National Water Harvesting & Storage Authority

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CONSULTANCY SERVICES TO CARRY OUT FEASIBILITY STUDY, PRELIMINARY AND FINAL DESIGNS, ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT AND PREPARATION OF TENDER DOCUMENTS FOR THE PROPOSED LONDIANI DAM WATER PROJECT IN KERICHO COUNTY

CONTRACT NO: NWC/RFP/011/2013-2014

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) STUDY REPORT

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Report Title:	Environment and Social Impact Assessment (ESIA) Study Report

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Table of Contents

LIST OF TABLES ..... **V**

LIST OF FIGURES ..... **VI**

ACRONYMS ..... **VII**

NON-TECHNICAL SUMMARY ..... **IX**

CHAPTER 1: INTRODUCTION **1**

1.1 Background 1
1.2 Project Justification 2
1.3 The Project 2
1.3.1 The Dam Site 2
1.3.2 Transmission pipelines 2
1.3.3 Storage Tanks 3
1.4 The ESIA Study 4
1.4.1 ESIA Terms of Reference 4
1.4.2 ESIA Scope of Work and Objective 4
1.5 ESIA Approach 5
1.5.1 Scoping Process 5
1.5.2 Documentary Review 7
1.5.3 Field Assessment 7
1.5.4 Detailed ESIA Study Activities 7
1.6 Stakeholders and Public Consultations 8
1.7 Reporting 8
1.8 Study Experts 8

CHAPTER 2: PROJECT DESCRIPTION **9**

2.1 Project History 9
2.2 Project Components Location 9
2.2.1 The Dam 9
2.2.2 Water Treatment Works 9
2.2.3 Water Transmission Pipeline 10
2.2.4 Treated Water Storage Tanks 11
2.2.4.1 Gravity Main 1 (Masaita Tank – Londiani –Kedowa – Chepseon) 12
2.2.4.2 Gravity Main 2 (Treatment Works – Kipkelion – Fort Ternan) 12
2.3 The Proponent and Key Stakeholders 12
2.4 Project Area Description 13
2.4.1 Catchment Area of the Dam 13
2.4.2 Dam Site and Buffer Areas 13
2.4.3 Service Areas 13
2.4.3.1 Treatment Works – Kipkelion – Fort Ternan 13
2.4.3.2 Masaita Tank – Londiani –Kedowa–Chepseon 14
2.4.4 Downstream Kipchorian River 14
2.4.5 Water Transmission Way Leave 14
2.4.6 Way Leave Crossings 15
2.5 Analysis of Project Alternatives 15
2.5.1 Dam Site Selection Criteria 16
2.5.2 Transmission Pipeline Routes 17
2.5.3 No Project Alternative 17
2.5.4 Material and Technology 17
2.6 Design Concepts 18
2.6.1 Basic Consideration 18
2.6.2 Dam Components Specifications 19
2.6.2.1 Dam Embankment 19
2.6.2.2 Diversion Culverts 20
2.6.2.3 Spillway 20
2.6.2.4 Intake Tower 20
2.6.2.5 Hydropower Unit 21

2.6.3 Water Treatment Works 21
2.6.4 Transmission Pipeline 23
2.7 WATER USE OPTIONS 23
2.7.1 Water Supply 23
2.7.2 Irrigation 23
2.7.3 Hydropower Generation 24
2.7.4 Other Benefits 24
2.8 PROJECT ACTIVITIES 24
2.8.1 Planning and Feasibility Studies 24
2.8.2 Design Work 24
2.8.3 Construction Phase 25
2.8.3.1 Resettlement Activities 25
2.8.3.2 Site Clearing 25
2.8.3.3 Sanitation Management 25
2.8.3.4 Public Amenities 25
2.8.3.5 Material Sourcing and Haulage 25
2.8.3.6 Restoration Activities 25
2.8.4 Commissioning 26
2.8.5 Dam Operations 26
2.9 KEY DAM LINKAGES 26
2.10 DAM SAFETY AND STABILITY 26
2.11 DECOMMISSIONING PHASE 27
2.12 IMPLEMENTATION SCHEDULE AND PROJECT ESTIMATED COST 27

CHAPTER 3: POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK 29

3.1 AN OVERVIEW 29
3.2 POLICY PROVISIONS 29
3.2.1 Constitution of Kenya 29
3.2.2 The Kenya Vision 2030 29
3.2.3 National Policy on Water Resources Management and Development 29
3.2.4 National Policy on Environment 30
3.2.5 The Agricultural Policy 30
3.2.6 The Land Policy 30
3.2.7 The National Biodiversity Strategy 31
3.2.8 National Water Harvesting and Storage Authority (NWHSA) 31
3.3 LEGAL FRAMEWORK 32
3.3.1 The Environment Management and Co-ordination Act, 1999 32
3.3.2 EMCA Regulations 32
3.3.2.1 Water Quality Management Regulations, 2006 (Legal Notice No. 120) 32
3.3.2.2 Waste Management Regulations, 2006 (Legal Notice No. 121) 34
3.3.2.3 Noise and Excessive Vibration Pollution Control Regulations, 2009 35
3.3.2.4 Air Quality Regulations 35
3.3.2.5 Biodiversity Regulations 36
3.3.3 The Water Act, 2016 37
3.3.4 Water Rules 37
3.3.5 The Public Health Act (Cap. 242) 38
3.3.6 The Forest Act 38
3.3.7 The Agriculture Act 39
3.3.8 Pest Products Control Act 39
3.3.9 Physical Planning Act (Cap. 286) 40
3.3.10 The Penal Code (Cap. 63) 40
3.3.11 Occupational Safety and Health Act, 2007 40
3.3.12 The HIV and AIDS Prevention and Control Act 41
3.3.13 The Workmen Compensation Act (Cap 236) 41
3.3.14 Work Injury Benefits Act, 2007 41
3.4 THE WATER SECTOR INSTITUTIONAL FRAMEWORK 41
3.4.1 Policy Provisions 41
3.4.2 Water Services Regulatory Board (WASREB) 42
3.4.3 Water Resources Authority (WRA) 42
3.4.4 Water Services Trust Fund (WSTF) 42
3.4.5 Water Works Development Agencies (WWDAs) 42

3.4.6 Water Services Providers 43
3.5 Catchment Management Initiatives 43
3.6 NEMA Compliance 44

CHAPTER 4: ENVIRONMENTAL BASELINE CONDITIONS 45

4.1 General Overview 45
4.2 Topography and Physiographic 45
4.3 Drainage and Hydrology 46
4.3.1 Drainage 46
4.3.2 Hydrology 47
4.4 Water Resources 48
4.4.1 Surface Water 48
4.4.2 Ground Water 48
4.4.3 Rainwater 49
4.5 Biodiversity 50
4.5.1 Fauna 50
4.5.2 Flora 50
4.6 Geology and Soil 51
4.6.1 Geology 51
4.6.2 Soils 51
4.7 Climatic Conditions 51

CHAPTER 5: SOCIAL AND ECONOMIC SETTINGS 52

5.1 Administrative Location 52
5.2 Political Setting 52
5.3 Population Features 52
5.4 Settlements Patterns and Housing 53
5.5 Land Tenure and Land Use 54
5.5.1 Land Tenure 54
5.5.2 Land Use 54
5.6 Social Services 54
5.6.1 Education 54
5.6.2 Water Supply 55
5.6.3 Health 56
5.6.4 Sanitation and Hygiene 56
5.7 Economic Setting 57
5.7.1 Agriculture 57
5.7.2 Livestock 58
5.8 Natural Resources 58
5.9 Trade and Livelihoods 58
5.10 Financial Institutions 59
5.11 Infrastructure and Communication 59
5.12 Sources of Energy 60
5.13 Cross Cutting Issues 60
5.13.1 Social and Cultural Aspects 60
5.13.2 Gender 61
5.13.3 Youth 61

CHAPTER 6: STAKEHOLDERS AND PUBLIC CONSULTATIONS 62

6.1 Overview 62
6.2 Public Consultation Forums 62
6.3 In-depth Interviews and Discussions 63
6.3.1 Overview 63
6.3.2 General Emerging Issues 63
6.3.3 Social Situations 63
6.4 Public Meetings 64
6.4.1 Masaita Area 64
6.4.2 Londiani Social Hall 66
6.4.3 Kapkondoo Area 68
6.4.4 Kipkelion West District 70
6.4.5 Barsiele Town 71

6.4.6 Kedowa Town 73
6.4.7 Chepseon Town 74
6.4.8 Siret Area 75
6.4.9 Fort Ternan Town 77
6.5 KEY SUGGESTIONS AND OPINIONS 79

CHAPTER 7: ANTICIPATED IMPACTS AND MITIGATION MEASURES 81

7.1 IMPACTS OVERVIEW 81
7.1.1 General Impacts Outline 81
7.1.2 General Mitigation Measures on General Impacts 82
7.2 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES 82
7.2.1 Sediment Generation and Transport 82
7.2.2 Effects on Water Quality 83
7.2.3 Impacts on Air Quality 85
7.2.4 Impacts on Hydrology 86
7.2.5 Impacts at Material Site 87
7.2.6 Loss of Biodiversity 88
7.2.7 Waste Management 88
7.2.8 Unaccounted for Water 89
7.3 SOCIAL IMPACTS AND MITIGATION MEASURES 89
7.3.1 General Positive impacts (Construction) 89
7.3.2 General Positive Impacts (Post-Construction) 89
7.3.3 Potential Social Disruptions 90
7.3.4 Impacts on Safety 91
7.3.5 Impacts on Health 92
7.3.6 Potential Cultural Disruption 93
7.3.7 Displacement of People and Livelihoods 95
7.3.8 Impacts on Livestock Farming 96
7.4 DAM SAFETY 97

CHAPTER 8: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN 98

8.1 MANAGEMENT PLAN PRINCIPLES 98
8.2 MANAGEMENT ISSUES 98
8.2.1 Construction Phase Issues 98
8.2.2 Post-Construction Phase Issues 99
8.3 MANAGEMENT RESPONSIBILITIES 99
8.4 ENVIRONMENTAL MANAGEMENT GUIDELINES 100
8.5 INSTITUTIONAL FRAMEWORK MANAGEMENT 100
8.6 ENVIRONMENTAL EDUCATION AND AWARENESS RAISING 100
8.7 HIV/AIDS ISSUES 100
8.8 ENVIRONMENTAL, SOCIAL, HEALTH AND SAFETY (ESHS) REQUIREMENTS 101
8.8.1 ESHS Requirements 101
8.8.2 Summary of Code of Conduct for the Contractor 102
8.8.3 Construction Environment and Social Management Plan (C-ESMP) 103
8.9 THE MANAGEMENT PLAN MATRIX 104

CHAPTER 9: CONCLUSIONS AND RECOMMENDATIONS 112

9.1 CONCLUSIONS 112
9.2 RECOMMENDATIONS 112

ANNEXES 114

ANNEX 1: TERMS OF REFERENCE 115
ANNEX 2: SITE LOCATION MAPS 130
ANNEX 3: STAKEHOLDERS CONSULTATIONS MEETINGS' NOTIFICATIONS AND SCHEDULES 164
ANNEX 4: PROCEEDINGS OF STAKEHOLDERS CONSULTATION MEETINGS 165
ANNEX 5: COMMENTS AND OPINIONS FROM STAKEHOLDERS 214
ANNEX 6: ASSORTED CORRESPONDENCES 215

LIST OF TABLES

TABLE 1: SCHEDULE OF PUBLIC CONSULTATIONS 8
TABLE 2: CRITICAL PIPELINES CROSSINGS 11
TABLE 3: DAM SITE SELECTION CRITERIA OUTLINE 16
TABLE 4: DAM SITE CHARACTERISTICS 18
TABLE 5: WATER TRANSMISSION LINES AND RESERVOIRS FEATURES 23
TABLE 6: DAM CONSTRUCTION COST 27
TABLE 7:WATER COMPONENT CONSTRUCTION COST 28
TABLE 8: NATIONAL DRINKING WATER QUALITY STANDARDS 33
TABLE 9: NATIONAL IRRIGATION WATER QUALITY STANDARDS 33
TABLE 10: NATIONAL WASTEWATER DISCHARGE STANDARDS 34
TABLE 11:NATIONAL NOISE GUIDELINES 35
TABLE 12: NATIONAL AIR QUALITY STANDARDS FOR GENERAL POLLUTANTS 36
TABLE 13: AMBIENT AIR QUALITY TOLERANCE LIMITS 36
TABLE 14: GUIDELINES FOR EFFLUENT DISCHARGE INTO SURFACE WATER RESOURCES 37
TABLE 15: GUIDELINES FOR DISCHARGE OF EFFLUENT ONTO LAND 38
TABLE 16: SAMPLE HILLS WITHIN PROJECT TARGET AREAS 45
TABLE 17: SOME LOCAL BOREHOLE DATA 48
TABLE 18: AREA AND ADMINISTRATIVE UNIT PER SUB-COUNTY 52
TABLE 19: PROJECT AREA POLITICAL UNIT 52
TABLE 20: POPULATION PROJECTION 53
TABLE 21:SUMMARY OF ESHS REQUIREMENTS 101
TABLE 22: PREPARATORY ACTIVITIES ESMP MATRIX 105
TABLE 23: CONSTRUCTION ESMP MATRIX 106
TABLE 24: POST CONSTRUCTION ESMP MATRIX 108

LIST OF FIGURES

FIGURE 1: STORAGE TANKS AND RELATED ROUTES....3
FIGURE 2: LONDIANI DAM GENERAL LOCATION....10
FIGURE 3: PROPOSED TRANSMISSION PIPELINE MAPS....11
FIGURE 4: VIEWS OF THE DAM AREA....13
FIGURE 5: SECTIONS OF THE TREATED WATER TRANSMISSION CORRIDORS....15
FIGURE 6: SAMPLE CROSSING OF THE PIPELINE WAY LEAVE....15
FIGURE 7: PROPOSED QUARRY SITE....17
FIGURE 8: THE EMBANKMENT WALL LOCATION....19
FIGURE 9: TOPOGRAPHICAL VIEW OF THE PROJECT....46
FIGURE 10: DRAINAGE FEATURES....47
FIGURE 11: A SECTION OF WETLAND SYSTEM DOWNSTREAM OF THE DAM WALL LOCATION....47
FIGURE 12: SAMPLE SURFACE WATER SOURCES....48
FIGURE 13: GROUND WATER SOURCES....49
FIGURE 14: ROOF RAIN WATER HARVESTING....49
FIGURE 15: WATER USES....49
FIGURE 16: LAND COVER....50
FIGURE 17: PROJECT GEOLOGICAL FEATURES....51
FIGURE 18: SAMPLE HOUSING STRUCTURES....53
FIGURE 19: SAMPLE EDUCATION INSTITUTIONS....55
FIGURE 20: SAMPLE HEALTH FACILITIES....56
FIGURE 21: POINT SOURCES OF WATER POLLUTION....57
FIGURE 22: SAMPLE CROPS GROWN....58
FIGURE 23: LIVESTOCK SAMPLES....58
FIGURE 24: SAMPLE MARKETS AND CENTRES....59
FIGURE 25: OTHER LIVELIHOODS....59
FIGURE 26: MODE OF TRANSPORT....60
FIGURE 27: PUBLIC CONSULTATION MEETING AT MASAITA PRIMARY SCHOOL....66
FIGURE 28: PUBLIC CONSULTATION MEETING AT LONDIANI SOCIAL HALL....68
FIGURE 29: PUBLIC CONSULTATION AT KAPKONDOO PRIMARY SCHOOL....69
FIGURE 30:PUBLIC PARTICIPATION MEETING AT KIPKELION WEST SOCIAL HALL....71
FIGURE 31:PUBLIC PARTICIPATION AT BARSIELE SECONDARY SCHOOL....73
FIGURE 32: PUBLIC PARTICIPATION AT SIRET SECONDARY SCHOOL....77
FIGURE 33:PUBLIC PARTICIPATION MEETING AT FORT TERNAN COFFEE MILLS....79

ACRONYMS

ACC	Assistant County Commissioner
AIDS	Acquired Immuno Deficiency Syndrome
ASAL	Arid and Semiarid Land
BOD	Biochemical Oxygen Demand
BoQ	Bills of Quantities
CBD	Convention on Biological Diversity
C-ESMP	Construction Environment and Social Management Plan
CIDP	County Integrated Development Plan
COD	Chemical Oxygen Diversity
CSR	Community Social Responsibility
DCC	District County Commissioner
ECD	Early Childhood Development
EMCA	Environmental Management Coordination Act
EMP	Environmental Management Plan
ESHS	Environmental, Social, Health and Safety
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental Social Management Plan
GBV	Gender Based Violence
HDPE	High Density Poly Ethylene
HIV	Human Immunodeficiency Virus
IUCN	International Union for Conservation of Nature
JICA	Japan International Cooperation Agency
KES	Kenya Shillings
KFS	Kenya Forest Services
km	Kilometre
km^2	Square Kilometre
KPLC	Kenya Power and Lighting Company
kW	KiloWatts
KWFT	Kenya Women Finance Trust
KWS	Kenya Wildlife Services
LPG	Light Petroleum Gas
m^3	Cubic Meter
m^3/hr	Cubic meter per hour
m^3/s	Cubic meter per Second
masl	Metres above sea level

MCA	Member of County Assembly
MCDA	Multi-Criteria Decision and Analysis
MDGs	Millennium Development Goals
mg/l	Milligram per litre
mm	Millimetres
MP	Member of Parliament
MWI	Ministry of Water and Irrigation
NBSAP	National Biodiversity Strategy and Action Plan
NEC	National Environment Commission
NEMA	National Environment Management Authority
NLC	National Land Commission
NWHSA	National Water Harvesting and Storage Authority
OHS	Occupational Health and Safety
OSHA	Occupational Safety and Health Administration
PAP	Project Affected Persons
PM	Particulate Matter
PPE	Personal Protective Equipment
PV	Permanganate Value
RAP	Resettlement Action Plan
RPM	Respirable Particulate Matter
SAR	Sodium Absorption Ratio
SCAMP	Sub-Catchment Management Plan
SEA	Strategic Environmental Assessment
SES	Socio-Economic Survey
TDS	Total Dissolved Solids
uPVC	Unplasticized Polyvinyl Chloride
VCT	Voluntary Counselling and Testing
WASREB	Water Services Regulatory Board
WRA	Water Resources Authority
WRUA	Water Resources Users Association
WSB	Water Services Board
WSTF	Water Services Trust Fund
WTW	Water Treatment Works

NON-TECHNICAL SUMMARY

Introduction

About 41% percent of Kenyans population rely on unimproved water sources, such as ponds, shallow wells and rivers, while 59% use unimproved sanitation solutions. These challenges are especially evident in the rural areas and the urban slums. Only 9 out of 55 public water service providers in Kenya provide continuous water supply, leaving majority of people searching for alternative water sources to meet their water demands. The capacity of water resources in the country has been declining with time due to a number of factors including catchment degradation from competition of land use requirements and reduced rainfall to recharge the sources as well as increasing water demand for domestic, commercial and also irrigation purposes for the urban and rural users. Kenya's Water resources are also highly vulnerable to climate variability often resulting into conditions of floods and severe droughts in equal measures. Inadequate storage capacity in the country limits the ability to buffer the nation against such water shortage shocks.

In Kericho County, most towns are experiencing rapid urbanization characterized by poor and uncontrolled planning. Increase in population and developments demands an increase in water supply and sanitation provision. Currently most of the water treatment facilities in Kipkelion east and west sub-counties that rely on pumping schemes and augment water supply are either lacking, not designed to meet the local conditions, poorly maintained or entirely unable to keep pace with the rising population. Additionally, the schemes are also faced with challenges ranging from high maintenance and operational cost due to high electricity cost of pumping water. This in turn has led to direct impact on environment especially on the biological diversity of the aquatic ecosystem as well as human health.

Water supply services provided to residents of Kipkelion east and west sub-counties is inadequate to meet the demands of the increasing populations. The status of existing water supply schemes has continued to deteriorate to date. Among the challenges facing water supply status in the project area include; inadequate service coverage of the water supply system and non-functional water treatment plants.

In order to address these challenges within the water sector, National Water Harvesting and Storage Authority (NWHSA) seeks to improve the water supply situation in Kipkelion East and west sub counties by commissioning of Londiani dam water supply project. The main objective of the project is to supply potable water and replace pump fed water service schemes that are not sustainable due to high cost of electricity. The project also aimed at reducing floods in the lower reaches of Nyando basin, alongside supplying water for irrigation and hydropower generation.

ESIA Study

The ultimate goal of this ESIA study was to identify impacts resulting from the proposed project to the environment and social setting. The impacts were determined on the basis of the baseline conditions established during the field work and information obtained from the documents reviewed as well as interviews of the stakeholders and the communities within. For subjective predictions of the impacts, the site area` was subjected to environmental scoping process. This was a process of evaluating the overall magnitude of the project and the significance of the anticipated impacts and possibilities of handling the same. Detailed evaluation of the project area was undertaken such as to focus on any significant environmental and social issues as established in the scoping process.

In accordance with the Terms of Reference, the following scope has been defined for this ESIA.

(i) Clear description of the physical location and linkages of the project including the baseline conditions of the project area;

(ii) A description of the project characteristics including project objectives, project design, activities, technology, procedures and processes, materials to be used, products, by-products and waste generated, during the project construction, operation and de-commissioning phases;

(iii) A description of the national environmental legislative and regulatory framework, baseline information and any other relevant information related to the project;

(iv) Description of the recipient environment (baseline environment and social setting of the project area and the water transmission pipeline corridor);

(v) The potential environmental effect of the project, including the social and cultural effects and the direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated;

(vi) Project alternative analysis including locations, technologies or process available, analysis of alternatives, and reasons for preferring the proposed option;

(vii) An environmental management and monitoring plan outlaying the activities, associated impacts, mitigation measures, monitorable indicators, implementation timeframes, responsibilities, and cost;

(viii) An Action Plan for the prevention and management of foreseeable accidents and hazardous activities in the cause of carrying out activities or major industrial and other development projects;

(ix) Measures to prevent health hazards and to ensure security in the working environment for the employees and for the management of emergencies;

(x) Conclusions, recommendations and identification of gaps and uncertainties which were encountered in compiling the report

This scoping report was designed to provide a preliminary view of the environmental and social status. The report presents the overall project concepts, anticipated magnitude, key stakeholders and the implementation plan outline. It also involved establishment of the diversity on physical environment, climatic conditions, demographic trends as well as the hydro-geological status in the area. Relevant policy and legal requirements were also listed. The study team strived to share experiences on water resources and social issues in that part of the country and in particular with regard to water demand and utilization. The report has provided the basic considerations that could be emphasized on during the detailed and consultation sessions.

The Project Justification and Background

Kenya is classified as a chronically water scarce country on the basis of having one of the lowest natural water replenishment rates, at 647m^3 per capita per annum which is far below the 1,000m^3 per capita per annum. Estimates of water supply in the country indicate that only about 56% of the population has access to safe water. This has since Prompted the necessity of alternative mechanisms be developed to harness available sources to supplement the little available. With intensive surface runoff during heavy rains, significant volumes of storm water are lost. Dam construction has been identified as an alternative to harness the storm water for storage and use during the dry conditions.

Clean and reliable water supply forms a major component of socio-economic development in a given area. Humans depend on water for their survival as well as other human activities. Scarcity of water slows down developments and creates social conflict due to limited access of the commodity hence threatening social wellbeing. Economic activities are also dependent on water particularly agriculture. It has become necessary that alternative mechanisms are developed to harness

available sources to supplement the little available. With intensive surface runoff during heavy rains, significant volumes of storm water are lost. Dam construction has been identified as an alternative to harness the storm water for storage and use during the dry conditions.

The project targeted areas relay on water supply schemes (Londiani, Chesinende, Kipkelion and Fort Ternan) for water provisions. Most of the water schemes are very old, outliving their initial lifespan hence making them inefficient. Increase in population as well as increase in human activities has exerted pressure to the existing water supply schemes hence not meeting the demand. The situation is made dire during the dry periods as the rivers have insufficient yield and alternative water sources dry up. Besides water demand challenges, the schemes are also faced with challenges ranging from high maintenance and operational cost due to high electricity cost of pumping water.

Lack of maintenance and constant monitoring of the treatment systems have contributed to supply of untreated water to the public. Lack of sufficient supply of clean and potable water compel the locals to source water from unreliable sources compromising their health status. Other water sources are small water dams with low water volumes during the dry periods. In order to address these challenges, National Water Harvesting and Storage Authority (NWHSA) plans to develop a multipurpose dam to provide water for domestic requirements and limited irrigation activities within Londiani locality of Kipkelion Sub-County.

Proposed Project Coverage

Dam Catchment

Kipchorian River is the main river feeding the proposed dam and it originates from Londiani forest at an altitude of about 3,900masl. Githee and Masaita Rivers are the main tributaries of Kipchorian River. Upstream the river is known as Masaita and changes name when it joins Githee River at Masaita farm at about 3,023masl. The Kipchorian River sub-catchment forms the upper Nyando drainage basin. Masaita River drains the western part of the catchment while Githee the eastern part. Londiani dam catchment area rises from about 2,200masl in the south to about 2,800masl with the catchment area upstream the proposed dam axis being 108.4km^2. The total catchment area leading to the dam is estimated at 140.8km^2. Apart from the upper parts of the catchment from which the major stream emerges from; the rest part of the dam catchment area is habited and utilized as agricultural land.

Dam Site and Buffer Area

The dam has been designed to a height of 42m and as a result expected to inundate 520ha of land. The inundated area comprises of privately-owned land parcels whose plans for acquisition are on course. The water line contour for the dam is designed at 2316masl. A buffer line has been set and contour 2322masl and/or 30m from the established water line allowed to ensure safety of the water as well as the riparian landowners. The setting of the dam allows land acquisition that will cover the highest water mark and the buffer areas. Land downstream of the dam to a distance of approximately 500m will also be acquired for the establishment of treatment works and emergency spillway. This also serves as a safety buffer against any risk failure. The dam, reservoir and treatment work's areas shall be staked out for acquisition.

Service area

The areas to be served by the proposed Londiani dam project are Kipkelion East and West sub-counties that rely on pumping schemes and augment water supply. Currently the Londiani, Chesinende, Kipkelion and Fort Ternan water supply schemes serve the project area but are faced by challenge leading to their inefficiency hence not meeting the communities' water demand. Two major bulk domestic treated water pipelines have been designed covering the two sub-counties major towns, trading centres and the surrounding population as follows:

(i) Treatment works-Kipkelion-Fort Ternan: Major towns are Kipkelion and Fort Ternan while enroute trading centres includes Tuyoibei (near Kipkelion), Lesirwo, Ngedale and Siret.

(ii) Masaita – Londiani – Chepseon: Major towns serve includes Londiani, Kedowa, Chepseon and Barsiele with Kapcheplanga, Kipsirichet and Jagoror. This supply line also serves area upstream of the dam that includes Kamuingi centre.

Downstream of the Dam

Land immediately downstream has been earmarked for establishment of the water treatment works and its associated components as well as location of emergency spillway. This is estimated to cover up to 500m downstream of the dam on both banks of the river. This is also estimated to serve as dam safety area on the eventuality of either overtopping and/or dam failure. Evident past the Londiani- Muhoroni road are settlements and agricultural activities taking place. Londiani town a trading centre though approximately 4km from the dam wall is downstream the dam.

Water Transmission Pipelines

The large part of the bulk water transmission pipelines has been designed to pass through roadway leaves for both major highways and all-weather rural roads with minimal utilization of Kenya Railways way leave. Relevant authorities have been contacted and permission for way leave acquired. On areas where pipeline have been designed to pass through private land, necessary acquisition process has been followed and a 3m wide corridor secured. Such areas include section to Masaita hill tank. In other areas such as Kapkondoo, the gravity transmission line from treatment works is designed to pass through riparian land for about 1.2km length before joining adjacent service road heading to Kipkelion town.

The proposed transmission pipelines for treated water supply are estimated to cross the following transport facilities:

(i) Londiani –Muhoroni Road (C35);
(ii) Londiani–Kericho Road (B1);
(iii) Londiani–Kedowa Road (D354);
(iv) Chepseon – Kipkelion Road (D313);
(v) Londiani– Kisumu Railway; and
(vi) Nakuru – Kisumu Oil Pipeline.

Project Activities

The following activities are envisaged through the project implementation;

(i) Planning and Feasibility Studies
(ii) Design Work
(iii) Construction Phase
- ✓ Resettlement Activities
- ✓ Site Clearing
- ✓ Sanitation Management
- ✓ Public Amenities
- ✓ Material Sourcing and Haulage
- ✓ Restoration Activities

(iv) Dam Commissioning
(v) Dam Operations

Study Findings

(i) The project area relies on water pumping schemes and unprotected water sources (rivers and shallow wells). Most of the pumping schemes are inefficient characterized with inadequate water supply capacities to meet the communities demand. Also, the high costs of operations and maintenance contribute to their inefficiency. During the dry periods the rivers and shallow wells are faced with low water volumes and is shared among people and livestock hence compromising the health standards of the communities.

(ii) In case there are notable graves, pit latrines and cattle pens around the dam area and the transmission pipeline routes (in cases where the transmission pipeline traverses through private property) which should be relocated. Reason for possible relocation will include clearing the highest water mark line and pipeline way leave as well as ensuring reduced risks to water quality from infiltration of pollutants from pit latrines and cattle pens. Graves will be relocated while for the pit latrines and cattle pens will be decommissioned and emptied and dumped far from the site avoid any cases of contamination in the future.

(iii) The project area lies within the upper Nyando drainage Basin. The undulating topography and the 3% average slope of land influence the general drainage of the area. The land slopes to the west as well as the drainage direction. River Kipchorian is the major drainage outfalls for Londiani area. Githee River drains the western parts of the dam catchment while Masaita River the eastern parts.

(iv) The project area has a cool and wet type of climate with adequate rainfall distribution throughout the year. The climate conditions experienced within the project area have an influence to the main land use and vegetation cover. The land use cover ranges from grazing land, woodlots and cultivation. The main vegetation types are food crops (maize, beans and kales among others), riverine vegetation (papyrus reeds) and the forested lands.

(v) Agriculture is the main economic activity within the project area with practices such as livestock and bee keeping. The exotic cows graze in free ranging and in some cases zero grazing. Shops with ordinary personal effects, food items and groceries are operated within the market centres. There are also service shops at the trading centres such as saloon, barber shops and Mpesa shops. Entertainment sites are also run within the centres particularly pubs.

(vi) Land acquisition will be immense affecting both sides of Kipchorian River. Most of the land within the project area is individually owned and have title deeds or other authoritative land ownership documents. The land is fenced within the homestead while the farmlands are open.

(vii) Local foot paths and village networks across the valley will be disrupted leading to possible inconveniences to residents. Two of the access roads will be relocated to run over the dam embankment wall.

(viii) The Treatment works is located immediately downstream of the dam wall on the right bank of Kipchorian river at approximately geo-reference 9984917m S, 786938m E (Datum: WGS 84 UTM Zone36S). The piece of land totalling 15ha will require to be acquired.

(ix) The project area is served by a tarmac road Londiani – Muhoroni from B1 road and accessed by an all-weather road (Londiani –Tinderet forest). There are also electricity power line traversing the area and public institutions such as schools and churches.

These infrastructures and utilities are within the dam catchment area with likelihood of being submerged. These service lines will require to be relocated accordingly.

Potential Impacts and Corrective Measures

Positive impacts likely to be derived from the proposed dam project include:

(i) Employment opportunities created will benefit the local communities with at least 60% of labour force being sourced from within. Material supplies will offer business and hence source of income contributing to improved living standards.

(ii) Water supply will be by gravity hence reducing the costs of operation and maintenance resulting from the pumping schemes.

(iii) Provision of adequate, clean and potable water supply to the communities for domestic and irrigation purposes.

(iv) Reduced cases of water borne diseases emanating from consumption of untreated water supply.

(v) Improvements on community sanitation and hygiene.

(vi) The dam will mitigate floods downstream during rain seasons and provide water for irrigation and domestic use during the dry periods.

Negative Impacts

The proposed project shall generate negative environmental and social impacts. The construction works are disruptive and obstructive by nature. The potential impacts need mitigation for sustainability. The negative impacts are diverse and they affect both natural and built environment. Some of these negative impacts include:

(i) Dam breaking
(ii) Acquisition of public and private land for the project
(iii) Increase to social vices and diseases from interactions of workers
(iv) Solid waste generation
(v) The dam spill ways breaking
(vi) Safety concerns (exposure to accidents e.g. drowning)
(vii) Possible water contamination from impurities (poison) which is a national security issue.

Mitigation measures

(i) Constant mitigation and supervision of construction works to enhance required quality standard
(ii) Awareness creation to the public on the project land demands
(iii) Awareness creation/ education on diseases and social vices
(iv) Ensure proper waste management practices as well as disposal methods
(v) Strict adherence on the set OHS standards
(vi) Fence the dam catchment area and constant patrolling

Environmental Management Plan

Management Plan Principles

The project is geared towards enhancing social and economic benefits through sustainable water supply and replacing as many as possible of the pumping schemes and augment water supply within Kericho County. Development of the Londiani dam project would be expected to comply with the environmental conservation requirements in accordance with the established Kenyan laws and regulations. To realize these goals, acceptability by a majority of the stakeholders and minimal effects to the physical environment will require to be ensured through participation in the project and continuous consultations, evaluations and review of the design aspects throughout project implementation cycles. It is also recommended that the environmental management guiding principles specific to this project improvement and water resources management be established to allow integration of environmental management considerations during construction and operations.

Management Responsibilities

An environmental supervision expert should be identified in order to implement the management plan. He should oversee the environmental and social management aspects including the dam conservation, soil erosion control, re-vegetation whenever appropriate, water conservation and equity in distribution, enhanced sanitation and hygiene measures throughout project area. The expert would also be required to coordinate and monitor environmental management activities during construction and post monitoring audits.

The contractor shall be the implementer of environmental protection initiatives in tandem with the construction works. He should be guided to declare and mitigate environmental faults that are occasioned by construction works. He should dedicate resources to anticipate and repair environmental and social damages due to dam construction. Other participants include;

(i) National Water Harvesting and Storage Authority (NWHSA) will be responsible for coordination of all the activities and liaisons, particularly in regard to the quality control of the works and social issues,

(ii) Water Service providers, in this case (Kericho Water and Sanitation Company – KEWASCO who have the responsibility to enforce water quality monitoring and efficient maintenance systems, procedures to minimize interruptions to water supply and ensure accessibility by all consumers,

(iii) National Environmental Management Authority (NEMA) through the county director's office shall be responsible of surveillance of environmental and social aspects of the project implementation.

Environmental Management Guidelines

The guidelines will include among other areas environmental management programmes, standard operation procedures, compliance monitoring schedules and environmental audit schedules as required by the law. Social harmony of the dam and associated component will be achieved through the collaborations with the stakeholders or community management committees introduced at various water consumption points.

Institutional Framework Management

The National Policy on Water Resources Management and Development and the Water Act 2016 are the guiding tools on water resources management. The policy goal is to facilitate the provision of water in sufficient quantity and quality and within a reasonable distance to meet all competing uses in a sustainable, rational and economical way. It also separates policy formulation, regulation and services provision and defines clear roles for sector actors within a decentralized institutional

framework and includes private sector participation and increased community development. The Ministry in-charge of Water is responsible for policy development, sector co-ordination, monitoring and supervision to ensure effective Water and Sewerage Services in the Country, sustainability of Water Resources and development of Water resources for irrigation, commercial, industrial, power generation and other uses.

Institutional integration encourages provision of sustainable development and a healthy environment to all Kenyans. The key functions of NEMA through the NEC include policy direction, setting national goals and objectives and determining policies and priorities for the protection of the environment, promotion of cooperation among public departments, local authorities, private sector, non-governmental organizations and such other organizations engaged in environmental protection programmes and performing such other functions as contained in the act. Other stakeholders include Kericho County Government, local administrative officers, Kenya Forest Service, Kenya National Highway Authority, Kenya Railways Corporation, ministry of Environment, Water and Natural Resources, Ministry of Agriculture and Livestock, Ministry of Water and Irrigation and the local communities.

Conclusions

(i) The proposed project is highly acceptable by a majority of the residents around the area and downstream in view of its appreciable benefits and the declining availability of clean water. Among the benefits appreciated include the public drinking water supply, supply of water to institutions such as schools and health facilities as well as requirements of the urban centres within the project area.

(ii) The project implementation will have social implications through acquisition of land for the dam prompting displacement of people and livelihoods. Due to the anticipated implication in this regard, appropriate mechanisms are critical to ensuring minimal social and economic impacts.

(iii) Downstream the project, however, will see an appreciation in land values and productivity prompting a possible influx of population. The urban centres and institutions downstream the dam areas are likely to also likely to experience upgrade with improved sanitation and hygiene.

(iv) Water quality is an important attribute towards the feasibility of the dam project. In this regard, it is noted that the catchment (Londiani Forest) and the immediate watersheds are undergoing serious degradation through deforestation and settlements (e.g. Kamuingi Settlement). Sustainability of the dam water quality and the health of the dependants could therefore be jeopardized in the long term.

(v) The dam construction has potential linkages to the environmental and social settings, in each case posing short- and long-term co-existence. Social benefits are to be enhanced while mitigation of negative impacts constitutes a larger part of this ESIA Report. This calls for collaborative management plans focused on the various social and environment sub-sectors.

(vi) The dam by nature is an environmental feature as a large water body. Its influence on the are micro-climate cannot be ignored while transformation of the local ecological conditions is also a reality.

(vii) Londiani dam is likely to contribute to the flood control far downstream in Kano plains of Kisumu County where Nyando River (that is Kipchorian River), implying that the dam design has this as part of its focus.

Recommendations

(i) Displacement of people and livelihoods is one single block of social impacts that requires to be addressed before the project implementation commences. It is, therefore, recommended that a comprehensive Resettlement Action Plan (RAP) be undertaken within the provisions of the established laws and guidelines. The RAP Report will then constitute part of the mitigation measures for the social impacts of the project.

(ii) The benefits of the project downstream have been expanded by optimized design guided by the relative locations along the Londiani – Kericho and Londiani – Fort Ternan roads. Efficiency in this benefit distribution is realized by the favourable topography that provides desired flows.

(iii) Social and environmental impacts will be addressed by ensuring appropriate tools have been developed and adopted. These tools, to be prepared under the Construction Environment and Social Management (C-ESMP) will include the following.

- ✓ Health and Safety Plan
- ✓ Air Quality Management Plan
- ✓ Noise Management Plan
- ✓ Stakeholders and Social Engagement Plan
- ✓ Labour Recruitment Plan
- ✓ Labour Influx Management Plan
- ✓ Child Protection Plan
- ✓ Gender Management Plan
- ✓ Waste Management Plan (including spoil disposal)

(iv) The dam development and operations thereafter should consider integration of comprehensive Catchment Management Plan with involvement of relevant communities in the key watersheds.

(v) It is recommended that a weather station be provided at the dam to facilitate monitoring of ecological transformation trends and emergent climatic conditions.

(vi) Flood control downstream will need to be monitoring to quantify impacts over a duration of time.

CHAPTER 1: INTRODUCTION

1.1 Background

Kenya is classified as a water scarce country in the world. The current access to clean water in Kenya is estimated at about 90% in the urban areas and approximately 45% in the rural areas while the national average stands at about 60%. At the same time, provision for safe sanitation stands at a national average of 80% (with an estimated 95% in the urban areas and about 77% in the rural). Water resources in Kenya face numerous challenges ranging from watersheds destruction, pollution, wastage, over abstraction and uncontrolled developments within riparian and buffer zones. Climate change is also further putting a strain on water resources through enhanced cycles of flooding and drought that are increasing in frequency and severity. Catchment destruction phenomenon is leading to flash discharges and undermines water retention capacity.

The National Water Master Plan 1992 identified construction of dams as a suitable strategy towards attainment of Kenya Vision 2030 goals of alleviating water scarcity and associated challenges. This objective is achieved through various Government of Kenya agencies. The National Water Harvesting and Storage Authority (NWHSA), established under the Water Act 2016 as an autonomous agency responsible for development and management of national public water works for water resources storage and flood control among other responsibilities. In line with Kenya Vision 2030, National Water Harvesting and Storage Authority (NWHSA) plans to develop a multipurpose dam to provide water for domestic requirements and limited irrigation activities within Kipkelion East and West Sub-County of Kericho County.

The proposed Londiani Dam is located at Masaita in Londiani location of Kipkelion East Sub-County Kericho County. It is on the foot of Masaita Hills, approximately 3km from Londiani Market along Road E254 Londiani – Sorget Road. The dam was identified as one of the 24No. Flagship dam projects to be developed in Kenya Vision 2030.The primary objective of Londiani Dam Project is to provide potable and adequate water supply to the residents of Kipkelion East and West sub-counties that are characterized with water shortage especially during the dry conditions. The proposed Dam was explored for multipurpose project for among other needs domestic, livestock, institutional and industrial uses, irrigation, flood control and hydropower being secondary objectives.

The existing water supplies in Kipkelion East and Kipkelion West sub-counties comprise of 3No.pumping water schemes and 1No. gravity system with no treatment system. These schemes have outlived their lifespan with some being as old as 50 years. Water production capacities from these schemes don't meet the communities' water demand needs due to challenges ranging from low water flow in the source Rivers and increased operation and maintenance costs. These water supply schemes are:

(i) Londiani water supply has a production capacity of 270m^3/day against present water demand of 900m^3/day serving a population of 2,800 against a target population of 8,920 persons within Londiani Township and its environs.

(ii) Chesinende water supply scheme has production capacity of 100m^3/day against a demand of 300m^3/day serving a population of 2,420 against a target population of 7,940 persons.

(iii) Kipkelion water supply has a production capacity of 90m^3/day against water demand of 330m^3/day serving a population of 1,470 against a target population of 4,100 persons.

(iv) Fort Ternan water supply has a production capacity of 170m^3/day against demand of 1,485m^3/day serving a population of 2,290 against a target population of 18,570 persons.

Chesinende water scheme is not operational and the community rely on borehole water drilled at Chepseon Catholic Church and other unreliable surface sources. Fort Ternan water supply scheme

is not reliable, especially during the dry seasons when there is no water, forcing the residents to fetch water from the nearby Kimologit River. With the increasing population, the water sources are getting overstretched and identification of alternative water sources is inevitable. The proposed Londiani dam is intended to supply treated water to supplement the capacity of these schemes.

1.2 Project Justification

Mau forest is one of the country's major water tower and is facing major challenges ranging from catchment degradation, low rainfall leading to low recharge levels and increasing water demands for communities' needs and irrigation purposes. Demand for land and land use activities within the catchment and its buffer zone is the main cause of destruction e Mau ecosystem leading to low flows into rivers and streams with effects to the water supply schemes and the target communities.

Kipkelion East and West sub-counties are among the worst hit by water scarcity resulting from the increasing demand of rising population and expanding social and economic activities. In order to address these challenges, the National Water Harvesting and Storage Authority (NWHSA) has proposed to construct Londiani dam to produce 172,200m^3/day of water to serve this population. This intervention will also help control floods downstream especially in the Kano plains of Kisumu County and also provide water for irrigation during the drought periods.

1.3 The Project

1.3.1 The Dam Site

Kipchorian River is the main river to feed into the proposed dam with its origins in Masaita Forest situated at an altitude of about 3,900masl. Githee and Masaita Rivers are the main tributaries into Kipchorian River. Londiani dam catchment area raises from about 2,200masl in the south to about 2,800 masl with the catchment area upstream the proposed dam axis being 108.4km^2. The total catchment area leading to the dam is estimated at 140km^2.The dam inundation area is estimated at 5,200,000m^2 such as to attain a dam height of 42m for a maximum gross storage capacity of 55Mm^3 of water.

The dam wall will be rock fill with a clay core to yield approximately 172,200m^3/day which is more than the total water demand estimated at 48,100m^3/day to serve about 550,000 people for domestic and irrigation schemes. The water line contour for the dam is designed at 2,316masl, while a buffer line has been set on contour 2,322masl and/or 30m whichever is higher from the established water line allowed to ensure safety of the water as well as the riparian landowners. Downstream, land will be acquired for water treatment works and a spillway channel.

1.3.2 Transmission pipelines

To the extent possible, the bulk water transmission pipelines will be confined on road reserves. Relevant authorities have been contacted for approval of the reserves. The main Bulk pipelines can be described as follows,

(i) Treatment works – Kipkelion – Fort Ternan: Major towns traversed include Kipkelion and Fort Ternan while enroute-trading centres are Tuyoibei (near Kipkelion), Lesirwo, Ngedalel and Siret.

(ii) Masaita – Londiani-Chepseon: Major towns traversed include Londiani, Kedowa and Chepseon. This line also from Masaita will run to Barsiele, Kapcheplanga, Kipsirichet, and Jagoror. There is a dedicated line from Masaita to Kamuingi centre and surroundings.

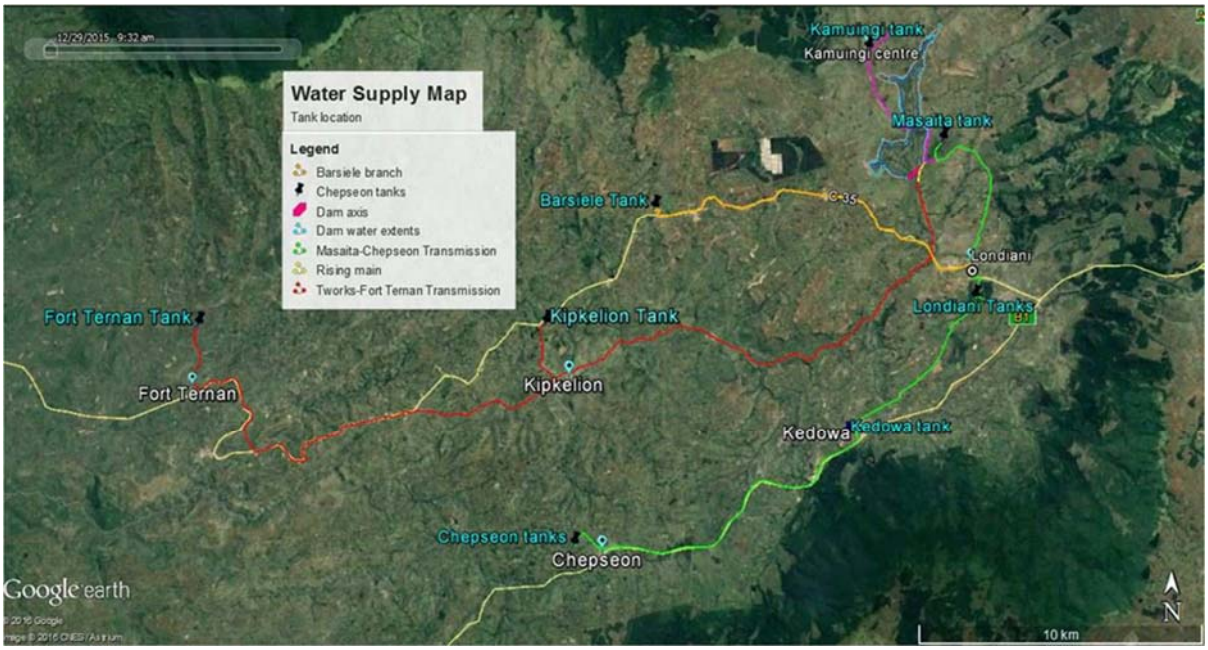


Figure 1: Storage Tanks and Related Routes

The water demand of the high areas of Londiani, Kedowa, Chepseon and Barsiele is estimated as 18, 816m^3/day by 2040. The tank on Masaita Hill should be able to supply this amount of water at the ultimate horizon. It is proposed that a 7,500m^3 tank be constructed at Masaita Hill. The physical difference in height between the pump-house at the treatment works and Masaita Hill is 136m. It is proposed that 4No. pumps capable of pumping 283m^3/hr against total head of 180m including friction losses would be installed at the pump-house. These shall comprise of 3No. operational and 1No. standby pump which shall be engaged through an intelligent sequence or interlocking mechanism that allows 3 No. pumps to operate at any given time. It is estimated that each pump shall be driven by a 200kW motor.

1.3.3 Storage Tanks

The proposed project main objective is provision of treated water supply to the existing schemes. For efficient supply of clean water to end users, storage facilities will be necessary. Storage reservoirs will be constructed using reinforced concrete and will vary in size and capacity based on estimated water demands of a given area. The project design manual proposes construction of the following storage reservoirs:

- ✓ 7,500m^3 Masaita Hill Tank
- ✓ 7,000m^3 Clear Water Tank at Water Treatment Works
- ✓ 5,000m^3 Tank adjacent to Londiani Tanks
- ✓ 500m^3 Tank at Barsiele
- ✓ 1000m^3 Tank at Kedowa
- ✓ 3,000m^3 Tank at Chepseon adjacent to the existing tanks at Chepseon Youth Polytechnic
- ✓ 4,000m^3 Tank on the hill adjacent to Taita Towet Boys School in Kipkelion
- ✓ 3,000m^3 Tank at the new site on Kipsinende Hill in Fort Ternan
- ✓ 250m^3 Tank at Kamuingi

1.4 The ESIA Study

1.4.1 ESIA Terms of Reference

In accordance with the Terms of Reference (see **Annex 1**), the following scope has been defined for this ESIA.

(i) A comprehensive description of the proposed project including its objectives, preliminary designs (to be availed by the Client), proposed implementation (from the feasibility or other reports) and anticipated by-products among others,

(ii) Description of the project area such as to cover the location, environmental setting, social and economic issues, development strategies as well as national development plans, etc. linkages will be established between the information so gained and the role of the proposed project,

(iii) Key social linkages including land ownership, access to water, disruption to access roads, potential displacements and compensation issues as well as social disruptions in terms of accessibility of common resources and amenities,

(iv) Policy, legal and institutional framework within which the proposed project will operate that will also include the corporate policy and strategic planning,

(v) An overview of the anticipated impacts from the project to physical environment, social status and general benefits to the national economy. Appropriate mitigation measures and plans would also be suggested,

1.4.2 ESIA Scope of Work and Objective

The ESIA report should be in line with the Environmental Impact Assessment and Audit Regulations of June 2003 established under Environmental Management and Coordination Act (EMCA), 1999. The objective of the study is to carry out an environmental and Social Impact Assessment for Londiani Dam. This dam should be able to provide the maximum yield in order to supply water to Kipkelion East and West sub-counties as well as providing water for irrigation downstream. In accordance to the ESIA regulations, therefore, the objectives of the study should include the following key issues;

(i) A clear description of the proposed project including its objectives, design concepts, proposed water uses and anticipated environmental and social impacts,

(ii) Description of the baseline conditions in the project areas such as to cover the physical location, environmental setting, social and economic issues,

(iii) A description of the legal, policy and institutional framework within which the proposed dam project will be implemented,

(iv) Description of the project alternatives and selection criteria,

(v) Details of the anticipated impacts to the environment, social and economic aspects of the area covered by the project,

(vi) Appropriate mitigation and/or corrective measures,

(vii) Develop an environmental management plan (EMP) presenting the project activities, potential impacts, mitigation actions, targets and responsibilities, associated costs and monitoring indicators.

The scope of the Environmental and Social Impact Assessment (ESIA) was to develop suitable recommendations to be integrated in the project design and implementation for mitigation of anticipated adverse impacts to the environment and social setting the project and service areas. An evaluation of public opinions and stakeholders' attitude towards the project was captured through interviews and consultative forums conducted throughout the project area variously during the study period.

1.5 ESIA Approach

The study was designed to identify impacts associated with the proposed project on the basis of the baseline conditions. Detailed evaluation of the project area was undertaken with focus on significant environmental and social issues. The communities living within the proposed dam coverage area and pipeline corridor were engaged through rapid interviews, public consultations and stakeholder workshops. Among the tools used included questionnaires, self-writing forms, photographs, etc. Overall, the study was undertaken through the stages below:

1.5.1 Scoping Process

This process was meant to identify environmental and social impacts issues that are likely to be of most important and related to the proposed project. It involves establishment of linkages between the physical environment, demography patterns, climate change and the hydro-geological status of the area. Relevant policy and legal requirements were listed. This enabled determination of project elements that would be emphasized among the aspects identified and that have been discussed in detail under this report.

<u>Environmental Aspects</u>

(i) Submergence of various seasonal streams including the related ecosystems (unique indigenous vegetation species and habitats for indigenous micro and macro organisms and breeding areas).

(ii) Potential silt transportation and storage in the dam and immediately upstream.

(iii) Water quality effects from point source dotted all over the project area including among other pit latrines, graves sites, livestock pens, settlement and market centres.

(iv) Emergence of new spices in the area as to include vectors, will animals and plant species.

(v) Excavation of biomass (live and dead accumulated over hundreds of years before induction.

(vi) Effects on micro climatic conditions in the neighbouring areas.

<u>Social and Economic</u>

(i) Land issues with respect to land ownership, land accusation, compensation and resettlement of the landowners,

(ii) Social linkages of the dam such as to include public (HIV/AIDS, Malaria, typhoid, bilharzia, Cholera etc.) income generation (employment, economic opportunities, irrigation etc.) and access to drinking water,

(iii) Cultural linkages including relocation of graves,

(iv) Economic values of existing natural resources (biomass, sand, stones etc.

Ecological Aspects

Ecological setting is also an important factor in dam development and operations in an area. In this connection, a comprehensive review, field analysis, documentation and collation of existing and relevant literature or reports was done to help gain a clear and detailed understanding of the ecological (e.g. climatic conditions etc.) and biological characteristics of the project sites and their environs. The biodiversity endowment (flora and fauna) of the project sites was assessed to document the baseline information of the flora and fauna species that are found in the project area and their conservation status based on the IUCN Red List. This focused on characterization of the woody species (trees and shrubs), wildlife species, reptiles and amphibians.

Other Issues

Additional emphasis was on the following key areas:

(i) Updating the environmental and social baseline conditions in and around Kericho County and the dam location, water transmission corridor and the user areas,

(ii) Evaluating the land use patterns within the project areas and the larger Kericho County in general with respect to influence from the dam construction and use thereafter,

(iii) Reviewing the environmental impacts with particular focus on physical environment, social and economic issues as well as natural resources aspects within the project areas,

(iv) Reviewing the social implications of the project to be gathered through structured public participation and interviews of the public officials, community groups, farmers, land owners, public institutions, opinion leaders, etc.,

(v) Reviewing the mitigation measures and an environmental management plan outline,

Hydrology

Hydrology is a factor considered for a sustainable dam. The hydrological analysis sought to establish the available water resources in the Kipchorian River sub-basin system and evaluated the stream flow trends, river recharge, flow duration curves to ascertain whether the flows are adequate for storage thereof with analysis of the following data:

(i) Daily rainfall data;
(ii) Daily Evaporation data;
(iii) Wind speed and direction;
(iv) Other climatic parameters (humidity, temperature), etc.

The presence of sediments in rivers has its origin in soil erosion, where the erosion is a result of series of complex and interrelated natural processes which would loosen and move away the soil and rock materials under the action of water, wind and other geological factors. Factors influencing soil erosion from any area is rainfall regime, vegetation cover, soil type, land physiographic and land use. Sediment generated uplands of the catchment is transported by surface runoff water into rivers downstream either as suspended load or as bed load.

With the establishment of a reservoir, sediment deposition occurs due to reduced velocities and turbulence of moving water. The sediment deposition in reservoirs is of considerable economic and practical interest since it reduces the storage capacity of the reservoir. The study has estimated the sediment deposition into the proposed dam development. Hence prudent mitigation measure should be identified to mitigate accumulation of sediments in the catchment reservoir so as not to compromise the gross reservoir storage volume.

1.5.2 Documentary Review

Documentary review was a continuous exercise that involved reviewing relevant documents to the project with an aim of understanding the terms of reference, environmental status of the project area and the target river systems, data on demographic trends (for the project area, the beneficiary areas and the adjoining districts), land use practices in the affected areas (either as catchments, dam location or the beneficiary areas), development strategies and plans (local and national) as well as the policy, legal and institutional documents.

1.5.3 Field Assessment

This process was meant to appreciate the project's scope of land requirement. This involved examination of the physical environment, social and biological environment as well as the project affected persons. With reference to the dam the examination included and not limited to the dam catchment area, transmission corridor, tank sites and the treatment works. Determination of the affected environmental and social features would not only be felt within the dam area but also in the neighbouring districts (upstream, around the dammed area and downstream). This process was meant to appreciate the project's scope of land requirement.

It was also essential to establish actual baseline as well as verification of facts stated for project designs. It was also undertaken to appreciate the social and economic trends and linkages with the water supply to ensure involvement, focused benefits and realistic measures for enhanced acceptability.

The main objective of the field assessment was establishing the anticipated positive and negative impacts in terms of physical and biological environment i.e. (hydrology, climatic patterns and water resources related aspects), social and economic trends, (population trends, settlement trends, economic patterns, cultural setting and linkages, land use and ownership issues, etc.

1.5.4 Detailed ESIA Study Activities

This assignment involved a series of activities carried out in liaison with the Client, relevant government departments, local authorities, community groups and other organizations in the area with a view to sharing their experiences and information with respect to environmental resources and social aspects. Effective evaluation of the social baseline status achieved through interviews (consultative meetings and discussions) and physical inspection of the entire project area. The baseline conditions provided the starting point for the impact's predictions and benchmark for the mitigation measures. Details of the activities have been listed under the terms of reference, but the expected outputs for each activity are outlined in the sub-sections below:

(i) Review of the proposed dam project details to understand project magnitude and the overall implementation plan by the client.

(ii) Establishment of the current baseline conditions to provide a documented foundation for the impact predictions and a benchmark for the development of mitigation measures.

(iii) Update of the legislative and regulatory requirements as a basis for drawing a compliance monitoring protocol for the construction and commissioning phases.

(iv) Environmental and social impacts assessments significant impacts to the environment and the nearby communities. Types and levels of impacts as well as criteria for developing suitable mitigation measures and an environmental management plan.

(v) Environmental management plan on mitigation measures, responsibilities, timeframes, environmental costs and an environmental management plan.

1.6 Stakeholders and Public Consultations

Consultations of the public and stakeholders commenced at the design stage when sensitization and awareness forum was undertaken to inform the stakeholders and the general public on the project scope and how it will be related to the communities. The sensitization and awareness forum were held on 6th January 2016 at Baration Secondary School a short distance from the proposed location of the dam wall. Participation of the forum, that also included attendance by the County Governor, was drawn such as to cover the dam and supply areas as follows:

(i) Londiani Supply Areas covering Kipsirichet, Londiani and Kedowa

(ii) Chepseon Supply Area with Chepseon, Kapsenger and Kipyemit

(iii) Kipkelion Supply Area covering Kipchorian and Lesirwa

(iv) Chinchila Supply Area where are covered include Chinchila, Siwet, Kipteris and Kapkwen.

A series of public consultations was undertaken between 16th April and 20th April 2018 as shown in the following schedule:

Table 1: Schedule of Public Consultations

Date	Venue	Time
16th April 2018	Masaita Primary School	10.00am – 1.00pm
17th April 2018	Londiani Town-Hall	10.00am – 1.00pm
	Kapkondoo Primary School	2.00pm – 4.00pm
18th April 2018	Kipkelion West Social Hall	10.00am – 1.00pm
	Barsiele Primary School	2.00pm – 4.00pm
19th April 2018	Kedowa Play Field	10.00am – 1.00pm
	Chepseon Market	2.00pm – 4.00pm
20th April 2018	Siret Secondary School	10.00am – 1.00pm
	Fort Ternan Coffee Mill	2.00pm – 4.00pm

1.7 Reporting

The process of report writing involved compilation of collected information from reconnaissance visit, site inspection and the public interviews and consultation during field visit. All the information collected during field visit was analysed for reporting. The report (inception, draft final and final draft and final) were done at pre-agreed timeframes such as to cover the requirements of the National Environmental Management Authority (NEMA) guidelines. The reports generated in this process include:

(i) Inception Report
(ii) Terms of Reference
(iii) Draft ESIA study Report
(iv) Final ESIA study Report

1.8 Study Experts

(i) Team Leader/Lead Expert
(ii) Social Expert
(iii) Water/Dam Engineer
(iv) Environmental Associates
(v) Assistant Sociologist

CHAPTER 2: PROJECT DESCRIPTION

2.1 Project History

The proposed Londiani dam water supply project was commissioned by the National Water Harvesting and Storage Authority (NWHSA) in line with Kenya Vision 2030 to improve the water supply situation. The Dam site is located in Kipkelion East Sub-County of Kericho County. The site was identified as one of the twenty-four dams to be developed under the Kenya Vision 2030 flagship project. The main objective of the project is to supply potable water and supplement the existing pump fed water service schemes that are not sustainable due to high cost of electricity and other operational. The project also aimed at controlling floods in the lower reaches of Nyando basin, alongside supplying water for irrigation and hydropower generation.

In a bid to identify the most suitable site in realizing this objective, the feasibility study estimated the water demands for the project area and established potential source(s) that can satisfy these demands on gravity feed system to replace the inefficient pumping schemes that are the characteristic of the existing water supply. Various dam sites alternatives and combinations evaluated for suitability on all aspects including serviceability were ranked. Based on the multi-decision criteria assessment, the current dam site located near Masaita primary school was ranked as the most suitable dam option. Stakeholders Consultative forums organised to evaluate the findings also recommended the site as the most preferred.

2.2 Project Components Location

2.2.1 The Dam

The proposed Londiani dam is located in Kericho County (Kipkelion East Sub-county, Londiani ward, Masaita and Baration locations). The site is located along Kipchorian River, 4km upstream of Londiani town with the embankment wall axis at approximately $0^0$08’7” S and $35^0$34’40” E and elevation of 2,322masl. Among the Villages in the locality include Kamuingi, Itoik and Masaita to the east of the dam, Cheresi and Baration. The embankment wall axis is slightly upstream of the old water pan locally referred to as Baration Dam.

