NAIVASHA WATER, SEWERAGE & SANITATION COMPANY LTD.

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT PROJECT REPORT FOR

KAYOLE MIRERA WATER SUPPLY PROJECT

PROPONENT:

NAIVASHA WATER SEWERAGE AND SANITATION COMPANY

P.O BOX 321 – 20117,

NAIVASHA.

AUGUST 2016

Environmental Impact Assessment Participants

Consultants

Mary N. Kamau Lead Expert

Proponent: NAIVASHA WATER SEWERAGE AND SANITATION COMPANY

This Environmental Impact Assessment Project Report has been prepared for and on behalf of the company by the undersigned officers.

For and on behalf of

NAIVAWASS

NAME OF THE PROPONENT:

M/S

……

DESIGNATION……

SIGNATURE…….

Tel: …….

DATE……..

Lead Expert

MARY N. KAMAU

EXPERT REG. NO.7071

SIGNATURE……

DATE……

Disclaimer:

This environmental impact assessment project report is based on information made available by the Proponent to the Consultant and findings from field assessment. It is strictly confidential to the Proponent and any materials thereof should strictly be in accordance with the agreement from the Proponent. It is, however, subject to conditions in the Environmental (Impact Assessment and Audit) Regulations, (2003).

SUMMARY OF PARTICULARS

Name of Proponent: NAIVASHA WATER SEWERAGE AND SANITATION COMPANY

Contact Person: - NAHASHON WAHOME

Address: P.O Box 321 – 20117, Naivasha.
Jonka Buiding, 1st Floor
Ngina/ Biashara Street Junction

Email: projects@naivashawater.co.ke

Proposed Activity: - **KAYOLE-MIRERA WATER SUPPLY PROJECT**

EIA Consultant: - **MARY N. KAMAU - LEAD EXPERT,**
Reg. No. 7071,
P. O. BOX 12035-00400,
Nairobi.

Email: kamaumary99@gmail.com

Nature of ESIA: - **Project Report**

Date: - **AUGUST 2016**

BUDGET

The total estimated cost of the project is=K.sh. **Ksh 89,288,815.00**

NEMA license fee @ 0.1% or minimum= K.sh. **Ksh 89,288.82**

ACKNOWLEDGEMENT

We wish to thank the Naivasha water sewerage and sanitation company (NAIVAWASS) for their immense assistance and cooperation during our field visit and assistance in availing relevant information.

Also, we thank residents, local communities for their support, who graciously provided pertinent data and/or information, documents and actively participated and interacted with the ESIA team.

LIST OF ABBREVIATIONS

AIDS	ACQUIRED IMMUNE DEFICIENCY SYNDROME
ESIA	ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT
EMP	ENVIRONMENTAL MANAGEMENT PLAN
HIV	HUMAN IMMUNODEFICIENCY VIRUS
LR	LAND REFERENCE
NEAPC	NATIONAL ENVIRONMENTAL ACTION PLAN
NEMA	NATIONAL ENVIRONMENTAL MANAGEMENT AUTHORITY
PPE	PERSONAL PROTECTIVE EQUIPMENT
SEM	SUSTAINABLE ENVIRONMENTAL MANAGEMENT
TOR	TERMS OF REFERENCE
GOK	GOVERNMENT OF KENYA
MDGS	MILLENNIUM DEVELOPMENT GOALS
WSS	WATER SUPPLY AND SEWERAGE
WASREB	WATER SERVICES REGULATORY BOARD
WSPS	WATER SERVICES PROVIDERS
IC	INDIVIDUALS CONNECTION
NC	NON-INDIVIDUAL CONNECTION
EMCA	ENVIRONMENTAL MANAGEMENT AND COORDINATION ACT
LPS	LITERS PER SECOND
LU	LIVESTOCK UNIT
M	METER
M	METER
MAX	MAXIMUM
MOWI	MINISTRY OF WATER AND IRRIGATION

NAIVAWASS	NAIVASHA WATER SUPPLY AND SANITATION COMPANY
Ø	NOMINAL OUTSIDE DIAMETER
O & M	OPERATIONS AND MAINTENANCE
ºC	DEGREES CENTIGRADE
P.A	PER ANNUM
RED	REDUCING
S	SOUTH
S.C.O	SUB – COUNTY OFFICER
SQ	SQUARE
UPVC	UNPLASTICIZED POLYVINYL CHLORIDE
W.O	WASH OUT
WRMA	WATER RESOURCES MANAGEMENT AUTHORITY
OSHA	OCCUPATIONAL HEALTH AND SAFETY ACT
WIBA	WORKER INJURY BENEFIT ACT
KWS	KENYA WILDLIFE SERVICE
Ops	OPERATION POLICIES
UNEP	UNITED NATION ENVIRONMENTAL PROGRAM

EXECUTIVE SUMMARY

Purpose

This Environmental and social Impact Assessment Report on has been prepared on behalf of Naivasha water sewerage and Sanitation Company by Mary Nyakobi. The report presents the findings for the proposed development of the project and makes recommendations on how to mitigate the negative impacts.

Background

Naivasha Water Sewerage and Sanitation Company is a corporate entity established under company act, cap 486 of laws of Kenya as an agent of Rift Valley Water Services Board with mandate of providing water and sanitation services within Naivasha Municipality and its environs on self-sustaining basis. The company abstracts water from several boreholes located at various regions in Naivasha Sub-County. The proposed project for Kayole - Mirera water supply project is aiming at reinforcing the water supply of Kayole and Mirera areas.

Scope of the study

The scope of this environmental and social impact assessment is and not limited to; the physical extent of the project, site location and its immediate environs, construction phase of the project, Operation phase and decommissioning phase. All these were done in light of relevant standards, legal and regulatory framework. The interaction of the water supply project and raw water abstraction pipeline with Flora and fauna; Land use; Socio-economic aspects; disease outbreak and response preparedness; mosquito breeding site and flooding were also assessed. Finally, a detailed evaluation of the project`s potential environmental and social impacts was done with mitigation measures being suggested accordingly.

Summary of project components

The project will involve the following;

- Drilling of borehole at karate
- Erection of an elevated tank at panda flowers farm.
- Laying of water distributions pipe in Kayole-Mirera
- Building of water kiosks
- Digging up trenches for the distribution pipes.

Summary of environment and social screening

World Bank undertakes environmental screening of each proposed operation to determine the appropriate extent and type of EA. World bank classifies the proposed project into one of four categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts.

a) Category A: A proposed project is classified as Category A if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works. EA for a Category A project examines the project's potential negative and positive environmental impacts, compares them with those of feasible alternatives (including, the "without project" situation), and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. For a Category A project, the project sponsor is responsible for preparing a report.

b) Category B: A proposed project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas—including wetlands, forests, grasslands, and other natural habitats—are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigatory measures can be designed more readily than for Category A projects. The scope of EA for a Category B project may vary from project to project, but it is narrower than that of Category A EA. Like Category A EA, it examines the project's potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. The findings and results of Category B EA are described in the Environmental Review Summary, which is prepared by IFC.10

c) Category C: A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further EA action is required for a Category C project.

This project falls under category A and hence the proponent involved environment experts to help prepare a project environmental impact assessment report.

Methodology

This study process adopted an integrated approach where data and information evaluation, field investigations, consultations among the team of experts, interviews and discussions with stakeholders and affected parties were undertaken at the same time.

The EIA study team made field visits to the proposed site and conducted desktop study to establish the following: Baseline data which included; biodiversity, socio-economic and environmental assessment legal Policies, Legislative and Institutional Framework governing the proposed project Perception of the proposed project from the local communities

Compatibility of the proposed project with the environment Types of waste to be generated, proposed management and disposal methods Potential positive and negative impacts of the project.

The study assessed and quantified the possible impacts of the proposed project to the residents in general and other administrative areas that share resources with the project beneficiaries.

Site Visits

Information gathering was conducted through site visits at the project and its surrounding areas including households. This involved a systematic field traversing to quantify perceived impacts of project on:-

- Existing land uses
- Land conflicts and ownership
- Areas of insecurity
- Institutions and organizations in the area
- Vegetation cover of the area

Existing sensitive environmental receptors including underground and surface waters; animal feeding grounds and routes, and methods of protection from destruction, interference, contamination and extinction, Waste management and disposal methods


Photo 1: Site visit by esia team. Photo 2: Discussion with affected people

Consultative Forums

Socio-economic impact assessment forums were held at the county and institution levels with KWSTI principal, Panda flowers company, county government representatives, and other stakeholders. At the communal level talks were held with the chiefs, community elder's, religious leaders and the public at large. The community members were receptive with regard to the project implementation and also emphasized on the need to implement the mitigation measures for the negative impacts.


Photos 3&4**: Consultation meeting with public at Kayole and Mirera respectively**

The aim was to identify possible environmental and social Impacts that might arise from the proposed project activities. The Consultant collected and assembled several relevant documents for review including maps, satellite images and other relevant documents

Summary of the legislative and policies reviewed

The ESIA protocol was in accordance with the Environmental Management and Coordination Act (EMCA, 1999) and the 2011 NEMA Guidelines for Strategic Environmental Assessment in Kenya for which a wide range of documents were scrutinized through intensive desk studies including the following among others namely the Environmental (Environmental Impact Assessment, and Audit) regulations, 2003, the Waste Management Standards (Legal Notice 121: The Environmental Management Coordination (Waste Management) Regulations), the Water Management Standards (Legal Notice 120: The Environmental Management Coordination (Water Quality) Regulations) and the Environmental Management and Coordination (Noise and Excessive vibration pollution) (Control) Regulations, 2009 (Legal Notice 61), The New Constitution of Kenya, Land policy (2009), Forest policy (2005),Water Policy (1999), Water Act 2002, Wildlife policy (2009), Kenya Vision 2030, NAIVAWASS strategic plan (2015-2019), NEAP (2009-2014), National Water Services Strategy, National Water Master Plan others include world bank policies on environment which include the following; Water Resources Management OP 4.07 Natural Habitats OP 4.04, Involuntary Resettlement OP 4.12, Physical Cultural Resources OP 4.11, Environmental Assessment Operational Policy OP 4.01.

Summary of Positive Impacts

Impact General Comment

- Employment Opportunities. The proposed project will create employment opportunities to the local communities during the entire project life cycle.
- Enterprise Development. Various commercial activities will come into operation in the course of project activities e.g. food kiosks and other farm based enterprises.

Summary of Negative environmental impacts and mitigation measures

Impact Mitigation Measure

- Generation of dust- Provide dust mask to the workers; Sprinkle water during the spreading and trench land filling
- Generation of noise - Sensitization of drivers and other machine operators; Check motor speed and noise
- Loss of biodiversity - Avoid processes and activities that impact negatively on both fauna and flora i.e. interfering with breeding, sheltering, watering and feeding grounds;

- Soil erosion - Introduce scours checks and gabion mattresses; avoid excessive bush and tree clearing and finally reseeding such grounds at appropriate times.
- Site specific impacts i.e. change of aesthetic value, dust menace, loss of access to public utilities and cultural sites, visual intrusion e.g construction traffic. - introduction of vegetation (trees, shrubs and grass) on open spaces and around the project site and their maintenance, appoint a safety officer to ensure that proper disposal guideline are observed, they will be no loss of public utilities and cultural sites.

Occupational Health and Safety hazards

- Apply Cap 514, all workstations to have trainings on OHS; all workers to be covered under the workman's compensation Act; ensure adequate facilities for sanitation
- As mitigation, all access to the hazardous areas should be secured with a fence and warning notices in English and Kiswahili and Kikuyu.
- Security during the construction phase may be by means of armed guards from the police reinforced by unarmed civilian guards. Water proof jackets, warm clothing and boots should be provided to the personnel.
- During construction there is a potential for accidents which may cause damage to life and property. The potential also exists as long as there will be personnel manning the site when operational. Mitigation;
- The contractor is advised to obtain insurance cover for at least the third party and workmen's compensation.
- First aid facilities should be availed at the site office. These include a properly stocked first aid box. Community sensitization
- Water borne disease Avoid water taps/pipeline/storage tanks leakage;
- Awareness creation on prevention of malaria by use of mosquito nets;
- Loss of vegetation cover - Avoid big trees during pipeline survey;
- Community training on catchment protection/conservation;
- Vandalism of project Community sensitization on respect of public property; community policing
- The persons in charge of first aid box should be competent to handle first aid with a valid practicing certificate.
- Impact Mitigation Measure on property along the piping

- Diversion of surface flow
- The contractor to adhere to the designs; Certificate of completion of work issued at the completion of the project.

Summary of public participation

Public participation was mainly achieved through direct interviews, observations, questionnaire administration, holding a stakeholder workshop and a public meeting. The ESIA team began the public consultation process by holding preparatory meetings to strategize on how to engage the stakeholders in the ESIA process. This was done in consultation with the proponent and members of self-help group who helped in the process of identification of the significant actors/stakeholders who could provide data relevant to the proposed project

The questionnaires with names and contacts of the people consulted as well as their views and comments regarding the project are attached in appendixes. It is worth noting that, the majority of the people supported the project citing increment in water supply in the area as a major reason. Issues raised during the consultations with the public included the following:

- Positive benefits; creation of employment, provision of clean water, adequate supply of water etc.
- Negative benefit; social diseases increment, loss of land, change of the original nature of land/ beauty, pvc and paper wastes etc.
- Social economic impacts; improvement of the standards of living, reduction in tooth decay and water related diseases
- Great emphasis on willingness to support the project

Recommendations

It is therefore recommended that the proposed project be approved subject the following recommendations:-

- Contractor to use serviceable vehicles only during transportation of materials to the site.
- Contractor to use only serviceable heavy machinery cautiously during construction phase.
- The construction should take the minimum period possible.
- Farmers will embrace modern farming methods and diversify their activities to reduce over dependence on spring waters.

- Ensure implementation of the proposed mitigation measures and compliance with EMP even during the operation of the water supply project.

Project cost

Cost Estimates for Water Supply

The estimated construction cost of the proposed water supply project is based on the prevailing construction cost the materials unit cost in the country. The **Ksh 89,288,815.00** are only estimates as per the attached bills of quantities, the actual costs will be based on several factors such as variation in prices between the tender, qualification and the efficiency of the construction

Table 1.0: Summary of Investment Cost

BILL NO.	DESCRIPTION	BoQ Original
A	PRELIMINARIES & GENERAL	4,062,000.00
B	WATER SUPPLY - KARATE-WATERWORKS	20,594,100.00
C	WATER SUPPLY-WATERWORKS -MIRERA	15,578,540.00
D	WATER SUPPLY - KAYOLE DISTRIBUTION	24,310,398.00
E	WATER SUPPLY-WATERWORKS-KAYOLE	9,638,820.00
F	WATER SUPPLY - MIRERA DISTRIBUTION	6,987,792.00
	SUB TOTAL 1	81,171,650.00
	ADD 5% OF SUB TOTAL 1 FOR PHYSICAL CONTINGENCIES	4,058,582.50

SUB TOTAL 2	85,230,232.50
ADD 5% OF SUB TOTAL 1 FOR PRICE CONTINGENCIES	4,058,582.50 89,288,815.00
GRAND TOTAL CARRIED TO FORM OF TENDER	89,288,815.00

Conclusion

The result of the ESIA report has indicated that there are no significant negative impacts likely to be generated by the activities of the proposed project which have not been addressed.

Most of the potential negative impacts to be generated have been rated as low and these rated as high are of positive nature and beneficial to all the effected stakeholders.

It is therefore concluded that the proposed project will not compromise the well-being of the kayole-mirera residents, ecological and environmental conditions and will improve food security and economic well-being of its members.

Table of Contents

List of Tables

CHAPTER ONE: INTRODUCTION

1.1 Background

The proponent in this case, Naivasha water sewerage and Sanitation Company has proposed to supply water to Kayole-Mirera areas located in the Riftvalley, Nakuru county Nakuru district Naivasha town and Kongoni divisions. Kayole region, which is just next to Naivasha town, is currently not supplied with water. The area is approximately 7.5 km^2 and is experiencing high rate of expansion. Currently, there is one major industry located in the region, 12 institutions (including schools and a mission hospital), and a population of approximately 12,757 people. Currently water situation in Kayole is as follows:

Table 1.1: Boreholes Functional in Kayole

Name	Description	Status
Small Traders Water Project	The original system comprised a network of one boreholes connected to a distribution system comprising pipelines and private connections and community water points	Currently the system operates only one borehole the sells water at the sources
Vision Water Project	A recently drilled borehole by Vision Co-operative Society to provide water to upper Kayole	Currently the system operates only one borehole the sells water at the sources

Mirera, also, is a low income peri-urban settlement situated 6km, south of Naivasha Town. The more urbanized parts of Mirera are settled by low income communities largely consisting of labourers from the neighbouring commercial flower farm and Lake Naivasha fishermen. Many of the residents are immigrant workers from other parts of the country. The outer parts of Mirera are mainly rural in nature settled by small scale agricultural farmers and agricultural workers.

Water in the larger Mirera area is supplied from several private and community owned boreholes located in the area. Currently, there are approximately 5 commercially operated private borehole and one community boreholes that serve the area.

The project is being funded by the World Bank and through the GPOBA's whose mandate is to fund, design, demonstrate, and document OBA approaches to improve the delivery of basic services to the poor in developing countries. OBA approaches have been tested in every region and applied in six sectors, including energy, water and sanitation, health, solid waste management, education, and information and communication technology (ICT). OBA projects have taken a diversity of approaches, each one with a unique design and financial model, incorporating lessons learned from previous experiences. Pilots have been implemented in urban, peri-urban, and rural areas, employing public and private operators, public-private partnerships (PPPs), nongovernmental organizations (NGOs), and community organizations as implementing agencies and service providers. Through these programs NAIVAWASS is implementing the project. The GPOBA ensures that a project like this one being carried out by NAIVAWASS follows all the requirements set aside by World Bank through its various policies touching on different aspect of the environment and development of project affecting people and land.

The Government of Kenya (GoK) National Water Policy (1999) envisages 100% access to safe water for the country's population by 2010. The millennium development goals (MDGs) envisage access to safe water and improved sanitation of 70% and 93% respectively by 2015. Current coverage figures are 49% and 86% respectively. During the 1980's and 1990's Kenya made large investments in water supply and sewerage (WSS) production and treatment capacities, but these did not result in efficient and sustainable service distribution. WSS operations were not transparent, unsustainable and ill-suited to respond to consumer needs. There was widespread collapse of infrastructure due to under-investment in operations and maintenance. To address the deteriorated situation and the previously fragmented water supply and sanitation (WSS) delivery responsibilities, GoK commenced a comprehensive sector reform in early 2003.

Water Act 2002 was enacted with an aim of harmonizing the management of water resources and WSS. The Act necessitated for separation of functions between each aspect of service delivery - policy making, regulation, asset ownership / control and service delivery operations. The consequent formalization of relationships between these functions is expected to reduce conflicts of interest and increase transparency and accountability. Consistent with this tenet, the GOK (i) is reorganized the Ministry of Water, Environment and Natural Resources into a body focused on policy issues, (ii) established a Water

Services Regulatory Board (WASREB), and (iii) established seven Water Services Boards (WSBs). Each WSB is mandated to appoint Water Services Providers (WSPs), which are legal entities contracted by WSBs to be responsible for service.

