be made without prior approval of WRA.

3. Water use charges

Water use charges shall apply to all water abstractors as required by Water Act 2016.

In the case of Amu GCA, abstractors will be subject to specific conditions and penalties that apply to all Groundwater Conservation Areas as specified in the WRM Rules 2007 section 108 and/or any other relevant subsequent legislations.

Exclusions and exemptions

Current use

Existing legal groundwater use in the GCA before the effective date of the GCA management guidelines shall be preserved, to the maximum extent practicable, consistent with WRM Rules 2007 and/or any other relevant subsequent Legislation. Evidence of current use must be presented to WRA before such use may be preserved. Whenever preserved, such use will be regularized by WRA in line with the GCA guidelines.

2.2 Well/Borehole Siting in GCA

Siting of wells/boreholes in the GCA shall be subject to all provisions of the WRM Rules 2007 (section 27) and Codes of Practice for Borehole Siting.

The siting shall be done by a licensed geologist/hydro-geologist. He/she shall compile a hydrogeological assessment report in conformity with WRM Rules Second Schedule including water balance before and after the proposed development.

Further to this, particular emphasis shall be laid to investigation methods which shall include an exhaustive inventory of existing data, including all existing groundwater abstraction in the neighbourhood of the current application without exception. Other Conditions for the Authority to grant an authorisation for drilling the borehole, including limits to abstraction, mandatory borehole design considerations; etc shall be stated by the siting geologist/hydrogeologist in his/her recommendations.

He/ she shall demonstrate in the report that investigation has been exhaustively done for WRA to consider granting the authorization to drill.

For Amu GCA

1. An application for major development within the GCA shall be accompanied by an environmental impact study that demonstrates that the quality and quantity of groundwater in the GCA and the recharge function of the area will be protected, conserved, improved or restored.

2. Groundwater use applications that promote storm water management and infiltration will be given priority in granting of authorisations to drill within the GCA. Such plans shall be subject to approval so that they do not pose groundwater contamination risk.

2.3 Borehole Construction

These guidelines are subject to the Codes of Practice for Construction of Boreholes and should be applied in conjunction with the following documents:

1. The Water Resources Management Rules, 2007 and subsequent legislations
2. The Code of Practice for the Siting of Boreholes

3. The Code of Practice for the Supervision of Construction of Boreholes
4. The Code of Practice for the Test Pumping of Boreholes
5. The Water Allocation Guidelines (2010)

2.3.1 Spacing requirements

To minimize as far as practicable the

- a) Drawdown of the water table and the reduction of artesian pressure, to prevent interference between boreholes and to
- b) Prevent degradation of water quality the Water Resources Authority will enforce spacing requirements on all new boreholes in the GCA. These will be in accordance with the spacing guidelines outlined in the Section 4.4 of the Water Allocation Guidelines (2010).
- c) In the case of a public supply well field, WRA may waive the spacing requirements on the well field if the applicant submits adequate evidence showing that the increased cone of depression caused by the well field will not increase the impact on nearby existing wells.

This calls for, *inter alia*, appropriately designed pumping tests and well field layout design.

2.3.2 Sanitary seal

The boreholes and wells in the GCA shall be lined to such a depth that will provide a reasonable seal to contaminated or polluted surface water. The area is a high-recharge area that is unconfined thereby highly susceptible to high risk of groundwater contamination

2.3.3 Defective/Unsuccessful wells/boreholes

Abandoning of defective/unsuccessful wells/boreholes shall be subject to sections 8, 9 and 10 of the Fourth Schedule of the Water Act 2016 and in accordance with the Codes of Practice for Borehole Construction.

The defective well arising from salty water shall be plugged or sealed off securely by the owner of the well to prevent intrusion into the fresh water aquifer thereby rendering the entire aquifer saline.

In addition to backfilling, an abandoned borehole in the GCA shall be sealed in the top 6 metres to ground level with bentonite.

2.4 Pollution Control

These guidelines shall be applied in conjunction with Water Act 2016 and Part V of the WRM Rules 2007. Due to the need to prevent pollution in the GCA, upon inspection, WRA may provide notice to affected parties and issue orders to prevent pollution. If WRA determines that an emergency situation exists, a temporary order to prohibit pollution and protect public health, safety and welfare shall be issued without notice. The order shall continue in effect for the lesser of fifteen (15) days or until tests are done. If the factual basis for the order is disputed, the affected parties may lodge a complaint with the Water Tribunal. The order shall however stay in place until the Tribunal determines the appeal.

2.5 Groundwater Recharge, Monitoring and Conservation

The recharge mechanism within the sand dune catchment area is through direct precipitation where rain water infiltrates/percolates within the highly permeable wind-blown sands to augment groundwater storage.