2.2.2 Water Treatment Works

The site for water treatment works is located approximately 500m downstream of the dam wall on the right bank of Kipchorian River. It is on the relatively flat side of the bank to allow for stable construction of structures as well as to avoid pipelines crossing the river after treatment. The raw water main has been kept short to maximize on the available head for gravity flow and head for generating limited hydropower. The location also aims at minimizing costs of the penstock leading to the turbines for power generation.

In addition, the location of the treatment works aims at reducing the total distance for which water is to be conveyed and ease the excess to discharge back to the river. The treatment works are anticipated to occupy a total land area of 15ha to accommodate support unit including treatment components as per design, an administration office, staff houses, waste handling facilities, sanitation facilities and other accessories necessary for operations as well as future expansion. The facility will also be provided with an access road, power supply and communication network.

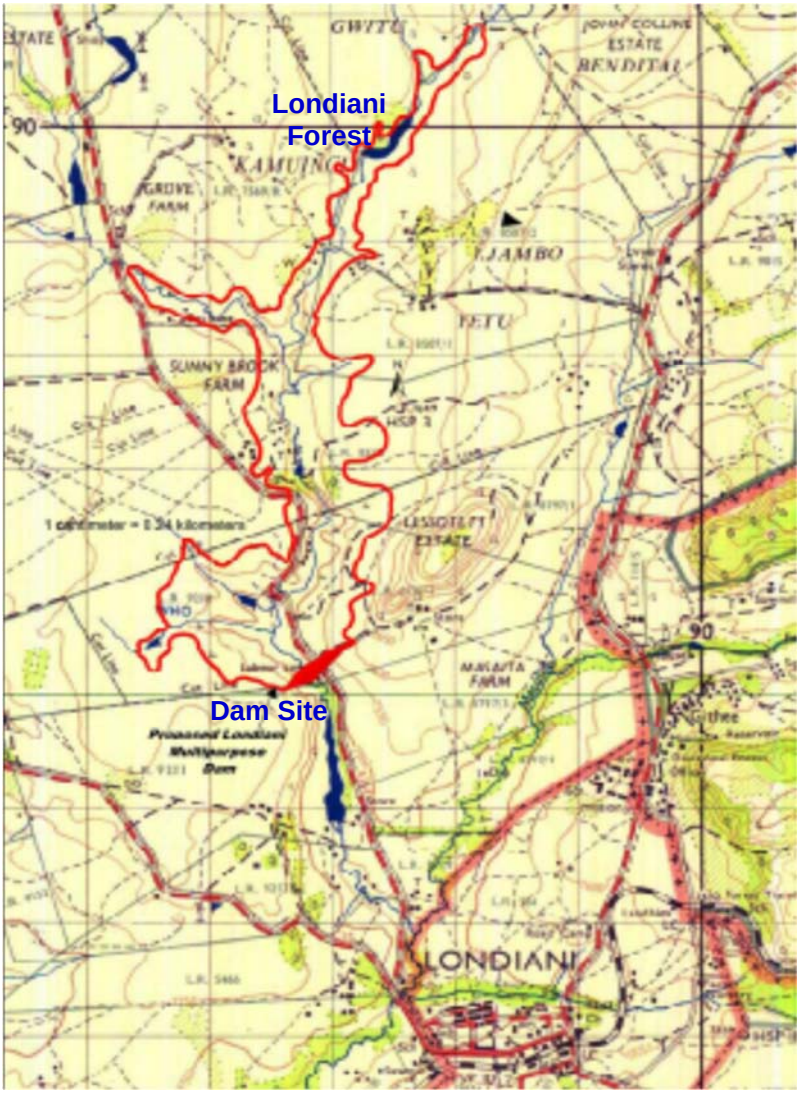


Figure 2: Londiani Dam General Location

2.2.3 Water Transmission Pipeline

A raw water rising main of 500mm diameter and 1.8km long will be laid from the treatment works to a distribution tank on Masaita hill to achieve about 147m head from the clear water tank. 2No. Gravity mains starts from Masaita hill tank will be laid to Londiani town and beneficiaries. The two proposed main bulk transmission pipelines are:

(i) Gravity main 1: Masaita tank – Londiani – Kedowa– Chepseon
(ii) Gravity main 2: Treatment works – Kipkelion – Fort Ternan
(iii) Pumped main 3: Kamuingi and Barsiele

Gravity 1 crosses Road C35 (Londiani – Muhoroni) near the entrance to Londiani town towards Kedowa Market via the Londiani Forest and old Londiani – Kedowa murram road. From Kedowa Centre, the pipeline runs along Londiani – Kericho (B1) Road reserve to Chepseon town. The pipeline terminates at the proposed new tank located at Chepseon Polytechnic. The total length of the pipeline is approximately 28km. In addition, the line has two branches namely Londiani – Barsiele (13km, 200mm dia.) and Masaita – Kamuingi (7km, 160mm dia.) which terminates at Barsiele and Kamuingi Centres respectively.

Gravity 2 will commence from the treatment works on a 500mm diameter pipe to run along Londiani – Sorget (E254) murram road, crossing Londiani – Muhoroni (C35) at Kipchorian River Bridge. From the bridge, the pipeline runs along Kipchorian River to Kipkelion town. From Kipkelion town, the pipeline runs access road reserves before joining Londiani – Muhoroni (C35) again at Ngedalel. From this point, the pipeline runs along the road reserve to Fort Ternan town terminating at Kipsinede Hill tank. The total length of the pipeline is approximately 39km with pipeline 17 nodal points comprising of two old tank connections and 15 new proposed connection points including a dedicated line to Kipkelion tank at Dr. Taita Towett School. Pumped scheme pipeline will also commence at Masaita Hill tank to serve dependents in Kamuingi settlements and the surrounding areas.

There will also be a pumped scheme commencing from Londiani Tanks to serve residents in Jagoror and markets along the road terminating at Barsiele Market. The pipelines will follow road reserves as much as possible to minimise need for land acquisition and facilitate easy access by the users. To avoid cutting of the tarmac road or conflict with railway line, it is recommended to conduct micro-tunnelling at the locations where the pipe is crossing a tarmac road or railway line while above ground cross-over is proposed for oil pipeline crossings. Air valves (28 No.), wash outs (14 No.) and section valves (7 No.) will be installed in the trunk main system.

The crossing areas are as follows:

Table 2: Critical Pipelines Crossings

No.	Crossing Description	No. of Crossings
1	Tarmac road crossing (Micro-Tunnelling)	2
2	Rural/ murram road crossing by cutting	6
3	Railway crossing (Micro-Tunnelling)	5
4	Oil pipeline crossing (cross over)	9

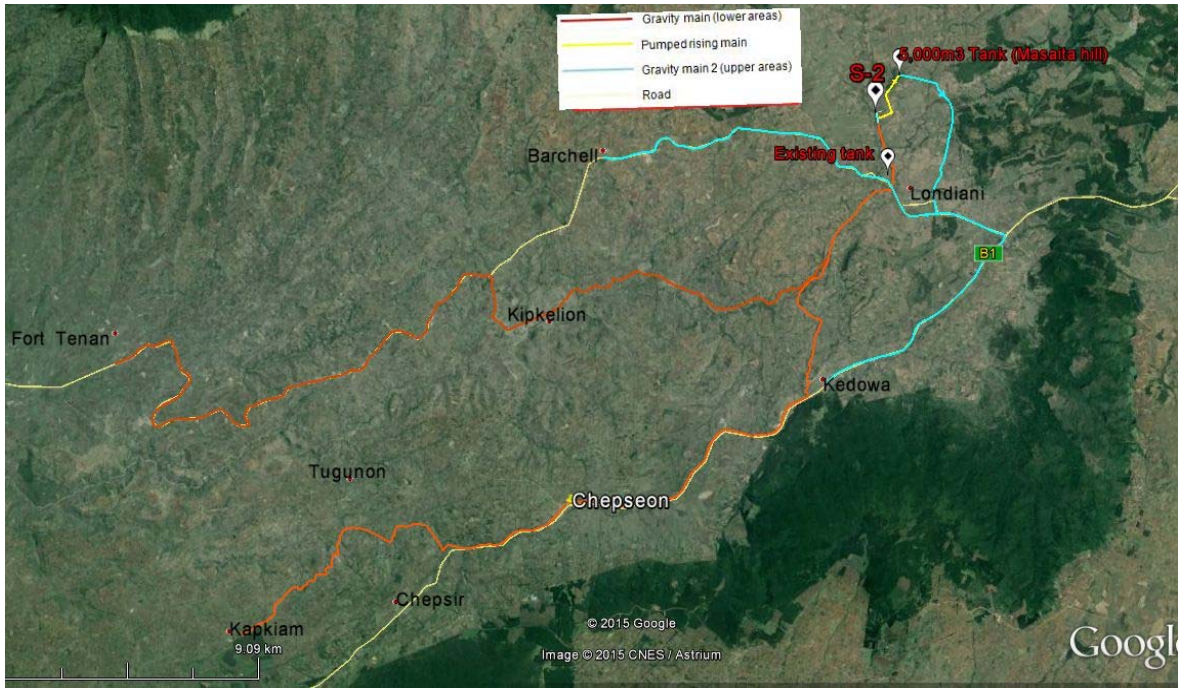


Figure 3: Proposed Transmission Pipeline Maps

2.2.4 Treated Water Storage Tanks

New Storage tanks have been proposed along the major water transmission pipelines and branches. Proposals for new storage tanks followed the realization that most of the old tanks were

way too small to cater for the current and future demands. The tanks have been designed to provide for at least half-day storage of the demand from total daily treated water inflows. Pipeline transit demands will be met through the allocated nodal points provided to serve as future distribution connection points. Provisions have also been made for connection to the existing distribution networks and storage tanks to allow for immediate benefit realization. Following are the proposed storage tanks based on the bulk supply transmission lines.

2.2.4.1 Gravity Main 1 (Masaita Tank – Londiani –Kedowa – Chepseon)

Main storage tanks proposed along the main includes:

(i) Masaita Hill Tank (7,500m^3)
(ii) Londiani (5,000m^3),
(iii) Kedowa (1,000m^3),
(iv) Chepseon (3,000m^3).

Tanks have been proposed along the terminal ends of the supply branches:

(i) Kamuingi (250m^3), and
(ii) Barsiele (500m^3).

2.2.4.2 Gravity Main 2 (Treatment Works – Kipkelion – Fort Ternan)

Proposed storage tanks will include:

(i) Clear Water Tank (7,000m^3) at the Treatment Works,
(ii) Kipkelion (4,000m^3) at Dr. Taita Towett School,
(iii) Fort Ternan (3,000m^3).

The new reservoirs will be ground tanks of reinforced concrete structure. The design also gives provision for a guard house and an ablution block. For each location the locations will be enclosed in a fence and a lockable double leaf gate.

2.3 The Proponent and Key Stakeholders

The proposed Londiani Dam development project will be constructed by the National Water Harvesting and Storage Authority (NWHSA) with funding from the Kenya Government. Other stakeholders who will have a role to play during the construction and post-constructions stages through the various obligations they have in enhancing sustainable development include the following:

(i) Ministry of Water and Irrigation,
(ii) Water Resources Authority,
(iii) Lake Victoria South Water Services Board,
(iv) Lake Victoria basin development authority,
(v) Kericho water and sanitation company (KEWASCO),
(vi) Kenya Forest Service (KFS)
(vii) Kenya Wildlife Services (KWS)
(viii) Ministry of Agriculture, Livestock and Fisheries,
(ix) Ministry of Health,
(x) County Government of Kericho,
(xi) Affected Communities including institutions.

2.4 Project Area Description

2.4.1 Catchment Area of the Dam

Kipchorian River originates from Londiani forest and will be the main river feeding the proposed dam. Its main tributaries being Masaita and Githee rivers. The Kipchorian river sub-catchment forms part of the upper Nyando River drainage basin discharging into Nyando River which discharge into Lake Victoria. The total catchment area leading to the dam is estimated at 140km^2. The catchment area raises from about 2,200masl in the south to about 2,800masl. The catchment is characterized with degraded Londiani Forest cover that forms part of the Mau eco system.

2.4.2 Dam Site and Buffer Areas

The proposed dam site is within a valley floor surrounded by two hills namely Lemotit and Masaita. The dam has been designed to a height of 42m and as a result expected to inundate 520ha of land. The inundated area comprises of privately and publicly owned land parcels whose plans for acquisition are on course. The project area is primarily under settlements, agro-forestry and livestock keeping and to a lesser extent horticultural farming along the river banks. The settlement patterns in the area is in clusters of related family homesteads which are widely scattered and confined within the elevated zones away from flood plains.

The water line contour for the dam is designed at 2316masl. According to the water rules, the allowed buffer zone from to a water body is 30m from the established water to ensure safety of the water as well as the riparian landowners. In this case the buffer zone will be under tree cover to restrict potential encroachment by the residents. Downstream dam embankment, it is proposed that a safety buffer is created. This will involve clearing settlements and other land use activities on a defined area presumed faced with safety risks.

The setting of the dam allows land acquisition that will cover the highest water mark and the buffer areas. Land downstream of the dam to a distance of approximately 500m will also be acquired for the establishment of treatment works and emergency spillway. This also serves as a safety buffer against any risk failure.

Figure 4: Views of the Dam Area

2.4.3 Service Areas

The project beneficiaries are spread out through Kipkelion East and Kipkelion West Sub-counties, the two key areas of Kericho County faced with serious water shortages. Two major bulk domestic treated water pipelines (see above) have been designed such as to cover settlements and market centres in the two sub-counties. Specific service corridors are as follows:

2.4.3.1 Treatment Works – Kipkelion – Fort Ternan

Major towns and market centres served by this pipeline are Kipkelion and Fort Ternan while en-route trading centres includes Tuyoibei (near Kipkelion), Lesirwo and Ngedale and Siret markets.

2.4.3.2 Masaita Tank – Londiani –Kedowa–Chepseon

Major towns to be served include Londiani, Kedowa and Chepseon. There are off-takes along the pipeline for rural connectivity.

Barsiele market as well as Kapcheplanga, Kipsirichet, Jagoror are served by a line running from Masaita tank terminating at Barsiele market along the Londiani – Fort Ternan Road (C35). A similar supply line also serves area upstream of the dam which includes Kamuingi centre. Nodal points have been established at various within the transmission lines aimed at increasing supply and coverage.

Provisions have also been provided for connection to the existing tanks and pipeline networks to ensure immediate benefits from the project. New large storage tanks have been proposed at major town including Londiani (5,000m^3), Kedowa (1,000m^3), Chepseon (3,000m^3), Kamuingi (250m^3), Barsiele (500m^3), Kipkelion (4,000m^3) and Fort Ternan (3,000m^3). The storage tanks aim at providing for increased distribution and supply as well as ensuring reliability and availability of water. In addition, the County Government might consider strategic water kiosks for easy access of water.

2.4.4 Downstream Kipchorian River

Areas downstream of the proposed Londiani Dam wall are characterized by riverine farming of vegetables (kales and cabbages), settlements and institutions, electricity power lines, local foot paths and access roads including E254 (Londiani – Sorget). The water treatment works and its associated components including the spillway are on the immediate downstream of the dam wall such as to cover up to 500m downstream of the dam on both banks of the river. This is also estimated to serve as dam safety area on the eventuality of either overtopping and/or dam failure.

2.4.5 Water Transmission Way Leave

The large part of the bulk water transmission pipelines has been designed to pass along road reserves. Relevant authorities have been contacted and way leave granted. Where pipelines have traversed through private land, necessary acquisition process will be put in place to acquire a 4m way leave. The water transmission way leaves involved in the project include:

(i) The rising main is of 500mm diameter 1.4km long pumped from the WTW to Masaita Hill tank reservoir.

(ii) Gravity mains from Masaita Hill to Londiani Town, crossing Road Londiani – Muhoroni (C35) to Kedowa market along the old Londiani – Kedowa gravel road. From Kedowa centre, the pipeline runs along Londiani – Kericho Road (B1) road reserve to Chepseon town and terminates at Chepseon Polytechnic. Total length of the pipeline is approx. 28km.

(iii) Londiani – Barsiele (~13km, 160mm dia.) mainly along road reserves and partly along private land.

(iv) Masaita – Kamuingi (~7km, 110mm dia.) running partly through private land and road reserves.

(v) The gravity main of 500mm diameter run along Londiani – Sorget (E54) murram road and crosses Londiani – Muhoroni (C35) at Kipchorian River Bridge. The pipeline runs along Kipchorian River banks before diverting to Kipkelion. From Kipkelion town, the pipeline runs along service roads before joining Londiani – Muhoroni at Ngedalel. From this point, the pipeline runs along the highway to Fort Ternan town terminating at Kipsinede hill tank. The total length of the pipeline is approx. 39km.

The Proposed Pipeline Section from T/Works to the new proposed storage tanks (Clear water Tank at the Treatment works, Masaita Hill, Londiani, Kedowa, Chepseon, Kamuingi, Barsiele, Kipkelion and Fort Ternan.

Through Londiani Forest to Kedowa Market

Along Londian – Fort Ternan Highway

Pipeline Corridor to Kamuingi

Figure 5: Sections of the Treated Water Transmission Corridors

2.4.6 Way Leave Crossings

The water transmission corridor will interact with service lines including Roads, Railway Line, Oil Pipeline and Power Line at different locations. The large part of the bulk water transmission pipelines has been designed to pass though road wayleaves for both major highways and all-weather rural roads with minimal utilization of Kenya Railways wayleave. Relevant authorities have been contacted and permission for wayleave acquired.

On areas where pipeline have been designed to pass through private land, necessary acquisition process has been followed and a 4m wide corridor secured. Such areas include section to Masaita hill tank. In other areas such as Kapkondoo, the gravity transmission line from treatment works is designed to pass through riparian land for about 1.2km length before joining adjacent service road en-route to Kipkelion town.

Railway Crossing Near Londiani

Sample Road Crossing

Oil Pipeline Corridor

Figure 6: Sample Crossing of the Pipeline Way Leave

2.5 Analysis of Project Alternatives

This section analyses the project alternatives with respect to site selection, transmission pipeline routes and tank location. Alternatives analysis is one of the most important aspect of environmental assessment that enhances the project design through examining optimum options in addition to reducing adverse impacts. This calls for the comparison of feasible alternatives for the proposed project site, transmission lines and/or tank locations. The alternatives are evaluated with respect to their potential environmental and social impacts, capital and recurrent costs, suitability under local conditions and acceptability by communities and users was covered in feasibility study stage where the current dam site ranked best. There were two alternatives considered for this project, namely:

2.5.1 Dam Site Selection Criteria

The criteria for selection of the best option focused on technical, financial, environmental and social considerations. Key technical issues considered were capacity to meet the demand for the target population and ability to supply the command area by gravity to the extent possible. Geological and geophysical setting was however, not considered in the selection criteria since all sites exhibited similar conditions and in similar geographical conditions. A mix of Qualitative and Quantitative Multi-Criteria Decision and Analysis (MCDA) process for the site identified was used for the dam.

The following dam site options were analysed and the following findings recorded. 3No. site options were considered and evaluated on the basis of their environmental and social linkages as well as costs among other design factors. A summary of this is illustrated in the table below.

Table 3: Dam Site Selection Criteria Outline

Option	Environmental	Social	Cost (KES)	Suitability
Dam Site 1	• Has significant sedimentation risks from land use activities • Low ecological disturbance	▪ Has significant ability to supply domestic and irrigation water demands by gravity ▪ Good accessibility to site ▪ Significant potential for individual displacement and social amenities disruptions ▪ Significant job creation potential	3.5	Significant
Dam Site 2 (Gravity Only)	• Has no significant sedimentation risk due to limited catchment land use. • Significant ecological disturbance (clearance of localized vegetation cover	▪ Has significant ability to supply domestic and irrigation water demands by gravity ▪ Very good accessibility to site ▪ Potential for displacement of people and livelihoods and disruption of social amenities ▪ Employment creation ▪ Will not serve upstream communities (high population settlements)	6.2	Significant
Dam Site 2 (Gravity and Pumping)	• Has no significant sedimentation risk for limited catchment land use • Significant ecological disturbance (clearance of localized vegetation cover)	▪ Has high ability to supply domestic and irrigation water demands by gravity ▪ Very good accessibility to site ▪ Potential for displacement of people and livelihoods and disruption of social amenities ▪ Employment creation ▪ Will service upstream communities (high population settlements)	7.2	High
Dam Site 3	• Has low significant sedimentation risk from watershed encroachments • High ecological disturbance (clearance of localized vegetation cover)	▪ Has high ability to supply domestic and irrigation water demands by gravity ▪ Poor accessibility to site ▪ Low potential for individual displacement and social amenities disruptions ▪ Low job creation potential	2.1	Low

On the basis of the above analysis, option 2 (pumping and gravity) was adopted and, therefore, dam site 2 the most preferred site for the dam project.

2.5.2 Transmission Pipeline Routes

Wide consultation with the Consultant design team (Dam and Water Engineers), County government (handling water distribution), Community leaders and current Water and Sanitation Companies and other water service providers including small community groups led to the adoption of a common design and layout that optimizes the intended project objective. Key to arriving at the proposed design and layout was increased water supply and coverage, connection to new tanks and existing pipeline network systems including tanks among others. The transmission pipeline covers the major trunk water supply lines. The adopted layout was approved at both feasibility study and preliminary design stage hence the only considered option.

2.5.3 No Project Alternative

The No-Project Alternative implies the status quo remains implying the following;

(i) The target beneficiary communities to continue suffering lack of adequate water supply and hence deteriorating quality of health and low economic growth,

(ii) The anticipated food production from irrigation initiatives will not be realised,

(iii) The intended flood control measures downstream in Nyando River plains will not be realised,

(iv) Harnessing and storage of flood flow from the degraded catchment will be a list opportunity,

(v) The anticipated displacement of people and livelihoods as well disruption of public amenities and ecological features will not be experienced.

2.5.4 Material and Technology

The proposed dam will be a composite rock fill structure with clay core. A quarry site for rock aggregate has been identified about 1.5km upstream of the dam wall (within the area for inundation) while clay borrow areas were identified near Kaptich Primary at approx. 0.7km further upstream of the quarry site. The selection of the dam construction materials followed a field assessment and geotechnical investigations. Any other sources are likely to be far implying additional costs of construction from land acquisition as well as posing a risk during materials extraction and also cost of transport. However, the Contractor will be free to investigate further for material sources.

The design envisages use of HDPE pipe materials for all transmission lines except where pressures are higher than 20bars steel pipes are recommended. HDPE pipes with butt welding joints are preferred because they have less leaks, easy to install, reduced excavation hence reduced installation cost, operation and maintenance and have a longer life.

Figure 7: Proposed Quarry Site

2.6 Design Concepts

2.6.1 Basic Consideration

The basic principle applied in the dam and water supply system design was to produce a satisfactory, functional structure at a minimum total cost. To achieve minimum cost, the dam was designed for maximum use of the most economical construction materials available, including materials excavated for its foundations and for appurtenant structures. The dam has been designed to ensure maximum safety and stableness during all phases of the construction and the operation of the reservoir. To accomplish this, the following design criterion was met:

(i) The embankment, foundation, abutments, and reservoir were designed to ensure stable conditions with no unacceptable deformations expected under all loading conditions brought about by construction of the embankment, reservoir operation, and earthquake.

(ii) Seepage flow through the embankment, foundation, abutments, and reservoir is to be controlled to prevent excessive uplift pressures, piping, instability, sloughing, and removal of material by erosion of material into cracks, joints, or cavities.

The water supply system was designed to allow for a gravity flow aimed at enhancing the supply coverage of the project area. However, coverage to elevated areas including upstream of the dam will be served through pumping scheme from Masaita hill tank. Hydropower generated from the dam shall be utilized in pumping the treated water to Masaita tank from the dam whose location allowed increased command of supply areas where supply by gravity alone was not possible. HDPE pipeline material were considered for the transmission pipelines for an efficient and cost-effective system in consideration of all project phases. Consideration was given to maintenance requirements so that savings achieved in the initial cost of construction do not result in excessive maintenance costs.

Key dam site parameter for this site are as listed in the table below.

Table 4: Dam Site Characteristics

Aspect	Characteristics
Dam Site	Londiani, Kericho County
Objective of the dam	Water Supply, Irrigation, Flood Control and Hydropower
Catchment Characteristics	Farmed/Cropped, forested, grassed (Unused farmland) and settled areas
Dam crest width (m)	5
Spillway type	Morning glory (Bell mouth)
Spillway size (m^3/s)	152
Flood water level (masl)	2316.00
Diversion type and size	Penstock (1.5m diameter)
Probable Maximum Flood, PMF (m^3/s)	556
Yield (m^3/day)	172,200
Inundated/Flooded area (ha)	520
Embankment type	Rockfill dam with clay core
Dam height (m)	42
Free board (m)	6
Storage Volume (m^3 x 106)	55
Catchment Area (km^2)	140.8
Fetch/Throw-back (km)	6
Crest length (m)	780
Environmental and Social impacts	Settled

Aspect	Characteristics
Supply area within Kipkelion East and West Sub-counties	Upstream and downstream areas (Londiani, Kedowa, Chesinende/Chepseon, Barsiele, Kipkelion, Fort Ternan) including areas around the dam
Ultimate Water Supply (m^3/day)	48,063
Population served (Ultimate)	450,000
Total Project Cost (Billion KES)	17
Unit costs (KES/m^3)	310
Cost of land (Billion KES)	1.8
Irrigation potential (Ha)	2,800
Hydropower potential (kW)	740
Installed Hydropower generator (kW)	1,000

2.6.2 Dam Components Specifications

2.6.2.1 Dam Embankment

The proposed dam embankment will be rock fill with a clay core. The crest length is 780m long with a top width of 5m. The designed maximum dam height is 42m with embankment slopes of 1:2.5 and 1:2.2 for the upstream and downstream sides respectively. On the upstream side of the embankment, the design provides for a 11.5m high cofferdam near the dam heel with a 5m berm. The core top will stand at 2,322masl and 5m wide crest.

On either side of the core are 0.5m thick filters, the downstream filter extending along the embankment bottom all the way up to the dam toe. A toe drain will also be provided on the downstream side of the dam. Materials will be developed from the rock deposits within the cuts or potential borrow areas identified.

Grout curtain is provided for under the core trench to avoid permeability. The purpose of this grout curtain will be primarily to address the potential for seepage through fractured zones oriented roughly parallel to the valley wall along with zones oriented roughly parallel to bedding if any. Depending on the effectiveness of the seepage cut-off efforts, it may also be necessary to install drainage tunnels below the spillway structure and within the left abutment upstream of the diversion channel excavation. An estimate of the cost of these tunnels has been included in the overall estimate developed for this study.

The dam provides for a freeboard of 6m. From flood routing, the height of water is 2.5m and with waves build-up of 2.58m the balance of free board (free board) is 0.92m which is more than 0.9m minimum required. This shows that 6m of freeboard is adequate.

Figure 8: The Embankment Wall Location

2.6.2.2 Diversion Culverts

The diversion culvert is required to pass diversion flow during construction, to regulate flood flows, to empty reservoir in case of emergency, to allow for reservoir lowering for inspection and repairs and to allow for routine de-sludging of reservoir bottom. The approach channel will be aligned straight to the diversion culvert to allow equal distribution of flow through it and in a way to avoid excavation, thus lowering the cost.

The diversion culvert will be 250m long with an adequate slope for drainage. A twin rectangular cross-section for the culvert will be adopted. One of the culverts will be blocked to form a dry culvert where a penstock of size DN 1500mm will pass and will also be the access to the intake tower. The second culvert will be closed at the upstream side of the dam and incorporate a gate valve to control the release of some of the flood waters through it and flushing of the bottom of the reservoir during the flooding period.

The diversion works consist of two culverts of 4m width and 3.5m high with a coffer dam coffer dam 8m from the culvert top head i.e. 9.75m above the culvert to fit. The diversion works are estimated to convey 312m^3/s, being design storm of 1 in 25 years based on a 6-hour rainfall intensity. Each culvert is hence expected to evacuate 156m^3/s. After construction, one of the culverts shall be used as a service culvert while the other shall form the horizontal duct of the morning glory spillway as well as the scour line.

2.6.2.3 Spillway

Geotechnical and hydraulic design considerations require that to minimize the risk of damage to the dam under flood conditions, the spillway and discharge channel should be kept clear of the embankment. The design for Londiani dam provides for two spillways, namely normal and emergency. A Morning Glory Spillway was found suitable as normal spillway for the proposed Londiani Dam site. The spillway is designed to withstand a design flood whose return period is 1:10,000 years. Based on design standard procedure, the time of concentration was found to be 7 hours but a 6-hour storm was used with a peak inflow flood established to be 556m^3/s.

Routing this through the reservoir was found to generate a maximum outflow flood of 152m^3/s. The spillway was designed to channel away flood a flow of 152m^3/s at a design height of 3m. It will have a crest diameter of 6.0m and throat diameter of 3.0m. The rectangular horizontal section is 4.0m wide and 3.5m high and shall be used to channel the flood to the stilling basin.

The provided spillway will be of sufficient capacity to channel away the flood flow without putting the embankment to risk of overtopping. On the event that the spillway is overwhelmed, the design has given provision for an emergency spillway on the right bank. The overflow channel for the emergency spillway is 10m wide by 1m deep design to provide for vehicular and foot passage. The channel bottom is set at 2318masl. The channel, whose estimated length is 135m, empties to 100m wide gabion steps stepped to 1m to the river where it is expected to discharge.

2.6.2.4 Intake Tower

A 4m long by 4m wide by 42m high intake tower is provided with provision of 3 No. draw-off points at elevations 2311masl, 2297.875masl and 2284.75masl, drawing 2.6m^3/s of water (30% higher than dam yield) through a series of pipe fittings of diameter of 1500mm. The draw-off pipe network is connected to a penstock of diameter 1500mm at the base of the service culvert.

The intake tower will serve the following purposes:

(i) Water inlet into the hydropower unit and supply system
(ii) Block debris and fish
(iii) Provide temporary diversion openings

(iv) Provide bulkheads for closure

(v) Provide control gates and measurement devices

The intake tower will be a 42m high free-standing square tower in concrete. A free-standing structure will allow flexibility in locating on site. It is easier to construct and allows better arrangement of conduits, openings, access structures and instruments as opposed to an inclined tower.

2.6.2.5 Hydropower Unit

The maximum head for power production at the dam will be 42m to discharge an average $2m^3/s$ (yield of the dam). It is expected that to regulate flow downstream of the river, the draw-off shall be maintained at a constant of $2m^3/s$. From the hydrological study, the head is expected to vary from 60% - 100% of the maximum head most of the time. Therefore, the head is expected to range between 42m to 25m hence gross power. The system is hence expected to generate a minimum of 350kW based on an efficiency of 75% at minimum head and a maximum of 780kW based on an efficiency of 90% at maximum head.

The intake shall be through a gated 1,500mm diameter steel penstock set at the base of the service culvert. It shall run through the service culvert under the dam wall and exit to the Power House which is a structure of 15.6m by 10.4m. The Power House shall comprise a generator room, an operation office and stores to enable water flow to the treatment works by gravity. A water supply bypass line through the Power House has been provided to aid in pumping in the event where the dam water levels are below the cascade aerator top elevation. The tail water is set at level 2281.1masl and flows to an open channel/canal leading to the river via the stilling basin.

The hydropower unit is scheduled to power the pumps lifting water to Masaita Hill tank (serving higher areas) and other requirements at the water treatment works (chemical mixers and dosers, backwash, staff house and street lighting among others). With the minimum power requirement for treatment works operation being about 611kW, the minimum power generated shall not be sufficient to start the pumps (pumps motors have soft start) though it is sufficient to run them. Connection to the national grid is provided for to cover the deficit.

The power generation unit shall either have a step-up transformer (1MVA) to convert the generated power to 415V or generate power at 415V, whichever shall be economically viable. Power supply shall also have a 1MVA transformer from KPLC as a stand-by unit with all change-over switches to take over when more power is required than the hydropower unit can generate.

2.6.3 Water Treatment Works

The water treatment works is designed based on guidelines and criteria recommended in the Ministry of Water and Irrigation (MWI) Practice Manual (2005), in addition to the consideration of the physical and chemical properties of water under consideration. Treatment processes have been designed for the physical removal of contaminants through filtration, settling (often aided by some form of chemical addition) and biological removal of micro-organisms by chlorination.

The water treatment facilities are expected to produce raw water flow of $48,063m^3$/day as the maximum yield of the dam at optimal height of 36m.

The proposed treatment processes will comprise:

(i) Cascade Aeration

(ii) Dosing with Sodium Carbonate (Soda Ash), to adjust the pH

(iii) Dosing with Aluminium Sulphate (alum), as a coagulant aid

(iv) Dosing with Polyelectrolyte, as a coagulant aid (when necessary)

(v) Flocculation
(vi) Horizontal Sedimentation
(vii) Rapid Sand Filtration
(viii) Disinfection with Chlorine

Sludge Treatment and Disposal process comprises of the following:

(i) Sludge Drying Beds to receive sludge from Sedimentation Units
(ii) Backwash Water Lagoon to receive sludge from Rapid Sand Filters - good environmental practice to recycle backwash water from the filters.

The treatment process outlined above requires construction of following structures and building:

(i) Inlet Works comprising of:
- ✓ Cascade Aerator
- ✓ Chlorine, Sodium Carbonate and Alum Dosing Points
- ✓ Flow Measurement

(ii) Flash Mixer
(iii) Flocculation/Distribution Units
(iv) Sedimentation Units
(v) Rapid Sand Filters
(vi) Treated Water Tank
(vii) Chemicals and Plant Buildings comprising of:
- ✓ Chemical Mixing and Dosing Building
- ✓ Pump Room and Air Blower Room
- ✓ Chemical Storage Building
- ✓ Gas Chlorination Building

(viii) Administration Building
- ✓ Laboratory
- ✓ Staff room

(ix) Workshop and Staff Room
(x) Control/Switch Room
(xi) Sludge Disposal and Treatment facilities comprising of:
- ✓ Sludge Drying Beds
- ✓ Backwash Water Lagoons

(xii) Staff Houses with interconnected foul and drainage system, roads and parking with lighting provisions.

The water treatment works shall be fenced off with provision for a controlled gated system.

2.6.4 Transmission Pipeline

Treated water is to be conveyed from the treatment works through a network of two trunk pipelines with two branch lines as provided in the table below:

Table 5: Water Transmission Lines and Reservoirs Features

No.	Commencement	Point of service	Length (km)	Diameter (mm)	Storage Tanks
1	Gravity Main (Treatment works-Kipkelion-Fort Ternan)	Treatment Works	0	500	7,000m^3 (2290masl)
		Kipkelion	19.9	400	4,000m^3 (2138masl)
		Fort Ternan	39.6	225	3,000m^3 (1774masl)
2 (i)	Rising Main	Masaita Hill	1.4	500	7,500m^3 (2425masl)
(ii)	Masaita Hill	Londiani Town (Barsiele branch)	6.5	500	(2293masl)
		Londiani	8.3	450	5,000m^3 (2357masl)
		Kedowa	14.7	400	1,000m^3 (2202masl)
		Chepseon	28.3	355	3,000m^3 (2277masl)
	Kamuingi Branch	Kamuingi	6.9	110	250m^3 (2359masl)
	Barsiele Branch	Barsiele	13.4	140	500m^3 (2304masl)

In order to ensure transmission efficiency and pressure management, pipeline design includes provision for air release valves, washouts, pressure regulating valves among other important components. The use of High-Density Polyethylene (HDPE) pipes connected with butt fusion aims at reducing connection joints which in overall reduce water loss by leakage compared to use of other pipe materials. This, alongside pressure management systems which includes using appropriate pipe sizes, shall aid in reduction of un-accounted for water.

Water shall be delivered to existing tanks where the capacity is sufficient and where it is not or where there are no tanks, new tanks shall be introduced with outlets for further distribution. All storage tanks have been designed with water level detectors for automatic closure when tanks fill or open when levels go below the maximum.

Along the bulk transmission pipelines, connection nodal points are provided for future connections and at the current storage tank locations outlets, points are provided for current connections. The design also provides for pipework leading to the proposed tanks.

2.7 Water Use Options

2.7.1 Water Supply

The main aim of developing Londiani Dam is to supply domestic water for the population in Kipkelion East and Kipkelion West Sub-counties that is suffering perennial water shortages. In order to achieve this objective, a treatment works will supply 48,063m^3/day. Water supply is to supplement existing sources in domestic needs, commercial uses (catering and trade) and also institutional needs.

2.7.2 Irrigation

The dam will also supply water for irrigation. However, irrigation water will be released back into the river stream to allow abstractions with specified intake points identified to serve the established schemes by gravity. This follows the development that only a few registered irrigation water user's groups have been established. As such, even after identifying that the dam has a capacity to irrigate 2800ha, it is hard to design for community smallholder schemes without defined members. The communities in the irrigation command will be advised to get into organized groups (WRUAs) and define their needs for irrigation.

2.7.3 Hydropower Generation

The hydropower unit is to be developed to generate power which for local operations requirements at the treatment works. The energy generated shall be used to power the pumps pumping water to Masaita hill tank (serving higher areas) and power requirements at the treatment works (chemical mixers and dosers, backwash, staff house and street lighting among others). Stream base flow and irrigation water shall be used at the hydropower unit before being released back to the river.

2.7.4 Other Benefits

The local residents expect they would benefit from the dam project in various ways including;

(i) Create source of employment during and after construction of the project to the local community hence improvement of living standards,
(ii) Provision of local water supply,
(iii) Introduction and commercialization of fishing activities for economic gain,
(iv) Aesthetic and tourism.
(v) Flood control downstream
(vi) Climate moderation

2.8 Project Activities

2.8.1 Planning and Feasibility Studies

At Feasibility study stage, various water source options identified were evaluated and ranked through a multi-decision criteria assessment to determine the best water source site option. The criterion included technical serviceability capacity, financial and economic analysis and environmental and social considerations. It is at this stage that the current site emerged the best option. Consultation with relevant stakeholders including water and sanitation companies in target supply area, Kericho County government and government ministries, elected leaders and potential beneficiaries in the affected and supply as well as affected persons recommended the current site. Resolution was adopted by National Water Harvesting and Storage Authority (NWHSA) and the site recommended for Preliminary design. This ESIA is thus set to establish the environmental and social conflicts and appropriate mitigation measures for adopted project option.

2.8.2 Design Work

Design work entailed significant ground activities; including reconnaissance survey, topographical survey, geotechnical investigation (identification of the geological setting, seismic risk assessment, geophysical survey, identification of the soil technical parameters and material investigations) and studies of the hydrology of the proposed Londiani Dam. The activities involved partial clearing of vegetation in some sections, intrusion into private lands, excavations and borehole drilling investigation in some parts to determine geological profiles among others. Interactions with the local communities for first-hand information particularly with respect to special physical features, land ownership and desired design considerations was also undertaken during this stage.

The rest of the work was carried out at the desk levels such as to include design calculations and drawings, consultations between various stakeholders and the Client, design reporting and development of detailed quantities and project costs estimates. The financial and economic analysis was also carried out as part of the design work. Implementation schedules and responsibilities are also prepared under this stage. Environment and social impact assessment study utilized the design outputs, in determining quantified impacts and appropriate preventive action plans. The environmental management plan is guided by the details in the design principles and further informs the total project cost.

2.8.3 Construction Phase

During the construction phase of a dam there are several significant features to be observed they include:

2.8.3.1 Resettlement Activities

While the Resettlement Action Plan (RAP) was not part of the current study, displacement of people and economic activities would be inevitable. It is anticipated that about 254 land parcels covering an estimated area of 898.29ha would be affected out of which about 50% (nearly 445.13ha) will be directly acquired for the dam. Information on the potentially affected individual land parcels is provided in **Annex 2** (the information was obtained from Land Report). The process of land acquisition and appropriate compensation will need to be completed before the actual dam construction commences. Details of this process will be covered under an independent Resettlement Action Plan (RAP) study process for the dam project.

2.8.3.2 Site Clearing

Vegetation clearing of the area covered to pave way for campsites establishment, parking yards for the contractor's machineries and the construction site of for the proposed dam. In the proposed location the predominant vegetation is plantations of maize and Irish potatoes. There are also a significant number of trees mainly Eucalyptus ssp, Cypress, Pine and Muiri as well as mixed fruit trees and a large of volume of ground covering shrubs and grasses. A record of the biomass removed, and particularly the trees will have to be kept to facilitate environmental compensation in addition to the monetary payments to the land owners.

In addition to the clearance of vegetation, there site clearance will generate huge volumes of top soil rich in organic and humic content for disposal. This materials management may be used for reclamation of wastelands or another safe disposal mechanism.

2.8.3.3 Sanitation Management

It is suspected that there are graves and pit toilets in some parts of the areas targeted for inundation. These features will not be buried under the water due to water quality as well as cultural reasons. For this reason, any graves and pit latrines will be decommissioned and removed under supervision in collaboration with the landowners, local leaders and the security agents.

2.8.3.4 Public Amenities

Disruption of access roads, power lines and water abstraction points are likely to be disrupted during the construction process. The project will be responsible of services relocation, provision for alternative amenities (access roads, bridges/crossings), public water access points (water pumps, transmission pipelines and public abstraction points). This will be undertaken in collaboration with the relevant services providers and authorities.

2.8.3.5 Material Sourcing and Haulage

It is expected that materials will be obtained from within such as to include gravel and hard stone quarries. Ideally, the entire earth fill should be drawn from within the reservoir area and, if required, from the cut spillway area. Therefore, borrow areas within the reservoir area should be given first preference, followed by those located on the valley sides close to the proposed embankment. Borrow pits in the reservoir have the added advantage of increasing the upstream storage capacity.

2.8.3.6 Restoration Activities

Upon completion of the project, it will be necessary to restore all sections damaged by the construction activities including surface destruction, access roads, river banks and downstream

flood plains. Other areas to be restored include material sources and spoil disposal areas. The dam surroundings will also require landscaping through re-vegetation for aesthetic purposes as well as conservation of the environment.

2.8.4 Commissioning

This will be the formal hand-over and operationalization of the dam upon completion. Among other activities, the contractor and the client will ensure there are no unresolved social concerns, the facility has been completed to the design details, affected sites have been well rehabilitated and that all components are operational. In addition to the paper work, there will be a physical evaluation of the facility that will involve the contractor, NWHSA, relevant Government departments and the design consultant. The inspection of the dam will ensure all the issues of dam safety are adequately considered and all the structures are operationally ready and approved to function as planned.

2.8.5 Dam Operations

The initial stage of the dam operation will be to ensure it is relieving water from the catchment through the rivers and runoff during the rains. This could take up to two years during which there will be strict management of flows in the river to ensure dependents and ecosystems downstream are sustained. Upon the dam filling, the water will be utilized in accordance to established guidelines and regulations agreeable to the Water Act and other regulatory authorities

2.9 Key Dam Linkages

Dam construction and operation have notable local implications to the environmental and social settings of the host areas. These linkages are to be analysed through this ESIA process as well as the RAP study process and other associated socio-economic studies. Among the key linkages include the following;

(i) Land-take is the one linkage with the highest social impacts especially to the affected landowners and the immediate surrounding communities. The linkage has potential for displacement of people and their livelihoods as well as loss of agricultural crops,

(ii) Loss of vegetation land covers including agricultural crops, tree cover and under cover (shrubs and grass) at the dam site. This will have effects on local climatic conditions as well as climate change aspects at the global levels. Retention of flood flow, however, is a mitigation measure for flush-flooding downstream associated with climate change scenarios,

(iii) Water quality of Kipchorian River downstream could get affected temporarily during the construction period. This will arise from earth moving and fills and also the construction of the dam embankment wall,

(iv) Presence of the dam will change the general life of the community with respect to easy access to water, safety risks, potential water related health issues and security consciousness, especially on terrorism and criminal acts targeting public water,

2.10 Dam Safety and Stability

The main safety factors include the following,

(i) The dam safety downstream associated with emergency releases of water or potential dam break. This risk is confined along the main Kipchorian River basin with the highest risk closer to the dam and reduces further downstream.

(ii) Risk around the reservoir among the risks being potential drowning of people and livestock as well as.

(iii) Potential invasion by wildlife into the dam with risks of safety the residents.

2.11 Decommissioning Phase

Decommissioning is an important phase in the project cycle and comes as the last to wind up the operations/activities of a particular project. The main purpose of decommissioning is to restore/ rehabilitate the site to acceptable standards. While it is not envisaged that the dam will be decommissioned any time soon, the need arises in future. At such point in time, a decommissioning audit of the dam and its components will need to be undertaken at least 12 months prior to the exercise and approved by NEMA. The decommissioning audit will generate a Decommissioning Plan to guide the process. The same process will be applied for the decommissioning of water supply system including pipeline network and lesser components such as storage tanks. The process shall also include structure installed in the process of execution the works including removal of contractors site camps.

2.12 Implementation Schedule and Project Estimated Cost

The project is expected to take 4 years (48 months) of construction works from the date of commencement. This period, however, is dependent on the completion of preliminary activities including land acquisition and contract mobilization. The project cost estimates have been based on the preliminary designs. The overall scheme has been broken down into its component sections such as embankment, diversion culvert, hydropower and spillway for dam and treatment works, transmission lines (Rising and gravity), storage tanks and housing for treatment works as given below:

Table 6: Dam Construction Cost

Bill No.	Description		Amount (KES)
1	Preliminary and General Items		1,217,002,915
2	Site Clearance		518,805,000
3	Drilling and Grouting		2,417,105,000
4	Coffer Dam and Rockfill Embankment Construction		5,659,900,000
5	Intake Tower, Bellmouth Spillway, Spillway and Service Culverts, Stilling Basin and Wingwall		329,809,300
6	Emergency Spillway		74,273,100
7	Instrumentation		37,398,000
8	Hydropower House and Instrumentation House		17,095,640
9	Londiani - Kamuingi Road Diversion		678,565,000
10	Miscellaneous Construction to Dam Works		178,438,000
11	Schedule of Dayworks		70,308,400
	SUB-TOTAL (1)		***11,198,700,355***
	Add 10% of (1) for Contingencies to be expended in part or deleted entirely by the Engineer.	10%	1,119,870,036
	Add 25% of (1) for Price Adjustment/Variation in accordance with Clause 139(4)(e) of the Public Procurement and Asset Disposal Act (PPADA) - Revised Edition 2016.	25%	2,799,675,089
	Add VAT	16%	1,791,792,057
	SUB-TOTAL (2)		**5,711,337,181**
	GRAND TOTAL CARRIED FORWARD TO FORM OF BID		**16,910,037,536**

Table 7:Water Component Construction Cost

Bill No.	Description		Amount (KES)
1	Preliminary and General Items		695,131,165
2	Water Treatment Works and Amenities		420,607,924
3	Water Treatments Works Tanks and Houses		314,896,531
4	Water Storage Tanks		647,164,993
5	Electromechanical Works		26,815,610
6	Water Transmission Lines		296,027,748
7	Schedule of Dayworks		70,307,400
	SUB-TOTAL (1)		***2,470,951,371***
	Add 10% of (1) for Contingencies to be expended in part or deleted entirely by the Engineer.	10%	247,095,137
	Add 25% of (1) for Price Adjustment/Variation in accordance with Clause 139(4)(e) of the Public Procurement and Asset Disposal Act (PPADA) - Revised Edition 2016.	25%	617,737,843
	Add VAT	16%	395,352,219
	SUB-TOTAL (2)		***1,260,185,199***
	GRAND TOTAL CARRIED FORWARD TO FORM OF BID		**3,731,136,570**

The total estimated project cost will be **KES 20,641,174,106 (KENYA SHILLINGS TWENTY BILLION, SIX HUNDRED AND FOURTY ONE MILLION, ONE HUNDRED AND SEVENTY-FOUR THOUSAND AND ONE HUNDRED AND SIX)** only.

CHAPTER 3: POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

3.1 An Overview

Policy and legislative developments have been substantially directed at redefining the role of the state with separation of policy and regulation (state responsibility) from implementation (private sector and/or statutory bodies). At the same time, there has also been movement to redefine the role of the state vis-à-vis the individual and/or community groups. The constitution and policies such as the National Land Policy have considerably strengthened the community rights. This is critically important as developments such as the proposed project components can create social conflicts with the affected communities or individuals effectively delaying the project. This implies a need to engage the affected communities from the earliest stages of project planning.

3.2 Policy Provisions

3.2.1 Constitution of Kenya

Article 42 of the Bill of Rights of the Kenyan Constitution provides that 'every Kenyan has the right to a clean and healthy environment, which includes the right to have the environment protected for the benefit of present and future generations through legislative and other measures. Part 2 of Chapter 5 of the constitution is dedicated to Environment and Natural Resources. Article 69 in Part 2 provides for among others sustainable utilization and exploitation of natural resources, public participation on matter affecting the environment, establish environmental assessments and monitoring systems.

Further, Article 70 states that if a person alleges that a right to a clean and healthy environment recognized and protected under Article 42 has been, is being or is likely to be, denied, violated, infringed or threatened, the person may apply to a court for redress. The sub-project should ensure compliance with the constitution in so far as equitable sharing of the resources, between the stakeholders. Further, the project should ensure the sustainability of livelihoods and biological resources within the project areas are protected. Any development proposals should also be cognizant of the increased powers under the Constitution given to communities and individuals to enforce their rights through legal redress.

3.2.2 The Kenya Vision 2030

One of the aims of the Kenya Vision 2030 is designed to make Kenya to be a nation that has a clean, secure and sustainable environment by 2030. This will be achieved through promoting environmental conservation to better support the economic pillar. Improving pollution and waste management through the application of the right economic incentives in development initiatives is critical. One of the aims of the vision is to make Kenya to be a nation that has a clean, secure and sustainable environment by 2030. This will be achieved through promoting environmental conservation to better support the economic pillar. Improving pollution and waste management through the application of the right economic incentives in development initiatives is critical. The current land use practices in the country are incongruent with the ecological zones.

3.2.3 National Policy on Water Resources Management and Development

National Policy on Water Resources calls for development of appropriate sanitation systems to protect people's health and water resources from institutional pollution. Economic activities, therefore, should be accompanied by corresponding waste management systems to handle liquid effluents and other wastes emanating there from that should also include appropriate measures to ensure environmental resources and people's health in the immediate neighbourhood are not negatively impacted by the effluent.

The National Policy on Water Resources Management and Development (Sessional Paper No. 1 of 1999) was established with an objective to preserve, conserve and protect available water resources and allocate it in a sustainable rational and economic way. It also desires to supply water of good quality and in sufficient quantities to meet the various water needs while ensuring safe disposal of wastewater and environmental protection. The policy focuses on streamlining provision of water for domestic use, agriculture, livestock development and industrial utilization with a view to realizing the goals of the Millennium Development Goals (MDGs) as well as Vision 2030. To achieve these goals, water supply (through increased household connections and developing other sources) and improved sanitation is required in addition to interventions in capacity building and institutional reforms.

3.2.4 National Policy on Environment

The National Environment Policy aims to provide a holistic framework to guide the Management of the environment and natural resources in Kenya. It further ensures that the linkage between the environment and poverty reduction is integrated in all government processes and institutions in order to facilitate and realize sustainable development at all levels. This is done in the context of green economy enhancing social inclusion, improving human welfare and creating opportunities for employment and maintaining the healthy functioning of ecosystem.

3.2.5 The Agricultural Policy

In Kenya the agricultural policy revolves around key areas of policy concern including increasing agricultural productivity, especially for small-holder farmers, emphasis on irrigation, encourage diversification into non-traditional agriculture commodities, enhancing food security, encourage private sector led development and ensure environmental sustainability.

The policy observes that droughts and floods have increased in frequency and intensity in the past three decades resulting in high crop failure and livestock death. Increased land degradation has decreased land resilience thereby exacerbating the effects of drought and floods leading to devastating famine that has taken a toll on human and animal lives. Some of the famine experienced could have been avoided or their impacts significantly mitigated. Inadequate early warning systems, disaster unpreparedness, farming practices that are environmental unfriendly, destruction of rainfall catchment areas mostly as a result of human activities (settlement, farming).

Involvement of women in small-scale agriculture (with over 75% of the labour force) is appreciated as an important factor towards improvement improves agricultural performance. However, despite their contributions women still face a number of hindrances especial limited access to productive resources like land ownership, inputs, extension services and marketing services that need to be addressed.

Environmental degradation and rising poverty are of major concern for agricultural development. The continued scarcity of productive land and increasing poverty levels has led to an increase in agricultural practices that conflict with the environment particularly in the rural areas. Pressure on high potential areas is pushing people to migrate into ASAL lands where they practice inappropriate farming practices leading to environmental degradation and thereby creating a vicious cycle of environmental degradation and poverty.

3.2.6 The Land Policy

Environmental management principles include to restore the environmental integrity the government shall introduce incentives and encourage use of technology and scientific methods for soil conservation and maintain beaches at high and low water mars and put in place measures to control beach erosion. Fragile ecosystems shall be managed and protected by developing a comprehensive land use policy bearing in mind the needs of the surrounding communities.

Zoning of catchment areas to protect them from further degradation and establishing participatory mechanisms for sustainable management of fragile ecosystems will also be done. It will also develop procedures for co-management and rehabilitation of forest resources while recognizing traditional management systems and sharing of benefits with contiguous communities and individuals. Lastly all the national parks, game reserves, islands, front row beaches and all areas hosting fragile biodiversity are declared as fragile ecosystems.

The sustainable management of land based natural resources depends largely on the governance system that defines the relationships between people, and between people and resources. To achieve an integrated approach to management of land based natural resources, all policies, regulations and laws dealing with these resources shall be harmonized with the framework established by the Environmental Management and Coordination Act (EMCA), 1999.

3.2.7 The National Biodiversity Strategy

The overall objective of the National Biodiversity Strategy and Action Plan (NBSAP) is to address the national and international undertakings elaborated in Article 6 of the Convention on Biological Diversity (CBD). It is a national framework of action to ensure that the present rate of biodiversity loss is reversed and the present levels of biological resources are maintained at sustainable levels for posterity. The general objectives of the strategy are to conserve Kenya's biodiversity to sustainably use its components; to fairly and equitably share the benefits arising from the utilization of biological resources among the stakeholders; and to enhance technical and scientific cooperation nationally and internationally, including the exchange of information in support of biological conservation.

3.2.8 National Water Harvesting and Storage Authority (NWHSA)

National Water Harvesting and Storage Authority (NWHSA) (previously known as National Water Conservation and Pipeline Corporation) was established under the Water Act 2016 as an autonomous agency responsible for development and management of national public water works for water resources storage and flood control among other responsibilities. Its roles include development and management of state water schemes including construction of dams, canals, dykes for flood control, artificial ground water recharge facilities and drilling of boreholes. The corporation objective is in line with vision 2030 as it aims to conserve water sources and start new ways of harvesting and using rain and underground water. NWHSA has 6 main objectives which are in line with the Kenya Vision 2030, Sustainable Development Goals (SDGs) and the Constitution of Kenya 2010. This includes;

(i) Develop and manage public water works infrastructure,
(ii) Protect/save lives and property from effects of floods,
(iii) Mainstream crosscutting and policy issues as per guidelines,
(iv) Enhance institutional capacity building
(v) Enhance financial sustainability,
(vi) Improve corporate image and enhance customer service.

The major functions of National Water Harvesting and Storage Authority (NWHSA) include:

(i) Develop state schemes and spearhead dam construction for water supplies, flood control and other multi-purpose uses, land drainage and construction of dykes.
(ii) Carry out ground water recharge using flood water.
(iii) Develop, retain existing and expand bulk water supply to Water Service Boards and other Water Service Providers.
(iv) Drill and equip boreholes

3.3 Legal Framework

Applications of national statutes and regulations on environmental conservation suggest that the Ministry of Water and irrigation and National Water Harvesting and Storage Authority will have a legal duty and social responsibilities to ensure the proposed dam development is carried out without compromising the status of the natural resources in the area, environment resources, social and cultural setting as well as the economic potential of the local communities' health and safety. This position enhances the importance of this environmental impact assessment for the proposed site to provide a benchmark for its sustainable operation. The key national laws that govern the management of environmental resources in the country have been briefly discussed below. It is noteworthy that wherever any of the laws contradict each other, the Environmental Management and Co-ordination Act 1999 (Environmental Management and Coordination (Amendment) Act 2015) prevails.

3.3.1 The Environment Management and Co-ordination Act, 1999

The Environmental Management and Coordination Act (EMCA) 1999 being the principle law shall be read alongside the Environmental Management and Coordination (Amendment) Act 2015. The latter provides amendments to the Principle Act on section by section basis.

Part II of the Environment Management and Coordination Act, 1999 states that every person in Kenya is entitled to a clean and healthy environment in accordance with the Constitution and relevant laws and has the duty to safeguard and enhance the environment. Section 3 of the Act also states that every person shall cooperate with the State Organs to protect and conserve the environment and ensure sustainable development and use of natural resources. In order to partly ensure this is achieved, Part VI under Section 58 of the Act directs that any proponent for any project to undertake and submit to NEMA an Integrated Environment Impact Assessment (unless exempted by NEMA), who in turn may issue a license as appropriate.

Section 9 of the Act provides for voluntary environment conservation practices through natural resources conservancies, easements, leases, payments for ecosystem services and other instruments. Guidelines in this regard are to be formulated through relevant Agency collaborations. This will be partly achieved through sustainable land use practices that are in conformity with conservation measures as emphasized under Section 51 of the Act. This include sustainable land use methods, selection and management of sensitive areas including buffer zones and catchments, control of alien species and encouraging traditional conservation knowledge integration among others.

Section 57 of the Acts provides that all policies, plans and programmes undergo Strategic Environment Assessment (SEA) following guidelines issued by NEMA. On specific projects, Part VII of the Act requires preparation of Integrated Environment and Social Impact Assessment as enhanced under Section 58 and sub-section 6. Proponents shall prepare and submit impact reports to the Authority unless they have been exempted. Under EMCA, 1999, a set of specific regulations have been developed to address management and compliance in special aspects of the environmental. Among the regulations established under EMCA 1999 and relevant in the proposed project are listed in the following section.

3.3.2 EMCA Regulations

3.3.2.1 Water Quality Management Regulations, 2006 (Legal Notice No. 120)

These regulations were drawn under section 147 of the Environmental Management and Coordination Act 1999. In accordance with the regulations, every person shall refrain from acts that could directly or indirectly cause immediate or subsequent water pollution and no one should throw or cause to flow into water resources any materials such as to contaminate the water. The regulation also provides for protection of springs, streams and other water sources from pollution. The following tables illustrates water quality standards established under these Regulations.

Table 8: National Drinking Water Quality Standards

Parameter	Guide Value (Maximum Allowable
pH	6.5 -8.5
Suspended Solids	30mg/l
Nitrates – NO_3	10mg/l
Ammonia – NH_4	0.5mg/l
Nitrite – NO_2	3mg/l
Total Dissolved Solids – TDS	1,200mg/l
E-Coli	Nil/100ml
Fluoride	1.5mg/l
Phenols	Nil mg/l
Arsenic	0.01mg/l
Cadmium	0.01mg/l
Lead	0.05mg/l
Selenium	0.01mg/l
Copper	0.05mg/l
Zinc	1.5mg/l
Alkyl Benzyl Sulphonate	0.5mg/l
Permanganate Value (PV)	1mg/l

Table 9: National Irrigation Water Quality Standards

Parameter	Permissible Level
pH	6.5-8.5
Aluminium	5 (mg/L)
Arsenic	0.1 (mg/L)
Boron	0.1 (mg/L)
Cadmium	0.5 (mg/L)
Chloride	0.01 (mg/L)
Chromium	1.5 (mg/L)
Cobalt	0.1 (mg/L)
Copper	0.05 (mg/L)
E.coli	Nil/100 ml
Fluoride	1.0 (mg/L)
Iron	1 (mg/L)
Lead	5 (mg/L)
Selenium	0.19 (mg/L)
Sodium Absorption Ratio (SAR)	6 (mg/L)
Total Dissolved Solids	1200 (mg/L)
Zinc	2 (mg/L)

Table 10: National Wastewater Discharge Standards

Parameters	Maximum levels permissible
Suspended solids (mg/L)	250
Total dissolved solids (mg/L)	2000
Temperature ^{0}C	20 -35
pH	6-9
Oil and Grease (mg/L)	where conventional treatment shall be used - 10
Oil and Grease (mg/L)	where ponds are a final treatment method - 5
Ammonia Nitrogen (mg/L)	20
Substances with an obnoxious smell	Shall not be discharged into the sewers
Biological Oxygen Demand BOD_5 days at 20^{o}C (mg/L)	500
Chemical Oxygen Demand COD (mg/L)	1000
Arsenic (mg/L)	0.02
Mercury (mg/L)	0.05
Lead (mg/L)	1.0
Cadmium (mg/L)	0.5
Chromium VI (mg/L)	0.05
Chromium (Total) (mg/L)	2.0
Copper (mg/L)	1.0
Zinc (mg/L)	5.0
Selenium (mg/L)	0.2
Nickel (mg/L)	3.0
Nitrates (mg/L)	20
Phosphates (mg/L)	30
Cyanide Total (mg/L)	2
Sulphide (mg/L)	2
Phenols (mg/L)	10
Detergents (mg/L)	15
Colour Less than	40 Hazen units
Alkyl Mercury Not Detectable	(nd)
Free and saline Ammonia as N (mg/L)	4.0
Calcium Carbide	Nil
Chloroform	Nil
Inflammable solvents	Nil
Radioactive residues	Nil
Degreasing solvents of mono-di-trichloroethylene type	Nil

3.3.2.2 Waste Management Regulations, 2006 (Legal Notice No. 121)

The regulations are formed under sections 92 and 147 of the Environmental Management and Coordination Act, 1999. Under the regulations, a waste generator is defined as any person whose activities produces waste while waste management is the administration or operation used in handling, packaging, treatment, conditioning, storage and disposal of waste. The regulations require a waste generator to collect, segregate and dispose each category of waste in such manners and facilities as provided by relevant authorities. Regarding transportation, licensed persons shall operate transportation vehicles approved by NEMA and will collect waste from designated areas and deliver to designated disposal sites.

