

THE WATER ACT

(No. 43 of 2016)

IN EXERCISE of the powers conferred by section 22(1) of the Water Act, 2016, the Water Resources Authority makes the following Order —

THE MARURA (EWASO NAROK) SWAMP CATCHMENT  
PROTECTION AREA ORDER, 2023

1. This Order may be cited as the Marura (Ewaso Narok) Swamp Catchment Protection Area Order, 2023.

Citation.

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

Interpretation.

“Act” means the Water Act, 2016;

No. 43 of 2016.

“association” means a water resources users association registered by the Authority in accordance with the Act;

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

“basin area” means the area designated by the Authority as a basin area under section 24 of the Act;

“protected area” means the area declared to be a protected area under paragraph 4 of this Order and is demarcated for protection and conservation within the Marura (Ewaso Narok) Swamp Catchment Management Plan;

“Plan” means the Marura (Ewaso Narok) Swamp Catchment Management and Conservation plan set out in the Second Schedule;

“riparian reserve” means land in respect of which management obligations are imposed on users or owners by the Authority due to its proximity to the protected area;

“soil and water conservation plan” means soil and water Conservation Plan as defined in regulation 2 of the Water Resources Regulations, 2021; and

LN. 170 of 2021.

“sub-basin Area” means the area designated by the Authority as a basin area under section 24(2) of the Act.

3. This Order shall apply to the National Government, national government entities, county governments, county government entities and any other person being a user of water resources and the riparian reserve of the protected area.

Application of this Order.

4. (1) The Marura (Ewaso Narok) Swamp Catchment Protection Area is declared to be a protected area for the purposes of the Act.

Declaration of protected area.

(2) The area declared in sub paragraph (1) shall be as per the extent and description set out in the First Schedule and is demarcated for protection and conservation within the Marura (Ewaso Narok) Swamp Catchment Management Plan.

5. (1) The Plan set out in the Second Schedule shall, without prejudice to the provisions of the regulations developed under the Act, be the basis for protection, conservation and use of the water resources within the protected area.

Marura (Ewaso Narok) Swamp Conservation Plan.

(2) The Authority shall place signboards and beacons in or near the protected area or in appropriate public places frequented by land and water users and at the Authority’s offices to display up-to-date information about the condition of the water resources of the protected area.

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

6. A person who contravenes this Order commits an offence and shall, upon conviction, be liable to a fine of twenty thousand shillings or imprisonment for a term not exceeding six months, or to both such fine and imprisonment.

Offence.

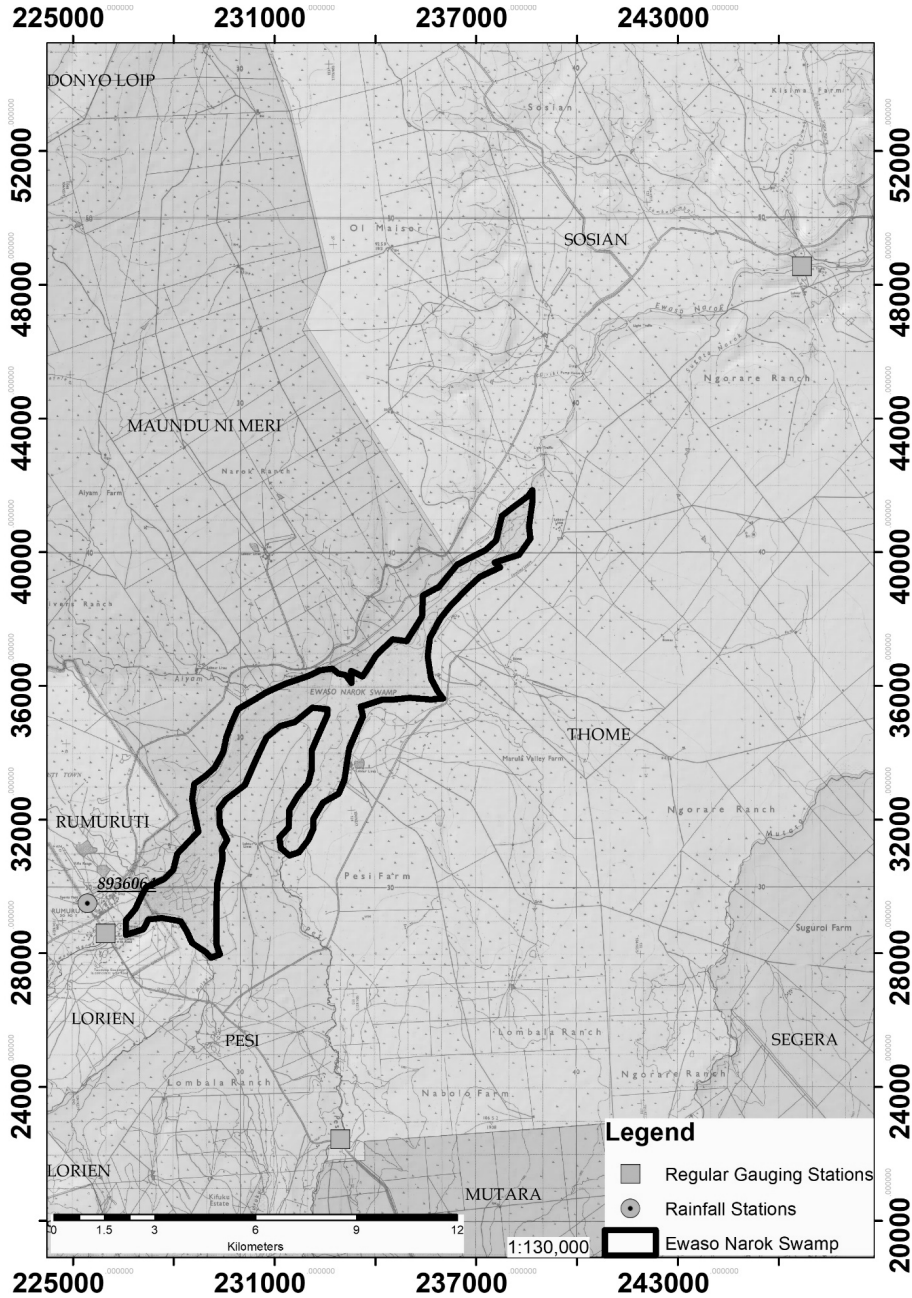
7. The Marura (Ewaso Narok) Swamp Catchment Protection Area Order, 2022 is revoked.