Beneficial land and water management practices that maximize aquifer recharge with good water quality and high quantity will be promoted. Gazettement of the GCA, rain water storage, biodiversity improvement and prohibition of degrading activities such as sand harvesting, deforestation through harvesting of mukoma for traditional liquor are among the proposed best practices.

Aquifer performance will be monitored to provide updated information. Therefore hydromet monitoring networks comprised of telemetric boreholes, full weather stations and a data centre will be established.

3. EXEMPT AND PROHIBITED ACTIVITIES

3.1 Prohibited Activities

The prohibited activities will be as per WRM Rules 2007 Sixth Schedule to the following activities that are considered high-impact uses due to the probability and/or potential magnitude of their adverse effects on groundwater and shall be prohibited in the GCA:

1. Tillage or cultivation on the sand dunes;
2. Clearing of indigenous trees/vegetation on the sand dunes;
3. Building of permanent structures;
4. Disposal of any form of waste within the sand dune: large capacity septic, untreated waste disposal wells, open defecation cemetery, untreated sewage waste disposal wells, cesspools, industrial waste, pit latrines;
5. Excavation of soil or development of quarries;
6. Planting of exotic species that may have adverse effect to water resources;
7. Landfills;
8. Construction of permanent residential structures;
9. Sand harvesting;
10. Activities that would significantly reduce the recharge to aquifers- obstruction of dune formation;
11. Radioactive waste disposal sites;
12. Charcoal burning, grazing, harvesting of Mukoma tree for traditional brew;
13. Or any other activity that in the opinion of the Authority and other relevant stakeholders may degrade the water resource.

3.3 Enforcement

The enforcement of management guidelines and prohibitions shall be in accordance with provisions of the Water Act 2016, Water Resources Management Rules 2007 and other subsequent legislations.

These shall include, *inter alia*, PART VIII - Water Use Charges, entails and additional five per cent to the water use charges. The itemized prohibited activities shall be enforced and complied with to all respective Authorities and the public through the gazette notice. **GROUNDWATER CONSERVATION MEASURES**

4.1 Conservation activities

The following activities will be undertaken to roll out the conservation plan post-gazettement:-

1. Public awareness campaigns following Gazettement of the GCA.
2. Reconciliation of the water permit database for the GCA with the actual abstraction points to ensure all existing groundwater abstractions are authorized.
3. Reconciliation of water use with the permit database to capture the actual abstraction against the permitted abstraction.
4. Review of permits to equitably match water needs with the permitted abstraction. A moratorium shall be declared for those found to be over-abstracting and their permits regularized to reflect the actual abstraction conditions, as long as the reviewed water use limit has been assessed positively and the permit revised accordingly.
5. Review of the Second Schedule (Technical Reports) contents of Hydrogeological Assessment Report for borehole siting in the GCA to include specific requirements for conservation areas. The revised rules will give reporting guidance to include definitions of the recharge/discharge conditions, identify groundwater/surface water interactions, characterize vulnerability to contamination, and provide a pre-to-post project water balance analysis and recommendation of appropriate mitigation measures.
6. Coordination with the Lamu County Government physical planning, agriculture, water, sanitation departments and NEMA to highlight GCA management guidelines and technical advice on County by-laws where required.
7. Installation of dedicated monitoring wells for the various aquifer levels in the GCA.
8. Enforcement of WRM Rules and GCA management guidelines.
9. Implementation of WRUA SCMP incorporating ecotourism activities

The Management Plan for the Amu GCA will comprise of the Water use plan, aquifer protection plan, conservation and recharge enhancement plan, aquifer protection plan education plan and ecotourism plan. The management plan will be reviewed every so often as to match the conservation needs and issues.

WATER USE PLAN

The objective of this water use plan is to protect the long term water storage and supply capacity of the aquifer by controlling average annual abstractions with respect to recharge.

<i>Water use plan Activity</i>	<i>Timeframe</i>	<i>Cost (Kenya Shillings)</i>	<i>Responsibility</i>
Establish the water balance	2019	5,000,000	WRUA, Lamu County Government, WRA, LAWASCO, NMK