Water situation in Kenya

Kenya is classified as a water scarce country with a limited natural endowment of water of only 647m^3 per capita and this is projected to fall down to 245m^3 per capita by the year 2025, well below the internationally recommended minimum of 1,000m^3/capita/year. Furthermore, Kenya's Water resources are highly vulnerable to climate variability often resulting into floods and drought with inadequate storage capacity which limits the ability to buffer against the water shortage shocks.

The development and management of water resources in Kenya is based on the view that water is a social good and is a catalyst for economic development. The current access to clean water in the country is estimated at about 90% in urban areas and approximately 44% in the rural areas while the national average stands at about 57%. At the same time, provision for safe sanitation stands at a national average of 80% (95% urban and 77% rural). To achieve the MDGs, that is to halve the population without access to water and sanitation by the year 2015, water supply (through increased household connections and developing other sources) and sanitation requires to be improved in addition to interventions in capacity building and institutional reforms.

The Government of Kenya (GoK) has recognized the need for comprehensive institutional reform and increased investment in the water and sanitation sector in order to remove bottlenecks in its programme to alleviate poverty, employment and wealth creation. Recent GOK efforts aimed at formulating a clear policy strategy has culminated in the enactment of a new legislation on water management. The Water Act 2002 is aimed at harmonizing and streamlining the management of water resources, water supply and sanitation services. In Kenya, the National Environmental Management Authority (NEMA) regulates environmental management. This is in accordance to the provisions of EMCA, 1999. Pursuant to the prevailing legal requirements as envisaged in the EMCA, 1999, and to ensure sustainable environmental management, the proponent undertook this EIA for the rehabilitation of the current Kayole mirera water supply and the laying of raw water supply project water abstraction pipeline; and incorporated substantial environmental aspects as advised by the NEMA registered lead expert. This EIA project report thus provides relevant

information and environmental considerations on the project proponent's intention to seek approval from NEMA for the development of the proposed project.

1.2 The objectives of Environmental and social Impact Assessment (ESIA)

The major objective of the ESIA study is to evaluate the impacts of the proposed development in relation to the environment i.e. physical, biological, and social-economic environments. It aims at enhancing the proposed development co-existence and compatibility with the surroundings environment by ensuring sustainable environmental management during the entire projects life cycle.

The scope of this environmental and social impact assessment covered the physical extent of the project, site location and its immediate environs, construction phase of the project, Operation phase and decommissioning phase. All these were done in light of relevant standards, legal and regulatory framework. The interaction of the water supply project and raw water abstraction pipeline with Flora and fauna; Land use; Socio-economic aspects; disease outbreak and response preparedness; mosquito breeding site and flooding were also assessed. Finally, a detailed evaluation of the project`s potential environmental and social impacts was done with mitigation measures being suggested accordingly.

The output of this study was this Environmental Impact Assessment study report, to be submitted to NEMA for the purposes of seeking an EIA license in accordance to EMCA, 1999.

1.3 Objectives of the assignment/project.

The proposed water supply project will increase access to water and sanitation services to improve the service levels.

Specific Objectives

- Feasibility study for water supply in Kayole and Mirera settlement
- Detailed design of the water supply project for the Kayole-Mirera project to meet the current and projected demand for both drinking and general use purposes;
- Design of water pumping, storage, and distribution systems
- To increase the water distribution network of the company and reach more people with drinking water

1.4 Scope of the ESIA

The study covered the following;

- Description of the project.
- Documentation of all baseline information including flora and fauna identification, soil and water analysis.
- Socio- economic study to get the views of different stakeholders using Questionnaires and Interviews
- Prediction of any sources of conflicts and making relevant recommendations
- Assessment of both the positive and negative impacts.
- Developing mitigation measures for negative impacts.
- Designing of an Environmental Management Plan for the project.
- Preparation of monitoring programs, parameters and procedures to be put in place for Control and corrective actions in case of emergencies.

The Scope of the ESIA includes the following;

- Impacts identification and evaluation

The study has been conducted to identify and evaluate the impacts of the proposed water supply project on the environment and the people of the affected areas. Proposal of mitigation measures to appropriately address the identified impacts have been made. A comprehensive Environment Management plan has also been given, as a guide to the proponent during the implementation of the project.

- Study period

During this study, impacts assessed covered the entire life cycle of the project, namely decommissioning and demolition of the existing facility, construction, operation and decommissioning phases. The areas of interest included:

1. Physical environment;
2. Flora and fauna;
3. Land use;
4. Socio-economic aspects;
5. Health issues;
6. Risks response preparedness;

1.5 Terms of Reference (ToR) for the ESIA

The Terms of Reference of the Environmental and social Impact Assessment Project included the following:

i. Importance of water supply project
ii. Standards, legal and regulatory framework governing water sector and water abstraction.
iii. Proposed Site for the project
iv. Neighboring facilities
v. Environmental degradation likely to arise from the construction activities mainly on soil, flora and fauna
vi. Inherent risks associated with the operations including injuries from falling and diseases.
vii. Environment mitigation and management measures to address the above potential risks,
viii. Environmental Monitoring Plan
ix. Conclusions and recommendations

1.6 Collection of Baseline Information

The baseline data reflected the objectives and indicators identified in the study include;

1. Physical environment - including climate, air quality, water resources and water quality, noise, topography, soils, geology, hydrology including risks of natural disasters.
2. Biological conditions - biodiversity, ecology and nature conservation in which issues of endangered species, protected ecosystems, habitat, species of commercial importance, invasive species and their impacts were assessed.
3. Social-economic conditions and human health – including but not limited to issues such as archeology and cultural heritage landscape and facial aspects, recreational, social economic aspects, land use, transportation, infrastructure, agricultural development, tourism, and human health.
4. Assessed the compliance of the programme to relevant national legislation and guidelines set under International Agreements, Treaties and other global conventions set for various objectives.
5. Specified the counterfactual (or no-change scenario) in terms of the chosen indicators. From these the Consultant carried out a situation analysis involving the interpretation of environmental baseline information, to enable an understanding of the existing environment or status quo.

1.7 ESIA approach and methodology i.e screening and scooping

Overview

This study process adopted an integrated approach where data and information evaluation, field investigations, consultations among the team of experts, interviews and discussions with stakeholders and affected parties were undertaken at the same time.

Physical evaluation of the area was also carried out with specific focus on the biophysical and socio-economic environments. The sensitive environmental receptors, biodiversity, land use and development trends, hydrology, physiographical features and climatic conditions along the project route were evaluated and analyzed. The social and economic status was also evaluated through organized consultative meetings at the administrative and communal levels in order to collect perceived information on the impacts associated with biophysical and socio-economic dimensions of project implementation.

The EIA study team made field visits to the proposed site and conducted desktop study to establish the following: Baseline data which included; biodiversity, socio-economic and environmental assessment legal Policies, Legislative and Institutional Framework governing the proposed project Perception of the proposed project from the local communities

Compatibility of the proposed project with the environment Types of waste to be generated, proposed management and disposal methods Potential positive and negative impacts of the project.

The study assessed and quantified the possible impacts of the proposed project to the residents in general and other administrative areas that share resources with the project beneficiaries.

Site Visits

Information gathering was conducted through site visits at the project and its surrounding areas including households. This involved a systematic field traversing to quantify perceived impacts of project on:-

- Existing land uses
- Land conflicts and ownership
- Areas of insecurity
- Institutions and organizations in the area
- Vegetation cover of the area

Existing sensitive environmental receptors including underground and surface waters; animal feeding grounds and routes, and methods of protection from destruction, interference,

contamination and extinction

Waste management and disposal methods


Photo 1: Site visit by esia team. Photo 2: Discussion with affected people

Consultative Forums

Socio-economic impact assessment forums were held at the county and institution levels with KWSTI principal, Panda flowers company, county government representatives, and other stakeholders. At the communal level talks were held with the chiefs, community elder's, religious leaders and the public at large. The community members were receptive with regard to the project implementation and also emphasized on the need to implement the mitigation measures for the negative impacts.


Photos 3&4**: Consultation meeting with public at Kayole and Mirera respectively**

The aim was to identify possible environmental and social Impacts that might arise from the proposed project activities. The Consultant collected and assembled several relevant documents for review including maps, satellite images and other relevant documents.

1.8 Desk Study and Reconnaissance visit

The team assembled maps, satellite images and other relevant documents and conducted a rapid desk study to bring into focus the basics of the assignment. The principal National legislation governing issues of environmental concern in Kenya is the Environmental Management & Coordination Act of 1999 typically referred to as EMCA. EMCA calls for Environmental Impact assessment (EIA) (under Section 58) to guide the implementation of environmentally sound decisions and empowers stakeholders to participate in sustainable management of the natural resources. Projects likely to cause environmental impacts require that an environmental impact assessment report to be carried out. It is under this provision that the ESIA project report was undertaken.

Other legislation adhered to during this ESIA Study are the regulations borne of EMCA 1999 namely the Environmental (Environmental Impact Assessment, and Audit) regulations, 2003, the Waste Management Standards (Legal Notice 121: The Environmental Management Coordination (Waste Management) Regulations), the Water Management Standards (Legal Notice 120: The Environmental Management Coordination (Water Quality) Regulations) and the Environmental Management and Coordination (Noise and Excessive vibration pollution) (Control) Regulations, 2009 (Legal Notice 61) among others

CHAPTER TWO: POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

2.1 Overview of the Policy Framework

2.1.1 National Water Policy

The National Policy of Water which was promulgated in April 1999 as Sessional Paper No. 1 of 1999 calls for decentralization of operational activities from the central government to other sectors, including local authorities, the private sector and increased involvement of communities in order to improve efficiency in service delivery. It also tackles issues pertaining to water supply and sanitation facilities development, institutional framework and financing of the sector.

According to the policy, in order to enable sustainable water supply and sanitation services, there is need to apply alternative management options that are participatory through enhanced involvement of others in the provision of these services but particularly the private sector. The overall objective of the National Water Policy is to lay the foundation for the rational and efficient framework for meeting the water needs for national economic development, poverty alleviation, environmental protection and social wellbeing of the people through sustainable water resource management.

2.1.2 Water catchments management policies

The policy on water catchments management has been shaped over time by two Sessional Papers as listed below;

Sessional paper No. 1 of 1968; and Kenya Forest Development Policy Sessional paper No. 9 of May 2005

Sessional Paper No. 9 encourages the involvement of the private sector, communities and other stakeholders' participation in forest management in order to conserve water catchments areas and reduce poverty.

2.1.3 Kenya Vision 2030

The Kenya Vision 2030 aspires for the country firmly interconnected through a network of roads, railways, ports, airports, water and sanitation facilities and telecommunications. According to Vision 2030, Kenya is a water scarce country. The economic and social developments anticipated by Vision 2030 will require more high quality water supplies than at present.

The country, therefore, aims to conserve water sources and start new ways of harvesting and using rain and underground water. The Vision 2030 goals for water and sanitation are to ensure that improved water and sanitation are available and accessible to all.

2.1.4 National Environment Action Plan Framework, 2009 - 2013

The National Environmental Action Plan Framework is the second national environmental policy after the 1994 National Environmental Action Plan (NEAP).The development of NEAP is provided for by EMCA, 1999 which requires preparation of Environmental Action Plan at different levels; district, provincial, and national levels. The framework recognizes the intertwined linkages between economic growth and environment in Kenya. It highlights priority themes and activities for the country towards achieving sustainable environment.

The policy framework among others, proposes integration of environmental concerns into regional and local development plans, promotion of appropriate land uses and enforcement of EMCA, 1999 and its subsidiary and other relevant legislations. The policy framework also advocates for efficient water harvesting, storage and usage. On human settlements and infrastructure, this policy framework recognizes the associated environmental issues. These include waste management, sanitation, diseases, land use changes in conservation areas, demand for water, energy, construction materials, pollution, land degradation, biodiversity loss etc. In managing operations of the proposed borehole, consideration of the highlighted issues is vital towards contribution to the national sustainable development goals.

Multiple stakeholders' involvement inclusive of the private sector is advocated for within the implementation of this framework towards achievement of sustainable development goals. Finally, the framework also advocates for monitoring and evaluation to ensure effective and efficient environmental policy implementation.

2.1.5 Policy on Environment and Development

This is presented as the Sessional paper No. 6 of 1999 on Environment and Development. The overall goal is to integrate environmental concerns into the national planning and management process and provide guidelines for environmentally sustainable development. Under section 4.3 of the document, Provision of potable water and water for sanitation is viewed as being central to satisfying basic human needs. It is indicated that the current water development programmes focus almost entirely on water delivery with little concern for demand management and conservation. Water resources have an extremely high value and effective mechanisms for

managing and conserving water could result unto economic benefits as well as sustainable use of this vital resource.

Some of the key objectives of the policy are:

- To protect water catchments;
- To ensure all development policies, programmes and projects take environmental
- considerations into accounts, and
- To enhance, review regularly, harmonise, implement and enforce laws for the management,
- Sustainable utilization and conservation of natural resources.
- Under this policy, broad categories of development issues have been covered that require sustainable approach. The policy recommends the need for enhanced re-use/recycling of residues including water and wastewater as well as increased public awareness raising and appreciation of clean environment. It also enhances participation of stakeholders in the management of natural resources within their respective localities.

2.1.6 The National Poverty Eradication Plan (NPEP), 1999

The NPEP has the objective of reducing the incidence of poverty in both rural and urban areas by 50 percent by the year 2015; as well as strengthening the capabilities of the poor and vulnerable groups to earn income.

2.1.7 Naivawass strategic plan (2015-2019)

NAIVAWASS is a registered private limited liability company owned by the County Government of Nakuru as a majority shareholder, the RVWSB and other minority shareholders. It was registered in 2005, then under the Municipal Council of Naivasha. The company's primary mandate is provision of clean water to the residents of Naivasha Sub County and its environs. The strategic plan has a mission and a vision which upholds core values, some of those relevant to the project is;

Community Participation

NAIVAWASS undertakes its business to produce an overall positive impact on society through economic, environmental and social actions. The company endeavours to undertake its activities in an environmentally conscious manner. Further, NAIVAWASS participates in social responsibility activities as a responsible corporate member of the society. The company will seek

to engage the community in strategic decision making and other activities as well as participate in activities that touch on the community's well-being.

2.2 Overview of the Legislative Framework

2.2.1 The Constitution of Kenya

The Constitution is the supreme law of the Republic and binds all persons and all State organs at all levels of government. The Constitution of Kenya, 2010 provides the broad framework regulating all existence and development aspects of interest to the people of Kenya, and along which all national and sectoral legislative documents are drawn. In relation to the environment, article 42 of chapter four, The Bill Of Rights, confers to every person 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 measures, particularly those contemplated in Article 69, and to have obligations relating to the environment fulfilled under Article 70.

Chapter 5 of the document provides the main pillars on which the 77 environmental statutes are hinged. Part 1 of the chapter dwells on land, outlining the principles informing land policy, land classification as well as land use and property. The second part of this chapter directs focus on the environment and natural resources. It provides a clear outline of the state's obligation with respect to the environment, thus; "The state shall-

- Ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits;
- Work to achieve and maintain a tree cover of at least ten per cent of the land area of Kenya;
- Protect and enhance intellectual property in, and indigenous knowledge of, biodiversity and the genetic resources of the communities;
- Encourage public participation in the management, protection and conservation of the environment;
- Protect genetic resources and biological diversity;
- Establish systems of environmental impact assessment, environmental audit and monitoring of the environment;
- Eliminate processes and activities that are likely to endanger the environment; and
- Utilize the environment and natural resources for the benefit of the people of Kenya."

There are further provisions on enforcement of environmental rights as well as establishment of legislation relating to the environment in accordance to the guidelines provided in this chapter.

In conformity with the Constitution of Kenya, every activity or project undertaken within the republic must be in tandem with the state's vision for the national environment as well as adherence to the right of every individual to a clean and healthy environment. The proposed project is a central development activity that utilizes sensitive components of the physical and natural environment hence, need for a clearly spelt out environmental management plan to curb probable adverse effects to the environment.

2.2.2 The Environmental Management and Co-ordination Act (EMCA), 1999

This Act of Parliament, also known as EMCA, is the parent Act of Parliament that provides for the establishment of appropriate legal and institutional framework for the management of the environment and for matters connected therewith and incidental thereto. EMCA, in its 13 interrelated parts, provides regulatory provisions for all levels of environmental conservation and management. The first four parts provide legislative guidelines on administrative and planning components of environmental management. They include;

- General principles
- Administration
- Environmental planning
- Protection and Conservation of the Environment. Parts five to seven focus on on-fieldmanagement of the environment as an integral component of actual or proposed projects.
- Environmental impact assessments (EIA), audits and monitoring
- Environmental audit and monitoring
- Environmental quality standards.

The last five parts of the Act regulate on enforcement of provisions outlined in the Act and recognition of international agreements along which the EMCA has been established. They are; Environmental Restoration orders, Environmental Easements, Inspection, analysis and records, Inspection Analysis and Records, International Treaties, Conventions and Agreements, National **Environment Tribunal, Environmental Offences**

All the chapters 1 to 13 apply to the proposed project at one stage or the other and therefore the project proponent is required to understand and conform with the Act accordingly. One such area

is Environmental Impact Assessment. This is expressly stated in section 58(2) of the Act."The proponent of a project shall undertake or cause to be undertaken at his own expense an Environmental Impact Assessment study and prepare a report thereof where the authority, being satisfied, after studying the report under sub-section (1), that the intended project may or is likely to have or will have a significant impact on the environment, so directs."

EMCA has set out several regulations for managing the environment which include the following:

(a) The Environmental (Impact Assessment and Audit) Regulations, 2003.

This is a supplementary legislation to the EMCA. It gives additional "punch" by providing guidelines for conducting Environmental Impact Assessments and Audits. It offers guidance on water supply project environmental aspects on which emphasis must be laid during field study and outlines the nature and structure of Environmental Impact Assessments and Audit reports. The legislation further explains the legal consequences of partial or non-compliance to the provisions of the Act.

Relevance

The kayole-mirera water supply as an activity is listed in the second schedule of EMCA as among projects that require an Environmental Impact Assessments before commencement. The project implementation cannot commence before the license is granted, upon conducting the ESIA. For this reason, this report provides the legal requirements for the project approval.

Impacts of the water supply project, involves major elements of the environment, including land, water and human health and safety. Therefore there is need to evaluate these impacts and establish the most sustainable approach to benefit both the current and the future generations, and mitigate projected negative impacts to people and the environment through conducting Environmental and Social Impact Assessment and subsequent audits.

(b) The Environmental Management and Coordination (Water Quality) Regulations, 2006

Described in Legal Notice No. 120 of the Kenya Gazette Supplement No. 68 of September 2006, these regulations apply to drinking water, water used for industrial purposes, agricultural purposes, recreational purposes fisheries and wildlife and any other purposes. It stipulates quality standards for sources and discharge of water to any environmental receptors within an activity area.

The Regulations outline various water quality standards in relation to use and discharge. Such aspects provided for are:

- Quality standards for sources of domestic water;
- Quality monitoring for sources of domestic water;
- Standards for effluent discharge into the environment;
- Monitoring guide for discharge into the environment;
- Standards for effluent discharge into public sewers;
- Monitoring for discharge of treated effluent into the environment.

Relevance

The proposed project will obtain water from karate boreholes. It is thus important for this water supply project to regularly analyze water qualities at the intake points and check for conformity to stipulated legal standards in this supplementary legislation.

Moreover, the quality of water discharged into any environmental receptor must be ascertained for safety and if not, treated.

