



REPORT ON GIS MAPPING OF INVESTMENTS AND CONSERVATION ALONG EWASO NG'IRO AND TANA RIVER BASINS, KENYA

Project name: Partners for Resilience II

BY

SPATIAL STREAM LTD

(Fredrick Juma, Luchu Owen & Chris Kamau)

EIA/GIS Specialists, Application Developers, Water
Engineers/Conservationists

FEBRUARY 26, 2018

P.O.BOX 54001-00200 NAIROBI

info@spatialstream.co.ke, fjuma20032003@yahoo.com

1. BACKGROUND

Wetlands International Kenya in Strategic Partnership (SP) with Cordaid, Kenya Red Cross, Red Cross Climate Centre and Netherlands Red Cross, is implementing a 5 year (2016-2020) Partners for Resilience (PfR) Programme to build and strengthen community resilience in Kenya by integrating Disaster Risk Reduction (DRR), Climate Change Adaptation (CCA), and Ecosystem Management and Restoration (EMR) – referred to as Integrated Risk Management (IRM).

The strategic partnership focuses primarily on environmental degradation and climate-related hazards, whose underlying causes and potential for disasters result to a large extent from human induced processes. One of the main objectives of PfR II SP is to ensure that by 2020, all new developments in investments (public and private) along Ewaso Ng'iro and Tana River basins comply with the IRM based safeguards or principles and apply IRM-based mitigation measures so as to avoid causing new and exacerbating existing vulnerabilities.

More often, public and private investment mechanisms fail to address IRM and there is hardly any accountability for sustainable inclusive development. It is against this background that Wetlands International Kenya is contracting Spatial Stream Limited to undertake mapping of water related investments along Ewaso Ng'iro and Tana River Basins covering 5 counties of Samburu, Laikipia, Isiolo, Kilifi, and Tana River.

Spatial Stream Ltd was appointed to undertake a consultancy on GIS mapping of investments along Ewaso Ng'iro and Tana basin, that are perceived to pose any threats /risks to environmental conservation of existing wetlands and related species.

The Project Name:-Wetland International, IRM-PfR Network (Mapping Water Infrastructures)

Project Coverage: Tana and Ewaso Ng'iro Basins (5 Counties: - Samburu, Laikipia, Isiolo, Tana river, Kilifi)

Main Objective of the consultancy: Mapping of Water Infrastructures, Geodatabases development

Tasks outlined in the Terms of reference:-

- Delineation/mapping of Ewaso Ng'iro & Tana River Basins
- Review of available list/maps of water infrastructures in 5 counties.
- Consultation with Wetland Intl., WARMA, NDMA, County Governmentt Water, NGOs
- Configuration of Mobile Data collector for Mapping
- Field Mapping of water infrastructures-sampling from the list
- Develop a GIS Geodatabase schema –populate as per attribute list
- Develop a prototype GIS Web Map Application-sharable portal

In the process of execution of the assignment, the consultant started off with an inception meeting, review of documents and an attempt to understand the goals of the project. The main activity involved was to identify relevant projects and initiatives and develop a database of all the water-related infrastructural projects along Ewaso Ng'iro and Tana River Basins covering Samburu, Laikipia, Isiolo, Kilifi and Tana River counties.

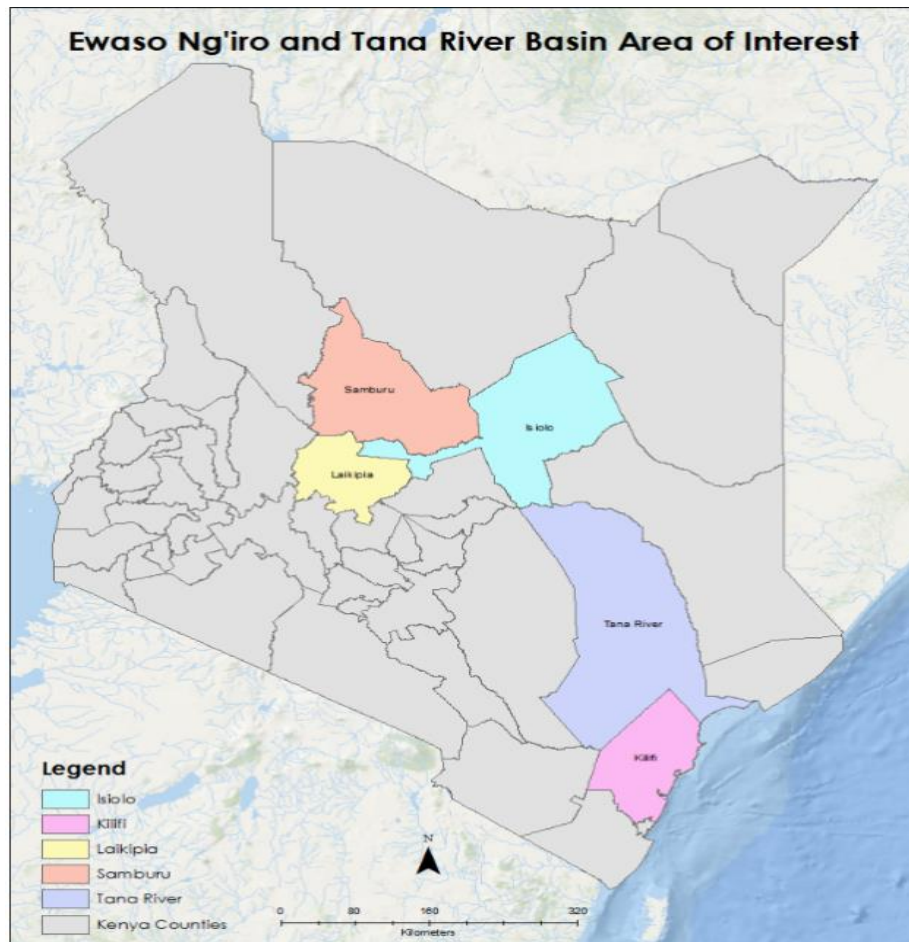
The Consultant focused on major projects and investments that have impact on Resilience of people, community and households, Conflict (water based access issues for example Crocodile Jaws Mega dam in Isiolo), Policy makers (eg. Need to review regulation on boreholes sinking

proximity and number per basin for the case of WRA) and best practices in irrigation agriculture is a necessity around source of streams flowing into Ewaso Ng'iro.

These investments include irrigation agriculture projects, domestic water supply, multi-purpose dam, urban infrastructure, boreholes, hospitality and energy production among others.

The consultant also undertook extra mile to map out all conservation areas along the basins, including ranches, community conservancies, wetlands, and landcover fragmentation in the landscape.