Revocation.  
L.N. No. 220 of 2022.

FIRST SCHEDULE

THE MARURA (EWASO NAROK) SWAMP CATCHMENT PROTECTED AREA

(p.4)



- NOTE:
- (i) The Protected Area is commonly known as Ewaso Narok (Marura) swamp and is partly located in Thome Sub-Location of Mutara location, Maundu Ni Meri and Sosian Sub-Locations of Sosian location all within Rumuruti Division of Laikipia West Sub-County, Laikipia County. The swamp is formed at the confluence of Ewaso Narok, Pesi and Aiyim rivers and is partly within the 5AA and 5AC sub basin of Ewaso Ngiro North Basin Area (Rumuruti Sub Basin Area Office). The land area protected is approximately 24 km<sup>2</sup> (2,400 Hectares).
  - (ii) The area that contributes surface run-off into the wetlands has been delineated through the use of Arc SWAT software. The drainage area upstream of the swamp measures 1,717.7 square kilometres and which contributes surface water flows into the swamp. The map shows the area of the swamp and the upstream catchment area that contributes flows into the swamp.

## SECOND SCHEDULE

(p.2, 5)

## THE MARURA (EWASO NAROK) SWAMP CATCHMENT MANAGEMENT PLAN

## PART I: INTRODUCTION

## 1.1 Citation

This Plan may be cited as the Marura (Ewaso Narok) Swamp Catchment Management Plan.

## 1.2 Acronyms

The following acronyms shall have the meanings as assigned below:

|                   |  |
|-------------------|--|
| AEZ               | Agro-Ecological Zone                             |
| ENNBA             | Ewaso Ngiro North Basin Area                     |
| KFS               | Kenya Forest Service                             |
| Km <sup>2</sup>   | Square Kilometer                                 |
| L. N.             | Legal Notice                                     |
| m.a.s.l.          | meters above sea level                           |
| M <sup>3</sup> /d | Cubic meters per day                             |
| M <sup>3</sup> /s | Cubic meters per second                          |
| Mm <sup>3</sup>   | million cubic meters                             |
| MoA               | Ministry of Agriculture                          |
| MoL               | Ministry of Lands                                |
| NEMA              | National Environment Management Authority        |
| NGAO              | National Government Administration Officer       |
| NLC               | National Land Commission                         |
| °C                | Degrees Celsius                                  |
| Q50               | Flow that is equaled or exceeded 50% of the time |
| Q80               | Flow that is equaled or exceeded 80% of the time |
| Q95               | Flow that is equaled or exceeded 95% of the time |
| RGS               | Regular Gauging Station                          |
| RQOs              | Resource Quality Objectives                      |
| ToR               | Terms of Reference                               |
| WDC               | WRUA Development Cycle                           |
| WRA               | Water Resources Authority                        |
| WRUA              | Water Resources Users Association                |
| WRM               | Water Resources Management.                      |

## 1.3 Application of the Plan

This Plan shall apply in respect to the management and use of the Marura (Ewaso Narok) Swamp Catchment Protected Area.

#### 1.4 Objectives

The objectives of this Plan are—

- (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; and
- (iii) to identify funding sources to implement water conservation programs that help to enhance water resources

#### 1.5 Background information

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 channeled into the river courses, resulting in flashfloods 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, declared as protected areas by being gazetted as such, protected from encroachment and pollution and managed sustainably to maintain their ecological integrity.

#### 1.6 Location and size of the Protected Area

The Ewaso Narok (Marura) Swamp (here after referred to as the “swamp”) is located within Maundu Ni Meri and Sosian sub locations of Sosian Location and Thome Sub-Location of Mutara location within Laikipia County.

The area lies within Ewaso Narok 5AA sub basin and Pesi 5AC sub basin and is part of the Ewaso Narok River system. The land area is in the form of a basin-like depression with an outlet to the north-east into Ewaso Narok River. The swamp is normally covered with vegetation, mainly the Marura plant, from which it derives its name.

#### 1.7 Watershed area

The area that contributes surface run-off into the wetlands has been delineated through the use of Arc SWAT software. The drainage area upstream of the swamp measures 1,717.7 square kilometres and which contributes surface water flows into the swamp. The map shows the area of the swamp and the upstream catchment area that contributes flows into the swamp.

#### 1.8 Criteria Adopted in Identifying Ewaso Narok (Marura) Swamp for Protection (L.N. 170 of 2021)

WRA has taken into account of the considerations provided under the Seventh Schedule of the Water Resources Regulations, 2021.

### PART II: PROCEDURES TO BE APPLIED FOR THE MANAGEMENT OF THE EWASO NAROK (MARURA) SWAMP CATCHMENT PROTECTED AREA

#### 2.1 Physiography

The Ewaso Narok river catchment area elevation ranges from a low of 1791 m.a.s.l at the swamp and rises to a high of 2893 m.a.s.l to the south west of the catchment around the Aberdare’s (source of Ewaso Narok and Pesi rivers) and with a mean

elevation of 2056 m.a.s.l. The catchment is leaf shaped and extends upstream in north south direction with a length of 75 kilometres (see the map above) and a width of 35 kilometres at its widest.

- 2.2 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 northerly direction, where the rivers form the Ewaso Narok River that confluences with Ewaso Ngiro River further to the north to form the main Ewaso Ngiro North River.

### 2.3 Climate

The climate around Rumuruti area is classified under the Köppen and Geiger climate classification system. The average annual temperature in Rumuruti is 18.3 °C, with March being the hottest month of the year at an average temperature of 19.6 °C and August being the coldest month of the year with an average temperature of 17.1 °C.

Table 1 and the figure below it set out in the Annexure to this Schedule shows the monthly average temperatures within Rumuruti.

### 2.4 Rainfall

The Ewaso Narok sub catchment lies within the agro-ecological zones (AEZ) IV UM which is mainly dry with grassland and shrubs and suitable for livestock rearing. In general, the area is characterized by moderate rainfall with annual rainfall of 708 mm (Rumuruti Ministry of Works No. 8936064). 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.

Table 2 and the figure below it set out in the Annexure to this Schedule show the mean monthly rainfall and humidity at Rumuruti.

### 2.5 Vegetation

The same area is currently characterized by land transformation into small-scale cultivation drawing water from the swamp. The number of farmers practicing crop farming has been increasing over the years posing a threat to the survival of the swamp.

