SECTION 7. TERMS OF REFERENCE

1.0 INTRODUCTION

1. INTRODUCTION

The Government of Kenya has received a credit from International Development Association (IDA) and intends to apply part of the proceeds for Consultancy Services for Improving Water Security. The Government therefore intends to carry out a Feasibility Study and develop a Master Plan for Water Services for Eldoret and Satellite Towns, under the Lake Victoria North Water Services Board (LVNWSB).

The Lake Victoria North Water Services Board (LVNWSB) is one of the eight Regional Water Services Boards that were created after enactment of the Water Act 2002. The Board was established through Gazette Notice No. 1717 of 12th March 2004 under the State Corporations Act Cap 446 of the Laws of Kenya. The LVNWSB is responsible for the efficient and economical provision of water and sewerage services in the entire Western Province (i.e. counties of Bungoma, Busia, Kakamega and Vihiga) and parts of the North Rift region of the counties Trans-Nzoia, Uasin Gishu and parts of Nandi and Elgeyo - Marakwet counties. The total coverage of the area of jurisdiction is 15,356 Km2 with an estimated population of about 7.0 million.

The consulting services envisaged in these Terms of Reference are for improving water security in Eldoret and selected satellite towns including Kesses/Lessos, Burnt Forest, Turbo, Ziwa, Moi's Bridge, Moiben, Sergoit, Soy, Mosoriot, Kipkorkot, Flax, Kipkaren, Simat, Elgeyo Border, Naiberi, Kaptagat, Kipkabus, Wonifor, Bayete, Leseru, Uhuru, Kamagut, Kaiboi, Plateau and Cheptil all of which are located within a radius of 70km from Eldoret Town. The focus is to prepare a Feasibility Study and Master Plan for progressive development of water sources for Eldoret and the other towns towards meeting water demand for the next 25 years. All possible surface water, groundwater options will be reviewed on the basis of technical, financial, economic, social and environmental sustainability criteria. A 25 year Master Plan based on the agreed strategy selected from the feasibility study will be developed with five year increments.

Objective of the assignment

The Main objective of the assignment is to carry out Feasibility studies and develop a water Supply Master Plan for Eldoret and its satellite towns. The study will involve the following 2 phases:

Phase 1

(i) Draft feasibility study considering all options and recommending 2-3 strategies to meet Year 2040 water demand in the most cost effective option;

(ii) Allow LVNWSB, ELDOWAS and Uasin Gishu County Government in consultation with other stakeholders to review the 2-3 strategies and select one strategy, which would be developed up to full feasibility study level. This will be carried out with full guidance of the consultant.

Phase 2

(i) Master plan for 25 years in 5 year increments (or stages) with preliminary designs and cost estimates for each stage.

2. EXISTING WATER AND SANITATION SITUATION UNDER ELDORET WATER AND SANITATION SERVICES COMPANY (ELDOWAS)

ELDOWAS is one of the 5 Urban Water Service Providers under the jurisdiction of LVNWSB with the mandate of providing Water and Sanitation Services in Eldoret Town and adjoining areas within Uasin Gishu County. Eldoret Town has the following Water Sources.

2.1 Surface Water

2.1.1 Moiben Dam

The dam is situated on Moiben River which is a tributary of Nzoia river. Based on hydrological studies and economic viability, abstraction of water from Moiben dam was undertaken in 1992 and commissioned in 1998, with a 98% reliable yield of 28,300m^3/day.

The dam has a total capacity of 6.2 x 106m^3 the embankment is of zoned earth with a clay core and random fill shoulders. Currently abstraction from the dam stands at an average of 24,700m^3/day.

2.1.2 Two Rivers Dam

This dam was constructed in on the Sosiani River at the confluence of Ellegerini River and Endoroto River in 1962/63. The dam has an effective storage capacity of 4.7 x 106m^3 at present the abstraction of 14,950m^3/day which is conveyed by gravity to Sosiani treatment works, through 375mm and 500mm diameter raw water mains covering 5.2 km.

2.1.3 Kaptagat intake

This was the first water supply in Eldoret developed by the colonial government in 1928 on River Ellegerini, a tributary of Sosiani River. The intake had a capacity of 2,300m^3/day and conveyed water to Kapsoya Treatment works that was also constructed in 1928 and upgraded in 1981 to treat 3,450m^3/day. Kapsoya currently receives very little flow due to over abstraction by communities upstream living close to the raw water pipelines. The pipelines are also substantially worn out due to age. The raw water pipelines are 200mm diameter asbestos, 150mm diameter cast iron and 125mm diameter cast iron pipes for 20 km.