(c) Environmental Management and Co-ordination (Waste Management) Regulations, 2006

Regulations guiding waste management are described in Legal Notice No. 121 of the Kenya Gazette Supplement No. 69 of September 2006. They offer legal provisions on handling of a variety of wastes emanating from various projects and activities. The waste categories covered by the regulations include;

- Industrial wastes;
- Hazardous and toxic wastes;
- Pesticides and toxic substances;
- Biomedical wastes;
- Radio-active substances

These Regulations outline requirements for handling, storing, transporting, and treatment / disposal of all waste categories as provided therein.

Relevance

The proposed project, during construction phase may involve the use of materials that release hazardous waste i.e. cement, oil spillage from vehicles, hence the need for all project actors to

abide by these regulations in dealing with such wastes, especially the provisions of industrial, hazardous and toxic wastes which may be handled in the course of the project life.

(d) Environmental Management and Coordination (Fossil Fuel Emission Control) Regulations 2006

These regulations are described in Legal Notice No. 131 of the Kenya Gazette Supplement No. 74 of October 2006 and will apply to all internal combustion engine emission standards, emission inspections, the power of emission inspectors, fuel catalysts, licensing to treat fuel, cost of clearing pollution and partnerships to control fossil fuel emissions.

Relevance

The fossil fuels considered are petrol, diesel, fuel oils and kerosene. This will be applicable to equipment and machinery used in the project during construction phase of the project.

(e) Environmental Management and Coordination (Noise and Excessive Vibration Pollution) Control Regulations, 2009

These Regulations prohibit making or causing any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment.

Relevance

Under the regulation the Contractor is prohibited from producing excessive noise and vibrations which annoy, disturb, injure or endanger the comfort, repose, health or safety of others and the environment or excessive vibrations which exceed 0.5 centimetres per second beyond any source property boundary or 30 metres from any moving source. Under the regulation the Contractor will be required to undertake daily monitoring of the noise levels within the project area during construction period to maintain compliance.

2.2.3 Water Act, 2002

Water in Kenya is owned by the Government, subject to any right of the user, legally acquired. However; this Act regulates conservation and management of all water resources within the republic, and related purposes. In section 3 of part II, it states that every water resource is vested in the State, subject to any rights of user granted by or under this Act or any other written law. The Act also provides for establishment of a Water Resource Management Authority, whose aim is to manage and coordinate conservation and utilization of water resources at national scale.

(a) The Water Resources Management Rules, 2007

As a subsidiary to the Act, a legislative supplement, The Water Resources Management Rules, 2007 was gazetted to guide all policies, plans, programmes and activities that are subject to the Water Act, 2002. The Water Resources Management Rules empower Water Resources Management Authority (WRMA) to impose management controls on land use falling under riparian land.

Relevance

Safe and clean water is the driving force behind the kayole-mirera project. In the proposed project, karate boreholes will be the main source of water whose drilling and water abstraction must comply with the provisions and legal procedures in this Act. The Act will thus play a central role in guiding the exploitation of the resource throughout the project life.

2.2.4 Occupational Health and Safety Act, 2007

The Act provides for the safety, health and welfare of workers and all persons lawfully present at work place, as well as the establishment of the National Council for Occupational Safety and Health and for connected purposes.

Section 3(1) and (2) of the Act explains that it applies in all workplaces where any person is at work, either temporarily or permanently. It expounds on the purpose, which is to secure the safety, health and welfare of persons at work as well as protecting persons other than persons at work against risks resulting from, or connected to, activities at workplace. Further, sections 43 and 44 of part V give regulations on registration of work places.

Relevance

The project will require significant manpower to drive and will thus result in employment of quite a number of people. There will also be need for designated workplaces for operation. Thus, compliance with the relevant provisions in this Act will be vital in ensuring that workers operate in safe and healthy environment, and that their welfare shall be catered for. There will also be need for establishment of contractor's health and safety plan in line with this Act. There are a number of supplementary legislative rules to the OSHA. The most relevant are;

(a) The Factory and Other Places of Work (Medical Examination) Rules, 2005

This supplementary legislation covers workers who are exposed to specific occupational hazards for the purpose of preventing or controlling occurrence of occupational diseases. In the first schedule of the legislation, works involving risks to healthcare are listed and recommended

examinations and their respective intervals are indicated for adherence by employers or company directors. Sample requisite certifications are also provided for employers.

Relevance

All persons employed will be required to undergo pre-employment and periodic medical examinations to ascertain their fitness and also to maintain their health and safety at the workplace. Examinations certificates will be required on regular basis, hence the need for adherence.

(b) The Factory and Other Places of Work (Noise Prevention and Control) Rules, 2005

Sections 1-4 of the legislation detail the permissible levels of noise in a workplace. Sections 5 and 6 elaborate on the recommended noise prevention programme as well as measurement and records to be undertaken by the contracted company during construction and even operational phases of the project.

Relevance

The construction phase of this project will involve use of heavy and noisy machines and equipment. This legislation will thus guide against health risks of excessive noise to workers at the work places, hence the relevance.

(c) The Factory and Other Places of Work (Fire Risk Reduction) Rules, 2007

The legislation requires establishment of elaborate fire safety policy and associated fire safety mechanism at every active workplace. It stresses the need for precautionary and strategic location of installations and machines with high fire risks.

Relevance

The construction and even operation phases of the project will involve use of equipment of such ilk. There is thus need for the contractor and the proponent to adhere to the laid down fire safety regulations to avoid safety risks to workers and other equipment resulting from fires.

2.2.5 The Work Injury Benefits Act (WIBA), 2007

The WIBA Act provides for compensation to employees for work related injuries and diseases contracted in the course of their employment and for connected purposes. Section 7(a) of the Act, on the obligations of the employer, requires an employer to obtain and maintain an insurance policy with an insurer approved by the State in respect of any liability that the employer may incur under this Act to any of his employees.

Section 10(1) States that an employee who is involved in an accident resulting in theemployee's disablement or death is subject to the provisions of this Act, and entitled to the benefits provided for under this Act. It also states expressly that an employer is liable to pay compensation in accordance with the provisions of this Act to an employee injured while at work.

On First Aid covered in section 45(1), an employer is supposed to provide and maintain such appliances and services for the rendering of first aid to his employees in case of any accident as may be prescribed in any other written law in respect of the trade or business in which the employer is engaged.

Relevance

As workers are employed by project contractors, they face myriad challenges to their health, safety and security, either from the equipment of use or work processes. WIBA offers legal backing on the incidents or accidents at the workplace or while on duty, including First Aid and compensation aspects. It is thus important to integrate the relevant provisions of this Act in the proposed project Activities.

2.2.6 The Physical Planning Act, 1996

The Act provides for the preparation and implementation of physical development plans and for connected purposes. It defines development, in section 3(a), as the making of any material change in the use or density of any buildings or land or the subdivision of any land which for the purposes of this Act classified as Class A development. Class A development constitutes deposition of refuse, scrap or waste materials on land, erection of dwellings and display of advertisements. In order to promote health, safety, order, amenity, convenience and general welfare of all its inhabitants as well as efficiency and economy in the process of development and improvement of communications, the Act provides that every local authority must have a physical development plan as. "...The basis for disposing of land acquired, or to be acquired under the plan by a local authority or relevant authority;

Section 4: The re-planning and reconstruction of the plan area, or any part thereof, including any provisions necessary for……..

Section 4 (e): Effecting such exchanges of land or cancellation of existing sub-divisions as may be necessary or convenient for purposes mentioned above in this paragraph

Section 4 (f): Adjustment of rights between owners or other persons interested in such lands, roads, streets or right of way……."

Section 29 of the Act vests powers in the local authorities to control development in their respective areas of jurisdiction, with legal mandate to vet development applications and approval or disapproval thereof.

In section 30, the legislation declares that any person intending to carry out development within a local authority is required to apply for development permission, forwarded to the clerk of the local authority. Until such permission is granted, no development activity shall be carried out by the proponent.

Relevance

The proposed project is likely to have a variety of additives, construction of pipelines and water storage tanks just but a few. For each development case, the stipulated procedure laid down by this Act shall be complied with before the activities begin.

2.2.7 The Public Health Act (Cap 242)

This Act makes provision for securing and maintaining health. Part III and IV of the Act focuses on notification, prevention and suppression of infectious diseases, including inspection, disinfection and provision of medical aid to affected parties in case of outbreaks of infectious diseases. Part IX regulates on sanitation and housing, granting health authorities powers to prevent or remedy any dangers to health arising from poor handling of sanitation issues as well as improper housing and nuisances arising there from. Besides, regulations governing prevention and destruction of mosquitoes, encompassing due maintenance of yards, premises, wells, cesspits and identification and destruction of breeding places are entailed in part XII.

Relevance

Sanitation, housing, disease outbreaks and communal resource sharing are obvious issues in construction projects. The Public Health Act provides the necessary legal guidelines regulating measures aimed at effective control and management of the said issues.

2.2.8 Wildlife act 2013

This Act provides for protection, conservation and management of wildlife in Kenya and related matters. The Act shall apply to all wildlife resources on public, community and private land, and Kenya territorial waters. The 119 sections of this Act are divided into 15 Parts: Preliminary (I); Establishment of the Service (II); Financial provisions (III); The wildlife regulation mechanisms (IV); Establishment of Wildlife Endowment Fund (V); Conservation, protection and management (VI); Establishment of the Wildlife Research And Training Institute (VII);

Conservation Orders, easements and incentives (VIII); Human wildlife conflict (IX); Licensing and regulation (XI); Offences and penalties (XI); International treaties, conventions and agreements (XII); Enforcement and compliance (XIII); Miscellaneous (XIV). (Completed by 11 Schedules)Wildlife resources shall be protected, conserved, managed and regulated in accordance with a national wildlife conservation and management strategy to be drafted every five years by the Cabinet Secretary. The Act establishes the Kenya Wildlife Service as a body corporate for management of wildlife resources and protected areas and a Wildlife Research and Training Institute.

Relevance

The project will go through the KWS training school and sanctuary which houses wildlife and makes it critical to follow the act on matters concerning compensation and procedures to follow to minimize water supply project negative impacts to resources and ways to mitigate those that are unavoidable.

2.2.9 Way Leaves Act (Cap. 292)

Way Leaves Act (Cap. 292) Section 3 of the Act states that the Government may carry any works through, over or under any land whatsoever provided it shall not interfere with any existing building or structures of an ongoing activity. Notice, however, will be given one month before carrying out any such works (section 4) with full description of the intended works and targeted place for inspection. Any damages caused by the works would then be compensated to the owner as per the section.

Finally section 8 states that any person without consent causes any building to be newly erected on a way leave, or cause hindrance along the way leave shall be guilty of an offence and any alterations will be done at his/her costs.

In accordance with the Act (section 4), notice will be given before carrying out works with full description of the intended works and targeted place for inspection. Any damages caused by the works would then be compensated to the owner as per this section.

2.2.10 HIV/AIDS Prevention and Control Act No. 14 Of 2006

The law prohibits various forms of sexual violence offences committed against men and women. These include rape, attempted rape, sexual assault, indecent acts, defilement, gang rapes, sexual

harassment, child pornography, child prostitution, child sex tourism, exploitation of prostitution, incest, deliberate transmission of HIV and AIDS including other life threatening sexually transmitted diseases, and cultural and religious offences. According to section 4 (1) the Government shall promote public awareness about the causes, modes of transmission, consequences, means of prevention and control of HIV and AIDS through a comprehensive nationwide educational and information campaign conducted by the Government through its various Ministries, Departments, authorities and other agencies. Pursuant to subsection (2), the educational and information campaign referred to in subsection (1) shall- (a) Employ scientifically proven approaches; (b) Focus on the family as the basic social unit; (c) Encourage testing of individuals; and (d) be carried out in schools and other institutions of learning, all prisons, remand homes and other places of confinement, amongst the disciplined forces, at all places of work and in all communities throughout Kenya. Subsection (3) provides that in conducting the educational and information campaign referred to in this section, the Government shall collaborate with relevant stakeholders to ensure the involvement and participation of individuals and groups infected and affected by HIV and AIDS, including persons with disabilities. Section 31 (1) provides that, no person shall be- (a) Denied access to any employment for which he is qualified; or (b) Transferred, denied promotion or have his employment terminated, on the ground only of his actual or suspected HIV status. RVWSB will endeavor to promote educational and informational campaigns and organize for Voluntary Counseling and Testing throughout the project cycle. In addition, the proponent shall ensure that the contractors do not discriminate workers on the basis of their HIV status.

2.3 Institutional Framework

New project developments can have major impacts on the environment including soil degradation, altering landscapes and destroying natural habitats. Other problems associated with development and human activity include land use conflicts, human and animal conflicts, water management and environmental pollution. In addition to harming the environment, these impacts can and do have significant economic costs and negatively affect human health.

In cognizance of this, the Government of Kenya has established a number of institutional and administrative entities to ensure adequate management of associated concerns and eventualities.

Inter-phase of national government and county government in relation to the project

The Kenyan water sector underwent far reaching reforms through the Water Act No 8 of 2002. Previously, water services provision had been the responsibility of a single National Water Conservation and Pipeline Corporation as well as a few local utilities established since 1996. After passage of the Act, service provision was gradually decentralized to 117 Water Services Providers (WSPs) who were linked to 8 regional Water Services Boards (WSBs) in charge of asset management through Service Provision Agreements (SPAs). The Act also created the Water Services Regulatory Board (WASREB) that carries out performance benchmarking and is in charge of approving SPAs and tariff adjustments. NAIVAWASS is under the Rift Valley Water Services Board (RVWSB).

The following are the main institutions that perform the regulatory role and are relevant to the project.

2.3.1 Ministry of Water and Irrigation

The mandate is formulation, review and implementation of policy on the water sector. The functions include:

Water harvesting and storage infrastructure for water conservation, which will help in

- Mitigating droughts and famine;
- Catchments area conservation;
- Water resources management policy;
- Urban and rural water development and supply;
- Waste water treatment and control;
- National water conservation and Pipeline Corporation;
- Flood preparedness and management to cope with and mitigate the impacts;
- Water quality and pollution control by adopting the 'Polluter Pays' principles in order to ensure water user responsibility.

Relevance

Supply of clean and safe water is the main driving factor in the project. Drilling and obtaining water as well as discharge of water from karate boreholes will be guided by the ministry through Rift valley Water services Board. It is thus paramount that the ministry is centrally involved in the planning and operational phases of the proposed project. The following are the key institutions of relevance to this project:

(a) The Water Resource Management Authority (WRMA)

The Authority shall have the following powers and functions:

- To develop principles, guidelines and procedures for the allocation of water resources;
- To monitor, and from time to time reassess, the national water resources management strategy;
- To receive and determine applications for permits for water use;
- To monitor and enforce conditions attached to permits for water use;
- To regulate and protect water resources quality from adverse impacts;
- To manage and protect water catchments; in accordance with guidelines in the national water resources management strategy, to determine charges to be imposed for the use of water from any water resource;
- To gather and maintain information on water resources and from time to time publish forecasts, projections and information on water resources;
- To liaise with other bodies for the better regulation and management of water resources;
- To advise the Minister concerning any matter in connection with water resources.

(b) Rift valley Water Services Board

The Board has the following mandate;

- strengthen the institution and build its capacity;
- provide water and sanitation services in an efficient, effective, affordable and sustainable
- manner;
- increase access and availability of water and sanitation services;
- strengthen communication with stakeholders;

Mainstream good corporate governance, gender, and HIV/AIDS awareness campaign in all core activities.

2.3.2 Ministry of Environment and Natural Resources

This is the state office in charge of all issues affecting, and affected by, the environment and all its components.

The Ministry's core mandate includes the following;

- Environment and Natural Resources Policy formulation, analysis and review;
- Sustainable management of Mineral resources and conservation of environment;
- Continuous development of geo-database for integrated natural resources and

- environmental management systems;
- Conduct applied research and dissemination of research findings in land resources and
- geology;
- Carry out geological surveys, mineral exploration and regulation of mining and use of
- commercial explosives;
- Promote, monitor and coordinate environmental activities and enforce compliance of
- environmental regulations and guidelines;
- Meteorological services.

Relevance

Water resources, land, flora and fauna and the air are core components of the natural environment. The proposed development project will utilize all these resources at one stage or another. Any extractive or depository uses of the resources are guided by the various programmes and regulations under the ministry and consistent consultative partnerships, including adherence to relevant legal provisions will be required in the entire course of the project.

(a) The National Environment Management Authority

The authority is mandated to carry out, among others, the following activities in the sector;

- Promote the integration of environmental considerations into development policies, plans, programmes and projects, with a view to ensuring the proper management and rational utilization of environmental resources, on sustainable yield basis, for the improvement of the quality of human life in Kenya;
- Undertake and coordinate research, investigation and surveys, collect, collate and disseminate information on the findings of such research, investigations or surveys;
- Identify projects and programmes for which environmental audit or environmental monitoring must be conducted under this Act;
- Initiate and evolve procedures and safeguards for the prevention of accidents, which may cause environmental degradation and evolve remedial measures where accidents occur e.g. floods, landslides and oil spills;
- Undertake, in cooperation with relevant lead agencies, programmes intended to enhance environmental education and public awareness, about the need for sound environmental

management, as well as for enlisting public support and encouraging the effort made by other entities in that regard;

- Render advice and technical support, where possible, to entities engaged in natural resources management and environmental protection, so as to enable them to carry out their responsibilities satisfactorily.

2.4 INTERNATIONAL POLICY FRAMEWORK

Kenya is a signatory as well as a party to various international conventions, treaties and protocols relating to the environment and aimed at achieving sustainable development. According to the Registrar of International Treaties and other Agreements in Environment (UNEP 1999), there are 216 treaties, 29 of which are of interest to Kenya. The country is a signatory to 16 such agreements, which range from use of oil, protection of natural resources and protection of the atmosphere. The agreements are both regional and international and became legally binding on Kenya upon ratification thereof by the rightfully designated Kenyan Authority. The agreements of interest to Kenya can be categorized as those for protecting natural resources, atmosphere and social well being of man.

2.4.1 Protection of Natural Resources

There are 12 agreements of significance to Kenya under this category which the country has signed and ratified. This section reviews a number of policies that are triggered or met by the proposed project:

2.4.2 United Nations Framework Convention on Climate change (UNFCCC)

The convention requires parties to take climate change considerations into account in their relevant social, economic and environmental policies and actions. The proponent has undertaken this ESIA with the aim of minimizing adverse effects of the project on the economy, on public health and on the quality of the environment. The requirements of this convention can be mitigated against to reduce impacts of climate change by growing trees suitable for the area. The proponent is advised to enhance the positive impacts of the project through engaging in activities that control climate change for example planting of trees and conserving the catchment through water conservation.

2.4.3 The World Commission on Environmental and Development

The commission focuses on the environmental aspects related to development and requires all development projects to be sustainable economically, socially and environmentally. The principle of the organization emphasis that development project should have no permanent negative impact on the biosphere and in particular the ecosystems.

It is recommended that the project proponent incorporate mitigation measures to ensure that the project impacts on the ecosystem are reduced. The consultants used participatory methods to involve the target group and concerned stakeholders in order to inform and enlighten them on the likely negative environmental and social impacts for them to prepare mitigation measures so as to ensure the proposed project is sustainable throughout its life span.

2.4.4 The Convention of Control of Desertification –UCCD (1992)

This convention requires parties to promote cooperation among affected parties in the fields of environmental protection and the conservation of land and water resources, as they relate to desertification and drought. The proponent is advised to engage in activities geared towards eradicating drought through engaging in tree planting activities, encouraging clean energy use and water conservation.