### 2.6 Vulnerability of the water resource

Ewaso Narok River has a Regular Gauging Station 5AC15 located at coordinates E036.800000, S01.272778 (37M 0255194.5, 9859215) at an elevation of 1705 m.a.s.l near Rumuruti Town and approximately 1 km upstream of the swamp. The station has daily discharge data starting from 1982 to the current. On the other hand, Pesi river has a Regular Gauging Station 5AB02 located at coordinates 37N 0232941, 0022450 (E036.600696, N00.202931) at an elevation of 1868 m.a.s.l approximately 9.5 kilometres upstream of the swamp. The station has daily discharge data from 1959 to date.

- 2.7 The encroachment on the Ewaso Narok swamp riparian and catchment land through cultivation, livestock grazing, harvesting of indigenous plants 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 Ewaso Narok River downstream of the swamp.

- 2.8 In order to have a clear understanding of the water resources availability in the Ewaso Narok swamp catchment, the available data for 5AB04 and 5AC15 stations was used.

Table 3 in the Annexure to this Schedule shows the flow duration analysis for Pesi and Ewaso Narok rivers.

- 2.9 The water resource quality objectives and the current status of the water resource

Section 20 of the Act 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 Resource Quality Objectives represent the desired status of the resource, covering all aspects of quantity, quality, timing and aquatic biota. The RQO's are different for different classes of water resource. The objectives generally relate to the extent to which the water body is allowed to be adversely impacted by water use with respect to its natural state. Conceptually the RQO's provide a "target" condition of the resources. Management decisions should be made such that the condition of the resource is progressively trending towards the RQO. The status of the resource is a measure of how far the condition of the resource is from the RQO. Initially, RQOs shall be determined at the nodes where the Reserve flows are being determined.

- 2.10 Initially, RQOs shall be determined at the nodes where the Reserve flows are being determined, in this case at RGS 5AB04 and 5AC15.

According to the ENNBA CMS (2014 - 2022) Ewaso Narok Management Unit is classified as of high Ecological importance. These are areas with almost natural ecological characteristics. The focus for water resources management is the protection of the natural ecological characteristics for ecological, recreational and development of tourism with economic importance. Key water resources issues include:

- (a) water scarcity;
- (b) catchment degradation;
- (c) erosion;
- (d) encroachment of water bodies and Land tenure around the swamp;
- (e) human activities in Ewaso Narok swamp affect the role of swamp;
- (f) social conflicts due to over abstraction.

- 2.11 Sustainable regional water resources management of these units would require cooperation collaboration and synergy with the Kenya Forest Service, the Kenya Wildlife Service, Counties, user communities.

- 2.12 The class of the water resource

The present aquifer classification system in Kenya is partly demand-oriented and partly geo-political and entails five classes:

2.12.1 STRATEGIC aquifers: aquifers used to supply significant amounts/proportions of water to an area where there are no alternatives, or where alternatives would take time and money to develop.

2.12.2 MAJOR aquifers: high-yielding aquifers with good quality water.

- 2.12.3 MINOR aquifers: moderate-yielding aquifers with variable water quality.
- 2.12.4 POOR aquifers: low-yielding aquifers with poor to reasonable quality water.
- 2.12.5 SPECIAL aquifers: aquifers or parts of aquifers designated 'special aquifers' by the WRA.
- 2.13 Each is further defined in terms of its status, i.e.:
- 2.13.1 Satisfactory: no immediate stress, pressure or threat.
- 2.13.2 Alert: stress, pressure or threat identified or anticipated.
- 2.13.3 Alarm: water levels declining, water quality declining (stress, pressure or threat identified).
- 2.14 The Ewaso Narok sub-catchment can be classified as "Alert" as the available water is at times not of adequate quantity and quality to meet the demand. The water availability is relatively good in terms of quantity and quality in the upper parts of the river but deteriorates as the river flows downstream due to pollution.
- 2.15 Land uses and their potential impact on the water resources
- Human Settlement: Ewaso Narok swamp is within a predominantly rural setting where the main economic stay is agriculture, with irrigation adding reliability and increasing the yields. Due to the economic gains from the agriculture due to low production costs, the area has attracted a lot of farmers with pressure increasing on land availability leading to encroachment on the swamp and more water abstractions leading to reduced water resources availability downstream.
- 2.16 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.

PART III: MEASURES FOR PROTECTION, CONSERVATION AND  
REHABILITATION OF THE MARURA (EWASO NAROK) CATCHMENT  
PROTECTION AREA

3.1 Authorised and Prohibited Activities

The activities to be undertaken within the protected area are those with zero impact on its ecological status and integrity.

The following activities are hereby specifically prohibited in the 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;
- (vii) land reclamation.

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—

- (a) demarcation of the wetland and its riparian zone and fence it off;

- (b) gazettement of the swamp as a protected water catchment area;
- (c) enforcement of the Ewaso Narok swamp management plan; and
- (d) control water resources abstraction from the swamp.

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 under Table 4 in the Annexure to this Schedule.

### 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:

- (a) removal of all inappropriate/invasive species of plants;
- (b) re-vegetation of the swamp with water friendly/native species of trees and vegetation; and
- (c) development of alternative livelihoods to discourage farming within the swamp.

The Rehabilitation Plan is set out in Table 5 in the Annexure to this Schedule.

### 3.4 Catchment and Water Resources Monitoring Plan

The objective of the monitoring plan is to collect and analyse 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:

- (a) establishment of a telemetric regular gauging station on Ewaso Narok and Pesi river upstream and downstream of the swamp to monitor water quantity and quality;
- (b) upgrading of the Rumuruti MoW rainfall station to a fully telemetric hydro-meteorological station to monitor precipitation, evaporation, humidity and temperature.

The catchment and water resources monitoring plan is set out in Table 6 in the Annexure to this Schedule.

### 3.5 Establishment and Operationalization of Management Structure

The objective of the management structure is to ensure that the Ewaso Narok swamp catchment protected area is managed in a sustainable manner with the involvement of all stakeholders under the leadership and coordination of WRA - ENNBA. These plan envisage a budget of Kes 75,700,000 to implement it in the medium term (approximately 5 years). The management will need to raise the funds through various activities and events. This will be achieved through:

- (a) setting up the management structure with defined ToRs and mandates;
- (b) development and implementation of resource mobilization strategies to raise funds for the management and conservation of the protected area;

Operationalization of the management structure shall be as set out under Table 7 in the Annexure to this Schedule.