2.1.4 Kesses/Lessos Water Supply

Kesses dam which has the capacity to convey 600m^3/day to Kesses/Lessos treatment works which Supplies Kesses and Lessos areas

2.1.5 Ellegerini Dam

The dam with a capacity of 9,000m^3/day was constructed in 1987 as a reserve dam for recharging the Two Rivers dam during dry periods.

Table 1: Summary of Present Eldoret water source capacities

Source	**Rated Capacity (m^3/d)**	**Treated water flows (m^3/d)**
Moiben Dam	28,000	26,000
Two Rivers Dam	14,950	14,200
Kaptagat Intake	3,450	3,000
Total		**43,200**

2.2 Ground Water

Since there is an increasing dependence on ground water as a supplementary source, there is need to improve knowledge about the sustainability of current ground water use in order to guide further development and management of the resource. More specifically, there is need for an accurate assessment of the safe yield of aquifers and the existing ground water production and constraints on ground water quality need to be fully delineated. There is also a need for developing a sound ground water-monitoring program.

However, there may be possibilities to use ground water in certain parts of the satellite towns.

2.3 Sewerage / Sanitation

The existing sewer network on the other hand comprises a trunk sewer system that has a total length of about 152 km covering only 40% of the town area served with water. There are 2 Sewage Treatment Plants in Eldoret, Quarry and Boundary with design capacities of 8,000m^3/day and 10,000m^3/day respectively.

The other towns within the county have no sewerage systems and only depend on onsite sanitation.

3. TARGET SATELLITE TOWNS

Existing sources for the target satellite towns are either rivers or boreholes. The details for each town are shown in the table below.

Table 2: Existing sources for Target Satellite Towns

	Area	**Population 2014**	**Existing Production** m^3/day		**Surface Water Sources**
			Surface water	**Borehole**	
1.	Kesses	28,951	600		Kesses Dam
2.	Turbo	7,334	526		Sosiani/Sergoit Rivers
3.	Soy	**13,569**	Storage tank 60m^3		River Sergoit
4.	Mosoriot	12,500			
5.	Kipkorgot	**14,824**			Sosiani River
6.	Ziwa	**14,349**			Ziwa Dam
7.	Moiben	**10,978**			Moiben River
8.	Moi's Bridge	**39,362**	380m^3/day		Nzoia River
9.	Moi's Bridge	**39,362**	380m^3/day		Nzoia River
10.	Flax				Endorooto
11.	Kipkarren				Kipkarren Dam (10,000m^3 Capacity)
12.	Plateau	168,742			River Endorooto
13.	Kaiboi				Kipkarren River
14.	Kamagut	28,553	118m^3/day		Kipkarren River
15.	Cheptil				Kipkarren River
16.	Leseru	2,000		28m^3	
17.	Kipkabus	1,200	504		Kipkabus Dam
18.	Uhuru				Chepkoilel River
19.	Kaptagat	80,717	227m^3		River Ellegerini
20.	Burnt Forest	6457	300		River Endarakwa (Burnt Forest Water Supply.
21.	Simat	**15,822**			Sosiani River
22.	Elgeyo Border	**3,027**			Chepkoilel River
23.	Naiberi				Ellegerini River
24.	Wanifor				Lolgarini River

25.	Bayete		Storage tank 45m^3		
26.	Sergoit	20,720			River Sergoit
27.	Ainapkoi	**8,676**			

Note that the 2014 populations are approximate and the Consultant will have to make a deliberate effort to acquire the correct population data.

4. WATER SUPPLY CHALLENGES AND OPPORTUNITIES

The lack of water has been identified by ELDOWAS as the main problem for the water supply of Eldoret. Demand management can contribute to further improvement in the existing water supply as part of the overall strategy for improving water security for Eldoret and its satellite towns.

The following factors are contributing to the current Eldoret water crisis:

i. Time lag and delay in new investment in water supply for the town
ii. High population growth without proportional development of service infrastructure
iii. Inadequate attention to groundwater development and management as part of the solution to the town's water supply
iv. Management of Non Revenue water

The other additional and specific challenges facing Eldoret water sources as well as opportunities for augment supply are as follows:

Kaptagat Intake

Kapsoya Treatment plant is currently out of operation due to over abstraction of the raw water by the community living upstream of the plant. The raw water pipelines are old and worn out thus contributing to the lack of supply to the plant. Maintenance costs along the pipeline are prohibitive since the pipes have surpassed their useful lives. Draw offs are done unprofessionally and hurriedly by the locals who leave leakages on the pipeline.