2.5 WORLD BANK OPERATIONAL POLICY

2.5.1 Environmental Assessment Operational Policy OP 4.01

Environmental Assessment is used in the World Bank to identify, avoid, and mitigate the potential negative environmental impacts associated with Bank lending operations, Kayole-mirera water supply project will result to numerous mild negative impacts to the environment which will be mitigated as the proposed project is categorized under category B under World Bank Categorizations criteria

Category A: A proposed project is classified as Category A if it is likely to have significant adverse impact on the environment. A project with complicated impact or unprecedented impact which are difficult to assess is also classified as Category A The impact of Category A projects may affect an area broader than the sites or facilities subject to physical construction.

Category B: A proposed project is classified as Category B if its potential adverse environmental impact is less adverse than that of Category A projects. Typically, this is site-specific, few if any are irreversible, and in most cases normal mitigation measures can be designed more readily.

Category C: A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impact. Projects that correspond to one of the following are, in principle, classified as Category C,

Kayole - Mirera water Supply project is a project whose impacts to the environment are less adverse to the environment and can be mitigated as they are site specific. The project does not traverse in any protected habitat but runs along the Kenya wildlife services training institute sanctuary with minimal vegetation clearance and minimal animal disturbances, international water way, indigenous persons regions.

2.5.2 Natural Habitats OP 4.04

This policy seeks to ensure that World Bank-supported infrastructure and other development projects take into account the conservation of biodiversity, as well as the numerous environmental services and products which natural habitats provide to human society. The policy strictly limits the circumstances under which any Bank-supported project can damage natural habitats (land and water areas where most of the native plant and animal species are still present).

Specifically, the policy prohibits Bank support for projects which would lead to the significant loss or degradation of any Critical Natural Habitats, whose definition includes those natural habitats which are either:

- legally protected,
- officially proposed for protection, or
- Unprotected but of known high conservation value.

In other (non-critical) natural habitats, Bank supported projects can cause significant loss or degradation only when there are no feasible alternatives to achieve the project's substantial overall net benefits and acceptable mitigation measures, such as compensatory protected areas, are included within the project.

2.5.3 Water Resources Management OP 4.07

This deals with water resources management in terms of provision of portable water, sanitation facilities, flood control and water for productive activity. It calls for economical viability, environmental sustainability and social equitability. The policy is relevant to the project because of sound management of water resources. This policy is triggered by the use of water resources for provision of safe drinking water.

2.5.4 Physical Cultural Resources OP 4.11

This directive defines the cultural property as having archaeological, palaeontological, historical, religious and unique natural values. There are no known physical cultural resources within the proposed site thus this policy may be not be triggered.

2.5.5 Involuntary Resettlement OP 4.12

The Bank's OP 4.12 is triggered in situations involving involuntary taking of land and involuntary restrictions of access to legally designated parks and protected areas. The policy aims to avoid involuntary resettlement to the extent feasible, or to minimize and mitigate its adverse social and economic impacts.

CHAPTER THREE: PROJECT LOCATION AND DESCRIPTION

3.1 Location of the Project

Map of the area

The location coordinates are; **Latt -0.671547^0; Long 36.387634^0**

3.2 Project description and designs

The proposed project is divided into the following sections

i) Karate to Water Works Station Pipeline

ii) Water Works to Kayole Pipeline

iii) Kayole Water Station and Distribution Lines

iv) Waterworks to Mirera Pipeline

DTI to Water Works Station Pipeline

Water Works Water Station

Water Works Water Station is second highly elevated station (after DTI) among NAIVAWASS water stations. Whereas DTI station is approximately 8 kilometres from Naivasha town, which is the main area served by NAIVAWASS, Water Works is at the heart of Naivasha town. This then makes Water Works to be an appropriate station for distribution of water to NAIVAWASS the customers. Currently, Water Works Station has a 500m^3 storage tank and two boreholes. To supply water to Kayole and Mirera, then Water Works Station becomes the best source owing to its proximity and elevation. However, the boreholes do not have sufficient water to meet the demand of the two areas.

The project proposes an additional water source in Karate Water Station. Boreholes are known to produce water of good physical and bacteriological quality (Water Services Regulatory Board, n.d.). However, depending on the composition of the aquifer, the chemical quality of borehole water may be influenced. In Naivasha, most underground water has high fluoride levels above the recommended amount (1.5 ppm). As such, this parameter should not be overlooked. This analysis, hence, focuses more on the fluoride levels of the boreholes in determination of borehole water quality.

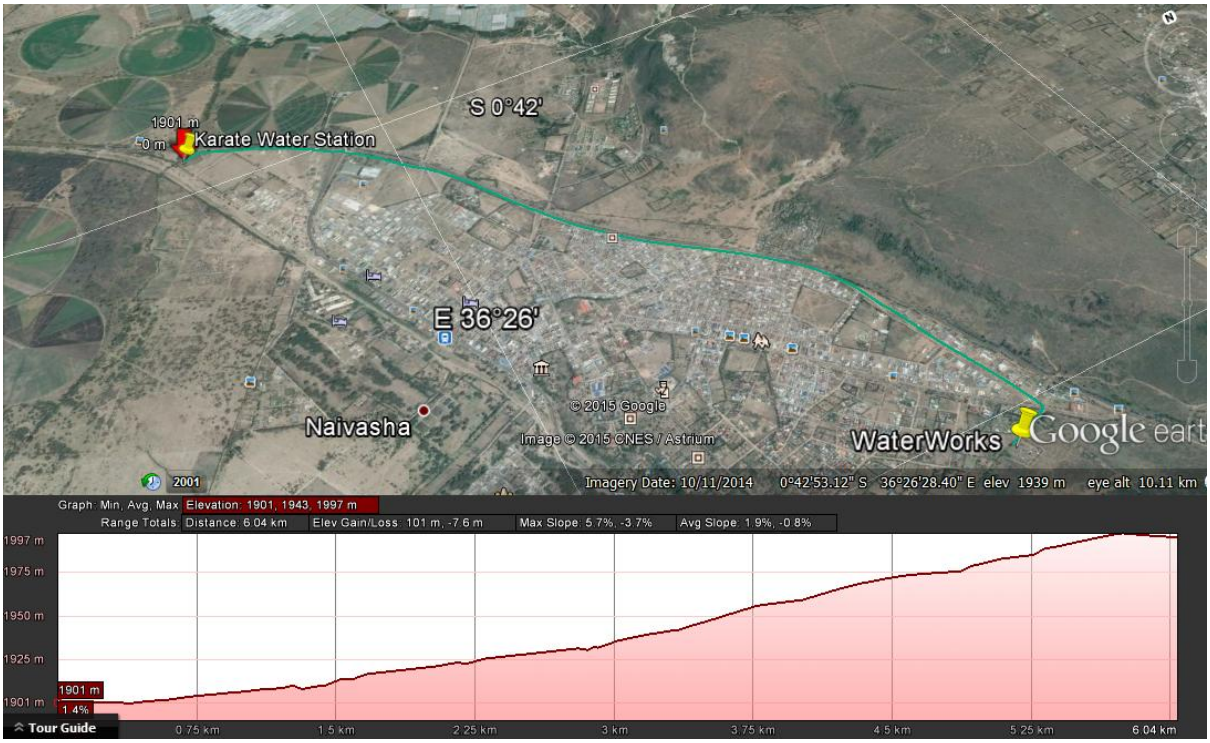
Water Quality from Karate Station boreholes is as follows:

- Borehole 1:1.2 mg/l
- Borehole 2: 1.33 mg/l

This shows that the two boreholes are of good quality.

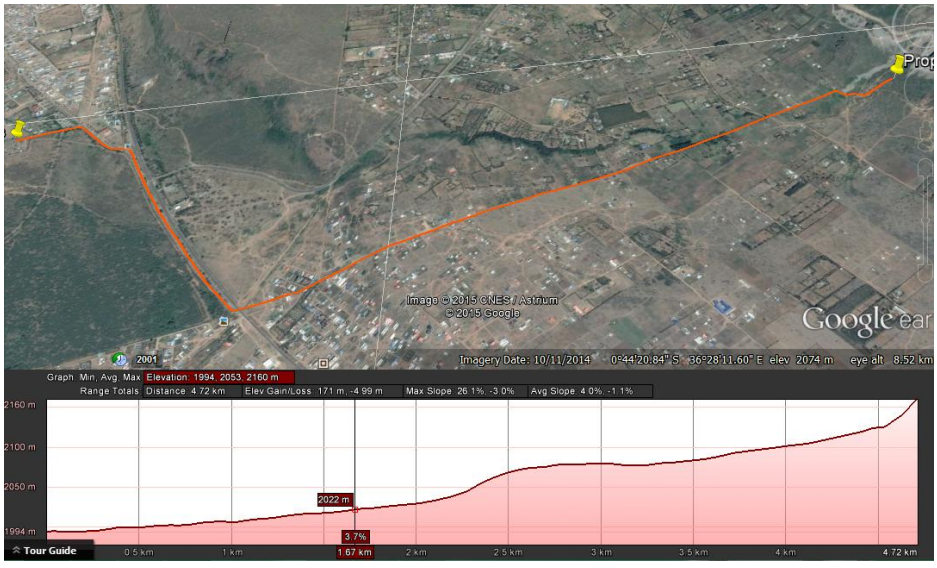
Similarly, drilling another borehole in Karate will also increase production capacity. The borehole will supplement water from water works to be supplied to Lakeview, Mirera and Kayole.

The A proposed line from Karate Water Station will hence transport water to the station. The line will be 200mm in diameter and 6.1km long.



Water Works Station to Kayole Pipeline

The proposed water supply project will be supplied through pipeline from Waterworks water station.



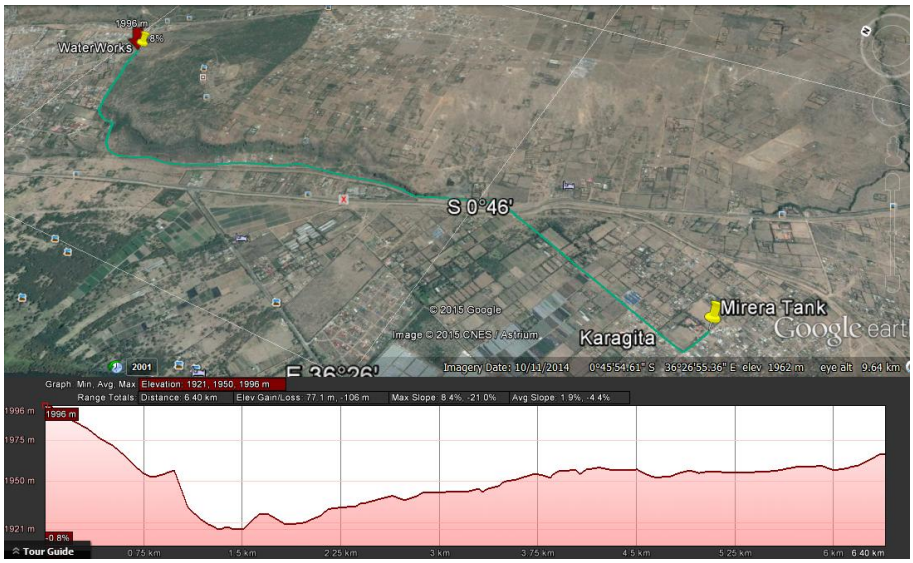
Kayole Water Station and Distribution Lines

Water to Kayole will be sourced from Waterworks Water Station boreholes as well as from DTI Station Boreholes, and is also supplemented by a borehole in the region.

Karate – Police Line Pipeline

Water Works-Mirera Pipeline

This proposal advocates for a 150 and 100mm pipeline to be constructed from Waterworks tank to Mirera Tanks.



WaterWorks-Mirera Pipeline

Current and Anticipated Water Capacity

Average demand per zone per day			
Area/Zone	**Average Current Demand (from current usage)**	**Future Demand**	**Ultimate Demand (M^3/day)**
CBD	747.1	1,023.71	1,402.73
CCCR and Industrial Area	920	1260.621763	1727.36
KABATI	764.43	1,047.46	1,435.27
LAKEVIEW	676.13	926.47	1,269.48
KCC	123	168.54	230.94
Kihoto	626	857.77	1,175.35
Karagita	1,079.00	1,478.49	2,025.89
Kayole	615	842.7	1,154.70
Industries	1,000.00	1,370.24	1,877.56
Total	**6,550.66**	**8,976.00**	**12,299.28**

3.2.1 General design criteria

3.2.1.1 Design Approval

The design standards as currently adopted by the NAIVAWASS should be used in all construction plans. Any modifications to these standard details require approval from NAIVAWASS

3.2.2.2 Connection and Construction Approval

All public water main extensions will be designed and approved by the Company, however construction permit would be sorted where necessary, and prior to construction.

3.2.2 Differentiation between Public and Private Water Lines

When the water distribution system is complete and the improvements have been formally accepted by the Company, the company shall be responsible for the repairs and

maintenance distribution lines and water mains located in the public right-of-way and publicly dedicated water mains and loop systems. Maintenance and repairs for the portion of the system located on private property shall be the responsibility of the property owner, or a property owner's association depending upon the property owner's covenants and guidelines. In such cases where the company performs maintenance or repairs on the private water service line the company reserves the right to charge the property owner for necessary work. All engineering plans shall clearly differentiate between all portions of the public and private water distribution system.

3.2.3 Easements

All public water mains that are to be located within a public right of way shall be placed in a public utility and drainage easement, minimum 5m wide or as directed by the NAIVAWASS. The easement shall be granted to the company either through a recorded plat of subdivision or a recorded plat of easement. The company shall be granted access to these easements if not directly adjacent to public right-of-way.

From the survey it was found out that the project will not involve any loss of land since the borehole will be drilled on a public land and the elevated tank will be erected on a land donated by the panda flower farm, and all the piping will be done along the roads and public pathways and along the KWS fence which they have already agreed the pipe to pass through their land. The project will not result in the permanent loss of granaries, shelter or other building and it will not result in any property transfer, and no accident is anticipated the trenches will be filled up after they are dug.

After thorough analysis on the factors that qualifies a project for compensation, it clear that the mirera/kayole project does not qualify for any compensation because the project activities have minimal impact and the activities involved will **NOT** result in any form of displacement and damages necessary to be compensated

3.2.4 WATER SUPPLY PLANNING

3.2.4.1 Basic Planning

A reconnaissance study was done in the proposed project area screening and elimination of all other option was carried out and hence the proposed water supply project was identified

as the best alternative project for the people within the area and further action was necessary. Basic planning for a water supply project was necessary as it involves an orderly consideration of the project from the original statement of purpose through the evaluation of alternatives to the final decision on course of action.

3.2.5 Basic Policy

The design is based on the basic policy outlined in the design manual for a water supply project and is formed on the basis of the following principles: -

- Capacity to satisfy demand to target year – Horizon of 5-10 years.
- Provision of safe and sanitary water.
- Wise, effective and efficient use of the water resource.
- Safe and sound O & M of Water facilities with no negative environmental impacts.
- The system must be in conformity with Water Act 2002.
- Enhancement of quality of living standards.
- Appropriate Technology relevant to beneficiaries.

3.2.6 SELECTION CRITERIA PRINCIPLES

3.2.6.1 General

The function of selection criteria for a water supply service is to decide when particular areas should be provided with water services. The very serious consequences that arise from lack of water services in the rural areas makes the existence of the population alone a sufficient criteria for providing water supply services. It is not obvious where the need is greatest and hence the criteria for lowest cost per head were the guiding principle for selection.

3.2.6.2 Parameters for Selection

- The population is normally captive of the water supply services and has no alternative water source in case of a failure. An inadequate water supply service is a health hazard and could result in epidemics.
- The quantity and quality of the socio-economic benefits that arise or will be impacted by the water supply services.
- The likely failure, in the near future, for the water supply scheme to meet water

demand for the current population.

3.2.6.3 Population Data of Kayole and Mirera Water Supply Areas

Based on Kenya's National Inter-censal Growth rate, an average of 4% population growth rate has been adopted for the purpose of population projections for the project area. Population projection is assumed to follow geometrical growth progression based on the following formula given below.

$$Pn = P_O(1+r)^n$$

Where

Pn – Projected population after n years

P_0 – Population during the reference year

r – Population growth factor (in percent)

n – Projection period

The Practice Manual for Water Supply Services in Kenya, 2005, recommends 20 years project life for water supply systems. The replaceable mechanical components are designed for 10 years while the network is designed to meet the ultimate demand (20 years). In reviewing the demand the following design periods adopted for the project are as follows;

- Initial period - 2016
- Future Period - 2026
- Ultimate Period-2036

Kayole - Mirera water supply improvement project will be expected to serve the following population:

Table 3.1 Population Projections

	HUMAN POPULATION			
	Census 2009	**Initial (2015)**	**Future (2025)**	**Ultimate (2035)**

Kayole	10,082	12,038	16,179	21,742
Mirera		24,000	32,254	43,346
Total		36,038	48,433	65,188

According to the Practice Manual for Water Supply Services in Kenya (2005), future institutional demand for schools may be estimated by assuming that 30% of the populations attend primary and/or secondary school. The initial school population is less than 30% of the current total population. It was thus assumed that the school population shall grow at general population growth rate of 3.2%. The projected school population is therefore obtained and is as shown in the table below:

Table 3.2 School Population Projections

AREA	SCHOOLS and LEARNING POPULATION		
	INITIAL (2016)	FUTURE (2026)	ULTIMATE (2036)
Kayole	2300	3152	4318
Mirera	3250	4453	6102
TOTAL	**5550**	**7605**	**10420**

The water demand for the area was calculated putting into consideration all the potential water users within the area.

The system infrastructures will be designed to meet the future demand of the year 2025 population only. The reasons for choosing a limited planning horizon relate to the fact that we are dealing with a master plan that:

1. It is a pro-poor project. This implies a minimum level of service to meet basic needs, but of course recognizing that this may precipitate a higher standard and living and increased demand and that this needs to be allowed for, as far as possible, in the designs.

2. Is "good enough" technically, not necessarily complying with Kenyan guidelines, but recognizing the savings to be brought about by using long lasting materials that will not leak.

3. Needs to be cautious about population growth in the current economic climate and low likelihood of employer expansion, and likely low demand for significant improved levels of service from tenant workers.

3.2.6.4 Water consumption rates

Practice Manual for water supply services in Kenya recommends consumption rate of 20 and 75l/h/day for estimating water demand communal and individual connections in low income communities such as Kayoel and Mirera areas. This rate is low as compared to the rate proposed in the design guidelines for water supplies in Kenya, 2005. The proposed arte are shown below.

Table 3.3: Domestic Water consumption Rates

Type of connection	Water Consumption Rate (l/h/day)
Individual connection	75
Communal watering point	20

3.2.6.5 Modified Water Consumption Rates

Recent studies however recommend modified consumption rates derived from actual measurement. The following table compares consumption rates proposed by the practice manual; rates derived from a water use study by CES/ Mangat, and field measurements for Malindi and Jinja urban water supply systems.

Table 3.4: Domestic Water Consumption Rates (l/h/day)

Housing Category	Design Manual (excluding 20% UfW)	Malindi (Kenya) actual	Jinja (Uganda) Actual	CES/Mangat Study '06	BCT Feasibility Study '03

Low cost areas (private connection)	60	75	45	30	50
Informal Settlements (communal water points	15	4-15	20	15	15

Water consumption rate of **50** and **15 l/p/day** is adopted for private and communal water points respectively in estimating water demand.