- 3.5.1 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 not for 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 linkages between various stakeholders are represented under Figure 2 in the Annexure to this Schedule. The arrows indicate the direction of flow of information. The dotted lines indicate WRUA can also communicate directly to communities and vice versa.

### 3.6 Monitoring and Evaluation Matrix

The matrix in Table 8 of the Annexure to this Schedule shall be adopted for Monitoring and Evaluation to capture detail of the progress of implementation of the planned activities.

ANNEXURE

FIGURE 1: WATERSHED AREA

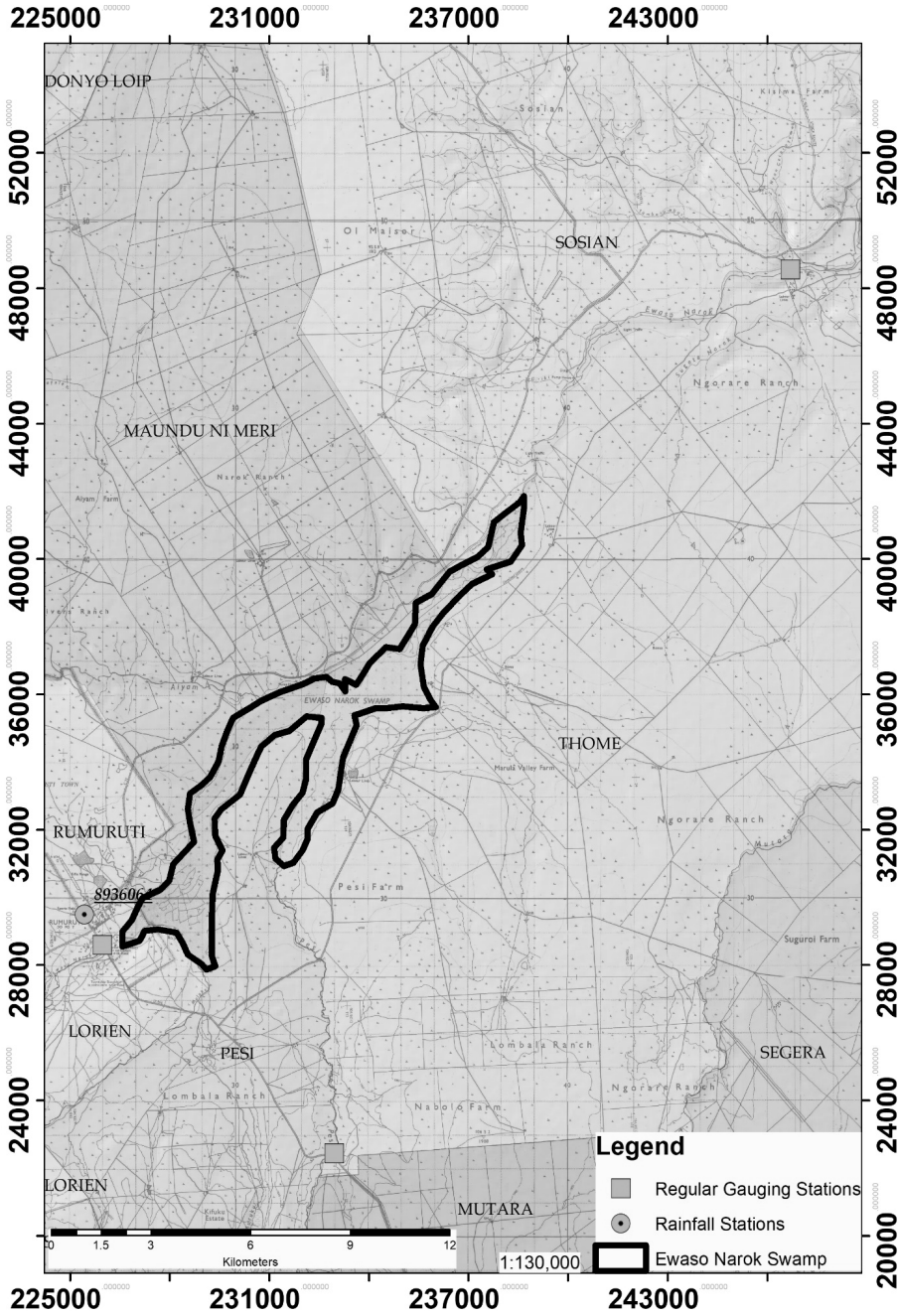


TABLE I: MEAN TEMPERATURES AND SUNSHINE HOURS AT RUMURUTI

|                 | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
|-----------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Mean            | 18.4 | 19.2 | 19.6 | 19.2 | 18.8 | 18   | 17.2 | 17.1 | 18   | 18.4 | 17.5 | 17.7 |
| Min             | 12   | 12.3 | 13   | 13.9 | 13.7 | 12.9 | 12.3 | 12.2 | 12.1 | 13   | 13.3 | 12.6 |
| Max             | 24.7 | 26   | 26.1 | 25.1 | 24.4 | 23.5 | 22.4 | 22.4 | 23.8 | 24   | 22.6 | 23.3 |
| Sun hours (Hrs) | 10.1 | 10.5 | 10.1 | 9.4  | 9.6  | 9.2  | 8.3  | 8.4  | 9.7  | 9.3  | 7.9  | 8.8  |