It is observed that the Regulations is limited on standards for general wastes management giving more weight on hazardous wastes. The project activities will release oils and grease residuals from machinery and vehicle maintenance. Oils and grease are considered hazardous waste whose treatment and handling guidelines under these Regulations are illustrated under the 3rd Schedule of the Regulations. The Contractor will observe the requirements under this regulation.

3.3.2.3 Noise and Excessive Vibration Pollution Control Regulations, 2009

Part II section 3(I) of these Regulations states that: no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment and section 3(2) states that in determining whether noise is loud, unreasonable, unnecessary or unusual. Part II Section 4 also states that: except as otherwise provided in these Regulations, no person shall (a) make or cause to be made excessive vibrations which annoy, disturb, injure or endanger the comfort, repose, health or safety of others and the environment; or (b) cause to be made excessive vibrations which exceed 0.5cm per second beyond any source property boundary or 30m from any moving source.

The second schedule defines maximum noise levels emitted from construction areas to facilities including health centres, educational institutions, homes for the aged and the aged, residential areas and commercial centres. The recommended levels are 60dBA by day and 35dBA by night. Other areas outside public locations are allowed to emit noise levels of up to 75dBA during the day and about 65dBA during the night. Quarrying activities within the proximity of silent zones and commercial areas are allowed to emit noise levels of up to 109dBA and 114dBA respectively. Under the first schedule, sensitive zones have been identified and clustered for noise level considerations in the table below. The Contractor will comply with these regulations.

Table 11:National Noise Guidelines

Zones	Noise Levels (dBA)		Remark
	Day	Night	
Silent zones	40	35	This covers hospitals, schools, homes for the aged, retreat centres, hotels, etc.
Places of worship	40	35	Churches, mosques and shrines
Residential areas	45 (indoors)	35	Estates and associated facility premises
	50 (outdoor)	35	Residents recreational centres
Mixed land use (residential, commercial and institutional	55	35	Urban centres and market areas
Commercial	60	35	Industrial areas and trading areas

3.3.2.4 Air Quality Regulations

Under the general prohibitions (Part II), section 5 states that no person shall act in a way that directly or indirectly causes immediate or subsequent air pollution. Among the prohibitions are priority air pollutants (as listed under schedule 2 of the regulations) that include general pollutants, mobile sources and greenhouse gases. Odours are also prohibited under section 9 of the regulations (offensive emissions). Emissions into controlled areas such as schools, hospitals, residential areas and populated urban centres are also prohibited.

Part VII on occupational air quality limits in section 29 states that an occupier of premises shall ensure that exposure of indoor air pollutants does not exceed the limits stipulated under the Factories and Other Places of Work rules or under any other law. Other sources are recognized at sections 32 and 33 are those arising from construction equipment and materials as well as particulate matter from demolitions of structures and buildings as well as stockpiled dry materials.

Sources of air pollutants from the construction works will include traffic in and out of the site emitting dust, rock crushing at quarry sites, batching plants, power generators and earth works at site among others. In these activities, the Contractor will comply with the following air quality standards.

Table 12: National Air Quality Standards for General Pollutants

Pollutant	Time Weighted Average	Property Boundary
Particulate matter (PM)	Annual Average	50 ug/m^3
	24 hours	70 ug/m^3
Oxides of Nitrogen (NOX);	Annual Average	80 ug/m^3
	24 hours	150 ug/m^3
Sulphur oxides (SOX);	Annual Average	50 ug/m^3
	24 hours	125 ug/m^3
Hydrogen Sulphide	24 hours	50 ug/m3
Lead(Pb)	Annual/24 hours	0.5 – 2.0ug/m^3
Ammonia	24 hours	100 ug/m^3

Table 13: Ambient Air Quality Tolerance Limits

Pollutant	Time Weighted Average			
		Industrial Area	Residential, Rural & Other Area	Controlled Areas
Sulphur oxides (SOX);	Annual Average	80 ug/m^3	60 ug/m^3	15 ug/m^3
	24 hours	125 ug/m^3	80 ug/m^3	30 ug/m^3
	Annual Average		0.019 ppm/50ug/m^3	
	Month Average			
	24 Hours		0.048ppm /125ug/m^3	
	Instant Peak		500 ug/m^3	
	Instant Peak (10 min)		0.191 ppm	
Oxides of Nitrogen (NOX);	Annual Average	80 ug/m^3	60 ug/m^3	15 ug/m^3
	24 hours	150 ug/m^3	80 ug/m^3	30 ug/m^3
	Annual Average		0.2 ppm	
	Month Average		0.3 ppm	
	24 Hours		0.4 ppm	
	One Hour		0.8 ppm	
	Instant Peak		1.4 ppm	
Nitrogen Dioxide	Annual Average	150 ug/m^3	0.05 ppm	
	Month Average		0.08 ppm	
	24 Hours	100 ug/m^3	0.1 ppm	
	One Hour		0.2 ppm	
	Instant Peak		0.5 ppm	
Suspended Particulate Matter	Annual Average	360 ug/m^3	140 ug/m^3	70 ug/m^3
	24 hours	500 ug/m^3	200 ug/m^3	100 ug/m^3
	Annual Average		100 ug/m^3	
	24 hours		180 ug/m^3	
Respirable Particulate Matter (<10□m) (RPM)	Annual Average	70 ug/m^3	50 ug/m^3	50 ug/m^3
	24 hours	150 ug/Nm^3	100 ug/Nm^3	75 ug/Nm^3
PM2.5	Annual Average	35 ug/m^3		
	24 hours	75 ug/m^3		
Lead (Pb)	Annual Average	1.0 ug/Nm^3	0.75 ug/Nm^3	0.50 ug/m^3
	24 hours	1.5 ug/m^3	1.00 ug/m^3	0.75 ug/m^3
	Month Average		2.5	
Carbon monoxide (CO)/ carbon dioxide (CO_2)	8 hours	5.0 mg/m^3	2.0 mg/m^3	1.0 mg/m^3
	1 hour	10.0 mg/m^3	4.0 mg/m^3	2.0 mg/m^3
Hydrogen sulphide	24 hours	150ug/m^3		
	instant Peak	700ppb		
Total VOC	24 hours	600 ug/m^3		
Ozone	1-Hour	200 ug/m^3	0.12 ppm	
	8 hours (instant Peak)	120 ug/m^3	1.25 ppm	

3.3.2.5 Biodiversity Regulations

Part II of Regulations, section 4 states that no person shall engage in any activity that may have adverse impacts on ecosystems, lead to introduction of exotic species or lead to unsustainable use of natural resources without an EIA license. The regulation puts in place measures to control and

regulate access and utilization of biological diversity that include among others banning and restricting access to threatened species for regeneration purposes. It also provides for protection of land, sea. Lake or river declared to be a protected natural environmental system in accordance to section 54 of EMCA, 1999.

3.3.3 The Water Act, 2016

Section 22 and sub-sections and 2 of the Act allows the Water Resources Authority the responsibility to take any lawful action that will protect established water catchment and the water resources thereof. Section 36 of the Act outlines requirements to be met for abstraction and use of water while Section 40 provides procedures of obtaining a water abstraction permit including undertaking Environment Impact Assessment study for the target abstraction point as well as appropriate consultations with the relevant stakeholders in accordance with the environmental impact assessment as per the Environmental Management and Coordination Act, 1999. Part of the water abstraction conditions are listed under Section 43 of the Act while groundwater abstraction is guided by the Fourth Schedule of the Act.

Section 22 of the Act provides for the identification and protection of vulnerable water resources (catchment areas) for surface water with the responsibilities placed on Basin Resources Committees as established under Section 26 of the Act. Water Resources Users Associations (WRUAs) are constituted at the sub-basin levels being community-based initiatives for collaborative management of water resources and conflict resolutions (Section 29. Water Resources Authority supports these initiatives through the formation of Sub-Catchments Management Plans (SCAMPs).

3.3.4 Water Rules

One of the outcomes of the water sector reforms has been improved regulatory framework for water resource management and use. In addition to the Water Act 2002, the main document outlining the regulations is the Water Resource Management Rules 2007. The rules set out the procedures for obtaining water use permits and the conditions placed on permit holders. Sections 54 to 69 of the Water Resources Management Rules 2007 impose certain statutory requirements on dam owners and users in regard.

Other sections within the rules imply that WRMA can impose water quality sampling requirements from the water sources and impacts to the hydrology, water chemistry and river morphology downstream basin. Section 16 of the Water Rules requires approval from the Water Resources Management Authority (WRMA) for a variety of activities that affect the water resources, including the storage of water in dams and pans. Approval by WRMA is conferred through a Water Permit. A permit is valid for five years and must be renewed.

Section 104 of the Water Resource Management Rules requires certain water permit holders to pay water use charges. The intention of the water use charges was to raise revenue for water resource management, raise revenue for catchment conservation activities, improve efficiency of water resource abstraction and provide a system of data collection on water resource usage.

Potential sources of water pollutants at the project will include discharges from camp sites, washrooms and toilets, car wash platforms, workshops, areas of earthworks and materials piles, spills from batching areas and parking areas. The Contractor will abide by the provisions of the Fourth Schedule of the Rules provides guidelines for effluent discharge into surface water sources and onto land as illustrated in the tables below:

Table 14: Guidelines for Effluent Discharge into Surface Water Resources

Parameter	Max Allowable (Limits)
Arsenic as As (mg/1)	0.1
Biochemical Oxygen Demand (BOD 5days at 20 °C) (mg/1)	30
Cadmium as Cd (mg/1)	1.0

Parameter	Max Allowable (Limits)
Chemical Oxygen Demand (COD (mg/1)	100
Chromium as Cr (mg/1)	Less than 0.01
Lead as Pb (mg/1)	Less than 0.01
Oil and grease	Absent
pH (Hydrogen ion activity)	5.0-9.0
Phenols, total (mg/1)	0.05
Sulphide as S (mg/1)	2.0
Total Suspended Solids, (mg/1)	30
Temperature (in degrees Celsius) based on ambient temperature	± 5
Cyanides as CN (mg/1)	Less than 0.2
Nickel as Ni (mg/1)	Less than 2.0
Detergents (ABS) (mg/1)	Less than 5.0
Mercury as Hg (mg/1)	Less than 0.01
Total Phosphorus as P (mg/1)	2
Total Nitrogen as N (mg/l)	10
Total pesticide residues	Absent

Table 15: Guidelines for Discharge of Effluent onto Land

Parameter	Maximum Permissible Level
pH	5.5-9.0
Boron (mg/l)	2.0
BOD (mg/l)	500
Chloride (mg/l)	600
Total Dissolved Solids (mg/l)	2100
Oils and grease (mg/l)	30
Sulphates (mg/l)	1000
Sodium (as percentage of total cation concentration)	60

3.3.5 The Public Health Act (Cap. 242)

Part IX section 115 of the Act states that no person/institution shall cause nuisance or condition liable to be injurious or dangerous to human health. Section 116 requires Local Authorities to take all lawful, necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable for injurious or dangerous to human health. Such nuisance or conditions are defined under section 118 and include nuisances caused by accumulation of materials or refuse which in the opinion of the medical officer of health is likely to harbour rats or other vermin.

3.3.6 The Forest Act

The Forest Act No7 of 2005 consolidates all forests under the act, and prescribes heavy penalties for damage to forests and trees. Charcoal burning in a forests or farmlands without a license or permit is an offence. Section 52(1) deals with felling, cutting, burning, injuring or removing of any forest produce only cover state, local authority or provisional forest. It sets heavy penalties for damaging trees. This will assist farmers in maximizing benefits from growing trees. Section 40(1) of the act sets to ensure that the forest areas under her management are maintained for biodiversity, cultural or recreational use. In addition, it protects the concession area from destruction and encroachment by other persons.

Section 41(1) says that all indigenous forests and woodlands shall be managed on a sustainable basis for purposes of, Conservation of water, soil and biodiversity, River line and shoreline protection. Cultural use and heritage. Recreation and tourism, Sustainable production of wood and non-wood products, Carbon sequestration and other environmental services Education and research purpose and. Habitat for wildlife in terrestrial forests and fisheries in mangrove forests. The Act puts emphasis on the need to strengthen community-based institutions by creation of Community Forest Associations, which gives the public a greater participatory role to the community in the forest conservation.

3.3.7 The Agriculture Act

Part IV no. 48 states that if the Minister considers it necessary or expedient so to do for the purposes of the conservation of the soil of, or the prevention of the adverse effects of soil erosion on, any land, he may, with the concurrence of the Central Agricultural Board, make rules to ensure the preservation of the environment. These rules may include:

(i) Breaking or clearing of land for the purpose of cultivation is prohibited.

(ii) Control, regulation or prohibition of grazing or watering animals.

(iii) With this prohibiting rule, the clearing or destruction of vegetation is deemed necessary by the minister for the preservation of soil and its fertility

Part IV no. 48(b) state the act requires the regulating or controlling of:

(i) The afforestation or reforestation of the land,

(ii) The protection of slopes, catchment areas or areas where rules made under (e) stating- for the maintenance of water in a body of water within the meaning of the Local Government Act.

(iii) Rules made under section 48 may provide for the seizure and forfeiture of any stock pastured in contravention of a land preservation order.

3.3.8 Pest Products Control Act

CAP 346, of the act says that no pest control product shall be sold without a label which has been approved by the board. Each label shall:

(i) Show name of pest control product and a description of its form and name of its active ingredients.

(ii) The class designation of the pest control product in capital letters and shall be classified as the first schedule.

(iii) Information detailing the nature and degree of hazard identified by appropriate precautionary symbol.

(iv) Information identifying any significant hazards in respect to handling, storage, display and disposal of the pest control product with information that will include instructions respecting procedures to alleviate hazards and when required by the board, instructions respecting decontamination procedures and disposal of the pest control product and the empty package.

Pest control product is to be used only in accordance with the directions on the label. It is an offence under the pest control products act to use or store a pest control product under unsafe conditions

3.3.9 Physical Planning Act (Cap. 286)

Section 24 of the Physical Planning Act gives provision for the development of local physical development plan for guiding and coordinating development of infrastructure facilities and services within the area of authority of County, municipal and town council and for specific control of the use and development of land. The plan shows the manner in which the land in the area may be used. Section 29 of the physical Planning Act gives the county councils power to prohibit and control the use of land, building, and subdivision of land, in the interest of proper and orderly development of its area. The same section also allows them to approve all development applications and grant development permissions as well as to ensure the proper execution and implications of approved physical development plans.

3.3.10 The Penal Code (Cap. 63)

Section 191 of the Penal Code states that any person or institution that voluntarily corrupts or foils water for public springs or reservoirs, rendering it less fit for its ordinary use is guilty of an offence. Section 192 of the same act says a person who makes or vitiates the atmosphere in any place to make it noxious to health of persons/institution in dwellings or business premises in the neighbourhood or those passing along public way, commit an offence.

3.3.11 Occupational Safety and Health Act, 2007

Before any premises are occupied, or used a certificate of registration must be obtained from the Director of Occupational Safety and Health Services. The Act provides for the health, safety and welfare for employees at workplaces. General requirements of this Act vesting obligations to occupiers (Part II) in order to ensure the safety, health and welfare at work of persons employed and to prevent occupational accidents shall be followed and any situation potentially hazardous shall be rectified when detected. Section 44 of the Act requires contractors to register with the Directorate of Occupational Safety and Health Services before commencement of works on site.

Competent persons shall be in charge of site safety and appropriate arrangements be made to ensure that safety and health committees are formed as provided for in Section 9 of OSHA and Section 4 of the Factories and Other Places of Work (Safety and Health Committees) Rules. All employees are expected to be made aware of their obligations to comply with provisions of the Act through appropriate trainings organized by the contractors. Appropriate personal protective equipment shall be provided by the contractors to all employees so as to protect them from hazards associated with their work. These should include highly reflective jackets, helmets, dust masks, ear muffs, safety harnesses when working at heights, and protective clothing.

Section 55 specifies requirements for compliance with provisions of Machinery Safety. In construction sites of the proposed magnitude and nature, strict protocols need to be put in place to ensure all plants and equipment conforms to these requirements. These include earth moving equipment, chains, hoists, and lifting equipment including tower cranes. This equipment shall be maintained in accordance with provisions of the subsidiary legislation.

Special care shall be taken by the contractor to ensure transport safety including maintenance of fleet and control of speeds so as not to foul the air with dust. Excessive dust may have dire consequences to aviation space and therefore must be checked through regular water sprinkling of routes used by trucks, or by application of appropriate hydroscopic materials on earth roads. In addition, the contractor must carefully select routes to be followed during movement of construction materials. All drivers must have the requisite training and competence to operate stationary and mobile equipment, and appropriate procedures developed by the contractor must be observed at all times. These may include loading and unloading procedures.

3.3.12 The HIV and AIDS Prevention and Control Act

This Act commenced in March of 2009. It is an Act of Parliament to provide measures for the prevention, management and control of HIV and AIDS, to provide for the protection and promotion of public health and for the appropriate treatment, counselling, support and care of persons infected or at risk of HIV and AIDS infection, and for connected purposes. Part 11, Section 7 requires HIV and AIDs education in the work place. The government is expected to ensure provision of basic information and instruction on HIV and AIDs prevention and control to; Employees of all Government ministries, Departments, authorities, and other agencies; and, Employees of private and informal sectors. The information on HIV/AIDs is expected to be treated with confidentiality at the work place and positive attitudes shown towards infected employees and workers. Provisions of this Act forms part of the bidding document and the Contractor will comply by utilizing resources set aside in the BoQ.

3.3.13 The Workmen Compensation Act (Cap 236)

Part II Section 5 of the Act instruct that personal injuries arising out of employment to a workman the employer shall be liable to pay compensation unless it is proved that the injuries are a result of wilful misconduct of the workman. Section 6 and 7 of the Act outlines payment of compensation to a workman or his/her dependents in the event of permanent injuries of death while at the place of work. Section 10 guides on the calculation of the compensation for the workman. Section 14 and 15 is a guide on reporting procedures for accidents and provision of medical examination and treatment to the workmen.

3.3.14 Work Injury Benefits Act, 2007

Part II of the Act requires Employers to obtain and maintain insurance policy for their employees while Part III Section 10 provides for compensation of employees who gets involved in accidents resulting in disablement or death and is entitled to benefits unless it is a result of misconduct of the employee. Under Section 34, in the event of death arising from the occupational accident, the compensation shall be paid to the dependents of the employee in accordance. Part VII section 45 requires that an employer provide and maintain appliance and services for rendering first aid to his employees. Section 48 instructs that an Employer shall defray any expenses reasonably incurred by an employee as a result of an accident arising out of and in the course of the employer's employment.

3.4 The Water Sector Institutional Framework

3.4.1 Policy Provisions

The National Policy on Water Resources Management and Development and the Water Act 2016, presently guides water resources management. The overall goal of the national water development policy is to facilitate the provision of water in sufficient quantity and quality and within a reasonable distance to meet all competing uses in a sustainable, rational and economical way. This policy separates policy formulation, regulation and services provision and defines clear roles for sector actors within a decentralized institutional framework and includes private sector participation and increased community development.

Under the policy, the Ministry of Water and Irrigation (MWI) is responsible for policy development, sector co-ordination, monitoring and supervision to ensure effective Water and Sewerage Services in the Country, sustainability of Water Resources and development of Water resources for irrigation, commercial, industrial, power generation and other uses. The MWI executes its mandate through the following sector institutions:

3.4.2 Water Services Regulatory Board (WASREB)

The Regulatory Board is responsible for the regulation of the water and sewerage services in partnership with the people of Kenya. The mandate of the regulator covers the following key areas:

(i) Regulating the provision of water and sewerage services including licensing, quality assurance, and issuance of guidelines for tariffs, prices and disputes resolution,

(ii) Overseeing the implementation of policies and strategies relating to provision of water services licensing of Water Services Boards and approving their appointed Water Services Providers,

(iii) Monitoring the performance of the Water Services Boards and Water Services Providers,

(iv) Establish the procedure of customer complaints,

(v) Inform the public on the sector performance,

(vi) Gives advice to the Minister in charge of water affairs.

3.4.3 Water Resources Authority (WRA)

The authority is responsible for sustainable management of the Nations Water Resources:

(i) Implementation of policies and strategies relating to management of Water resources,

(ii) Develop principles, guidelines and procedures for the allocation of water,

(iii) Development of Catchments level management strategies including appointment of catchments area advisory committees,

(iv) Regulate and protect water resources quality from adverse impacts,

(v) Classify, monitor and allocate water resources.

3.4.4 Water Services Trust Fund (WSTF)

This body assists in the financing of the provision of Water Services to areas of Kenya which are without adequate water services. This shall include providing financing support to improved water services towards:

(i) Capital investment to community water schemes in underserved areas

(ii) Capacity building activities and initiative among communities

(iii) Water services activities outlined in the Water Services Strategic Plan as prioritized by the Government

(iv) Awareness creation and information dissemination regarding community management of water services

(v) Active community participation in the management of water services

3.4.5 Water Works Development Agencies (WWDAs)

The Water Works Development Agencies (WWDAs) are responsible for the efficient and economical provision of water and sewerage services infrastructure within their areas of jurisdiction. Their operations are overseen by the Water Service Regulatory Board (WASREB) and are mandated to:

(i) Ownership and custodian of water and sewerage assets/infrastructure,

(ii) Planning, development and expansion of water and sewerage services infrastructure,

(iii) Appoint viable and well managed water service providers and ensure they have appropriate systems among others; enforce water quality monitoring, ensure effective and efficient maintenance systems and procedures to minimize interruptions to water supplies,

(iv) Build capacities of water service providers to embrace efficiency, accountability and responsibility to water supplies,

(v) Monitoring and supervision of water and sewerage services provision by WSPs.

3.4.6 Water Services Providers

Water Service Providers are the utilities or water companies instituted to operate under the supervision of Water Services Boards. They are, therefore, public owned but have been commercialized to improve performance and operated within a context of efficiency, operational and financial autonomy, accountability and strategic, but minor investment.

3.5 Catchment Management Initiatives

Catchment management is a responsibility to be exercised through collaboration of various stakeholders with interest to the catchment areas and the watersheds. Kipchorian River Catchment draws interests from among other stakeholders:

(i) The Water Sector (source of water from localized and downstream requirements),

(ii) Agricultural Sector (for sustainable land utilization in food production without compromising the land, environment and water resources quality,

(iii) Forest sector that ensures sustained forest resources exploitation with compromising land cover and water catchments,

(iv) Livestock keeping that relies of sustained vegetation cover for production,

(v) Housing and settlements for people that should be undertaken such as to compromising the integrity of land, environment and water resources for the location and downstream dependents.

Catchment management plan is a tool for application in ensuring harmonized and reproducible mechanisms to address various features of the catchments and watersheds for sustainable utilization, exploitation, sharing and conservation of natural resources therein. Key parameters in regard to Kipchorian River catchment and watersheds include the following:

(i) Land use patterns,

(ii) Ground land cover including forest,

(iii) Soil erosion (silt generation),

(iv) Human settlements and markets centre development,

(v) Agrochemicals applications and management,

(vi) Social factors including economic activities, livelihoods and poverty levels,

(vii) Natural resources exploitation trends (forest resources, mining, water resources, wildlife, etc.),

(viii) Knowledge and skills for the landowners, institutions, farmers, administration, etc.

The implementation of the Environment and Social Management Plan (ESMP) will require to be aligned with the SCAMPs for long term harmony and integration of the dam construction and operations with respect to the watershed management.

3.6 NEMA Compliance

The government established the National Environmental Management Authority (NEMA) as the supreme regulatory and advisory bodies on environmental management in Kenya under EMCA 1999. NEMA is charged with the responsibility of coordinating and supervising the various environmental management activities being undertaken by other statutory organs. NEMA also ensures that environmental management is integrated into development policies, programmes, plans and projects.

This integration encourages provision of sustainable development and a healthy environment to all Kenyans. The key functions of NEMA through the NEC include policy direction, setting national goals and objectives and determining policies and priorities for the protection of the environment, promotion of cooperation among public departments, local authorities, private sector, non-governmental organizations and such other organizations engaged in environmental protection programmes and performing such other functions as contained in the act.

CHAPTER 4: ENVIRONMENTAL BASELINE CONDITIONS

4.1 General Overview

The area is generally cold and wet characterized by relief type of rainfall, heavily influenced by its geographical location relative to the Mau Forest system and altitude. The physiography of the area is undulating landscape with an average westerly slope of ~3%. The land generally slopes to the west direction a factor that also influences the general flow trend of rivers and streams.

Areas within Mau catchment have rich, fertile and well-drained soils and the pleasant climatic conditions favour agricultural activities. As a result, there is high population with majority of the locals practicing mixed farming hence reducing the poverty levels. During the dry periods, the rivers experience low water flows a situation that impacts negatively on agriculture. The following section briefly describes the baseline conditions on environmental features.

4.2 Topography and Physiographic

Kericho County is characterized by Tinderet Hills to the north, Mau Escarpment on the east. To the North West are the hilly areas of Kipkelion rolling towards Koru. The central part of the county rises eastward towards Mau Ridge up to 3,000masl. The Kericho plateau forms the central part of the county sloping gently from 2,500m on the east to about 1,800masl to the West. Londiani Hill is on the gentle rolling land between Tinderet Hills and the Mau system.

The geographical expanse which forms the Londiani dam catchment area raises from about 2,200masl in the South to about 2,800masl North with an average slope of ~3% towards the West. The land is characterized by an undulating topography made up of hills and valleys bottoms. Masaita Hill is situation on the eastern side ~2km upstream the dam axis, Lemotit Hill is on the northwest side of the dam while Chepseon is on the South of the dam site.

Kedowa area is characterized by flat land terrain gently sloping towards river valleys. Some of the physiological features affecting the general topography of the area include Kimasian and Tulogo Kipsigis Hills. Chepseon area is characterized by a hilly terrain with Chilchila Hill and Chepseon Polytechnic grounds being some of high elevated areas. Traces of rock outcrops are evident within Kipkelion West Sub-County at altitude 2,325masl. Kipkelion area is characterized by hills, rolling terrain with rock outcrops and within the low laying areas a flat terrain. Some of the notable high elevated areas of Kipkelion include Kimautsigiriat Hill and Taita Towet Secondary School grounds. Fort Ternan area has a flat land terrain characterized by hills and valleys.

The land rises from the low river valleys of Kimologit River to high areas of Kipsinende Hill. Some physiological features within the project target areas are:

Table 16: Sample Hills within Project Target Areas

Hills	Area
Simba Hill	North of Kamuingi area
Chilchila Hill	Chepseon area
Kimautsigiriat Hill	Around river farm area
Kipsinede Hill	Fort Ternan area
Chepseon Hill	South of Londiani market

Figure 9: Topographical View of the Project

4.3 Drainage and Hydrology

4.3.1 Drainage

Kericho County is well drained favoured by the ragged terrain (steep slopes and deep valleys) and with a number of rivers traversing including Chemosit, Kiptaret, Kipsonoi, Timbilil, Maramara, Itare, Nyando, Kipchorian, Kimlongit and Malaget. Kericho County generally lies within the west of the Mau water shed which is Kenya's largest water catchment area. The Mau forest complex separates the Lake Victoria drainage basin with the Rift Valley drainage basin, hence streams and rivers in Kericho County drains into the Sondu River and Nyando River into Lake Victoria. The project is located on the upper catchment of Nyando river basin.

The project drainage is influenced by Kipchorian River and its tributaries: Masaita and Githee. The Githee stream consists of about ten small streams draining from the western direction while Masaita drains from eastern side. The two rivers join and form Kipchorian River which forms the upper sub-basin of Nyando River.

Timbililwet and Chesinede rivers (seasonal) are the main drainage outfall for Kedowa and Chepseon respectively. The sloping land terrain towards the river beds influences the general drainage of the area. The area is well drained though the areas along the river beds are prone to flooding from surface run off. The vegetation cover, also influence drainage within this area. Kipkelion area drainage is influenced by Kipchorian River the main drainage outfall. The hilly land terrains sloping towards Kipchorian River influence drainage as well as the vegetation cover. Within Fort Ternan area Kimologit River is the main drainage outfall. The soil type and the vegetation ensure the area is well drained.

Surface drainages in the project area is generally with no defined pattern especially in the settlements and urban centres. The main roads, however are provided with culvert crossings to facilitate storm water movement. Though the project area is well drained, high rainfall experienced contribute to flooding downstream along Kipchorian river flood plains with intensity rising in the lower zones of Nyando river basin, with poor land use practices and land cover destruction, there is serious soil erosion and silt transport from the catchment.

Kipchorian River U/S Dam Site

Kipchorian River at the Dam Site

Kipchorian D/S Dam Site

Some of the Kipchorian River Tributaries

Figure 10: Drainage Features

4.3.2 Hydrology

Rivers and streams in the project area constitute part of the sub-catchment of upper Nyando River basin that ultimately drains in Lake Victoria Basin. The rivers namely Kipchorian and its tributaries Masaita and Githee originate from the Mau forest escarpment and have a permanent flow throughout the year though during the dry periods their recharge is low. Githee stream consists of about ten small streams draining to the western parts of the catchment while Masaita River drains the eastern part. Surface hydrology of the rest of the project area is influenced by Kipchorian River and its tributaries. The dam catchment area is 140.8km^2 receiving a high rainfall that is distributed throughout the year with a peak in August. The highest annual rainfall is over 1400mm which influence the general recharge of rivers and streams.

Figure 11: A Section of Wetland System Downstream of the Dam Wall Location

4.4 Water Resources

The Kericho County is generally endowed with water resources where numerous streams and rivers that constitute part of Lake Victoria watershed originate. Kipchorian River provides the main source of water to the residents of Londiani and its environs who use the water either directly or through water scheme. Other sources of water in the region are boreholes with yield as high as 16.4m^3/hr. and lows of 1.1m^3/hr. On average the depths range from a minimum of 42.7m to a maximum of 228.6m.

4.4.1 Surface Water

Surface water within the project area is the major source of water for domestic and irrigation needs. Surface water is also shared with livestock that are watered directly in the rivers, a situation that compromise human health status. Further, with increasing agricultural activities, settlements and urban expansion, the sources are also faced with increasing pollution threat and hence not available for use. Kipchorian River is the main basin with other streams constituting its tributaries including among other Masaita River and Githee Stream. This system constitutes the main headwaters of Nyando River downstream.

Figure 12: Sample Surface Water Sources

4.4.2 Ground Water

Ground water aquifer occurrence in Londiani are characterized with varying thickness yields that fluctuates with seasons. The hydrogeology of this area is described by deep and shallow ground water regimes. Shallow groundwater regimes are up to 50m deep and are recharged by localized percolation and infiltration of rainwater. The deep ground water aquifers are found at depths of between 50 – 250m and are recharged from wider catchment. Ground water sources in Londiani include boreholes and shallow wells whose quality cannot be guaranteed. Some of the boreholes in this area are listed below.

Table 17: Some Local Borehole Data

B/H No	Depth (m)	WSL (m)	WRL (m)	Yield (m^3/hr)
C 2181	228.6	222.5	76.2	5.5
C2692	125.0	63.4 – 118.9	46.6	9.1
C2693	137.2	109.7	61.0	5.5
C2808	84.4	82.3	78.3	2.7
C2809	73.2	12.2	-	1.6
C2810	42.7	15.2	-	1.2
C2831	158.5	152.4	15.8	3.0
C 2938	54.3	54.3	27.4	1.1
C 2985	145.1	67.1 –135.6	78.0	9.1
C 3072	185.3	18.3, 103.6,146.3 – 176.9	7.3	16.4

Shallow Well

Borehole

Figure 13: Ground Water Sources

4.4.3 Rainwater

The project area experiences relief type of rainfall averaging to approximately 1400mm p.a. Rainfall distribution is influenced by altitude, vegetation and the Mau forest systems proximity. Rainwater is alternative water sources within the project area though limited rainwater harvesting methods have been explored by the locals.

Figure 14: Roof Rain Water Harvesting

Public Access to Water Sources

Livestock Watering

Irrigation along Flood Plains

Water Abstraction by Pumping

Figure 15: Water Uses

4.5 Biodiversity

Over time, the project area ecology is increasingly getting degraded as a result of high population demanding more land for food production and settlement. Forest destruction is evident leaving small forest pockets and almost bare catchment areas. There is no indication that species of unique or special biodiversity value occur at the dam site or in its environs.

4.5.1 Fauna

The county is generally endowed with different types and species of fauna, influenced by the Mau forest ecology. The types and number of wild animals in the county include: elephants, hyenas, velvet baboons, olive baboons, and bird's species. Within the project are velvet baboons, rodents (squirrels and moles), reptiles (snakes) are present. There is no significant presence of wildlife within and around the project area due to (agricultural, settlements, institutional and commercial activities). Domestic animals among them dairy cows, goats and poultry present alternative animal present in the project area.

Kipchorian River has limited aquatic life due to moderate water flow. Present aquatic animals include frogs and toads as well as river insects.

4.5.2 Flora

Vegetation species in the area is influenced by the general Mau forest ecosystem. The well-drained fertile soils and pleasant climate characterized by adequate and reliable rainfall make the area vegetation conducive for land cover including agricultural activities and agro-forestry too. Londiani forest is the only notable forest within the project area characterized with flora species including grass species, tree species (cypress, pine, cedar, croton, gravellia, blue gum and various shrub species). Increase in population and demand on land for agricultural activities is leading to land cover change towards agricultural crop cover. The predominant agricultural crops include coffee, potatoes, maize, beans and horticultural crops (tomatoes, vegetables among others). Riverine wetland zones are characterized with macrophytes like papyrus and reeds.

Agroforestry | Forestry | Riverine Vegetation

Banana Farm | Maize Plantation | Sugar Came Plantation

Figure 16: Land Cover

4.6 Geology and Soil

4.6.1 Geology

The geology of the Londiani area is composed of volcanic rocks of Tertiary age to Recent and lacustrine and fluviatile sediments derived from the volcanic rocks. Lava flows are not common in this area. Only small trachytic lava amounts were observable at Lessotet and Masaita hill rocks. Much of the geology of the area is composed of variable pyroclastic rock derived from ash-flow than ash-fall. Many of these pyroclastic rocks are welded. The geological cross-section through the general area indicates that there are no faults within close proximity to the project area. This means that the area did no experience tectonic disruption during the Tertiary times, but instead a thick mantle was laid up.

The geology of dam area is composed of sediments, agglomerates and welded tuffs (T) of Tertiary Age to Recent and lacustrine and fluviatile sediments derived from the volcanic rocks. The sediments are well bedded comprising of sandstones, tuffs, clay stones, grits, friable reddish soils, laminated clay stones and gravel deposits. Exposures of the elements are poor, but they form rapids where the rivers are incised. The Londiani volcanic rocks are not wide spread and are represented by a thin layer of young basalts from local volcanic vents (Lessotet and Masaita hills).

Illustrative Geological Structure at Kedowa

Maffic Basalt Rock outcrops at the Dam Site

Figure 17: Project Geological Features

4.6.2 Soils

The soil type affect surface runoff in watershed and the hydrologic abstractions (evapotranspiration, consumption by plants, river-flow) runoff volumes and subsurface base flow of a catchment. Low permeability soils have low potential for infiltration and percolation to contribute to the base flow of streams. The soils in the project area are drained dark reddish-brown sandy clay loam Phaeozomes). The soils in upper reaches of Londiani dam catchment are well drained reddish clay loam (with some sandy clay) and good moisture capacity.

4.7 Climatic Conditions

The climate of the project area is heavily influenced by its geographical location and altitude. The climatic conditions within the project area is regarded as cool and wet with rainfall adequate and well distributed throughout the year. The climate conditions are pleasant and support agricultural activities and as a result, there is a high population growth rate within the area.

Kericho County receives relief type of rainfall, with moderate temperatures of 17^0C and low evaporation rates. The county experiences two rainy seasons, the long rainy season occurring between April and June whereas the short rainy season occurs between October and December every year. The rainfall pattern is such that the central part of the county, where tea is grown, receives the highest rainfall of about 2,125mm while the lower parts of Soin and parts of Kipkelion receive the least amount of rainfall of 1,400 mm. The driest season is mostly from January to February. The overall average rainfall at Kericho station is 1,710mm.

CHAPTER 5: SOCIAL AND ECONOMIC SETTINGS

5.1 Administrative Location

Kericho County is composed of 15 No. administrative divisions that are further sub-divided into 85 locations and 209 sub-locations. The County covers an area of 2,479km^2. Londiani Dam site is administratively located in Masaita and Baration locations within Londiani division of Kipkelion East Sub-county, Kericho County. The reservoir traverses three sub-locations namely: Baration/Tuyoibei, Masaita, Kamuingi and Itoik. The treatment works is located in Masaita location while the bulk transmission pipelines are designed to serve both Kipkelion East and Kipkelion West sub-counties of Kericho County. Kipkelion East has three divisions namely: Londiani, Sorget and Chepseon while Kipkelion West Sub-county has four divisions; Kunyak, Chilchila, Kamasian and Kipkelion.

Table 18: Area and Administrative Unit per Sub-county

Constituency	Sub-county	Divisions	Area (km^2)	Number of Locations	Number of Sub locations
Kipkelion West	Kipkelion West	▪ Kunyak ▪ Chilchila ▪ Kamasian ▪ Kipkelion	333	16	35
Kipkelion East	Kipkelion East	▪ Londiani ▪ Sorget ▪ Chepseon	774.4	14	32
Total	**2**	**7**	**1107.4**	**30**	**67**

5.2 Political Setting

The county has six constituencies, namely: Ainamoi, Kipkelion East, Kipkelion West, Sigowet/Soin, Bureti and Belgut with a total of 30 electoral wards. Bureti, with seven wards, has the largest number of electoral wards in the county while Sigowet/Soin, Kipkelion West and Kipkelion East have the least number of wards with four each. The project is located within Kipkelion East and West constituencies of Kericho County.Based on the political boundary, the dam is located in Londiani and Sorget/Tendenyo wards. However, supply by both the gravity and pumped water mains network covers all the wards in both Kipkelion East and Kipkelion West constituencies as follows:

Table 19: Project Area Political Unit

Constituency	Ward	Area (km^2)
Kipkelion East	Sorget	202.70
	Londiani	120.20
	Kedowa	241.60
	Chepseon	181.90
Kipkelion East	Kunyak	68.00
	Kamasian	80.50
	Kipkelion	107.80
	Chilchila	104.60

5.3 Population Features

As per 2019 Kenya national population and housing census report, Kericho county has a population of 901,777 with a growth rate of 2.2% per annum. However, Kericho County had a population of 758,339 according to the national Population and Housing Census Report 2009 with a growth rate of 2.5% per annum between 1999 and 2009. This population was projected to increase to 926,237 by 2017. Due to favourable climatic conditions, evenly distributed rainfall, social amenities provisions and fertile soils among other factors most of the county has a high population density and rising. The project area constituencies of Kipkelion West and Kipkelion East, however, are less densely populated compared to Ainamoi and Bureti.

The project area has two towns with a population of more than 2,000 people but less than 10,000 according to the CIDP. The two towns are Londiani (with 5,437 people) and Kipkelion town (with 3,629 people). Based on the county population grow rate of 2.51%, the projected project population by design period is summarized below:

Table 20: Population Projection

Town	Population Projections				
	2009	2017	2020	2030	2040
Kipkelion	3,629	4,425	4,767	6,108	7,826
Londiani	5,437	6,630	7,141	9,151	11,725

5.4 Settlements Patterns and Housing

Settlement patterns are partly influenced by climatic factors (including land fertility, rainfall) land productivity as well as economic PotentialThe high populations observed in the highland areas of Londiani and Chepseon as compared to the lower areas of Kipkelion and Fort Ternan are explained by the productivity and economic potential The sparse population in lower lands is attributed to decreased rainfall amount which in turn lead to reduced level of economic activities. There is also higher population along major transport corridors including Londiani – Kericho highway, Londiani – Muhoroni highway that also influence land use changes to commercial activities. Many small centres are emerging along the highways that also influence demand for water.

In accordance with the Social Economic Survey, majority of the population (70.2%) around the dam area have main houses made of mud walls and corrugated iron sheet roofs. About 24% have main houses made of timber walls and corrugated iron sheet roofs while 2.9% have brick walls houses and corrugated iron sheet roofs. Another 2.9% have main houses made of stone walls and corrugated iron sheet roofs.

The study also revealed that about 48.8% of the population in the supply area had main houses made of timber walls and iron sheet roofs, 29.6% main houses were made of mud walls and corrugated iron sheet roofs and only about 10.3% had houses made of stone walls and iron sheet roofs. The most comprised of 7.9% with, mud walls and grass thatch roof 2.5%, with and brick walled and iron sheet roofs while 1% had stone walled and tile roofs.

Stone Block Wall Houses

Mud Walled House

Brick Walled House

Iron Sheet Houses

Timber Houses

Figure 18: Sample Housing Structures

5.5 Land Tenure and Land Use

5.5.1 Land Tenure

According to socio-economic survey, land within the project area and its immediate neighbourhood is publicly and privately owned. Public land in the area include the 30-meter river riparian/Kipchorian riverine reserve`s, roads and institutional land (schools, public services, health centres also market areas private land is either ancestral through inheritance allocation for settlement or bought. A majority of the land owners (87%) hold title deeds about 10% hold allotment letters with about 3% having no document of ownership.

Majority of people in the supply areas including the irrigation areas acquired their land through inheritance and a low number have bought their land. In Chepseon and Sereng, there exists equal number of people who inherited and purchased land perhaps due to the level of productivity.

5.5.2 Land Use

Land use is largely dictated by agro-ecological zones, soil fertility and climate as well as cultural practices. Land use in the project area is dominated by settlements and mixed farming involving food crops and livestock keeping. Crop farming occupy the larger part of the land at 88%, while grazing/pasture land, homestead and woodlots occupy 5%, 4% and 2% of the land owned respectively. Among the crops grown, maize is the main crop in the dam area and the upper zones of the supply area where it is mixed with other crops on lower scales including beans, potatoes, tomatoes, peas and vegetables. The lower supply areas up to Fort Ternan one characterized with sugarcane growing as the main crop mixed with others including coffee and food crops. Other land use features are market centres (among them Londiani, Chepseon and Kipkelion). In addition, there are public institutions among them being Schools, Health centres and hospitals.

5.6 Social Services

5.6.1 Education

Literacy levels in Kericho County stand at 75% with institutional provisions including, about 737No. ECD centres, 600 primary schools and 190 secondary schools. About 36,570No. pupils are in ECD, 191,000No. in primary schools and 74,981No. in secondary schools. Other education facilities include universities campuses Teachers Training College, commercial colleges etc. most of which are found in Kericho town. Londiani host important public intuitions training in forest conservation as well as paramilitary. Kipkelion West constituency has the highest share of residents with no formal education at 19%. Among the institutions in the project area include schools both secondary and primary schools, Health centres, Police Post, Kenya Forest Collage, Banks, Administration office and churches.

Majority of the population (53%) have only attained primary education, 32% have secondary education, 5% have attained tertiary certificate, while 7% and 3% have attained diploma and university degree education. Provision of clean, safe and reliable water supply will go a long way into improving education performance and enrolment within the project area. Provision of water to both houses and institutions will also save a lot of time spent in fetching water rather than learning. Sample schools within the project area per ward.

Figure 19: Sample Education Institutions

5.6.2 Water Supply

The County's main water sources are shallow wells, roof catchments, boreholes and surface water (rivers). Only about 40% of residents in Kericho County use improved sources of water while the rest relying on unimproved sources of unreliable quality Kipkelion East constituency has the highest share of residents using improved sources of water (53%) compared to Kipkelion West Sub-county. The average distance to the nearby water resource is 1km in Kipkelion West.

The main existing water supply namely in Kipkelion East and Kipkelion West sub-counties is met by 4No.Pumping water schemes namely Londiani Water Supply, Chepseon Water Supply, Kipkelion Water Supply, and Fort Ternan water Supply. These schemes have outlived their lifespan with some being as old as 50 years. And the water production capacity from these schemes does not meet the communities' water demand due to challenges ranging from low water flow in source Rivers and increased operation and maintenance costs from high pumping electricity cost.

(i) Londiani water supply has a production capacity of 270m^3/day against present water demand of 900m^3/day serving a population of 2,800 against a target population of 8,920 persons within Londiani Township and its environs.

(ii) Chesinende water supply scheme has production capacity of 100m^3/day against a demand of 300m^3/day serving a population of 2,420 against a target population of 7,940 persons.

(iii) Kipkelion water supply has a production capacity of 90m^3/day against water demand of 330m^3/day serving a population of 1470 against a target population of 4,100 persons.

(iv) Fort Ternan water supply has a production capacity of 170m^3/day against demand of 1485m^3/day serving a population of 2,290 against a target population of 18,570 persons.

Chesinende water scheme is not operational and the communities rely on a borehole at Chepseon Catholic Church and nearby surface sources. Fort Ternan water supply scheme is not reliable due to poor availability water. The proposed Londiani dam water project intends to supply treated water to supplement these schemes utilizing the existing infrastructure, expanding the command zone and additional tanks and pipeline.

5.6.3 Health

Kericho County has about 13No. hospitals, 8No. Sub-district hospitals, 15No. health centres, 162No. dispensaries, 30No. private clinics and 2No. nursing homes, with the average distance to the nearest facility being 5km, a doctor patient ratio of 1:23000 and nurse patient ratio of 1:2000. The most prevalent diseases in the county are Malaria (50%), Flu (20%), stomach ache (4%), diarrhoea (3%) and respiratory tract diseases (2%). It is worth noting that, most of the facilities are under-utilized due to lack of staff, equipment and drugs. The infant mortality rate stands at 62.1 per 1,000 while the fewer than five mortality rate stands at 98 per 1,000 Morbidity rates per month stands at 19.1% (17.2% for men and 18.5% for females).

The prevalent diseases within project area include malaria 49% and common cold 14%. Chepseon water supply area the prevalent diseases were malaria 53%, amoeba 7%, diarrhoea 3%, typhoid 20% and common cold 17%. Kipkelion water supply area prevalent diseases were typhoid 80%, diarrhoea and malaria 10% each. Fort Ternan water supply areas the prevalent diseases were typhoid 93% and chest pains 7%. This is attributed to low availability of clean water to the residents who seek for alternative and unreliable water sources such as shallow wells and surface water. More often, shallow wells are not properly sited and are in conflict with sanitation facilities including pit latrines with potential water contamination. Uncovered wells stagnant water pools act as mosquito's breeding ground. People openly share surface water sources with livestock hence compromising their general health further justifying the dam project.

Figure 20: Sample Health Facilities

5.6.4 Sanitation and Hygiene

The project area is not served with water borne sanitation facilities. Nearly the entire population (99% of the residents) relies on pit latrines, while only a few (1%) uses septic tanks for human waste disposal. Pit latrines are mostly found in rural homesteads while the urban centres use both pit latrines and septic tanks as their mode of human waste disposal. In spite of this, sanitation and hygiene related diseases typhoid, diarrhoea and cholera are prevalent in the project area. This is attributed to use of unsafe or contaminated water and wells siting close to the pit latrines. The proposed project will promote hygiene through improved water supply. However, lack of elaborate solid waste management systems in the town's compromises the general sanitation and hygiene especially during the rains. About 77% of the resident population use burning as the single most common method of solid waste disposal while 20% and 3% use pit near house and composting as the solid waste disposal mechanisms respectively. Solid waste management measures need to be put in place to check on contamination of water.

Cattle Dips

Waste Dumps

Direct Livestock Watering

Pit Latrines

Figure 21: Point Sources of Water Pollution

5.7 Economic Setting

5.7.1 Agriculture

Kericho County experiences a bimodal type of rainfall where long rains fall between Mid-March to May followed by a cool season usually with drizzles and frost during June to August while short rains come mid-October to November.

Agriculture is the major economic activity in the county including the project area engaging approximately over 69.4% of the population hence contributing the most important to the household income and livelihoods. Production is mainly subsistence on small land holdings while large scale farming is evident on large tracks of land. Farming is usually mechanized in large scale farming but hand held equipment are used in small scale farming.

Cash crops such as coffee and sugarcane are normally grown in Kipkelion West near Fort Ternan while food crops such as maize, potatoes and beans are widely grown across in both Kipkelion East and West sub-counties. Horticultural crops such as tomatoes, chilies, kales, spinach are also grown. Fruit crops grown include bananas, avocados and passion fruits among others are also grown in the lower areas around Fort Ternan.The agricultural sector in Kericho County is faced with some challenges that include erratic weather, fluctuating commodity prices, high cost of inputs and unexploited potential in trade and industry that may require to be addressed during the irrigation piloting.


Mixed Cropping


Maize Plantation


Irish Potatoes


Sugar Cane Plantation


Cabbages Farm


Coffee Farm

Figure 22: Sample Crops Grown

5.7.2 Livestock

Kericho County and its environs are also suitable for livestock farming, commonly featuring cattle, sheep and goats as well poultry. Cattle are the most reared livestock accounting for 58% while sheep, goat and poultry account for 19%, 0.5% and 22.5% of the livestock respectively. The County has potential for self-sustaining in both milk and meat and surplus for export to neighbouring counties although currently the production is below capacity. Poultry rearing is also undertaken mostly for subsistence consumption though the demand in the market is high. The dam project will help in providing water for enhancing irrigation and livestock besides domestic requirements.


Sheep Rearing


Cattle Grazing

Figure 23: Livestock Samples

5.8 Natural Resources

Land is the primary natural resource in the area seconded by surface and sub-surface water. Residents depend on raw water from rivers such as Kipchorian River and a few ground waters wells and boreholes. In addition, the project area has forest resources (Londiani) which provide fuel, raw materials for wood products, soil conservation and protection of water catchment areas.

5.9 Trade and Livelihoods

Trading is one of the main activities in the area that also provide employment as well as market outlet for agricultural and other products. Kedowa and Chepseon markets are some of the busiest open-air markets, located along Londiani – Kericho highway. Other markets include Londiani, Barsiele, Kipkelion and Fort Ternan in addition to other roadside shopping centres. Market days are usually once a week on specific days with Londiani (Wednesday), Chepseon (Thursday), Fort Ternan (Friday) and Kipkelion (Tuesday).

Some of the common merchandise sold includes agricultural produce, animals and animal products, cloth, foot wears etc. Garages, welding sheds and woodwork shops hotels, general shops, bicycle/motorcycle repairs, barber and salon and hotels/bars are among the light industries present. Small trade centres serve the project area and include: Kamuingi, Kedowa, Jagoror, Kapcheplanga, Kipsirichet, Barsiele and Siret. The chief source of energy in the urban trading centres is electricity supply and solar while petroleum fuels and charcoal are also applied the rural area both electricity and lamps.

Kamuingi Market

Londiani Market

Kedowa Market

Figure 24: Sample Markets and Centres

General Shops

Quarrying

Bee Keeping

Figure 25: Other Livelihoods

5.10 Financial Institutions

The main financial institutions in the project towns are Kenya Commercial Bank, Cooperative Bank, Family Bank, Equity Bank either directly or through Agents. In addition, there are numerous micro-finance institutions including KWFT in Chepseon. However, the most common transfer services are M-pesa and bank agencies (KCB's Mtaani and Cooperatives' Jirani).

5.11 Infrastructure and Communication

Kericho County has a road network comprising of 285.9km Bitumen (tarmac); 592.5km gravel surface and 1007.6km is earth roads. The 592.5km gravel surfaced roads are crucial in accessing major agriculture and settlement areas of the county's while the 1007.6km earth surfaced roads are the common access to settlement and interior institutions and are in bad conditions, especially during rainy seasons. The county is partially served by a railway line covering a distance of 60km through the project area though it has not been used for a long time. The main roads traversing the project are:

(i) Road B1 (Londiani –Kericho),

(ii) Road C35 (Londiani – Muhoroni) linking Londiani, Kedowa, Chepseon, Kipkelion and Fort Ternan),

(iii) Roads D314 (Londiani – Kedowa – Kipkelion) and Road D313 (Chepseon – Kipkelion),

(iv) Road E254 (Londiani – Sorget) and Road Londiani – Tentai – Kimasian),

The local public services available in the area include “matatus” and buses transporting passengers to various towns and centres including inter-county (Kericho, Nakuru, Kisumu and Nairobi). Motorbikes also known as "boda-bodas" transport people to the hinterland areas not covered by public service vehicles. The area is covered well by the local mobile service providers in including Safaricom, Orange and Airtel. Mobile phones are, therefore, commonly used as the means of communication. There are also cyber cafes that provide internet services; other infrastructure includes power connections and water supply.

Trucks

Tractor Pulled Trolleys

Bicycles

Donkeys

Motorcycles

Walking

Figure 26: Mode of Transport

5.12 Sources of Energy

The main type of fuel used for cooking and lighting by households is firewood and kerosene respectively. Majority of the population (88%) comprising of the rural households use firewood for cooking while 11% and 1% use charcoal and LPG gas for cooking. Majority of the rural population (66%) use kerosene for lighting as compared to 42% in urban setting. Solar and electricity are also in use with 29% and 5% usage in rural areas respectively while 21% and 36% in urban areas use solar and electricity for lighting respectively. and charcoal/firewood. Firewood is the cheapest source as it is available at farm levels while charcoal is limited due to conservation of forests. Kerosene is the main source of energy for lighting in the rural homes though limited use of solar energy is on the rise. Towns and centres are connected with electricity for lighting while the rural electrification programme is benefiting more rural homes.

5.13 Cross Cutting Issues

5.13.1 Social and Cultural Aspects

The Kipsigis ethnic group inhabits most of the project area. The dam area is habited by Kikuyu community in the upper zones including the catchment while Kipsigis are on the lower zones. There is a characteristic Kipsigis, Luo mix the lower end of the project towards Fort Ternan. This illustrates the level of cultural interaction across the project.

Though most of the traditional practices have been eroded by modernization and inter cultural mix, original traditions by the communities still remains including Circumcision, Marriages, Funerals

Family values etc. The project area also hosts a number of religious institutions including Christian churches.

5.13.2 Gender

The population in the project area comprises of 59% men and 41% women. Households in the project area are largely headed by men. As such most of the household decisions are made by a man which is a cultural norm. In order to realize full benefits of the water project, the community has hence got to be trained on gender issues so as to ensure the use of affordable technologies.

5.13.3 Youth

The youth in the project area were mainly involved in motor cycle transport businesses and grocery shops in the main towns. A small proportion were engaged in dairy farming and other agricultural activities. Otherwise other youth especially those with college education and staying in the rural areas were generally unemployed. Key informants said that unlike in most other rural areas in the country, youth in project area were not involved crime although a number in every village or town indulged in local brew consumption. The youth interviewed indicated that the main challenge they faced in trying to improve their standards of living was reluctance of their parents to allocate land for their use or inter-generational land transfer in general. They therefore argued that in large part they had no secure access to land for agricultural investments. They also complained of lack of access to credit to employ in agricultural enterprises. This is the reason they resorted to relatively low capital and easy to enter businesses such as motor cycle transport and grocery shops although returns were low and often uncertain.

CHAPTER 6: STAKEHOLDERS AND PUBLIC CONSULTATIONS

6.1 Overview

Public and Stakeholders Participation is an important process in ESIA studies. Through this process, stakeholders contribute to the overall project design by making recommendations and raising concerns. In addition, the process creates a sense of responsibility, commitment and local ownership for smooth implementation of the project.

Consultation and public participation involve extensive discussions and in-depth interviews with NWHSA, leaders, individual water committee members, national and county government as well as residents within the dam area/neighbourhood. During Consultation and public participation, the consultant presentations covered the following:

(i) The EMCA of 1999 that emphasizes that any project should undergo an Environmental impact assessment to establish the positive and negative impacts of a project. Mitigation measures should be formulated to counter the negative impacts that would be anticipated during and after construction.

(ii) The socio-economic issues addressed and that are likely to change as a result of the project including settlement structures, population totals, structures and growth rate; economy and livelihoods; socio-cultural relations. The RAP will be undertaken which will also establish the number of graves and pit latrines that will need to be relocated.

(iii) Active participation of the communities in the proposed development during the construction process and post-construction operations of the project.

6.2 Public Consultation Forums

Public Consultation

This session was also held in two sub-sessions at different locations within the project area and the pipeline transmission corridor. The objective was to present the proposed project concepts and early anticipated linkages to the stakeholders. It was anticipated that the stakeholders would react and provide their views and opinions on the project to add value to the design and planning as well as enhancing social and economic benefits an as well as avoiding potential cultural conflicts. The meetings were held as follows:

Dam Area

(i) Londiani area at the dam site location and was chaired by the District Commissioner on 16th April 2018 starting from 10am

(ii) Londiani Town at the social hall chaired by Assistant County Commissioner (ACC 1) on 17th April 2018 starting from 11am

Pipeline Transmission Corridor

(i) Kapkondoo Primary School and was chaired by the District Officer on 17th April 2018 starting from 2pm

(ii) Kipkelion West Social Hall and was chaired by the District Commissioner on 18th April 2018 at 11am

(iii) Barsiele Secondary School and was chaired by the District Officer on 18th April 2018 at 2pm

(iv) Kedowa Town the meeting was chaired by the District Officer on 19th April 2018 at 10pm

(v) Chepseon Market the meeting was chaired by the District Officer on 19th April 2018 at 3pm

(vi) Siret Secondary School and the meeting was chaired by the District Officer for Kipkelion West 0n 20th April 2018 at 10am

(vii) Fort Ternan Coffee Mill the meeting was chaired by the District Officer of the area on 20th April 2018 at 2pm

6.3 In-depth Interviews and Discussions

6.3.1 Overview

In-depth discussions revealed that the water provision in the county is at 40% which is lower than expected margin with over 60% of the population living in the towns; it has increased the demand for the scarce resource. Even those with connections are forced to rely on raw river water as their taps have gone dry. This is compounded by the fact that they still are forced to pay high bills and this has begun to be viewed as extortion. The dam project development in the area was seen as an opportunity for the youth to get employed and to improve their living standards as well as social economic development for the area.

The County's main water sources are shallow wells, roof catchments, boreholes and surface water (rivers). In Kericho County most of residents use improved sources of water and with the rest relying on unimproved sources Kipkelion East constituency has the highest share of residents using improved sources of water at 53% compared to Kipkelion West Sub-county. The average distance to the nearby water resource is 1km.

6.3.2 General Emerging Issues

From all the Consultation forums, various opinions and views were collected. Among the emerging issues ranged from personal linkages, community linkages to regional and nations issues. The project is generally acceptable to a majority of the stakeholders and members of public but conditions of acceptance were as varying as were the stakeholder categories. The following sub-sections have presented the key perceived benefits, fears and concerns as well as suggestions and opinions on improvements and enhanced acceptability.

6.3.3 Social Situations

(i) A majority of the respondents have lived in the area all their lives with only a few having migrated into the project areas from among other places like Kericho, Nakuru and Nairobi,

(ii) The main occupation is farming though a few indicated among other involvements including business, employment within and outside the project area,

(iii) A majority of the respondents are educated up to primary school with a few holding secondary and university education certificates. This situation, however, is associated with the fact that most of the respondents are the landowners who are generally elderly people (>45 years) and above,

(iv) Common diseases and infections are mainly environmental (malaria, influenza, diarrhoea, typhoid, respiratory infections and eye infections,

(v) The most common mode of local travel is walking and motorcycles (commonly known as *boda-bodas*) in accessing the markets and services (schools, health services and

churches). Links to the major towns including Londiani and Kericho, the area is served by Matatus and Local Taxi,

(vi) The project area has low water connectivity as most of these pumped water schemes have outlived their lifespan with some being as old as over 50 years. The water production capacities of all the schemes do not meet the respective water demands besides most of them facing the challenge of operation and maintenance due to high electricity costs of pumping water, so most of the people rely on rain water harvesting and from rivers hence the construction of the dam will ease the burned of the local people from going long journeys to fetch for clean water,

(vii) The project area is well served with electricity (high connectivity) though not all of the people are connected as the main source of energy is kerosene with a smaller percentage using solar energy however, new communication technology has not picked in the area and all relies with the common mobile phones,

(viii) A large percentage of the residents are served with pit latrines for their sanitation needs and only few use septic tanks mostly in government institutions,

(ix) There are a number of community-based organizations in the area, mostly formed by the residents to meet their local needs.

6.4 Public Meetings

6.4.1 Masaita Area

Benefits perceived to emulate from the project include:

(i) Job opportunities for the local people, especially the youth during the construction phase,

(ii) Improvement of infrastructure after the construction of the dam as most roads used during construction period will be damaged, and also Improvement of transport in the area through the development of access road into the dam areas,

(iii) Appreciation of land values in the area following potential opportunities associated with the dam,

(iv) There are opportunities associated with the dam including water supplies to institutions, homes and limited irrigation,

(v) Acquisition of land for the dam construction has a potential economic opportunity for the affected persons,

(vi) Potential for access of water to residents and landowners along the transmission pipeline corridor,

(vii) Crop productivity in the area will increase due to the fact that there will be available water for irrigation,

(viii) Security will improve after the construction of the dam as water is a security issue and has to be guarded and also due to the fact that the area's economy will improve,

(ix) There will be potential social economic improvements of the town as the area will attract a lot of investments and tourists in the area,

(x) Improved living standards as most of the people will get access to clean water that will be also used for small scale irrigation purpose,

(xi) The ultimate benefit of improved water supply for Londiani, Kipkelion, Chepseon, Kedowa, Fort Ternan and Barsiele Towns.

Fears and Concerns

(i) Land acquisition is expected to lead to physical and economic displacement of people and loss of access to the land that provides for economic resources as well as shelters. The land already identified for the construction is owned by different individuals who are utilizing the pieces of land into various land uses ranging from shelter/home, livestock keeping and subsistence Agriculture.