<i>Water use plan Activity</i>	<i>Timeframe</i>	<i>Cost (Kenya Shillings)</i>	<i>Responsibility</i>
Develop water allocation plan for the Amu GCA	2019	55,000,000	WRUA, Lamu County Government, WRA, LAWASCO, NMK
Enhance Water use efficiency (introduction of technologies)	Continuous	10,000,000	WRA, NMK, WRUA, LAWASCO, Lamu County Government
TOTAL		70,000,000	
AQUIFER PROTECTION PLAN			
The objective of the aquifer protection plan is to protect it by encouraging activities that enhance water quality and by discouraging activities that degrade it.			
<i>Aquifer Protection Plan Activity</i>	<i>Timeframe</i>	<i>Cost</i>	<i>Responsibility</i>
Gazettement of GCA	Up to 2020	87,000,000	WRA, MWS
Enforcement of Amu GCA guidelines and other legislations	Continuous	15,000,000	WRA, National Govt
Total		102,000,000	
CONSERVATION AND RECHARGE ENHANCEMENT PLAN			
The objective of the conservation and recharge enhancement plan is to maximize aquifer recharge with good water quality and quantity by promoting beneficial land and water management practices.			
<i>Activity</i>	<i>Timeframe</i>	<i>Cost</i>	<i>Responsibility</i>
Study of ground water potential and bio-diversity (Identifying endemic/ invasive/ endangered species for both flora and fauna)	2019	6,400,000	WRA, ICRAF, KFS, WWF, NEMA, KFS, KEFRI
Re-vegetation of the catchment area	Continuous	38,100,000	WRUA, WRA, KFS
Rain water storage enhancement.	Continuous	68,000,000	WRA, CSWB Lamu County Government and WRUA
Restricting activities that may lead to pollution and destruction of the eco-system	Continuous	14,400,000	WRA, Lamu County Government, NMK, KFS, WRUA, NEMA
Alternative livelihood activities	Continuous	50,000,000	WRA, NMK, WRUA, ASDP, Agriculture, fishing and livestock, KFS, Trade, KWS
Regulation of development of wells/ boreholes within GCA	Continuous	7,000,000	WRA, LAWASCO, Lamu County Government, CSWSB

<i>Water use plan Activity</i>	<i>Timeframe</i>	<i>Cost (Kenya Shillings)</i>	<i>Responsibility</i>
Regulation of abstraction limits	Continuous	3,800,000	WRA, WRUA, County Commissioner
Controlling encroachment and review of grants	Ongoing	65,000,000	NLC, WRA, Lamu County Government
Sub Catchment Management Plans Implementation	Ongoing	20,000,000	WRUA, WRA, NMK, Lamu County Government, NEMA, WSTF
Establish WRA satellite centre for Lamu	2019 – 2022	15,000,000	WRA, NMK, NEMA, Lamu County Government
Total		287,700,000	

MONITORING PLAN

The objective of the monitoring plan is to collect water resources data and maintain a comprehensive scientific database on the Amu aquifer that provides information on water levels, electrical conductivity, well performance, aquifer response to pumping, general water quality (salinity) and hydro- metrological parameters.

<i>Action</i>	<i>Time frame</i>	<i>Costs</i>	<i>Responsible</i>
Establish and maintain Groundwater monitoring networks	2018	60,000,000	WRA
Establish and maintain hydromet networks	2019	50,000,000	WRA
Ground water sampling and analysis	Continuous	30,000,000	WRA
Establish a water resources database for ground water quality and ground water levels	2019	30,000,000	WRA
Groundwater assessment and modeling of the Amu aquifer	2019	10,000,000	WRA, Consultant
Aquifer assessments in Lamu other areas	2019-2022	20,000,000	WRA, Lamu County Government
Capacity Building	Continuous	1,000,000	Stakeholders and WRA
Total		201,000,000	

EDUCATION PLAN

The objectives of this education plan is to publish and disseminate information on the Amu GCA Management for sustenance of fresh water aquifer in the sand dunes

<i>Activity</i>	<i>Timeframe</i>	<i>Costs</i>	<i>Responsible</i>
Establish an Amu GCA management working group comprising of key stakeholders	3 months after Gazettement	5,000,000	WRA/Lamu County Government, NMK
Publish and disseminate the best practices and prohibited activities within the sand dune aquifer	Continuous	10,000,000	WRA, Lamu County Government, NMK, NEMA, WRUA
Promote best programs on Water Sanitation and Health	Continuous	2,100,000	WRA, Lamu County Government, Public health office/WRUA
Disseminate information on Amu aquifer and its recommended management guidelines	July 2017-June 2022	29,000,000	WRA, Lamu County Government, WRUA
Total		46,100,000	

ECOTOURISM PLAN

The objective of the ecotourism plan seeks to enhance sustainable conservation of the sand dunes by promoting nature-based experiences of the local communities while ensuring ecological, economic and social needs

<i>Action</i>	<i>Timeframe</i>	<i>Cost</i>	<i>Responsibility</i>
Conceptualize the ecotourism in Amu sand dunes {walkway Nature trails (bio-diversity), Hiking, Camping, filming, tour guides Bird watching, Viewpoints (highest peaks), Dig a day (Archeological sites especially in the low lying areas)}	Jan 2019- July 2019	16,500,000	WRA, NMK, KTB, KTDC, NEMA, WWF, KWS, Lamu County Government
Establish walkways around and within Amu GCA and other related infrastructures	Nov 2019 – Nov 2020	57,000,000	WRA, NMK, NEMA, KWS, KTB, KWS, Lamu County Government, Amu WRUA
Total		57,000,000	

Made on the 31st August, 2021

MOHAMED M. SHURIE,
Chief Executive Officer,
Water Resources Authority