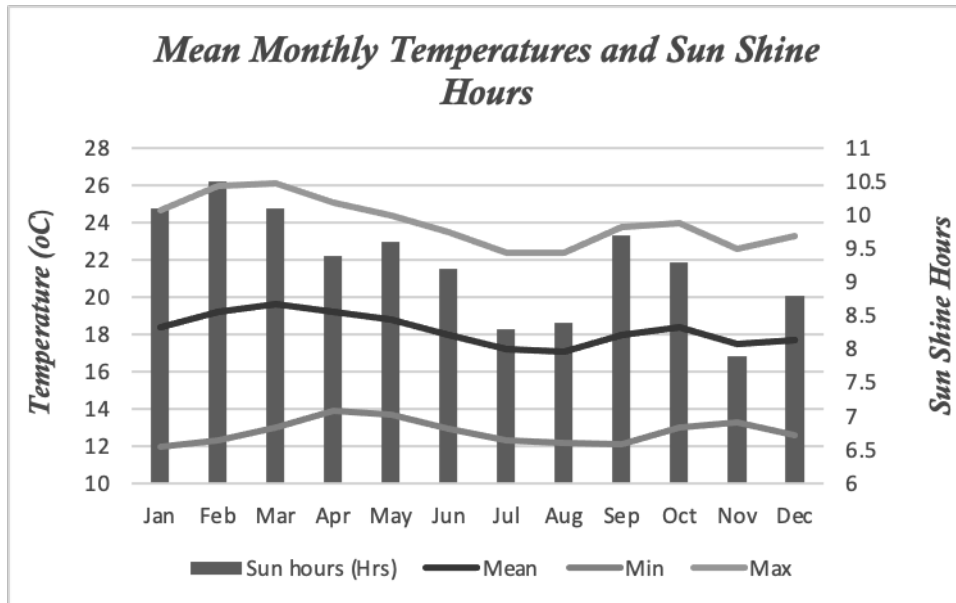
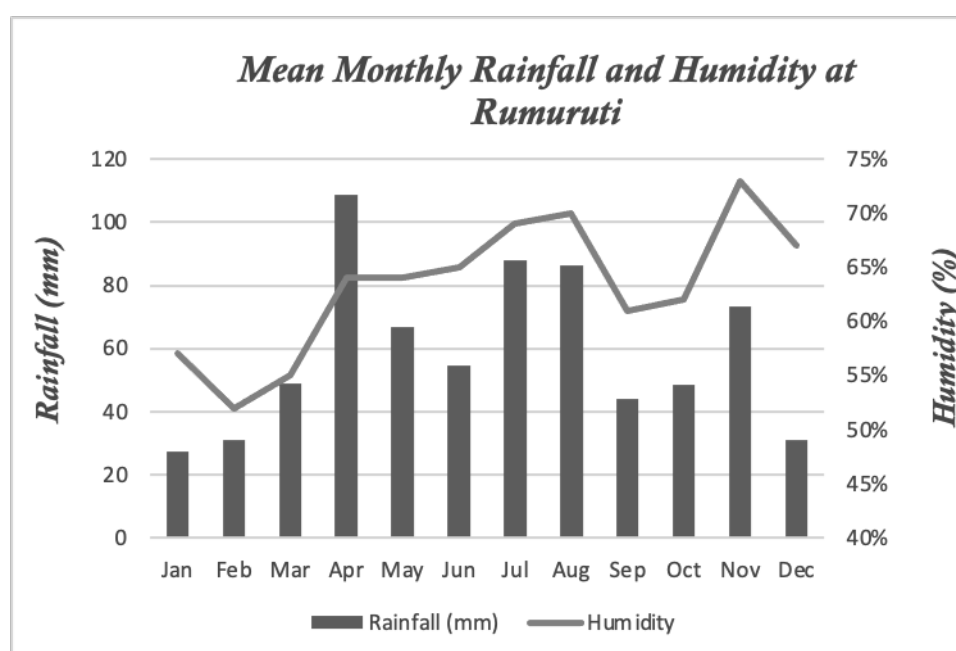


TABLE 2: MEAN MONTHLY RAINFALL AND HUMIDITY AT RUMURUTI

## Mean Monthly Rainfall and Humidity at Rumuruti

| Month         | Jan  | Feb  | Mar | Apr   | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  | Total |
|---------------|------|------|-----|-------|------|------|------|------|------|------|------|------|-------|
| Rainfall (mm) | 27.4 | 30.8 | 49  | 108.6 | 66.9 | 54.5 | 87.9 | 86.3 | 43.9 | 48.6 | 73.2 | 30.9 | 708   |
| Humidity      | 57%  | 52%  | 55% | 64%   | 64%  | 65%  | 69%  | 70%  | 61%  | 62%  | 73%  | 67%  | 63%   |



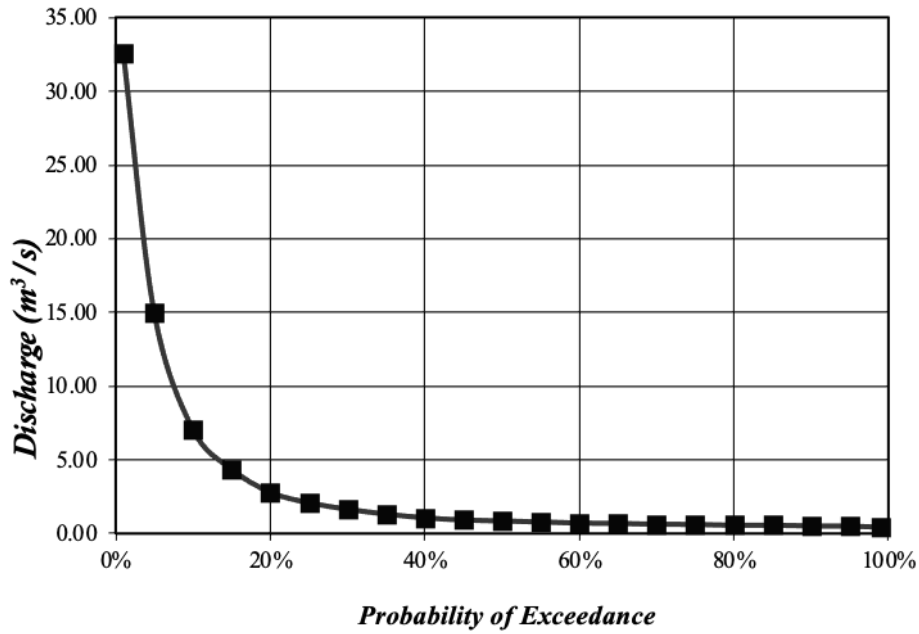
## Mean Monthly Rainfall and Humidity at Rumuruti

TABLE 3: SURFACE WATER AVAILABILITY FOR NYAMASARIA RIVER

|                    |             | <i>Allocation</i> | <i>Allocated</i> | <i>Balance</i> |
|--------------------|-------------|-------------------|------------------|----------------|
| Q95                | Reserve     | 15,206            | 0                | 15,206         |
| Q80                | Normal Flow | 7,517             |                  | 7,517          |
| Q50                | Flood Flow  | 20,218            |                  | 20,218         |
| Mean               |             |                   | 6.265            |                |
| Standard Deviation |             |                   | 14.215           |                |