(ii) The process of preparation and especially construction may not be all inclusive allowing the residents to participate in sharing ideas as well as getting opportunities for direct and indirect employment.

(iii) Those without land ownership documents feared that they may not get adequate compensation and/or may completely miss out. This may include those who don't have death certificates but have documents to establish them as the next of kin.

(iv) There were also fears that the government may offer little compensation than that of the market value.

(v) Majority of the people have fears on the compensation process as they fear that the process will be high jacked by middle men acting as brokers.

(vi) The people to be displaced expressed concern on where their alternative settlements will be. Among the questions requiring appropriate plan, therefore, should be undertaken in which the affected persons would be involved with a clear flow of information included;

- Is there government land available for the affected people?
- Will the affected people be facilitated to buy land within the locality?
- Will it be possible to remain within the neighbourhood?
- How will the graveyards be handled?

(vii) Residents left behind after others are resettled may no longer have an opportunity to benefit and still resume to growing arrow roots and fishing from the river.

(viii) The changes of climate brought by dams have also raised some fears among the residents as some stated that the dam will bring about diseases associated with climate change and also Mosquitoes.

(ix) Those downstream raised concerns that the dam may take too long to be filled up with water. This may deny them access to the water for domestic and irrigation within the time before the dam is filled.

(x) Landowners expressed hope that the land adjudication will be completed and title deeds issued before the people are relocated. This will pre-empt the legal/social conflict that could face land acquisition that would in return complicate the project progress.

(xi) It was observed that there will be dust and noise pollutions resulting from the earth works and the construction process of the dam.

(xii) It was observed that delays in construction of the dam and inadequate information has resulted to unnecessary psychological suffering on the residents who have no motivation to further develop their land as they fear of being evacuated.

(xiii) Members of the community, particularly women groups need to be sensitized on the actual value of water for enhanced appreciation and conservation. In this regard, community education and awareness rising should be undertaken through involvement of the local people who understands their own.

(xiv) Regarding the abstraction of water from the dam, the residents wondered what mechanisms will be put into place to enable all to access water for all their requirements without compromising the law. Formation of community groups and obtaining permits would perhaps need to be facilitated.

Figure 27: Public Consultation Meeting at Masaita Primary School

6.4.2 Londiani Social Hall

Social Situations

(i) The main occupation is farming though a few indicated among other involvements including business, employment within and outside the project area,

(ii) There are a number of community-based organizations in the area, mostly formed by the residents to meet their local needs.

(iii) The most common mode of local travel is walking and motorcycles (commonly known as boda-bodas) in accessing the markets and services (schools, health services and churches). Links to the major towns including Londiani, Kedowa and Chepseon towns, the area is served by Matatus.

(iv) Most of the people living in the area are not served by piped water with majority of them relying on water from the rivers and rain water for home consumption and for washing their clothes, with majority of them walking long distances to fetch water.

(v) Common diseases and infections are mainly environmental (malaria, influenza, diarrhoea, typhoid, others include dental problems, arthritis, ulcers, diabetes, hypertension, etc.

(vi) The project area is well served with electricity but not many people are connected with majority using Kerosene as the main energy supply with a few using solar energy.

Perceived Benefits

(i) The community will be assured an all year-round access to water from the dam, directly or through alternative distribution systems (piped supply system or other) than before.

(ii) The dam is expected to create significant economic and social benefits to the communities and contribute to the attainment of the country's priority goals and ongoing national efforts to accelerate economic growth and alleviate poverty.

(iii) Employment opportunities for the local people through employment as casual labourers at the dam during construction period.

(iv) Appreciation of land values in the area following potential opportunities associated with the dam.

(v) It was observed that the dam will be able to control flooding in the area especially to those living downstream of Kipchorian River.

(vi) The county government will be able to spend less on water pumping schemes as most of the water will be connected and distributed through gravity hence reducing on the cost of electricity as the dam also has a hydroelectric generation area for pumping the water.

(vii) Reduction of water borne diseases will be of added advantage to the local people as there will be availability of clean water for consumption.

Fears and Concerns

(i) The landowners in the affected areas expressed concern that the extent of the dam water and buffer area had not been marked on the ground. This makes it difficult to visualize how much land and development they are likely to lose,

(ii) With enhanced water availability and land productivity, there is a possibility more people will move into the areas. This scenario will exert stress and pressure on resources including land, forests, water supply and energy as well as infrastructure,

(iii) The water body will have the capacity to attract new species of animals among them crocodiles, hippos, snakes, birds and new insect types. This scenario may partly contribute to safety risks to the residents from dangerous animals such as crocodiles and hippos unless collaboration with relevant authorities (e.g. KWS) is considered during the operation stage,

(iv) Widened gender disparities will be experienced. This will be occasioned by either imposing a disproportionate share of social costs on women or through an inequitable allocation of the benefits generated. The general impoverishment of communities and the social disruption, trauma and health impacts resulting from displacement will typically have more severe impacts on women. The employment created during the construction of large dams generally benefits men,

(v) The project is likely to separate kinship, disrupt social networks and interfere with traditional support systems leading to serious conflicts at various levels within the project area and at host destinations,

(vi) The residents suggested fears of time allowed to resettled that the time suggested was not enough for them,

(vii) Influx of people in the area may cause security issues as the dam construction will create job opportunity with people from different areas coming to work at the dam especially the construction workers brought by the constructor,

(viii) The of construction of the dam will lead to noise and dust pollution resulting to the earth works and excavation process as the trucks moving around the project area will be omitting dust that may affect the people but this is only for a short term so the contractor should look for ways to address the issues.

Figure 28: Public Consultation Meeting at Londiani Social Hall

6.4.3 Kapkondoo Area

Social Situations

(i) There are a number of community-based organizations in the area, mostly formed by the residents to meet their local needs,

(ii) The main occupation is farming though a few indicated among other involvements including business, employment within and outside the project area,

(iii) There are a number of community-based organizations in the area, mostly formed by the residents to meet their local needs,

(iv) The most common mode of local travel is walking and motorcycles (commonly known as boda-bodas) in accessing the markets and services (schools, health services and churches). Links to the major towns including Londiani, Kedowa and Chepseon towns, the area is served by Matatus,

(v) Most of the people living in the area are not served by piped water with majority of them relying on water from the rivers and rain water for home consumption and for washing their clothes, with majority of them walking long distances to fetch water,

(vi) Common diseases and infections are mainly environmental (malaria, influenza, diarrhoea, typhoid, others include dental problems, arthritis, ulcers, diabetes, hypertension, etc.

(vii) The project area is well served with electricity but not many people are connected with majority using Kerosene as the main energy supply with a few using solar energy.

Perceived Benefits

(i) Creation of employment to the local people while the pipeline is being constructed the youth will be employed as casual labourers.

(ii) The pipeline construction will be able to reduce the social evils around the area from gambling and drinking menace.

(iii) It shall reduce the time spend by women to go and fetch water from the rivers and time will be spend on doing other economic benefits.

(iv) Potential for access of water to residents and landowners along the transmission pipeline corridor,

(v) Increase of food production in the area as the people will be able to plant food crops like Kales, Cabbages and Tomatoes that they will sell and earn a living.

(vi) Improvement of social lives as the people will get income from food crops sold using the water.

(vii) Reduction of water borne diseases brought about by the use of un clean water.

Fears and Concerns

(i) Challenge of land valuation on affected people where the pipeline will touch their land,

(ii) Potential damage to and loss of productive farmland. Destruction of community productive bases in agriculture,

(iii) Evection of the people who will be affected by the pipeline will lead to social pressure on families,

(iv) Potential dust and noise pollution as the excavation works begins,

(v) Disruption of access roads leading to their homes as some will be affected when the construction works begin due to this the constructor is advised to provide better access roads,

(vi) Safety of the local people especially the old and young children because of the huge trenches that will be dug to accommodate the pipeline during construction time.

Figure 29: Public Consultation at Kapkondoo Primary School

6.4.4 Kipkelion West District

Social Situations

(i) There are a number of community-based organizations in the area, mostly formed by the residents to meet their local needs,

(ii) The main occupation is farming though a few indicated among other involvements including business, employment within and outside the project area,

(iii) There are a number of community-based organizations in the area, mostly formed by the residents to meet their local needs,

(iv) The most common mode of local travel is walking and motorcycles (commonly known as *boda-bodas*) in accessing the markets and services (schools, health services and churches). Links to the major towns including Londiani, Kedowa and Chepseon towns, the area is served by Matatus,

(v) Most of the people living in the area are not served by piped water with majority of them relying on water from the rivers and rain water for home consumption and for washing their clothes, with majority of them walking long distances to fetch water,

(vi) Common diseases and infections are mainly environmental (malaria, influenza, diarrhoea, typhoid, others include dental problems, arthritis, ulcers, diabetes, hypertension, etc.

(vii) The project area is well served with electricity but not many people are connected with majority using Kerosene as the main energy supply with a few using solar energy.

Perceived Benefits

(i) The community will be assured an all year-round access to water from the dam, directly or through alternative distribution systems (piped supply system or others) than before,

(ii) The community will also be assured of water for their animals,

(iii) Job opportunities for the local people, especially the youth during the construction phase,

(iv) The women and girls will have less time going to fetch water from the rivers and this will enable them to do other economic activities that will improve their lives and girls will be able to go to school and not waste time fetching water,

(v) Increase of food production in the area as the people will be able to plant food crops like Kales, Cabbages and Tomatoes that they will sell and earn a living,

(vi) Reduction of water borne diseases brought about by the use of unclean water.

Fears and Concerns

(i) The process of preparation and especially construction may not be all inclusive allowing the residents to participate in sharing ideas as well as getting opportunities for direct and indirect employment,

(ii) There were also fears that the government may offer little compensation than that of the market value,

(iii) There were also some fears and concerns of the safety of the people during construction of the pipeline as there will be huge trenches that will be dug to accommodate the pipes hence the constructor is advised to show warning signs and allocate path ways that are safe for the locals to cross,

(iv) The landowners in the affected areas expressed concern that the extent of the pipeline area had not been marked on the ground. This makes it difficult to visualize how much land and development they are likely to lose,

(v) Members of the community, particularly women groups need to be sensitized on the actual value of water for enhanced appreciation and conservation. In this regard, community education and awareness rising should be undertaken through involvement of the local people who understands their own,

(vi) Some expressed concerns on the benefits of the water as some believe that not all of them will benefit from the water supply,

(vii) Disruption of access roads leading to their homes as some will be affected when the construction works begin due to this the constructor is advised to provide better access roads,

(viii) Those without land ownership documents feared that they may not get adequate compensation and/or may completely miss out. This may include those who don't have death certificates but have documents to establish them as the next of kin,

(ix) There were also fears that the employment criteria that will be used will not be correct as some fear that the contractor will come with his own people, hence the contractor is advised to give first employment opportunities to the local before going elsewhere.



Figure 30:Public Participation Meeting at Kipkelion West Social Hall

6.4.5 Barsiele Town

Social Situations

(i) There are a number of community-based organizations in the area, mostly formed by the residents to meet their local needs,

(ii) The main occupation is farming though a few indicated among other involvements including business, employment within and outside the project area,

(iii) There are a number of community-based organizations in the area, mostly formed by the residents to meet their local needs,

(iv) The most common mode of local travel is walking and motorcycles (commonly known as *boda-bodas*) in accessing the markets and services (schools, health services and

churches). Links to the major towns including Londiani, Kedowa and Chepseon towns, the area is served by Matatus,

(v) Most of the people living in the area are not served by piped water with majority of them relying on water from the rivers and rain water for home consumption and for washing their clothes, with majority of them walking long distances to fetch water,

(vi) Common diseases and infections are mainly environmental (malaria, influenza, diarrhoea, typhoid, others include dental problems, arthritis, ulcers, diabetes, hypertension, etc.

(vii) The project area is well served with electricity but not many people are connected with majority using Kerosene as the main energy supply with a few using solar energy.

Perceived Benefits

(i) Job opportunities for the local people, especially the youth during the construction phase,

(ii) Availability of clean water for domestic use and consumption throughout the year,

(iii) The women and girls will have less time going to fetch water from the rivers and this will enable them to do other economic activities that will improve their lives and girls will be able to go to school and not waste time fetching water,

(iv) Availability of food crops from the use of water,

(v) Improvements of house hold living standards as the locals will be able to plant food crops especially the women who will sell and earn a living,

(vi) Reduction of water borne diseases that are brought by the use of unclean water,

(vii) Elevation of the town as the water will enable the locals to plant crops and selling them thus making the economy of the area to improve,

(viii) The locals will no longer have to buy water for home consumption,

(ix) Empowerment of the local people especially the youth, who will get skills from the employment opportunities.

Fears and Concerns

(i) The locals expressed concerns over sensitization on the use of water especially the women,

(ii) The women and girls will have less time going to fetch water from the rivers and this will enable them to do other economic activities that will improve their lives and girls will be able to go to school and not waste time fetching water,

(iii) The locals expressed fears that the distribution of water may be unfair as the county tasked with the distribution may do it only for the people who have high places in the towns, (the wealthy),

(iv) Safety of the people living adjacent to the pipeline in case it breaks down was another concern,

(v) Dust and noise pollution when the construction begins was a concern to the residents,

(vi) Labour discrimination or the criteria that will be used to employ the local people was a concern as the people said that the contractor may come with his own people thus giving the local youth a small percentage of the labour.



Figure 31:Public Participation at Barsiele Secondary School

6.4.6 Kedowa Town

Social Situations

(i) There are a number of community-based organizations in the area, mostly formed by the residents to meet their local needs,

(ii) The main occupation is farming though a few indicated among other involvements including business, employment within and outside the project area,

(iii) There are a number of community-based organizations in the area, mostly formed by the residents to meet their local needs,

(iv) The most common mode of local travel is walking and motorcycles (commonly known as *boda-bodas*) in accessing the markets and services (schools, health services and churches). Links to the major towns including Londiani, Kedowa and Chepseon towns, the area is served by Matatus,

(v) Most of the people living in the area are not served by piped water with majority of them relying on water from the rivers and rain water for home consumption and for washing their clothes, with majority of them walking long distances to fetch water,

(vi) Common diseases and infections are mainly environmental (malaria, influenza, diarrhoea, typhoid, others include dental problems, arthritis, ulcers, diabetes, hypertension, etc.

(vii) The project area is well served with electricity but not many people are connected with majority using Kerosene as the main energy supply with a few using solar energy.

Perceived Benefits

(i) The locals expressed concerns over sensitization on the use of water especially the women,

(ii) The women and girls will have less time going to fetch water from the rivers and this will enable them to do other economic activities that will improve their lives and girls will be able to go to school and not waste time fetching water,

(iii) The locals expressed fears that the distribution of water may be unfair as the county tasked with the distribution may do it only for the people who have high places in the towns, (the wealthy),

(iv) Safety of the people living adjacent to the pipeline in case it breaks down was another concern,

(v) Dust and noise pollution when the construction begins was a concern to the residents,

(vi) Labour discrimination or the criteria that will be used to employ the local people was a concern as the people said that the contractor may come with his own people thus giving the local youth a small percentage of the labour.

Fears and Concerns

(i) The residents that use the quarry expressed fears that the process of constructing a pipeline will interfere with the social lives thus affecting their income,

(ii) There was also a concern in the employment process as they think that it will not be fair with majority stating that the youth may miss out in the process,

(iii) There were also fears that the government may offer little compensation than that of the market value,

(iv) Those affected by the pipeline stated that the Compensation process may not be fair as many of the local people expressed fears that the process may be hijacked by middle men or brokers thus taking most of the money that will be given to them,

(v) Security concerns on safety of the people during construction phase was a fear to the people as many stated that the huge trenches that will be dug may be of danger to the people especially the elderly and small children going to school,

(vi) There was concern on the health status of the town as the locals stated that there may be increase of immorality in the town thus increasing communicable diseases like STIs.

6.4.7 Chepseon Town

Social Situations

(i) There are a number of community-based organizations in the area, mostly formed by the residents to meet their local needs,

(ii) The main occupation is farming though a few indicated among other involvements including business, employment within and outside the project area,

(iii) There are a number of community-based organizations in the area, mostly formed by the residents to meet their local needs,

(iv) The most common mode of local travel is walking and motorcycles (commonly known as *boda-bodas*) in accessing the markets and services (schools, health services and churches). Links to the major towns including Londiani, Kedowa and Chepseon towns, the area is served by Matatus,

(v) Most of the people living in the area are not served by piped water with majority of them relying on water from the rivers and rain water for home consumption and for washing their clothes, with majority of them walking long distances to fetch water,

(vi) Common diseases and infections are mainly environmental (malaria, influenza, diarrhoea, typhoid, others include dental problems, arthritis, ulcers, diabetes, hypertension, etc.,

(vii) The project area is well served with electricity but not many people are connected with majority using Kerosene as the main energy supply with a few using solar energy.

Perceived Benefits

(i) Increase in farm production as the people will use the water to farm for their produce,

(ii) Availability of clean water for home use and for consumption to the people,

(iii) Less time spent on fetching water for home use thus women will use this time to do others work related activities to gain a good living standard,

(iv) Creation of job opportunities to the youth and other community members during construction phase,

(v) Development in the area will be boosted as many of the people will sell their produce at the market and gain income from them,

(vi) Reduction on water borne diseases that are brought by un clean water,

(vii) Reduction on the poverty levels among the local people as many will be able to get sustainable income from the sales of their farm produce.

Fears and Concerns

(i) Many of the people expressed fears of the money that will be compensated from affected land,

(ii) Employment opportunities was also a concern as many thoughts that the youth may not get an opportunity,

(iii) The local expresses fear and concerns on the security issues regarding the breakdown of the pipes many fears that if the pipes break down it may cause flooding and loss of lives,

(iv) There was also a security concern on the influx of workers coming from other areas as the local's fear that they may be increase on insecurity,

(v) The members suggested that there may be increase of accidents during construction as their animals and children may be knocked down by moving excavators and lorries that will be working on the pipeline,

(vi) Others stated that there may be a problem in connectivity by the county government as others don't trust the county government do distribute water to their locations.

6.4.8 Siret Area

Social Situations

(i) There are a number of community-based organizations in the area, mostly formed by the residents to meet their local needs,

(ii) The main occupation is farming though a few indicated among other involvements including business, employment within and outside the project area,

(iii) There are a number of community-based organizations in the area, mostly formed by the residents to meet their local needs,

(iv) The most common mode of local travel is walking and motorcycles (commonly known as *boda-bodas*) in accessing the markets and services (schools, health services and churches). Links to the major towns including Londiani, Kedowa and Chepseon and Kipkelion towns, the area is served by Matatus,

(v) Most of the people living in the area are not served by piped water with majority of them relying on water from the rivers and rain water for home consumption and for washing their clothes, with majority of them walking long distances to fetch water,

(vi) Common diseases and infections are mainly environmental (malaria, influenza, diarrhoea, typhoid,

(vii) The project area is well served with electricity but not many people are connected with majority using Kerosene as the main energy supply with a few using solar energy.

Perceived Benefits

(i) Job opportunities for the youth and the locals during construction period,

(ii) Availability of clean water for home use and for consumption,

(iii) Reduction of time spent on fetching water from the rivers as most go as long as 2-3km thus by the availability of tap water the residents especially the ladies will use that time in doing other gainful activities,

(iv) Reduction of water borne diseases that are mainly contracted by the use of untreated water,

(v) Economic development in the area as most of the local people will be able to sell their products in the town also people will also invest in the town due to availability of water especially hotels,

(vi) Infrastructural development due to the fact that the contractor will improve the roads damaged during the construction period,

(vii) Appreciation of land values in the area following potential opportunities associated with the pipeline,

Fears and Concerns

(i) The methods and criteria used for employment is a concern to the people as many believe that most of the youth may not get that opportunity,

(ii) The methods of compensation are also a concern to the people as many thinks that they may not be given the deserved price for their land,

(iii) Damages of existing infrastructure in the area as the machines used for digging may shake their house and leading them to fall,

(iv) Dust and noise pollution during construction period Is of concern the excavation works begins,

(v) Security issues regarding the spilling of the pipes if they happen to burst up is of concern to the local people most of them stated that they may flood the area leading to damages,

(vi) Influx of workers in the area is a course of security as many things that many workers will

lead to increase in insecurity,

(vii) The local people suggested that the contractor should at least leave the area as found or improve on the road damaged by the huge excavators and lorries transporting materials.



Figure 32: Public Participation at Siret Secondary School

6.4.9 Fort Ternan Town

Social Situations

(i) There are a number of community-based organizations in the area, mostly formed by the residents to meet their local needs,

(ii) The main occupation is farming though a few indicated among other involvements including business, employment within and outside the project area,

(iii) There are a number of community-based organizations in the area, mostly formed by the residents to meet their local needs,

(iv) The most common mode of local travel is walking and motorcycles (commonly known as boda-bodas) in accessing the markets and services (schools, health services and churches). Links to the major towns including Londiani, Kedowa and Chepseon and Fort Ternan towns, the area is served by Matatus,

(v) Most of the people living in the area are not served by piped water with majority of them relying on water from the rivers and rain water for home consumption and for washing their clothes, with majority of them walking long distances to fetch water,

(vi) Common diseases and infections are mainly environmental (malaria, influenza, diarrhoea, typhoid, others include dental problems, arthritis, ulcers, diabetes, hypertension, etc.,

(vii) The project area is well served with electricity but not many people are connected with majority using Kerosene as the main energy supply with a few using solar energy,

(viii) The main economic activity in the area is farming with majority of the people carrying out subsistence farming.

Perceived Benefits

(i) Appreciation of land values in the area following potential opportunities associated with the dam,

(ii) Job opportunities for the local people, especially the youth during the construction phase,

(iii) There are opportunities associated with the pipeline including water supplies to institutions, and tourism,

(iv) Acquisition of land for the pipeline construction has potential economic opportunities for the affected persons,

(v) Potential for access of water to residents and landowners along the transmission pipeline corridor,

(vi) Potential enhanced pool market for the farm produce in the area, especially in regard to associated supply of water in the area,

(vii) Time spent for fetching water will be reduced as most of the residents will have availability of tap water in their homes thus most of the women will undertake gainful form of income generation activities and the young girls will be able to go to school without getting to go home and fetch for water,

(viii) Improved infrastructure the area as the roads damaged will be improved and due to the fact, the availability of clean water will be able to allow investors to come,

(ix) Promotion of growth and development in the area as the construction of the pipeline will enable development of other facilities in the area that will boost the economy of the town,

(x) Improve living standards of the people as many of them will be able to sell farm produce and earn a living and decrease of water borne related diseases like typhoid,

(xi) Schools will be able to get clean water for the students and also use the water for cooking that will ease the burden of buying water,

(xii) Reduction of water borne diseases that are brought by the use of unclean water and improved sanitation.

Fears and Concerns

(i) The local people have a concern on the lack of equal distribution of jobs opportunities,

(ii) The residents were concerned about equal distribution of water to their homes,

(iii) Damages of existing infrastructure in the area as the machines used for digging may shake their house and leading them to fall,

(iv) Dust and noise pollution during construction period Is of concern the excavation works begins,

(v) Increase of insecurity due to the influx of the people coming to work at the pipeline,

(vi) The local people suggested that the contractor should plant tress that have been cut down during the construction period,

Figure 33:Public Participation Meeting at Fort Ternan Coffee Mills

6.5 Key Suggestions and Opinions

(i) Generation of fugitive dust in the atmosphere during excavation and civil works construction should be contained. Mitigation measures should be incorporated into the contracts to provide for dust control by providing water spraying during excavation and filling, by surfacing access roads with no dust generating materials, and by proper stockpiling and cover for construction materials,

(ii) The project may lead to further marginalization of the older women children who are orphans should be helped through special programmes built within the project financing,

(iii) Necessary plantation of inhabited areas should be taken up under social forestry or agro-forestry schemes,

(iv) There were suggestions that the PAPs be given basic investment knowledge to enhance associated benefits to the families,

(v) Potentially adverse environmental and socio-economic effects in the form of displacement, disruptions of livelihoods and loss of assets and property of project affected persons (PAPs) will be experienced. A Resettlement Action Plan (RAP) is one of the major means of addressing these problems in a planned and coordinated manner,

(vi) The RAP process should involve all family members while payment need to be undertaken with both of the land-owning couples so that none of them elope with the money. The divorced women, children and unmarried women should also be included as the beneficiaries of the resettlement money. Compensation money to be paid to landowners directly,

(vii) The established potential significance and often irreversible losses of cultural resources due to dam construction should be adequately considered in the cultural heritage management planning process,

(viii) There is need for informed about the start and construction duration for the project early in advance to enable affected persons plan their lives,

(ix) There was also a request for early notice for relocation of graves and compensation for the relocation. There may be need to identify a common place for relocation of the graves that will be exhumed. Further, advance information should be provided on when the census begins, the valuation and the total discloser of the amount of money to be paid,

(x) During the whole process, there is need for the committee to be transparent at all times. The resettlement process should be humane as many in the past have been treated very badly during valuation,

(xi) Those affected should be allowed to harvest the trees they have planted. Along the same line, there is need to draw a memorandum of understanding with NWHSA for the community to be allowed to benefit from the dam in terms of fishing among other uses of the water.

CHAPTER 7: ANTICIPATED IMPACTS AND MITIGATION MEASURES

7.1 Impacts Overview

Construction of the dam is beneficial to the target populations of Kipkelion East and West (Kericho County) and the country in general. However, dam developments have their share of ecological as well as social challenges that need to be addressed. Impoundment of water has implications on the upstream systems through shifting of ecosystem boundaries upstream as a result of changes in flood regimes. At the proposed Londiani dam site the inundated areas are habited by people and utilized for agricultural, settlements and urban development purposes.

Implications from the inundation ranges from slowed silt, nutrients and pollutant transportation rate to downstream zones, potential loss and/or introduction of species (both plants and animals), displacement of social and economic features and land use changes for the residual riparian landowners. Downstream impacts are associated with regulated flows of the affected rivers/streams, dam safety risks, deprived sediment loading and land use changes due to the availability of water. Summary of the major linkages on land use trends and the proposed dam location as well as ecological transformation is briefly presented in the following Sub-sections.

7.1.1 General Impacts Outline

The anticipated impacts outline comprises the following;

(i) The dam is likely to attract population to the project areas with potential land use changes, increased demands for settlements, land economic competition activities, cultural conflicts and public security,pressure on amenities,

(ii) The downstream hydrology of Kipchorian River and its tributaries (Masaita and Gathe) will slightly change. Retention of flood flows and abstraction of water for supply to the beneficiary areas implies non-availability of the equivalent flow for social and ecological requirements downstream the river. However, the dam is well moderate the flows downstream during the low flow periods,

(iii) The dam will be the deposition of he main pollutants from the catchments including agrochemical residuals, silt nutrients from pit latrines and cattle pens as well as urban wastes from the markets. Other sources of pollutants to the dam during and after construction include graves, soils from long term sanitation facilities. Cumulation of the pollutants in the dam water (in the sediments and water phases) may also slowly get discharged downstream effectively impacting on the water quality,

(iv) Retention of sediments in the dam and reduced flood areas downstream the dam will reduce the effective productivity of the flood plains ecologically as well as from the riverline agricultural cropping,

(v) There is potential migration of wildlife species to the dam area with potential safety conflicts,

(vi) The project will affect on critical amenities serving the communities including access roads and bridges, water supply pipelines, power lines and water access points along the rivers. Relocation of these services/amenities will be necessary .

The water treatment works and the treated water transmission pipeline are not anticipated to pose significant noteworthy impacts to the environment. However, the construction may have limited and short-lived social impacts that may include safety risks, minor disruption to access roads localized soil erosion and siltation of the river bed.

7.1.2 General Mitigation Measures on General Impacts

The mitigation measures under this document will serve as the main reference guide towards the identified impacts associated with the project construction and operations thereafter. The ESIA Report presents specific mitigation actions and a comprehensive environment and social management plan for integration into the project implementation. For effective integration of the mitigation measures, close collaboration will be required between the Contractor, the Project Supervision, the Client and the Stakeholders including the County Government

7.2 Environmental Impacts and Mitigation Measures

The overall impacts arising from the dam construction are positive with respect to the social and economic perspective. Londiani Dam will supplement water supply to Kipkelion East and West. These being the main benefit from the project specific positive impacts including the following among the key negative impacts anticipated include the following;

7.2.1 Sediment Generation and Transport

Construction Impacts

Construction, activities involving massive earth works will generate soil that will be mobilized into the lower bed downstream by rainwater. Siltation of the lower downstream will affect the river hydrology and ecology. Associated impacts will include;

Silt is a transport media for organic matter and agrochemical residuals with constant effect on water quality. Construction of the water treatment works will also involve significant excavations and earth works. The works has potential to release sediments discharge into Kipchorian River. Cutting and excavation of the water pipelines tunnels has a potential to discharge soil sediments into natural drains and transported into Kipchorian River.

Mitigation Measures

- ✓ *It is recommended that construction be undertaken during the dry conditions to minimize erosion when the soil is loosened. The top soil excavated be retained on silt using silt nets or silt interception pans downstrea,*
- ✓ *A retention basins/check dam may be established downstream of the dam wall location which to retain excessive silt during construction,*
- ✓ *The steep slopes surrounding the dam construction area should be stabilized, and protected to reduce on erosion and potential landslides as a result of deep cutting,*
- ✓ *The Prived residents with alternative access to clean drinking water during the construction period. Such as to include additional safe shallow wells, access to other streams or delivery of clean water with tankers to schools and institutions,*
- ✓ *Develop a catchment management plan in consultation with other dam lead agencies,*
- ✓ *Regular de-silting of retention basins and proper silt disposa,*
- ✓ Excavations of the water pipeline channels will also be undertaken such as to prevent soil transport into the adjacent river streams.

Post-Construction Impacts

Generally, dams and reservoirs will hold approximately 90% of silt generated from the catchments with main effect of reduced storage capacity. The silt generations depend on the catchment

characteristics i.e. soil types, topography, land use and vegetation cover levels. The slope of the Kipchorian River is estimated at less than 1% and the flow is physically sluggish, a situation that indicates a higher retention and storage in the dam.

Gross silt production is the amount of sediment eroded and removed from the catchment area and transported to the dam. With the establishment of the dam, sediment deposition will occur due to reduced velocities and turbulence of moving water silt retention in the dam will deny downstream flood plains the opportunity for production in the dam reservoir.

Washout activities of the water treatment facility including backwashing of the filters and washout of the storage tanks will generate sediments and solid materials likely to be disposed of into Kipchorian River downstream. In addition, water consumer points will generate surface runoff into open drains and perhaps streams transporting silt.

Mitigation Measures

- ✓ *Encourage re-afforestation and improved farming systems upstream of the dam,*
- ✓ *Erosion and sediment monitoring and control plan should be prepared for the lifetime of the project,*
- ✓ *There should be a progressive catchment management plan targeting Kipchorian River sub-basins as well as the tributaries feeding into it. In this regard, involvement of the communities, landowners and relevant authorities will be necessary,*
- ✓ *The design of the dam should provide for scouring or regulated discharge of silt to downstream riverine for sustenance of agricultural and ecological productivity,*
- ✓ *Develop a deliberate initiative for a collaborative monitoring of river flood basins productivity requirements and their reliance to the silt loading for all the dammed rivers to guide an effective silt management at the dams' outlets,*
- ✓ *Provide containment of washout residuals and silt (interceptors for solid materials) at the locations to prevent the solid materials discharging directly into Kipchorian River,*
- ✓ *silt and solid materials obtained from silt traps should be disposed off onto land, being neutral and inert,*
- ✓ *Potential sources of silt including consumer tanks, inspection chambers and washout valves shall be provided with cutoff drains to control silt transportation by spilling water.*

7.2.2 Effects on Water Quality

Construction Impacts

Water quality in the local water courses may be affected by;

(i) Site clearing with the disruption of the natural drainage patterns and hence pollutants transport,

(ii) Construction earth works will cause water turbidity downstream kipchorian river,

(iii) Potential water contamination from hydrocarbons release mainly from contraction machineries,

(iv) Water pollutants arising from decomissioning of pit latrines ,cattle pens,graves and homesteads,

(v) Vegetation residual and humic soils leading to elevated organic pollutant levels,

(vi) Construction of the water treatment works and the treated water transmission pipelines do not have significant impacts on water quality apart from the potential silt loading from the excavation activities.

Mitigation Measures

- ✓ *All point sources of pollution within and around the dam including graves, pit latrines and livestock sheds within 30m of the buffer line shall be decommissioned or relocated through approved procedures and under supervision before construction begins (this will be part of the site clearing stage),*
- ✓ *Protective measures will be applied u during site clearing and construction to minimize erosion and sedimentation of the streams down stream,*
- ✓ *Any water abstruction should be permited and inline with WRA regulations,*
- ✓ *Strict adhearance to water quality regulations,*
- ✓ *Ensure rehabilitation works of the intake facility takes the shortest time possible to minimize turbid effects of Kipchorian River,*
- ✓ *Control discharges of oil and grease from construction equipment. Machinery service bays be concrete with bunding and a roof while drains are fitted with interception of oils and grease for safe disposal*

Post-Construction

(i) The dam water quality is faced with risk from the growing market centers via surface runoff with among other pollutantsorganic matter (including sewage), solid waste materials and commercial wastes from stores and workshops.The points of pollution are Kamuingi and Barsiele

(ii) Water treatment process has the potential for water pollution associated with by-products residual chemicals,backwashing water,sludge etc,

(iii) Discharge from cattle pens settlement will likely to affect the water quality,

(iv) Nutrients deposited into the dam from agriculture activities may lead to eutrophication rendering the water more expensive to treat and growth of the aquatic vegetation hampering the free flow of the water at the offtake installations,

(v) Reduction in the storm flow of water downstream may lead to increased concentration of pollutants such as agrochemical residualsespecially during the dry season arising from low dilution capacity,

(vi) The water user areas in Kipkelion East and West sub-counties have the potential of water contamination where pipelines cross with wastewater lines and waste dumps risking the health of the target consumers.

Mitigation Measures

- ✓ *Encourage re-afforestation and better farming systems in the catchment areas for protecting the dam,*
- ✓ *Institute a water quality monitoring system, programmes and maintaining appropriate records on water quality,*

- ✓ *Enhance 24hr security of the dam to prevent possible criminal acts for the security of the public,*
- ✓ *In order to safeguard the dam from water contamination arising from the settlements and the markets, the design should provide appropriate isolation of the dam through CUT-OFF drains diverting local surface runoff from the dam such as to discharge downstream of the dam wall,*
- ✓ *Avoid sinking of pit latrines and graves within 50m from the dam buffer zone to reduce chances of water contamination,*
- ✓ *Ensure catchment management plan prescribes silt management upstream,*
- ✓ *Improve on sanitation and hygiene practices in settlments and market places close to the dam catchment area,*
- ✓ *Educate and sensitize the locals on proper waste management practices to control illegal open dumping,*
- ✓ *Ensure control of nutrients flow and institute monitoring for continuous mitigation of eutrophication in the dam and downstream water bodies,*
- ✓ *Ensure that the clean water pipelines are concreted where they cross with waste water lines or cross waste dumps toavaoid contamination.*

7.2.3 Impacts on Air Quality

Construction Impacts

The main sources of emissions during construction include dust arising from site clearing, earthworks, traffic movements, loading and unloading of materials, stock piling of materials and soil movement. Dust emissions may also be generated at material borrow areas and quarry sites and the concrete processing plant. In addition, exhaust emissions from the contractor's machinery and vehicles could contribute to air pollution. Also, emissions from burning waste generated contribute to air pollution. Aerial dust may affect the health of residents, pollination for agricultural crops as well as the natural flora.

Mitigation Measures

- ✓ *Ensure proper maintenance of the construction equipments and machinery to minimise emission,*
- ✓ *Practice dust control measures such as water sprinkling,*
- ✓ *Limit speed for the construction and trucks along the acess roads for reduced dust,*
- ✓ *Undertake earthworks under dump conditions to reduce dust,*
- ✓ *Ensure solid waste management practices are observed at both construction and camp sites,*
- ✓ *Use of manual labour as compared to machines and equipment to best way possible,*
- ✓ *Provision of PPEs to all workers and strict adherence,*
- ✓ *Avoid burning of cleared vegetation*

Post-Construction Impacts

(i) Introduction of intence vegetation around dam will significantly moderate local climate and landscape,

(ii) Limited benthic conditions in the deep levels of the dam water could affect the water quality,

(iii) It is assumed that pumping will be electric driven to ensure no aerial emissions are anticipated from the project.Application of disel pumps will have effect on aerial emission.

Mitigation Measures

- ✓ *Ensure effective scouring as appropriate to reduce silt and also accumulation of organic matter in the lower layers of the dam,*
- ✓ *Reafforestation and replacement of fell down tree species,*
- ✓ *Provide acoustic features to absorb exess noise in the generator room.*

7.2.4 Impacts on Hydrology

Construction Impacts

Impact on hydrology of Kipchorian River is dependent on the design specification, purpose of the dam and the dam operation requirements. Dam construction works will;

(i) Temporaliliy Interrupt the river flow regim of the river with consequence of change in the river stream flow patterns downstream,

(ii) Silt loading of downstream riverbed from excavations works with potential changes in the river discharge,

(iii) Reduce avarage high water levels downstream the basin,

(iv) Potential river water abstruction for construction use,

(v) Potential alteration of the local drainage system through obstruction and earth moving activities during the construction.

Mitigation Measures

- ✓ *Ensuring complience with water resource regulations at all times .At least 30% of the base flow should always flow in the stream to sustain ecological and social requirements downstrea,*
- ✓ *Reactivating gauging stations around the dam and downstream to monitor effects of the dam to the river basin over time,*
- ✓ *Ensure diversions of the river during construction has limited effects to the downstream river flow,*
- ✓ *Appropriate silt control at the construction areas to avoid siltation of the river downstream,*
- ✓ *Use of manual labor as compared to machinery along the riverbanks to the extent*

possible.

Post-Construction Impacts

(i) There would be consequential reduction in the stormwater flow in Kipchorian river slightly affecting related social ecological opportunities,

(ii) The dam will moderate downstream flows to a standard trend all year around,

(iii) Storage of flood flow during the rains will be released gradually for resistance where there is acess,

(iv) The dam will also retain sedimants for protection of downstream lower beds but also gradual release of sedimants for reductivity,

(v) Downstream dependants of strom flows will be denied the opportunity,

(vi) Constant distribution of silt depositions (land fertility for downstream farmers) will be confined on a narrower flood plain since flood flows will be reduced.

Mitigation Measures

- ✓ *All natural drains in the catchment areas be delineated for management and protection to reduce entry of silt and pollutants into the dams. Protection may include soil erosion control measures, vegetation enhancement and introduction of silt traps at farm levels,*
- ✓ *Monitor the hydrology of Kipchorian River with respect to inflow rates, silt levels and water quality trends over a duration of time.*

7.2.5 Impacts at Material Site

Construction

Rock fill dam will require large volumes of hard stone boulders and clay gravel for construction. These materials are sourced outside the project area or identified borrow and quarry sites by contractor. Quarrying and excavation activities have significant damage to land (loss of vegetation, loose top soil, air pollution and noise and vibration. Quarry site for the main dam has been identified short distance from dam embankment while gravel borrow area is yet to be identified.

Mitigation Measures

- ✓ *Ensure provisions of (PPEs) personal protective equipment from dust and noise (dust masks and ear plugs),*
- ✓ *Prepare rehabilitation plan for material sites upon exhaustion or project completion,*
- ✓ *Obtain appropriate approvals and management plans for material sites outside the project areas. This will also include consents from the respective landowners,*
- ✓ *Oil storage should be slubbed and provided with oil interceptors and clean exit drains from the material site,*
- ✓ *Environmental impact assessment to be undertaken prior to extraction of materials from identified sites and approved by NEMA,*
- ✓ *Materials haulage and storage to observe environmental control measures including dust control, safety measures, conflicts with other road users, etc.*

7.2.6 Loss of Biodiversity

Dam construction implies clearing and removal of vegetation cover (trees, shrubs and crop cover). The impacts will arise as follows;

(i) Removal of riverine vegetation at the dam catchment location including reeds and grasses Potential removal of trees including shrubs and ground cover grasses along the dam site, transmission pipeline route and tank locations,

(ii) The proposed site for the water treatment plant is on a clear land covered with grass and limited trees cover that will be removed,

(iii) The water pipeline (from the treatment plant to distribution tank reservoir and later service points) may have various affect the vegetation on road reserves,

(iv) Potential habitat disruptions from tree felling which may lead to extinction of some bird species.

Mitigation Measures

- ✓ *Make tree counts at the construction area for replacement purposes,*
- ✓ *Prepare a vegetation management plan to be integrated with catchment management plan for implementation,*
- ✓ *Provide environmental awareness to all employees, minimizing vegetation clearance by clarly demarcating th work areas.*

7.2.7 Waste Management

Dam construction activities will result to the increase waste generation (solid and liquid), workers on site and camp sites will generate foul waste during their day to day operation. The generated waste needs proper handling to prevent diseases like typhoid and cholera. Also, solid waste like bottles, organic waste food and construction materials debris will be generated during project cycle. Spoil disposal from excavation may be nuisance at disposal destination points to the neighbouring land uses and ecological features.

Mitigation Measures

- ✓ *Camp sites shall be provided with sound waste handing receptacles,*
- ✓ *Provide temporary sanitary facilities for construction workers at a clean state,*
- ✓ *Adopt appropriate waste management practices in accordance with the regulations,*
- ✓ *Spoil disposal should be disposed of appropriately,*
- ✓ *Wastes to be segregated as recyclable and land fill and combustible,*
- ✓ *Construction wastes (debris, scrap metals, timber and plastics) should be recycled to the extentpossible,*
- ✓ *Contract waste service provider for municipal waste management.*

7.2.8 Unaccounted for Water

Construction

There are no possibilities of water losses during the construction phase.

Post-Construction

There is tendency of misuse of water at service points from an attitude that the water comes easily the cost notwithstanding. Other avenues of water loss include burst pipes, leaking taps and overflowing storage tanks.

Mitigation Measures

- ✓ *Monitor the reservoir retention capacity on continuous basis with respect to the integrity of the dam floor geology,*
- ✓ *Educate and create awareness to the water users on the value of water and water resources for enhanced conservation,*
- ✓ *Consult on reasonable water tariffs to sustain the water supply as well as creating a sense of value for water to the beneficiary community,*
- ✓ *Ensure optimum maintenance of the water supply system components including pipelines, valves and consumer taps.*

7.3 Social Impacts and Mitigation Measures

7.3.1 General Positive impacts (Construction)

There are anticipated positive impacts identified from the proposed dam and water supply project including among others,

(i) Employment opportunities arising from construction of the dam and related componets,

(ii) Secondary benefits to the communities including improvements of acess roads areas,

(iii) Local Economy from construction opportunities such as empoyment and demand for goods and services,

(iv) Benefit of skills development potential for alternative livelihood by the PAPs through the land acqusation proceeds.

7.3.2 General Positive Impacts (Post-Construction)

The main anticipated post-construction positive impacts are as follows:

(i) Clean water supply to local community hence improved social welfare,

(ii) Improved security within the dam area associated with the enhanced facility protection,

(iii) Creation of employment opportunities during and after commissioning of the dam including operations,maintainance,buffer fencing etc,

(iv) Enhanced water connectivity and revenue for resource sustaince,

(v) Hydrological moderation,

(vi) The standards of living of the beneficiary residents will improve such as to include

income generation and productivity,housing ,health and hygine.etc.,

(vii) Reduction of distance and time spent in search for water hence benefiting the (women and children) using the energy and time on economically and socially viable activities for the families,

(viii) Increase of food supply to area not only receiving water for irrigation but also to residents of neighbooring districts in food supply,

(ix) Provision of ready markets for goods and services which will then reduce rural-urban migration as the people will be employed in the upcoming opportunities in the area due to the ovrall increase of population and density as many people will be attracted by high economic production in the area,

(x) The Dam will spur economic growth of the area due to raising population growth and densities resulting from natural growth and immigration, that futher enhances availability of cheap labour and ready markets for goods and services,

(xi) There will be positive social economic impact arising from the upgrading of certain roads, necessary for construction and maintenance of the dam that will contribute to better transport and travel networks in the area.

7.3.3 Potential Social Disruptions

The dam construction will have permanent social impacts across the project area. Among the affected features will include the following:

(i) Social and traditional recreation facilities including community playgrounds, under-tress meeting points for villagers will be disrupted,

(ii) Social services and amenities that may have to be relocated including access roads, foot bridges/paths, existing water pans, water supply lines and power lines,

(iii) Easy access to families and friends living across the river will be cut –off,

(iv) Settlement with housing structures, toilets, cattle pens as well as small-scale trading points along the area. This will also disrupt the co-existence of the villagers as well as the attachment to their homes,

(v) Potential dissatisfaction to the project affected persons (PAPs) on the mode of compensation and quality of alternative settlements may be a challenge to the project, due to inadequate preparation and sensitization of the PAPs,

Mitigation Measures

- ✓ *Restore public amenities and services disrupted for the people to continue access during and after the construction period,*
- ✓ *Prepare a comprehensive social responsibility strategy for integrating interventions into social needs as part of the project implementation. Among areas of intervention include education, health, access to water, group welfare, etc,*
- ✓ *Apply Social Engagement Plan in addressing social-economic concerns of the communities affected by the project implementation,*
- ✓ *Address restoration livelihoods and housing for disrupted communities through the detailed RAP report,*
- ✓ *Provide alternative routes for the villagers to access,*
- ✓ *Connect the households near the existing submerged waterpans to water and provide*

livestock watering points.

- ✓ *Involvement of the residents through consultations and participation will be necessary to ensure acceptability and ownership of the project by all stakeholders.*

7.3.4 Impacts on Safety

Construction Impacts

The construction phase will involve heavy machinery and excavation areas. Among the safety risks to the people will include;

(i) Public safety risks from construction trucks ferrying materials into and spoil out of the site,

(ii) Potential safety risks at steep excavations and cuttings (dam excavations and pipeline channels especially elderly, the sick and children,

(iii) Workers injuries from accidental falls, use of faulty equipment during construction,

(iv) Workers safety risks (slips, falls and accidents) at construction and material sites,

(v) Unauthorized access to the project sites by the public,

Mitigation Measures

- ✓ *Prepare a comprehensive emergency preparedness plan and integrate the same through the project implementation,*

- ✓ *Undertake a comprehensive dam safety audit on the design drawing for appropriate interventions* before implementation. Among the dam safety interventions should include:

  - Review of the Dam design and Dam Construction by independent panel of experts
  - Prepare relevant safety plans,
  - Prepare an emergency preparedness plan

- ✓ *Provide* appropriate information materials and warning signage for the workers and neighbouring communities accessing construction sites,

- ✓ *All workers will be provided with appropriate PPEs and application of the same enforced at all time during working hours,*

- ✓ *Provide necessary training and undertake drills on safety for the workers,*

- ✓ *Fully stocked first aid kits on sites and first aid training,*

- ✓ *Ensure Occupational Health and Safety (OHS) requirements are observed at all times during the construction,*

- ✓ *Provision of fire extinguishers to fuel storage areas especially at the camp site,*

- ✓ *Ensure driving discipline among the drivers and other construction workers with respect to the public safety,*

- ✓ *Appropriate management of excavation especially in the steep slopes to avoid landslides and attendant accidents.*

Post-Construction Impacts

(i) Potential risks of livestock and people drowning especially minors, elderl,

(ii) Risks of dam break to the downstream social (settlements ammenities and institutions) economic(markets farmland) etc and ecology (riverline and adjucent feutures),

(iii) *Risk of the transmission pipeline bursts with damages to land, crops,structures roads and risks to safety,*

(iv) Human wildlife conflicts cases will potentially increase from the presence of aquatic animals notablly crocodiles that may pose a threat to the safety of the residents.

Mitigation Measures

- ✓ *Put up a perimeter fence surrounding the dam area, as well as provision safety information of simple infrastructures (e.g. guard rails) at critical places along the dam reservoir,*
- ✓ *Create awareness to the community on the co-existence with the dam project,*
- ✓ *Provide appropriate safe access to water points for the communities,*
- ✓ *Provide safety information and signage around the dam and its components,*
- ✓ *It will be necessary to engage the Kenya Wildlife Services in monitoring and training the communities on potential coexistence with emergent wildlife.KWS will also be asked to establish control mechanisms for migrating wildlife species into the area,and adopting economic activities that co-exist with wildlife such as eco-tourism.*

7.3.5 Impacts on Health

Construction Impacts

(i) Respiratory problems from dust from earth moving and construction materials, emissions from the equipments,

(ii) Upsurgeof STIs and HIV/AIDS preverance,

(iii) Environmental health arising of solid waste materials disposal including decomissioning of pit latrines,

(iv) Potential health problems from inadequate provision of sanitation and hygiene facilities.

Mitigation Measures

- ✓ *The use of preventive measures like condoms by availing condom dispensers to construction staff will be undetaken,*
- ✓ *HIV/AIDS awareness creation and VCT services for community members, construction workers to be integrated,*
- ✓ *Regular and appropriate maintenance of construction machinery to control of health risks from emission,*
- ✓ *Provision of adequate sanitation facilities for all workers during construction,*
- ✓ *Appropriate disposal of waste including oil wastes from workshops,*

- ✓ *Appropriate management of excavation especially in the steep slopes to avoid landslides and attendant accidents,*
- ✓ *Provision of adequate and appropriate protection gear (PPES) for construction workers,*
- ✓ *Sprinkling water around the construction sites to reduce dust,*
- ✓ *Provision of potable water and adequate sanitation facilities for all workers during construction.*

Post Construction Impacts

(i) Dam construction will encourage new agricultural activities and promote use of chemical pesticides and fertilizer leadly to contaminated water hence a health risk to the people and livestock,

(ii) Dam reservoir may provides habitat for waterborne vectors with potential disease such as mosquitos,snails and malaria,

(iii) Potential risks of drowning to the residents especially children, the aged and the drunk people as well as their livestock into the dams or in their spillways,

(iv) Human-wildlife conflicts cases are likely to increase from the potential attraction of aquatic animals to the dam's locations including among other hippos and crocodiles.

Mitigation Measures

- ✓ *Fence off the dam to avoid accidental or deliberate (suicidal) drowning,*
- ✓ *Create malaria awareness in the community and provide bed-nets to counter malaria in the project areas. This may be achieved through CSR initiatives,*
- ✓ *Secure the dams and their respective components (e.g., spillways and provide strategic signage and information for safety of the dam. The public around the dam should also be educated and sensitized on coexistence with the dam,*
- ✓ *To prepare a public communication plan on disease control, especially with respect to sanitation, hygiene and water borne infections,*
- ✓ *Consider provision of a public health center OR improve selected health facilities in the localities to cater for the public needs, especially those related to impoundment of water such as Malaria, typhoid, dysentery and cholera, This will be achieved through CSR initiatives.*

7.3.6 Potential Cultural Disruption

Construction Phase Impacts:

Overall Impacts

(i) Influx of foreign construction workers (non-residents of Kericho County) may contribute to cultural conflicts with the residents,

(ii) Potential relocation of graves touches on cultural values, with the local community claim in that relocation of graves has never been in their traditions,

(iii) Displacement of people from their family land may face cultural challenges, especially

from the elderly PAPs,where attached with ancestrol land and their life homes cannot be ignored,

(iv) There are no cultural features established within the project area. However, there arechances to find during the construction phase.

Mitigation Measures:

- ✓ *The community to assist in the identification of all cultural sites in the project area including grave yards, prayer sites and other important social sites,*
- ✓ *Negotiate with the communities on the modalities for the restoration of affected cultural sites including relocation of grave yards,*
- ✓ *For non-identifiable cultural features, the Contractor to abide to the following principles,*
- ✓ *If the Contractor discovers archeological sites, historical sites, remains and objects, including graveyards and/or individual graves during excavation or construction, the Contractor shall:*
  - *Stop the construction activities in the area of the chance find;*
  - *Delineate the discovered site or area;*
  - *Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be arranged until the responsible local authorities or the Ministry in charge of managing cultural heritage and related resources takes over;*
  - *Notify the supervisory Project Environmental Officer and Project Engineer who in turn will notify the responsible local authorities and the responsible ministry immediately (within 24 hours or less)*
- ✓ *Responsible local authorities and the responsible ministry would then be in charge of protecting and preserving the site before deciding on subsequent appropriate procedures. This would require a preliminary evaluation of the findings to be performed by the archaeologists assigned by the government. The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage, namely the aesthetic, historic, scientific or research, social and economic values,*
- ✓ *Decisions on how to handle the finding shall be taken by the responsible authorities and/or ministry. This could include changes in the layout (such as when finding irremovable remains of cultural or archeological importance) conservation, preservation, restoration and salvage,*
- ✓ *Implementation for the authority decision concerning the management of the finding shall be communicated in writing by relevant local authorities,*
- ✓ *Construction work may resume only after permission is given from the responsible local authorities or the responsible ministry concerning safeguard of the heritage.*

Post-construction Impacts

(i) Potential influx of tourists to be involved in water sports and savor emerging hospitality facilities,

(ii) Potential influx of business people from other parts of the country and world to take advantage of emerging business opportunities such as hospitality,

(iii) Potential cultural conflict between local and other business people and visitors.

Mitigation Measures

- ✓ *Kericho County Government to plan future tourist activities and promote eco-tourism enterprises that will involve local people, incentivize their participation and map out their benefits,*
- ✓ *Kericho County Government to carry out physical planning of the area especially with regard to business zoning and provide the necessary public education to ensure realistic cultural expectations locally,*
- ✓ *Public education and training to ensure local people appreciate other cultures and that visitors are sensitive to local cultural norms and traits.*

7.3.7 Displacement of People and Livelihoods

Construction

There is displacements and re-settlement of people to alternative locations. Some Project Affected Persons (PAPs) may be marginally disrupted while those whose land wholly falls within the dam areas will relocate to other parts of the County or country. Among other anticipated impacts include:

(i) Potential fragmentation and separation of families and clans,

(ii) There are possibilities of disenfranchising and interfering with livelihoods for the community especially the vulnerable,

(iii) Potential loss of shelter and associated services and amenities,

(iv) Potential loss of institutional facilities,

(v) There will be impacts to the residual PAPs who will co-exist with the dams for the rest of their lives,

(vi) Limited employment opportunities arising from construction activities and operation,

(vii) Stimulation of the local economy from supplies to the project construction.

Mitigation Measures:

- ✓ *Involve local labour to the extent possible for construction and enhance benefits and ownership,*
- ✓ *A Resettlement Action Plan (RAP) should be completed and implemented for land acquisition and displacement of people and livelihoods as well as issues relating to the alternative settlements of the PAPs,*
- ✓ *The RAP should include a comprehensive Grievance Redress Mechanism (GRM) to address all concerns and fears of the displaced and Residual PAPs during and after the project construction periods.*

Post-construction Impacts

Besides the displacement of people, the residents who will remain are to co-exist with the dam. Among the changes expected to the surrounding environment include local weather conditions, new plant species and aquatic animal species. Social changes will include relocation and rerouting of public utilities (power lines, optic cables, access roads etc.). Though there will be water provision, health and safety risks may arise.

Mitigation Measures

- ✓ *Establish a social responsibility strategy that will maximize benefits to the stakeholding communities,*
- ✓ *Prepare and execute a public engagement plan.*

7.3.8 Impacts on Livestock Farming

Construction Phase

(i) There are traditional pasturelands and community watering points at the dam site that will be disrupted during construction,
(ii) Loss of agricultural land to the dam will also mean reduced fodder production to the dairy sub-sector,
(iii) Potential accidents for livestock and herders at the construction site.

Mitigation Measures

- ✓ *Compensate loss of agriculture opportunities,*
- ✓ *Fencing off the dam area to limit access to livestock and herders,*
- ✓ *Placement of warning signages around the dam area for safety,*
- ✓ *Provision of alternative watering points away from the dam catchment for usage.*

Post Construction

(i) The dam reservoir will permanently submerge watering points for local livestock,
(ii) Potential risks of livestock drowning in the reservoir,
(iii) Possible attacks on livestock by wildlife.

Mitigation Measures

- ✓ *Lost opportunities for livestock production should be considered in the RAP implimentation,*
- ✓ *A safe and easy public access to the water should be provided for the community livestock,*
- ✓ *Fence off the reservoir and dam area to alleviate livestock drowning in the reservoir,*
- ✓ *Engage with KWS to deal with any emergent wildlife with risks to livestock.*

7.4 Dam Safety

At 42m high, the proposed dam is a Large Dam that is subject dam safety considerations during the construction and post-construction phases covering;

(i) Dam Safety under construction
(ii) Dam Safety under operation
(iii) Dam flooding process
(iv) Dam break risks

Standard requirements for large dams are tabulated below:

Standard Requirements	**Comments**
For the life of any dam, the owner is responsible for ensuring that appropriate measures are taken and sufficient resources provided for the safety of the dam.	Under NWHSA responsibility.
It requires that the dam be designed and its construction supervised by experienced and competent professionals.	The supervision company will be chosen according to its experience on similar project and the resources involved will have to be competent.
Reviews by an independent panel of experts (the Panel) of the investigation, design, and construction of the dam and the start of operations	▪ Under NWHSA responsibility. ▪ An independent panel of expert will have to validate the different steps of the Dam project ▪ The cost of expert panel will have to be include in the global environmental costs during full ESIA study
Plan for construction supervision and quality assurance, an instrumentation plan, an operation and maintenance plan, and an emergency preparedness plan	▪ These plans will be prepared during design phase of the project and will insure the management of Dam Safety. ▪ The plan should be extended to the dam
Prequalification of bidders during procurement and bid tendering	This phase is undergoing and a proper Tender document have been prepared
Periodic safety inspections of the dam after completion.	Under HWHSA responsibility.

Mitigation Measures

- ✓ *Adequate diversion of the river and protection of the site during construction,*
- ✓ *Review the Dam design and Dam Construction by independent panel of experts,*
- ✓ *Prepare relevant plans (Plan for construction supervision and quality assurance, an instrumentation plan, an operation and maintenance plan),*
- ✓ *Prepare an emergency preparedness plan,*
- ✓ *Install proper instrumentation in the dam,*
- ✓ *Ensure frequent maintenance of the dam structures,*
- ✓ *Design and install metrological sensors and alarm during the construction to alert workers in case of risk of flood,*
- ✓ *Ensure use of high quality standard materials during construction phase.*

CHAPTER 8: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

8.1 Management Plan Principles

The proposed dam project is geared towards enhancing social and economic benefits through sustainable water supply. Development of the Londiani dam project would be expected to comply with the environmental conservation requirements in accordance with the established Kenyan laws and regulations. To realize these goals, acceptability by a majority of the stakeholders and minimal effects to the physical environment will require to be ensured through participation in the project and continuous consultations, evaluations and review of the design aspects throughout project implementation cycles.

It is similarly recommended that the environmental management guiding principles specific to this project improvement and water resources management be established to allow integration of environmental management considerations during construction and operations. Among the aspects that need to be considered in this particular project execution will comprise;

(i) The contractors and other players in the project activities be prevailed upon to implement the EMP through a sustained supervision and continuous consultations,

(ii) safeguard control of soil erosion and siltation of the water sources (rivers and the streams),Incorporation of dam safety provisions and the associated components,

(iii) Compensation of any land or property that may be affected by the project in accordance to the laid down regulations,

(iv) Enhancing integration of environmental, social and economic functions in the project execution.

8.2 Management Issues

8.2.1 Construction Phase Issues

Development of the proposed Londiani Dam and its accessories will comply with established environmental and social conservation requirements and social safeguards in accordance with established Kenyan environmental laws and regulations as well as the Environment, Social, Health and Safety (ESHS) guidelines. It will meet acceptability by a majority of the stakeholders and have minimal effects to the local physical and social environment. To realize this, participation and continuous consultations, evaluations and reviews of the design aspects throughout the project implementation cycles will be necessary. It is also confirmed that the Contractor will be guided by ESMP (and C-ESMP) in the integration of environmental and social management considerations during the construction.

The scope of environment and social management plan (ESMP) document is to provide a tool for all involved in the construction, maintenance and utilization of the new facilities in fulfilment of environmental and social requirements. It is also recommended that the environment and social management guiding principles specific to this project improvement and water resources management be established to allow integration of environmental management considerations during construction and operations. Among the issues that need to be addressed for Londiani Dam project implementation include:

(i) Ensuring control of soil erosion in the Kipchorian River watersheds for reduced siltation of the water sources (rivers and the streams) and ultimately silt loading in the dams,

(ii) Incorporating dam safety provisions and the associated components in the dam's operations with a focus to the downstream risks, neighbouring communities as well as the operator employees. Integrated information, involvement of the communities and

operators as well as installation of necessary deterrent measures at risk sections of the dams,

(iii) Enhancement integration of environmental, social and economic compliance requirements in the project implementation and monitoring performance, in accordance with the ESMP,

(iv) Compensation for land or property that will be affected by the project in accordance to the Resettlement Action Plan (RAP) as well as established regulations,

(v) Prevailing upon the contractor and other players in the project activities to implement the ESMP through a sustained supervision and continuous consultations.

In order to implement the ESMP, it is recommended that the Contractor engage an Environment and Social Expert to oversee integration of environment and social management aspects into the project implementation. The Supervising Consultant will also engage similar counterpart professional experts to collaborate with the Contractor in achieving the same objective.

8.2.2 Post-Construction Phase Issues

Upon completion and commissioning of the dam, it will be necessary to establish appropriate operational guidelines on environment and social linkages in line with Water Resources Management Policies to enable identification of critical issues and appropriate management actions towards minimizing associated internal and external conflicts. The guidelines include among other areas:

(i) Environmental management programmes,
(ii) Standard operation procedures,
(iii) Compliance monitoring schedules and
(iv) Environmental audit schedules as required by the law.

Social harmony of the dam operations and management of associated components will be achieved through the collaborations between the Dam Management, the main stakeholders and the community committees introduced at various water consumption points.