Two Rivers Dam

Rapid siltation of the dam as a result of farming activities upstream of the dam
No siltation data available. Two rivers dam was commissioned in 1962 and raw water was supplied to Sosiani treatment works through 375 mm diameter gravity main. In 1979 a booster station was installed as an emergency measure to provide additional flow. This pipeline became obsolete in 1991 after a lifespan of 30 years. A new 600mm diameter steel main was laid in 1985. A hydrological study for exploring opportunities for increasing the yield is necessary.

5. PREVIOUS STUDIES AND INVESTIGATIONS

A number of previous studies and investigations have been undertaken to identify bulk water source options for Eldoret and other satellite towns. These are presented in the table below.

Table 3: Previous Studies on water sources

	Proposed Water source/Study	**Expected capacity, Mm^3/(yield, m^3/day)**	**Studies available**
1	Eldoret	28,300/day	yes
2	Sergoit	28.5 x 10^6m^3 Storage	Yes
3	Sergoit	26,000m^3/day	Yes
4	Onyokie	27.4 x 10^6m^3 Storage	Yes
5	Nureri	15.2 x 10^6m^3 Storage	Yes
6	Kisongi	5.0 x 10^6m^3 Storage	Yes
7	Kerita	17.6 x 10^6m^3 Storage	Yes
8	Nderuguti	5.0 x 10^6m^3 Storage	Yes
9	Nzoia River (Hempsted's Bridge)	250.0 x 10^6m^3 Storage	Yes
10	Sosiani River (Downstream of Two River's Dam)	68,650m^3/day.	Yes

	Proposed Water source/Study	Expected capacity, Mm^3/(yield, m^3/day)	Studies available
1	Eldoret	28,300/day	yes
11	Kipkarren Dam	10,000m^3/day	Yes

The expected yields in the previous studies (Table 3) shall be as guidelines and the Consultant will be expected to carry out confirmatory studies for purposes of undertaking this exercise.

6. THE MASTER PLAN

6.1 Goal

The goal of the Master Plan is to identify a robust, flexible water source development strategy that ensures security of supply to towns within Eldoret and its surrounding (Uasin Gishu County) and meets the expected growth in water demands over the next 25 years from 2015. In so doing it is important that, in the light of increasing pressure on existing water sources, the Master Plan allows for the early design and construction of the initial works for the first stage of 5 years.

Scope of the Master Plan Study

The Scope of Services for the Master Plan includes:

i. To identify potential water source(s) in Uasin Gishu County and recommend strategies for their development after consideration of hydrological, geo-technical/social / economic and environmental factors. This will include mapping of the existing sources including transmission and distribution networks. This will also include a comparison of life-time cost. When doing so attention should be paid to the possibilities of electricity production in gravity transmission mains and optimizing friction losses to save pumping costs.

ii. To prepare demand estimates for the Region upto to the year 2040;

iii. To prepare a water resources master plan for the preferred water source (s) based on the development strategies recommended in (i) above

iv. To prepare investments needs both short and long term to address the gap in water supply and focus on growth.

v. To highlight various Environment and Social Issues that will be triggered by the Proposed Projects,

vi. To prepare detailed hydrological, and Geo-technical study reports;

vii. To prepare detailed feasibility study, and preliminary engineering designs.

viii. Develop an implementation schedule of proposed strategies of the Master Plan within a period of 25 years in stages of 5 years.

ix. To share with the Stakeholders (LVNWSB, Uasin Gishu County and ELDOWAS) the findings of the Master Plan

6.2 Main Areas of Focus of the Master Plan

The main areas of consulting services are as follows:

i. Water Resource Assessments for surface water, ground water, and any other possible options such as rain water harvesting etc;

ii. Water Demand and Supply Assessment for the Region;

iii. Feasibility study on all the identified water resources options. Study to include preliminary designs and costs, economic analysis and financial analysis;

iv. Ranking the options in order of viability taking into consideration economic analysis, environmental factors and cost of investment.

v. Preparation of Water Resources Master Plan: Engineering pre-design, development schedule, investment /financial plan, risk management plan, asset management plan;

vi. To assess the Environmental and Social impacts of the various options as well as preliminary costs estimates for resettlement issues for each option. The purpose of this will be to help in carrying out a cost benefit analysis and in arriving at a life-time cost comparison for the various options The Main Resettlement Action Plan (RAP) and Environmental and Social Impact Assessment (ESIAs) for the Selected Projects will however be undertaken under a separate consultancy assignment.

7. DURATION OF SERVICES

The Master Plan shall be executed under a single contract of twelve (12) calendar months duration from the date of commencement.