## Surface water availability for Pesi River (Rgs5ab02)

| <i>Probability of non-exceedance</i> | <i>Probability of exceedance</i> | <i>Flow</i>       | <i>Flow</i>         | <i>Available for allocation</i> | <i>Days</i> | <i>Total volume</i>    | <i>Volume per year</i> |
|--------------------------------------|----------------------------------|-------------------|---------------------|---------------------------------|-------------|------------------------|------------------------|
| %                                    | %                                | m <sup>3</sup> /s | m <sup>3</sup> /day | m <sup>3</sup> /s               | nos         | Million m <sup>3</sup> | Million m <sup>3</sup> |
| 99%                                  | 1%                               | 7.731             | 667,916             |                                 | 3.65        | 2.44                   | 133.3                  |
| 95%                                  | 5%                               | 2.792             | 241,229             |                                 | 18.25       | 4.40                   | 130.9                  |
| 90%                                  | 10%                              | 1.730             | 149,472             |                                 | 36.50       | 5.46                   | 126.5                  |
| 85%                                  | 15%                              | 1.255             | 108,449             |                                 | 54.75       | 5.94                   | 121.0                  |
| 80%                                  | 20%                              | 1.028             | 88,836              |                                 | 73.00       | 6.49                   | 115.1                  |
| 75%                                  | 25%                              | 0.869             | 75,082              |                                 | 91.25       | 6.85                   | 108.6                  |
| 70%                                  | 30%                              | 0.756             | 65,318              |                                 | 109.50      | 7.15                   | 101.7                  |
| 65%                                  | 35%                              | 0.678             | 58,579              |                                 | 127.75      | 7.48                   | 94.6                   |
| 60%                                  | 40%                              | 0.606             | 52,358              |                                 | 146.00      | 7.64                   | 87.1                   |
| 55%                                  | 45%                              | 0.552             | 47,693              |                                 | 164.25      | 7.83                   | 79.5                   |
| 50%                                  | 50%                              | 0.497             | 42,941              | 20,218                          | 182.50      | 7.84                   | 71.6                   |
| 45%                                  | 55%                              | 0.435             | 37,593              |                                 | 200.75      | 7.55                   | 63.8                   |
| 40%                                  | 60%                              | 0.385             | 33,264              |                                 | 219.00      | 7.28                   | 56.2                   |
| 35%                                  | 65%                              | 0.352             | 30,413              |                                 | 237.25      | 7.22                   | 49.0                   |
| 30%                                  | 70%                              | 0.314             | 27,130              |                                 | 255.50      | 6.93                   | 41.7                   |
| 25%                                  | 75%                              | 0.291             | 25,142              |                                 | 273.75      | 6.88                   | 34.8                   |
| 20%                                  | 80%                              | 0.263             | 22,723              | 7,517                           | 292.00      | 6.64                   | 27.9                   |
| 15%                                  | 85%                              | 0.236             | 20,390              |                                 | 310.25      | 6.33                   | 21.3                   |
| 10%                                  | 90%                              | 0.213             | 18,395              |                                 | 328.50      | 6.04                   | 15.0                   |
| 5%                                   | 95%                              | 0.176             | 15,206              | 0.000                           | 346.75      | 5.27                   | 8.9                    |
| 1%                                   | 99%                              | 0.117             | 10,109              |                                 | 361.35      | 3.65                   | 3.7                    |



Surface water availability for Pesi river (RGS5AB02)

Surface water availability for Ewaso Narok river (RGS5AC15)

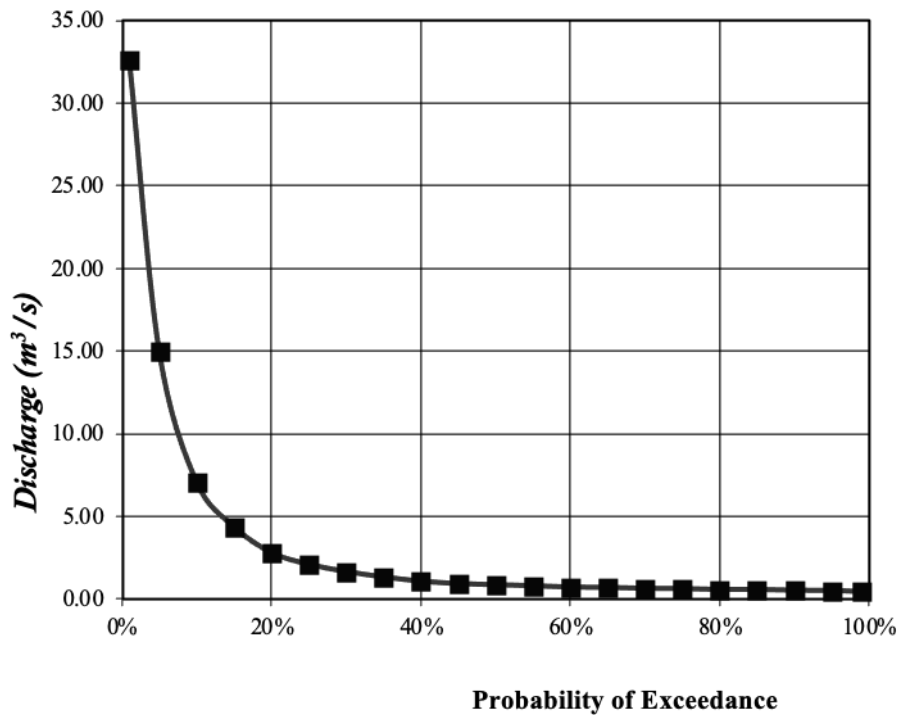
|     |             | <i>Allocation</i> | <i>Allocated</i> | <i>Balance</i> |
|-----|-------------|-------------------|------------------|----------------|
| Q95 | Reserve     | 43,114            | 0                | 43,114         |
| Q80 | Normal Flow | 5,702             |                  | 5,702          |
| Q50 | Flood Flow  | 25,056            |                  | 25,056         |

|                    |        |
|--------------------|--------|
| Mean               | 6.265  |
| Standard Deviation | 14.215 |