8.3 Management Responsibilities

To implement the management plan, it is recommended that an expert be identified to oversee the environmental and social management aspects including the dam conservation, soil erosion control, re-vegetation whenever appropriate, water conservation and equity in distribution, enhanced sanitation and hygiene measures throughout project area. The expert would also be required to coordinate and monitor environmental management activities during construction and post monitoring audits. Other recommended participants include:

(i) National Water Harvesting and Storage Autority will be responsible for coordination of all the activities and liaisons, particularly in regard to the quality control of the works and social issues,

(ii) Water Service providers, in this case Kericho water and sanitation company, whohave the responsibility to enforce water quality monitoring and efficient maintenancesystems, procedures to minimize interruptions to water supply and ensureaccessibility by all consumers,

(iii) National Environmental Management authority (NEMA) through the county directors office shall be responsible of surveillance of environmental and social aspects of the project implementation.

8.4 Environmental Management Guidelines

The guidelines will include among other areas environmental management programmes, standard operation procedures, compliance monitoring schedules and environmental audit schedules as required by the law. Social harmony of the dam and associated component will be achieved through the collaborations with the stakeholders or community management committees introduced at various water consumption points.

8.5 Institutional Framework Management

The National Policy on Water Resources Management and Development and the Water Act 2016 are the guiding tools on water resources management. The policy goal is to facilitate the provision of water in sufficient quantity and quality and within a reasonable distance to meet all competing uses in a sustainable, rational and economical way. It also separates policy formulation, regulation and services provision and defines clear roles for sector actors within a decentralized institutional framework and includes private sector participation and increased community development. The Ministry in-charge of Water is responsible for policy development, sector co-ordination, monitoring and supervision to ensure effective Water and Sewerage Services in the Country, sustainability of Water Resources and development of Water resources for irrigation, commercial, industrial, power generation and other uses.

The Ministry executes its mandate through the following sector institutions:

(i) Water Services Regulatory Board (WASREB)
(ii) Water Resources Management Authority (WRMA)
(iii) Water Services Trust Fund (WSTF)
(iv) Water Services Boards (WSBs)
(v) Water Services Providers

This integration encourages provision of sustainable development and a healthy environment to all Kenyans. The key functions of NEMA through the NEC include policy direction, setting national goals and objectives and determining policies and priorities for the protection of the environment, promotion of cooperation among public departments, local authorities, private sector, non-governmental organizations and such other organizations engaged in environmental protection programmes and performing such other functions as contained in the act. Other stakeholders include Kericho County Government, Ministry of Environment, Water and Natural Resources, Ministry of Agriculture and Livestock and Fisheries and the Local Community.

8.6 Environmental Education and Awareness Raising

National Water Harvesting and Storage Authority and the water consumers and beneficiaries need to understand the basic environmental, water use sanitation and hygiene principles. In this regard therefore the following steps may be considered:

(i) Establishment of cooperation on all matters related to environment, health and safety,

(ii) Encourage contribution of improvement ideas on specific issues related to the management of the facilities,

(iii) Establish initiatives that would instill a sense of ownership of the facilities and related components to all beneficiaries.

8.7 HIV/AIDS Issues

The contractor will take the responsibility for providing HIV/AIDS awareness and Voluntary Counselling and Testing (VCT) services for community members adjacent to the dam and workers' camp site as well as to construction workers. It is expected that there will be clauses in the contract

binding the contractor to offering those services throughout the contract period. Additionally, in order to safeguard the interest of the girl child and avoid sexual abuse of women in poor households, the contractor will also be bound to inducting all their workers to the rights of local people especially women and girls to ensure workers' discipline with regard to how they deal with local women and girls.

8.8 Environmental, Social, Health and Safety (ESHS) Requirements

8.8.1 ESHS Requirements

The Environment, Social, Health and Safety Management (ESHS) are focused on the Contractors' procurement requiring that all bids integrate appropriate safeguards for implementation and compliance. In this regard, ESHS will form an important aspect of the contractual obligations of the Contractor to comply with the Bank procurement documents. The Project Proponent as well as the Supervision Consultant will also adopt the ESHS requirements for monitoring. Among the aspects of the ESHS include:

(i) Declaration of responsibilities and liabilities,
(ii) Developing planning documents as an implementation tool,
(iii) Description of managing non-conformances,
(iv) Allocation of resources for ESMP implementation,
(v) Inspections and reporting programmes on performances and challenges faced,
(vi) Capacity building including on the job-training initiatives for the staff,
(vii) Environmental procedures including construction material sources,
(viii) Health and safety management systems,
(ix) Labour issues.

In order to ensure full integration of the environment and social concerns into the project under the ESHS, the ESMP will constitute an important annex to the construction contracts that the Contractor will then upgrade to a Construction Environment and Social Management Plan (C-ESMP) reflecting the realities of the project implementation for reference in the environment and social integration. While preparing the C-ESMP, the Contractors will be required to fully understand the ESHS requirements (see Table below). The understanding of ESHS Requirements is illustrated as they prepare their bids for this project construction.

Table 21:Summary of ESHS Requirements

No.	Subject	Enhancement/s
1	Declaration of contract suspension or termination	Bidders are required to make a declaration listing any civil works contracts that have been suspended or terminated by an employer and/or performance security called by an employer, for ESHS reason/s. This information will be used to inform enhanced due diligence.
2	Strengthened specifications/ employer's requirements	The Employer is required to set out clearly the minimum expectations of ESHS performance from the outset, to ensure that all Bidders are aware of the ESHS requirements.
3	Workers' ESHS Code of Conduct	▪ Bidders are required to submit, as part of their Bid an ESHS Code of Conduct that will apply to their employees and sub-contractors, and details of how it will be enforced. ▪ The suitability of the Code of Conduct can be assessed and discussed as part of the Bid evaluation and negotiations. ▪ The successful Bidder is required to implement the agreed Code of Conduct upon contract award.
4	Contractor's ESHS Management Strategy and Implementation	▪ Bidders are required to submit, as part of their Bid, ESHS Management Strategies and Implementation Plans required to manage the key ESHS risks of the project. ▪ The suitability of these strategies and plans can be assessed as part of the Bid evaluation and discussed during pre-contract discussions, as appropriate.

No.	Subject	Enhancement/s
	Plans	▪ These strategies and plans will become part of the Contractor's Environmental and Social Management Plan (C-ESMP). ▪ Particular Conditions of Contract now include the (C-ESMP), e.g.: ✓ A requirement that the Contractor shall not commence any Works unless the Engineer is satisfied that appropriate measures are in place to address ESHS risks and impacts; ✓ At a minimum, the Contractor shall apply the plans and ESHS Code of Conduct, submitted as part of the Bid/Proposal, from contract award onwards.
5	ESHS Performance Security	▪ The successful Bidder is required to provide, in addition to the standard Performance Security, an ESHS Performance Security (the sum of the two "demand" bank guarantees, normally not to exceed 10% of the contract price). ▪ The ESHS performance security is in the form of a "demand" bank guarantee." ▪ The application of this provision is at the Borrower's discretion. It is recommended for contracts where there is significant ESHS risks as advised by Social/Environmental specialist/s.
6	ESHS Provisional Sum	▪ An additional provisional sum, specifically for ESHS outcomes, may be included in the Request for Bids documents and eventual contract. ▪ Normally, the payment for the delivery of ESHS requirements shall be a subsidiary obligation of the Contractor covered under the prices quoted for other Bill of Quantity/price items.
7	Key ESHS Personnel	▪ Bidders are required to demonstrate that they have suitably qualified ESHS specialists among their Key Personnel. ▪ Key Personnel must be named in the Bid and in the contract. ▪ The quality of the proposed Key Personnel (including ESHS specialists) will be assessed during the evaluation of Bids. ▪ The Contractor shall require the Employer's consent to substitute or replace any Key Personnel. ▪ The Engineer may require the removal of Personnel if they undertake behaviour which breaches the ESHS Code of Conduct, e.g. spreading communicable diseases, sexual harassment, gender-based violence, illicit activity, or crime.
8	ESHS Reporting	▪ Contracts now contain specific ESHS reporting requirements. These relate to: ▪ ESHS incidents requiring immediate notification ▪ ESHS metrics in regular progress reports.
9	ESHS considerations during contract variation	As part of variation procedures, the Contractor shall provide relevant ESHS information to enable the Engineer to evaluate the ESHS risks and impacts.
10	Ability to withhold interim payment	Contracts now contain provisions allowing interim payments to be withheld where there is a failure to perform an ESHS obligation.
11	ESHS considerations included in civil works Consulting Services	The standard Request for Proposals for consulting services now include ESHS considerations to apply to the supervision of civil works.

8.8.2 Summary of Code of Conduct for the Contractor

A Code of Conduct shall be established by the Contractor for a specific project taking into consideration the issues, impacts, and mitigation measures identified in:

(i) Project reports e.g. ESIA/ESMP
(ii) Consent/permit conditions
(iii) Required standards including the EHS guidelines
(iv) National legal and/or regulatory requirements and standards
(v) Relevant standards e.g. workers' accommodation: process and standards
(vi) Relevant sector standards e.g. Workers accommodation
(vii) Grievance redress mechanisms.

The types of issues identified could include risks associated with: labour influx, spread of communicable diseases, sexual harassment, gender-based violence, illicit behaviour and crime, and maintaining a safe environment etc. A satisfactory code of conduct will contain obligations on all project staff (including sub-contractors and day workers) that are suitable to address the following issues, as a minimum. Additional obligations may be added to respond to particular concerns of the region, the location and the project sector or to specific project requirements. The issues to be addressed include:

(i) Commitment to implementation of C-ESMP,
(ii) Compliance with applicable laws, rules, and regulations of the jurisdiction
(iii) Compliance with applicable health and safety requirements
(iv) The use of illegal substances
(v) Non-Discrimination
(vi) Interactions with community members
(vii) Sexual harassment
(viii) Gender Based Violence and/or exploitation
(ix) Child Protection
(x) Sanitation requirements
(xi) Avoidance of conflicts of interest
(xii) Respecting reasonable work instructions
(xiii) Protection and proper use of property
(xiv) Duty to report violations of this Code
(xv) Non-retaliation against workers who report violations of the Code.

The Code of Conduct and Action Plan is developed for implementing established ESHS and OHS standards and preventing Gender Based Violence (GBV) among other aspects. Key types of Codes of Conduct include Company Code of Conduct, Managers Code of Conduct and Individual Code of Conduct. The Contractor should ensure that the workers are sensitized and familiarized with the code of conduct through preparation and causing all managers and individual workers to append their signatures a Code of Conduct statement singularly or collectively addressing the key issues. This is achieved through writing in plain language and signed by each worker to indicate that they have:

(i) Received a copy of the code;
(ii) Had the code explained to them;
(iii) Acknowledged that adherence to this code of conduct is a condition of employment;
(iv) Understood that violations of the code can result in serious consequences, up to and including dismissal, or referral to legal authorities.

8.8.3 Construction Environment and Social Management Plan (C-ESMP)

The Construction Environment and Social Management Plan (C-EMP) is an upgraded version of the ESMP prepared by the Contractor that illustrates integration of the realities of the project works implementation. The Contractor will, upon finalization of the Construction Plan and approval of the same by the Supervision Consultant and the PMU, pick out the works items and for each present practical action that will be undertaken to realize achievement of the ESMP.

The Construction Environment and Social Management Plan (C-ESMP) will reflect and also assist in realizing the ESHS Requirements. The actions on works items should address environmental and social aspects associated with the works and in line with guidelines from the ESMP. Based on these ESMP outline, the Contractor will be instructed to prepare a Construction Environment and Social Management Plan (C-ESMP) addressing the following issues:

(i) Establish a works specific environment and social policy and regulations,
(ii) Provision of ESHS Resources (personnel, performance statements and equipment),
(iii) National policies and regulations,
(iv) Monitoring programme,
(v) Health and safety procedures,
(vi) Capacity building schedules,
(vii) Compliance tools,
(viii) Environmental integration (wastes, noise, air quality, biodiversity, etc.).

The C-ESMP will also integrate the following plans among others as per the ESHS Guidelines:

(i) Health and Safety Plan
(ii) Air Quality Management Plan
(iii) Noise Management Plan
(iv) Traffic Management
(v) Stakeholders and Social Engagement Plan
(vi) Labour Recruitment Plan
(vii) Labour Influx Management Plan
(viii) Child Protection Plan
(ix) Gender Management Plan
(x) Waste Management Plan (including spoil disposal)

8.9 The Management Plan Matrix

The ESMP will include:

(i) The RAP (with separate report) including support to development of affected people;
(ii) The monitoring plan
(iii) The institutional and managerial arrangement for implementation of the full ESMP
(iv) The cost of the implementation programme during pre-construction, construction and post construction if applicable.

In the final ESMP, it is proposed to analyse any measure present in the ESMP according to the following element:

(i) Main technical characteristics of the measure
(i) Operating arrangements to implement the measure
(ii) Justification and expected results
(iii) Conditions of eligibility
(iv) Activities to carry out to implement the measure
(v) Cost of the measure
(vi) Arrangements for monitoring and evaluation of implementation and impacts of the measure

The ESMP matrix below summaries the action plans and responsibilities on the key negative impacts anticipated from the project activities.

Table 22: Preparatory Activities ESMP Matrix

Project Activity and Issues	Key Impacts	Areas of Concern	Management Action Plans and Responsibilities	Timeframe and Cost Estimates (KES)
Construction Preparation Activities				
▪ Land acquisition and compensation ▪ Relocating landowners and affected structures ▪ Setting the embankment ▪ Catchment alignment	✓ Potential displacements of project affected persons (PAPs) ✓ Change of land use systems, ✓ Temporary disruption of water access by the residents	Dam site, Tank sites and parts of identified transmission pipeline route	▪ Preparation and Implementation of the Compensation and Resettlement Action Plan, ▪ Ensure adequate and timely compensation, ▪ Creation of awareness To PAPs on Alternative Land Use Practices, **Responsibilities** National Lands Commission (NLC) Proponent (NWHSA) Grievance Redress Committee	
▪ Site Surveys. ▪ Setting up construction cap site ▪ Setting up materials holding site	✓ Social conflicts ✓ Loss of vegetation cover ✓ Loss of trees	o Dam construction site, riverine zone and its immediate surroundings, o Identified water transmission pipeline route o Selected camp site location o Access passages o Water treatment works vicinity	▪ Notify the affected community on expected activities related to the project, ▪ Involve the local administration and other social groups in recruitments **Reponsibilities** Contractor Proponent (NWHSA) Supervision Consultant	
Site clearing ▪ Removal of vegation ▪ Mapping water diversion ▪ Removal of pit latrines and livestock sheds	✓ Degradation of the river banks ✓ Potential Riverine biodiversity degradation ✓ Potential soil erosion on cleared sites ✓ Siltation to Kipchorian River ✓ Water pollution(increased turbidity)	o Dam Construction sites o Project campsites o Water treatment works area o Water Transmision corridors o Tanks sites o River sub-catchment upstream and downstream of River kipchorian	▪ Ensure proper handling and disposal of the waste generated (Vegetaion and trees species) ▪ All the graves on the project site should be identified and exhumed, ▪ Follow the required cultural procedures in the grave relocations ▪ Avoid unnecessary vegetation clearing ▪ Ensure minimal interferences with watering points **Reponsibilities** Contractor Supervision Consultant Community Representatives Public health NEMA	
▪ Decommissioning of sanitary facilities and cattle pens ▪ Relocation of graves ▪ Removal of houses where applicable	✓ Social concerns ✓ Cultural issues regarding grave relocation ✓ Potential water pollution ✓ Health and sanitation issues	o The tanks location Masaita, Londiani, Barsiele, Kedowa, Chepseon, Taita Towett and Kipsenende o Water Transmission corridor o Construction sites o All affected settlements o Entire river catchments	▪ Ensure proper handling and disposal of the waste generated, ▪ All the graves on the project siteshould be identified and exhumed, ▪ Follow the required cultural ▪ procedures in the grave relocations **Responsibilities** NWHSA Contractor Public Health County Administration Supervision Consultant Community Representative	

Table 23: Construction ESMP Matrix

Project Activity and issues	Key Impacts	Areas of concern	Management Action Plans and Responsibilities	Timeframe and Cost Estimates (KES)
Construction Works and related components				
Earth moving	✓ Noise and vibrations from earth moving, ✓ Oil spills from contractors machinery ✓ Improper disposal of spoil earth materials ✓ Air pollution (exhaust and dust emissions), ✓ Potential soil erosion, ✓ Siltation to downstream water sources	o Spoil dumping areas o Downstream Kipchorian River o Camp site, workshops and service areas,	▪ Practice soil control measures(terracing) ▪ Spoil dumping only in approved locations ▪ Construction to be carried out during dry seasons, ▪ Limit construction during daytime, ▪ Sprinkle water on the excavated to sections to abate dust emissions **Responsibilities** NWHSA Contractor Supervision Consultant Community Project Committee	In Construction Plan No direct costs
▪ Dam formation and excavations (WTW and pipelines channels) ▪ Machinery, materials and waste management	✓ Potential temporary disruption of water flow ✓ Health and safety risk ✓ Potential noise and vibration ✓ Water Pollution ✓ Air pollution (dust, exhaust emissions) ✓ Oil spillages ✓ Land degradation (material sites) ✓ Spoil management and conflicts	o Construction sites o Material sites and spoil dumping areas o Water Transmission Pipeline Corridors o The tanks location Masaita, Londiani, Barsiele, Kedowa, Chepseon, taita Towett and Kipsenende	▪ Limit construction to day time ▪ Make certain regular maintenance of contractors machineries and vehicles ▪ Provide adequate signage and reflective tapes for restricted areas ▪ Provision of protective gears to the workers. ▪ Training workers on environmental health and safety procedures and emergency preparedness ▪ Sprinkling water to reduce dust levels ▪ Implement the rehablitation plan for material sites. **Responsibility** NWHSA Contractor Supervision consultant Community representative	In Construction Plan Allow KES 3M for environmental management
▪ Social interactions ▪ Safety Aspects ▪ Health Issues	✓ Challenges in accessing water sources during the construction ✓ Risks to health and safety ✓ Disruption of access roads ✓ Potential threat to safety of the workers and adjacent communities, ✓ Possible intrusion to the local communities privacy by construction	Entire project area and surrounding areas	▪ Provide workers with appropriate personal protective gear and enforce application of the same at all times while at work ▪ Provide an awareness and sensitization forum for the workers as well as the neighboring communities, especially on communicable social infections including HIV/AIDS, ▪ Collaborate with the local leadership on selecting camp site locations. ▪ Provide public safety signage and information appropriately ▪ Create awareness to the public for allconstruction operations ▪ Isolate the project area and site from the public during the construction period. ▪ Provide for alternative access routes.	Through Construction Period Allow KES 5M for Public Engagement Activities Allow KES 10M for Safety and Health Initiatives

Project Activity and issues	Key Impacts	Areas of concern	Management Action Plans and Responsibilities	Timeframe and Cost Estimates (KES)
	workers, ✓ Possible immigration into the project area by construction workforce ✓ Safety aspects (public safety, occupational safety)		**Responsibilities** - Contractor(s) - Supervision consultant - Public and Local Leadership	
Economic Issues	✓ Lost opportunities for cultivation on the river basin, ✓ Loss of direct water access points	o Dam area o Neighbouring market centers o Water Transmission Pipeline Corridors o The tanks location Masaita, Londiani, Barsiele, Kedowa, Chepseon, taita Towett and Kipsenende	▪ Provide opportunities for local labour (upto 60%) ▪ Integrate access to water points into the construction ▪ Enhance benefits from materials procurements to the local communities **Responsibilities** - NWHSA - Contractor - Supervision Consultant - Community Representatives	Initial project activities Allow KES 10M for restoration initiatives Allow KES 20M for CSR Interventions

Table 24: Post Construction ESMP Matrix

Project Activity and issues	Key Impacts	Areas of concern	Management Action Plans and Responsibilities	Timeframe and Cost Estimates (KES)
Operation Phase				
▪ Health and Sanitation ▪ Waste Management	✓ Risks from water borne diseases and vectors, ✓ Potential water pollution from surrounding land-use activities (irrigation and livestock keeping), ✓ Risk from introduction of impurity to the water reservoir ✓ Potential contamination of water from market centers (wastewater, surface runoffand solid wastes) ✓ Waste disposal from the water treatment works (sludge disposal, filter backwashing water, scrap materials disposal, etc.) ✓ Sewage and wastewaterfrom the operators housing.	o Dam Area o Water abstraction points o Water supply areas (Kipkelion East and West sub-Counties) o Other water use areas o Water Treatment Works	▪ Ensuring 24 Hr security to the dam area, ▪ Ensure regular water quality monitoring and maintenance of the water supply system, ▪ Influence the surrounding land-use activities, ▪ Creation of awareness on water resource management and conservation, ▪ Ensure proper water treatment plant installation at the site, ▪ Ensure provision and operational sludge drying beds ▪ The water treatment works should be provided with waste collection yard with a removal schedule **Responsibility** WRA NWHSA Local community	Dam operations Allow KES 20M annually for social intervention Initiatives and protection of the dam
Catchments' Management ▪ Pollution control from the watershed into the dam, ▪ Enhancing efficient runoff interception into streams, ▪ Soil erosion control and reduced silt transportation ▪ Re-vegetation of the watersheds	✓ Enhanced vegetation cover ✓ Changed land use practices, ✓ Changes in agricultural practices, including controlled application of agro-chemicals ✓ Influenced sanitation trends in the neighbouring homesteads around the dam site ✓ Silt interception in the ✓ catchment	All feeder rivers catchment	▪ Immediate landowners to be motivated into maintaining buffer zones along the river and the dam banks, ▪ Guide landowners in the catchment in changing their land use practices including mode of agricultural and irrigation methods as well as application of agrochemicals. ▪ Initiate afforestation programmes of slopes and other steep sections of the watershed area in collaboration with landowners, ▪ Consider sand interception dams along the main tributaries in the catchments for control of silt discharge into the dam, ▪ Undertake a comprehensive catchment management plan for the entire Kipchorian River basin and involve landowners and all stakeholders, ▪ Integrate a comprehensive Land Use Management Plan, Pest Control Management Plan and a Water Use **Responsibility** WRA NWHSA	No Direct Costs Initiate process for effective Catchment Management Plan with logical costs indications

Project Activity and issues	Key Impacts	Areas of concern	Management Action Plans and Responsibilities	Timeframe and Cost Estimates (KES)
			✓ The WRUA	
▪ Water use Trends ▪ Accountability ▪ Sustainability and Equity	✓ Access of water by the local communities ✓ Potential water wastage and leakage along the transmission lines ✓ Potential uneven distribution of water ✓ Illegal water abstraction for illegal connections, ✓ Illegal water vending (especially if obtained from the dam)	o Project area o Potential water kiosks o Transmission water pipelines o Water supply areas (Kipekelion East and West Sub-counties) o Other water use areas	▪ Come up with guidelines regarding water abstraction and use, ▪ Support the communities by forming WRUA for support in the use of the water resources including the dam ▪ Sensitize the community on sustainable water use, ▪ Collaborate with other players in the region on sanitation, health and hygiene awareness creation. **Responsibility** ✓ WRA ✓ NWHSA ✓ Local community (WRUA)	No Direct costs Operational budget planning necessary
▪ Downstream Ecology ▪ Disruption of social income ▪ Downstream hydrology	✓ Changes in hydrological regimes downstram ✓ Reduced silt loads into the ecosystem ✓ Reduced agricultural productivity on the river flood plain ✓ Reversed nutrient cycling and disruption of habitats ✓ Controlled moderated release of flood flows downstream	o Kipchorian River sub-basin	▪ Simulate the dam to allow appropriate artificial flood release to ensure water quality regulation and silt feed into downstream ▪ Liaise with relevant authorities to establish a detailed ecological and social characteristics of Kipchorian river sub-basin ▪ The flood releases will also replenish silt and nutrients on the flood plains for higher agricultural productivity **Responsibility** ✓ WRMA ✓ NWHSA	Operations Allow KES 10M annually for social and ecological monitoring
▪ Social and economic issues, ▪ Downstream dependants, ▪ Water use trends and accountability, ▪ Facility Ownership	✓ Vandalism of water pipelines infrastructure, ✓ Creation of employment to locals, ✓ Introduction of new economic activities, ✓ Potential improvement of infrastructure ✓ Potential change in landuse practices, ✓ Potential deprivation of sediment downstream, ✓ Potential illegal water connections, ✓ Wastage of water through leakages.	o Project Dam area o Pipeline transmission corridor o Immediate downstream of	▪ Sensitization on water resource management and conservation ▪ Local communities should also participate in water resource management and planning ▪ Encourage formation of WRUA's for sustainable water utilization, ▪ Heavy penalties on illegal water connection and vandalism ▪ Development of water resources use guidelines for all consumers and beneficiaries ▪ Provide appropriate safe access points of water for the communities. **Responsibility** ✓ WRA ✓ NWHSA ✓ Water consumers	

Project Activity and issues	Key Impacts	Areas of concern	Management Action Plans and Responsibilities	Timeframe and Cost Estimates (KES)
User Safety and risks	✓ Potential injuries to the operators and visitors, ✓ Safety risks of a dam break to downstream aquatic ecosystems, social and economic features. ✓ Safety risks to settlements and farmlands along the transmission pipeline, ✓ Risks of drowning into the dam to children, the aged and livestock	o Settlements around the project area and transmission pipelines o Water supply areas (Kipkelion East and West Sub-counties of Kericho County) o Other water use areas	▪ Undertake a comprehensive risk assessment study or the dam as part of the pre-commissioning stage. Develop clear emergency preparedness strategies ▪ Construct a perimeter fence around the dam with provision for limited and/or controlled access to the dam water, ▪ Enhance close stakeout by the community, especially those living on risk prone areas. Sensitize the communities on dam safety issues associated with the dam. ▪ Create awareness programmes to the communities on dam safety aspects ▪ Provide safe access points to water for the community around the dam, ▪ Consider acquiring the land directly below the dam wall to avoid safety risks to the affected residents. **Responsibility** WRA NWHSA Water consumers	
Institutional Aspects	✓ Non-compliance with water abstraction regulations, ✓ Natural Resources Utilization, ✓ Water use linkages amongthe communities.	o Around the dam (applying to surrounding communities) o Ecological resources downstream o Management of irrigation water at farm level	▪ Comply to the provisions of the Water Resources Management Authority, ▪ Organize communities for effective and sustainable utilization of natural resources associated with the dam. ▪ Establish appropriate water user associations in the areas neighbouring the dam, ▪ Establish a specific monitoring system for the dam and its water **Responsibility** WRA NWHSA Water consumers	Need for institutional development with logical costed components
Decommissioning	✓ Removal of construction sites (housing, toilets, waste dumps, etc.), ✓ Removal of construction material holding sites, ✓ Effects of material borrow pits left open ✓ Disposal effects of wastes and debris	o Dam construction camp sites o Materials sites	The contractor to prepare a decommissioning plan of all construction installations and associated sited at least 3 months prior to end of construction. **Responsibilities** WRA NWHSA	No direct costs

Project Activity and issues	Key Impacts	Areas of concern	Management Action Plans and Responsibilities	Timeframe and Cost Estimates (KES)
	✓ Removal of part or all of the water treatment plants ✓ Demolition of the water distribution tanks, ✓ Demolition of the dam structure, ✓ Removal of the transmission pipeline	o Dam component locations (water pumps, WTPPower houses, tanks,) etc, o The dam itself o Water treatment works o Water transmissionpipeline	▪ Notify NEMA at least one year before the intention to decommission ▪ Undertake a decommissioning audit at least six months before the activity and provide a decommissioning plan, ▪ Undertake the decommissioning following the decommissioning plan and under supervision by NEMA, ▪ Rehabilitate the affected locations to the satisfaction of NEMA and other stakeholders **Responsibilities** WRMA NWHSA	No direct cost

CHAPTER 9: CONCLUSIONS AND RECOMMENDATIONS

9.1 Conclusions

(i) The proposed project is highly acceptable by a majority of the residents around the area and downstream in view of its appreciable benefits and the declining availability of clean water. Among the benefits appreciated include the public drinking water supply, supply of water to institutions such as schools and health facilities as well as requirements of the urban centres within the project area,

(ii) The project implementation will have social implications through acquisition of land for the dam prompting displacement of people and livelihoods. Due to the anticipated implication in this regard, appropriate mechanisms are critical to ensuring minimal social and economic impacts,

(iii) Downstream the project, however, will see an appreciation in land values and productivity prompting a possible influx of population. The urban centres and institutions downstream the dam areas are likely to also likely to experience upgrade with improved sanitation and hygiene,

(iv) Water quality is an important attribute towards the feasibility of the dam project. In this regard, it is noted that the catchment (Londiani Forest) and the immediate watersheds are undergoing serious degradation through deforestation and settlements (e.g. Kamuingi Settlement). Sustainability of the dam water quality and the health of the dependants could therefore be jeopardized in the long term,

(v) The dam construction has potential linkages to the environmental and social settings, in each case posing short- and long-term co-existence. Social benefits are to be enhanced while mitigation of negative impacts constitutes a larger part of this ESIA Report. This calls for collaborative management plans focused on the various social and environment sub-sectors,

(vi) The dam by nature is an environmental feature as a large water body. Its influence on the are micro-climate cannot be ignored while transformation of the local ecological conditions is also a reality,

(vii) Londiani dam is likely to contribute to the flood control far downstream in Kano plains of Kisumu County where Nyando River (that is Kipchorian River), implying that the dam design has this as part of its focus.

9.2 Recommendations

(i) Displacement of people and livelihoods is one single block of social impacts that requires to be addressed before the project implementation commences. It is, therefore, recommended that a comprehensive Resettlement Action Plan (RAP) be undertaken within the provisions of the established laws and guidelines. The RAP Report will then constitute part of the mitigation measures for the social impacts of the project,

(ii) The benefits of the project downstream have been expanded by optimized design guided by the relative locations along the Londiani – Kericho and Londiani – Fort Ternan roads. Efficiency in this benefit distribution is realized by the favourable topography that provides desired flows,

(iii) Social and environmental impacts will be addressed by ensuring appropriate tools have been developed and adopted. These tools, to be prepared under the Construction Environment and Social Management (C-ESMP) will include the following,

- ✓ Health and Safety Plan
- ✓ Air Quality Management Plan
- ✓ Noise Management Plan
- ✓ Stakeholders and Social Engagement Plan
- ✓ Labour Recruitment Plan
- ✓ Labour Influx Management Plan
- ✓ Child Protection Plan
- ✓ Gender Management Plan
- ✓ Waste Management Plan (including spoil disposal)

(iv) The dam development and operations thereafter should consider integration of comprehensive Catchment Management Plan with involvement of relevant communities in the key watersheds,

(v) It is recommended that a weather station be provided at the dam to facilitate monitoring of ecological transformation trends and emergent climatic conditions,

(vi) Flood control downstream will need to be monitoring to quantify impacts over a duration of time.

Annexes

Annex 1: Terms of Reference

The Project

Project Background

The National Water Harvesting and Storage Authority, established by Legal Notice No. 270 of 24th June 1988 in accordance with the provisions of the State Corporations Act Cap. 446 of the Laws of Kenya, is an autonomous agency to developing water state schemes and spearheading construction of dams for water supplies, flood control and other uses, construction of dykes for flood control and development of bulk water supplies for Water Service Boards and other Water Service Providers among other responsibilities. NWHSA is developing the proposed multipurpose dam being one of such initiatives designed to provide water for domestic requirements, limited irrigation activities and generation of hydro-power.

National Water Harvesting and Storage Authority have the mandate to develop dams and National water schemes among other functions in the Country. In line with vision 2030 Government Plan, National Water Harvesting and Storage Authority plans to carry out Feasibility Study, Preliminary and Final Designs, Environmental and Social Impact Assessment and preparation of Tender documents for the proposed Londiani Dam in the financial year 2015/2016. This is a follow up to the pre-feasibility study that was carried out in September 2012 by National Water Harvesting and Storage Authority. Feasibility Study Report established that there is need to implement Londiani Dam for sustainable water supply in the region as a long-term solution. Four dam sites were evaluated for suitability on all aspect including serviceability. On serviceability and cost a combination of dams supplying water by a combination of gravity and pumping was evaluated and ranked.

Londiani dam project is proposed to supply clean, potable and adequate water for domestic as well as irrigation purposes within Kipkelion East and West sub-Counties. Currently the project area relies on water supply schemes for water provisions namely (Londiani, Kipkelion, Chesinede and Fort Ternan water supply). Water production capacities from these schemes don't meet the communities water demand needs as there faced by challenges ranging from low water flow in Catchment Rivers and increased operation and maintenance costs from high pumping electricity cost. The main objective is supplying water by gravity though the rivers lack sufficient yield upstream leaving the only viable option being to establish a possible dam to conserve water during the rains and use it during the drought periods. As an intervention for sustainability and long-term solution to water supply, Londiani dam project was viewed as a viable option.

Londiani dam project is a multi-purpose dam proposed to provide clean, potable and adequate water supply for domestic, livestock, institutional, flood control and irrigation use. It targets to replace as many as possible of the pumping schemes and augment water supply within Kericho County and also provide water to serve other areas that are not currently served by any of the existing schemes. The dam is proposed to supply water to area of Kipkelion East and West sub-counties as envisaged in the National Water Master Plan of 1992 where it is listed as one of the twenty-four dams to be developed in Vision 2030, Kenya National Development Plan.

Project Objectives

The primary objective of Londiani Dam Project is to provide potable and adequate water supply that shall replace as far as possible all the water pumping schemes within Kericho County and which are located on the downstream of the dam. Therefore, the proposed Londiani Dam was explored as a multipurpose project for and not limited to domestic, livestock, institutional and industrial uses, irrigation, flood control and hydropower being secondary objectives. The Dam is implemented as a water supply project as sustainable and long-term solution to provide about 48,100m^3/day of water to serve a population of 550,000 persons and possible irrigation schemes. The target is to replace as many as possible of the pumping schemes and augment water supply within Kericho County and also provide water to serve other areas that are not currently served by any of the existing schemes.

Specific Objectives will be;

- ✓ To supply potable water to Londiani area (Kipkelion East and Kipkelion West sub-counties) and other areas on the downstream of the proposed dam incorporating as many pumping schemes as possible in the two sub-counties.
- ✓ To supply water for irrigation
- ✓ To reduce floods in the lower reaches of Nyando River.

The Project Location

The dam site is located at Londiani locality in Kipkelion East Sub-County of Kericho County. It is closer to Masaita Hills, approximately 3km from Londiani Town and traverses E254 Londiani – Sorget Road. The dam will be a rock fill dam with a clay core constructed downstream across Kipchorian River with its tributaries including Githee and Masaita Rivers that are 1km upstream the dam. With reference to the master plan, Londiani dam has an estimated yield of 172,200m^3/day which is more than the water demand estimated at 48,100m^3/day to serve 550,000 people and if possible, irrigation schemes.

The dam has been designed and constructed to supplement water supply for Kipkelion East and West Sub-Counties as envisaged in the Water Master Plan for Kericho. The dam inundation area is estimated at 5,200,000m^2 such as to attain a dam height of 42m for a maximum gross storage capacity of 55Mm^3. The dam size is expected to impart socio-economic impacts such as the potential relocation of people and economic activities as well as potential disruption of the residual residents and land use features along the water transmission pipeline corridors.

Specific locations of the dam components will include;

Catchment area
Kipchorian River is the main river feeding the proposed dam and it originates from Londiani forest at an altitude of about 3,900m above sea level. Githee and Masaita Rivers are the main tributaries of Kipchorian River and the two rivers. Upstream the river is known as Masaita and changes name when it joins Githee River at Masaita farm at about 3,023m above sea level. The Kipchorian River sub-catchment forms the upper Nyando drainage basin. Masaita River drains the western part of the catchment while Githee the eastern part. Londiani dam catchment area raises from about 2,200m asl in the south to about 2,800m with the catchment area upstream the proposed dam axis being 108.4km^2.

Dam Site and Buffer areas
The proposed dam site is characterized by undulating topography with a land average slope of 3% to the west. The project area is mainly under cultivation, settlements and institutions. The project area practice mixed farming involving livestock keeping and growing of crops mainly subsistence crops. To a lesser extent irrigation, farming of flower and vegetables is practiced at Masaita Holding farm. The area has a rural residential settlement patterns with close family members living in the same compound. The homesteads are closely located due to the areas minimum land holding size being less than 2 acres. According to the water rules, the allowed buffer zone from to a water body is 30m which in this case will be under tree cover to restrict encroachment by the residents.

The dam has been designed to a height of 42m high such as to inundate flood plains upstream of Kipchorian River and the adjoining tributaries.

Service Areas
The areas to be served by the proposed Londiani dam project are Kipkelion east and west sub-counties that rely on pumping schemes and augment water supply. Currently the Londiani, Chesinende, Kipkelion and Fort Ternan water supply schemes serve the project area but are faced by challenge leading to their inefficiency hence not meeting the communities' water demand. In addition, the project is proposed to serve other areas that are not currently served by any of the existing schemes. Water flow from the dam site, treatment works and distribution tanks will be by gravity to the consumer points.

Project Justification

Increase in population as well as increase in human activities has exerted pressure to the existing water supply schemes hence not meeting the demand. Londiani water supply has a capacity of 270m^3/day against present water demand of 900m^3/day. It serves a population of 2,800 against a target population of 8,920 persons within Londiani Township and its environs. Chesinende Water Supply has production capacity of 100m^3/day against a demand of 300m3/day serving a population of 2,420 against a target population of 7,940 persons.

The source of water is a dam that occasionally dries up during the dry periods. Kipkelion water supply pumping production capacity is 90m3/day against water demand of 330m^3/day serving a population of 1,470 against a target population of 4,100 persons. Fort Ternan Water Supply has a production capacity of

170m^3/day against demand of 1485m^3/day serving a population of 290 against a target population of 18,570 persons. The main source of water is Kimlongit River and only chlorination is done before supply. Besides water demand challenges, the schemes are also faced with challenges ranging from high maintenance and operational cost due to high electricity cost of pumping water.
Lack of sufficient supply of clean and potable water compel the locals to source water from unreliable sources compromising their health status. The situation gets worse during the dry periods as the rivers have insufficient yield and alternative water sources dry up. During the rainy seasons, the rivers recharge and to some extent break their banks leading to flooding downstream. Establishment of a dam is the only viable solution to flood control and provide clean and potable water supply to Londiani and adjacent towns. The proposed dam project will be a sustainable and long-term solution to low cost water supply since water movement to target area is by gravity. The main object of the project is to replace as many as possible of the pumping schemes and augment water supply within Kericho County and also provide water to serve other areas that are not currently served by any of the existing schemes. Therefore, it's for these reasons the proposed project should be implemented.

Project Activities

Construction Phase
During the construction phase of a dam there are several significant features to be observed they include;

- ✓ The process of land acquisition and appropriate compensation will be completed before the actual dam construction commences. Details of this process may be covered under an independent RAP study process for the site.

- ✓ Vegetation clearing of the area covered to pave way for campsites establishment, parking yards for the contractor's machineries and the construction site of for the proposed dam. In the proposed location the predominant vegetation is plantations of tea, coffee and pineapples. There are also a significant number of trees mainly Eucalyptus ssp., Gravelia, wattle tree as well as fruit trees and a large of volume of ground covering shrubs and grasses.

- ✓ In addition to the clearance of vegetation, there site clearance will generate huge volumes of top soil rich in organic and humic content for disposal. This materials management may be used for reclamation of wastelands or other safe disposal mechanism.

- ✓ It is suspected that there are graves and pit toilets in some parts of the areas targeted for inundation. These features will not be buried under the water due to water quality as well as cultural reasons. For this reason, any graves and pit latrines will be decommissioned and removed under supervision in collaboration with the landowners, local leaders and the security agents.

- ✓ Disruption of access roads, power lines and water abstraction points are likely to be disrupted during the construction process. The project will be responsible of services relocation, provision for alternative amenities (access roads, bridges/crossings), public water access points (water pumps, transmission pipelines and public abstraction points).

- ✓ It is expected that materials will be obtained from within such as to include gravel and hard stone quarries. Ideally, the entire earth fill should be drawn from within the reservoir area and, if required, from the cut spillway area. Therefore, borrow areas within the reservoir area should be given first preference, followed by those located on the valley sides close to the proposed embankment.

- ✓ Upon completion of the project, it will be necessary to restore all sections damaged by the construction activities including surface destruction, access roads, river banks and downstream flood plains.

Operations

This will be the formal hand-over and operationalization of the dam upon completion. Among other activities, the contractor and the client will ensure there are no unresolved social concerns, the facility has been completed to the design details, affected sites have been well rehabilitated and that all components are operational. In addition to the paper work, there will be a physical evaluation of the facility that will involve the contractor, NWHSA, relevant Government departments and the design consultant. The inspection of the dam will ensure all the issues of dam safety are adequately considered and all the structures are operationally ready and approved to function as planned.

The initial stage of the operation will be to ensure it is relieving water from the catchment through the rivers and runoff during the rains. This could take up to one year during which there will be strict management of flows in the river to ensure dependants and ecosystems downstream are sustained. Development a management plan for the entire water supply system to ensure optimum utilisation of the water resource.

Design Features

Basic Consideration

The basic principle of design was to produce a satisfactory, functional structure at a minimum total cost. Consideration was given to maintenance requirements so that savings achieved in the initial cost of construction do not result in excessive maintenance costs. Maintenance costs vary with the provisions of upstream and downstream slope protection, drainage features, and the type of appurtenant structures and mechanical equipment. To achieve minimum cost, the dam was designed for maximum use of the most economical materials available, including materials excavated for its foundations and for appurtenant structures.

A dam must be safe and stable during all phases of the construction and the operation of the reservoir. To accomplish this, the following general principles are adopted;

- ✓ The embankment, foundation, abutments, and reservoir rim must be stable and must not develop unacceptable deformations under all loading conditions brought about by construction of the embankment, reservoir operation, and earthquake,

- ✓ Seepage flow through the embankment, foundation, abutments, and reservoir rim must be controlled to prevent excessive uplift pressures, piping, instability, sloughing, and removal of material by erosion of material into cracks, joints, or cavities. The amount of water lost through seepage must be controlled so that it does not interfere with planned project functions,

- ✓ The reservoir rim must be stable under all operating conditions to prevent the triggering of a landslide into the reservoir that could cause a large wave to overtop the dam,

- ✓ The embankment must be safe against overtopping or encroachment of freeboard during occurrence of the IDF (inflow design flood), by the provision of sufficient spillway and outlet works capacity.

Design of the Londiani Dam for safety and economic reasons will be based on the design of small dams hand book by United State Bureau for Reclamation (USBR), Review of other dams based on COLD bulletins, Ministry of Water and Irrigation manual for small dams and other relevant manuals. Criteria for the design of the Londiani Dam is categorized as related to the following:

- ✓ Service provision and Sustainability: This was fully addressed in feasibility study stage that lead to the current dam and its location being confirmed,

- ✓ Safety: This shall be addressed fully in this design stage and the parameters,

- ✓ Safe design is a major consideration. For hazards such as floods and earthquakes, for which the design employs normally a probabilistic approach, the following area the rational choice of safety criterion.

Dam Components

Foundation Loading

In principal the embankment should not overstress the foundation, the embankment should be designed to suit the foundation soil present at the site. The foundation is estimated to have a bearing strength of 500kN/m^2 while the dam bearing pressure is 320kN/m^2. While geophysical investigation found the foundation to be good, its strength shall be confirmed by geological investigation by drilling.

Embankment

From United States Bureau of Reclamation, (USBR) manual for design of small dams (1987) as well as Practice Manual for Small Dams, Pans and other water conservation structures in Kenya (2015). Resources from ICOLD were also useful in pinpointing areas of importance. The design concepts and criteria for the design of the proposed dam are based on general local and internationally recognised design standards and guidelines. Generally, the design ensures a safe and economical dam structure.

Dam Spillway Structure
The provided spillway should be of sufficient capacity to channel away the flood flow without putting the embankment to risk of over topping. The spillway is designed to convey floods of magnitudes of 1:10,000 year considering that the dams is upstream of Londiani Market.

Dam Freeboard
The provided freeboard should be sufficient to prevent overtopping by wave action. Based on the USBR manual, normal freeboard should be based on a wind velocity of 160km/hr and a minimum of 80km/hr.

Seepage
Seepage through the embankment, foundation and abutments should not result in excess forces and piping of materials is not permitted. For embankment construction it is recommended to use embankment materials that have a permeability of less than 5 x 10 – 7m/s (5 legions) and in foundation and abutments if permeability is more than 5 lugeons treatment in terms of grouting is recommended.

Diversion Culvert
A storm of 1 in 25 years is the design storm which is 302m^3/s for a 6hr rainfall hence each culvert should be able to evacuate 151m^3/s. The diversion works consist of two culverts is 4m wide and height of 3.5m high with a coffer dam 8m from the culvert centre i.e. 6.5m above the culvert to fit. This has a capacity to drain a maximum of 302m^3/s which coincide with a flood with a return period of one in 25 years. After construction one of the culverts shall be used as a service culvert while the other shall form the horizontal duct of the morning glory spillway as well as score line.

Intake Works
At the level of 2,285m asl there is a draw off penstock with 1,500mm internal diameter supplying a demand of 2.6m^3/s (30% higher than dam yield). The system has potential to generate 740kW of hydropower. At 1.5m below is a scour pipe of internal diameter 600mm.

Water Use Options

Water Supply
- ✓ Irrigation
- ✓ The local residents expect they would benefit from the dam project. Some of the benefits expected include;
- ✓ Create source of employment during and after construction of the project to the local community hence improvement of living standards,
- ✓ Provision of local water supply,
- ✓ Introduction and commercialization of fishing activities for economic gain as alternative for other income generating activities like tea farming, coffee farming and pineapple farming which may be affected by the dam.

Preliminary Study Findings

Overview

Dam construction and operations of associated water supply systems have notable local implications to the environmental and social settings of the project areas. These linkages are to be analysed through this ESIA Study process (as well as the RAP study) and other activities associated with socio-economic interactions. Among the key linkages include the following;

- ✓ Land-take is perhaps the one linkage with the highest social impacts especially to the affected land owners and the immediate surrounding communities. The linkage has potential for displacement of people and their livelihoods as well as loss of agricultural crops,
- ✓ Loss of vegetation land covers including agricultural crops, tree cover and under cover (shrubs and grass). This will have effects on local climatic conditions as well as climate change aspects at the global levels. Retention of flood flow, however, is a mitigation measure for flush-flooding downstream associated with climate change scenarios,

- ✓ Water quality of the Source River and tributaries downstream could get affected temporarily during the construction period. This will arise from earth moving and fills and also the construction of the dam embankment wall,

- ✓ Presence of the dam will change the general life of the community in respect to access to water, safety risks, potential water related health issues and security consciousness, especially on terrorism and criminal acts targeting public water,
- ✓ The geology of the Dam area is composed of volcanic rocks of Tertiary age to Recent and lacustrine and fluviatile sediments derived from the volcanic rocks. Lava flows are not common in this area. Only small trachytic lava amounts were observable at Lessotet and Masaita hillocks. Much of the geology of area is composed of variable pyroclastic rocks derived from cash-flow than ash-fall,

- ✓ The foundation rocks at Londiani Dam Site area are of volcanic origin and pyroclastic in nature and were laid down during Tertiary times. They have not undergone any deformation, only some weathering at the surface. Therefore, they provide stable subsurface conditions. The nature of interfaces between the various rocks and especially permeability requires detailed investigations by core drilling.

- ✓ Soils close to the dam axis have high permeability and most are dispersive. They are not suitable for embankment core construction and hence more trial pits were dug further afield.

Dam Stability Factors

Preliminary geotechnical observations at Londiani Dam site shows the following: -

There is resistance variation in the dam area related to the geology of the subsurface that reveals the stratigraphic layering and the rock characteristics in terms of weathering,
The slightly weathered or un-weathered rock on the hillsides is relatively shallow (<10m). However, within the valley the un-weathered rock is relatively deep (>20m),
From the results of trial pits and the associated soil tests shows that the permeability of the soil material at the site is sufficiently impermeable,

General Environmental and Social Features

The project area relies on water pumping schemes and unprotected water sources (rivers and shallow wells). Most of the pumping schemes are inefficient characterized with inadequate water supply capacities to meet the communities demand. Also, the high costs of operations and maintenance contribute to their inefficiency. During the dry periods the rivers and shallow wells are faced with low water volumes and is shared among people and livestock hence compromising the health standards of the communities.

The project area lies within the upper Nyando drainage Basin. The undulating topography and the 3% average slope of land influence the general drainage of the area. The land slopes to the west as well as the drainage direction. Rivers Masaita and Githee are the major drainage outfalls for Londiani area. Githee River drains the western parts of the dam catchment while Masaita River the eastern parts.

The project area has a cool and wet type of climate with adequate rainfall distribution throughout the year. The climate conditions experienced within the project area have an influence to the main land use and vegetation cover. The land use cover ranges from grazing land, woodlots and cultivation. The main vegetation types are food crops (maize, beans and kales among others), riverine vegetation (papyrus reeds) and the forested lands.

Agriculture is the main economic activity within the project area with practices such as livestock and bee keeping. The exotic cows graze in free ranging and in some cases zero grazing. Shops with ordinary personal effects, food items and groceries are operated within the market centres. There are also service shops at the trading centres such as saloon, barber shops and Mpesa shops. Entertainment sites are also run within the centres particularly pubs.

Land acquisition will be immense affecting both sides of Kipchorian River. Most of the land within the project area is individually owned and have title deeds or other authoritative land ownership documents. The land is fenced within the homestead while the other parts are open. The project area is served by a tarmac road Londiani – Muhoroni from B1 road and accessed by an all-weather road (Londiani –Tinderet forest). There are also electricity power line traversing the area and public institutions such as schools and churches. These infrastructures and utilities are within the dam catchment area with likelihood of being submerged.

Following are among preliminary observations on social settings;

- ✓ Majority of the people were using water from poor water sources.
- ✓ In most households, women were the ones mostly involved in fetching water.
- ✓ Water consumption per person was very low compared to the recommended the Practice Manual for Water Supply Services in Kenya by: Ministry of Water and Irrigation.
- ✓ Most of the households spend about KShs. 500 per month on water and hence this should be used when determining the water tariff.
- ✓ Majority of the residents preferred pipe water but for varying reasons other than health issues. This shows that there is need for health education of the project was to succeed.
- ✓ Project affected persons had no objection in giving land for the project provided they were promptly and adequately compensated.
- ✓ It was established that water borne diseases are common in the project area.
- ✓ Land compensation for those displaced by the project.

Features along the treated water transmission pipeline corridor, the treated water storage tank and the supply areas will be established during the study.

Potential Impacts

General Overview

Construction of dams and water supply systems is beneficial to the stakeholders and the country in general. However, it has its fair share of ecological as well as social challenges. Impoundment of large volumes of water has implications on the upstream systems through shifting of ecosystem boundaries upstream as a result of changes in flood regimes. At the dam site itself and the inundated areas, implications ranges from slowed silt, nutrients and pollutant transportation rate to downstream zones, potential loss and/or introduction of species (both plants and animals), displacement of social and economic features and land use changes for the residual riparian landowners.

Abstraction and transmission of water has got direct and indirect interactions with the environmental and social setting of the affected areas and downstream of the source streams. Among the broad linkages include the following,

- ✓ Abstractions reduces the flows in the target rivers and streams effectively denying the ecosystems and social requirements downstream the opportunity for the associated values,
- ✓ On the other hand, transmission involves trenching, physical installations (pipelines, tanks, treatment works and support structures). Transmission of water is perhaps the one with most social linkages including at times limited displacement of people and livelihoods,
- ✓ Finally, operations water supply reticulation has attached risks to social aspects such as water accessibility conflicts, wastage of water, economic factors associated with water (e.g. the concepts and modalities of paying for water).

Finally, downstream impacts are associated with regulated flows of the affected rivers/streams, shifting of species to upstream areas, safety risks, deprived sediment load and land use changes due to the constant flow trends introduced by the dam. The above impact concepts guide the identification of the impacts associated with the proposed dam such as to focus on the following aspects;

- ✓ Hydrological patterns of the affected river basin,
- ✓ Hydraulic characteristics at the dam site associated with the dam designs,
- ✓ Water quality issues with respect to the watershed and catchment land use practices,
- ✓ Geological trends studies in regard to physical water retention,
- ✓ Aquatic ecosystems and habitat requirements,
- ✓ Riparian land use trends and natural features,

- ✓ Social features (land use, settlements, economic activities, cultural features, etc.).
- ✓ Social trends including population and settlement dynamics, social integration and kinship relations, cultural values, displacement and relocation, gender equity and disease prevalence,
- ✓ Economic trends namely economic activities, poverty levels and livelihood changes.

Environmental and Social Impacts

The proposed improvements of abstraction and transmission of water could have a direct and indirect impact on the environment and the people in the project area. Among the broad linkages include the following,

- ✓ Construction of the dam involving notable earth works and may lead to elevated turbidity and pollute the water temporarily for the users downstream.
- ✓ Transmission which involves trenching, installation of pipes and tanks will result to displacement of people and loss of livelihoods.
- ✓ Removal of vegetation along the transmission line and especially at the intake will result to loss of biodiversity and disruption of the ecosystem in the forest.
- ✓ Potential water losses at the intake and transmission pipeline leakages
- ✓ Linkages with other water users including downstream communities and the ecological requirements
- ✓ Potential vegetation removal along the pipeline network.
- ✓ On the other hand, transmission involves trenching for physical installations (pipelines, tanks, treatment works and support structures) with potential linkages to roadside social activities, drainage and loss of vegetation,
- ✓ Social aspects such as water accessibility conflicts, wastage of water at sources, connectivity, revenue collection, sanitation and hygiene.

Positive Impacts
The general environmental positive impacts associated with the proposed new water supply system will include;

- ✓ Potential poverty reduction and improvement of livelihoods for the local residents resulting from increased disposable incomes realized from employment of the skilled and unskilled locals for construction, spending by the construction workers. Through services such as catering, housing, transportation, etc.,
- ✓ Improved accessibility to acceptable water quality by additional beneficiaries that in turn will reduce potential risks of water borne diseases, improved general hygiene in the area and encourage use of sanitation at household levels,
- ✓ Investment on improving the water distribution would be necessary for the Company to meet the operation costs of the network.

Negative Impacts
Though the proposed project has positive impacts, negative impacts should also be identified and possible mitigation measure prescribed to ensure the projects satisfactions. These negative impacts have influence to both the natural and physical environment. Some of these negative impacts include:

- ✓ Increase in social vices and infectious diseases that may arise during construction from social interactions
- ✓ Potential vegetation removal along the work areas
- ✓ Increased exposure to limited accidents during construction and operation phases.
- ✓ Potential disruption of people and livelihoods, especially along the pipeline corridors and tank locations
- ✓ Additional wastewater generation in an area not well covered with waterborne sewerage system.
- ✓ Land acquisition for the dam and the new pipeline corridors will lead to limited social disruption through land take. This will require a Resettlement Action Plan (RAP) to provide the procedures and compensation schedules.

Management Issues

The project is designed for enhancing social and economic benefits through sustainable water supply and sanitation services. The Project would be expected to comply with the environmental conservation requirements in accordance with the established Kenyan laws and regulations. To realize these goals, acceptability by a majority of the beneficiaries and stakeholders as well as ensuring minimal effects to the physical environment will require to be ensured through participation in the project and continuous consultations, evaluations and review of the design aspects throughout project implementation cycles.

It is also recommended that the environmental management guiding principles specific to this project improvement and water resources management be established to allow integration of environmental management considerations during construction and operations. In order to implement the management plan, it is recommended that an expert be identified to oversee the environmental and social management aspects including the water source conservation, soil erosion control, re-vegetation whenever appropriate, water conservation and equity in distribution, enhanced sanitation and hygiene measures throughout project area to match the water supply initiative. The expert would also be required to coordinate and monitor environmental management activities during construction and post-monitoring audits.

General ESIA Study Approach

ESIA Study

Due to environmental and social challenges associated with dam construction activities, a comprehensive environmental and social impact assessment study (ESIA) is necessary for every new project to evaluating the current environmental and social status (baseline conditions), establish potential impacts, establish the potential for social and economic benefits and estimate the project cost, obtain opinion of the local communities and develop appropriate mitigation and remedial actions for integration in the project design and implementation. According to the Environmental Management and Coordination Act (EMCA), 1999, section 58 requires that all new projects falling under the second schedule of the Act must undergo comprehensive environmental and social impact assessment studies. ESIA study should also comply with the EIA Regulations of 2003 on the minimum and other convectional Environmental Guidelines

ESIA Objectives and Scope

Objectives

In accordance to the Terms of Reference, the objectives of the study will be;

- ✓ Predict the anticipated environmental and social impacts.
- ✓ Recommend feasible and cost-effective measures to prevent or reduce negative impacts to acceptable levels and enhance positive impacts of the project.
- ✓ Estimate the impacts and costs of those measures, and of the institutional and training requirements to implement them.
- ✓ Prepare an environmental impact assessment report to include an Environmental and Social Management Plan (ESMP) including proposed work programs, budget estimates, schedules, staffing and training requirements, and other necessary support services to implement the mitigating measures.
- ✓ Explain how the project would comply with the Kenyan guidelines together with international best practices.

The ESIA report should be informed by the opinions collected during Public Consultations. The public consultations will be conducted such as to share initial findings with project stakeholders.

ESIA Scope

The environmental and social aspects that could be associated with the construction of the dams and associated components include,

- ✓ Impacts on water resources and water quality and future scenarios predictions,
- ✓ Impacts on biodiversity and predictions based on the changing and balanced flow trends,
- ✓ Impacts on land and soil,
- ✓ Impacts on hydrology and drainage with focus on the river sub-basin and social and economic dependents,
- ✓ Impacts on air quality including relative humidity

- ✓ Impacts on climatic conditions of the area
- ✓ Land requirements and associated social disruptions

The project also has the potential to transform environmental linkages as well as social and economic setting in the area in terms of land use practices, human settlements and demographic trends, economic activities, institutional development and, therefore, the need to establish the baseline conditions by generating fresh data and information as well as gather information from existing sources for effective identification of related impacts and appropriate mitigation measures.

ESIA Study Approach

In accordance to the Kenyan EIA regulations (Kenya Gazette Notice No. 56 of 13 June 2003), following are the key issues expected of a full environmental impact assessment study;

- ✓ A comprehensive description of the proposed project including its objectives, preliminary designs (to be availed by the Client), proposed implementation (from the feasibility or other reports) and anticipated by-products among others,
- ✓ Description of the project area such as to cover the location, environmental setting, social and economic issues, development strategies as well as national development plans, etc. linkages will be established between the information so gained and the role of the proposed project,
- ✓ Key social linkages including land ownership, access to water, disruption to access roads, potential displacements and compensation issues as well as social disruptions in terms of accessibility of common resources and amenities,
- ✓ Policy, legal and institutional framework within which the proposed project will operate that will also include the corporate policy and strategic planning,
- ✓ An overview of the anticipated impacts from the project to physical environment, social status and general benefits to the national economy. Appropriate mitigation measures and plans would also be suggested,

Following on the above, emphasis on the environmental and social assessment for project will be laid on the following key areas;

- ✓ Updating the environmental and social baseline conditions in and around Kericho County and the dam location, water transmission corridor and the user areas,
- ✓ Evaluating the land use patterns within the project areas and the larger Kericho County in general with respect to influence from the dam construction and use thereafter,
- ✓ Reviewing the environmental impacts with particular focus on physical environment, social and economic issues as well as natural resources aspects within the project areas,
- ✓ Reviewing the social implications of the project to be gathered through structured public participation and interviews of the public officials, community groups, farmers, land owners, public institutions, opinion leaders, etc.,
- ✓ Reviewing the mitigation measures and an environmental management plan outline,

An Environmental and Social Impact Study Report on the dam project will be developed on the basis of available information and a report will be prepared for submission to the National Environmental Management Authority (NEMA) in accordance to the legislation. In addition to the physical environmental assessment, the communities (Farmers, business people, landowners, institutional heads, residents, etc.) within the project area will be involved through interviews and consultation forums to give their views and opinions as beneficiaries. Liaison with the local leadership and the administration is expected to facilitate this process while the presence of the Client's representative at this stage would be necessary in order to clarify certain policy issues that may arise during the meetings.

The ultimate goal will be to identify the anticipated impacts resulting from the proposed project that is determined on the basis of the baseline conditions established during the field work and information obtained from the documents reviewed.

Study Activities

Reconnaissance visits and preliminary evaluation were carried out to enable formulation of an Action Plan for Full ESIA study which led to the development of this ToR. The activities of this assignment, therefore, involves review of the baseline studies, integrate the status along the water transmission pipeline corridor and the

treated water tank location as well as updating the impact/mitigation and the environmental management plan (ESMP). The following study activities will be undertaken for both ESIA and RAP Study Teams concurrently.

Consultations

Commencement Meetings

Following mobilization of the study team, the commencement meeting with the Client followed by a combined reconnaissance site visit. The joint site visit, attended by all the Consultant Team, The Client Representatives and NWHSA as well as Community Representatives, was meant to provide a common appreciation of the project location characteristics.

In order to ensure harmonized procedure for desk and fieldwork, information gathering and reporting, the Team Leader called a meeting of all the participating experts to discuss and agree on the approach and thereafter engage them in frequent consultative sessions throughout the study. The team deliberated on among other issues among them being;

- ✓ The diversity on physical environment, climatic conditions, demographic trends as well as the hydrology and geological patterns (geotechnical characteristics) in the project area,
- ✓ Discuss the design criteria as a basis for identifying the impacts and necessary amendment recommendations,
- ✓ Appreciate the analysis of the social setting and related linkages to enable identify relevant implications and preventive measures,
- ✓ Policy, legal and regulatory requirements, particularly governing the water sector,
- ✓ Share experiences on environmental resources and social issues in that region, and in particular with regard to water resources management and exploitation,
- ✓ Report the coverage structure, terms of reference, procedure and an overview on the timeframes.