2. Project Coverage by Counties:



The study focused on the collection of data as per below list of attributes

- I. Name of the project
- II. Brief description
- III. Specific products
- IV. Project details (duration, geographic and demographic coverage – including coordinates)
- V. Type of population
- VI. Potential affected population
- VII. Affected population
- VIII. Type of water related? ecosystem goods and services
- IX. Volume of Water abstraction
- X. Executing agency (Company names or state enterprises)
- XI. Company risk management / safeguard policy
- XII. Funding agency and Funding

- XIII. Funding agency risk management / safeguard policy
- XIV. Relevant government actors
- XV. Other actors
- XVI. Potential ecosystem impacts
- XVII. Existing ecosystem impacts
- XVIII. Potential socio-economic impacts
- XIX. Existing socio-economic impacts
- XX. Project status
- XXI. Development of alternatives
- XXII. Do you consider this as a success? Why? Explain briefly.
- XXIII. Policy and legal framework
- XXIV. Contacts
- XXV. Project website/links

From the list above, the following attributes were partially filled in the final database, since they not easily accessible during the study period due to issues related to political interference during the Kenyan election of August 2017, causing most government officers, state parastatal heads to take leaves and travel to villages to participate in voting. Some of the issues are confidential and were not easily accessible.

- Type of water related? ecosystem goods and services
- Company risk management / safeguard policy
- Funding agency and Funding
- Relevant government actors
- Other actors
- Existing ecosystem impacts
- Existing socio-economic impacts
- Development of alternatives
- Do you consider this as a success? Why? Explain briefly.
- Policy and legal framework
- Project website/links

3. Purpose of Study:

The mapping of investments along the two pilot basins in Kenya (Tana and Ewaso Ngiro) is for creating a dynamic GIS Database is to allow partners and their staff to access some information for use during programming, targeting interventions related to collaboration, oversight and advocacy issues, with interest in managing environmental resources in an amicable way. Access to information informs dialogue, enhances access to resources to allow Resilience Building of Ecosystems and Community.

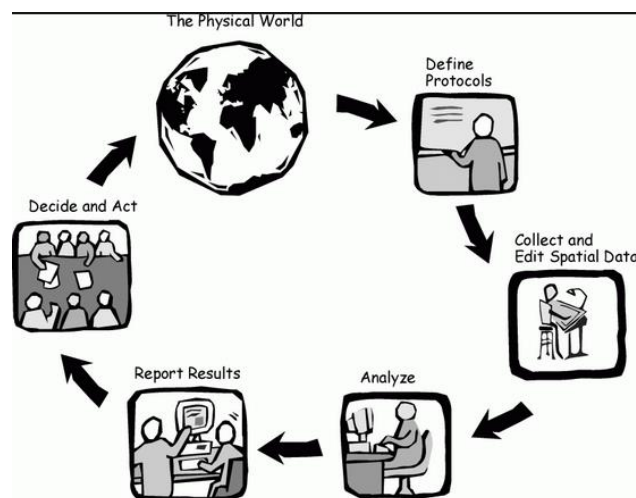


Figure 1: GIS Mapping and Use of Spatial data for Decision Making

4. List of stakeholders consulted during fieldwork

Field site visits and investment mapping was done for the period between 23 July and 1st August 2017, however, since the area was vast most of the study involved sampling project sites, secondary mapping using desk reviews and conducting key informant interviews which went on till December 2017.

The following stakeholders were consulted across the landscape within the target counties and Tana and Ewaso Ngiro basins.

- Mr. Joseph Olendira-Impact Nanyuki
- Mr. Ibrahim-Mid Program Isiolo
- Mr. Felix-of WARMA:Water Abstraction(Mid &Upper Ewaso Ngiro)
- Mr. Njuguna-GIS section of CETRAD Nanyuki
- Mr. James Mwangi, Starnle Kiremi of Laikipia Wildlife Forum
- Mr. Tom of Rural Focus-Nanyuki office
- Mrs. Sarah Mwaura-NEMA Nanyuki office
- Mr. David Mumo and Madam Rehab of Lower Ewaso WARMA Rumuruti Mr. Mbogoni Mureithi-WARMA Isiolo office
- Mr. Mututo NEMA CDE & Vincent Mahiva (NEMA Officer) –Isiolo
- Mr. John Mwaniki-Technical Manager ENNDA-Isiolo HQ
- Mr. Gichuhi, Technical manager- Garissa Water & Sanitation Co.

- Madam Nasra Hanshi MD of Tana Water & sanitation Company
- Mr. Jacob Hamisi of Hola Irrigation Scheme
- Mr. Mwamuzi of KFS, Kilifi Ecosystem..effects of Magarini Salt Co.
- Madam. Arafa Baya of Mida Creek Conservation Community
- Engineer Felix Shiundu of Bura Irrigation Scheme
- Mr. Maulidi Diwayu of TDIP by TARDA
- Mr. Abdi Omar of WRMA lower Tana basin

Other References and websites reviewed

- NORTHERN WATER SERVICES BOARD
- NATIONAL IRRIGATION BOARD (NIB)
- LAPPSET AND VISION 2030
- MINISTRY OF ENVIRONMENT AND NATURAL RESOURCES

5. Summary of datasets collected into the Geodatabase

The following datasets were captured during the study, including, the major investment in the target basins, boreholes, wetlands, conservancy, ranches and land cover/land uses. The major infrastructure was required as per ToR however, during the study, it was found relevant to map out other related developments that may have impact on basins such as boreholes to determine their intensity and effects on groundwater especially in Laikipia county.

Other natural resources mapped were found to be necessary to be mapped to understand the pattern and threats.

Boreholes classification and permit process as per WRA for definition of class A,B,C,D is shown below:

Category A: Water use activity deemed by virtue of its scale to have low risk of impacting the water resource. Applications in this category will be determined by WRA Regional Offices

Category B: Water use activity deemed by virtue of its scale to have potential to make a significant impact on the water resource. Permit applications in this category will be determined by WRA Regional Offices.

Category C: Water use activity deemed by virtue of its scale to have a measurable impact on the water resource. Permit applications in this category will be determined by WRA Regional Offices after consideration by the Catchment Area Advisory Committees (CAACs)

Category D: Water use activity which involves either international waters, two different catchment areas, or is of a large scale or complexity See more details in the annex.

Major Investments database in Ewaso Ngiro and Tana basins

Type of infrastructures	Investment Category	No. of facilities	Products/Threats
Oil refineries	Energy Production	2	Oil, Gases,By-products
Oil & Gas Exploration block	Energy Production	16	Oil,Gases,By-products
Oil & Gas Discovery Wells	Energy Production	32	Oil,Gases,By-products
Biofuel & Oil Seed farms	Irrigation Agriculture	2	Crops,energy,water use
Irrigation schemes	Irrigation Agriculture	22	Crops, water use
Water and Sanitation facilities	Water and Sanitation Company	11	Water,Sewage
Hydro Electric Dams	Energy Production	10	HEP,Water
Flower Irrigation farms in Laikipia	Irrigation Agriculture	3-49	Chemicals, flowers
Urban Cities Expansion	Urban Infrastructure	4	Urbanization
Lapsset Transport infrastructures	Urban Infrastructure	3	road,rail,pipeline
Others natural resources			
Boreholes drilled in Ewaso basin	Water facilities	1011	Ground water over abstraction
Wetlands & Swamps	Conservation sites	Many	Wildlife
Ranches	Conservation sites	91	Wildlife
Community & Private Conservancy	Conservation sites	23	Wildlife

6. Example Category of investments under focus

Chinese firm to build Kenya's largest water reservoir

Posted on May 11, 2014 by Jane Mwangasha



Dam construction. High Grand Falls Dam will hold 5.6 billion cubic metres of water. PHOTO/COURTESY

Figure 4: Sample projects under target for mapping

7. Development of the web portal, access and user manual

Once the database schema was prepared, some field data was captured using ArcGIS collector installable on mobile smart phones and tablets, where all attributes including names, photographs and GPS coordinates are captured and remotely pushed into an online dashboard for quality control. The data is later available for download as CSV or Excel files. Thereafter, published on a web portal below.