Surface water availability for Ewaso Narok river (RGS5AC15)

| <i>Probability of non-exceedance</i> | <i>Probability of exceedance</i> | <i>Flow</i>       | <i>Flow</i>         | <i>Available for allocation</i> | <i>Days</i> | <i>Total volume</i>    | <i>Volume per year</i> |
|--------------------------------------|----------------------------------|-------------------|---------------------|---------------------------------|-------------|------------------------|------------------------|
| %                                    | %                                | m <sup>3</sup> /s | m <sup>3</sup> /day | m <sup>3</sup> /s               | nos         | Million m <sup>3</sup> | Million m <sup>3</sup> |
| 99%                                  | 1%                               | 32.606            | 2,817,117           |                                 | 3.65        | 10.28                  | 324.0                  |
| 95%                                  | 5%                               | 14.989            | 1,295,015           |                                 | 18.25       | 23.63                  | 313.7                  |
| 90%                                  | 10%                              | 7.067             | 610,606             |                                 | 36.50       | 22.29                  | 290.1                  |
| 85%                                  | 15%                              | 4.371             | 377,654             |                                 | 54.75       | 20.68                  | 267.8                  |
| 80%                                  | 20%                              | 2.802             | 242,093             |                                 | 73.00       | 17.67                  | 247.1                  |
| 75%                                  | 25%                              | 2.091             | 180,662             |                                 | 91.25       | 16.49                  | 229.4                  |
| 70%                                  | 30%                              | 1.651             | 142,646             |                                 | 109.50      | 15.62                  | 213.0                  |

| Probability of non-exceedance | Probability of exceedance | Flow              | Flow                | Available for allocation | Days   | Total volume           | Volume per year        |
|-------------------------------|---------------------------|-------------------|---------------------|--------------------------|--------|------------------------|------------------------|
| %                             | %                         | m <sup>3</sup> /s | m <sup>3</sup> /day | m <sup>3</sup> /s        | nos    | Million m <sup>3</sup> | Million m <sup>3</sup> |
| 65%                           | 35%                       | 1.324             | 114,394             |                          | 127.75 | 14.61                  | 197.3                  |
| 60%                           | 40%                       | 1.068             | 92,275              |                          | 146.00 | 13.47                  | 182.7                  |
| 55%                           | 45%                       | 0.921             | 79,574              |                          | 164.25 | 13.07                  | 169.3                  |
| 50%                           | 50%                       | 0.855             | 73,872              | 25,056                   | 182.50 | 13.48                  | 156.2                  |
| 45%                           | 55%                       | 0.791             | 68,342              |                          | 200.75 | 13.72                  | 142.7                  |
| 40%                           | 60%                       | 0.711             | 61,430              |                          | 219.00 | 13.45                  | 129.0                  |
| 35%                           | 65%                       | 0.686             | 59,270              |                          | 237.25 | 14.06                  | 115.5                  |
| 30%                           | 70%                       | 0.636             | 54,950              |                          | 255.50 | 14.04                  | 101.5                  |
| 25%                           | 75%                       | 0.618             | 53,395              |                          | 273.75 | 14.62                  | 87.4                   |
| 20%                           | 80%                       | 0.565             | 48,816              | 5,702                    | 292.00 | 14.25                  | 72.8                   |
| 15%                           | 85%                       | 0.565             | 48,816              |                          | 310.25 | 15.15                  | 58.6                   |
| 10%                           | 90%                       | 0.521             | 45,014              |                          | 328.50 | 14.79                  | 43.4                   |
| 5%                            | 95%                       | 0.499             | 43,114              | 0.000                    | 346.75 | 14.95                  | 28.6                   |
| 1%                            | 99%                       | 0.438             | 37,843              |                          | 361.35 | 13.67                  | 13.7                   |



Surface water availability for Ewaso Narok river (RGS5AC15)

TABLE 4: CONSERVATION PLAN

| <i>Activity</i>  | <i>Sub-activity</i>   | <i>Timeframe</i> | <i>Cost</i> | <i>Responsibility</i>     |
|--|---|------------------|-------------|---------------------------|
| 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   | CGL, 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          | 35,000,000  | WRA, ENWRUA               |
|  | Place signs and notices to warn the public that this is a protected area.   | Continuous       | 250,000     | WRA, ENWRUA               |
| Gazette the Ewaso Narok Wetland as a protected water catchment area. | Assess the status of Ewaso Narok 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.  | 2021             | 2,500,000   | WRA with all stakeholders |
|  | Submit gazette instrument to the Cabinet Secretary in charge of water.  | 2021             | 200,000     | WRA                       |
| Enforce the Ewaso Narok wetland guidelines.                          | Create awareness to stakeholders the wetland guidelines and conservation plan.  | 2022             | 500,000     | WRA                       |
|  | Enforce Ewaso Narok wetland protected area guidelines, management plan and relevant legislations.                         | Continuous       | 0           | WRA, National Govt        |

| <i>Activity</i>                      | <i>Sub-activity</i>   | <i>Timeframe</i> | <i>Cost</i> | <i>Responsibility</i> |
|--------------------------------------|---|------------------|-------------|-----------------------|
| Control water resources abstraction. | Enforce requirements for acquiring water use permits for any abstraction from the swamp as per the Water Act, 2016 and Water Resources Regulations, 2021. | Continuous       | 0           | WRA, WRUA             |
| Sub-Total                            |   |                  | 41,500,000  |                       |

TABLE 5: REHABILITATION PLAN

| <i>Activity</i>  | <i>Sub-activity</i>  | <i>Timeframe</i> | <i>Cost</i> | <i>Responsibility</i> |
|--|--|------------------|-------------|-----------------------|
| Removal of all inappropriate/invasive species of plants.                                 | Identify and remove inappropriate and invasive tree species from the wetland.  | 1 Year           | 5,000,000   | WRA, KFS, NGAO, WRUA  |
|  | Exotic species control.  | Continuous       | 200,000     | WRA, KFS, WRUA        |
| Re-vegetation of the wetland with water friendly/native species of trees and vegetation. | Establish indigenous plants nursery.   | Continuous       | 5,000,000   | WRUA, WRA             |
|  | Grow live fence on the boundary of the wetland.  | Continuous       | 3,000,000   | WRA, KFS, WRUA        |
|  | Planting and growing of propagated seedlings (Watering and tending).   | 1 year           | 2,500,000   | WRUA                  |
| Development of alternative livelihoods to discourage farming within the wetland.         | Identification and Development of proposals for alternative livelihoods (eco-tourism, bee-keeping, agro-forestry, etc.). | 1 Year           | 10,000,000  | WRA, WRUA             |
| Sub-Total  |  |                  | 25,700,000  |                       |

TABLE 6: CATCHMENT AND WATER RESOURCES MONITORING PLAN

| <i>Activity</i>  | <i>Sub-activity</i>  | <i>Timeframe</i> | <i>Cost</i> | <i>Responsibility</i> |
|--|--|------------------|-------------|-----------------------|
| Upgrade to telemetry status RGS 5AB04, 5AC15 (upstream) and 5AC10 (downstream) of the Swamp. | Identify appropriate equipment and transmission system and install stations. | 3 months         | 7,500,000   | WRA                   |