Stakeholder Selection Criteria

The project area comprises various categories of stakeholders who should be consulted and involved in the study process. The Stakeholders categories considered and relevance are as follows;

- ✓ The Community Project Committee representing the landowners will be engaged as a supplementary forum following the comprehensive stakeholders and public consultations during the preliminary assessment of the dam areas,
- ✓ The landowners around the dam site and its immediate neighbourhoods and sample institutions who will be engaged on a Focus-Group Discussions basis. Representatives will be selected in consultation with the County Commissioner's Office, Sub-County Administrator and the Community Project Committee,
- ✓ Landowners, Institutions and Leaders along the treated water transmission pipeline corridor will be identified and engaged on rapid interviews followed by a structured public consultation meeting at venues to be jointly determined in collaboration with the County Commissioner's Office and the Sub-County Administrator,
- ✓ For purposes of land acquisition (RAP), the specific landowners will be identified and engaged as Project Affected People (PAPs) to obtain their opinions and suggestions on mode of compensation,
- ✓ There will also be a briefing of the County Government and County Commissioner on a day and venue to be determined.

Stakeholders and Public Consultation Meetings

Rapid and structures stakeholders and public consultations were undertaken for the dam areas during the preliminary assessments. Stakeholders and Public Consultation public meetings will be conducted at in collaboration with the Client and the local administration to provide forums for the stakeholders to present and express their opinions and suggestions on the proposed project. The forums will also provide the Client with an opportunity to explain the project to the stakeholders. While the ESIA Study will address the wider population, RAP process will focus on the PAPs, i.e. residents directly affected by the project both at the dam and along the treated water transmission pipelines corridor. During the ESIA Study phase, the following consultation meetings will be convened;

- ✓ Supplementary meetings around the dam to include Focus Group Discussions. The Community Dam Committee will also be engaged to clarify certain issues of interest to the community,

- ✓ Stakeholders and public along the treated water transmission pipeline corridor, including those along the target Northern Collectors corridor, will be engaged through a rapid interview session as well as a structured meeting at a venue to be identified,
- ✓ The Consultant will also hold consultative meetings with the County Government of Kericho (County Secretary in-charge of water resources)
- ✓ The Project Affected Persons (PAPs) will also be engaged through the RAP process. The PAPs and the Stakeholders Meetings, however, might overlap and hence possibility of sharing the outcomes.
- ✓ Institutions whose services are interrupted directly or indirectly,
- ✓ Any other interested parties

Presentations to the Client

Presentations of the Draft ESIA Study Report and RAP Report to the Client will also constitute a forum for consultations where the comments and sentiments received will go into improving the content of the final reports.

Documentary Review

Various relevant documents will be reviewed for an understanding of the terms of reference, environmental status, data on demographic characteristics of the project area, land use practices, development strategies and plans (local and national) as well as the policy and legal documents. In summary, among the documents to be reviewed will include;

- ✓ The Terms of Reference,
- ✓ ESIA Project Report as submitted to NEMA,
- ✓ All relevant project documents (feasibility study reports, design reports and drawings, hydrology reports, socio-economic reports, etc.),
- ✓ Nairobi Water Master Plan
- ✓ Kericho County Integrated Development Plans,
- ✓ Policy documents and legal statutes governing the water sector,
- ✓ Selected literature in management practices in the water sector,
- ✓ The Constitution of Kenya
- ✓ The Kenya Vision 2030
- ✓ National population census and economic reports (2009),
- ✓ National Economic strategy
- ✓ Other ESIA and RAP Report water projects in the area
- ✓ Other documents as may be identified.

Field Assessments

A comprehensive physical evaluation of the project area will be undertaken taking into consideration physical and biological environmental status, human settlement and socio-economic activities. Field visits will also involve interviews of selected persons, groups of persons or institutional officials. Interviews will be arranged in collaboration with the and /or other person as will be assigned by the Client at pre-determined locations and time schedules. A questionnaire and other information collection tools will be prepared and distributed to the stakeholders prior to the meetings.

The proposed project site is a well-defined feature defined on the ground and this will enable determination of the exact physical environmental features to be affected. However, the effects may be felt on a wider area covering up to a radius of 3km from the project area. The fieldwork session will, therefore, be designed to establish the anticipated positive and negative impacts over each impact zone in terms of physical environment, social and economic trends, population trends, hydrology and climatic patterns. Among the objectives of the detailed fieldwork will be to;

- ✓ Obtain any available information and data from the local public offices including environment, water, lands, tourism, Forest Department and Agriculture. Interviews will also be organized with focus group members of

the communities in the dam area since a comprehensive meeting had already been undertaken through the ESIA project preparation,

- ✓ Full interviews and consultation meetings will be undertaken along the water transmission corridor where there are no previous interactions,
- ✓ Interactions with the County Government Offices of Kericho County,
- ✓ Visiting potential construction material sites with respect to land use and loss, proximity to human settlements, relationship with the hydrology and drainage, potential health and safety of the residents, size and ownership among other issues,
- ✓ Evaluate proposed construction camp site and their effects to the surrounding social and economic conditions (if any has been identified),
- ✓ Physical observations will be focused on the topography, land use trends, surface water sources, public amenities, wetlands, settlements, forests, soils, etc.,
- ✓ Carry out rapid assessments of population densities, human settlement trends, social and economic activities and presence of any important cultural sites within the impact radius,
- ✓ Identify climatic and land cover characteristics of the affected areas,

Reporting

The process of report writing will involve participation of the team members through analysis of respective data and information. This will be translated into findings and anticipated impacts. It will also provide a basis for development of mitigation measures and an Environment Monitoring Plan for incorporation into the project implementation and other investigation. The Project Report will be submitted following a timeframe to be agreed in the contract such as to cover the requirements of National Environmental Management Authority (NEMA) guidelines. The reporting outputs will include the following;

- ✓ Inception Report
- ✓ Terms of Reference on ESIA Study for NEMA approval
- ✓ Draft ESIA Study Report
- ✓ Final ESIA Report

Work Plan

Study Activities

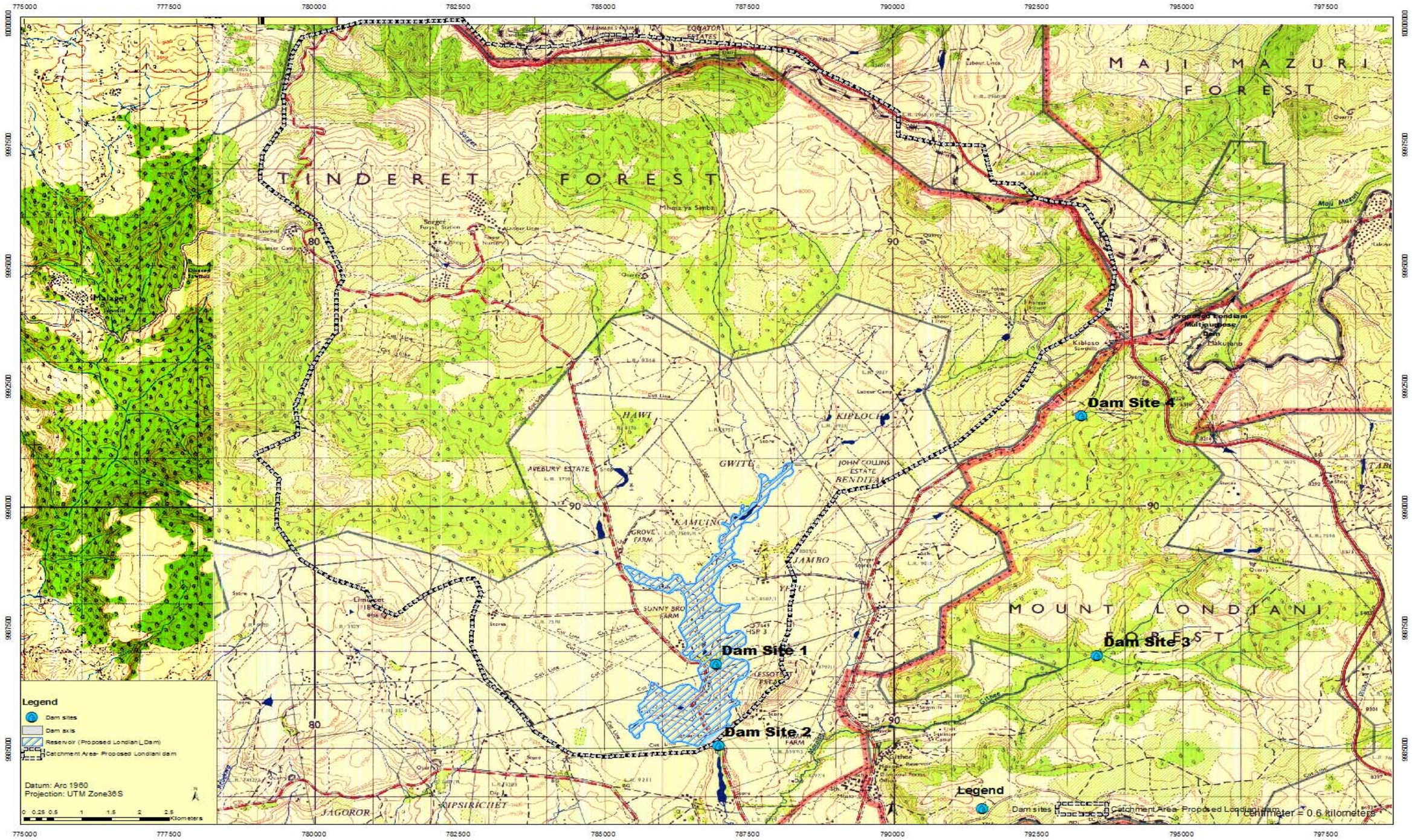
This assignment will involve a series of activities in the sequence listed under the terms of reference. There will be close liaison with relevant county departments, local authorities, community groups and other organizations in the area with a view to sharing their experiences and information with respect to environmental resources and social aspects. Effective evaluation of the baseline status will comprise of interviews (consultative meetings and discussions) and physical inspection of the entire project area. The current status (baseline environmental and social conditions) will provide the starting point for the impact's predictions and benchmark for the mitigation measures.

The planning of the assignment will be influenced by the two main outputs, namely the Environment and Social Impact Assessment (ESIA) Study on the one hand and the Resettlement Action Plan (RAP) on the other. The consultant teams for the two studies will overlap on some activities since the two outputs complements each other. The two assignments will, however, run concurrently.

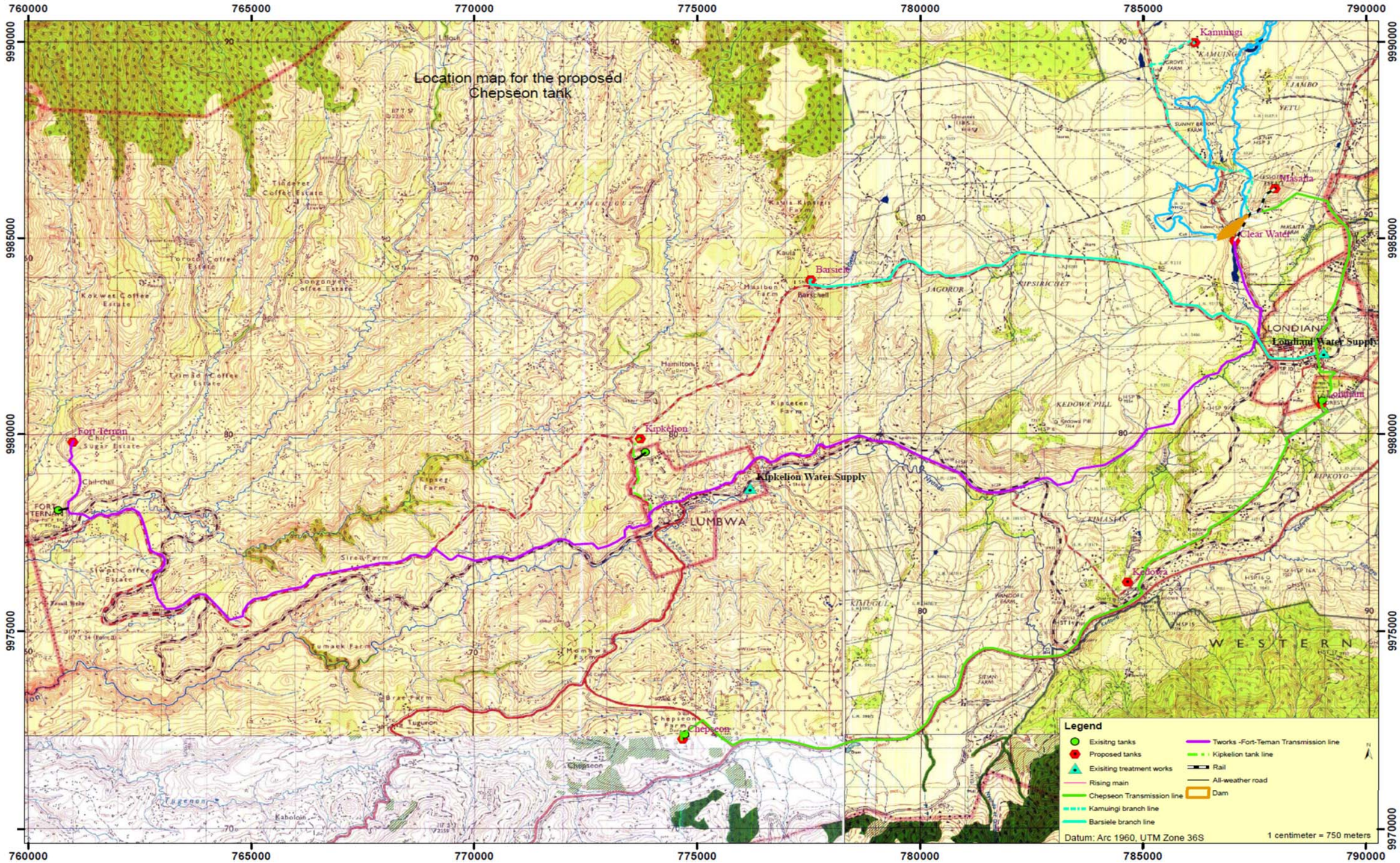
Assignment Phase	**Activities**	**Deliverables**
A: Environment and Social Impact Assessment (ESIA)	Initial Consultations Reconnaissance visits Inception Report preparation Submission and presentation of Inception Report	Combined Inception Report (ESIA and RAP)
	Review of original ToR Review of ESIA Project Report Prepare ToR for ESIA Study for NEMA approval	Submission and approval Terms of Reference on ESIA Study
	Field assessments Supplementary environmental assessment Stakeholders and public consultations.	Draft ESIA Study Report for review by the Client

Assignment Phase	**Activities**	**Deliverables**
	Cumulative Impacts Assessments	
	Review of ESIA Study Report Presentation to the Client Integration of Comments (NEMA and Client) Final ESIA Study Report	ESIA Study Report submission to NEMA

Annex 2: Site Location Maps



General locations of the identified possible dam sites



Water Storage Tanks, Related Pipeline Routes and Service Interrupted

Service interruptions points

Road Crossing and Way Leaves

Road Crossing Point	Location Coordinates (WGS84-Zone 365)		Remarks
	E(m)	N(m)	
1	789310	9981297	Entry to Londiani Town from Londiani Muhoroni road
2	787637	9981997	Kipchorian Bridge at Londiani
3	769032	9976646	At Ngedalel
Way Leave			
WL_1	787861	9981606	Londiani
	777819	9983460	Barsiele
WL_2	785023	9975664	Kedowa
	775882	9971771	Chepseon
WL_3	769032	9976646	Ngedalel
	761215	9977333	Fort Ternan

Rail Crossing and Way Leaves

Rail Crossing Point	Location Coordinates(WGS84-Zone 365)		Remarks
	E(m)	N(m)	
1	789017	9981645	Londiani
2	787139	9977720	Near Kedowa
3	784952	9975768	Kedowa
4	781834	9978281	Along Kedowa-Kipkellion Marrum road
5	778869	9979558	Along Kedowa-Kipkelion murram road (near Tuyoibei pry)
6	764114	9975426	Near Fort Ternan along Londiani-Muhoroni road
7	763227	9975187	
8	762864	9975911	
9	761146	9977378	Fort Ternan
Way Leave			
WL_1	782674	9978607	Near Tuyoibei pry on way to Kipkelion
	781834	9978281	
WL_2	772621	9976744	2 km from kipkelion town
	770174	9977378	

Oil Crossing and Way Leaves

Oil Crossing Point	Location Coordinates (WGS84-Zone 365)		Remarks
	E(m)	N(m)	
1	789255	9980772	Near Londiani Town (Kapkondoo)
2	786863	9981461	Near Londiani town (forest)
3	779387	9983677	Along Londiani-Muhoroni road (Sugutek)
4	777832	9983482	Along Londiani-Muhoroni road (Barsiele)
5	768056	9976417	Along Londiani-Muhoroni road (near Siret)
6	766401	9975948	Along Londiani-Muhoroni road
7	766198	9975777	Along Londiani-Muhoroni road
8	765038	9975323	Along Londiani-Muhoroni road

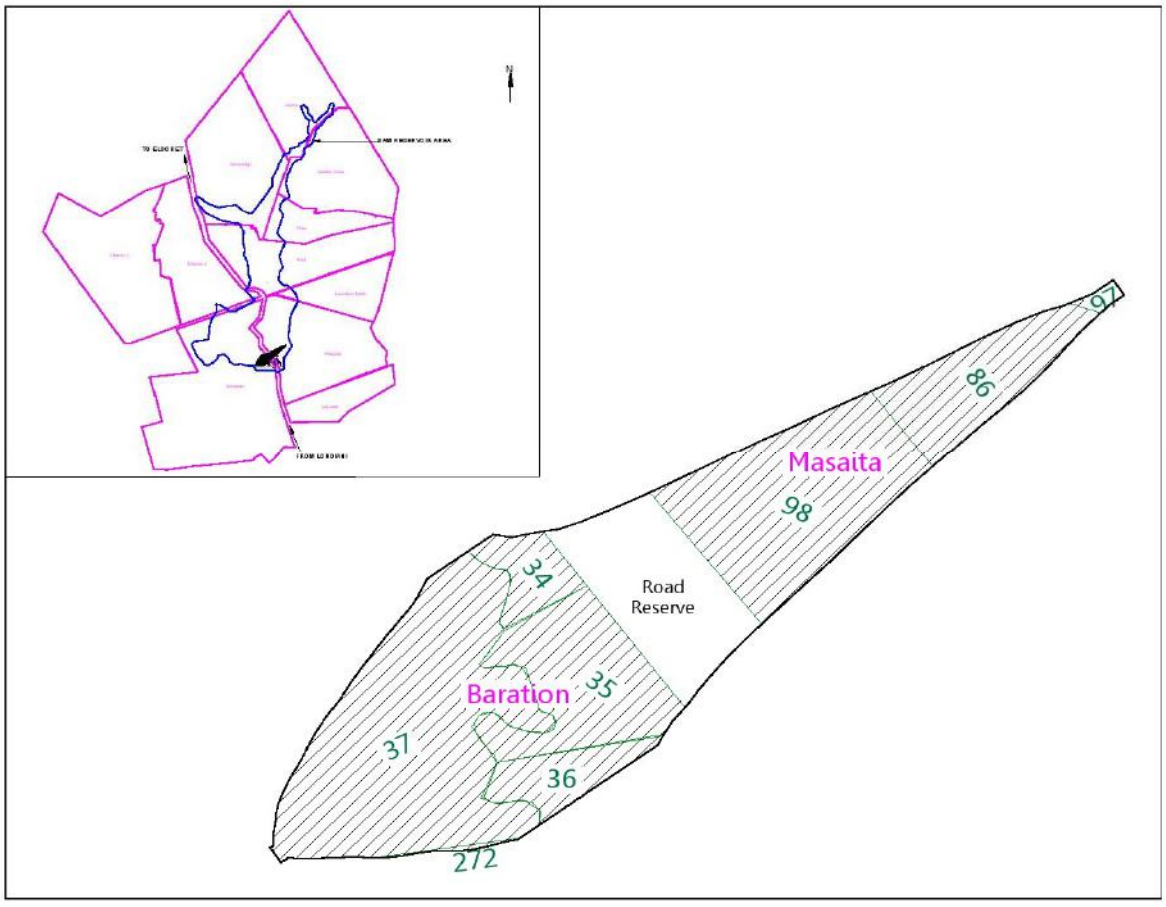
Appendix 2.2: Details of the project affected land parcels

NOTE: *"Details provided her in are based on Registry Index Maps (RIMS), Land searches for the project affected area based on project design" – this information including associated land parcel searches can also be obtained from Land Report which is one of the outputs of the task.*

Appendix	Description
2.2.1	Affected land parcels for dam site area
2.2.2	Affected land Parcels due to acquisition for Water Treatment works, power house and another facilities site
2.2.3	Affected land Parcels due to acquisition of Water Storage Tanks
2.2.4	Affected land Parcels due to acquisition of Way leave for Water transmission pipelines
2.2.5	Affected Land parcels in the Reservoir Area
2.2.5.1	Affected Land parcels in LR 8507/2-FIR No. 161/44 (Jambo Farm)
2.2.5.2	Affected Land parcels in L.R 8797/1-Londiani-Londiani Block 2 (Londian Farm-Sheet No.2)
2.2.5.3	Affected Land parcels in LR.8751-Sorget-kalyet Block 1 (Gwitu-Sheet No.1)
2.2.5.4	Affected Land parcels in Kericho/Sorget-kalyet/Block 3 (Itoik)
2.2.5.5	Affected Land parcels in LR 8797/2- Londiani Joubert kedowa Block 14 (Masaita-Sheet No.1)
2.2.5.6	Affected Land parcels in L.R 7569/R-Londiani-Londiani Block 3 (Kamuingi -Sheet No.1)
2.2.5.7	Affected Land parcels in Kericho/Sorget-Kalyet Block 2 (Kamuingi-Yetu)
2.2.5.8	Affected Land parcels in L.R7570-Sorget-Kalyet Block 1 (Cheres)
2.2.5.9	Affected Land parcels in LR 9211-Londiani Joubert Kedowa Block 6 (Baration)
2.2.6	Parcels of Land where remaining part is agriculturally uneconomical

Appendix 2.2.1: Affected land parcels for dam site area

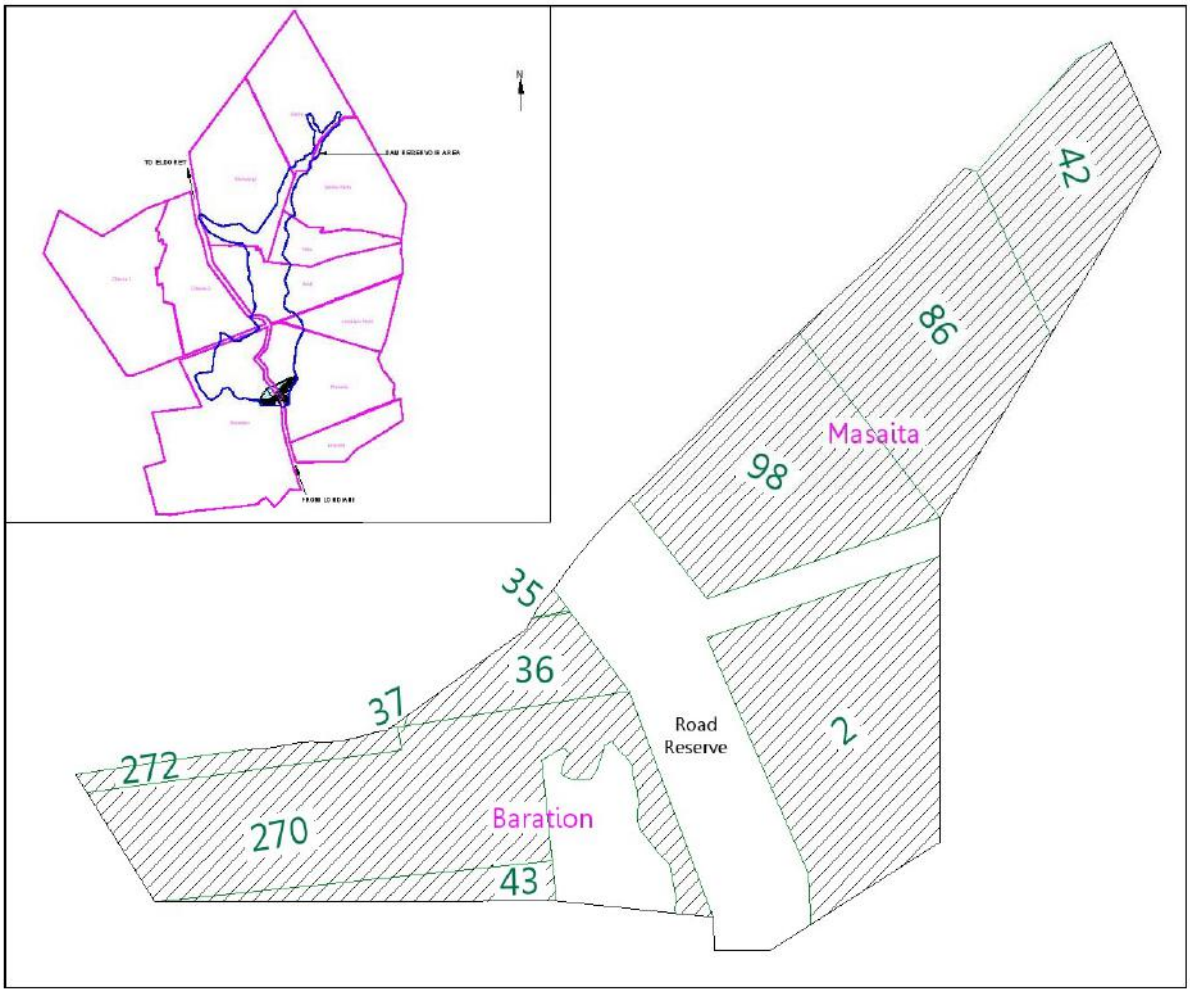
RIM No.	LR No.	Land Owner	AREA (Ha)			Remarks
			Total	Affected	Remaining	
Baration-Block 6 LR 9211-Londiani Joubert Kedowa Block 6 (Baration)	35	Kipnyobi A. Chepkwony	1.22	1.22	0	Whole land acquisition
LR 8797/2- Londiani Joubert kedowa Block 14 (Masaita-Sheet No. 1)	98	The President of the Republic of Kenya	4.85	4.85	0	Public land
	86	Richard Kipngetichlabo	8.06	7.19	0.87	Partial acquisition
		Total	**14.13**	**13.466**	**0.664**	



Appendix 2.2.2: Affected land Parcels due to acquisition for Water Treatment works, power house and other facilities sites

RIM No.	LR No	Land Owner	Area (Ha)			Remarks
			Total	Affected	Remaining	
LR 9211-Londiani JoubertKedowa Block 6 (Baration)	272	Francis Kiprono Soi	0.6	0.4	0.2	Uneconomical (Acquire whole)
	270	Kipkorir A. Tonui	5.964	4.564	1.4	Partial acquisition
	43	Kipkoskei A. Mwei	16.56	0.012	16.548	Partial acquisition
	36	Title not issued	9.212	9.212	0	Whole land acquisition
LR 8797/3: Londiani Joubert kedowa Block 14 (Masaita-sheet No. 1)	42	Joseph Kipkurui Rotich	3.66	0.45	3.21	Partial land acquisition
	2	KimeuChepkwony	19.67	2.3598	17.36	Partial acquisition
		Total	**55.666**	**16.9978**	**38.718**	

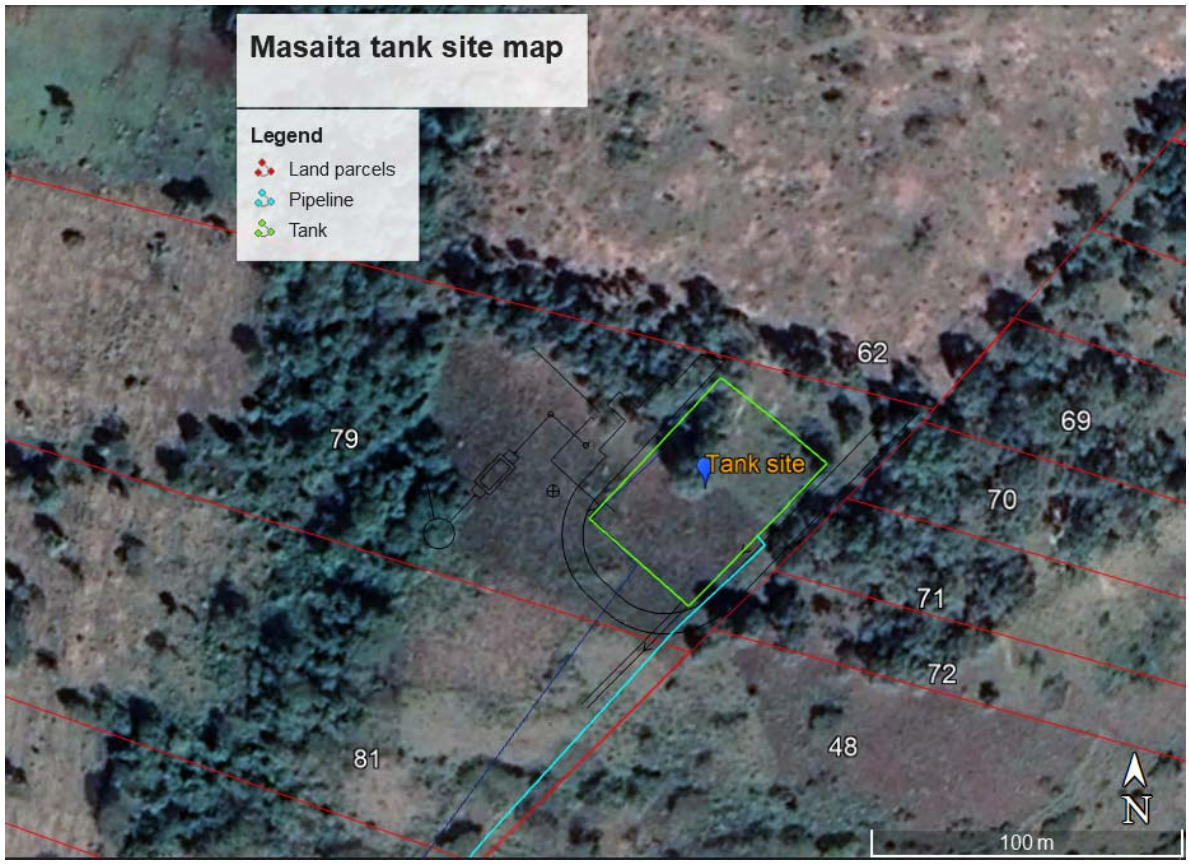
Treatment workspower house and other facilities



Appendix 2.2.3: Affected land Parcels due to acquisition of Water Storage Tanks

RIM No.	LR No	Location of the Tank	Land Owner	AREA (Ha)			Remarks
				Total	Affected	Remaining	
LR.8751-Sorget-Kalyet Block 1 (Gwitu-Sheet No.1)	50	Kamuingi	Water Company	0.113	0.064	0.049	Partial Acquisition
LR 8797/3: Londiani Joubert kedowa Block 14 (Masaita-sheet No.1)	62	Masaita hill	Joel Kimutai Sang	11.71	0.80	10.91	Partial Acquisition
Londiani	Forest land	Londiani	GOK – Forest Depart.	0	0.31		Partial acquisitions
Kericho-Londiani Joubert kedowa Block 12-Kimasian	276	Kedowa	Samuel Kipsiele A. Maina	3.6	0.068	3.532	
Kericho-Kipkellion-Chepseon block 4	555	Chepseon	Catholic Diocese of Kenya	0.81	0.128	0.682	
Kericho-Kipkellion-Barsiele block 1 (Kaula)4	205	Barsiele	Republic Of Kenya-Barsiele Pry. Sch.	3.917	0.045	3.872	
Kericho-Kipkellion-Barsiele block 2 (Kaplaba)	36	Kipkelion	Joseph Kiplangat, John Chruyot A. Tonui, Kipron Tonui	8.502	0.26	8.242	Partial acquisitions
Kericho-chilchila-fort ternan Block 3, (Murgut)	39	Fort Ternan	Kipkorir A. Koech Sigulai	4.481	0.256	4.225	
			Total	**33.133**	**1.931**	**31.512**	

Masaita Water Tank Site

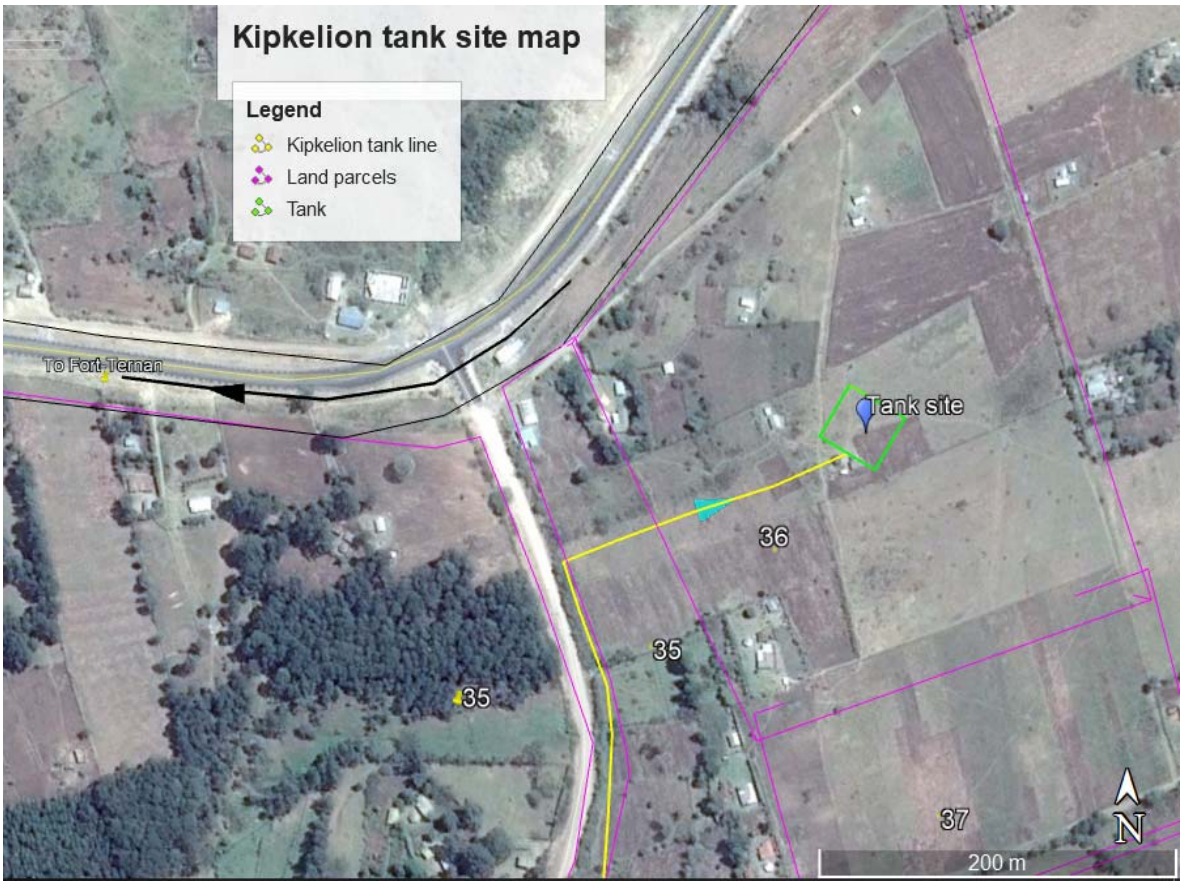


Kedowa Water Tank Site

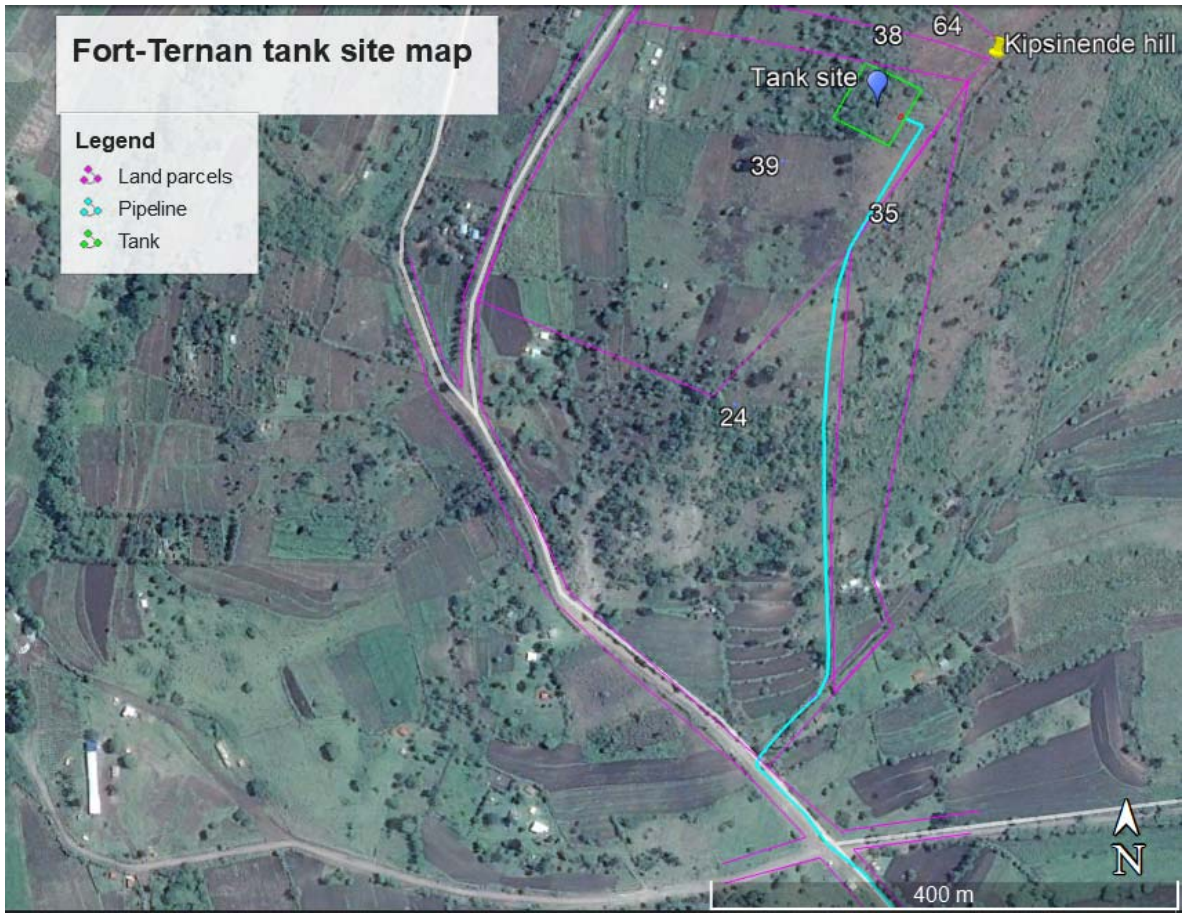
Chepseon Water Tank site

Barsiele Water Tank Site

Kipkelion tank site Map

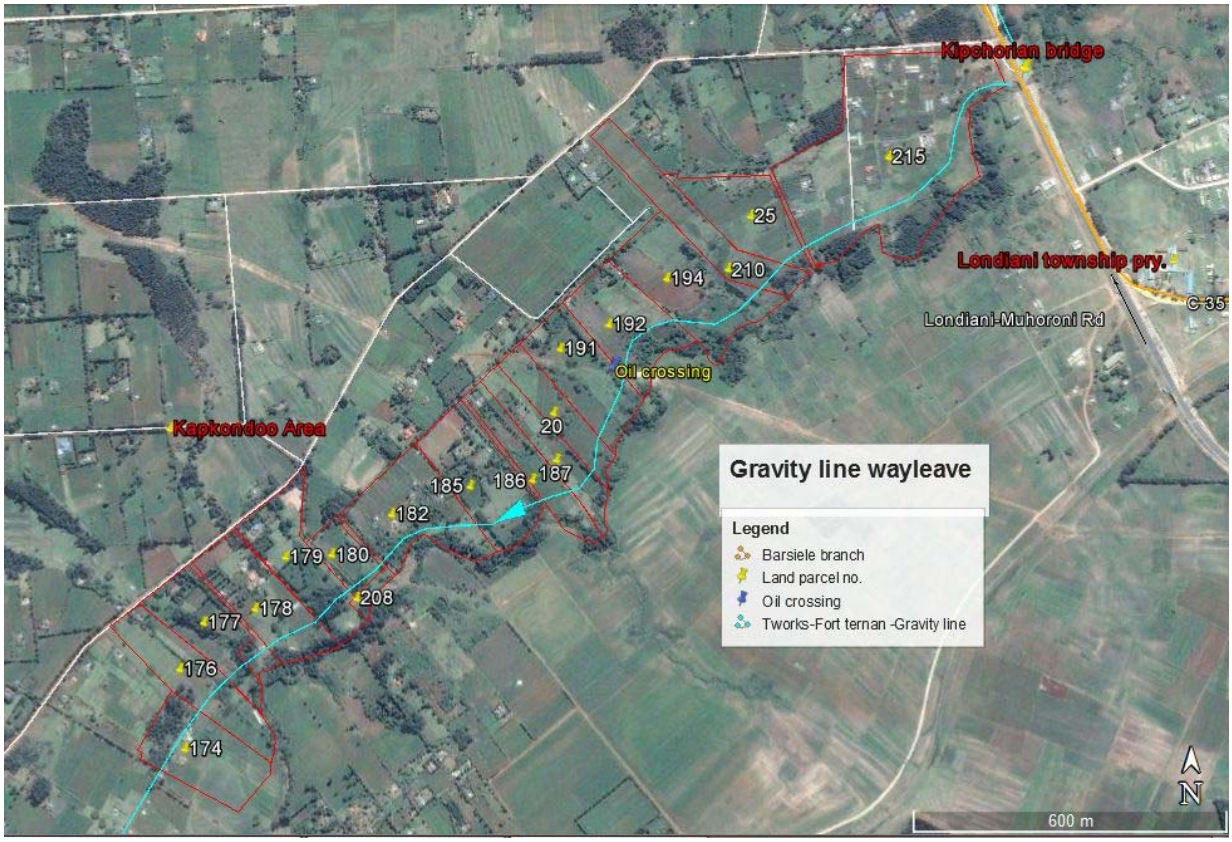


Fort Ternan Tank Site



Appendix 2.2.4: Affected land Parcels due to acquisition of Way leave for Water transmission pipelines

RIM No.	LR No.	Land Owner	Area (Ha)			Remarks
			Total	Affected	Remaining	
LR 8797/3: Londiani Joubert kedowa Block 14 (Masaita-sheet No. 1)	56	John Kiprotich Birir	4.92	0.552	4.368	Partial Acquisition
	81	Kipkoech Arap Sitienei	3.31	0.083	3.227	Partial Acquisition
	82	Joseph Kibet Chelogoi	8.32	0.026	8.294	
	80	James Kiplangat Tum	8.32	0.035	8.285	
	79	Benjamin Kipngetich Tum	8.32	0	0	Factored in Reservoir where large size of land falls
Kericho/Londian Jourbet/kedowa block 10(United Soy)	20	Green card missing	4.0	0.72	3.28	Partial Acquisition
	25	Grace Cherono	3.0	0.068	2.932	Partial Acquisition
	165	Green card missing	3.0	0.045	2.955	Partial Acquisition
	175	Green card missing	3.30	0.09	3.21	Partial Acquisition
	174	Kipsoi Arap Chepkwony	3.0	0.09	2.91	Partial Acquisition
	176	Henry Chepkwony Langat	3.0	0.081	2.919	Partial Acquisition
	177	Chesiele Mary Kirwa	3.2	0.09	3.11	Partial Acquisition
	178	Kipsiele Baraiwo	3.2	0.108	3.092	Partial Acquisition
	179	Alexander Kipkoech Koskei	3.0	0.09	2.91	Partial Acquisition
	180	Joseph Cheruyot Koech	1.3	0.072	1.228	Partial Acquisition
	182	Maritim A Cheruyot	3.7	0.225	3.475	Partial Acquisition
	185	Charles Kipngetich Langat	3.0	0.045	2.955	Partial Acquisition
	186	Ruth ChepKirui Sang	1.6	0.054	1.546	Partial Acquisition
	187	Leah Chebet Sang	1.0	0.023	0.977	Partial Acquisition
	191	Joseph Kipchumba A Rotich	4.2	0.153	4.047	Partial Acquisition
	192	Esther Tolong Maina	3.2	0.27	2.93	Partial Acquisition
	194	Igbals Arap Soi	3.2	0.099	3.101	Partial Acquisition
	215	GOK	10.8	0.495	10.305	Partial Acquisition
Kericho-Kipkellion-Barsiele block 2 (Kaplaba)	35	Henry Kiprono A.	33.67	0.116	33.554	Restriction on dealing
	36	Joseph Kiplangat, John Chruyot A. Tonui, Kipron Tonui	8.502	0.046	8.456	Partial Acquisition
Kericho-Chilchila-fort Ternan Block 3 (Murgut)	24	No title	6.7	0.405	6.295	Partial Acquisition
	39	Kipkorir A, Koech	6.0	0.09	5.91	Partial Acquisition
		Total	148.762	4.171	136.271	

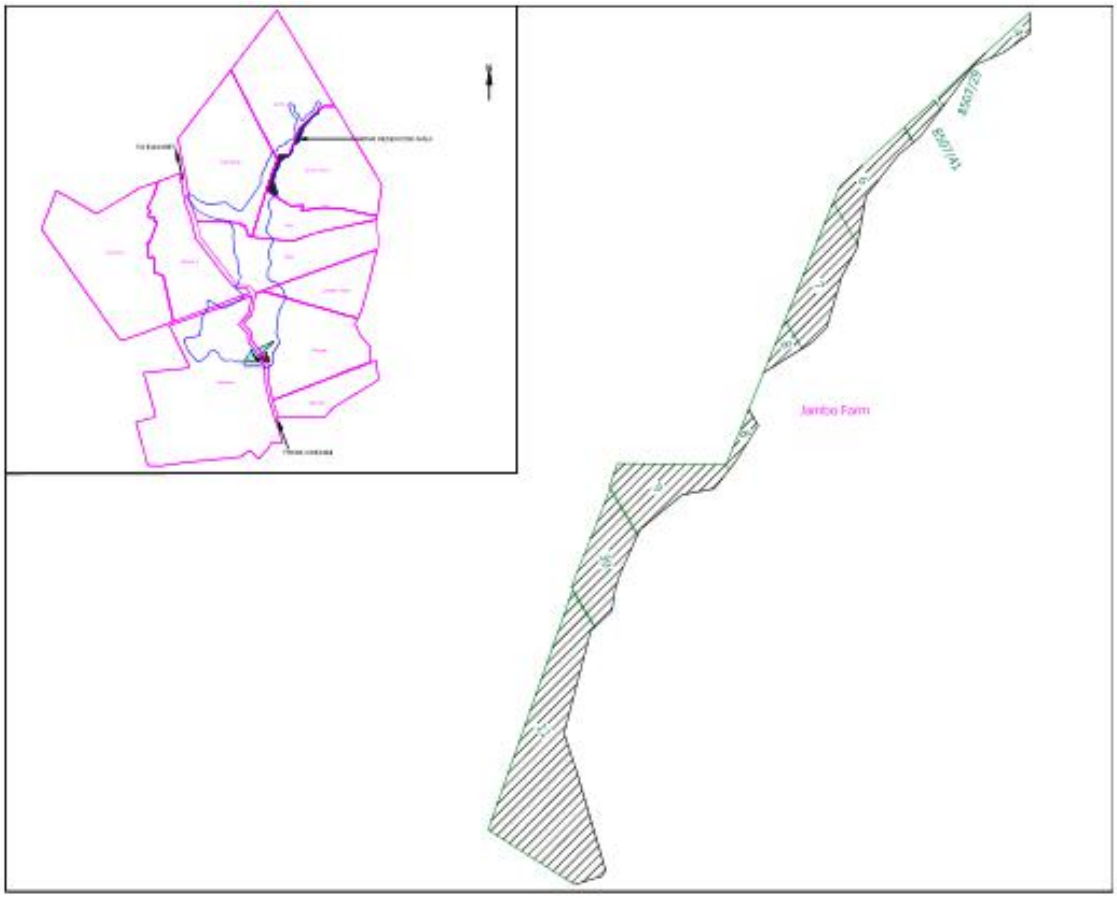

Kipchorian bridge
215
25
Londiani township pry.
194
210
C 35
Londiani-Muhoroni Rd
192
191
Oil crossing
Kapkondoo Area
20
187
186
185
182
179
180
208
178
177
176
174
Gravity line wayleave
Legend
Barsiele branch
Land parcel no.
Oil crossing
Tworks-Fort ternan -Gravity line
N
600 m

Appendix 2.2.5: Affected Land parcels in the Reservoir Area

Appendix	Description
4.5.1	Affected Land parcels in LR 8507/2-FIR No. 161/44 (Jambo Farm)
4.5.2	Affected Land parcels in L.R 8797/1-Londiani-Londiani Block 2 (Londian Farm-Sheet No.2)
4.5.3	Affected Land parcels in LR.8751-Sorget-kalyet Block 1 (Gwitu-Sheet No.1)
4.5.4	Affected Land parcels in Kericho/Sorget-kalyet/Block 3 (Itoik)
4.5.5	Affected Land parcels in LR 8797/2- Londiani Joubert kedowa Block 14 (Masaita-Sheet No.1)
4.5.6	Affected Land parcels in L.R 7569/R-Londiani-Londiani Block 3 (Kamuingi -Sheet No.1)
4.5.7	Affected Land parcels in Kericho/Sorget-Kalyet Block 2 (Kamuingi)
4.5.8	Affected Land parcels in L.R7570-Sorget-Kalyet Block 1 (Cheres)
4.5.9	Affected Land parcels in LR 9211-Londiani Joubert Kedowa Block 6 (Baration)

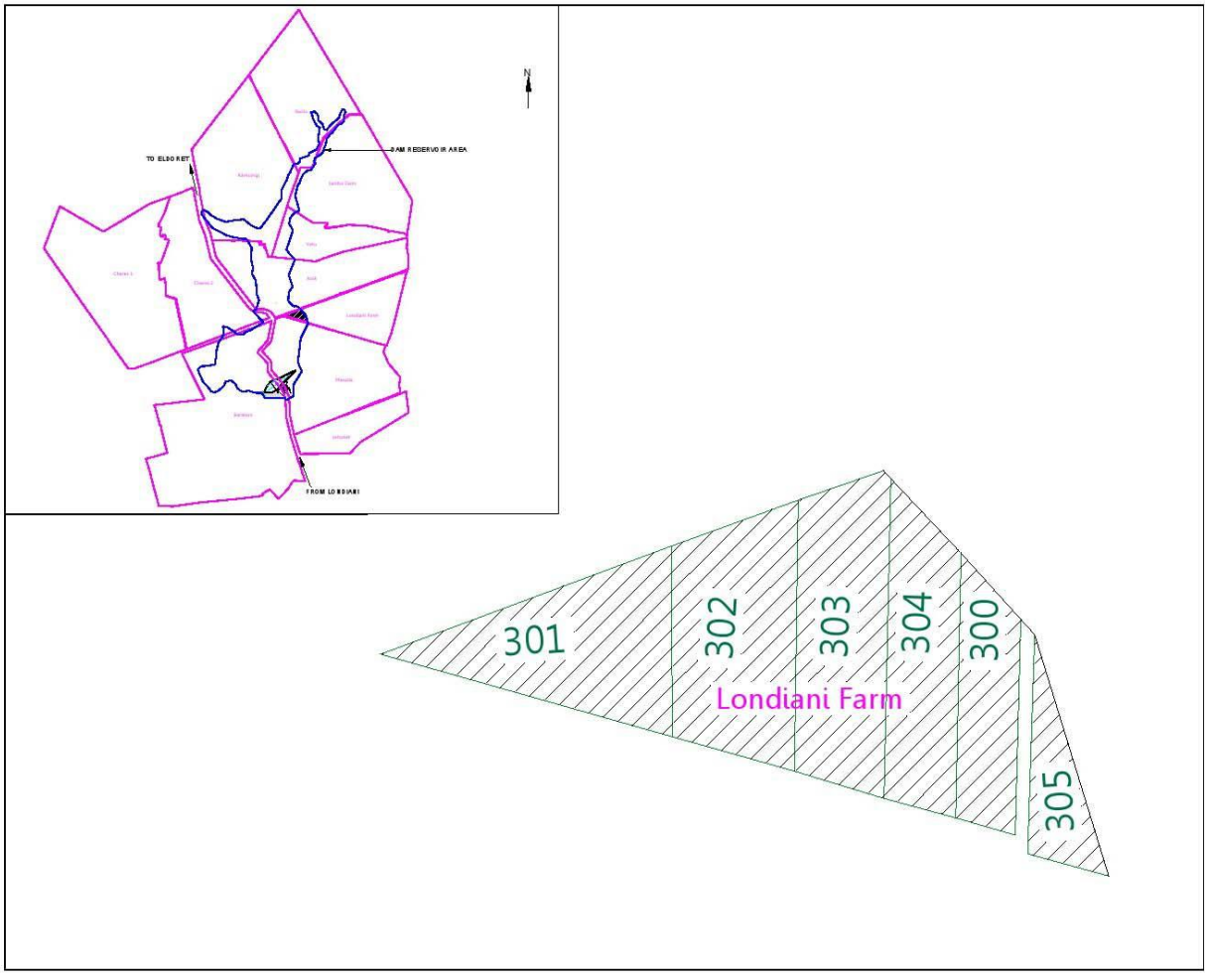
Appendix 2.2.5.1: Affected Land parcels in LR 8507/2-FIR No. 161/44 (Jambo Farm)

RIM No.	LR No.	Land Owner	Area (Ha)			Remarks
			Total	Affected	Remaining	
LR 8507/2-FIR No. 161/44 (Jambo Farm)	8507/11	Philip Gititu Ngunjiri, Danson Gititu Ngunjiri, Justus Muirui Ngunjiri and James Wamai Ngunjiri	24.34	7.42	16.92	Partial acquisition
	8507/9	Erustus Kamunya Macharia	24.35	2.13	22.22	Partial acquisition
	8507/8	Josiah Njuguna kariuki	31.58	0.55	31.03	Partial acquisition
	8507/7	Grace Wanjiru Maguru	24.34	2.27	22.05	Partial acquisition
	8507/6	Cyrus Mbinu Njoroge	24.34	1.25	23.09	Partial acquisition
	8507/4	Peter Macharia Gathumbi	24.34	0.44	23.90	Partial acquisition
	8507/41		9.40	0.3	9.10	
	10/39--		4.63	2.13	2.5	Partial acquisition
	Total		**167.32**	**16.49**	**150.81**	



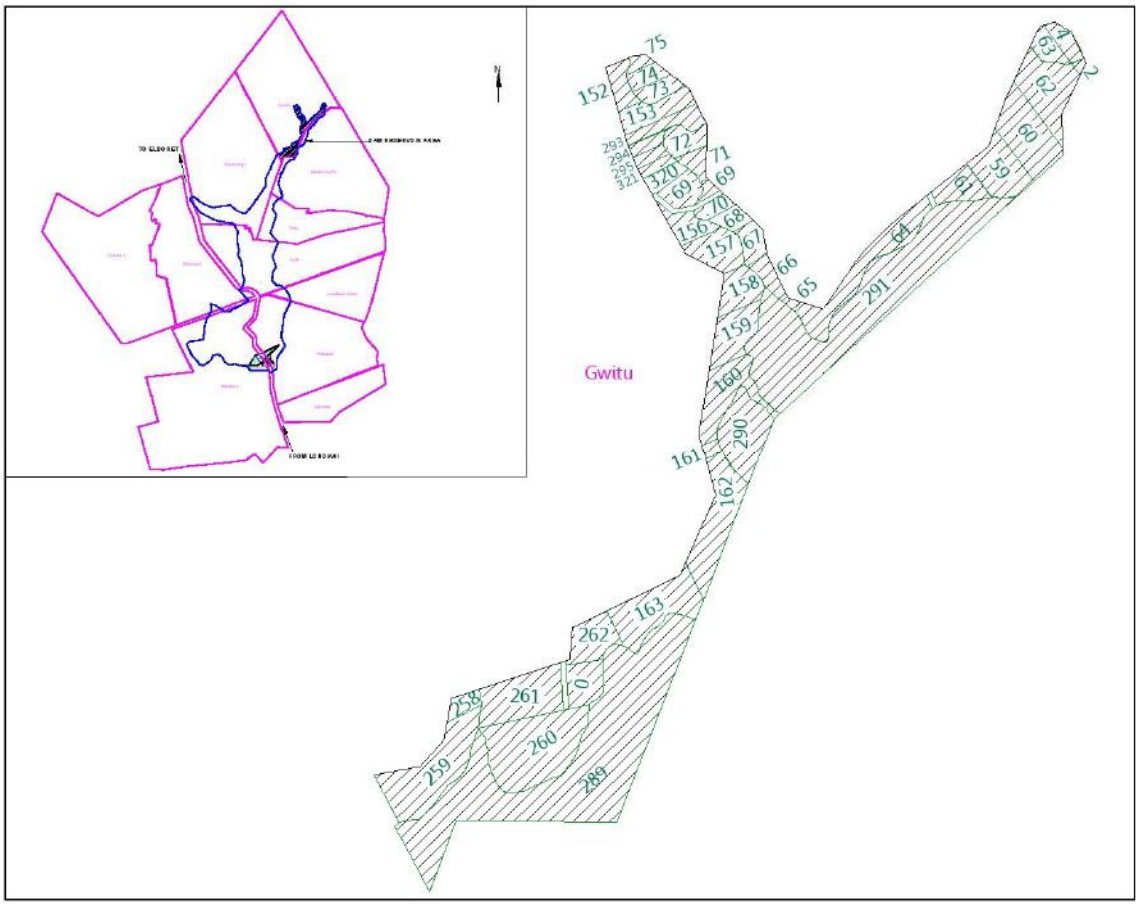
Appendix 2.2.5.2: Affected Land parcels in L.R 8797/1-Londiani-Londiani Block 2 (Londian Farm-Sheet No.2)

RIM No.	LR No.	Land Owner	Area (Ha)			Remarks
			Total	Affected	Remaining	
	305	Selina Chepkorir Mosonik	0.985	0.45	0.535	Partial acquisition
	304	Ngigi Njuguna Mwangi	1.291	1.067	0.224	Partial acquisition
	303	Johana Kipkoech Busienei	1.356	1.226	0	Whole land acquisition
	302	Vincent Kiprotich Mosonik	1.453	1.453	0	Whole land acquisition
	301	Henry Kipngetich Bii	1.384	1.384	0	Whole land acquisition
	300	Stephen Waweru Kamau	1.311	0.821	0.49	Partial acquisition
		Total	7.7795	6.401	1.249	



Appendix 2.2.5.3: Affected Land parcels in LR.8751-Sorget-kalyet Block 1 (Gwitu-Sheet No.1)

	LR No.	Land Owner	Area (Ha)			Remarks
			Total	Affected	Remaining	
LR.8751-Sorget-kalyet Block 1 (Gwitu-Sheet No.1)	289	Title not issued	4.769	4.769	0	Whole land acquisition
	163	John Kinyanjui Gichimu	1.53	0.72	0.81	Partial land acquisition
	162	Elizabeth Chemutai Marisin	1.9	0.85	1.05	Partial land acquisition
	262	John Karanja Wainaina	1.58	1.46	0.102	Uneconomical (Acquire whole)
	261	John Kiplangat A. Sang	1.44	0.81	0.63	Uneconomical (Acquire whole)
	260	Title not issued	1.39	1.39	0	Whole land acquisition
	259	Philip Luhya Sagwa	1.48	1.11	0.37	Uneconomical (Acquire whole
	258	Jacob W.	1.487	0.138	1.349	Partial land acquisition
	290		0.72	0.72	0	Whole land acquisition
	291		3.40	3.40	0	Whole land acquisition
	161		0.20	0.057	0.143	Partial land acquisition
	160		1.50	0.61	0.89	Partial land acquisition
	159		1.46	0.46	1.0	Partial land acquisition
	158		1.41	0.35	1.06	Partial land acquisition
	157		1.5	0.4	1.1	Partial land acquisition
	156		1.22	0.25	0.97	Partial land acquisition
	320		0.85	0.15	0.70	Partial land acquisition
	321		0.35	0.09	0.24	Partial land acquisition
	295		0.45	0.09	0.36	Partial land acquisition
	294		0.45	0.10	0.35	Partial land acquisition
	293		0.60	0.35	0.25	Partial land acquisition
	153		1.43	0.38	1.05	Partial land acquisition
	152		1.40	0.21	1.19	Partial land acquisition
	75		1.45	0.07	1.38	Partial land acquisition
	74		1.40	0.15	1.25	Partial land acquisition
	73		1.5	0.17	1.33	Partial land acquisition
	72		1.45	0.24	1.21	Partial land acquisition
	71		1.45	0.14	1.31	Partial land acquisition
	70		0.21	0.21	0	Whole land acquisition
	69		0.15	0.15	0	Whole land acquisition
	68		1.62	0.15	1.48	Partial land acquisition
	67		1.48	0.20	1.28	Partial land acquisition
	65		0.30	0.10	0.20	Partial land acquisition
	64		1.10	1.10	0.0	Whole land acquisition
	61		1.14	0.31	0.83	Partial land acquisition
	60		1.63	0.75	0.88	Partial land acquisition
	59		1.63	0.54	1.09	Partial land acquisition
	62		1.72	0.60	1.12	Partial land acquisition
	4		0.2	0.2	0	Partial land acquisition
	2		0.30	0.027	0.273	Partial land acquisition
		Total	51.246	23.971	27.247	