Table 3.5: IC-CWP ratio

Ratio of total population			
	Initial (2015)	**Future (2025)**	**Ultimate (2035)**
Individual connection	50%	50%	50%
Communal Water connection	50%	50%	50%

3.2.7 Water Mains

3.2.7.1 Basis of Design

The water system has been designed using EPANET – Computer Network Analysis Program. The present year according to the preliminary design water demand has been calculated on the basis of the current land use patterns, type of activity and geographical distribution by the type of housing.

3.2.7.2 Design Calculations.

Design Criteria

The following design criteria were adopted:

- A design period of 10 years for pumping systems
- Design will base on Colebrooke formulae and Darcy-Weisbach equations.
- A design period of 10 years for pipe systems
- Water consumption rate of 50 liters per person for I.C. and 15 liters per person per day for C.W.P .

- Washouts at lowest points should be provided with gate valves.
- A steel tank should be raised for 20m above the ground level
- Sectional valves should be fitted at 2 km internal
- Air valves at sharp points should be provided with gate valves to ease servicing
- All branches/connections should be provided with gate valves and nipples
- All water kiosk should be provided with water meters
- A master meter will be provided at the off take.
- Design flow is assumed 18hrs
- Preferred range of velocities is (0.5 – 1.5) m/s.
- Acceptable range of velocities: (0.2 – 0.8) m/s in UPVC pipes (1.5 – 3.0) m/s in G.I pipes.

  Darcy's formula;

Using Darcy's formulae Q = (πd2/4)V the pipe diameter was calculated assuming an initial velocity of 1m/s. The actual velocity was then determined and subsequently the pipe losses were calculated using the Darcy-Weisbach equation for head losses;

$$\Delta H_w = \lambda . \frac{l}{D} . \frac{v^2}{2.g}$$ Darcy Weisbach formula

Where;

$$\lambda = \frac{0{,}25}{(\log(\frac{\upsilon}{0{,}4.v.D.\sqrt{\lambda}} + \frac{k}{3{,}7.D}))^2}$$

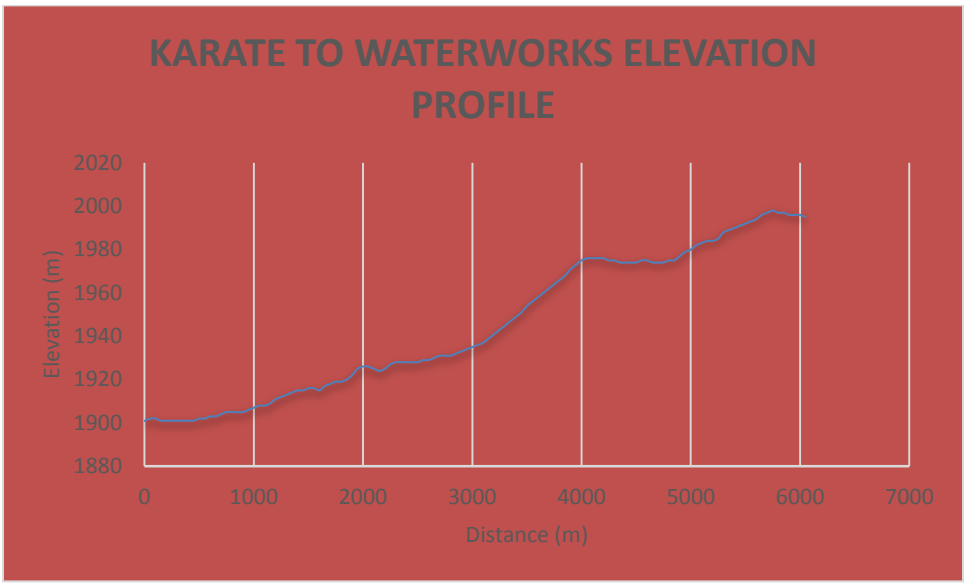
Note: for this project the EPANET program is used to perform the hydraulic calculations. The advantage is that now a number of different scenarios can be calculated quit easily, to evaluate the influence of using different internal diameters, elevation of tanks, etc. and also the influence of applying an usage pattern.

3.2.8 Karate-Water Works Pipeline design

a. Topography

The terrain from Karate Production site to Water Works Station rises gradually as the profile

progresses. The lowest point is at elevation 1901 m ASL at Karate while the highest point is at 1998 m ASL. The general elevation profile of the pipeline is as shown in the chart below.



Graph 3.1: Karate-Waterworks Elevation Profile

b. Karate Water Station

Currently, Karate water station has three functional borehole. Two of the boreholes are used by Naivawass while one borehole supplies Naivasha G.K prison with water. According to the estimated demand, the two boreholes are not in a position to supply enough water, and therefore there is need to have an additional source of water. A new borehole can be drilled at Karate Station considering the following issues

- The quality of aquifer (with respect to Flouride levels) in Karate water station is impressively superior as compared to the surrounding aquifers in Naivasha town
- The aquifer is also in a position to provide sufficient water to meet the required demand

c. Existing Facilities

Table 3.6: Existing facilities at Karate Production Site

Facility	Description	Condition	Requirements
Ground Masonry Water	100 m3	In good condition	

Tank			
Elevated Steel Tank	100 m3	In good condition	
Pump House	The current pump house has control panels for the borehole pumps and high-lift pumps.	In good condition	The pump house has enough space for a new pump. The highlift pump to Waterworks will be installed in the pumphouse
Laboratory	Equipped with sampling and water quality testing equipment	In good condition	
Staff House	Currently being used by the staffs working in the station.	In good condition	

d. Water Works Station

Water Works Water Station is second highly elevated station among NAIVAWASS water stations. The following table indicates the elevation of all the Water Stations in NAIVAWASS.

Table 3.7: Elevations of water production sites in Naivasha

S No.	Water Station	Elevation (m a. s.l)
1	DTI	2024
2	Water Works	1999
3	PoliceLine	1961
4	AIC Booster	1925
5	Karate	1901
6	DCK	1898

Whereas DTI station is approximately 8 kilometres from Naivasha town, which is the main area

served by NAIVAWASS, Water Works is at the heart of Naivasha town. The elevation combined with its closeness to Kayole and Mirera makes Water Works to be an appropriate station for distribution of water to the two areas.

e. Existing Facilities

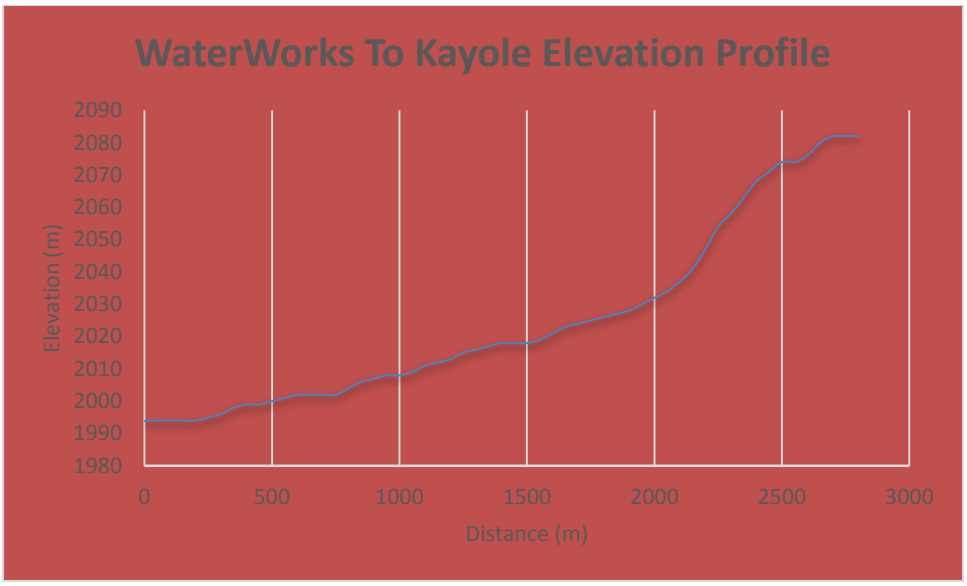
Table 3.8: Existing Facilities at Water Works Station

Facility	Description	Condition	Requirements
Ground Masonry Water Tank	Capacity of 500 m3	In good condition	The tank will be used for storage as well as sump tank before pumping water to Kayole
Pump House	The current pump house has control panels for the borehole pumps.	In good condition	The pump house requires rehabilitation in order to create enough space for a highlift pump to pump water from WaterWorks to Kayole.
Laboratory	Equipped with sampling and water quality testing equipment	In good condition	
Offices	They are currently being used by the RVSB and Ministry of water		
Staff House	Currently being used by the staffs working in the station.	In good condition	

3.2.9 WaterWorks-Kayole Pipeline design

f. Topography

The terrain rises gradually as the profile progresses. The lowest point is at elevation 1991 m ASL at WaterWorks water station while the highest point is at 2082 m ASL. The general elevation profile of the pipeline is as shown in the chart below.



Graph 3.2: WaterWorks to Kayole Elevation Profile

g. Kayole Tank

The design proposes to construct a 100 m^3 elevated steel tank in Kayole. A higher ground in Kayole has been established (elevation 2093 m asl).

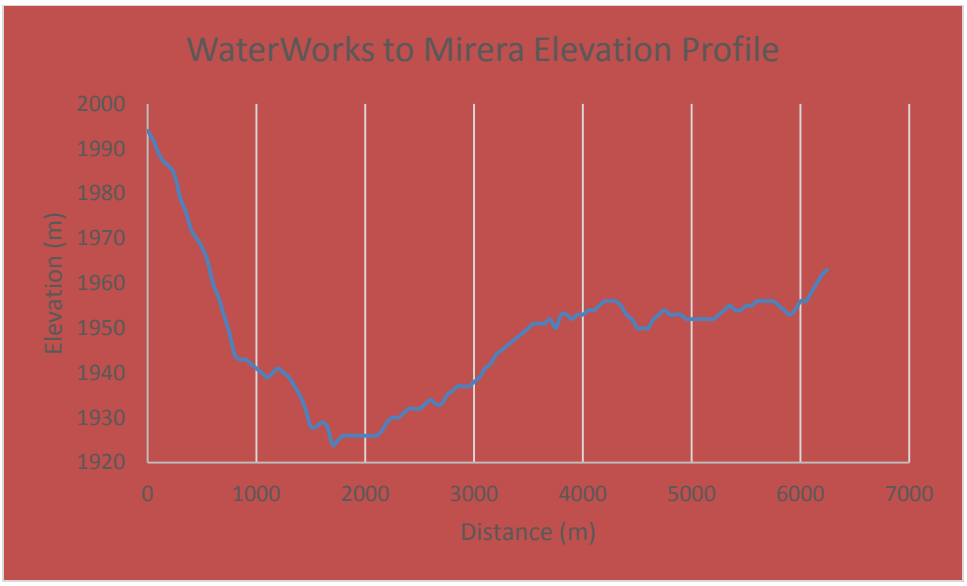
Scope of works for the tank is as follows:

- Construct a 100 m^3 elevated steel tank
- Fencing

3.2.10 WaterWorks-Mirera Pipeline design

1) Topography

The terrain is falls progressively up to chainage 1700 and then falls and rises gradually as the profile progresses. The lowest point is at elevation 1924 m ASL while the highest point is at 1994 m ASL. The general elevation profile of the pipeline is as shown in the chart below.



Graph 3.3: WaterWorks to Mirera Elevation Profile

1) Kayole Reticulation Design

Current Situation

Water supply in Kayole is from boreholes located in the project area. The total number of boreholes currently functional in the area is three, all of which are privately owned.

Table 3.9: Boreholes Functional in Kayole

Name	Description	Status
Small Traders Water Project	The original system comprised a network of one boreholes connected to a distribution system comprising pipelines and private connections and community water points	Currently the system operates only one borehole the sells water at the sources
Vision Water Project	A recently drilled borehole by Vision Co-operative Society to provide water to upper Kayole	Currently the system operates only one borehole the sells water at the sources

Water Demand

The Kayole water project area has a potential to absorb a large population growth as the development of this is also linked significant growth in Naivasha Town. The projected water demand for the area of the project area is estimated as presented on the table below. The total water demand was calculated from the domestic demand, institutional demand, commercial demand, industrial demand and any future tourism demand of the area.

Table 3.10: Water demand for Kayole

		Percentage of total population				Water Demand per day		
		Census 2009	Initial (2015)	Future (2025)	Ultimate (2035)	Initial (2015)	Future (2025)	Ultimate (2035)
Kayole	Individual connection	10082	6019	8089	10871	300,961	404,466	543,569
	Communal Water connection		6019	8089	10871	90,288	121,340	163,071
Total (Liters per day)	Total (Liters per day)					391,249	525,806	706,639
Demand (m3/hr)	Demand (m3/hr)					16.30	21.91	29.44

The designed calculations are based on ultimate demand and from the table above, the ultimate water demand was equivalent to 706, 639 liters per day or 707 M^3 per day. This was equivalent to a flow of 29.4 per hour, assuming a flow period of 24 hours a day.

3.2.11 Mirera Reticulation design

Current Situation

Water supply in Mirera is from boreholes located in the project area. The total number of boreholes currently functional in the area are six, of which five (5) are privately owned and one (1) is community owned. Of these boreholes, five (5) are privately owned and are used to supply water to the public through individual connections and communal water points. The community operated boreholes which were inherited from the former colonial land owners or drilled through funding from the government agencies. Of the three boreholes only one is currently functional.

In the current situation in Mirera and Kiu, water is provided at private by two private operators, Macharia and Mugambi, at water kiosks and by private vendors who buy in bulk from the borehole owners. This scenario results into insufficient water supply and high cost of water. Water in the areas also has high levels of fluoride. Due to the poor water quality (high fluoride levels), centrally located water kiosks equipped with de-fluoridation units will be introduced. The level of service is on the basis on shared water points at a plot yards or a water kiosk within acceptable walking distance. The following two service levels for water supply are considered.

The existing private and community boreholes and water supply system in the area comprises the following;

Table 3.11: Community Systems in Mirera

Name	Description	Status
Mirera Suswa Community Water Project	The original system comprised a network of three boreholes connected to a distribution system comprising pipelines and private connections and community water points	Currently the system operates only one borehole the sells water at the sources, there is one pumping mainline to a nearby police post
Mirera Primary School	A recently drilled borehole to provide water to the school	Borehole is operational

Table 3.12: Private Supply Systems in Kayole

Name	Description	Status
Macharia Borehole	The borehole was recently drilled (2010) and supply water to the community is through a distribution network comprising two main pipelines connected to private connection, Water is also sold in bulk at a water point next to the borehole,	Functional
Mugambi borehole (Karagita Site), originally Emily Wanjiru Borehole	The borehole has been in operation for more than five years. The system mostly sells water at the sources with a few individual connections. This is one of the two main water sources in Mirera area	The borehole has not been functioning for sometimes due to power problem, due to long time of disuse, the borehole is reported to be blocked
Mugambi borehole (Kiu), Original Mwita) Borehole	The system operates a single boreholes connected to 80m3 overhead storage tanks. The borehole system has been in operation for last five years. The borehole was recently sold to Mugambi who has developed an elaborate supply network comprising water points and private	Currently operational

	connections.	
John Njuguna Borehole (#2)	The borehole has been in operation for last five years., This is one of the two main water sources in Mirera site	Currently operational

Whereas the privately borehole systems are expanding their coverage, the community based water systems however suffer from myriad of challenges ranging from management challenges, high operational costs, and lack of technical capacity and leadership issues.

Existing Delegated Model

The existing delegated model in the low income areas/schemes incorporates private operators/subagents to act on behalf of the Company in service provision in those areas. The sub agent purchases raw water from the borehole owners, and manages distribution through the local network to household connections and kiosks. The chain of distribution is shown below-:

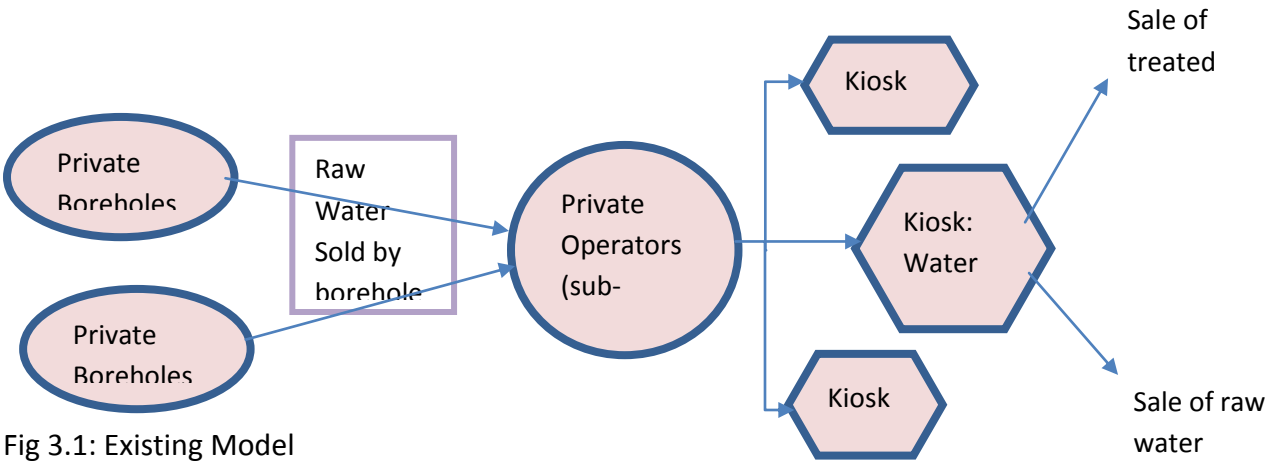


Fig 3.1: Existing Model

3.2.12 Water Demand

The Mirera water project area is potential to absorb a large population growth as the development of this is also linked to the agricultural activities of the area as well as the envisaged tourism development of the area. The projected water demand for the area of the

project area is estimated as presented on the table below. The total water demand was calculated from the domestic demand, institutional demand, commercial demand, industrial demand and any future tourism demand of the area.

Table 3.13: Water demand for Mirera Area

		Percentage of total population				Water Demand per day		
		Census 2009	Initial (2015)	Future (2025)	Ultimate (2035)	Initial (2015)	Future (2025)	Ultimate (2035)
Mirera	Individual connection	(only 50% will be served)	6000	8063	10836	300,000	403,174	541,833
	Communal Water connection		6000	8063	10836	90,000	120,952	162,550
Total (Liters per day)	Total (Liters per day)					390,000	524,127	704,383
Demand (m3/hr)	Demand (m3/hr)					16.25	21.84	29.35

The designed calculations are based on ultimate demand and from the table above, the ultimate water demand was equivalent to 704,383 liters per day or 704 M^3 per day. This was equivalent to a flow of 29.35 M^3 per hour, assuming a flow period of 24 hours a day.

3.2.13 Pipe Material

The pipes commonly used for water supply in Kenya includes: Grey cast Iron (CI), Ductile iron (DI), Galvanized Mild Steel GMS), steel, unplasticised Polyvinyl Chlorine (uPVC), High Density Polyethylene (HDPE). The choice of pipe adopted for this project was

GI pipes 250MM, 200MM and 160 MM, HDPE pipes 250MM, 200MM, 160MM, 110 MM, 90MM, 75 MM, 63MM, 50MM, 40MM, 32MM and 25 MM diameter.