8. DELIVERY OF THE MASTER PLAN

In summary, the services shall be phased as follows:-

Phase 1: Identify Development Strategies (to be completed within seven (7) months after the contract effectiveness). This will include the necessary field work, geophysical investigations and assessments.

i. Review and assess water use demands and use the findings to facilitate identifying the preferred development strategies for short term, medium term and long term measures.

ii. Review existing options, carry out feasibility studies on the options, recommend a twenty five (25) year development strategy and prepare Preliminary Designs and cost estimates.

iii. Review potential social/environmental impacts and use findings to facilitate identifying the preferred development strategy.

Phase 2: Prepare Master Plan (to be completed within Five (5) months of completion of phase 1)

i. Prepare a development Master Plan for the preferred strategies including detailed technical, financial and economic evaluation and pre-designing of short term to medium term works;
ii. Assess capacity/quality of ground water, recommend a management strategy and use findings to facilitate preparation and evaluation of the Master Plan;
iii. Review potential social/environmental impacts for the preferred development strategy in detail, prepare a preliminary environment management plan, and use findings to facilitate preparation and evaluation of the master plan;

The Master Plan will allow for staged construction of water supply facilities that provide for an incremental increase in supply to match the expected demand growth. In this way, lead times required to produce additional water source capacity will be minimized and the overall Master Plan made more manageable.

9. DESCRIPTION OF SERVICES FOR THE MASTER PLAN

9.1 Water Demand Assessment and Water Balance

i. The Consultant shall review and assess the present, short term, medium term and long term water demand for the Eldoret Town and other Satellite towns within the region. The demand shall be assessed for all potential water users for the Eldoret Town and the other Satellite towns. Demand assessment shall have a maximum horizon of twenty five years (25).

ii. The demand assessment shall take into account of the latest statistics from the Kenya Bureau of Statistics as well as various planning studies undertaken by the Government of Kenya. The Consultant shall liaise and consult with LVNWSB and key stakeholders to determine levels of water demand. Demand assessment shall take account of such factors as: changing land use, proposed demand management strategies, optimization of existing supply / demand arrangements, demographics (including rural to urban migration), and demand management strategies being implemented by ELDOWAS.

iii. The Consultant shall prepare a water balance to compare projected demands with potential sources of water. The water balance shall take account of the water resource capacity and water demand evaluations undertaken by the Consultant as part of this assignment.

iv. The Consultant shall present the findings of the demand assessment and water balance to the LVNWSB, Eldowas, Uasin Gishu County Government and key stakeholders for their review and agreement.

9.2 Surface Water Resource Assessment

9.2.1 Liaison, Consultation, and Approach

The Consultant shall review surface water resources in relation to developing future water sources for Eldoret and its Satellite surrounding towns. The review shall concentrate on the new water sources planned for region, long term development Plan and other studies and options identified by LVNWSB.

The main objectives of the review are:

i. Review the capacity and quality of various sources of surface water for the development of a future water source for Eldoret and its Satellite Towns;
ii. Review the potential of surface water to be used as a source of water to Eldoret and its Satellite Townsin conjunction with possible ground water resources.
iii. Review the potential of rainwater to be used as a source of water supply for the study areas.
iv. Include the integration of the implications of climate change on the hydrological assessment.

9.3 Ground Water Resource Assessment

The Consultant shall undertake to study the ground water resources

9.3.1 The main objectives of the study are:

i. Identify, assess, and report the capacity and quality of ground water in the Project area
ii. Evaluate the potential of ground water resources to be used as either a primary, secondary, or emergency supply. Provisions shall be made for additional geophysical investigations, test wells and test pumping, and groundwater modeling work for aquifers.
iii. Include the integration of the implications of climate change on the hydrological assessment.

9.3.2 Analysis and Evaluation

The Consultant will carry out Ground Water Resource Assessment based on the available data from Water Resources Management Authority. However in cases where data may not be available to aid the assessment, the Consultant will be responsible for any additional Ground Water Modeling and Simulation exercise while carrying out the following tasks:

i. The Consultant shall undertake hydro-geological analysis of the aquifers under review to determine potential supply capacity. The analyses shall include at least the following: aquifer characteristics recharge potential, water quality, flow trends and potential water yield.

ii. The Consultant shall identify and evaluate ground water contamination. Evaluation of ground water contamination shall consider at least: type of contamination, extent / degree of contamination, source of contamination, potential to rectify the contamination, possible remediation methods, estimated cost (if applicable) to rectify the contamination.