To access partners organization web map portal, use the credentials below;

URL: <https://wetlandsint.maps.arcgis.com/home/index.html>

Username: wetlandsinternational

Password: wetlands2017

See attached user guide in the Annex to help you navigate and use different functionalities of the web application.

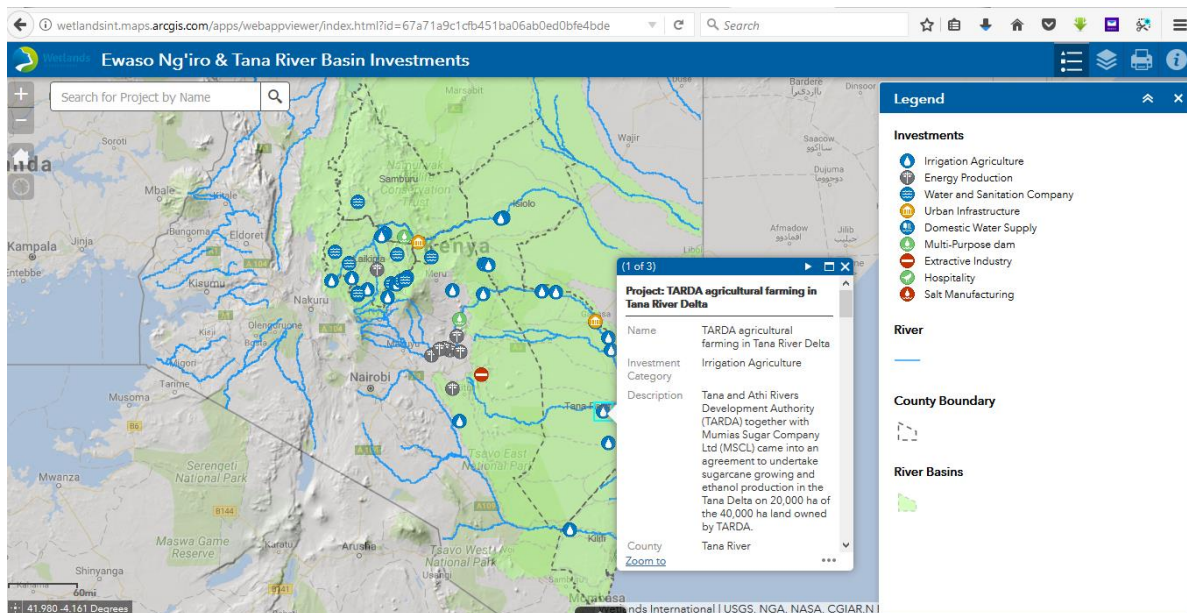


Figure 2: Web map with sample investments and attributes

8. Key Challenges profiled during the study

1. Logistic challenges, as a result of bad roads and long rain season in July-August in Kenya
2. Some Key Government Staff on leave due to Election of campaign before 8th August 2017
3. Suspicion and delay or negative feedback on information to complete database-Sensitivity
4. Government staff decline to give information unless from higher office especially on high profile project planned under vision 2030 eg. LAPSSET
5. Prolonged political temperatures in the country during August 2017 elections in Kenya was an impediment to access of data
6. Scarcity of information on websites and published literature online to complete database eg. Flower firms and Water Companies
7. Poor GPS Coordinates from WARMA data-however it was key data of analysis on groundwater discharge points.
8. Level of details required for the secondary information was found to be beyond mapping, rather requires a long-term research
9. Flower industry players were not willing to allow access to premise or information related to ground water abstractions and discharges systems

Key recommendations

- I. Scarcity of attributes to infrastructure development:** Given the scarcity of the infrastructure information, its recommended that the GIS mapping should be a long-term and continuous exercise to compile and fill the GIS database with any new information encountered that is relevant to the assignment. This will ensure completeness of the database as information emerges.

- II. **Small scale irrigation farmers:** It's important to continuously work with partners eg. Water Resources Authority (WRA), especially in important catchments such as Mt. Kenya around Nanyuki and along river Tana to map and identify small scale farmers who abstract water for horticultural irrigation activities, the intensity of some of the illegal small-scale abstractions result in significant siltation and water diversions Upstream. If the users are identified, trained it can lead to controlled abstraction based on emerging framing methods. The GIS consultant can provide technical training where necessary to WRUA and other partners.
- III. **Mapping of Boreholes and wetlands to determine ground water threats:** PfIR partners and the GIS consultant can work with WRUAs across key basins to map and update existing wetlands database and use remote sensing techniques to identify and determine change detection over the year to inform strategic management and conservation measures to counter encroachment from farmers. This will also inform prioritization of interventions for the areas that are heavily affected or those wetlands that are disappearing. Boreholes data from WARMA needs to be verified by trained WRUAs since accuracy of their positions and intensity of borehole location can be used to inform groundwater abstraction challenges.
- IV. **Status of projects mapped:** Most of the investments projects identified have not been implemented and are in the planning stage, some are in courts or donors pulled out due to the inherent controversy especially on mega project in wetland areas. For those implemented are mainly under water supply, with less sanitation component.

ANNEXE

1. User Guide to Web portal
2. Abstract of database for 51 development infrastructures
3. Sample GIS Geodatabase
4. Sample web portal maps
5. Land use maps for the Ewaso Ngiro and Tana basin
6. Other databases of wetland, conservancy and ranches

User Guide

Introduction

This user guide will help staff to manage and update the GIS database, use mobile application to collect new information and present the information on a web map application. this guide is categorized into 3 main components

1. Mobile Application
2. Web Map for Admin and Data Editors
3. Web Map Application for Viewers

1. Mobile Application to Collect New/Update Existing Data

Prerequisite steps:

#Turn on WIFI connection or use your mobile data to download and set up the app.

#Turn on your GPS from your mobile settings.

Step 1: Download Collector for ArcGIS App

- *iOS* – Go to App Store search for *Collector for ArcGIS* App, Download and Install
- *Android* – Go to Google Play Store search for *Collector for ArcGIS*, Download and Install

Step 2: Sign in to Collector App




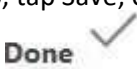
- From your apps, tap to open Collector for ArcGIS app
- Sign in to Collector Username: **wetlandsinternational** Password: **wetlands2017**
- Once you are logged in, you will see the field map (investments collect).
- To collect data using internet – tap on *investments collect* to open the map
- To collect data without internet – tap on Download link (additional steps are discussed below).