The GI pipes were chosen for the following reasons:

i) High strength and rigidity and is able to withstand high pressure.
ii) The soil and the environment is aggressive and the pipe can be protected.
iii) History has shown this type of pipe material to be effective at regions of high external and internal pressure

The HDPE pipes were chosen for the following reasons:

i) Less pressure loss then with other materials. Nearly no risk fouling / blocking because of little sediment growth
ii) Low costs because of relative long lifespan and Resistant to wastewater with abrasive solid materials Friendly to the environment
iii) No electrical dangers
iv) Simple and easy to construct by welding / bolting
v) Fast, easy and moneysaving assembling
vi) Restrained joints, watertight

3.2.13.1 Depth of Pipe Cover

The pipe has been design with a uniform gradient as much as possible to reduce the number of air valves and wash outs. All pipes shall be laid to a minimum depth of 600mm and an average of 900mm depth measured from the proposed ground surface to the top of the pipe, unless specifically allowed otherwise in special circumstances by the Technical Manager

Pipeline passing beneath the road surface will be done in consultation with the relevant authority. At places where the over burden and traffic is high, the pipeline will be protected with pipe sleeves and or mass concrete surrounds.

3.2.13.2 Water Pipeline Sizing

a. Over sizing Requirements

It may be possible that the water main or the service lines thereof has been oversized in order to provide service to additional benefiting properties foreseen by the consultants projects.

b. Limits of Installation

At a minimum, water main shall extend across the frontage of the property, where there is no public land or way leave and for individual connection will be done at the developer's cost, such that a connection could be made with minimal disturbance in the future. In some cases, the company may require that the water main be installed from one corner to the diagonally opposite corner to enhance efficiency in future. All water main stubs for future extension shall terminate with a valve and hydrant. Restrained joints shall be located 12m from the capped end.

c. Grid iron or Looping

For other design consideration each 150, 200 and 250 mm diameter water main shall be looped at a distance not to exceed 30m. This is applicable in this project.

3.3 Project Activities

Some of the project activities will include but not limited to the following;

1. Sensitizing and mobilizing the community and local leaders about the project
2. New borehole water source
3. Elevated Steel Tank 100m^3
4. Pipe network
5. Water Kiosks
6. Kiosk Operator training
7. Mobilizing and sensitizing the community on home environmental sanitation
8. Monitoring and Evaluation of the project

3.4 Project cost

Cost Estimates for Water Supply

The estimated construction cost of the proposed water supply project is based on the prevailing construction cost the materials unit cost in the country. The **Ksh 89,288,815.00** are only estimates as per the attached bills of quantities, the actual costs will be based on several factors such as variation in prices between the tender, qualification and the efficiency of the construction

Table 3.14: Summary of Investment Cost

BILL NO.	DESCRIPTION	BoQ Original
A	PRELIMINARIES & GENERAL	4,062,000.00
B	WATER SUPPLY - KARATE-WATERWORKS	20,594,100.00
C	WATER SUPPLY-WATERWORKS -MIRERA	15,578,540.00
D	WATER SUPPLY - KAYOLE DISTRIBUTION	24,310,398.00
E	WATER SUPPLY-WATERWORKS-KAYOLE	9,638,820.00
F	WATER SUPPLY - MIRERA DISTRIBUTION	6,987,792.00
	SUB TOTAL 1	81,171,650.00
	ADD 5% OF SUB TOTAL 1 FOR PHYSICAL CONTINGENCIES	4,058,582.50
	SUB TOTAL 2	85,230,232.50
	ADD 5% OF SUB TOTAL 1 FOR PRICE CONTINGENCIES	4,058,582.50 89,288,815.00
	GRAND TOTAL CARRIED TO FORM OF TENDER	89,288,815.00

CHAPTER FOUR: ENVIRONMENTAL BASELINE CONDITION

4.1 Overview

Mirera Settlement

Mirera is a low income peri-urban settlement situated 6km, south of Naivasha Town. The more urbanized parts of Mirera are settled by low income communities largely consisting of labourers from the neighbouring commercial flower farm and Lake Naivasha fishermen. Many of the residents are immigrant workers from other parts of the country. The outer parts of Mirera are mainly rural in nature settled by small scale agricultural farmers and agricultural workers. The project area is located in Mirera Sub location, Hells gate location in Naivasha district of the Rift Valley.

Kayole

Kayole region, which is just next to Naivasha town, is currently not supplied with water. The area is approximately 7.5 km^2 and is experiencing high rate of expansion. Currently, there is one major industry located in the region, 12 institutions (including schools and a mission hospital), and a population of approximately 12,757 people. The proposed project for Kayole water supply project is aiming at reinforcing the water supply of Kayole area.

Residents in Kayole rely on individual and communal boreholes as well as water vendors as source of water, which has not been reliable. A study on the area indicates that over 70 percent of Kayole residents prefers NAIVAWASS water supply.

4.2. Topography and geology

Topography

The project area, including Lake Naivasha and environs, is situated in the floor of the Great Rift Valley. The Lake Naivasha basin covers an area of 3,400 km2 and the lake itself stands at around 1,885 metres above sea level (masl). The lake basin is bound to the west by the Mau Escarpment (3,080 masl), and to the south and south east by the Olkaria and Longonot Mountains. To the east of the lake basin is the Kinangop Plateau. The Nyandarua (Aberdare) Range (3,900 masl) lies to its north and north east and the Eburru volcanic pile flanks the western side of lake basin. The general topography of the study area is characterised by a wide range of features associated with volcanic activity. They include craters, remnants of preexisting craters, fault scarps, fissures and steam jets. The Olkaria area where the geothermal station is located comprises volcanic

features that consist of steep sided domes formed from pyroclastic rock and lava flows. The domes enclose an approximately circular depression that has been cut by the Ol Njorowa Gorge, which was formed by out flowing water from Lake Naivasha..

Geology

The geology of Lake Naivasha area has been described by Thompson and Dodson (1958). Along the floor of the Rift Valley, the most common rocks are basically quaternary deposits mainly the pyroclastic rocks, which consist of tuffs and ashes. The tuffs are usually medium to pale grey in colour but are sometimes green, yellow, pink or purple, occasionally calcified and brown when weathered. The tuffs are quarried for building purposes. The lavas are also a major geological feature of the Rift Valley. They range from under saturated basic rocks (tephrites) to acid rocks (rhyorites and obsidians) with numerous gradations in between. Close to the project area, the geology is complex and usually consists of several geological formations. Around the project area, rocks are volcanic with lake and fluvatile sediments. The volcanic rocks in the area consist of tephrites, basalts, trachytes, phonolites, ashes, tuffs, agglomerates and the acid lava rhyolite, commendite and obsidian. The lake beds are mainly composed of reworked volcanic material or sub-aqueously deposited pyroclastics

4.2.1 Soil Properties

4.2.2 Climate

The climatic features in the Rift Valley, including the project area, are closely related to the altitudinal changes and variations induced by the local topography. The floor of the Rift Valley experiences higher temperatures than the highlands. The mean minimum monthly temperature in the project area has been recorded to range from 15.9 - 17.8˚C with a mean of 16.8˚C. The mean monthly maximum temperatures range from 24.6 - 28.3˚C and the month of July is the coldest month while the hottest month is February.

4.2.3 Social-economic Infrastructure

4.2.3.1 Administration and Security

Table 4.1: Administrative units of the settlements

Province	County	District	Division	Settlements
Rift Valley	Nakuru	Nakuru	Naivasha Town	Kayole

			Kongoni	Mirera

4.2.3.2 Education

Currently, there is one major industry located in the region, 12 institutions (including schools and a mission hospital), and a population of approximately 12,757 people. These schools include Longcrest Junior Academy, Mirera secondary school, Neema preparatory school.

4.2.3.3 Health

According to the Kenya National Bureau of Statistics (KNBS) 2008, good health is considered a pre-requisite to the socio-economic development of any country, since a healthy population is capable of participating in economic, social and political development. Health constitutes the physical, mental and social well-being of the people and not merely the absence of disease or infirmity. The areas have several health centres and clinics. These among others are Mirera-Kijani community dispensary etc.

4.2.3.4 Commerce and Industry

The area being mostly residential has no industrial activities except for light powered industries such as sawmills. The business industry however is a boom in the area which includes the shops, bars, mini-supermarkets, kiosks, small side kiosks (vibandas) and markets.

4.2.3.5 Transport and Communications

The area can be accessed through the Nairobi-naivasha highway approximately 6kms from naivasha town. The areas are then accessed through all weather roads running in each of the areas. The areas are also well served with communications masts of airtel, safaricom and telcom lines. This means the areas are well connected to the outside world as well as the rest of the country.

4.2.3.6 Agriculture

Most of the areas are settled by low income communities largely consisting of labourers from the neighbouring commercial flower farms and Lake Naivasha fishermen. Many of the residents are immigrant workers from other parts of the country. The outer parts of Mirera are mainly rural in nature settled by small scale agricultural farmers and agricultural workers

4.2.3.7 Cultural/historical sites

On awareness of any sites of special/particular interests in the region such as sacred places, graveyards, cultural places, archaeological places, and recreational places among others that could hinder successful implementation of the proposed project, majority of respondents indicated that they had no knowledge of such sites.

4.2.4 Existing Water Supplies

4.2.4.1 Location, Source and Ownership

Water Supply to Mirera Area

Water supply in Mirera is from boreholes located in the project area. The total number of boreholes currently functional in the area are six, of which five (5) are privately owned and one (1) is community owned. Of these boreholes, five (5) are privately owned and are used to supply water to the public through individual connections and communal water points. The community operated boreholes which were inherited from the former colonial land owners or drilled through funding from the government agencies. Of the three boreholes only one is currently functional.

In the current situation in Mirera and Kiu, water is provided at private by two private operators, Macharia and Mugambi, at water kiosks and by private vendors who buy in bulk from the borehole owners. This scenario results into insufficient water supply and high cost of water. Water in the areas also has high levels of fluoride. Due to the poor water quality (high fluoride levels), centrally located water kiosks equipped with de-fluoridation units will be introduced. The level of service is on the basis on shared water points at a plot yards or a water kiosk within acceptable walking distance. The following two service levels for water supply are considered.

The existing private and community boreholes and water supply system in the area comprises the following;

Community Systems

Name	Description	Status
Mirera Suswa Community Water Project	The original system comprised a network of three boreholes connected to a distribution system comprising pipelines and private connections and community water points	Currently the system operates only one borehole the sells water at the sources, there is one pumping mainline to a nearby police post
Mirera Primary School	A recently drilled borehole to provide water to the school	Borehole is operational

Private Supply Systems

Name	Description	Status
Macharia Borehole	The borehole was recently drilled (2010) and supply water to the community is through a distribution network comprising two main pipelines connected to private connection, Water is also sold in bulk at a water point next to the borehole,	Functional
Mugambi borehole (Karagita Site), originally Emily Wanjiru Borehole	The borehole has been in operation for more than five years. The system mostly sells water at the sources with a few individual connections. This is one of the two main water sources in Mirera area	The borehole has not been functioning for sometimes due to power problem, due to long time of disuse, the borehole is reported to be blocked

Mugambi borehole (Kiu), Original Mwita) Borehole	The system operates a single boreholes connected to 80m3 overhead storage tanks. The borehole system has been in operation for last five years. The borehole was recently sold to Mugambi who has developed an elaborate supply network comprising water points and private connections.	Currently operational
John Njuguna Borehole (#2)	The borehole has been in operation for last five years., This is one of the two main water sources in Mirera site	Currently operational

Whereas the privately borehole systems are expanding their coverage, the community based water systems however suffer from myriad of challenges ranging from management challenges, high operational costs, and lack of technical capacity and leadership issues.

Kayole

Name	**Description**	**Status**
Small Traders Water Project	The original system comprised a network of one boreholes connected to a distribution system comprising pipelines and private connections and community water points	Currently the system operates only one borehole the sells water at the sources
Vision Water Project	A recently drilled borehole by Vision Co-operative Society to provide water to upper Kayole	Currently the system operates only one borehole the sells water at the sources

CHAPTER FIVE: ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

5.1 Introduction

In this task the consultant set out to undertake environmental scanning and focusing of significant issues through;

- Taking stock of the project proposal vis a vis natural and environmental resources present and identify environmental opportunities and constraints that may present themselves
- Forecasting on potential impacts (environmental, ecological, social-economic and community, health and safety) that are likely to arise from the proposal.
- Identifying and updating the list of information gaps.

The Consultant undertook an environmental scanning exercise to identify potential impacts that may arise from the project. These impacts are cross cutting and will encompass environmental, ecological, socio-economic and cultural impacts both positive and negative. Some of the environmental components that have been screened for possible impacts include; Environmental resources and valued ecosystem present (forests, wildlife, and aquatic systems); Hydrology - surface and underground water quality and quantity; Fauna and flora diversity and densities;

Weather and climate; Soils and land uses; Catchment drainage, Economic, social and environmental change is inherent to development.

Whilst development aims to bring about positive change it can lead to conflicts. In the past, the promotion of economic growth as the motor for increased wellbeing was the main development thrust with little sensitivity to adverse social or environmental impacts. The need to avoid adverse impacts and to ensure long term benefits led to the concept of sustainability. This has become accepted as essential feature of development if the aim of increased well-being and greater equity in fulfilling basic needs is to be met for this and future generations. The Environmental and social Impact Assessment (ESIA) has been systematically conducted to determine whether or not the proposed project will have a diverse impact on the environment. The Environmental Management and Co-ordination Act (EMCA) No.8 of 1999 provide the legal and statutory guideline for the Environment and Social Impact Assessment process in Kenya. Water projects like the one covered in this study induce and generate a wide range of physical, biological and social changes with consequences to the environment during the construction

phase; however, during the operation stage most of the impacts are positive and lead to achievement of the millennium development goals

5.2 Positive impacts

The positive impacts anticipated during construction and operations of the project are outlined below:

a) *Increased quality water supply.* Water supply is essential for human health and survival, for food security and the empowerment of women as well as the education of girls, for reduction in productivity losses due to morbidity and malnutrition, for the management and protection of natural resources. Although the crucial importance has been widely recognized, the right to safe water remains a promise unfulfilled for the world's poorest citizens. The lack of access to safe drinking water impedes economic development, thwarts progress towards gender equality and puts the health in danger.

The project will ease the current water deficit in the project area and the environs consequently promoting the economic growth; the community will get access to quality clean water for drinking and domestic use. This will minimize cases of waterborne diseases resulting to a healthy community; reduce drudgery associated with water collection and result in gender balance

b) *Employment opportunities to the local people.* Temporary job opportunities shall be available during the construction phase of the project and shall include casual laborers, food catering, artisans, etc. This shall be an important positive impact to the community because unemployment has been cited as one of the most pressing problems in Kenya today. During operation phase, there will be employment of permanent workers to work in the treatment plant lab, operation and maintenance, security service and billing.

c) *Creation of market for construction materials.* The Project will require construction materials, some of which will be sourced locally and some internationally. These include cement, sand, coarse aggregates, pump sets, steel pipes, valves, and chemicals. These will provide a ready market for suppliers in and outside the project area.

5.3 Potential Impacts and Mitigation Measures

5.3.1 Disturbances to the animals and vegetation

The project will go through a section of the Kenya wildlife training institute sanctuary and this may lead to disturbance to the animals and loss of vegetation in the area to be affected. The impacts that would result have been greatly mitigated by the reduction of time in the sanctuary and backfilling of the trenches the same day to reduce falling of animals in the trenches.

5.3.2 Construction Impacts

During the construction phase of the proposed project the potential impacts that may be generated may include destruction and clogging of storm drains by the heavy transport vehicles for the building materials.

Secondly the excavation of soils to construct the trenches for the pipings may cause soil disturbance that may be washed causing erosion.

Thirdly there may be the possibility of grease and oil spillage from the heavy machinery and equipment during this phase that may cause oil pollution to the surface waters.

Transportation of materials

The impact assessment was done and **mitigation measures** outlined as follows;

- Ensure that the contractor uses only serviceable vehicles and equipment during transportation.
- Transportation of the materials should take the shortest period possible.
- Minimize damage to existing drainage system during transportation.
- Ensure minimal grease and oil leakage.

Excavation of soil and clearing of vegetation & Use of Heavy construction machinery and equipment

The impact assessment was done and **mitigation measures** outlined as follows;

- Ensure use of manual labor and hand tools where appropriate to minimize erosion to soils.
- Ensure that all approaches to trenches and heights are secured with guard rail and adequate notices and ensure that the dug up site is out of bounds for members of the surrounding community.
- Replant suitable shrub and tree species to restore ecological balance and ground cover.
- The spillway should be stabilized during the construction phase.

- The walls of all excavations should be sloped or stepped to reduce the chances of collapse.
- The contractor should provide first aid facilities and have some workers trained in first aid management.

Increased human activities and settlement

The contractor may put up a temporary labor camp and offices including pit latrines near the site. Manual labor will also be sourced from either the surrounding areas or transported from nearby centers. The heightened human activity may cause harm to the existing drainage and pollution to surface water. During construction workers may be exposed to falling objects from heights. Those working on high levels may fall from those heights leading to loss of life or injury.

The impact assessment was done and **mitigation measures** outlined as follows;

- Ensure that only the critical numbers of workers are hired during the construction phase and ensure that litterbins and proper pit latrines are in place at the site.
- Minimize any human settlement within the forest reserve by using migrant labor from nearest community or transporting them daily.
- Contractor should ensure proper scaffolds are used during construction and should comply with the Factories (Building Construction and Works of Engineering Construction) Rules made under the Factories and other places of Work Act Cap 514. This is in regard to safe work procedures and provision of personal protective equipment like hand gloves, dust masks, helmets, harness and boots.
- Smoking should be restricted to designated areas which do not have flammables and there is adequate fire-fighting capability.
- Means of putting off fire should be provided at the site.

Impacts on Flora and Fauna

The digging of trenches implies removal of existing vegetation and/or possibility of submerging of others. It is likely there will be loss and/or introduction of species. Downstream impacts are associated with regulated flows in the river, shifting of species to upstream areas.

There is also potential disruption of habitats downstream of the water supply project area as a result of construction activities discharge of excessive particulate matter, cement and other construction materials) as well as interrupted flow of water downstream.

Upon the digging of the trenches, the following impacts are anticipated;

- A completely new ecosystem will also be established around the inundated area. Planktons, periphytons and macrophytes will get established with implications on current natural life,
- This also has a linkage to the water quality that will range from improved aeration, pollutant removal,
- Vectors are part of the biodiversity, but will have negative implications to the residents. These include mosquitoes (associated with stagnant water), snails (carriers of bilharzia) and micro-organisms carrying other disease causing germs (typhoid, cholera, dysentery, skin infections, eye infections, etc)

The impacts on flora and fauna can be mitigated through;

- Making use of the inventory developed in this study of the unique biodiversity within the affected areas for purposes of preventing species loss. In this regard, regularly update database of animal and plant species found in the project area as a basis for conservation and monitoring of newly introduced species in the future. The inventory and monitoring register should be maintained by NAIVAWASS in collaboration with the environmental office and other interested parties,
- The role of the Kenya Wildlife Services would be crucial in monitoring the new habitats and characteristics of the wildlife migrating out of the sanctuary due to disturbances,

Vegetation

The project will lead to clearance of vegetation to pave way for the piping, camp site and access roads and even the site offices.

There will be habitat loss or modification for many species of flora and fauna.