Gwitu
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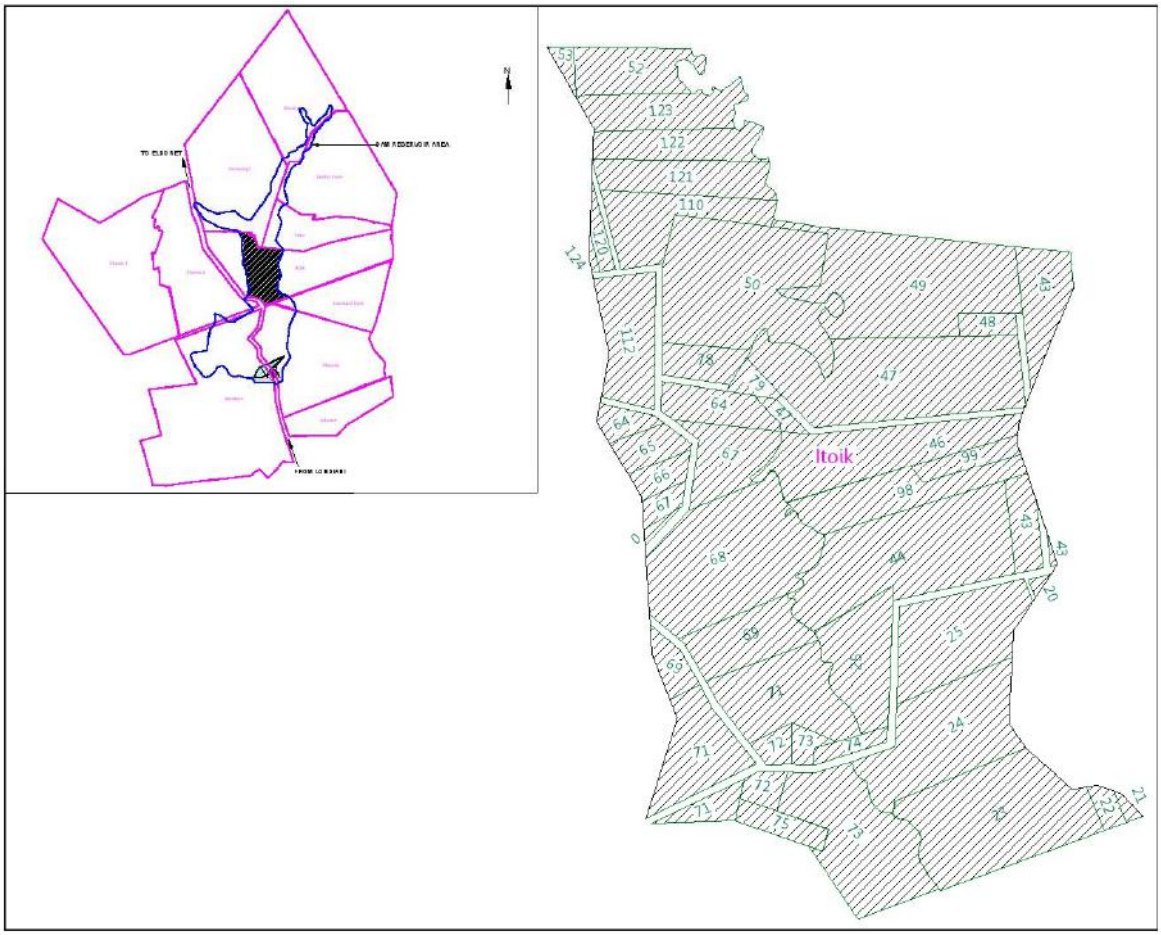
Appendix 2.2.5.4: Affected Land parcels in Kericho/Sorget-kalyet/Block 3 (Itoik)

RIM No.	LR No.	Land Owner	Area (Ha)			Remarks
			Total	Affected	Remaining	
	20	Title Not Issued	1.9	0.05	1.85	Partial land acquisition
	21	Title Not Issued	1.43	0.11	1.32	Partial land acquisition
	22	Joshua Kipkorir Koech	0.83	0.35	0.48	Partial land acquisition
	23	Job Kibet Sang	6.44	5.91	0.53	Partial land acquisition
	24	Rachael Chepkurui Langat	6.22	4.48	1.74	Partial land acquisition
	48	Philip Kibiegon Rono	0.4	0.4	0	Whole land acquisition
	74	Government of Kenya	0.4	0.4	0	Whole land acquisition
	75	Government of Kenya	0.76	0.76	0	Whole land acquisition
	78	Government of Kenya	0.94	0.94	0	Whole land acquisition
	79	Government of Kenya	0.44	0.44	0	Whole land acquisition
	98	Joseph Kipkurui Kenduiwa	2.46	2.34	0.12	Uneconomical (acquire whole)
	99	Jonah Kipketer Ngerechi	0.8	0.67	0.13	Uneconomical (acquire whole)
	110	John Kipkorir Towett	2.023	2.023	0	Whole land acquisition
	112	James Kipkemoi Kenduiwa	4	2.26	1.74	Partial land acquisition
	121	Richard Samoei	2.023	2.023	0	Whole land acquisition
	122	Peter Kiplangat Bore	2.023	2.023	0	Whole land acquisition
	123	Samwel Kimoni Karuga	2.023	2.023	0	Whole land acquisition
	125	Green Card Missing	3,87	2.65	1.22	Partial land acquisition
	25	David Kipkirui Chelule	3.92	3.55	0.37	Uneconomical (acquire whole)
	42	Richard K.A. Ngeny	6.42	0.07	6.36	Partial land acquisition
	43	Joseph Chepkwony Tuiya	5.73	2.45	3.28	Partial land acquisition
	44	Joseph Kipkirui Kenduiwa	6.2	6.2	0	Whole land acquisition

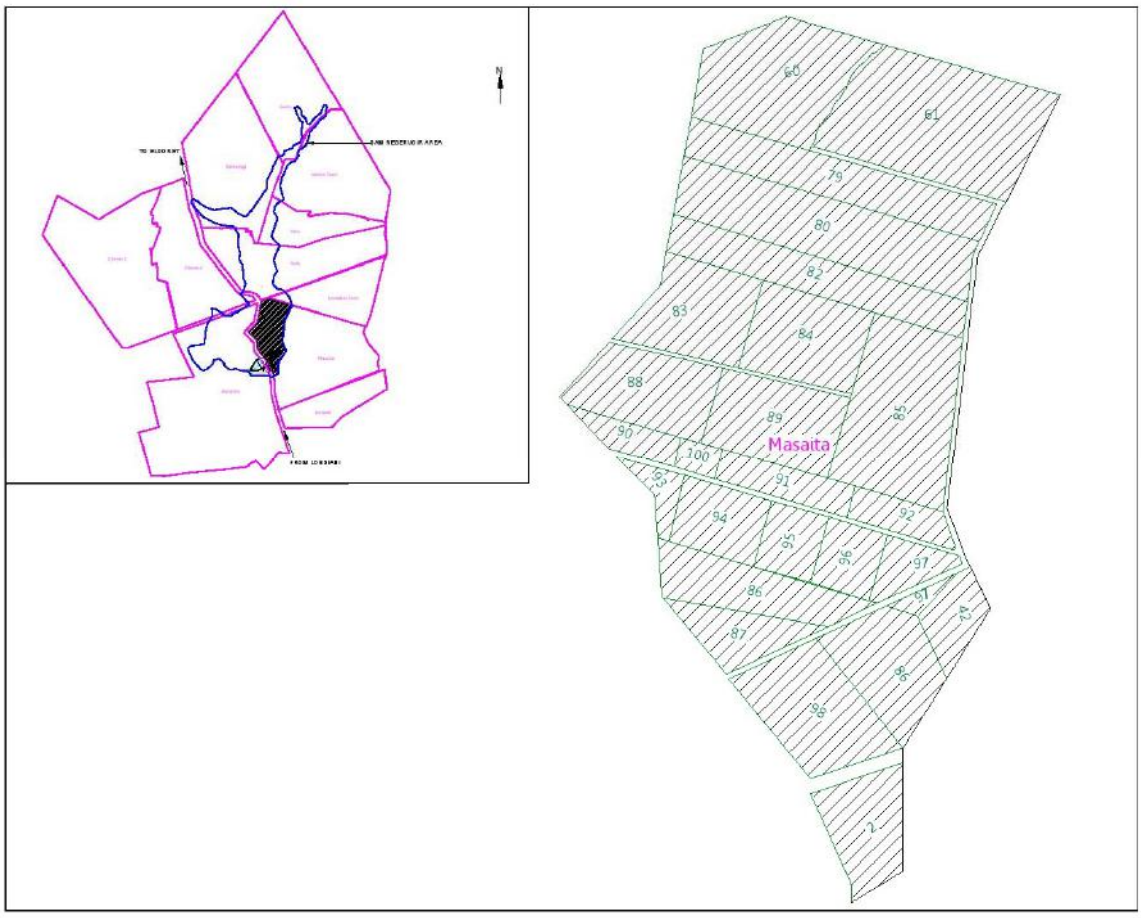
Appendix 2.2.5.4: Affected Land parcels in Kericho/Sorget-kalyet/Block 3 (Itoik) *Continued from page above*

RIM No.	LR No.	Land Owner	Area (Ha)			Remarks
			Total	Affected	Remaining	
Kericho/Sorget-kalyet/Block 3 (Itoik)	46	Title Not Issued	3.86	3,76	0.1	Uneconomical (acquire whole)
	47	Rusi Cherotich Chelule	6.72	6.72	0	Whole land acquisition
	73	Jacob Chelule Cheruiyot	4.78	4.78	0	Whole land acquisition
	72	Rachel Chebii Koech	0.8	0.8	0	Whole land acquisition
	71	Lily Kazelyo	7.28	5.33	3.792	Partial land acquisition
	69	Jonathan Kiplangat Koech	4.34	2.597	1.743	Partial land acquisition
	68	Mary Chepngeno Keter	7.56	7.273	0.287	Partial land acquisition
	67	Moses Chepkonga	2.84	2.47	0.47	Partial land acquisition
	66	Samwel Kipngeno Sang	3.12	0.55	2.57	Partial land acquisition
	65	Patrick Kiplangat Mulei	3.6	0.69	2.91	Partial land acquisition
	64	Richard Kipkorir Chomo	4.82	1.76	3.06	Partial land acquisition
	52	Gitau Muthere	1.9	1.9	0	Whole land acquisition
	50	Joel Kipkurui A. Biwot	6.52	6.52	0	Whole land acquisition
	49	Esther Chepngetich Rop	6.36	6.36	0	Whole land acquisition
		Total	211.882	168.872	34.072	


Itoik

Appendix 2.2.5.5: Affected Land parcels in LR 8797/2- Londiani Joubert kedowa Block 14 (Masaita-Sheet No.1)

RIM No.	LR No	Land Owner	Area (Ha)			Remarks
			Total	Affected	Remaining	
LR 8797/2-Londiani Joubert Kedowa Block 14 (Masaita-Sheet No. 1)	100	Paul Kiprop Rotich	0.5	0.5	0	Whole land acquisition
	97	No title	1.22	1.22	0.0	Whole land acquisition
	96	Joseph Kibet Rotich	1.59	1.59	0	Whole land acquisition
	95	Paul Kiprop Rotich	1.57	1.57	0	Whole land acquisition
	94	Francis Rotich Kipkorir	2.36	2.36	0	Whole land acquisition
	93	John Kipkemoi Rotich	0.8	0.8	0	Whole land acquisition
	92	Kiprotich A. Korir	1.55	0.73	0.82	Partial land acquisition
	91	Elizabeth Chepkemoi Rotich	1.68	1.68	0	Whole land acquisition
	90	Samuel Kipkurui Rotich	1.63	1.63	0	Whole land acquisition
	89	Julius Kimutai A. Mitei	1.58	1.58	0	Whole land acquisition
	88	Julius Kimutai A. Mitei	4	4	0	Whole land acquisition
	87	Elizabeth Cherotich Yebor	3.16	3.16	0	Whole land acquisition
	85	Julius Kimutai A. Mitei	7.83	7.83	0	Whole acquisition
	84	Julius Kimutai A. Mitei	13.67	13.67	0	
	83	Julius Kimutai A. Mitei	3.87	3.87	0	Whole land acquisition
	82	Joseph Kibet Chelogoi	8.32	5.84	2.48	Partial land acquisition
	80	James Kiplangat Tum	8.32	6.82	1.5	Partial land acquisition
	79	Benjamin Kingetich Tum	8.32	5.145	3.075	Partial land acquisition
	61	Edward Kipngetich Sang	8.65	7.77	0.88	Whole land acquisition
	60	Daniel Kibet Sang	5.8	5.8	0	Whole land acquisition
		Total	86.42	77.565	8.755	

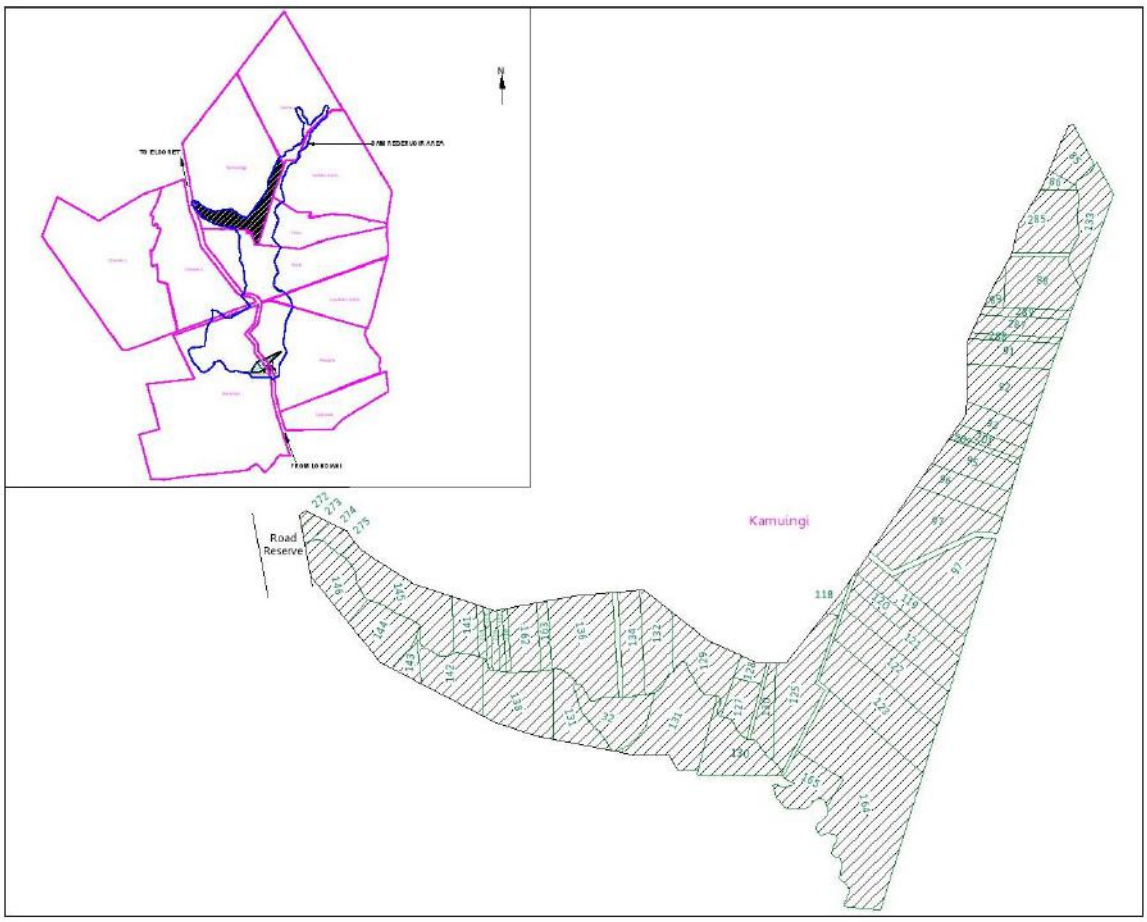

Masaita

Appendix 2.2.5.6: Affected Land parcels in L.R 7569/R-Londiani-Londiani Block 3 (Kamuingi -Sheet No.1)

RIM No.	LR No	Land Owner	Area (Ha)			Remarks
			Total	Affected	Remaining	
L.R 7569/R-Londiani-Londiani Block 3 (Kamuingi -Sheet No.1)	32	No title	1.712	1.712	0	Whole land acquisition
	85	Wolace Ngungi Njuguna	3.547	0.866	2.681	Partial land acquisition
	86	Stephen Muhu Kamau	2.198	0.428	1.77	Partial land acquisition
	88	John Ruria Mbugua	2.198	2.033	0.165	Uneconomical (Acquire whole)
	89	Simon Mwangi Maina	2.09	0.22	1.87	Partial land acquisition
	91	Peter Mwangi Gachane	2.162	1.408	0.754	Partial land acquisition
	92	Julius Mwangi Macharia	3.093	2.123	0.970	Partial land acquisition
	93	Kamau Kahugu	1.911	0.97	0.94	Partial land acquisition
	95	Michael Mwangi Gikonyo	2.257	1.407	0.85	Partial land acquisition
	96	Peter Wainaina Kamau	2.049	1.329	0.72	Partial land acquisition
	97	Peter Kinuthia Nduati	4.32	2.87	1.45	Partial land acquisition
	119	Mbogo Mwangi Kabarai	1.636	1.466	0.17	Uneconomical (Acquire whole
	120	Mary Nyabura Mbogo	0.6091	0.6	0	Whole land acquisition,
	121	Burungu Muturi Mwiraria	2.174	2.174	0	Whole land acquisition
	122	Kihuha Mwangi	2.628	2.628	0	Whole land acquisition,
	123	Gitonga Maru Gitau	3.631	3.631	0	Whole land acquisition
	125	Charles Wairuga Kinungi	3.87	2.65	1.22	Whole land acquisition
	127	James G. Chimu	0.8719	0.8719	0	Whole land acquisition
	128	Gichimu Mwambura	1.218	0.585	0.36	Whole acquisition (remaining uneconomical)
	129	Peter Kamau Kura	9.292	1.41	7.88	Partial land acquisition

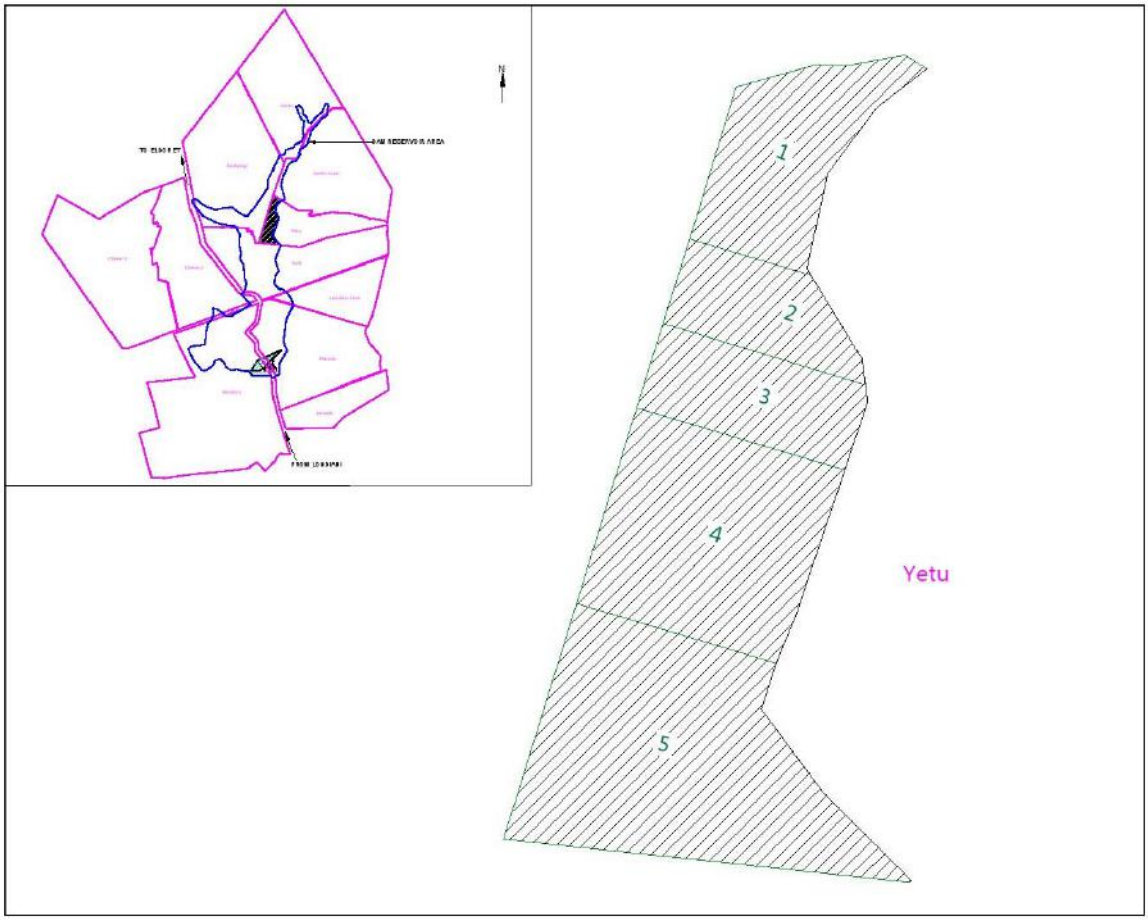
Appendix 2.2.5.6: Affected Land parcels in L.R 7569/R-Londiani-Londiani Block 3 (Kamuingi -Sheet No.1)
Continued from page above

RIM No.	LR No.	Land Owner	Area (Ha)			Remarks
			Total	Affected	Remaining	
L.R 7569/R-Londiani-Londiani Block 3 (Kamuingi -Sheet No.1)	130	Daudi Kamundu Murachia	2.795	2.795	0	Whole land acquisition
	131	Simon Chege Njihia	6.008	3.324	2.684	Whole land acquisition
	132	Cecilia Wambui Njuguna	3.702	1.132	2.57	Partial land acquisition
	133	Government of Kenya	1.624	1.624	0	Whole land acquisition
	134	Mbaya Kirukwa	2.735	0.976	1.76	Partial land acquisition
	136	Paul Njoroge Kimani	5.267	1.367	3.9	Whole land acquisition
	138		4.20	2.52	1.68	Partial land acquisition
	141		2.20	0.80	1.40	Partial land acquisition
	142		4.0	1.825	2.175	Partial land acquisition
	143		3.45	0.385	3.065	Partial land acquisition
	144		2.92	1.66	1.26	Partial land acquisition
	145		6.61	2.925	3.685	Partial land acquisition
	146		2.0	1.58	0.42	Partial land acquisition
	162		3.1	1.22	1.88	Partial land acquisition
	163		1.16	0.44	0.72	Partial land acquisition
	164	Peter Njuguna Munyuti	8.816	8.816	0	Whole land acquisition
	201	Mary Njoki Maina	1.0	0.643	0.357	Uneconomical (Acquire whole)
	202	Daniel Mwangi Macharia	0.362	0.231	0.131	Uneconomical (acquire whole)
	214		0.65	0.24	0.41	Partial land acquisition
	215		0.62	0.21	0.41	Partial land acquisition
	216		0.75	0.27	0.48	Partial land acquisition
	217		0.62	0.21	0.41	Partial land acquisition
	218		0.52	0.20	0.32	Partial land acquisition
	272		1.34	0.068	1.272	Partial land acquisition
	273		1.22	0.255	0.965	Partial land acquisition
	274		0.95	0.20	0.75	Partial land acquisition
	275		1.10	0.22	0.88	Partial land acquisition
	285	Gachane Chege	3.177	1.877	1.3	Partial Acquisition
	287	Ann Mugure Kemondo	1.843	1.267	0.576	Partial Acquisition
	288	James Kabuchi Maruga	0.6	0.4	0.2	Uneconomical (Acquire whole
	289	Isaac Mwangi Mbiyu	0.4	0.3	0.1	Uneconomical (Acquire whole
		Total	129.206	71.362	57.56	


Road
Reserve
Kamuingi

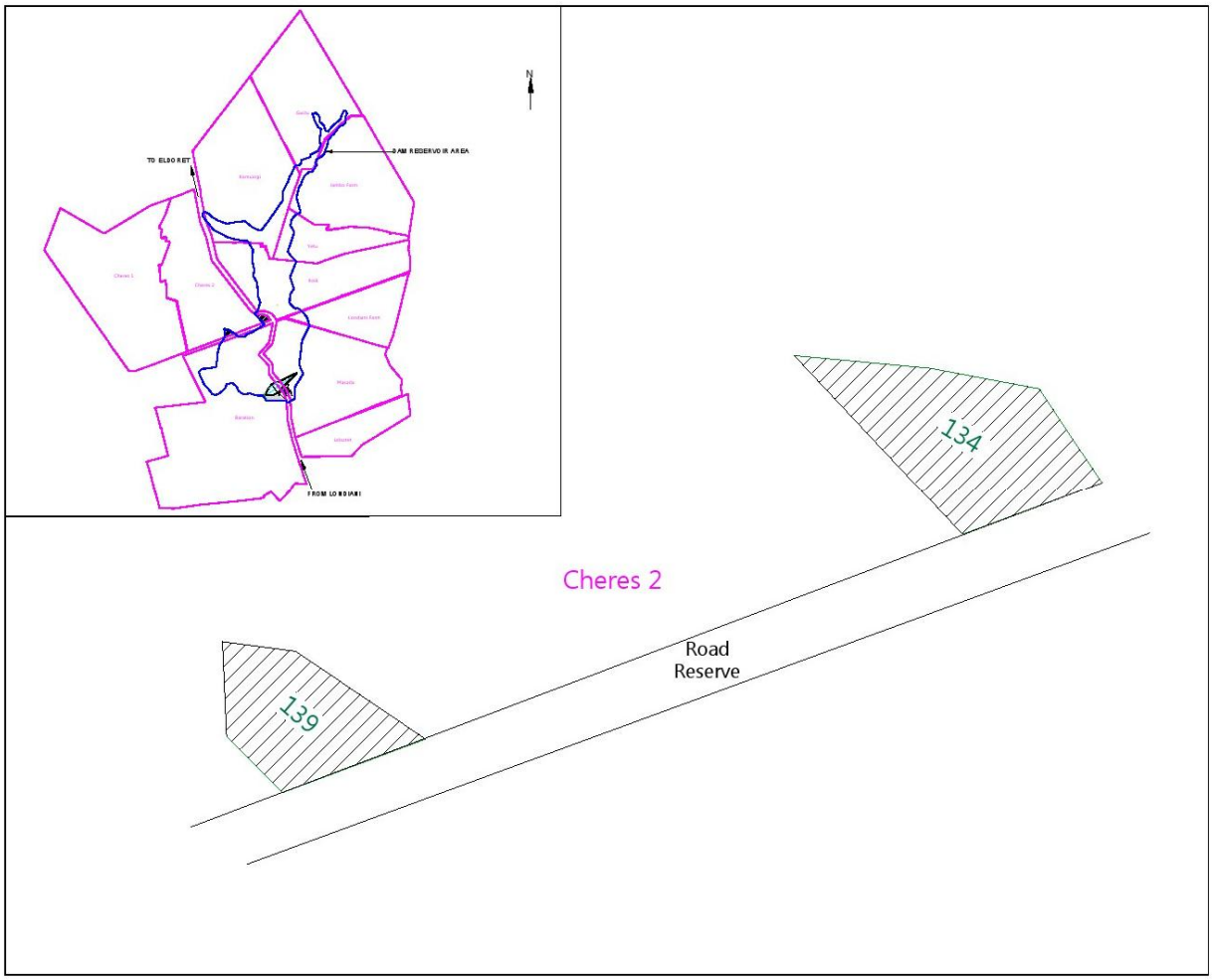
Appendix 2.2.5.7: Affected Land parcels in Kericho/Sorget-Kalyet Block 2 (Kamuingi-Yetu)

RIM No.	LR No.	Land Owner	Area (Ha)			Remarks
			Total	Affected	Remaining	
	5	Joshua Waweru Nderu	2.651	2.651	0	
	4	Elias Muchai	1.803	0.947	0.856	Partial land acquisition
	3	Samwel Gatonga Ikenye	2.281	2.281	0	Whole land acquisition
	2	Elizabeth Njiiri T. Muraga	3.053	3.053	0	Whole land acquisition
	1	Sammy Kamau and John Njoroge Kiarie	1.445	0.535	0.91	Partial land acquisition
		Total	11.233	9.467	1.766	



Appendix 2.2.5.8: Affected Land parcels in L.R 7570-Sorget-Kalyet Block 1 (Cheres)

RIM No.	LR No.	Land Owner	Area (Ha)			Remarks
			Total	Affected	Remaining	
	139	Daniel Kipkoskei Koech	5.06	1,4	3.66	Partial land acquisition
	140	Joseph Chepkwony Letting	16.8	0.15	16.65	Partial land acquisition
	134		7.20	3.83	3.37	Partial land acquisition
		Total	29.31	4.904	24.406	



Appendix 2.2.5.9: Affected Land parcels in LR 9211-Londiani Joubert Kedowa Block 6 (Baration)

RIM No.	LR No.	Land Owner	Area (Ha)			Remarks
			Total	Affected	Remaining	
LR 9211-Londiani Joubert Kedowa Block 6 (Baration)	1	Kipkorir A. Sogor	17.74	15.623	2.117	Partial land acquisition
	2	Leah Chepkorir Rogony	12.55	11.49	1.046	Partial land acquisition
	3	Kiplangat Koskei Mutai	1.64	0.87	0.77	Partial land acquisition
	4	Job K. Mutai	1.25	1.25	0	Whole land acquisition, the remaining not economical
	5	Cecilia Chebet Rono	1.43	0.87	0.56	Partial land acquisition
	6	Pilot Kimutai Soi	5	4.72	0.28	Uneconomical (acquire whole)
	7	Joseph KipKirui Churchil	1.27	1.27	0	Whole land acquisition
	8		1.471	1.471	0	Whole land acquisition
	9	Job K. Mutai	0.54	0.54	0	Whole land acquisition, the remaining not economical
	10	Cecelia Chebet Rono	0.62	0.62	0	Whole land acquisition, the remaining not economical
	11	Joseph Kipkoskei Kirui	3.11	3.11	0	Whole land acquisition
	12	Raphael Cheruiyot Rotich	7.84	6.96	0.88	Partial land acquisition
	13	Helena Chepkurui Langat	5.91	4.01	1.9	Partial land acquisition
	14	Robert Kiprono Bett	1.59	1.59	0	Whole land acquisition
	15	David Chepkwony Bett	2.02	1.38	0.64	Partial land acquisition
	21	Kipkilei A. Taketany	28.64	9.74	18.90	Partial land acquisition
	22		1.37	1.37	0	Whole land acquisition, the remaining not economical
	23	David Malakwen Kogo	2.3	2.3	0	Whole land acquisition

Appendix 2.2.5.9: Affected Land parcels in LR 9211-Londiani Joubert Kedowa Block 6 (Baration) *Continued from page above*

RIM No.	LR No.	Land Owner	Area (Ha)			Remarks
			Total	Affected	Remaining	
LR 9211-Londiani Joubert Kedowa Block 6 (Baration)	24	Johana Cheruiyot Koskei	0.63	0.63	0	Whole land acquisition
	25	Christopher Kipngetich Koskei	0.55	0.55	0	Whole land acquisition
	27	Samwel Kipngeno Koskei	3.26	0.66	2.6	Partial land acquisition
	28	Kipsilei A. Choroibal	19.87	12.44	7.43	Partial land acquisition
	29	Alice Chepkoros Terer	7.37	5.57	1.8	Partial land acquisition
	30	Kipkorir A. Sogor	4.72	4.45	0.27	Uneconomical (acquire whole)
	31	Nelson Kibet A Soi	4.48	3.58	0.9	Partial land acquisition
	32	Jason Kimutai Serem	11.53	10.57	0.98	Partial land acquisition
	33	David Kipyegon Langat	0.81	0.81	0	Whole land acquisition
	34	Joseph Kipkurui A. Mutai	2.49	2.49	0	Whole Land acquisition
	37	Jonathan Kiplangat A. Churchir	9.09	9.09	0	Whole land acquisition
	38	Kiplanda A. Chepyots	2.52	1.55	0.97	Partial land acquisition
	44	James Kibil A. Siele	1.02	0.16	0.86	Partial land acquisition
	194	Kipnyobii A. Chepkwony	6.48	5.28	1.20	Partial land acquisition
	195	Kipnyobii A. Chepkwony	5.62	4.66	0.96	Partial land acquisition
		Total	176.731	131.724	44.963	

Summary of Land Affected by the Project

No.	Project Component	No. of affected parcels	Total area (ha)	Land required/affected (ha)
1	Embankment	3	14.13	13.26
2	Water Treatment works	5	55.666	18.306
3	Water storage tanks	7	33.133	1.931
4	Transmission Pipelines	25	106.6	2.397
5	Reservoir	199	874.5475	510.631
6	Road affected (Relocation site)	0	0	14.2
7	Power line Affected (Relocation site)	0	0	2.7
	Total	239	1084.0765	563.425

Annex 3: Stakeholders Consultations Meetings' Notifications and Schedules

Annex 4: Proceedings of Stakeholders Consultation Meetings

PROPOSED LONDIANI DAM PROJECT AND ASSOCIATED CIVIL WORKS FOR ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT PUBLIC PARTICIPATION

MINUTES FOR ESIA PUBLIC PARTICIPATION HELD AT MASAITA PRIMARY SCHOOL, LONDIANI WARD OF KIPKELION EAST SUB-COUNTY, ON 16TH APRIL 2018

MEMBERS PRESENT

The participants include the following groups (see attendance list for details of participants)

1. Client (NWHSA)
2. Consultants
3. Local Community
4. Local Administration
5. County Representatives
6. Institution Officials

AGENDA

1. Convening, Assembly and Introduction
2. Project brief – NWHSA
3. Proposed Project brief - Consultant
4. Matters arising from the briefing – interactive session
5. Adjournment

ITEM	DELIBERATIONS	ACTION
Min 1/2018	**Convening, Assembly and Introduction** Participants convened at Masaita Primary School hall at 11:30 am. The area Assistant County Commissioner called the meeting to order and requested for a volunteer to lead in a word of prayer. He thanked the locals for attending the meeting for discussing the Londiani Dam project. He introduced the local administrative officers present and their area of jurisdiction. He lastly invited the District County Commissioner to take over the meeting **District County Commissioner** The DCC welcomed the Dam project team and the community members. He introduced the area leaders present then called upon the project team leader to a self-introduce his team. In his opening remarks, he stated the project is a national government funded which is meant to benefit residence of Kipkelion East and West Sub-Counties. His expectations to the project are that there will be access to clean and safe water hence helping address challenges experienced in accessing water. He noted that the entire project coverage area would greatly benefit from the initiative	
Min 2/2018	**PROJECT BRIEF** **NWHSA** The representative appreciated the community for turning up to the consultative forum. She encouraged them to brace up to freely air their views and concerns about the Dam project to eliminate speculations related to the project. She reiterated that the Dam project was funded by National Government through the NWHSA as the project executing agency. She stated the proposed Londiani Dam project was among 24 dams identified by the National Government in the realization of vision 2030. She emphasized also the 1992 National Water Master Plan by JICA identified the dam as an intervention measure in addressing water challenges in Kericho County. In addition, the 1992 Master plan had proposed the dam to start by 2010 though that was not the case.	

ITEM	DELIBERATIONS	ACTION
	She revealed that NWHSA tasked to undertake dam development took the mandate to carry out a reconnaissance site visit to identify the water supply status of the project area in 2013-2014. The visit was not limited to water supply but also operations, demands and challenges within Kipkelion East and West Sub-Counties. From the site visit the team came up with findings: ✓ The water supply infrastructures within the area are old and inefficient hence not meeting the locals water demands, ✓ The schemes are characterized by high pumping electricity costs, ✓ High cost of operations and maintenance, ✓ Low production capacities against the present demands She added in order to address the challenges and provide clean potable water to the communities by gravity; dam construction would be a viable option. The dam intervention would also help control flooding downstream Nyando River, provide water for irrigation and generate hydro power for pumping water to Masaita hill for distribution hence addressing the high cost of electricity. She added NWHSA identified a consultant to undertake the dam design feasibility as well as Environment and Social Impacts report for submission to NEMA. She declared that the design consultant would disclose the design details of the project while the ESIA expert would explain both environmental and social linkages to the dam project. She invited the project design engineer to disclose the design details in brief to the community	
Min 3/2018	**PROJECT DETAILS- BY ENGINEER** He started by informing participants that the design objective was to identify a favourable site for dam location which would store enough water to be used for irrigation and domestic use. He mentioned the design team undertook feasibility study of available sites and only Masaita dam site meet the minimum threshold for water supply enough to meet NWHSA project objective. He informed the participants on the dam components *Dam catchment* He started by indicating that Kipchorian river is the main river feeding the dam and the dam catchment would be 140.8km^2. He added the dam wall would transverse 700m from the river and stretch 6km upstream. The dam height will be 42m.Also he stated the dam will have a 30m buffer which will be fenced for protection and safety purposes. He stated downstream the dam wall, water treatment facility would be constructed for raw water treatment. He continued by indicating the hydro power generated from the dam will be used to pump treated water from the treatment works to Masaita hill storage tanks for movement to intended locations by gravity. *Distribution supplies* He stated there will be two main water distribution networks i.e.: Masaita – Londiani – Chepseon. He stated the gravity main starts at Masaita Hill moving along murram road into Londiani water tanks. It crosses Londiani-Muhoroni road at Londiani Town entry enroute to Kedowa through the forest. From Kedowa centre the pipeline moves along road B1 way leave enroute to Chepseon town and terminates at Chepseon polytechnic. The total pipeline length is 28km. In addition, he stated the line also had two branches namely Londiani – Barsiele (13km, 200mm dia.) and Masaita – Kamuingi (7km, 160mm dia.) which terminates at Barsiele and Kamuingi centres respectively.	

ITEM	DELIBERATIONS	ACTION
	Treatment Works – Kipkelion – Fort Ternan He stated the pipeline from the pipeline will move along Londiani – Sorget road reserve and cross the Londiani – Muhoroni road at Kipchorian River bridge. It will then follow Kipchorian River riparian before joining service roads en-route to Kipkelion. From Kipkelion the pipelines move along road and railway way leaves as well as private land before crossing Road C35 at Ngedale. From this point it moves along the highway way leave to Fort Ternan town from where it joins a service road en-route to Kipsinede hill tank. The total length of the pipeline is approximately 39km. *Treated Water Storage Tanks* He noted the two main water distribution lines will have storage tanks for water storage then distribution to user points as follows: *Gravity main 1: Masaita tank-Londiani-Chepseon* Storage tanks proposed along the this main includes: • Masaita hill tank (7,500m^3) • Londiani (5,000m^3), • Kedowa (1,000m^3), and • Chepseon (3,000m^3). Tanks proposed along the terminal ends of the branches: • Kamuingi (250m^3), and • Barsiele (500m^3). *Gravity main 2: Treatment works-Kipkelion-Fort Ternan* Proposed storage tanks include: • Clear water tank (7,000m^3), • Kipkelion (4,000m^3), and • Fort Ternan (3,000m^3). He lastly thanked participants for listening to him and invited the ESIA team leader to give a brief	
Min 4/2018	**Project details – by ESIA Expert** The consultant explained that the ESIA was a legal process for safeguarding the environment under Environmental management and Coordination (Amendment) Act, EMCA 2015 and coordinated by the National Environment Management Authority, NEMA. He reiterated that public consultation was a component of the process as well as the community's constitutional right. He observed that the process was meant to ensure that the proposed project was sustainable, optimally beneficial and that environmental and social impacts were mitigated during the project cycle. He stated some of the projects positive impacts included: ▪ Flood control ▪ Provision for water for irrigation ▪ Improved public health status ▪ Improved sanitation and hygiene ▪ Clean water supply ▪ Employment opportunities and ▪ Growth and development of the areas. He noted the project will also have negative impacts which will require mitigation so as to ensure project sustainability as well as community ownership. Some of the negative impacts included: ✓ Wastage of water and leakages at consumer points due increased surplus of water supply.	

ITEM	DELIBERATIONS	ACTION
	Mitigation Measure ▪ Sensitization on water resource management and conservation ▪ Local communities should also participate in water resource management and planning ✓ HIV/AIDs may also increase from interaction of the workers, local communities and migrant influx. Mitigation Measure Provide an awareness and sensitization forum for the workers as well as the neighbouring communities, especially on communicable social infections including HIV/AIDS, ✓ Risks from water borne diseases and vectors thrive. Mitigation Measure He indicated by Creation of awareness on water resource management and conservation will abet in mitigation. ✓ Risks of drowning into the dam to children, the aged and livestock. Mitigation Measure • The Environmental expert stated that by Constructing a perimeter fence around the dam with provision for limited and/or controlled access to the dam water will alleviate the risk. • Create awareness programmes to the communities on dam safety aspects • Provide safe access points to water for the community around the dam, Other impacts include ✓ Change of hydrology ✓ Dust emissions ✓ Noise and vibration ✓ Potential people displacement Lastly, he emphasised the community to use the water sustainable avoiding wastage since the resource is infinite.	

Min 5/ 2018 **Matters arising from the briefing – (see questionnaires)**

The proceedings of the interactive session are captured in the response matrix provided below: -

Name	Comment/ Question	Response by consultant
Stephen Sawe	He informed the public the Masaita Primary School Board has identified land for school relocation. There is need for the project developer to engage the land owner so as to acquire. Masaita Primary School development such as borehole will it be compensated for sinking in the identified proposed school relocation land	Once the RAP and valuation team complete their task, the developer may engage the land owner for acquisition of land for the school. The project will have adequate water supply hence there will be no need to sink a borehole for school water supply.
Michael Mwangi	He appreciates the project as it will address water challenges He proposed for a meeting between the PAPs and the valuation team so that they can be briefed on what is expected of them. He insisted on protection of existing community water projects	Once the valuation team commences on their activities, a meeting with the PAPs will be called for.
Samuel Rotich	He requested for the PAPs to draft CBA on the land payment modalities by the developer, He proposed for establishment of a KWS office in case the dam attracts wild animals that can	Due to safety issues, one cannot get water directly from the dam. The dam design has an irrigation component though downstream the dam.

Name	Comment/ Question	Response by consultant
	cause destruction to properties and crops. He requested for locals to be allowed to get irrigation water directly from the dam	
Joseph Kinuthia	Will the project uneconomical land be compensated?	Uneconomical land will be acquired and compensated.
Richard Langat	What are the mitigations put in place to address potential health diseases (cold, malaria) brought by the dam's proximity to settlements? Will land be taken by force if the land value price is not accepted by the land owner.	So as to shield communities from disease brought by dam development, dispensaries equipped with medicine will be established as well as upgrading the existing. Land will not be taken by force rather there will be engagement between the valuer and land owner to ensure they agree
Daniel Chege	After valuation can one use the trees for firewood purposes?	After valuation exercise the community will be advised on whether to harvest trees or use for other purposes or not.
David Yegon	Where will the people relocate to and is there land identified for them? There will be need for the valuation team to sensitize the community on various aspect before commencing the activities.	It will be one's obligation to identify land for relocation and within his budget spending allocation. Before commencement of the valuation exercise, the PAPs will be called for a briefing meeting.
Vincent K Langat	He recommended for the valuation team not to comprise of County valuers since the project is by the National Government	
Simon Koskei	What are the valuation aspects and principles	During the valuers briefing meeting, all aspects and principles regarding valuation will be presented and elaborated.
Alfred Maina	In case of land ownership queries during valuation, what will happen to the process	There is need for the PAPs to address some of the land ownership challenges before commencement of the valuation process
Nicholas Koskei	He mentioned from dam projects in other areas, compensation has not yet taken place yet the dams are nearly complete. Will the same happen to Londiani Dam PAPs?	He was assured of full compensation before relocating.
Rotich	The project commencement date	The project will commence once all the approvals have been got and the funds available
Peter Koech	He proposed that future meeting to be conducted based on how the project affects or benefits you	

Min 6/ 2018 **Adjournment**

The District County Commissioner gave a vote of thanks and appreciated that the Community Public Participation had adequately sensitized the members of the public on the project matter. Lastly, he requested for public opinion on acceptance of the proposed project and everyone agreed to the project. He declared that the project was accepted and welcome.

There being no other business, the meeting ended at 2.30 pm

Joshua Gichuki
Taking Minutes
Consultant Team

Date: 13th September 2018

Eng. Tabitha Kimani
Project Engineer
Client Representative (NWHSA)

Date: 13th September 2018

PROPOSED LONDIANI DAM PROJECT AND ASSOCIATED CIVIL WORKS FOR ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT PUBLIC PARTICIPATION

MINUTES FOR ESIA PUBLIC PARTICIPATION HELD AT LONDIANI SOCIAL HALL, LONDIANI WARD OF KIPKELION EAST SUB-COUNTY, ON 17TH APRIL 2018

MEMBERS PRESENT

The participants include the following groups (see attendance list for details of participants)

1. Client (NWHSA)
2. Consultants
3. Local Community
4. Local Administration
5. County Representatives

AGENDA

1. Convening, Assembly and Introduction
2. Project brief – NWHSA
3. Proposed Project brief - Consultant
4. Matters arising from the briefing – interactive session
5. Adjournment

ITEM	DELIBERATIONS	ACTION
Min 1/2018	**Convening, Assembly and Introduction** Participants convened at Londiani Social Hall at 10:30 am. The area Assistant County Commissioner called the meeting to order and requested for a volunteer to lead in a word of prayer She thanked the locals for attending the meeting for discussing the Londiani Dam project. She added the project is being implemented by the National Government and is in line with the president's 4 growth agenda pillars. She stated stakeholder's involvement in developments such as this is a constitutional requirement as the communities give their views and ideas towards a project. She emphasized on the participants to listen carefully on the project briefing and thereafter as questions in regards to the project. She stated the project will be of benefit to the people of Londiani Town in addressing water challenges experienced. The locals will get clean safe water supply for their domestic use and drinking water for livestock. Lastly, she introduced the local administrative officers present in the meeting before inviting the project developer to introduce the project team and their role on the dam project	
Min 2/2018	**PROJECT BRIEF** **NWHSA** The project team leader first thanked the participants for attending the consultative forum meant to sensitize them on the proposed dam project. He then introduced the project team members and their roles to the dam and later inviting the project engineer to give a brief on the project background. Project Engineer She started by encouraging participants to brace up to freely air their views and concerns about the Dam project to eliminate speculations related to the project. She reiterated that the Dam project was funded by National Government through the NWHSA as the project executing	

ITEM	DELIBERATIONS	ACTION
	agency. She stated the proposed Londiani Dam project was among 24 dams identified by the National Government in the realization of vision 2030. She emphasized also the 1992 National Water Master Plan by JICA identified the dam as an intervention measure in addressing water challenges in Kericho County. In addition, the 1992 Master plan had proposed the dam to start by 2010 though that was not the case due to logistic challenges. She revealed that NWHSA tasked to undertake dam development took the mandate to carry out a reconnaissance site visit to identify the water supply status of the project area in 2013-2014. The visit was not limited to water supply but also operations, demands and challenges within Kipkelion East and West Sub-Counties. From the site visit the team came up with findings: ✓ The water supply infrastructures within the area are old and inefficient hence not meeting the locals water demands, ✓ The schemes are characterized by high pumping electricity costs, ✓ High cost of operations and maintenance, ✓ Low production capacities against the present demands She added in order to address the challenges and provide clean potable water to the communities by gravity; dam construction would be a viable option. The dam intervention would also help control flooding downstream Nyando River, provide water for irrigation and generate hydro power for pumping water to Masaita hill for distribution hence addressing the high cost of electricity. She added NWHSA identified a consultant to undertake the dam design feasibility as well as Environment and Social Impacts report for submission to NEMA. She declared that the design consultant would disclose the design details of the project while the ESIA expert would explain both environmental and social linkages to the dam project. She invited the project design engineer to disclose the design details in brief to the community.	
Min 3/2018	**PROJECT DETAILS- BY ENGINEER** He started by informing participants that the design objective was to identify a favourable site for dam location which would store enough water to be used for irrigation and domestic use. He mentioned the design team undertook feasibility study of available sites and only Masaita dam site meet the minimum threshold for water supply enough to meet NWHSA project objective. He informed the participants on the dam components. *Dam catchment* He started by indicating that Kipchorian river is the main river feeding the dam and the dam catchment would be 140.8km^2. He added the dam wall would transverse 700m from the river and stretch 6km upstream. The dam height will be 42m.Also he stated the dam will have a 30m buffer which will be fenced for protection and safety purposes. He stated downstream the dam wall, water treatment facility would be constructed for raw water treatment. He continued by indicating the hydro power generated from the dam will be used to pump treated water from the treatment works to Masaita hill storage tanks for movement to intended locations by gravity. *Distribution supplies* He stated there will be two main water distribution networks i.e.:	

ITEM	DELIBERATIONS	ACTION
	Masaita – Londiani – Chepseon He stated the gravity main starts at Masaita Hill moving along murram road into Londiani water tanks. It crosses Londiani – Muhoroni road at Londiani Town entry en-route to Kedowa through the forest. From Kedowa centre the pipeline moves along road B1 way leave enroute to Chepseon town and terminates at Chepseon polytechnic. The total pipeline length is 28km.In addition he stated the line also had two branches namely Londiani-Barsiele (13km, 200mm dia.) and Masaita – Kamuingi (7km, 160mm dia.) which terminates at Barsiele and Kamuingi centres respectively. *Treatment Works – Kipkelion– Fort Ternan* He stated the pipeline from the pipeline will move along Londiani – Sorget road reserve and cross the Londiani – Muhoroni road at Kipchorian River bridge. It will then follow Kipchorian River riparian before joining service roads en-route to Kipkelion. From Kipkelion the pipelines move along road and railway way leaves as well as private land before crossing Road C35 at Ngedale. From this point it moves along the highway way leave to Fort Ternan town from where it joins a service road en-route to Kipsinede hill tank. The total length of the pipeline is approximately 39km. *Treated Water Storage Tanks* He noted the two main water distribution lines will have storage tanks for water storage then distribution to user points as follows: *Gravity main 1: Masaita tank – Londiani – Chepseon* Storage tanks proposed along the this main includes: ▪ Masaita hill tank (7,500m^3) ▪ Londiani (5,000m^3), ▪ Kedowa (1,000m^3), and ▪ Chepseon (3,000m^3). Tanks proposed along the terminal ends of the branches: ▪ Kamuingi (250m^3), and ▪ Barsiele (500m^3). *Gravity main 2: Treatment works-Kipkelion-Fort Ternan* Proposed storage tanks include: ▪ Clear water tank (7,000m^3), ▪ Kipkelion (4,000m^3), and ▪ Fort Ternan (3,000m^3). He lastly thanked participants for listening to him and invited the ESIA team leader to give a brief	
Min 4/2018	**Project details – by ESIA Expert** The consultant explained that the ESIA was a legal process for safeguarding the environment under Environmental management and Coordination (Amendment) Act, EMCA 2015 and coordinated by the National Environment Management Authority, NEMA. He reiterated that public consultation was a component of the process as well as the community's constitutional right. He observed that the process was meant to ensure that the proposed project was sustainable, optimally beneficial and that environmental and social impacts were mitigated during the project cycle. He stated some of the projects positive impacts included: ▪ Flood control	

ITEM	DELIBERATIONS	ACTION
	▪ Provision for water for irrigation ▪ Improved public health status ▪ Improved sanitation and hygiene ▪ Clean water supply ▪ Employment opportunities and ▪ Growth and development of the areas. He noted the project will also have negative impacts which will require mitigation so as to ensure project sustainability as well as community ownership. Some of the negative impacts included: ✓ Wastage of water and leakages at consumer points due increased surplus of water supply. <u>Mitigation Measure</u> ▪ Sensitization on water resource management and conservation ▪ Local communities should also participate in water resource management and planning ✓ HIV/AIDs may also increase from interaction of the workers, local communities and migrant influx. <u>Mitigation Measure</u> Provide an awareness and sensitization forum for the workers as well as the neighbouring communities, especially on communicable social infections including HIV/AIDS, ✓ Risks from water borne diseases and vectors thrive. <u>Mitigation Measure</u> He indicated by Creation of awareness on water resource management and conservation will abet in mitigation. ✓ Risks of drowning into the dam to children, the aged and livestock. <u>Mitigation Measure</u> ▪ The Environmental expert stated that by Constructing a perimeter fence around the dam with provision for limited and/or controlled access to the dam water will alleviate the risk. ▪ Create awareness programmes to the communities on dam safety aspects ▪ Provide safe access points to water for the community around the dam, Other impacts include ✓ Change of hydrology ✓ Dust emissions ✓ Noise and vibration ✓ Potential people displacement Lastly, he emphasised the community to use the water sustainable avoiding wastage since the resource is infinite.	

Min 5/ 2018 **<u>Matters arising from the briefing – (see questionnaires)</u>**

The proceedings of the interactive session are captured in the response matrix provided below:

Name	Comment/ Question	Response by consultant
Andrew Macharia	What criteria will be used to dictate the land value within the dam area? Is it the market price or a figure that will be agreed upon	Land values are dictated by the current market price for land

Name	Comment/ Question	Response by consultant
David Njoroge	▪ He appreciates the project as it will address water challenges. There should be no land brokers during the valuation exercise. He proposed on having seminars to sensitize and educate the PAPs on even financial management before relocation. ▪ The local administration to be used in the recruitment of labour force. ▪ There is need for the locals to have dam layout designs and maps so that they can know if they are among the PAPs. ▪ How will the project developer manage spread of diseases (malaria and cold) that are attributed to dam developments?	▪ Land valuation exercise will comprise of the land owner, claimants and the valuation team. ▪ Seminars will be done for the PAPs to sensitize them on proper use of compensation money in improving their livelihood. ▪ The areas local administration will fully be engaged in the project labour force recruitment. ▪ Dam layout design and maps will be availed to the area administration and the community members are free to visit the office ▪ The project has a CSR component that will involve construction of dispensaries and stocking the existing ones with medicines so as to address disease such as malaria.
Samuel Kariuki	What are some of the project CSR components? What are some of the impacts downstream of the dam wall in case of breakage? Safety issues by material transporting vehicles in settlement areas	▪ The dam project has set funds for CSR activities. It's upon the community and the local administration to share some of the CSR activities they require with the developer. ▪ The likelihood of dam break is minimal as the design has anticipated such and materials used for construction will be of high quality. ▪ Drivers will be advised to maintain a 10km/hr speed in the settlement areas.
Jackson Rotich	▪ When will the dam project begin? ▪ Does it mean there will be two parallel pipes, one for irrigation and the other clean water? ▪ What is the project coverage area? ▪ What are the main pipe sizes and depth?	▪ The project will commence once all the approvals have been got and the funds available. ▪ The main pipeline will be for clean water supply. Irrigation will be by dam water release and the downstream people are the beneficiary. ▪ Maps and project layout designs will be availed to the local administration for the locals to view the project coverage. ▪ The main pipes will be steel and UPVC which will be laid 3m down the ground.
Simon Koskei	Compensation payments will it be in phases or once	Compensation will be done once and not in phases
Charles Cherinyot	Will there be compensation of uneconomical land?	Uneconomical land will be acquired and compensated
Peter Mwangi	▪ Will the dam water supply be sufficient? ▪ What are some of the dam safety measures	▪ The dam water supply is sufficient to meet the demand. The dam has a capacity of 55Mm^3 ▪ The dam will have a 30m buffer and a fence all round. Trees will be planted on the buffer to reduce siltation
Emanuel	▪ Once the dam is fenced, locals will not be able to take livestock to drink water. ▪ Are there set aside areas for livestock drinking?	Livestock will not access the dam. The fence is for dam safety to prevent accidents.

Min 6/ 2018 **Adjournment**

The Assistant County Commissioner gave a vote of thanks and appreciated that the Community Public Participation had adequately sensitized the members of the public on the project matter. Lastly, she requested for public opinion on acceptance of the proposed project and everyone agreed to the project. She invited a volunteer to close the meeting with a word of prayer.

There being no other business, the meeting ended at 2.00 pm

Joshua Gichuki
Taking Minutes
Consultant Team

Date: 13th September 2018

Eng. Tabitha Kimani
Project Engineer
Client Representative (NWHSA)

Date: 13th September 2018

PROPOSED LONDIANI DAM PROJECT AND ASSOCIATED CIVIL WORKS FOR ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT PUBLIC PARTICIPATION

MINUTES FOR ESIA PUBLIC PARTICIPATION HELD AT KAPKONDOR PRIMARY SCHOOL HALL, LONDIANI WARD OF KIPKELION EAST SUB-COUNTY, ON 17TH APRIL 2018

MEMBERS PRESENT

The participants include the following groups (see attendance list for details of participants)

(i) Client (NWHSA)
(ii) Consultants
(iii) Local Community
(iv) Local Administration
(v) MPs Personal Assistant

AGENDA

(i) Convening, Assembly and Introduction
(ii) Project brief – NWHSA
(iii) Proposed Project brief - Consultant
(iv) Matters arising from the briefing – interactive session
(v) Adjournment

Item	Deliberations	Action
Min 1/2018	**Convening, Assembly and Introduction** Participants convened at Kapkondoo Primary School Hall at 3:30 pm. The area Assistant County Commissioner called the meeting to order and requested for a volunteer to lead in a word of prayer She thanked the locals for attending the meeting for discussing the Londiani Dam project. She added the project is being implemented by the National Government and is in line with the president's 4 growth agenda pillars. She stated stakeholder's involvement in developments such as this is a constitutional requirement as the communities give their views and ideas towards a project. She emphasized on the participants to listen carefully on the project briefing and thereafter as questions in regards to the project. She stated the project will be of benefit to the people of Kapkondoo in addressing water challenges experienced. The locals will get clean safe water supply for their domestic use and drinking water for livestock. She invited the MPs Personal Assistant to address the gathering MPs Personal Assistant He started by thanking the community members for attending the public participation meeting. He informed the participants that the area MP has been actively involved in ensuring the project starts so as to supply water to his constituents. He finished by reaffirming the MPs dedication to ensuring the project is completed on time. Lastly, she introduced the local administrative officers present in the meeting before inviting the project developer to introduce the project team and their role on the dam project	
Min 2/2018	**PROJECT BRIEF** **NWHSA** The project team leader first thanked the participants for attending the consultative forum meant to sensitize them on the proposed dam project. He then introduced the project team members and their roles to the dam and later inviting the project engineer to give a brief on the project background.	

Item	Deliberations	Action
	Project Engineer She started by encouraging participants to brace up to freely air their views and concerns about the Dam project to eliminate speculations related to the project. She reiterated that the Dam project was funded by National Government through the NWHSA as the project executing agency. She stated the proposed Londiani Dam project was among 24 dams identified by the National Government in the realization of vision 2030. She emphasized also the 1992 National Water Master Plan by JICA identified the dam as an intervention measure in addressing water challenges in Kericho County. In addition, the 1992 Master plan had proposed the dam to start by 2010 though that was not the case due to logistic challenges. She revealed that NWHSA tasked to undertake dam development took the mandate to carry out a reconnaissance site visit to identify the water supply status of the project area in 2013-2014. The visit was not limited to water supply but also operations, demands and challenges within Kipkelion East and West Sub-Counties. From the site visit the team came up with findings: ▪ The water supply infrastructures within the area are old and inefficient hence not meeting the locals water demands, ▪ The schemes are characterized by high pumping electricity costs, ▪ High cost of operations and maintenance, ▪ Low production capacities against the present demands She added in order to address the challenges and provide clean potable water to the communities by gravity; dam construction would be a viable option. The dam intervention would also help control flooding downstream Nyando River, provide water for irrigation and generate hydro power for pumping water to Masaita hill for distribution hence addressing the high cost of electricity. She added NWHSA identified a consultant to undertake the dam design feasibility as well as Environment and Social Impacts report for submission to NEMA. She declared that the design consultant would disclose the design details of the project while the ESIA expert would explain both environmental and social linkages to the dam project. She invited the project design engineer to disclose the design details in brief to the community.	
Min 3/2018	**PROJECT DETAILS- BY ENGINEER** He started by informing participants that the design objective was to identify a favourable site for dam location which would store enough water to be used for irrigation and domestic use. He mentioned the design team undertook feasibility study of available sites and only Masaita dam site meet the minimum threshold for water supply enough to meet NWHSA project objective. He informed the participants on the dam components. *Dam catchment* He started by indicating that Kipchorian river is the main river feeding the dam and the dam catchment would be 140.8km^2. He added the dam wall would transverse 700m from the river and stretch 6km upstream. The dam height will be 42m.Also he stated the dam will have a 30m buffer which will be fenced for protection and safety purposes. He stated downstream the dam wall, water treatment facility would be constructed for raw water treatment. He continued by indicating the hydro power	

Item	Deliberations	Action
	generated from the dam will be used to pump treated water from the treatment works to Masaita hill storage tanks for movement to intended locations by gravity. *Distribution supplies* He stated there will be two main water distribution networks i.e.: *Masaita – Londiani – Chepseon* He stated the gravity main starts at Masaita Hill moving along murram road into Londiani water tanks. It crosses Londiani – Muhoroni road at Londiani Town entry enroute to Kedowa through the forest. From Kedowa centre the pipeline moves along road B1 way leave enroute to Chepseon town and terminates at Chepseon polytechnic. The total pipeline length is 28km.In addition he stated the line also had two branches namely Londiani – Barsiele (13km, 200mm dia.) and Masaita – Kamuingi (7km, 160mm dia.) which terminates at Barsiele and Kamuingi centres respectively. *Treatment Works – Kipkelion– Fort Ternan* He stated the pipeline from the pipeline will move along Londiani – Sorget road reserve and cross the Londiani – Muhoroni road at Kipchorian River bridge. It will then follow Kipchorian River riparian before joining service roads en-route to Kipkelion. From Kipkelion the pipelines move along road and railway way leaves as well as private land before crossing Road C35 at Ngedale. From this point it moves along the highway way leave to Fort Ternan town from where it joins a service road en-route to Kipsinede hill tank. The total length of the pipeline is approximately 39km. *Treated Water Storage Tanks* He noted the two main water distribution lines will have storage tanks for water storage then distribution to user points as follows: *Gravity main 1: Masaita tank – Londiani – Chepseon* Storage tanks proposed along the this main includes: ▪ Masaita hill tank (7,500m^3) ▪ Londiani (5,000m^3), ▪ Kedowa (1,000m^3), and ▪ Chepseon (3,000m^3). Tanks proposed along the terminal ends of the branches: ▪ Kamuingi (250m^3), and ▪ Barsiele (500m^3). *Gravity main 2: Treatment works – Kipkelion-Fort Ternan* Proposed storage tanks include: ▪ Clear water tank (7,000m^3), ▪ Kipkelion (4,000m^3), and ▪ Fort Ternan (3,000m^3). He lastly thanked participants for listening to him and invited the ESIA team leader to give a brief.	
Min 4/2018	**Project Details – by ESIA Expert** The consultant explained that the ESIA was a legal process for safeguarding the environment under Environmental management and Coordination (Amendment) Act, EMCA 2015 and coordinated by the National Environment Management Authority, NEMA. He reiterated that public consultation was a component of the process as well as the community's constitutional right. He observed that the process was meant to ensure that the proposed project was sustainable, optimally beneficial and that environmental and social impacts were mitigated during the project cycle.	