Step 3: Download Map on Device

- Once you are logged in Tap on [Download](#) Link to download *investments collect* map on your device. This will allow users to collect information without internet connection.
- If prompted to choose basemap, choose to download a new basemap **streets**

- Choose your work area – Tap on CHOOSE MAP DETAILS
- Expand the extent - Pinch outwards to ensure that project county boundary is within the highlighted extent. Tap on DOWNLOAD > this will take you back to the maps page, you will see the download progress.
- Once the download is complete, [Sync](#) Link will be shown on your map thumbnail

Step 4: Open Downloaded Questionnaire

- Tap on *investments collect* map to open it.
- If [Improve My Location](#) window pops up > Tap on Settings > Check the box next to Use GPS Satellites > Click Back button to go back to your data collection interface.
- Tap on the GPS icon  to activate your current location
- Tap Collect New  to start collecting facilities' location. To avoid poor accuracy warning, you should have a clear sky above you.
- Tap 'Projects'
- Complete the attributes as discussed in the orientation.
 - Project name
 - Investment Category
 - Description
 - County
 - Location
 - Specific Products
 - Project Start Date
 - Population Type, etc
- Take a photo by clicking on Add Attachment  Tap Camera > Take a photo of the feature.
- If you're happy with the photo, tap Save; otherwise, tap Discard to take a new photo.
- Save your entries by tapping **Done** 

(Note that, if you don't tap on submit/Done button, your data will NOT be committed to the database).

Step 5: Synchronizing data

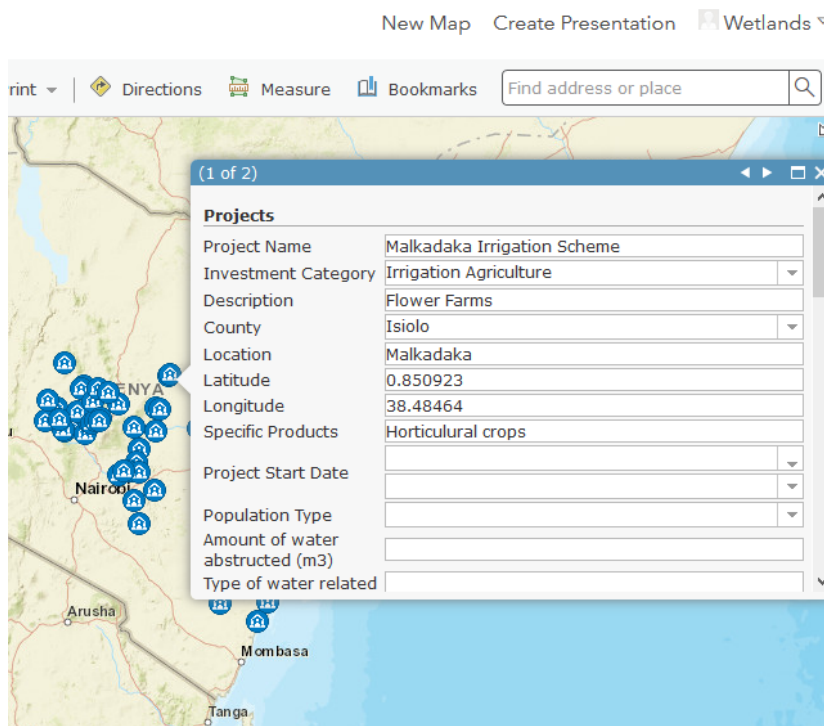
Once all the entries are complete, click on *Sync (Number of facilities collected)* next to investments collect map thumbnail on Collector App. You need internet connection to perform this task.

2. Web Map for Admin and Data Editors

- Go to your web browser, follow the link below to access the web map.
<http://bit.ly/2Gf3bP7>
- Sign in using administrative credentials: Username: **wetlandsinternational** Password: **wetlands2017**
- Click Edit at the standard bar of the web map as shown below



- Click project location to open the pop up as shown below



- Update the information on the pop up by typing in the specific field. For example, Project start date is missing in Malkadaka Irrigation Scheme. When you have the right Start Date, you can go ahead and type it in, then scroll and click Close.

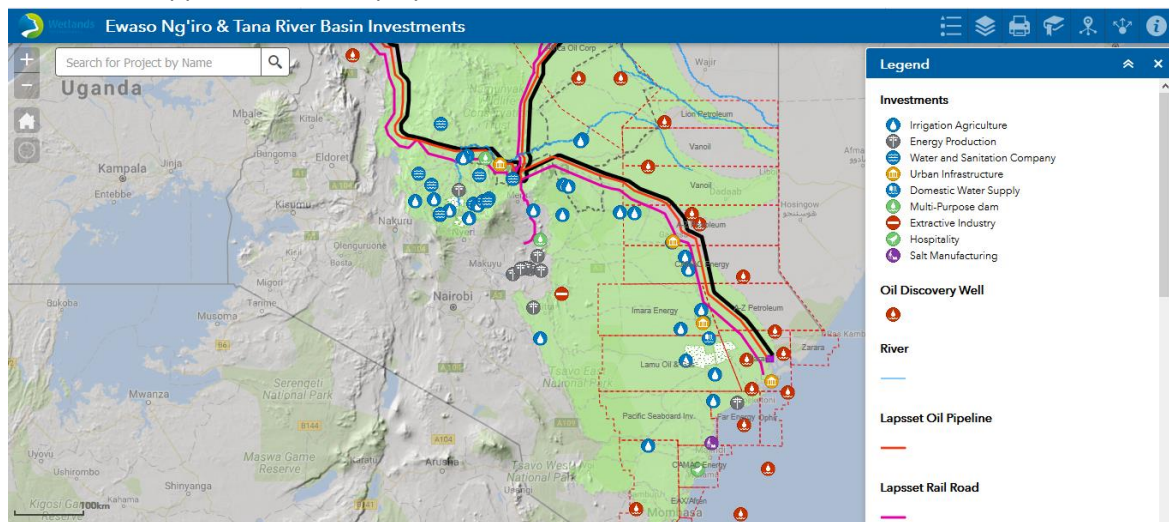


- That's it, you are done editing the attributes and this information is now visible to all staff or stakeholders who have access to the system.

3. Web Map Application for Viewers

Web map application is the interface used by staff and stakeholders to visualize and query the data. To use this application, follow the steps below:

- Go to your web browser, follow the link below to access the web map.
- <http://bit.ly/2tycpmR>
- Sign in using administrative credentials: Username: **wetlandsinternational** Password: **wetlands2017**
- The application will display as shown below:



-Alternatively, go to www.arcgis.com sign in using the credentials above. This will show the home page



Click the thumbnail to open a specific map e.g. investments map

- To navigate to different functions of the map, click the icons below for different tasks such as print, share, info summary etc.