iii. The Consultant shall identify primary aquifer recharge areas. The Consultant shall review existing land use in the recharge areas and assess the compatibility of land use with the need to adequately protect ground water recharge. The Consultant shall make recommendations for protecting and conserving ground water recharge potential.

iv. The Consultant shall identify important existing and planned ground water well field areas. The Consultant shall review land use and water use in the well field areas and assess the compatibility of land and water use with the need to adequately protect ground water resources. The Consultant shall make recommendations for protecting and conserving ground water resources.

v. The Consultant shall evaluate the potential of the ground water resources to be used either as a primary, secondary, or emergency. The Consultant shall recommend a strategy and plan to develop, use, protect, and conserve ground water resources.

The strategy and plan shall address such issues as: safe levels of extraction, ground water management, ground water monitoring, ground water inventories.

9.4 Other Water Source Options

9.4.1 Identification of other Water Source Options

The Consultant shall propose other options to develop including but not limited to the development of well field, storage dams, springs, water treatment and transmission facilities.

10. QUALITY ASSURANCE OF OUTPUTS

10.1 Quality of Work Undertaken

All investigations, analyses, designs and the like carried out and prepared by the Consultant will be subject to audit and approval by LVNWSB, Eldowas, Uasin Gishu County Government and all interested stakeholders to ensure that the work undertaken for the Master Plan have been carried out with due regard to:

i) Quality assurance systems have been implemented and maintained during the period consistent with Good Industry Practice.

ii) Works performed are fit for purpose, of acceptable quality and that claims for payments made are consistent with the work performed.

iii) Adequate internal controls existed during the period to ensure reasonable accuracy of facts and numbers included in reports.

iv) Adequate documentation exists to support the assertions and recommendations made in the various reports.

11. FACILITIES, EQUIPMENT AND DATA

11.1 Provided by the consultant

The Consultant shall be responsible for the provision of all the necessary resources to carry out the Services; and shall make arrangements for the establishment of office, supporting office equipment

and furniture, transport, accommodation, utilities, communications, reporting materials and any other required resources.

11.2 Provided by the Client

The Employer will provide free of charge all available existing information, data, reports and maps as far as available and will assist the Consultant in obtaining other relevant information and materials from governmental institutions and state authorities as far as possible. However, it is the duty of the Consultant to check availability, quality and suitability of this information.

12. DELIVERABLE

All reports and communications related to these services shall be in the English language and shall be submitted to the Employer in the number and form specified below. All reports shall have an Executive summary and shall be complete without cross referencing to other reports.

REPORTS	**SUBMISSION DATE**	**COPIES**	
		Hard Copy (No)	**Soft Copy in CD ROM**
Inception Report	1 month after Contract Effectiveness Date	6	2
Water Demand and supply Assessment Report	3 months after Contract Effectiveness date	6	2
Draft Feasibility Study Report	4 months after Contract Effectiveness date	6	2
Final Feasibility Study Report	6 months after Contract Effectiveness date	6	2
Draft Preliminary Design Report for all strategies	8 months after Contract Effectiveness date	6	2
Detailed Design Report for Stage 1 Projects	10 Months after Contract Effectiveness date	6	2
Draft Water Resources Report	5 months after Contract Effectiveness date	6	2
Final Water Resources Report	7 months after Contract Effectiveness date	6	2
Draft Water Master Plan with development action plan	10 months after Contract Effectiveness date	6	2
Final Water Master Plan Report with development action plans	12 months after Contract Effectiveness date	6	2

13. REPORTING REQUIREMENT

The Lake Victoria North Water Services Board (LVNWSB), as the client, shall have overall responsibility for managing this consultancy, its procurement and its contract, and shall supervise the job on site. The consultant will be reporting to the Chief Executive Officer of The Lake Victoria North Water Services Board.

However during the Assignment Period, the Consultant will work very closely with Uasin Gishu County Government and ELDOWAS to ensure that the Master Plan is all inclusive and captures to a very large extent the Water Requirements for Eldoret and its Satellite Towns.

14. DATA AND REFERENCES

The consultant may require the following documents for reference:-

i. WaSSIP Project Appraisal Document (PAD),
ii. The Water Act 2002
iii. The Local government Act, Cap 265
iv. The State Corporation Act Cap 446
v. Sessional paper No. 1 of 1999, National Water Policy.
vi. Environment Act, Cap 8
vii. The Vision 2030

viii. The National Water Services Strategy Policy,2007
ix. The Nation Water Master Plan 1992 by JICA
x. Eldoret Water Resources Study
xi. The 2009 National Census Data