Item	Deliberations	Action
	He stated some of the projects positive impacts included: ▪ Flood control ▪ Provision for water for irrigation ▪ Improved public health status ▪ Improved sanitation and hygiene ▪ Clean water supply ▪ Employment opportunities and ▪ Growth and development of the areas. He noted the project will also have negative impacts which will require mitigation so as to ensure project sustainability as well as community ownership. Some of the negative impacts included: ✓ Wastage of water and leakages at consumer points due increased surplus of water supply. Mitigation Measure • Sensitization on water resource management and conservation • Local communities should also participate in water resource management and planning ✓ HIV/AIDs may also increase from interaction of the workers, local communities and migrant influx. Mitigation Measure Provide an awareness and sensitization forum for the workers as well as the neighbouring communities, especially on communicable social infections including HIV/AIDS, ✓ Risks from water borne diseases and vectors thrive. Mitigation Measure He indicated by Creation of awareness on water resource management and conservation will abet in mitigation. Other impacts include ✓ Dust emissions ✓ Noise and vibration Lastly, he emphasized the community to use the water sustainable avoiding wastage since the resource is infinite.	

Min 5/ 2018 **Matters arising from the briefing – (see questionnaires)**

The proceedings of the interactive session are captured in the response matrix provided below:

Name	Comment/ Question	Response by consultant
Charles Kiplagat	✓ He proposed for the project developer to do distribution to the point the locals can connect ✓ He requested the existing water infrastructures in the area to be used for storage and distribution ✓ He wanted confirmation that the locals will get clean water supply from the dam project	✓ The dam developer is mandated to do main trunk mains while the distribution aspect is by the County Government. ✓ The proposed dam project will cater water supply needs for both Kipkelion East and West sub-Counties. The water supply is more than the demand.
Philip Langat	He proposed for the youths to benefit from employment opportunities	There will be equal employment opportunities for the youth.
Bernard Kipkemoi	✓ Will public utilities (schools and dispensaries) be connected to water supply ✓ During land valuation land brokers should not be involved	✓ Public utilities along the distribution line will be served with T for connection ✓ Land valuation exercise will comprise of the landowner, claimants and the valuation team

Name	Comment/ Question	Response by consultant
Reuben Koech	✓ Political interference should not be tolerated by the developer since that will stall the implementation of the project	✓
Edward Kosikei	The PAPs should be compensated fully before relocating elsewhere	Before relocation PAPs will have been compensated fully
Kipkorir Rotich	He appreciates the project as it will address water challenges	
Paul	Land compensation/payment will follow which criteria	Land values are dictated by the current market price for land. Land will be compensated based on the authentic available document of ownership or agreement. There is need for the potential PAPs to start addressing their land issues before the valuation exercise begins.

Min 6/ 2018 Adjournment

The Assistant County Commissioner gave a vote of thanks and appreciated that the Community Public Participation had adequately sensitized the members of the public on the project matter. Lastly, she requested for public opinion on acceptance of the proposed project and everyone agreed to the project. She invited a volunteer to close the meeting with a word of prayer.

There being no other business, the meeting ended at 5.30 pm

Joshua Gichuki
Taking Minutes
Consultant Team

Date: 13th September 2018

Eng. Tabitha Kimani
Project Engineer
Client Representative (NWHSA)

Date: 13th September 2018

PROPOSED LONDIANI DAM PROJECT AND ASSOCIATED CIVIL WORKS FOR ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT PUBLIC PARTICIPATION

MINUTES FOR ESIA PUBLIC PARTICIPATION HELD AT BARSIELE SECONDARY SCHOOL, KIPKELION WEST SUB-COUNTY, ON 18TH APRIL 2018

MEMBERS PRESENT

The participants include the following groups (see attendance list for details of participants)

(i) Client (NWHSA)
(ii) Consultants
(iii) Local Community
(iv) Local Administration
(v) MCA

AGENDA

(i) Convening, Assembly and Introduction
(ii) Project brief – NWHSA
(iii) Proposed Project brief - Consultant
(iv) Matters arising from the briefing – interactive session
(v) Adjournment

ITEM	DELIBERATIONS	ACTION
Min 1/2018	**Convening, Assembly and Introduction** Participants convened at Barsiele Secondary School Hall at 3:30 pm. The area chief called the meeting to order and requested for a volunteer to lead in a word of prayer. He invited the Assistant County Commissioner to chair the meeting **District County Commissioner** She thanked the locals for attending the meeting for discussing the Londiani Dam project as it will be of benefit to Barsiele residents and the general Kipkelion sub-county in water provision. She added the project is being implemented by the National Government and is in line with the president's 4 growth agenda pillars. She invited the MCA to address the gathering Area MCA He started by thanking the community members for attending the public participation meeting. He welcomes the project as it is in line with his development manifesto in which he promised the electorates that he would ensure provision of clean water supply. He also committed to working with the county government in ensuring water distribution mains are put in place He stated there is need for the project developers to consider the youths in employment opportunities. He finished by reaffirming his dedication to ensuring the project is completed on time.	
Min 2/2018	**PROJECT BRIEF** **NWHSA** The project team leader first thanked the participants for attending the consultative forum meant to sensitize them on the proposed dam project. He then introduced the project team members and their roles to the dam and later inviting the project engineer to give a brief on the project background.	

ITEM	DELIBERATIONS	ACTION
	Project Engineer She started by encouraging participants to brace up to freely air their views and concerns about the Dam project to eliminate speculations related to the project. She reiterated that the Dam project was funded by National Government through the NWHSA as the project executing agency. She stated the proposed Londiani Dam project was among 24 dams identified by the National Government in the realization of vision 2030. She emphasised also the 1992 National Water Master Plan by JICA identified the dam as an intervention measure in addressing water challenges in Kericho County. In addition, the 1992 Master plan had proposed the dam to start by 2010 though that was not the case due to logistic challenges. She revealed that NWHSA tasked to undertake dam development took the mandate to carry out a reconnaissance site visit to identify the water supply status of the project area in 2013-2014. The visit was not limited to water supply but also operations, demands and challenges within Kipkelion East and West Sub-Counties. From the site visit the team came up with findings: ✓ The water supply infrastructures within the area are old and inefficient hence not meeting the locals water demands, ✓ The schemes are characterized by high pumping electricity costs, ✓ High cost of operations and maintenance, ✓ Low production capacities against the present demands She added in order to address the challenges and provide clean potable water to the communities by gravity; dam construction would be a viable option. The dam intervention would also help control flooding downstream Nyando River, provide water for irrigation and generate hydro power for pumping water to Masaita hill for distribution hence addressing the high cost of electricity. She added NWHSA identified a consultant to undertake the dam design feasibility as well as Environment and Social Impacts report for submission to NEMA. She declared that the design consultant would disclose the design details of the project while the ESIA expert would explain both environmental and social linkages to the dam project. She invited the project design engineer to disclose the design details in brief to the community.	
Min 3/2018	**PROJECT DETAILS- BY ENGINEER** He started by informing participants that the design objective was to identify a favourable site for dam location which would store enough water to be used for irrigation and domestic use. He mentioned the design team undertook feasibility study of available sites and only Masaita dam site meet the minimum threshold for water supply enough to meet NWHSA project objective. He informed the participants on the dam components. *Dam catchment* He started by indicating that Kipchorian river is the main river feeding the dam and the dam catchment would be 140.8km^2. He added the dam wall would transverse 700m from the river and stretch 6km upstream. The dam height will be 42m.Also he stated the dam will have a 30m buffer which will be fenced for protection and safety purposes. He stated downstream the dam wall, water treatment facility would be constructed for raw water treatment. He continued by indicating the hydro power generated from the dam will be used to pump treated water from the treatment works to Masaita hill storage tanks for movement to intended locations by gravity. *Distribution supplies* He stated there will be two main water distribution networks i.e.: Masaita – Londiani – Chepseon	

ITEM	DELIBERATIONS	ACTION
	He stated the gravity main starts at Masaita Hill moving along murram road into Londiani water tanks. It crosses Londiani – Muhoroni road at Londiani Town entry enroute to Kedowa through the forest. From Kedowa centre the pipeline moves along road B1 way leave enroute to Chepseon town and terminates at Chepseon polytechnic. The total pipeline length is 28km.In addition he stated the line also had two branches namely Londiani-Barsiele (13km, 200mm dia.) and Masaita – Kamuingi (7km, 160mm dia.) which terminates at Barsiele and Kamuingi centres respectively. Treatment Works – Kipkelion– Fort Ternan He stated the pipeline from the pipeline will move along Londiani – Sorget road reserve and cross the Londiani – Muhoroni road at Kipchorian River bridge. It will then follow Kipchorian River riparian before joining service roads en-route to Kipkelion. From Kipkelion the pipelines move along road and railway way leaves as well as private land before crossing Road C35 at Ngedale. From this point it moves along the highway way leave to Fort Ternan town from where it joins a service road en-route to Kipsinede hill tank. The total length of the pipeline is approximately 39km. *Treated Water Storage Tanks* He noted the two main water distribution lines will have storage tanks for water storage then distribution to user points as follows: *Gravity main 1: Masaita tank-Londiani-Chepseon* Storage tanks proposed along the this main includes: • Masaita hill tank (7,500m^3) • Londiani (5,000m^3), • Kedowa (1,000m^3), and • Chepseon (3,000m^3). Tanks proposed along the terminal ends of the branches: • Kamuingi (250m^3), and • Barsiele (500m^3). *Gravity main 2: Treatment works-Kipkelion-Fort Ternan* Proposed storage tanks include: • Clear water tank (7,000m^3), • Kipkelion (4,000m^3), and • Fort Ternan (3,000m^3). He lastly thanked participants for listening to him and invited the ESIA team leader to give a brief.	
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ITEM	DELIBERATIONS	ACTION
	▪ Employment opportunities and ▪ Growth and development of the areas. He noted the project will also have negative impacts which will require mitigation so as to ensure project sustainability as well as community ownership. Some of the negative impacts included: ✓ Wastage of water and leakages at consumer points due increased surplus of water supply. Mitigation Measure • Sensitization on water resource management and conservation • Local communities should also participate in water resource management and planning ✓ HIV/AIDs may also increase from interaction of the workers, local communities and migrant influx. Mitigation Measure Provide an awareness and sensitization forum for the workers as well as the neighbouring communities, especially on communicable social infections including HIV/AIDS, ✓ Risks from water borne diseases and vectors thrive. Mitigation Measure He indicated by Creation of awareness on water resource management and conservation will abet in mitigation. Other impacts include: ✓ Dust emissions ✓ Noise and vibration Lastly, he emphasised the community to use the water sustainable avoiding wastage since the resource is infinite.	

Min 5/ 2018 **Matters arising from the briefing – (see questionnaires)**

The proceedings of the interactive session are captured in the response matrix provided below:

Name	Comment/ Question	Response by consultant
Mr. Pascal Bysienei	He wanted an assurance that indeed the project would be executed as they've had other similar projects in the area that didn't materialize.	The project will be implemented
Mr. Andrew Kirui	He requested for sensitization of the community during Construction phase in regards to safety	Construction of a perimeter fence around the dam with provision for limited and/or controlled access to the dam water will alleviate the risks involved during construction phase. Creation of awareness programmes to the communities on dam safety aspects will be provided.
Mr. Reuben Rotich	He requested to have distribution to areas not incorporated in the design.	The scope of the NWHSA it to supply the bulk water. The distribution of water is under the County Government jurisdiction. In this case Kericho County Government will be involved in the distribution of water**.**
Mr., Stephen	He requested to have distribution to areas not incorporated in the design. He urged NEMA to monitor the planting of trees on the river riparian to avoid plantations of blue gum.	The distribution of water is under the County Government jurisdiction. In this case Kericho County Government will be involved in the distribution of water**.**

Name	Comment/ Question	Response by consultant
	Mr. Stephen requested that for the CSR, the proponent to construct a hospital in the area as they are forced to walk long distances carrying patients in sacks for lack of hospitals in the area.	
Mr. Kiplagat	He sought to know the capacity of the proposed tank at Barsiele primary. He urged the County Government to ensure that water supply is conducted fairly	The proposed tank at Barsiele primary school has a capacity of (500m^3).

Min 6/ 2018 **Adjournment**

The Assistant County Commissioner gave a vote of thanks and appreciated that the Community Public Participation had adequately sensitized the members of the public on the project matter. Lastly, she requested for public opinion on acceptance of the proposed project and everyone agreed to the project. She invited a volunteer to close the meeting with a word of prayer.

There being no other business, the meeting ended at 5.30 pm

Joshua Gichuki
Taking Minutes
Consultant Team

Date: 13th September 2018

Eng. Tabitha Kimani
Project Engineer
Client Representative (NWHSA)

Date: 13th September 2018

PROPOSED LONDIANI DAM PROJECT AND ASSOCIATED CIVIL WORKS FOR ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT PUBLIC PARTICIPATION

MINUTES FOR ESIA PUBLIC PARTICIPATION HELD AT SIRET DAY SECONDARY SCHOOL IN KIPKELION WEST SUB-COUNTY, ON 20TH APRIL 2018

MEMBERS PRESENT

The participants include the following groups (see attendance list for details of participants)

(i) Client (NWHSA)
(ii) Consultants
(iii) Local Community
(iv) MPs Personal Assistant
(v) Area MCA
(vi) Sub-County Administrator

AGENDA

(i) Convening, Assembly and Introduction
(ii) Project brief – NWHSA
(iii) Proposed Project brief - Consultant
(iv) Matters arising from the briefing – interactive session
(v) Adjournment

Item	Deliberations	Action
Min 1/2018	**Convening, Assembly and Introduction** Participants convened at Siret Day Secondary School at 11:30 am. The area Assistant County Commissioner called the meeting to order and requested for a volunteer to lead in a word of prayer She thanked the locals for attending the meeting for discussing the Londiani Dam project. She added the project is being implemented by the National Government and is in line with the president's 4 growth agenda pillars. She stated the project will be of benefit to the people of Siret in addressing water challenges experienced. The locals will get clean safe water supply for their domestic use and drinking water for livestock. She called upon chiefs present to introduce themselves and the area they represent. She invited the area MCA and the Sub-County Administrator to address the gathering Area MCA He started by thanking the community members for attending the public participation meeting. He stated that provision of clean water supply was among his election promises to the community. He appreciates and supports the project fully since it will address water challenges experienced in the area. He requested the people be given equal job opportunities during the recruitment exercise. He proposed the developer to involve the local administration and his office during the exercise. He added the project will not succeed until all the stakeholders are involved/consulted at each stage of project implementation. He committed to ensuring the project runs smoothly and champion the rights of his people Ward Administrator She stated that she supports the project and emphasized on the need for the locals to benefit in job opportunities Lastly the ACC invited the project developer to introduce the project team and their role on the dam project.	

Item	Deliberations	Action
Min 2/2018	**PROJECT BRIEF** **NWHSA** The project team leader first thanked the participants for attending the consultative forum meant to sensitize them on the proposed dam project. He then introduced the project team members and their roles to the dam and later inviting the project engineer to give a brief on the project background. Project Engineer She started by encouraging participants to brace up to freely air their views and concerns about the Dam project to eliminate speculations related to the project. She reiterated that the Dam project was funded by National Government through the NWHSA as the project executing agency. She stated the proposed Londiani Dam project was among 24 dams identified by the National Government in the realization of vision 2030. She emphasized also the 1992 National Water Master Plan by JICA identified the dam as an intervention measure in addressing water challenges in Kericho County. In addition, the 1992 Master plan had proposed the dam to start by 2010 though that was not the case due to logistic challenges. She revealed that NWHSA tasked to undertake dam development took the mandate to carry out a reconnaissance site visit to identify the water supply status of the project area in 2013-2014. The visit was not limited to water supply but also operations, demands and challenges within Kipkelion East and West Sub-Counties. From the site visit the team came up with findings: ▪ The water supply infrastructures within the area are old and inefficient hence not meeting the locals water demands, ▪ The schemes are characterized by high pumping electricity costs, ▪ High cost of operations and maintenance, ▪ Low production capacities against the present demands She added in order to address the challenges and provide clean potable water to the communities by gravity; dam construction would be a viable option. The dam intervention would also help control flooding downstream Nyando River, provide water for irrigation and generate hydro power for pumping water to Masaita hill for distribution hence addressing the high cost of electricity. She added NWHSA identified a consultant to undertake the dam design feasibility as well as Environment and Social Impacts report for submission to NEMA. She declared that the design consultant would disclose the design details of the project while the ESIA expert would explain both environmental and social linkages to the dam project. She invited the project design engineer to disclose the design details in brief to the community.	
Min 3/2018	**PROJECT DETAILS - BY ENG. MURIUKI** He started by informing participants that the design objective was to identify a favourable site for dam location which would store enough water to be used for irrigation and domestic use. He mentioned the design team undertook feasibility study of available sites and only Masaita dam site meet the minimum threshold for water supply enough to meet NWHSA project objective. He informed the participants on the dam components *Dam catchment* He started by indicating that Kipchorian river is the main river feeding the dam and the dam catchment would be 140.8km^2. He added the dam wall would transverse 700m from the river and stretch 6km upstream. The dam height will be 42m.Also he stated the dam will have a 30m buffer which will	

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Min 5/ 2018 **<u>Matters arising from the briefing – (see questionnaires)</u>**

The proceedings of the interactive session are captured in the response matrix provided below:

Name	Comment/ Question	Response by consultant
John Cheriyot	When will the project begin and end?	▪ The project design has been done and currently we are in the process of seeking NEMA approval. A RAP and valuation will be done for compensation purposes. Tendering for a contractor will be done then the project will start ▪ The project is projected to take three years to completion
Joseph Langat	▪ Which water service board will be in charge once the project is completed? ▪ There is need to avail the project layout and coverage	▪ After completion the project will be handed to Lake Victoria North service Board who partner with Kericho Water and Sanitation Company for Kericho County ▪ Maps and project layout designs will be availed to the local administration for the locals to view the project coverage.

Name	Comment/ Question	Response by consultant
Monica	What are some of the dam safety measures put in place?	▪ The likelihood of dam break is minimal as the design has anticipated such and materials used for construction will be of high quality. ▪ The dam will have a 30m buffer and a fence all round. Trees will be planted on the buffer to reduce siltation
Joseph Ruto	▪ He welcomes the project and states its long overdue since the communities are suffering in accessing clean water supply ▪ He proposed the design engineer to integrate the existing distribution line to the project design	The project design has catered for the main water trunk distribution line to specific storage tanks. Distribution from the tanks to user points will be handled by the County Government
Edwin Kirui	In case of property destruction or land uptake, will there be compensation	Compensation will be made for only those whose land or developments will be affected by the project development
Daniel Toret	How did the design conclude Kipchorian river has sufficient flows for the project?	The engineers undertook feasibility assessments such as geotechnical and hydrology assessment for the river. The assessment conclusion was the flow was sufficient to supply water to targeted areas
Samuel Maritain	▪ He proposed for establishment of water points (kiosks) to serve the high areas that water will not gravitate ▪ How will adverse environmental impacts of the dam be mitigated	The dam potential impacts have been identified and mitigation measures prescribed in the EMP
Richard	▪ He welcomes the project as it will address water challenges within the area	
Richard Yegon	▪ Will there be compensation for distribution lines to homestead ▪ Has the project considered relocation of graves	▪ Compensation is only for the land uptake in the dam site, storage tanks and distribution main lines ▪ Grave relocation will be after consultation with the owners so that they can advise on cultural practices undertaken for the process
Solomon Mbore	Maps should be issued showing the project layout and coverage	▪ Dam layout design and maps will be availed to the area administration and the community members are free to visit the office
Vincent Kosikei	He requested for equal job opportunities among the locals during dam development	There will be equal employment opportunities for the youth and the local administration officers will be involved in the recruitment exercise
Samuel Kipto	He welcomes the project as it will address water challenges within the area	

Min 6/ 2018 **<u>Adjournment</u>**

The Assistant County Commissioner gave a vote of thanks and appreciated that the Community Public Participation had adequately sensitized the members of the public on the project matter. Lastly, she requested for public opinion on acceptance of the proposed project and everyone agreed to the project. She invited a volunteer to close the meeting with a word of prayer.

There being no other business, the meeting ended at 2.30 pm

Joshua Gichuki
Taking Minutes
Consultant Team

Date: 13th September 2018

Eng. Tabitha Kimani
Project Engineer
Client Representative (NWHSA)

Date: 13th September 2018

PROPOSED LONDIANI DAM PROJECT AND ASSOCIATED CIVIL WORKS FOR ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT PUBLIC PARTICIPATION

MINUTES FOR ESIA PUBLIC PARTICIPATION HELD AT KIPKELION WEST SOCIAL HALL, KIPKELION WEST SUB-COUNTY, ON 18TH APRIL 2018

MEMBERS PRESENT

The participants include the following groups (see attendance list for details of participants)

(i) Client (NWHSA)
(ii) Consultants
(iii) Local Community
(iv) Local Administration
(v) MCA

AGENDA

(i) Convening, Assembly and Introduction
(ii) Project brief – NWHSA
(iii) Proposed Project brief - Consultant
(iv) Matters arising from the briefing – interactive session
(v) Adjournment

Item	Deliberations	Action
Min 1/2018	**Convening, Assembly and Introduction** Participants convened at Kipkelion West Social Hall at 11:00 am. The area Assistant County Commissioner called the meeting to order and requested for a volunteer to lead in a word of prayer She thanked the locals for attending the meeting for discussing the Londiani Dam project as it will be of benefit to Kipkelion residents in water provision. She lastly invited the District County Commissioner to chair the meeting. **District County Commissioner** First, he thanked the residence for attending the Londiani Dam projects sensitization meeting. He stated stakeholder's involvement in developments such as this is a constitutional requirement as the communities give their views and ideas towards a project. He added the project is being implemented by the National Government and is in line with the president's 4 growth agenda pillars. He stated the project will be of benefit to the people of Kipkelion in addressing water challenges experienced. The locals will get clean safe water supply for their domestic use and drinking water for livestock. He invited the MCA to address the gathering Area MCA He started by thanking the community members for attending the public participation meeting. He informed the developer that communities have had challenges in accessing water especially the high areas of Kipkelion. He stated there is need for the project developers to consider the youths in employment opportunities. He finished by reaffirming his dedication to ensuring the project is completed on time. He introduced the local administrative officers present in the meeting before inviting the project developer to introduce the project team and their role on the dam project	
Min 2/2018	**PROJECT BRIEF** **NWHSA** The project team leader first thanked the participants for attending the consultative forum meant to sensitize them on the proposed dam project. He then introduced the project team members and their roles to the dam and later inviting the project engineer to give a brief on the project background.	

Item	Deliberations	Action
	Project Engineer She started by encouraging participants to brace up to freely air their views and concerns about the Dam project to eliminate speculations related to the project. She reiterated that the Dam project was funded by National Government through the NWHSA as the project executing agency. She stated the proposed Londiani Dam project was among 24 dams identified by the National Government in the realization of vision 2030. She emphasised also the 1992 National Water Master Plan by JICA identified the dam as an intervention measure in addressing water challenges in Kericho County. In addition, the 1992 Master plan had proposed the dam to start by 2010 though that was not the case due to logistic challenges. She revealed that NWHSA tasked to undertake dam development took the mandate to carry out a reconnaissance site visit to identify the water supply status of the project area in 2013-2014. The visit was not limited to water supply but also operations, demands and challenges within Kipkelion East and West Sub-Counties. From the site visit the team came up with findings: ✓ The water supply infrastructures within the area are old and inefficient hence not meeting the locals water demands, ✓ The schemes are characterized by high pumping electricity costs, ✓ High cost of operations and maintenance, ✓ Low production capacities against the present demands She added in order to address the challenges and provide clean potable water to the communities by gravity; dam construction would be a viable option. The dam intervention would also help control flooding downstream Nyando River, provide water for irrigation and generate hydro power for pumping water to Masaita hill for distribution hence addressing the high cost of electricity. She added NWHSA identified a consultant to undertake the dam design feasibility as well as Environment and Social Impacts report for submission to NEMA. She declared that the design consultant would disclose the design details of the project while the ESIA expert would explain both environmental and social linkages to the dam project. She invited the project design engineer to disclose the design details in brief to the community.	
Min 3/2018	**PROJECT DETAILS- BY ENGINEER** He started by informing participants that the design objective was to identify a favourable site for dam location which would store enough water to be used for irrigation and domestic use. He mentioned the design team undertook feasibility study of available sites and only Masaita dam site meet the minimum threshold for water supply enough to meet NWHSA project objective. He informed the participants on the dam components *Dam catchment* He started by indicating that Kipchorian river is the main river feeding the dam and the dam catchment would be 140.8km^2. He added the dam wall would transverse 700m from the river and stretch 6km upstream. The dam height will be 42m.Also he stated the dam will have a 30m buffer which will be fenced for protection and safety purposes. He stated downstream the dam wall, water treatment facility would be constructed for raw water treatment. He continued by indicating the hydro power generated from the dam will be used to pump treated water from the treatment works to Masaita hill storage tanks for movement to intended locations by gravity. *Distribution supplies* He stated there will be two main water distribution networks i.e.:	

Item	Deliberations	Action
	Masaita – Londiani – Chepseon He stated the gravity main starts at Masaita Hill moving along murram road into Londiani water tanks. It crosses Londiani – Muhoroni road at Londiani Town entry enroute to Kedowa through the forest. From Kedowa centre the pipeline moves along road B1 way leave enroute to Chepseon town and terminates at Chepseon polytechnic. The total pipeline length is 28km.In addition he stated the line also had two branches namely Londiani – Barsiele (13km, 200mm dia.) and Masaita – Kamuingi (7km, 160mm dia.) which terminates at Barsiele and Kamuingi centres respectively. *Treatment Works – Kipkelion - Fort Ternan* He stated the pipeline from the pipeline will move along Londiani-Sorget road reserve and cross the Londiani-Muhoroni road at Kipchorian River bridge. It will then follow Kipchorian River riparian before joining service roads en-route to Kipkelion. From Kipkelion the pipelines move along road and railway way leaves as well as private land before crossing Road C35 at Ngedale. From this point it moves along the highway way leave to Fort Ternan town from where it joins a service road en-route to Kipsinede hill tank. The total length of the pipeline is approximately 39km. *Treated Water Storage Tanks* He noted the two main water distribution lines will have storage tanks for water storage then distribution to user points as follows: *Gravity main 1: Masaita tank-Londiani-Chepseon* Storage tanks proposed along the this main includes: • Masaita hill tank (7,500m^3) • Londiani (5,000m^3), • Kedowa (1,000m^3), and • Chepseon (3,000m^3). Tanks proposed along the terminal ends of the branches: • Kamuingi (250m^3), and • Barsiele (500m^3). *Gravity main 2: Treatment works-Kipkelion-Fort Ternan* Proposed storage tanks include: • Clear water tank (7,000m^3), • Kipkelion (4,000m^3), and • Fort Ternan (3,000m^3). He lastly thanked participants for listening to him and invited the ESIA team leader to give a brief.	
Min 4/2018	**Project Details – by ESIA Expert** The consultant explained that the ESIA was a legal process for safeguarding the environment under Environmental management and Coordination (Amendment) Act, EMCA 2015 and coordinated by the National Environment Management Authority, NEMA. He reiterated that public consultation was a component of the process as well as the community's constitutional right. He observed that the process was meant to ensure that the proposed project was sustainable, optimally beneficial and that environmental and social impacts were mitigated during the project cycle. He stated some of the projects positive impacts included: ▪ Flood control ▪ Provision for water for irrigation ▪ Improved public health status ▪ Improved sanitation and hygiene ▪ Clean water supply ▪ Employment opportunities and	

Item	Deliberations	Action
	▪ Growth and development of the areas. He noted the project will also have negative impacts which will require mitigation so as to ensure project sustainability as well as community ownership. Some of the negative impacts included: ✓ Wastage of water and leakages at consumer points due increased surplus of water supply. <u>Mitigation Measure</u> • Sensitization on water resource management and conservation • Local communities should also participate in water resource management and planning ✓ HIV/AIDs may also increase from interaction of the workers, local communities and migrant influx. <u>Mitigation Measure</u> • Provide an awareness and sensitization forum for the workers as well as the neighbouring communities, especially on communicable social infections including HIV/AIDS, ✓ Risks from water borne diseases and vectors thrive. <u>Mitigation Measure</u> He indicated by Creation of awareness on water resource management and conservation will abet in mitigation. Other impacts include: ✓ Dust emissions ✓ Noise and vibration Lastly, he emphasised the community to use the water sustainable avoiding wastage since the resource is infinite.	

Min 5/ 2018 **<u>Matters arising from the briefing – (see questionnaires)</u>**

The proceedings of the interactive session are captured in the response matrix provided below:

Name	Comment/ Question	Response by consultant
Mr. Koech	Mr. Koech stated the he had accepted the proposed Dam project. He prompted the other local residents to embrace the project and a have a sense of ownership for the proposed Londiani Dam and everyone to play their part in protecting water resource.	
Mr. Reuben Kochir	He sought to know whether the community was involved in the design stage of the project.	The public was involved in the design phase. In addition, the Consultative public participation is part of public involvement in the proposed Dam project
Mr. Joseph	▪ Mr Joseph aspired to know of the Dam safety to the locals living downstream of the dam wall. ▪ He wanted to know whether the flow of River Kipchorian would be affected by the Dam. ▪ He inquired on the project's timeframe.	▪ Dam safety aspect has been taken into consideration ▪ Kipchorian River will still be able to flow as usual. ▪ The proposed dam project timeframe to be approximately 3 years
Mr. David	Mr. David indicated the he had approved of the proposed Dam project	
Mr. Emanuel	He requested to be provided with the Dam layout	The maps will be made available to the local administrative offices

Name	Comment/ Question	Response by consultant
Mr. Elijah	He requested to know whether a transmission corridor could be provided at Kamasian.	The scope of the NWHSA it to supply the bulk water. The distribution of water is under the County Government jurisdiction. In this case Kericho County Government will be involved in the distribution of water.
Ann Koech	She requested to have water distributed to their homesteads	▪ The scope of the NWHSA it to supply the bulk water. The distribution of water is under the County Government jurisdiction. In this case Kericho County Government will be involved in the distribution of water.
David Tanui	▪ He inquired to know the Dam capacity ▪ He also sought to know the number of the affected persons (PAPs). ▪ He wanted to know who will be involved in water supply	▪ The dam inundation area is estimated at 5,200,000m2 such as to attain a dam height of 42m for a maximum gross storage capacity of 55Mm3. ▪ A census of the affected person and an inventory of their assets and livelihoods are compiled and the related costs quantified for appropriate compensation through established policies. ▪ The distribution of water is under the County Government jurisdiction. In this case Kericho County Government will be involved in the distribution of water

Min 6/ 2018 **Adjournment**

The Assistant County Commissioner gave a vote of thanks and appreciated that the Community Public Participation had adequately sensitized the members of the public on the project matter. Lastly, she requested for public opinion on acceptance of the proposed project and everyone agreed to the project. She invited a volunteer to close the meeting with a word of prayer.

There being no other business, the meeting ended at 2.30 pm

Joshua Gichuki
Taking Minutes
Consultant Team

Date: 13th September 2018

Eng. Tabitha Kimani
Project Engineer
Client Representative (NWHSA)

Date: 13th September 2018

PROPOSED LONDIANI DAM PROJECT AND ASSOCIATED CIVIL WORKS FOR ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT PUBLIC PARTICIPATION

MINUTES FOR ESIA PUBLIC PARTICIPATION HELD AT KEDOWA PLAY FIELD, LONDIANI WARD OF KIPKELION EAST SUB-COUNTY, ON 19TH APRIL 2018

MEMBERS PRESENT

The participants include the following groups (see attendance list for details of participants)

(i) Client (NWHSA)
(ii) Consultants
(iii) Local Community
(iv) Area MP Personal Assistant
(v) Local Administration

AGENDA

(i) Convening, Assembly and Introduction
(ii) Project brief – NWHSA
(iii) Proposed Project brief - Consultant
(iv) Matters arising from the briefing – interactive session
(v) Adjournment

Item	Deliberations	Action
Min 1/2018	**Convening, Assembly and Introduction** Participants convened at Kedowa Play Field at 11:30 pm. The area Assistant chief called the meeting to order and requested for a volunteer to lead in a word of prayer He called upon chiefs present to introduce themselves and the area they represent. Lastly, he invited the ACC to chair the meeting and introduce the dam project team members. Assistant County Commissioner She thanked the locals for attending the meeting for discussing the Londiani Dam project. She added the project is being implemented by the National Government and is in line with the president's 4 growth agenda pillars. She stated stakeholder's involvement in developments such as this is a constitutional requirement as the communities give their views and ideas towards a project. She emphasised on the participants to listen carefully on the project briefing and thereafter as questions in regards to the project. She stated the project will be of benefit to the people of Kedowa in addressing water challenges experienced. The locals will get clean safe water supply for their domestic use and drinking water for livestock. She invited the area MPs personal assistant to address the gathering. MPs Personal Assistant He started by thanking the community members for attending the public participation meeting. He informed the participants that the area MP has been actively involved in ensuring the project starts so as to supply water to his constituents. He finished by reaffirming the MPs dedication to ensuring the project is completed on time. Lastly, she invited the project developer to introduce the project team and their role on the dam project	
Min 2/2018	**PROJECT BRIEF** **NWHSA** The project team leader first thanked the participants for attending the consultative forum meant to sensitize them on the proposed dam project.	

Item	Deliberations	Action
	He then introduced the project team members and their roles to the dam and later inviting the project engineer to give a brief on the project background. <u>Project Engineer</u> She started by encouraging participants to brace up to freely air their views and concerns about the Dam project to eliminate speculations related to the project. She reiterated that the Dam project was funded by National Government through the NWHSA as the project executing agency. She stated the proposed Londiani Dam project was among 24 dams identified by the National Government in the realization of vision 2030. She emphasised also the 1992 National Water Master Plan by JICA identified the dam as an intervention measure in addressing water challenges in Kericho County. In addition, the 1992 Master plan had proposed the dam to start by 2010 though that was not the case due to logistic challenges. She revealed that NWHSA tasked to undertake dam development took the mandate to carry out a reconnaissance site visit to identify the water supply status of the project area in 2013-2014. The visit was not limited to water supply but also operations, demands and challenges within Kipkelion East and West Sub-Counties. From the site visit the team came up with findings: ▪ The water supply infrastructures within the area are old and inefficient hence not meeting the locals water demands, ▪ The schemes are characterized by high pumping electricity costs, ▪ High cost of operations and maintenance, ▪ Low production capacities against the present demands She added in order to address the challenges and provide clean potable water to the communities by gravity; dam construction would be a viable option. The dam intervention would also help control flooding downstream Nyando River, provide water for irrigation and generate hydro power for pumping water to Masaita hill for distribution hence addressing the high cost of electricity. She added NWHSA identified a consultant to undertake the dam design feasibility as well as Environment and Social Impacts report for submission to NEMA. She declared that the design consultant would disclose the design details of the project while the ESIA expert would explain both environmental and social linkages to the dam project. She invited the project design engineer to disclose the design details in brief to the community	
Min 3/2018	**<u>PROJECT DETAILS- BY ENGINEER</u>** He started by informing participants that the design objective was to identify a favourable site for dam location which would store enough water to be used for irrigation and domestic use. He mentioned the design team undertook feasibility study of available sites and only Masaita dam site meet the minimum threshold for water supply enough to meet NWHSA project objective. He informed the participants on the dam components. *<u>Dam catchment</u>* He started by indicating that Kipchorian river is the main river feeding the dam and the dam catchment would be 140.8km^2. He added the dam wall would transverse 700m from the river and stretch 6km upstream. The dam height will be 42m. Also, he stated the dam will have a 30m buffer which will be fenced for protection and safety purposes. He stated downstream the dam wall, water treatment facility would be constructed for raw water treatment. He continued by indicating the hydro power	

Item	Deliberations	Action
	generated from the dam will be used to pump treated water from the treatment works to Masaita hill storage tanks for movement to intended locations by gravity. *Distribution supplies* He stated there will be two main water distribution networks i.e.: *Masaita – Londiani – Chepseon* He stated the gravity main starts at Masaita Hill moving along murram road into Londiani water tanks. It crosses Londiani-Muhoroni road at Londiani Town entry enroute to Kedowa through the forest. From Kedowa centre the pipeline moves along road B1 way leave enroute to Chepseon town and terminates at Chepseon polytechnic. The total pipeline length is 28km. In addition, he stated the line also had two branches namely Londiani-Barsiele (13km, 200mm dia.) and Masaita-Kamuingi (7km, 160mm dia.) which terminates at Barsiele and Kamuingi centres respectively. *Treatment Works – Kipkelion – Fort Ternan* He stated the pipeline from the pipeline will move along Londiani-Sorget road reserve and cross the Londiani-Muhoroni road at Kipchorian River bridge. It will then follow Kipchorian River riparian before joining service roads enroute to Kipkelion. From Kipkelion the pipelines move along road and railway way leaves as well as private land before crossing Road C35 at Ngedale. From this point it moves along the highway way leave to Fort Ternan town from where it joins a service road enroute to Kipsinede hill tank. The total length of the pipeline is approximately 39km. *Treated Water Storage Tanks* He noted the two main water distribution lines will have storage tanks for water storage then distribution to user points as follows: *Gravity main 1: Masaita tank-Londiani-Chepseon* Storage tanks proposed along the this main includes: • Masaita hill tank (7,500 m^3) • Londiani (5,000m^3), • Kedowa (1,000m^3), and • Chepseon (3,000m^3). Tanks proposed along the terminal ends of the branches: • Kamuingi (250m^3), and • Barsiele (500m^3). *Gravity main 2: Treatment works-Kipkelion-Fort Ternan* Proposed storage tanks include: • Clear eater tank (7,000m^3), • Kipkelion (4,000m^3), and • Fort Ternan (3,000m^3). He lastly thanked participants for listening to him and invited the ESIA team leader to give a brief	
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Item	Deliberations	Action
	▪ Improved public health status ▪ Improved sanitation and hygiene ▪ Clean water supply ▪ Employment opportunities and ▪ Growth and development of the areas. He noted the project will also have negative impacts which will require mitigation so as to ensure project sustainability as well as community ownership. Some of the negative impacts included: ✓ Wastage of water and leakages at consumer points due increased surplus of water supply. <u>Mitigation Measure</u> • Sensitization on water resource management and conservation • Local communities should also participate in water resource management and planning ✓ HIV/AIDs may also increase from interaction of the workers, local communities and migrant influx. <u>Mitigation Measure</u> Provide an awareness and sensitization forum for the workers as well as the neighbouring communities, especially on communicable social infections including HIV/AIDS, ✓ Risks from water borne diseases and vectors thrive. <u>Mitigation Measure</u> He indicated by Creation of awareness on water resource management and conservation will abet in mitigation. Other impacts include ✓ Dust emissions ✓ Noise and vibration Lastly, he emphasised the community to use the water sustainable avoiding wastage since the resource is infinite.	

Min 5/ 2018 **<u>Matters arising from the briefing – (see questionnaires)</u>**

The proceedings of the interactive session are captured in the response matrix provided below:

Name	Comment/ Question	Response by consultant
Joseph Sang	▪ Can the water supply be used to irrigate farms within the area? ▪ Are the locals required to pay water bills once connected?	▪ The water supplied to their homes is purely drinking and for domestic use. Irrigation water will be abstracted from Kipchorian River but after getting relevant water abstraction permits ▪ The locals will pay water bills so as to improve on service delivery and also meet the operation costs
Newton	▪ What will be the criteria for recruiting labour force? ▪ He proposed the youths from the area should benefit from the project	There will be equal employment opportunities for the youth and the local administration officers will be involved in the recruitment exercise
David Terer	▪ He appreciates the project as it will address water challenges within the area ▪ Will there be compensation for even structures or land alone ▪ Will the dam construction interfere with Kipchorian River flows	▪ Compensation will be done for land, developments and crops ▪ The dam will not interfere with water flow in Kipchorian River. The dam is mainly for surface run off storage during the rains
Andrew	Will the areas of Chebewor benefit from the project water supply	All areas within Kedowa will have water supply

Name	Comment/ Question	Response by consultant
Stephen Kirui	Will the dam water project address the water challenges experienced in the area?	The dam water is enough to serve Kipkelion East and West water demands for the next 20 years and more
Julius Langat	Does the dam project have any CSR components for the community?	▪ The CSR components cover education and health aspects. ▪ It's the responsibility of the community and the local administration to identify a CSR initiative among the two for funding.
Phillip Kirui	What is the project timeframe	▪ The project design has been done and currently we are in the process of seeking NEMA approval. A RAP and valuation will be done for compensation purposes. Tendering for a contractor will be done then the project will start
Koech	Will individual houses be connected with water	NWHSA is mandated to do large dams and main trunk lines and storage facilities. Local water distribution is by the County through water service provider

Min 6/ 2018 **Adjournment**

The Assistant County Commissioner gave a vote of thanks and appreciated that the Community Public Participation had adequately sensitized the members of the public on the project matter. Lastly, she requested for public opinion on acceptance of the proposed project and everyone agreed to the project. She invited a volunteer to close the meeting with a word of prayer.

There being no other business, the meeting ended at 1.30 pm

Joshua Gichuki
Taking Minutes
Consultant Team

Date: 13th September 2018

Eng. Tabitha Kimani
Project Engineer
Client Representative (NWHSA)

Date: 13th September 2018

PROPOSED LONDIANI DAM PROJECT AND ASSOCIATED CIVIL WORKS FOR ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT PUBLIC PARTICIPATION

MINUTES FOR ESIA PUBLIC PARTICIPATION HELD AT CHEPSEON MARKET OF KIPKELION EAST SUB-COUNTY, ON 19TH APRIL 2018

MEMBERS PRESENT

The participants include the following groups (see attendance list for details of participants)

1. Client (NWHSA)
2. Consultants
3. Local Community
4. MPs Personal Assistant
5. Area MCA
6. Ward Administrator

AGENDA

1. Convening, Assembly and Introduction
2. Project brief – NWHSA
3. Proposed Project brief - Consultant
4. Matters arising from the briefing – interactive session
5. Adjournment

Item	Deliberations	Action
Min 1/2018	**Convening, Assembly and Introduction** Participants convened at Chepseon Market at 3:30 pm. The area Assistant chief called the meeting to order and requested for a volunteer to lead in a word of prayer He called upon chiefs present to introduce themselves and the area they represent. Lastly, he invited the DCC to chair the meeting and introduce the dam project team members. District County Commissioner She thanked the locals for attending the meeting for discussing the Londiani Dam project bracing the heavy rain. She added the project is being implemented by the National Government and is in line with the president's 4 growth agenda pillars. She stated stakeholder's involvement in developments such as this is a constitutional requirement as the communities give their views and ideas towards a project. She stated the project will be of benefit to the people of Chepseon in addressing water challenges experienced. The locals will get clean safe water supply for their domestic use and drinking water for livestock. She invited the area MPs personal assistant, MCA and the Sub-County Administrator to address the gathering. MPs Personal Assistant He started by thanking the community members for attending the public participation meeting. He informed the participants that the area MP has been actively involved in ensuring the project starts so as to supply water to his constituents. He finished by reaffirming the MPs dedication to ensuring the project is completed on time. Area MCA He started by thanking the community members for attending the public participation meeting. He stated that provision of clean water supply was among his election promises to the community. He appreciates and supports the project fully since it will address water challenges experienced in the area.	

Item	Deliberations	Action
Min 2/2018	He committed to ensuring the project runs smoothly and champion the rights of his people. Ward Administrator He supports the project and emphasised on the need for the locals to benefit in job opportunities. Lastly, she invited the project developer to introduce the project team and their role on the dam project **PROJECT BRIEF** **NWHSA** The project team leader first thanked the participants for attending the consultative forum meant to sensitize them on the proposed dam project. He then introduced the project team members and their roles to the dam and later inviting the project engineer to give a brief on the project background. Project Engineer She started by encouraging participants to brace up to freely air their views and concerns about the Dam project to eliminate speculations related to the project. She reiterated that the Dam project was funded by National Government through the NWHSA as the project executing agency. She stated the proposed Londiani Dam project was among 24 dams identified by the National Government in the realization of vision 2030. She emphasised also the 1992 National Water Master Plan by JICA identified the dam as an intervention measure in addressing water challenges in Kericho County. In addition, the 1992 Master plan had proposed the dam to start by 2010 though that was not the case due to logistic challenges. She revealed that NWHSA tasked to undertake dam development took the mandate to carry out a reconnaissance site visit to identify the water supply status of the project area in 2013-2014. The visit was not limited to water supply but also operations, demands and challenges within Kipkelion East and West Sub-Counties. From the site visit the team came up with findings: ▪ The water supply infrastructures within the area are old and inefficient hence not meeting the locals water demands, ▪ The schemes are characterized by high pumping electricity costs, ▪ High cost of operations and maintenance, ▪ Low production capacities against the present demands She added in order to address the challenges and provide clean potable water to the communities by gravity; dam construction would be a viable option. The dam intervention would also help control flooding downstream Nyando River, provide water for irrigation and generate hydro power for pumping water to Masaita hill for distribution hence addressing the high cost of electricity. She added NWHSA identified a consultant to undertake the dam design feasibility as well as Environment and Social Impacts report for submission to NEMA. She declared that the design consultant would disclose the design details of the project while the ESIA expert would explain both environmental and social linkages to the dam project. She invited the project design engineer to disclose the design details in brief to the community	
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	design team undertook feasibility study of available sites and only Masaita dam site meet the minimum threshold for water supply enough to meet NWHSA project objective. He informed the participants on the dam components *Dam catchment* He started by indicating that Kipchorian river is the main river feeding the dam and the dam catchment would be 140.8km^2. He added the dam wall would transverse 700m from the river and stretch 6km upstream. The dam height will be 42m.Also he stated the dam will have a 30m buffer which will be fenced for protection and safety purposes. He stated downstream the dam wall, water treatment facility would be constructed for raw water treatment. He continued by indicating the hydro power generated from the dam will be used to pump treated water from the treatment works to Masaita hill storage tanks for movement to intended locations by gravity. *Distribution supplies* He stated there will be two main water distribution networks i.e.: Masaita – Londiani – Chepseon He stated the gravity main starts at Masaita Hill moving along murram road into Londiani water tanks. It crosses Londiani-Muhoroni road at Londiani Town entry enroute to Kedowa through the forest. From Kedowa centre the pipeline moves along road B1 way leave enroute to Chepseon town and terminates at Chepseon polytechnic. The total pipeline length is 28km.In addition he stated the line also had two branches namely Londiani-Barsiele (13km, 200mm dia.) and Masaita-Kamuingi (7km, 160mm dia.) which terminates at Barsiele and Kamuingi centres respectively. Treatment Works – Kipkelion - Fort Ternan He stated the pipeline from the pipeline will move along Londiani-Sorget road reserve and cross the Londiani-Muhoroni road at Kipchorian River bridge. It will then follow Kipchorian River riparian before joining service roads enroute to Kipkelion. From Kipkelion the pipelines move along road and railway way leaves as well as private land before crossing Road C35 at Ngedale. From this point it moves along the highway way leave to Fort Ternan town from where it joins a service road enroute to Kipsinede hill tank. The total length of the pipeline is approximately 39km. *Treated Water Storage Tanks* He noted the two main water distribution lines will have storage tanks for water storage then distribution to user points as follows: *Gravity main 1: Masaita tank-Londiani-Chepseon* Storage tanks proposed along the this main includes: • Masaita hill tank (7,500m^3) • Londiani (5,000m^3), • Kedowa (1,000m^3), and • Chepseon (3,000m^3). Tanks proposed along the terminal ends of the branches: • Kamuingi (250m^3), and • Barsiele (500m^3). *Gravity main 2: Treatment works-Kipkelion-Fort Ternan* Proposed storage tanks include: • Clear water tank (7,000m^3), • Kipkelion (4,000m^3), and • Fort Ternan (3,000m^3). He lastly thanked participants for listening to him and invited the ESIA team leader to give a brief	

Item	Deliberations	Action
Min 4/2018	**Project details – by ESIA Expert** The consultant explained that the ESIA was a legal process for safeguarding the environment under Environmental management and Coordination (Amendment) Act, EMCA 2015 and coordinated by the National Environment Management Authority, NEMA. He reiterated that public consultation was a component of the process as well as the community's constitutional right. He observed that the process was meant to ensure that the proposed project was sustainable, optimally beneficial and that environmental and social impacts were mitigated during the project cycle. He stated some of the projects positive impacts included: ▪ Flood control ▪ Provision for water for irrigation ▪ Improved public health status ▪ Improved sanitation and hygiene ▪ Clean water supply ▪ Employment opportunities and ▪ Growth and development of the areas. He noted the project will also have negative impacts which will require mitigation so as to ensure project sustainability as well as community ownership. Some of the negative impacts included: ✓ Wastage of water and leakages at consumer points due increased surplus of water supply. Mitigation Measure • Sensitization on water resource management and conservation • Local communities should also participate in water resource management and planning ✓ HIV/AIDs may also increase from interaction of the workers, local communities and migrant influx. Mitigation Measure Provide an awareness and sensitization forum for the workers as well as the neighbouring communities, especially on communicable social infections including HIV/AIDS, ✓ Risks from water borne diseases and vectors thrive. Mitigation Measure He indicated by Creation of awareness on water resource management and conservation will abet in mitigation. Other impacts include: ✓ Dust emissions ✓ Noise and vibration Lastly, he emphasised the community to use the water sustainable avoiding wastage since the resource is infinite.	

Min 5/ 2018 **Matters arising from the briefing – (see questionnaires)**

The proceedings of the interactive session are captured in the response matrix provided below:

Name	Comment/ Question	Response by consultant
Area MCA	He welcomes the project as it will address water challenges within Chepseon area	
Moses Kelongoi	Does the dam project have any CSR components for the community?	▪ The CSR components cover education and health aspects. ▪ It's the responsibility of the community and the local administration to identify a CSR initiative among the two for funding.

Name	Comment/ Question	Response by consultant
Charles Chepkuony	He appreciates the project as it will address water challenges within the area	
Rono	He hopes the project is a reality and not a lie as compared with other water projects the community were promised and they never started	The project was proposed by JICA 1992 Water master plan as an intervention measure to address water challenges in Kipkelion East sub-county
Ngetich Rairi	She welcomes the project as it will address water challenges women go through in fetching water from rivers. Also, the market area will benefit hence reducing spread of waterborne diseases	
Kelvin Chirchir	▪ He welcomes the project as it is of benefit to the locals by providing clean water supply ▪ Will water distribution cover the interior areas of Chepseon? ▪ What sizes of pipes and storage tanks to be used	▪ The dam water supply is adequate to serve even the interior areas of Chepseon though distribution to this area will be undertaken by the County Government ▪ The main pipes will be steel and which will be laid 3m down the ground.
Ward Administrator	▪ What is the project timeframe? ▪ What is the project coverage area?	▪ The project design has been done and currently we are in the process of seeking NEMA approval. A RAP and valuation will be done for compensation purposes. Tendering for a contractor will be done then the project will start ▪ Maps and project layout designs will be availed to the local administration for the locals to view the project coverage.
Kiptanui Arap Motai	▪ He welcomes the project as it will address water challenges within the area. ▪ Does the water distribution cover the high areas of Chepseon?	Distribution tank at Chepseon Polytechnic will ensure water flows to even the high areas.
Jason Cheriyot	▪ He welcomes the project and hope it will start soonest and not a scum like other promised water projects that never kicked off. ▪ Will the water be metered or its for free?	The locals will pay water bills so as to improve on service delivery and also meet the operation costs.
Stephen Kimeu Laboso	He welcomes the project more so since the market will have water for use hence solving spread of diseases attributed to eating unclean fruits.	

Min 6/ 2018 **<u>Adjournment</u>**

The District County Commissioner gave a vote of thanks and appreciated that the Community Public Participation had adequately sensitized the members of the public on the project matter. Lastly, she requested for public opinion on acceptance of the proposed project and everyone agreed to the project. She invited a volunteer to close the meeting with a word of prayer.

There being no other business, the meeting ended at 5.30 pm

Joshua Gichuki
Taking Minutes
Consultant Team

Date: 13th September 2018

Eng. Tabitha Kimani
Project Engineer
Client Representative (NWHSA)

Date: 13th September 2018

PROPOSED LONDIANI DAM PROJECT AND ASSOCIATED CIVIL WORKS FOR ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT PUBLIC PARTICIPATION

MINUTES FOR ESIA PUBLIC PARTICIPATION HELD AT KIPKELION COFFEE MILLS HALL IN KIPKELION WEST SUB-COUNTY, ON 20TH APRIL 2018

MEMBERS PRESENT

The participants include the following groups (see attendance list for details of participants)

(i) Client (NWHSA)
(ii) Consultants
(iii) Local Community
(iv) MPs Personal Assistant
(v) Sub-County Administrator

AGENDA

(i) Convening, Assembly and Introduction
(ii) Project brief – NWHSA
(iii) Proposed Project brief - Consultant
(iv) Matters arising from the briefing – interactive session
(v) Adjournment

Item	Deliberations	Action
Min 1/2018	**Convening, Assembly and Introduction** Participants convened at Kipkelion Coffee Mills Hall at 3:00 pm. The area Assistant County Commissioner called the meeting to order and requested for a volunteer to lead in a word of prayer He called upon chiefs present to introduce themselves and the area they represent. He invited the area Sub-County Administrator to address the gathering Sub-County Administrator She thanked the locals for attending the meeting for discussing the Londiani Dam project. She stated the project will be of benefit to the people of Fort Ternan and its environs in addressing water challenges experienced. The locals will get clean safe water supply for their domestic use and drinking water for livestock. Lastly the ACC invited the project developer to introduce the project team and their role on the dam project	
Min 2/2018	**PROJECT BRIEF** **NWHSA** The project team leader first thanked the participants for attending the consultative forum meant to sensitize them on the proposed dam project. He then introduced the project team members and their roles to the dam and later inviting the project engineer to give a brief on the project background. Project Engineer She started by encouraging participants to brace up to freely air their views and concerns about the Dam project to eliminate speculations related to the project. She reiterated that the Dam project was funded by National Government through the NWHSA as the project executing agency. She stated the proposed Londiani Dam project was among 24 dams identified by the National Government in the realization of vision 2030. She emphasised also the 1992 National Water Master Plan by JICA identified the dam as an intervention measure in addressing water challenges in Kericho County.	

Item	Deliberations	Action
	In addition, the 1992 Master plan had proposed the dam to start by 2010 though that was not the case due to logistic challenges. She revealed that NWHSA tasked to undertake dam development took the mandate to carry out a reconnaissance site visit to identify the water supply status of the project area in 2013-2014. The visit was not limited to water supply but also operations, demands and challenges within Kipkelion East and West Sub-Counties. From the site visit the team came up with findings: ▪ The water supply infrastructures within the area are old and inefficient hence not meeting the locals water demands, ▪ The schemes are characterized by high pumping electricity costs, ▪ High cost of operations and maintenance, ▪ Low production capacities against the present demands She added in order to address the challenges and provide clean potable water to the communities by gravity; dam construction would be a viable option. The dam intervention would also help control flooding downstream Nyando River, provide water for irrigation and generate hydro power for pumping water to Masaita hill for distribution hence addressing the high cost of electricity. She added NWHSA identified a consultant to undertake the dam design feasibility as well as Environment and Social Impacts report for submission to NEMA. She declared that the design consultant would disclose the design details of the project while the ESIA expert would explain both environmental and social linkages to the dam project. She invited the project design engineer to disclose the design details in brief to the community	
Min 3/2018	**PROJECT DETAILS- BY ENGINEER** He started by informing participants that the design objective was to identify a favourable site for dam location which would store enough water to be used for irrigation and domestic use. He mentioned the design team undertook feasibility study of available sites and only Masaita dam site meet the minimum threshold for water supply enough to meet NWHSA project objective. He informed the participants on the dam components *Dam catchment* He started by indicating that Kipchorian river is the main river feeding the dam and the dam catchment would be 140.8km^2. He added the dam wall would transverse 700m from the river and stretch 6km upstream. The dam height will be 42m.Also he stated the dam will have a 30m buffer which will be fenced for protection and safety purposes. He stated downstream the dam wall, water treatment facility would be constructed for raw water treatment. He continued by indicating the hydro power generated from the dam will be used to pump treated water from the treatment works to Masaita hill storage tanks for movement to intended locations by gravity. *Distribution supplies* He stated there will be two main water distribution networks i.e.: *Masaita – Londiani – Chepseon* He stated the gravity main starts at Masaita Hill moving along murram road into Londiani water tanks. It crosses Londiani – Muhoroni road at Londiani Town entry en-route to Kedowa through the forest. From Kedowa centre the pipeline moves along road B1 way leave en-route to Chepseon town and terminates at Chepseon polytechnic. The total pipeline length is 28km. In addition, he stated the line also had two branches namely Londiani – Barsiele (13km, 200mm dia.) and Masaita – Kamuingi (7km, 160mm dia.) which terminates at Barsiele and Kamuingi centres respectively.	

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Item	Deliberations	Action
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Min 5/ 2018 **Matters arising from the briefing – (see questionnaires)**

The proceedings of the interactive session are captured in the response matrix provided below:

Name	Comment/ Question	Response by consultant
John Kipchar Boit	▪ For those wishing to do irrigation is there a cost ▪ Are there mitigation measures put in place for catchment rehabilitation?	▪ Irrigation is a county devolved function. It will depend on the county whether to charge or not ▪ The ESIA report has a chapter on catchment management safeguards
Joel Sitinei	He expects all that is discussed by the project team is real and will be executed as proposed	
Wesley Rono	▪ He welcomes the project and states that it will address water scarcity challenges in the area ▪ Is Mentera area within the project coverage scope? ▪ He proposed for establishment of a tank uphill to serve the Mentera residence	Water pressure is enough to gravitate to Mentera area
Michael Chepkuonyi	Kunya area should be integrated to the project design	The tank storage at Kipsinede hill has capacity to serve even Kunya area
John Rotich	▪ Will high areas of Siwot be covered in the project design? ▪ He proposed for equal job opportunities among the locals	▪ The project design has incorporated Siwot area as water supply beneficiary ▪ There will be equal employment opportunities for the youth and the local administration officers will be involved in the recruitment exercise
Leah Chep	▪ She welcomes the project since water burden has always been a woman responsibility. ▪ The project will address challenges faced by women in accessing water supply.	
Wilson Soi	He proposed for transparency among various project players to give community confidence in taking ownership of the project	

Name	Comment/ Question	Response by consultant
Charles	The project time frame will the design engineer incorporate existing water tanks for storage into the project	▪ The project design has been done and currently we are in the process of seeking NEMA approval. A RAP and valuation will be done for compensation purposes. Tendering for a contractor will be done then the project will start ▪ The project is projected to take three years to completion ▪ The project design has catered for the main water trunk distribution line to specific storage tanks. Distribution from the tanks to user points will be handled by the County Government
Daniel Langat	Will there be a dedicated water supply line for irrigation	Irrigation is a devolved County function hence the County Government will meet the locals and deliberate on way forward.
David Koech	He proposed employment opportunities should be fair and shared among locals of the two project sub-counties	There will be equal employment opportunities for the youth and the local administration officers will be involved in the recruitment exercise
Rose Langat	She welcomes the project as it will address water challenges within the area	
Joel Bosinie	What mechanism has been put in place to report and address complains from project development	▪ A committee will be formed comprising of elders, local administration and few community members. ▪ The committee will be airing grievances to the client and contractor

Min 6/ 2018 **Adjournment**

The Assistant County Commissioner gave a vote of thanks and appreciated that the Community Public Participation had adequately sensitized the members of the public on the project matter. Lastly, she requested for public opinion on acceptance of the proposed project and everyone agreed to the project. She invited a volunteer to close the meeting with a word of prayer.

There being no other business, the meeting ended at 5.30 pm

Joshua Gichuki
Taking Minutes
Consultant Team

Date: 13th September 2018

Eng. Tabitha Kimani
Project Engineer
Client Representative (NWHSA)

Date: 13th September 2018

Annex 5: Comments and Opinions from Stakeholders

Annex 6: Assorted Correspondences