Database of 51 development infrastructure in the Tana and Ewaso Ngiro basin

Project Name	Investment Category	Description	County	Location	Latitude	Longitude	Specific Products
Oil and Gas Exploration in Block L6	Energy Production	Flow Energy Limited is planning to explore oil and gas in Block L6, Lamu and Tana Delta Districts, covering a total area of about 3142.61km2 with approximately 25% onshore	Tana Delta	Witu, Kipini and Kiongwe.	-2.51634	40.46901	Biological resources
							Natural Gas
Bedford Biofuels Jatropha	Irrigation Agriculture	Bedford Biofuels Ltd proposed to establish Jatropha plantations on 6 ranches in Tana Delta on 64,000 ha. Phase one would commence on 10,000 ha in Kitangale ranch; phase 2 would take a further 30,000 ha in 4 other ranches, while phase 3 would add another 24,000 ha.	Tana Delta	Kintangale Ranch	-1.98204	39.80426	Bio fuels-Ethanol
							Jatropha
							Carbon offsets
							Land
Tarda agricultural farming in Tana River Delta	Irrigation Agriculture	Tana and Athi Rivers Development Authority (TARDA) together with Mumias Sugar Company Ltd (MSCL) came into an agreement to undertake sugarcane growing and ethanol production in the Tana Delta on 20,000 ha of the 40,000 ha land owned by TARDA.	Tana Delta	Ingile Area	-1.57845	39.74168	Land
							Sugar
							Ethanol
							Rice
							Corn/Maize
Proposed High Grand Falls Multipurpose Dam	Multi-Purpose dam	Construction of High Grand Falls Dam by GoK in Mwingi aimed at promoting irrigation and supply clean water in Ukambani and Tana River regions. The proposed 165km2 dam will also be used to generate between 500MW and 700MW of electricity.	Kitui-Mwingi North	West of Katse Market	-0.4302	37.93791	Water

		Negative impacts include reduction of the amount of water flowing into Tana Delta from River Tana. This will exacerbate changes in downstream ecosystem and biodiversity, further disrupting the flooding regime, which has already been disrupted by existing dams; and also affect livelihoods for farmers, fishermen and pastoralists					Biological resources
G4 Industries Oil seed farming project	Irrigation Agriculture	G4 International Limited entered into a legal agreement for the management of Wachu ranch in Garsen, west of the Tana Delta. The aim is to establish an oilseed crop growing and processing facility in the property. They proposed to grow crambe, castor and sunflower crops on a 28,911 hectares land, with the main water source coming from the Tana River.	Tana Delta	Wachu Ranch-Garsen	-2.49913	40.16004	Crude oil
							Carbon offsets
							Land
Proposed Mega Dam on River Ewaso Ng'iro, Kenya	Multi-Purpose dam	In early 2013, The National Water Conservation and Pipeline Corporation announced plans to construct a mega dam on Ewaso Ng'iro River in Isiolo County. The twin dams will be set up at Crocodile Jaws and Ngerendare and it's principally meant to provide water to the proposed Isiolo resort city, to be set up at Kipsing Gap.	Isiolo	Crocodile Jaws and Ngerendare	0.604904	37.24158	Water for domestic/industrial, Tourism Services
Malkadalka Phase I Irrigation Project	Irrigation Agriculture		Isiolo		0.830734	38.45701	
Rapsu Irrigation Project	Irrigation Agriculture		Isiolo		0.252762	38.30356	

Oldonyiro Irrigation Project	Irrigation Agriculture		Isiolo		0.646353	37.004	
Rahole Irrigation Project	Irrigation Agriculture	Rice and Vegetble irrigation	Garissa		-0.08946	39.14743	
Mitunguu Irrigation Project	Irrigation Agriculture		Meru		-0.06519	37.85174	
Ngobit Irrigation Project	Irrigation Agriculture		Laikipia		-0.11594	36.66136	
Tumaini/Mutiriri Phase II Project	Irrigation Agriculture	Tumaini Dam and farming	Laikipia	Tumaini dam site	0.057436	36.33297	
Kavisuni Irrigation Project	Irrigation Agriculture		Kitui		-1.70136	37.94122	
Usueni Irrigation Project	Irrigation Agriculture		Kitui		-0.11023	38.22827	
Nanyuki Water and Sanitation Company	Water and Sanitation Company	Aim is to provide water supply and sanitation services within Nanyuki Municipal Area and its environs under the current Water Act 2002.A full treatment water supply infrastructure with a capacity of 14,650 m3 /day but operating at 12,000m3 /day, it also has 2 wier dams, 2 row water mains and 7 Storage tanks - 8,000m3. The facility has approx 8,500 connections. It Also has a conventional biological waste water treatment ponds (lagoons) facility, capable of treating approx 1,965 m3 /day	Laikipia	Likii River	0.02643	37.0808	
Imetha Water and Sanitation Company	Water and Sanitation Company	Company presently dealing wih water supply only	Meru	Timau River	0.063216	37.25864	
Sirimon Water and Sanitation Company	Water and Sanitation Company	Company presently dealing wih water supply only	Laikipia	Sirimon River	0.058598	37.20517	
Doldol Water and Sanitation Company	Water and Sanitation Company	Company presently dealing wih water supply only	Laikipia	Doldol Borehole	0.384963	37.15984	

Maralal Water and Sanitation Company	Water and Sanitation Company	Contracted on 26 th January 2007 . No sewage works in Maralal and the company is presently dealing with water services only.The water supply was run by the ministry of water and irrigation before the water company was contracted. Average monthly water production is 28,000m ³ or 933m ³ /day. Current water demand is 1,700m ³ /day or 51,000m ³ /month. Population served by the scheme is 36,666. Area covered by the scheme is 10m ²	Samburu	Nundoto Boreholes and Suyien dam	1.048333	36.66628	
Isiolo Water and Sanitation Company	Water and Sanitation Company	Aim is to provide water supply and sanitation services within Nanyuki Municipal Area and its environs under the current Water Act 2002.The total number of connections are 4329	Isiolo	Burat Boreholes	0.347962	37.58786	
Mutito Water and Sanitation Company	Water and Sanitation Company	Company presently dealing with water supply only	Laikipia	Ngobit River	-0.10464	36.6601	
Sipili Water and Sanitation Company	Water and Sanitation Company	Company presently dealing with water supply only	Laikipia	Sipili Borehole	0.415983	36.37631	
Rumuruti Water and Sanitation Company	Water and Sanitation Company	The water service provider was contracted on 29 th June 2006. The water supply was operated and maintained by Rumuruti town council before contracting the WSP. There is no sewerage system in Rumuruti township. Estimated population served by the water supply is 7000. The average daily water production is 150m ³	Laikipia	Rumuruti	0.274577	36.54742	