There will be loss of vegetation cover leading to soil erosion. Mitigation procedures are as follows;

- The site should be re-vegetated once site withdrawal is complete and choice of species should be as close to the previous species as possible.
- Ground cover by use of various grass species should also be done.
- Spillway should be stabilized to reduce erosion.
- More suitable tree species should be planted to improve vegetation cover.

Waste pollution

Solid waste will be generated from the excavation works. Some of the excavated soil will be reused as backfill while the rest will be disposed off to the designated areas. Solid topsoil wastes from the site will be the main form of solid waste. Other solid wastes will include metallic pieces, wooden planks, and stone debris.

Mitigation

- Littering and the random discarding of solid waste on the site must be prevented. Proper storage and disposal of waste must be carefully planned.

Waste Management

The anticipated waste management related activities should be done prior and/or immediately on commencement of construction depending on the type of waste and disposal method. Types of wastes include Solid waste which will be deposited in receptacles near the site and collected for proper disposal, construction wastes which are collected weekly for disposal and sewage which will be disposed through pit latrines that are to be put up away from surface drainage and should be deep.

Fire

Workers involved in construction may smoke cigarettes, light fires for cooking or heating which may lead to forest or equipment fires. This may lead to loss of life or injury and loss of equipment or forest cover.

Mitigation procedures are as follows;

- Contractor should provide suitable fire extinguishers including ABC or CO_2 and place them near probable sources of ignition.
- A few workers should be instructed on how to put off fires.
- Smoking should be restricted to designated areas away from flammable materials and where there is adequate provision for fire-fighting.
- All open fires should be authorized after all precautions are taken.
- Vegetation clearance around the site of the water supply project construction including proper vegetation clearance to act as a fire barrier should be done and maintained.

Community Health

There will be migrant labour involved in construction which may take several months to complete. The community neighboring the site will interact with the migrants to an extent that

several communicable diseases whose prevalence may not be high presently may be more prevalent. Such diseases are venereal diseases which are communicable including AIDS.

Mitigation procedures are as follows;

- Community based organizations should conduct awareness programs around the area before commencement of the project to prepare the community for the possible impacts.
- Health, safety and sanitation should be incorporated in education programs targeting the communities.
- Churches and provincial administration should also pass this message to their subjects.

Noise

During the construction, there is the potential for permissible/acceptable human noise levels that may be temporarily exceeded due to the operation of Lorries and heavy equipment in the working zone of the water supply project.

Noise abatement measures will be taken in the zones crossing the residential areas, including agreed upon work scheduling.

Health and safety issues during construction

Unsafe labour practices can have a significant impact on the health and safety of the workers and of the public. Worker productivity may be also adversely affected. It is anticipated that most unskilled and semi-skilled workers will be recruited locally so that there will be no significant influx of workers into the project area. The incidence of diseases normally associated with the influx of workers into project area will be limited.

Mitigation

- Worker and public health and safety should be safeguarded at all times through application of health and safety measures required by law and by internationally accepted standards which need to be complied with. All workers and especially the temporary labour recruited locally should be equipped with adequate H&S protection or personal protective equipment

Air Quality Degradation

The digging of the trenches and transportation of construction material, earth movement and excavation may cause dust and air pollution. These will be short-term impacts and will cease with completion of the construction phase. Indeed, during dry weather, fugitive dust emissions as

a result of mobilization and construction activities are likely to be very high, a precursor to respiratory tract infections.

To mitigate these impacts, during transportation and storage of construction material will be minimized by covering materials and/or by spraying the surface with water. Work will be restricted to daytime reducing nuisance from noise. Vehicles will be regularly maintained to minimize exhaust emissions.

5.3.3 Impacts during the operation of the project

The project is potentially very beneficial especially on economic and environmental fronts. We highlight some of the negative impacts here below:

The potential impacts likely to occur during the operations and maintenance phase of the water supply project include:

a) Occupational Health and Safety Issues

Occupation health and safety hazards during the operation and maintenance phases shall result from various sources and have adverse effects if not controlled within recommended limits.

Some of the risk sources are opening of air valve to vandalize water; disease vectors; water borne diseases. The air valves have high pressure and can lead to fatal accidents or even flooding of project area among other water related accidents.

The following mitigation measures are recommended to enable safeguard against occupational health and safety impacts:

- Educate community against interfering with water supply infrastructure for example pipes and water valves;
- Conduct continuous monitoring to curb water vandalism; monitoring can also be done through use of online electronic monitoring gadgets to enable curb vandalism on time;
- Ensure that, water supply infrastructure are tested for integrity prior to commencing work.

5.3.4 Environmental rating criteria for the impacts associated with the project

Table 5.1: Impacts assessment scale

Key	Type of Impact	Key	Type of Impact
++	Major positive impact	+	Minor positive impact
--	Major negative impact	-	Minor negative impact
0	Negligible/ zero impact	NC	No change
Sp	Specific/ localized	W	Widespread
R	Reversible	Ir	Irreversible
Sh	Short term	L	Long term
T	Temporary	P	Permanent

On the basis of information gathered during the field study, potential environmental impacts of the project are tabulated below.

Table 5.2: Anticipated Environmental Impacts

Impacts on or due to the implementation of the project.	Construction	Occupation	Remarks
Pollution: Air/ dust Noise	 - t ir - t ir	 -/0 -	During construction: dust and exhaust emissions from involved machinery will affect air quality; construction activities, hooting of the involved vehicles and workers will generate noise and (vibration) which may have effect to the immediate neighbourhoods.
Site drainage	-/0	+/0	Run-off will result from the increased impervious surfaces of the proposed project. Due consideration should be taken on the surface drainage systems of the entire project and roof catchments installed.
Soil erosion	- L sp	0	Earthworks during construction will have an impact on soil erosion. During operation phase, soil erosion will not be a problem. Incorporating appropriate soil conservation measures and proper drainage facilities during construction would mitigate the impacts.
Water resources	- sh	+	Water for construction purposes will be obtained from existing county water pipe lines. To take care of any shortages, the proponent will be expected to install water reservoirs on the roof of the building.
Vegetation/ Flora	- L, sp ir	+	There is no significant vegetation on site and where it can't be avoided necessary measures to replant after back filling have been addressed in the ESMP. Landscaping will be done within the site to improve site appearance. During operation, any impact on vegetation/ flora will be negligible.
Health and Safety	- t ir	NC	During construction, increased dust, noise and air pollution levels could impact on health and safety, particularly in the

			direct impact zone. During the operation of the project no major health and safety effects will be expected.
Disturbance of the public	- t ir sp	-	Disturbance to the public/neighbours would occur due to noise and dust during construction and traffic movement. After construction, noise levels compared to the current situation will be negligible.
Visual intrusion	- t/p	+/- p	During construction, visual intrusion is attributed to construction works including construction traffic. After construction of the project, the situation will be permanent. In line with this, the proposed project should be blend in a way to merge with the existing environment and approvals by the county councils. Visual impacts can be mitigated through controlling the operating hours of construction traffic and landscaping the site.
Construction waste	- sh sp	0	Construction waste will be minimal. Proper disposal of wastes generated is necessary; the waste should be disposed into the approved dumpsites, by licensed waste handlers.
Clean on completion	- sp	0	The contractor should ensure that when works are completed, the site is left clean and tidy.
Positive impacts	++, t	++, L	Construction activities will create jobs for skilled and non-skilled workers. Job opportunities for skilled and non skilled personnel during operation phase i.e. more engineers, masons and technicians and others who will be working on the apartment.

5.4 Decommissioning and withdrawal

The impacts generated during this phase will be from wastes and unused building materials scattered all over the compound. The wastes and unused building materials may be washed by surface waters into the drainage systems and cause clogging and pollution. Open pits may be left unused leading to loss of human and animal life. The wastes may also be scattered around by wild animals.

Mitigation;

- Ensure all waste and unused building materials are collected in receptacles or designated areas then transported away for disposal.
- Ensure that all waste receptacles are located in enclosed areas away from wild animals.
- Ensure all wastes with potential environmental impacts like oils and plastic containers and papers are transported on a daily basis.
- Fill all open pits.

5.5 Social Inclusion and Economic Impact

The Kayole water project is potential to absorb a large population growth, as the development of this area is also linked to its closeness to Naivasha town as well as the envisaged tourism development in Naivasha. The projected water demand for the area of the project area is estimated as presented on the table below. The total water demand was calculated from the domestic demand, institutional demand, commercial demand, and industrial.

The water demand for the area was calculated putting into consideration all the potential water users within the area and is shown in the table below

The project area was considered as high potential and the applicable consumption rates were applied as given by the Practice Manual for Water Supply Services in Kenya (2005).

Table 5.3: Water demand for Kayole

		Percentage of total population				Water Demand per day		
		Census 2009	Initial (2015)	Future (2025)	Ultimate (2035)	Initial (2015)	Future (2025)	Ultimate (2035)
Kayole	Individual connection	10082	6019	8089	10871	300,961	404,466	543,569
	Communal Water connection		6019	8089	10871	90,288	121,340	163,071
Total (Liters per day)	Total (Liters per day)					391,249	525,806	706,639
Demand (m3/hr)	Demand (m3/hr)					16.30	21.91	29.44

The designed calculations are based on ultimate demand and from the table above, the ultimate water demand was equivalent to 706, 639 liters per day or 707 M^3 per day. This was equivalent to a flow of 29.4 per hour, assuming a flow period of 24 hours a day.

It is proposed that, access of water be provided through a combination of water kiosks and individually connection. The distribution between individual connection users (IC) and non-individual connection users (NC) i.e. consumers using kiosks or communal water points or share connections for the purpose of the demand projection for new supplies is assumed to be as shown in the table below. All the connections will be metered and paid for.

5.6 Compensation and resettlement

From the survey it was found out that the project will not involve any loss of land since the borehole will be drilled on a public land and the elevated tank will be erected on a land

donated by the panda flower farm, and all the piping will be done along the roads and public pathways and along the KWS fence which they have already agreed the pipe to pass through their land. The project will not result in the permanent loss of granaries, shelter or other building and it will not result in any property transfer, and no accident is anticipated the trenches will be filled up after they are dug.

After thorough analysis on the factors that qualifies a project for compensation, it clear that the mirera/kayole project does not qualify for any compensation because the project activities have minimal impact and the activities involved will **NOT** result in any form of displacement and damages necessary to be compensated

5.7 Occupational and Public Health and Safety

An activity at the intake that may affect health and safety is mainly drowning related for workers/operators at the site. The intake however will not be manned throughout.

- As mitigation, all access to the hazardous areas should be secured with a fence and warning notices in English and Kiswahili and Kikuyu.
- Security during the construction phase may be by means of armed guards from the police reinforced by unarmed civilian guards. Water proof jackets, warm clothing and boots should be provided to the personnel.
- During construction there is a potential for accidents which may cause damage to life and property. The potential also exists as long as there will be personnel manning the site when operational. Mitigation; the contractor is advised to obtain insurance cover for at least the third party and workmen's compensation.
- First aid facilities should be availed at the site office. These include a properly stocked first aid box. The persons in charge of first aid box should be competent to handle first aid with a valid practicing certificate.

5.8 Gender

Gender can be defined as being a male or female and translated into the opportunities enjoyed by either of the two sexes as prescribed by the societal values and norms. The society in the project area has put restrictions on these opportunities thus causing disparities between male and females. In the project area, gender disparities are manifested through school enrolment, property ownership, access to credit and discrimination on places of work among others.

The main challenges facing females in the project area include: lack of technical knowhow, absence of role models, child labour, lack of drugs, poor infrastructure, low income, poor roads, insecurity and unauthorized tea hawking. The main challenges facing males in the project area include insecurity when late at work areas and markets, lack of capital, heavy family responsibilities, low impacts in decision making, absence of role models, child labour, lack of drugs, poor infrastructure and low income. The following are the main observations in gender status;

(i) Appreciable low gender disparities in provision of education and attainment of education at all levels of schooling

(ii) (ii) High status of women in society in decision making and development

(iii) (iii) Inadequate awareness and understanding of gender issues

(iv) (iv) Biases in property ownership/rights favoring men

5.9 Environmental Education and Awareness Raising

NAIVAWASS 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) Creation of liaisons 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 .

HIV/AIDS

The contractor would be expected to incorporate HIV/AIDS programmes during construction phase. Awareness, prevention and training on HIV/AIDS and other social diseases is important during project construction and operation phase. The awareness creation should be improved through putting up of banners, posters and training should be facilitated within the project area to the construction workers and the community.

CHAPTER SIX: DESCRIPTION OF THE ALTERNATIVES

Given the objectives of the kayole-mirera project, the results of the policy and legal framework and key issues identified in the field, three alternatives were selected.

6.1 Alternative 1: Do nothing option/zero alternative/business as usual

The "no action" or no project alternative would maintain the status quo of the situation i.e. unsafe and insufficient water to kayole and mirera residents. As such, the project proposed interventions would not be implemented. This alternative would thus result in the ongoing scarcity of domestic water.

This option would mean that the local and regional/national benefits would not be realized. With the "no-action" alternative, the potential agricultural and socio-economic benefits to the area would be foregone, and quality of life would remain at a low level. Long-term development plans for the area would be compromised and slowed down, since a reliable water supply and the improved service associated with are to achieving the full benefits of other development initiatives and meeting the Millennium Development Goal (MDG). Therefore, from both an environmental and social viewpoint, the "no-action" alternative is not preferable to project implementation.

6.2 Alternative 2: Fully implement the project

The main goal of the project is to improve water supply and also ensure safe water for the resident of kayole and mirera. The project was analyzed and consultations were done at all levels including the conception of world bank backing meaning the project was a good venture and had good intentions for the residents.

Overall, it is considered that the advantages of proceeding with the project outweigh the negative impacts and that with the adoption of the recommended safeguards; the negative impacts can be minimized and managed to acceptable levels.

6.3 Alternative 3: Location

Most residents use jerry cans either on human or donkey backs to ferry water for domestic use from kiosks and mainly the water is usually unsafe and costly.

The water is mainly from boreholes and usually not treated and this has led to tooth decay and water related diseases. Of late, water borne diseases particularly typhoid fever, have been quite common in the area.

Roof water harvesting is practiced at very low level. Therefore it has not been able to meet the daily water demand.

The proposed site was selected following extensive studies taking cognizance of each of the various site attributes, namely configuration of slope, environmental and sustainability, including the strength and stability of the area.

CHAPTER SEVEN: ENVIRONMENTAL MANAGEMENT PLAN (EMP)

7.1 Introduction

Environmental Management Plan (EMP) is an important result of ESIA since it provides a framework or checklist for project monitoring and evaluation/audit. Some of the mitigating measures proposed, will be incorporated into the project designs. The monitoring plan should be implemented during the whole project cycle. The monitoring involves the observation, review, and assessment of onsite activities to ensure adherence to regulatory standards and the recommendations made to reduce negative impacts. The EMP for the water supply project provides a logical framework within which identified negative environmental impacts can be mitigated and monitored. The EMP assigns responsibilities, actions to be taken and provides a timeframe within which mitigating measures and monitoring are done.

Table 7.1: EMP Table

Environmental concerns	Proposed Mitigation	Responsibility for intervention and Monitoring	Maintenance	Monitoring means	Time Frame	Budget
PRECONSTRUCTION PHASE						
a) Delays on project designs and approvals and licenses	Ensure that the approvals are timely not to delay the timing of project setting out**.** Ensure the NEMA license is out in time for project approval	Client Nema	client	Before project setting out	Before project setting out	90,000
b) Clearing of vegetation due to contractors camp	Design and implement an appropriate landscaping programme to help in re vegetation of parts of the project area after construction Ensure proper demarcation and delineation of the project area to be affected by construction works	• Client • contractor	Client	Periodic and Surprise checks during construction	During Construction and completion	50,000
c) Training on HIV and AIDs	Ensure creation of awareness through banners, posters, trainings and social media	Client Contractor	Contractor Client	Periodic throughout project cycle	Throughout project cycle	30,000

CONSTRUCTION PHASE						
1. Loss of vegetation cover	➢ Ensure proper demarcation and delineation of the project area to be affected by construction works. ➢ Introduction of vegetation (trees, shrubs and grass) on open spaces and around the project site and their maintenance. ➢ Design and implement an appropriate landscaping programme to help in re vegetation of parts of the project area after construction. i.e KWSIT	• Client • contractor • Project Engineer	Client	Periodic and Surprise checks during construction	During Construction and completion	50,000
2. Air pollution by dust and VOCs generated	➢ All personnel working on the project will be trained prior to starting construction on methods for minimizing air Quality impacts during construction. ➢ Construction heavy earth moving vehicle drivers will be under strict instructions to minimize unnecessary trips, refill petrol fuel tanks in the afternoon and minimize idling of engines. ➢ Careful screening of construction site to contain and arrest construction-related dust. ➢ Exposed stockpiles of e.g. dust and sand, will been closed, covered, and watered daily, or treated with non-toxic soil	• Proponent; • Contractor • County department of Health: • County public health officer • NEMA inspectors • Ministry of Labour	proponent	Periodic Activities	Inspection and routine Maintenance	10 000 per month over the construction period

	binders. ➢ All workers will be required to wear protective gear ➢ Ensure construction machinery and equipment are well maintained to reduce exhaust gas emission					
3. Pollution from Hazardous waste	➢ Handling of the materials using the material safety data provided by the manufacturers ➢ Appoint a safety officer to ensure that proper disposal guideline are observed ➢ Ensuring that maintenance and/or piece of work carried out on any piece of equipment or construction work is undertaken by qualified personnel ➢ In case of spillage emergency spillage control measures to be instituted ➢ Containerization of any wastes and disposal through a licensed waste handler.	• Proponent; • Contractor • County department of health • NEMA inspectors	Contractor /proponent	Periodic Inspection	Regular Checks	10 000 per month over the construction period
4. Noise and vibration	➢ Use of equipment designed with noise control elements will be adopted where necessary. ➢ Trucks used at construction site shall be routed away from noise sensitive areas where feasible. ➢ Idling time for pick-up trucks and other small equipment will be minimized to limited time. ➢ All workers operating in noisy	• Proponent; • Contractor • County Public Health Officer • Ministry of • Labour Workers • NEMA inspectors	Proponent Nema inspectors	Routine Activities	Periodic and surprise checks	10 000 per month over the construction period

	areas or operating noisy equipment will be provided with earpieces to protect against extreme noise. ➢ Comply with Noise prevention and control rules, 2009 ➢ In case of the area under the sanctuary minimize use of vehicles and machines that may cause disturbances to animals.					
5. Public Health and Occupational Safety	➢ Ensure proper solid waste disposal and collection facilities ➢ Ensure effective waste management ➢ Provide first Aid kits ➢ Sensitizing stakeholders/workers on environmental management. ➢ Workers should be trained on Occupational health and safety	• Contractor/ proponent	Proponent	Observation	Weekly Monthly	50,000
6. Traffic and Transport	➢ Adequate maintenance to reduce emissions. ➢ Vehicle comply with axle load limits ➢ Well trained and experienced drivers	• Contractor • Traffic police	Contractor	Routine Activities	Periodic and surprise checks	Nil
7. Workers accidents during construction Process.	➢ All workers will be sensitized before construction begins, on how to control accidents related to construction. ➢ A comprehensive contingency plan will be prepared before construction begins, on accident response. ➢ Accordingly, adherence to	• Proponent; • Contractor • County Public Health Officer • Ministry of Labour • Workers • NEMA inspectors	Proponent	Routine Activities	Periodic checks	10, 000