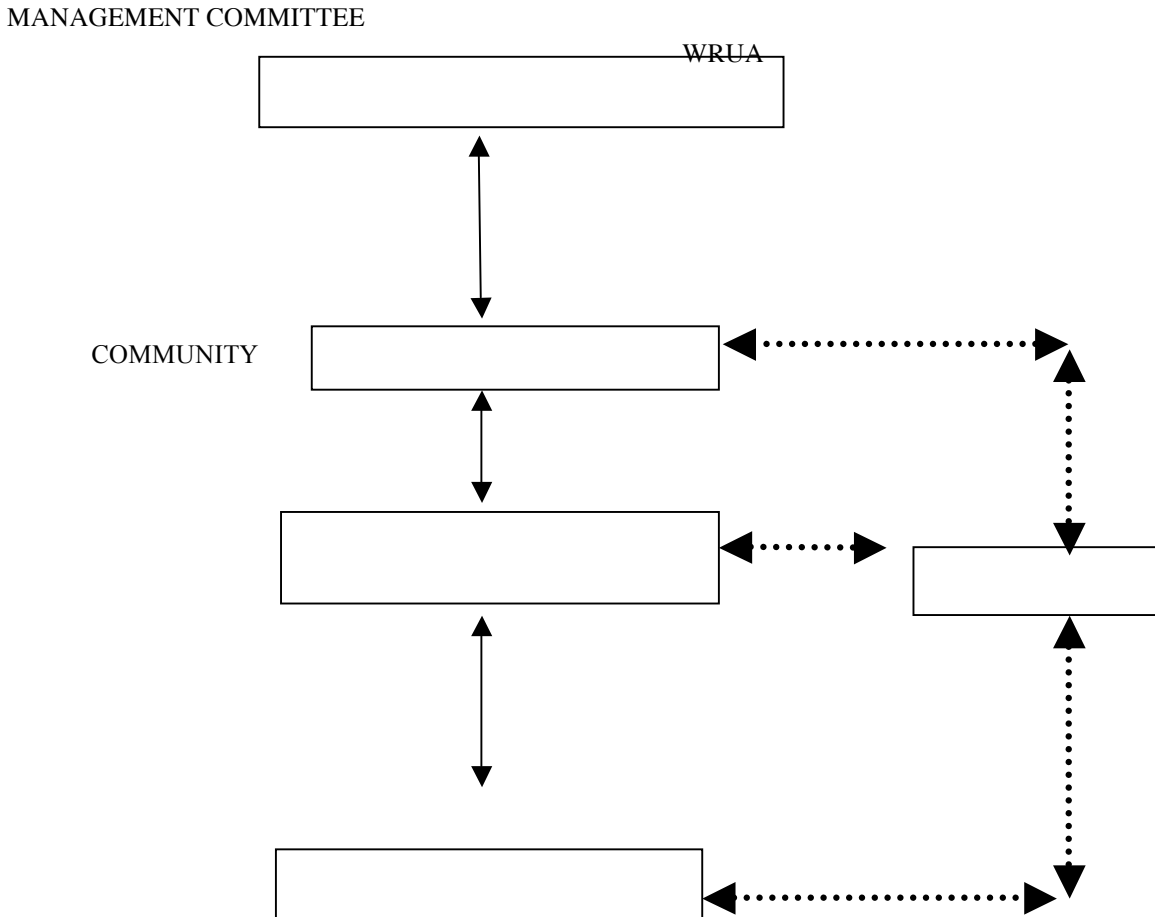
| <i>Activity</i>  | <i>Sub-activity</i>                              | <i>Timeframe</i> | <i>Cost</i> | <i>Responsibility</i> |
|--|--|------------------|-------------|-----------------------|
| Upgrade to a full hydro-meteorological station the rainfall station at WRA Rumuruti office compound. | Identify an appropriate site to install station. | Continuous       | 0           | WRUA, WRA             |
|  | Procure, install and commission the equipment.   | Continuous       | 1,000,000   | WRA                   |
|  | Collect and analyse hydromet data.               | Continuous       | 0           | WRA                   |
| Sub-Total  |  |                  | 8,500,000   |                       |

TABLE 7: MANAGEMENT STRUCTURE

| <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:<br>1. Kenya Forest Service;<br>2. National Government Administration in Laikipia County;<br>3. National Environmental Management Authority;<br>4. Ministry of Agriculture;<br>5. The Ewaso Narok WRUA.   | 3 months         | 300,000     | WRA                   |
|                                     | Terms of References (ToR) will include but not limited to:<br>▪ to manage the catchment prudently on behalf of other stakeholders;<br>▪ to submit quarterly reports to WRA - ENNBA on all planned and implemented activities;<br>▪ to develop by - laws and submit a copy to WRA – ENNBA for approval before implementation. | Continuous       | 0           | WRA, WRUA             |
|                                     | Mandate and responsibilities:<br>▪ promote the conservation and protection of the catchment.<br>▪ promote equitable distribution of the resources within the catchment.  | Continuous       | 0           | WRUA, WRA             |

| <i>Activity</i> | <i>Sub-activity</i>  | <i>Timeframe</i> | <i>Cost</i> | <i>Responsibility</i> |
|-----------------|--|------------------|-------------|-----------------------|
|                 | <ul style="list-style-type: none"> <li>▪ promote socio-economic and environmental sustainability of the catchment.</li> <li>▪ mapping of stakeholders and potential donors.</li> <li>▪ development and marketing of resources mobilization strategies.</li> </ul>            |                  |             |                       |
|                 | <p>The sources of funds for the committee may include:</p> <ul style="list-style-type: none"> <li>▪ bee keeping;</li> <li>▪ tree Nursery;</li> <li>▪ eco-tourism;</li> <li>▪ well-wishers/Donors;</li> <li>▪ WRA/WRUA - (WDC);</li> <li>▪ cultural/sports events.</li> </ul> | Continuous       | 5,000,000   | WRA                   |
| Sub-Total       |  |                  | 5,300,000   |                       |

FIGURE 2: REPORTING LINKAGES FOR THE MANAGEMENT COMMITTEE



Note:

- (i) The arrows indicate the direction of flow of information. The dotted lines indicate WRUA can also communicate directly to communities and vice versa;
- (ii) WRA as the agent of the National Government in the regulation of use and management of water resources, will be the co-ordinator 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.

TABLE 8: 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 14th July, 2023.

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