Elkarama Hydro-electric Company	Energy Production	Privately Owned Energy Production	Laikipia	Near Confluence of Elkarama Ranch, Ewaso Nyiro	0.198282	36.89954	HEP
Ibis/Flamingo Group/Homegrown Flowers	Irrigation Agriculture	Flower Farms	Laikipia	Ontulili Dam	0.006381	37.14074	Flower cuts
KHE/Kenya Horticultural export	Irrigation Agriculture	Flower Farms	Meru	Timau River	0.094878	37.2821	Flower cuts
Triple A Flower Firm	Irrigation Agriculture	Flower Farms	Nyeri	Narumoru River	-0.15875	37.03086	Flower cuts
Ngobit Irrigation Scheme	Irrigation Agriculture	Horticultural crops	Laikipia	Ngobit River	-0.05707	36.78069	Horticultural crops
Malkadaka Irrigation Scheme	Irrigation Agriculture	Flower Farms	Isiolo	Malkadaka	0.850923	38.48464	Horticultural crops
Rapsu Irrigation Scheme	Irrigation Agriculture	Flower Farms	Isiolo	Rapsu	0.267248	38.24109	Horticultural crops
Oldonyiro Irrigation Scheme	Irrigation Agriculture	Flower Farms	Isiolo	Oldonyiro	0.6128	36.95484	Horticultural crops
Intensive Small Scale Farming Vegetables Upstream	Irrigation Agriculture	Flower Farms	Laikipia	Pesi near Rumuruti	0.086767	36.58362	Horticultural crops
Isiolo Resort City	Urban Infrastructure	LAPPSET Corridor	Isiolo	Isiolo Town	0.533237	37.42202	Urban Town
Garissa City	Urban Infrastructure	LAPPSET Corridor	Garissa	Garissa Town	-0.45533	39.64182	Urban Town
Hola City	Urban Infrastructure	LAPPSET Corridor	Hola	Hola Town	-1.49813	40.0339	Urban Town
Lamu Port & City	Urban Infrastructure	LAPPSET Corridor	Lamu	Lamu Town	-2.24805	40.91269	Urban Town
Garissa Water and Sewerage company (GAWASCO)	Domestic water Supply	Treatment and distribution of domestic water to Garissa town	Garissa	Garissa Town	-0.46343	39.63664	Supply treated water to residents of Garissa town
The NYS Camp Garissa Mbalambala Field Station	Agriculture	Gravity conveyance of irrigation water on earth canals to rice paddy and adjacent community farms	Garissa	Balambala	-0.07874	38.96505	NYS cultivate mainly Rice, fruit trees while community are allowed also to plant bananas and maize
Masalani Water Company	Domestic water Supply	treatment and distribution of domestic water to Masalani town	Garissa	Masalani town	-1.69952	40.11127	Supply treated water to residents of Masalani town
Magarini Private Salt Companies	Salt Manufacturing	Ocean water diversion to inland drying ponds for salt extraction. By evaporation	Kilifi	Magarini	-3.0366	40.1414	Sea Salt
Mida Ecotourism	Hospitality CBO	CBO dealing with eco tourism, bee keeping, organic farming, conservation awareness, Mangrove nursery	Kilifi	Mida creek	-3.375	39.96556	Ecosystem conservation

Bura Irrigation & Settlement Scheme	Agriculture	Lift irrigation from Tana River and gravity conveyance of irrigation water on earth canals to farmers lands	Tana River	Abstraction point Nanighi	-0.81691	39.83918	food crops: Commercial maize, seed maize, rice, horticulture, cotton, bananas
Tana Water and Sewerage Company (Tawasco)	Domestic water Supply	treatment and distribution of domestic water to Hola town	Tana River	Hola town	-1.4935	40.03698	Supply treated water to residents of Hola town
Hola Irrigation Scheme	Agriculture	Gravity conveyance of irrigation water on earth canals to farmers lands	Tana River		-1.33662	40.00914	Based on farmers interests- maize, sorghum, watermelon, onions maize, rice, green grams
Tana Delta irrigation project (TDIP) by TARDA	Agriculture	water diversion and civil works air controlled rubber dam directing water for gravity conveyance of irrigation water on earth canals to parastatal farms	Tana River	Garsen division	-2.15407	40.18173	Rice,maize and green grams
Garissa-Tana River Water Abstraction for farming	Agriculture	Lift and Gravity conveyance of irrigation water on earth canals to farmers lands	Tana River and Garissa	spread along the lower Tana River drainage basin	-0.65607	39.7993	Based on farmers interests- maize, sorghum ,watermelon , maize, horticulture ,bananas
Galana/Kulalu Food Security Project	Irrigation Agriculture	gravity conduit irrigtaion			-3.06351	39.32662	Maize, Sugarcane
Coal Mining Mui Basin of Kitui County	extractive industry	Coal mining	Kitui	Mui	-1.12242	38.21421	Coal
Masinga dam	Energy production	HEP generation	Embu	Masinga	-0.87851	37.5889	HEP
Kindaruma dam	Energy production	HEP generation	Embu	Kindaruma	-0.8099	37.81228	HEP
Kiambere dam	Energy production	HEP generation	Embu	Kiambere	-0.63975	37.90881	HEP
Gitaru dam	Energy production	HEP generation	Embu	Gitaru	-0.7953	37.74972	HEP
Kamburu dam	Energy production	HEP generation	Machakos	Kamburu	-0.80778	37.68676	HEP
Mutonga dam	Energy production	HEP generation	Kitui	Mutonga	-1.30193	37.853	HEP
Karura dam	Energy production	HEP generation	Kitui	Karura	-0.83338	37.95004	HEP

Database of Private Ranches in Ewaso Ngiro basin

Name of Ranch	Land Use	County Name	Location Name	X	Y
ADC Mutara	Private Ranch	Laikipia	ADC Mutara	36.68808050860	0.13814313985

Adrencaple	Private Ranch	Laikipia	Adrencaple	37.25461412950	0.10759954221
Allus	Private Ranch	Laikipia	Allus	37.04656375580	0.04833922968
Barkas	Private Ranch	Laikipia	Barkas	36.96360633550	0.23324245702
Bhora	Private Ranch	Laikipia	Bhora	36.63801764250	0.21529116933
Bhora Outspan	Private Ranch	Laikipia	Bhora Outspan	36.60431756850	0.20172819218
Bhora-2	Private Ranch	Laikipia	Bhora-2	36.52578155620	0.26671636673
Bloom Hill	Private Ranch	Laikipia	Bloom Hill	37.23424920910	0.10959689154
Borana	Private Ranch	Laikipia	Borana	37.36750390420	0.19861727792
Borana	Private Ranch	Laikipia	Borana	37.30190414080	0.24689725968
Brown	Private Ranch	Laikipia	Brown	36.96249580770	0.24316284132
C.C Forest (Rwathia)	Private Ranch	Laikipia	C.C Forest (Rwathia)	36.37160677750	0.06282977282
Cattle tracks	Private Ranch	Laikipia	Cattle tracks	36.75160835190	0.39839433450
Cattle tracks	Private Ranch	Laikipia	Cattle tracks	36.38513914460	0.04152481866
Chololo	Private Ranch	Laikipia	Chololo	36.98774912460	0.38726933355
Chong'oti	Private Ranch	Laikipia	Chong'oti	36.64728047010	0.31037451005
Dawa Farm	Private Ranch	Laikipia	Dawa Farm	37.05566123930	0.05471597241
Deighton H.G.	Private Ranch	Laikipia	Deighton H.G.	36.63200946760	0.01753929682
Elkarama	Private Ranch	Laikipia	Elkarama	36.92896481750	0.21689101741
Enasoit	Private Ranch	Laikipia	Enasoit	37.07339722670	0.25510089974
Ex-Longolois Outspan	Private Ranch	Laikipia	Ex-Longolois Outspan	36.65269720410	0.38523677275
Franscombe	Private Ranch	Laikipia	Franscombe	36.87702893450	0.64237656959
G. Land	Private Ranch	Laikipia	G. Land	36.51724575500	0.08090099852
G.G Kariuki	Private Ranch	Laikipia	G.G Kariuki	36.57093464580	0.24762268479
G.L(Ngare Ndare)	Private Ranch	Laikipia	G.L(Ngare Ndare)	37.34425172280	0.20234548098
G.L.(Rumuruti Forest	Private Ranch	Laikipia	G.L.(Rumuruti Forest	36.45054864900	0.19886736317
G.L.(Rware)	Private Ranch	Laikipia	G.L.(Rware)	36.58709210600	0.07737732457
Govt. Land (G. G. Kariuk	Private Ranch	Laikipia	Govt. Land (G. G. Kariuk	36.58617464910	0.23721601415
Govt. Land (OI Doinyo)	Private Ranch	Laikipia	Govt. Land (OI Doinyo)	36.78028393200	0.43770903727
Hippo Estate	Private Ranch	Laikipia	Hippo Estate	36.38365243120	0.03971420550
Icuga	Private Ranch	Laikipia	Icuga	37.04476566120	-0.01611592196
Jessel	Private Ranch	Laikipia	Jessel	36.86930455360	0.26860822583
John C. Cardoville	Private Ranch	Laikipia	John C. Cardoville	36.44203471870	0.18732584151
Kahora Farm	Private Ranch	Laikipia	Kahora Farm	36.38962572850	0.03639298333
Karagoin	Private Ranch	Laikipia	Karagoin	36.52090386720	0.07005179450
Karamuton	Private Ranch	Laikipia	Karamuton	36.46119698680	0.13690668009
Kifuko	Private Ranch	Laikipia	Kifuko	36.56774169860	0.19094992389
Kihoto	Private Ranch	Laikipia	Kihoto	36.88871619720	0.24396933961
Kimani	Private Ranch	Laikipia	Kimani	36.73001726890	0.21687652231
Kimuri	Private Ranch	Laikipia	Kimuri	36.99591243130	0.10818545066
Kisima	Private Ranch	Laikipia	Kisima	36.72909768990	0.52290887338
Kisima-Sosian Outspa	Private Ranch	Laikipia	Kisima-Sosian Outspa	36.74019607140	0.44897104025

Kurikuri	Private Ranch	Laikipia	Kurikuri	37.19092715730	0.48259209956
L.T.C	Private Ranch	Laikipia	L.T.C	36.27381499390	0.02929636919
Lamuria Centre	Private Ranch	Laikipia	Lamuria Centre	36.86302324920	-0.13275240996
Loisaba	Private Ranch	Laikipia	Loisaba	36.80180399100	0.61488345690
Loldaiga	Private Ranch	Laikipia	Loldaiga	37.12198190800	0.22748489120
Loldoto	Private Ranch	Laikipia	Loldoto	36.98620321400	0.16812985059
Lolmarik	Private Ranch	Laikipia	Lolmarik	37.25802179780	0.14044421554
Lombala Ranch	Private Ranch	Laikipia	Lombala Ranch	36.62087279540	0.23158708134
Makurian	Private Ranch	Laikipia	Makurian	37.17517991020	0.33847079485
Male	Private Ranch	Laikipia	Male	36.98738832230	0.42037902013
Mar mar Ranch	Private Ranch	Laikipia	Mar mar Ranch	36.65693371230	0.79606462857
Maundu ni meri Outspan	Private Ranch	Laikipia	Maundu ni meri Outspan	36.57807706970	0.32995619660
Mburugutia	Private Ranch	Laikipia	Mburugutia	36.96547724840	-0.01007788557
Mission	Private Ranch	Laikipia	Mission	36.73947299400	0.22215140605
Mogwooni	Private Ranch	Laikipia	Mogwooni	36.99556018330	0.22545940891
Mpala	Private Ranch	Laikipia	Mpala	36.87077669620	0.39474648296
Mukima Scheme	Private Ranch	Laikipia	Mukima Scheme	37.03863307070	0.09748300034
Mukogodo	Private Ranch	Laikipia	Mukogodo	36.97110098910	0.44654070990
Mukogodo Outspan	Private Ranch	Laikipia	Mukogodo Outspan	36.90023876230	0.43839420324
Mutara Outspan	Private Ranch	Laikipia	Mutara Outspan	36.67708254740	0.07141817398
Mwicheiri Farmer	Private Ranch	Laikipia	Mwicheiri Farmer	37.08461884510	0.09483872749
Naibor Outspan	Private Ranch	Laikipia	Naibor Outspan	37.02277856650	0.16812102972
Nanyuki Ranch	Private Ranch	Laikipia	Nanyuki Ranch	37.01264066050	0.06167869820
Nanyuki Ranch	Private Ranch	Laikipia	Nanyuki Ranch	37.05235893770	0.06605469072
Ngare Ndare Community	Private Ranch	Laikipia	Ngare Ndare Community	37.40837899280	0.19618886009
Ngorare Ranch	Private Ranch	Laikipia	Ngorare Ranch	36.70635540670	0.31692645334
Nyahururu Scheme	Private Ranch	Laikipia	Nyahururu Scheme	36.38716935190	0.04199578532
Nyahururu Scheme	Private Ranch	Laikipia	Nyahururu Scheme	36.39862374210	0.03180492343
Ol Bolossat Swamp	Private Ranch	Laikipia	Ol Bolossat Swamp	36.38376940590	0.03625814579
Ol Doinyo Lemboro	Private Ranch	Laikipia	Ol Doinyo Lemboro	36.79634341830	0.43750001608
Ol Jogi	Private Ranch	Laikipia	Ol Jogi	36.98165997250	0.31702085825
Ol maisor	Private Ranch	Laikipia	Ol maisor	36.62324932120	0.45240105539
Ole Naishu	Private Ranch	Laikipia	Ole Naishu	37.18878319630	0.21813730134
Private Ranches	Private Ranch	Laikipia	Private Ranches	37.14161944220	0.37777326749
Rware-3	Private Ranch	Laikipia	Rware-3	36.58857366940	0.06380451151
Segera/Mukenya	Private Ranch	Laikipia	Segera/Mukenya	36.82204525840	0.26271272486
Soita Nyiro Farm	Private Ranch	Laikipia	Soita Nyiro Farm	36.88059028970	0.44909501945
Solio	Private Ranch	Laikipia	Solio	36.93441523410	-0.21434873574
Sosian Outspan	Private Ranch	Laikipia	Sosian Outspan	36.80404502540	0.65087354586
Sosian Ranch	Private Ranch	Laikipia	Sosian Ranch	36.67400207200	0.49079674853
Subuko	Private Ranch	Laikipia	Subuko	36.36477812960	0.15523704904

Suguroi	Private Ranch	Laikipia	Suguroi	36.62040820380	-0.04631371687
Suguroi Outspan	Private Ranch	Laikipia	Suguroi Outspan	36.60376588670	-0.07221830818
Sukuta Naibor Outspan	Private Ranch	Laikipia	Sukuta Naibor Outspan	36.75387224070	0.41414201899
Thiru	Private Ranch	Laikipia	Thiru	36.38538890010	0.14554552304
Thome Outspan	Private Ranch	Laikipia	Thome Outspan	36.59685496000	0.25469706270
W. Smith	Private Ranch	Laikipia	W. Smith	36.96018277270	0.25093515063
Weruini	Private Ranch	Laikipia	Weruini	36.72926036400	0.00047455454

Conservancy database in Ewaso Ngiro basin

Name of Conservancy	County	Type /Description	Hectares	Longitude	Latitude	Source
Sera	Samburu	NRT Conservancy	340454.2	37.80119070940	1.02185316734	NRT
Biliqo Bulesa	Isiolo	NRT Conservancy	379003.1	38.27326122900	1.13239152242	NRT
Ilngwesi	Laikipia	NRT Conservancy	9436.5	37.35783314860	0.33553738635	NRT
Ishaqbini		NRT Conservancy	73266.1	40.29408137510	-1.86368204660	NRT
Kalama		NRT Conservancy	45861.1	37.51462320220	0.72520413607	NRT
Lekuruki		NRT Conservancy	8785.9	37.32534974640	0.46365829382	NRT
Leparua	Samburu	NRT Conservancy	32835.2	37.44887136880	0.36843049367	NRT
Meibae		NRT Conservancy	101400.7	37.13831542870	0.90150841620	NRT
Mpus Kutuk		NRT Conservancy	53615.9	37.24094409940	0.60800229869	NRT
Naibunga	Laikipia	NRT Conservancy	46857.4	37.03541122050	0.47885635808	NRT
Namunyak		NRT Conservancy	287326.9	37.39895986850	1.23052046940	NRT
Nasuulu		NRT Conservancy	34676.8	37.48771912990	0.48868567001	NRT
Ndera		NRT Conservancy	115543.2	39.96213781600	-1.93862127791	NRT
Ngare Ndare	Isiolo	NRT Conservancy	5510.7	37.36584241920	0.16174315770	NRT
Ruko		NRT Conservancy	17896.9	36.14690176390	0.65888878722	NRT
West Gate	Samburu	NRT Conservancy	40053.7	37.34989545930	0.73232248686	NRT
Ltungai		NRT Conservancy	19389.3	36.49011013240	0.90140899381	NRT
Nakuprat-Gotu	Isiolo	NRT Conservancy	71963.9	37.96925096840	0.67408402779	NRT
Melako	Marsabit	NRT Conservancy	549124.7	37.93285622460	1.68438068272	NRT
Shura	Marsabit	NRT Conservancy	417098.2	38.49654026070	2.10921987185	NRT
Songa		NRT Conservancy	103868.1	37.89604425480	2.16632144370	NRT
Jaldesa		NRT Conservancy	52078.7	38.07449517450	2.35165432807	NRT

Water Permitting and Category as per WRA

PERMIT CATEGORIES

The water resources management rules provides for four different categories into which water use permits shall be classified:

Category A

Water use activity deemed by virtue of its scale to have low risk of impacting the water resource. Applications in this category will be determined by WRA Regional Offices

Category B

Water use activity deemed by virtue of its scale to have potential to make a significant impact on the water resource. Permit applications in this category will be determined by WRA Regional Offices.

Category C

Water use activity deemed by virtue of its scale to have a measurable impact on the water resource. Permit applications in this category will be determined by WRA Regional Offices after consideration by the Catchment Area Advisory Committees (CAACs)

Category D

Water use activity which involves either international waters, two different catchment areas, or is of a large scale or complexity and which is deemed by virtue of its scale to have a measurable impact on the water resource. Permit applications in this category will be determined by WRA Regional Offices after consideration by Catchment Area Advisory Committees (CAACs) and approval by WRA Headquarters.

THE PROCESS OF ACQUIRING A WATER PERMIT

The Permitting Process begins when an application for a water permit is received and ends with the issuance of a water use permit. This permit is renewable every 5 years. The permitting process is done manually through the various application steps, as well as electronically through the Permit Database.

The following are the permitting processes as per the ISO Procedure for Water Use Permitting and the Water Act.

STEP 1: RECEIPT OF AN APPLICATION FOR WATER USE PERMIT

An application is received together with the attachments and verified as per the Application Check List. Attachments include Hydrological/Hydrogeological Assessment reports. If requirements are met, assessment fees paid as per category of the application. Applicant to be notified if requirements are not met.

STEP 2: APPLICATION ENTERED INTO THE PERMIT DATABASE

The application is entered into the Permit Database where a unique file number containing WRA/Catchment area code/Sub region/Sub catchment number/Application number/initial determining whether the application for Surface water (/S), groundwater (/G), effluent discharge (/E) or Swamp Drainage (F).

STEP 3: PUBLIC NOTIFICATION OF THE APPLICATION AS PER WATER RESOURCES MANAGEMENT RULE 29

Application is subjected to public notification; site verification undertaken by WRA.

STEP 4: TECHNICAL EVALUATION OF THE APPLICATIONS

Application is evaluated by the Technical Evaluation Committees (TECs) at the 6 regional offices.

STEP 5: ISSUANCE OF AUTHORIZATIONS TO CONSTRUCT WORKS

Category A Approvals issued

Category B Authorizations issued

Categories C and D applications evaluated by Catchment Area Advisory Committees (CAACs).

If approved, Category C Authorizations issued at the regional offices while category D forwarded to WRA headquarters for further evaluation by the Headquarter TEC

If approved Category D Authorization issued

STEP 6: CONSTRUCTION OF AUTHORIZED WORKS

If Works are constructed as authorized, then proceed to Step 7

If not constructed apply for extension of Time Limit to Authorizations

STEP 7: SUBMISSION OF REQUIREMENTS FOR ISSUANCE OF WATER USE PERMITS

Completion Certificate

Borehole Completion Record (applicable to Ground Water applications only), Water quality analysis report, collection of Water abstraction permit fees as per category of application.

STEP 8: FINAL INSPECTION OF CONSTRUCTED WORKS

WRA technical officers carry out inspections to verify construction as per the authorized conditions.

STEP 9: PERMIT ISSUANCE

Water use permits issued for categories B, C and D applications or varied as per the recommendations of the inspecting officer and subsequent payments.

STEP 10: PERMIT RENEWAL

Collection of permit renewal fees per category of permit.

Inspection of existing works.