	safety procedures will been forced. ➢ All workers to wear protective gear during construction, including helmets. ➢ Construction work should be limited to daytime only					
8. Inadequate human waste disposal by workers during construction process	➢ As provided for by the Building Code, a temporary latrine will be provided on site to be used by construction workers	• Proponent; • Contractor • Ministry of Health and labor. • NEMA inspectors	contractor	Periodic Activities	Daily	100,000
9. Soil Erosion	➢ The contractor must implement erosion control measures to avoid erosion in areas that are prone to erosion, e.g. steep slopes and drainage lines. These measures must include the construction of cross drains and other appropriate measures	• Contractor and proponent	Proponent	Routine Activities	Periodic checks	30, 000
10. Noise Machine noise	➢ Use noise abatement ➢ Good timing during construction not to interrupt ongoing activities in the vicinity. ➢ gear/regular machine services ➢ In the sanctuary only hand tools will be used and there will be minimal use of vehicles to ensure minimal or no noise effects to animals.	• Contractor	Enforce safety guidelines	Tests/EMCA guidelines	Continuous	Nil
11. Damage to Public Utilities (water pipes, electric	➢ Enforce county government Bylaws/ restore as before. ➢ All adjoining properties and	• Contractor	Contractor	Observation/ tests	During constructio n	Nil

cable)	utilities shall be protected from damage during rehabilitation					
12. Waste management (solid waste)	➢ Safe waste management. No dumping on site or in the surroundings ➢ After Construction provide strategic designated site for on-site disposal of waste	• Site manager/ Public health guidelines	As given by county Bylaws& EMCA guidelines	Proponent	Weekly	20,000
13. Scraps and other debris on site	➢ Use of integrated solid waste management system. ➢ Waste generated from decommissioning phase should be characterized, sorted and disposed appropriately. ➢ All structures and machinery out of use should be removed recycled or reused ➢ Where reuse/ recycling of materials, structures or equipment is not possible, materials should be taken to approved dumpsites	• Contractor	-	-	-	One-off
14. Socio-Economic Impacts	➢ Safety of workers and neighbors should be first priority ➢ Adopt a project completion policy; identify key issues to be considered earlier before decommissioning ➢ Provide contraceptive and create awareness for communicable diseases and other social behavior changes due to increased population interaction ➢ Assist with re-employment	• proponent	-	-	-	

	and job seeking of the involved workforce. ➢ Recommend the workers to help in seeking opportunities elsewhere ➢ Offer advice and counsel on issues such as financial matters.					
15. Security	➢ Provide security guards and facilities during construction periods ➢ Security men should always be available to alleviate cases of robbery and other related incidences	• Contractor	Proponent	Surveillance Observation	Daily	10,000 per month
16. Record keeping	➢ Collection and analysis of relevant environmental data at the site ➢ Vehicle movement in and out of the site	• proponent	proponent	Inspection	weekly	5000
DURING OPERATION						
17. Water borne diseases	➢ Awareness creation; mosquito nets; Boiling and treatment of drinking water if collected from water pools; ➢ Regular supervision of the piping in order to identify system malfunctioning early enough	• Proponent; • Naivasha water and sanitation company	Inspector	Precautionary principle	once	30,000
18. Hydrological Situation	➢ Monitor the water trends in the Water supply project over time. ➢ Catchment is maintained at all times in accordance with Water Resources	➢ NAIVAWASS • proponent	Proponent	measurements	Periodic	should be part of Proponents cost

	Management Rules.					
19. Disturbance e.g of animals	➢ Naivawass will ensure minimal working hours especially in the sanctuary. ➢ They will also not use machines in the sanctuary only using hand tools i.e. jembes and spades ➢ The trenching and the backfilling will be done the same day to reduce the risks of the animals falling in the trenches or being trapped there.	• Proponent and Service providers	Proponent	Observation	During Construction	Nil
20. Internal Audits to ensure observation of laid down procedures and laws governing project.	➢ Monitoring will involve measurements, observations, evaluation assessment of changes in water quality, waste management, noise levels, contractor safety etc.	• proponent	proponent	Annual inspections	Annually	40,000
21. Unpredictable impacts i.e digging up graves, hostility during digging etc	➢ Ensure significant recoinnaisce study of the area before trenching begins and also consult with the owners of the areas to ensure such areas are not affected.	• proponent	Proponent i.e NAIVAWASS	INSPECTION BEFORE	During construction	nil

7.2 Management Plan Principles

This proposed project is geared towards meeting the water demand for the residents of Kayole Mirera area and its environs. The project will observe environmental conservation requirements in accordance to the established laws and regulations. To realize this goal, an Environmental Management Plan (EMP) has been prepared. Major factors that were considered in this EMP include;

- Enhancing integration of environmental, social and economic functions in the project implementation.
- Ensuring the water resources conservation throughout the project area and downstream.
- Ensuring soil erosion control and prevention of siltation into the water sources.
- Ensuring prevention of pollutants discharge into the water sources, and
- The contractors and other players in the project activities will be prevailed upon to implement the EMP through a sustained supervision and continuous consultations.

7.3 Monitoring

The overall objective of environmental monitoring is to ensure that mitigation measures are implemented and that they are effective. Environmental and social monitoring will also enable response to new and developing issues of concern. The activities and indicators that have been recommended for monitoring are presented in the EMP. Environmental monitoring will be carried out to ensure that all construction activities comply and adhere to environmental provisions and standard specifications, so that all mitigation measures are implemented. The contractor shall employ an officer responsible for implementation of social/environmental requirements. This person will maintain regular contact with proponent's county Environmental Officer. The contractor and proponent have responsibility to ensure that the proposed mitigation measures are properly implemented during the construction phase.

The environmental monitoring program will operate through the preconstruction, construction, and operation phases. It will consist of a number of activities, each with a specific purpose with key indicators and criteria for significance assessment.

Monitoring should be undertaken at a number of levels. Firstly, it should be undertaken by the Contractor at work sites during construction, under the direction and guidance of the Supervision Consultant who is responsible for reporting the monitoring to proponent. It is recommended that the Contractor employ local full time qualified environmental inspectors for the duration of the

Contract. The Supervision Consultant should include the services of an international environmental and monitoring specialist on a part time basis as part of their team. Environmental monitoring is also an essential component of project implementation. It facilitates and ensures the follow-up of the implementation of the proposed mitigation measure, as they are required. It helps to anticipate possible environmental hazards and/or detect unpredicted impacts over time. Monitoring includes:

- Visual observations;
- Selection of environmental parameters;
- Sampling and regular testing of these parameters.
- Periodic ongoing monitoring will be required during the life of the Project and the level can be determined once the Project is operational.

7.3.1 Internal Monitoring

It is the responsibility of the proponent to conduct regular internal monitoring of the project to verify the results of the Contractor and to audit direct implementation of environmental mitigation measures contained in the EMP and construction contract clauses for the Project. The monitoring should be a systematic evaluation of the activities of the operation in relation to the specified criteria of the condition of approval.

The objective of internal monitoring and audit will be:

- To find out any significant environmental hazards and their existing control systems in force.
- Meeting the legal requirements as stipulated in the Environmental Management& Coordination Act, EMCA-1999.

The responsibility for mitigation monitoring during the operation phase will lie with the Environmental Section of the proponent. Environmental monitoring of the following parameters is recommended as a minimum for the Project.

Noise Levels Monitoring

Although noise during construction is expected to be a problem, periodic sampling of Contractor equipment and at work sites should be undertaken to confirm that it is not an issue. Noise level monitoring could be supplemented by consulting with Project Affected People in the first instance to identify the level of monitoring required.

Air Quality Protection

The Construction Contractor shall monitor wind velocity and site dust levels during earthmoving activities. The Construction Contractor shall also monitor emissions from vehicles. If excessive dust is generated, the Construction Contractor shall immediately water down areas generating dust or, if this is not effective, cease the activities generating dust. Stop all excavation work if wind threshold velocity has been exceeded.

Soil Erosion Monitoring

The excavation of earth will exacerbate soil erosion. It will, therefore, be the responsibility of the Contractor's environmental inspectors to ensure the implementation and effectiveness of erosion control measures. Focus should be given to work sites where soil is disturbed and its immediate environ.

Monitoring of Accidents/Health

The Contractor's safety and health officer must make sure that appropriate signs are posted at appropriate locations/positions to minimize /eliminate risk. The proponent will have overall responsibility to oversee that all environmental measures are put in place and that regulations are enforced. The construction supervision consultant should assist the proponent in this process in order to make sure that contractors fulfill the environmental requirements

The following parameters could be used as indicators:

- Presence of posted visible signs
- Level of awareness of communities pertaining to dangers/risks
- Accident reports. Records on actual accidents associated with the project could be compiled.

Waste Management Monitoring

The Construction Contractor shall regularly monitor the management of wastes to ensure that;

All stored waste shall be contained within construction sites;

Solid waste: all site waste is to be collected and disposed of in an approved site. Where possible segregation of waste (paper, glass, metal) should be undertaken and recycling opportunities identified.

Workforce Training

The Construction Contractor shall ensure that all workers have been inducted. The Construction Contractor shall regularly monitor that occupational health and safety requirements are implemented. The client representative shall audit that all requirements are met. Where

occupational health and safety requirements are not being implemented relevant workers shall immediately be trained and instructed to implement these requirements.

7.3.2 External Monitoring and Evaluation

The Consultant recommends that a consultant should be hired to carry out Annual Environmental Audits in line with NEMA requirements. NEMA has the overall responsibility for issuing approval for the Project and ensuring that their environmental guidelines are followed during Project implementation. Its role therefore is to review environmental monitoring and environmental compliance documentation submitted by the implementing authorities and they would not normally be directly involved in monitoring the Project unless some specific major environmental issue arose.

The proponent through the consultant will therefore provide NEMA with reports on environmental compliance during implementation as part of their annual progress reports and annual environmental auditing reports. Depending on the implementation status of environmentally sensitive project activities, NEMA will perform annual environmental reviews in which environmental concerns raised by the project will be reviewed alongside project implementation.

Table 3: Monitoring Plan Table

Environmental Component	*Standard*	*Location*	*Frequency*	*Supervision*
Soil Erosion	NEMA Guidelines	Construction Site and the Surrounding	During & after Construction	Proponent
Diesel and Oil Spillage	EMP	Equipment, vehicles and Machinery	Continuous	Proponent
Noise levels	NEMA guidelines on Noise (LN 25) <75dB	Decommissioning Site and the surrounding	Quarterly	Proponent Contractor
Occupational Health and Safety Hazards	EMP	Decommissioning site and the surrounding	End of project life cycle	Contractor Proponent
Rehabilitation of Site	EMP	Construction Period & End of the Project cycle	End of project life	Contractor proponent
Accidents	EMP	Construction & Decommissioning Phase	Continuous	contractor

Environmental Compliance	EMCA Regulations	Throughout Operation phase	Yearly	Consultant Proponent

7.4 Occupational Safety and Health issues

During construction phase, the following mitigation and management measures will be put in place:

- Dust control through regular watering of access roads
- Use of respiratory protective equipment by workers closely involved in excavation, blasting and crushing activities
- Capacity building and training of personnel with respect to environment, health and safety shall be observed. Personal protective equipment as per health safety regulations and medical checkup of workers as is required by factories and other places of work Act(cap 514) shall also be observed.
- Observing effective emergency response plans to reduce health and safety risks.
- Waste, including excavated soil and debris shall be properly disposed off by backfillingand landscaping. The contractor shall provide acceptable and standard sanitary convenience to the workers.
- Health and safety issues
- Limiting the extent of site clearance as far as possible.
- Keeping stockpiled materials moist.
- Rehabilitating disturbed areas as soon as possible.
- Keeping earth and gravel roads water supply project.
- Maintaining machines in good order. Workforce accidents. The following measures will be introduced to minimize adverse workforce-induced impacts, and enhance potential benefits:
- Implementation of a preferential employment strategy.
- Ensure that health programmes and measures are provided for the construction workforce (e.g. Programmes on STDs and occupational health).
- A structured consultation programme will be implemented to ensure that there is regular liaison and interaction with community representatives, local authorities and NGOs. The consultation structure will be used to discuss workforce issues and community concerns, to

agree on any corrective measures and to discuss ways to enhance the provision of basic services by local entrepreneurs.

- Road signs will be put in place and the speed of vehicles controlled. Heavy traffic shall be restricted to the day period for reasons of security and the restful sleep of the inhabitants.

CHAPTER EIGHT: PUBLIC PARTICIPATION AND CONSULTATION

8.1 Introduction Legal Requirement

Section 17 of the Environmental (Impact Assessment and Audit) Regulations of 2003, requires that all ESIA Studies must incorporate Public Consultation (PC). The aim of the PC is to ensure that all stakeholders interested in a proposed project (including project beneficiaries and the general public in the vicinity of the proposed project) are identified and their opinion considered during project planning, design, construction, operation and decommission phase. Public participation is basically concerned with involving, informing and consulting the public in planning, management and other decision-making activities. Public participation tries to ensure that due consideration is given to public values, concerns and preferences when decisions are made. It encompasses the public actively sharing in the decisions that government and other agencies make in their search for solutions to issues of public interest. Effective public participation requires the availability of adequate information in public inputs. The latter involves various values, critiques, questions, information, suggestions and other inputs, which are expressed by individuals, groups or organizations among the general public in an attempt to influence decision-making. Public consultations with interested and affected parties (IAPs) were done with the following aims:

- To inform the local people, leaders and other stakeholders about the proposed project and its objectives
- To seek views, concerns and opinions of people in the area concerning the project
- To establish if the local people foresee any positive or negative environmental effects from the project and if so, how they would wish the perceived impacts to be addressed.
- To find out if there are issues or places of cultural/or religious importance to the local communities that could be negatively impacted upon by the project and its infrastructure.

8.2 Methodology

Public participation was mainly achieved through direct interviews, observations, questionnaire administration, holding a stakeholder workshop and a public meeting. The ESIA team began the public consultation process by holding preparatory meetings to strategize on how to engage the stakeholders in the ESIA process. This was done in consultation with the proponent and

members of self-help group who helped in the process of identification of the significant actors/stakeholders who could provide data relevant to the proposed project

8.2.1 Consultation with Interested and Affected Parties

In compliance with the requirements of the regulations, the proponent and the consulting team conducted several interviews with opinion leaders e.g. the Sub County commissioner, Sub County Water officer, Sub County environment Officer, Hells gate and Lake View Chiefs, ward administrators and Member of the county assembly (MCA) and Kayole and Mirera residents. The consultation process also included to a large extent public consultation through structured questionnaires circulated to the relevant parties and interviews with relevant officers.

Objectives

- To inform local people about the proposed development activities.
- To seek views, concerns and opinions of people in the area concerning the project
- Incorporate the information collected in the ESIA project report.
- To establish if the local people foresee any positive or negative environmental effects from the project and if so, how they would wish the perceived impacts to be addressed.

The Questionnaires

The questionnaire was to assist in gathering information and opinions relating to:

I. Awareness about the proposed development project
II. Acceptance of the proposed project development by the respondents and
III. Whether the proposed water project will cause negative impacts on the following:
    - Natural forest and ecology of the area
    - The human environment
    - Recreational and leisure facilities
    - Public health and safety
    - Water resources and quality
    - The access to public utilities
    - Areas of scenic beauty
    - Road transport and
    - Communal/social importance sites
    - Land, property and crops.

8.3 Comments and views from stakeholders

Public participation meetings for the project were carried out on the Month of July 2016, 4th July 2016 at Mirera area, and on 6th July 2016 at Kayole area there was also a stakeholders meeting held on 8th July 2015 at the NAIVAWASS boardroom.

The key informants were mainly neighboring residents, local leaders, Institutions among other facilities

The questionnaires with names and contacts of the people consulted as well as their views and comments regarding the project are attached in appendixes. It is worth noting that, the majority of the people supported the project citing increment in water supply in the area as a major reason. Issues raised during the consultations with the public included the following:

- Positive benefits; creation of employment, provision of clean water, adequate supply of water etc.
- Negative benefit; social diseases increment, loss of land, change of the original nature of land/ beauty, pvc and paper wastes etc.
- Social economic impacts; improvement of the standards of living, reduction in tooth decay and water related diseases
- Great emphasis on willingness to support the project

Table 8.1: Summary of the outcome of consultations

INSTITUTION/PERSON	ISSUES
Kenya wildlife service training institute	• **Vegetation clearing-** the Kenya wildlife training institute representative raised the concern about the vegetation cleared during the project construction whereby the environment team suggested that the cleared vegetation will be replanted with consideration of endemic species in place. • **Animal disturbance-** they raised an issue on animal disturbances due to the presence of the workers and the machines to be used during the construction period in the sanctuary. The proponent will aim at using machines with little disturbances or none at all and also limit the working hours in the sanctuary.

Panda flowers farm	• **Time frame of the projects**-the panda group wanted to know how long the project will take and if there is a possibility of it starting soon because it is eagerly awaited by the community and the panda who donated the land • **Possibility of using the borehole in future-**the panda group wanted to know if they will use the borehole in future or not • **Benefits of the project to the community**-the**y** wanted to know the benefits accrued from the project because they donated the land and if they still incur any charges as the rest of other members who will be willing to connect the water • **Land ownership-** it was still unclear on the conditions on the use of land and its ownership and the terms of transfer which was agreed that Eng: Wahome will seek further clarification about land ownership
Kayole Community members	**Consistence of water-** the community wanted to know the consistence of the water from the project, they were assured on water consistence and that the project is aiming at supplying water throughout since the project wants to ensure adequacy of water in the area. One of the main project activities will be drilling a borehole to increase the water quantity. **Who to incur the piping cost-** they raised the issue of piping cost and it was made clear to them that the Naivawass will be responsible for the trenching and laying out the pipe but only the main pipes .The owners of the households will bear the piping cost to connect to their own households from the mains pipes. **Source of labour during project construction-** they raised a concern on the sourcing of labourers from outside the locality and they were assured that the unskilled labour will come from the community members **Payment after work-** the raised an issue on delayed payment he project engineer clarified to them that contractor will be given terms and conditions of work and above all ensure that people are paid after completing their jobs with the current payments rates in the area. **Affordability-**they also raised an issue on how affordable the water will be and this was clarified by the project engineer by breakdown of the costs as follows: The individual connection will be Ksh 5,000, and also they can be able to pay it in installments within a year.

Mirera residents	**Project design and the target area-** A serious issue was raised by the resident of Mirera [oasis] on water scarcity in their area, they complained that the project has left them behind or they were not considered well since the project will not supply them with water. The project Eng told them that he will look at the designs again and there will be a room for redesigning they will be considered and there is a second project phase targeting the area, because it had to work within the set budget.
Chief	• The chief stated that the administration has full support for the project since it will improve the water quality for the people of Kayole and Mirera • He also stated that they are dedicated in ensuring that the project security and project cooperation components are realized.

Summary of the community members' comments and issues raised.

Name of the interviewee	location	Issues raised
Peter nduati	kayole	She says water borne related illness has been on the rise due to the fact that, there is no pre-treatment to some of the water they use domestically. No major effect on the current water sources if project implemented
Jane waruguru	kayole	Water rationing affects her domestic operations. Therefore she wishes to have a constant supply from the water kiosks. More water kiosks to be established
Helen wangechi	kayole	She buys water expensively and sometimes is forced to walk longer distance in such of water. Adequate supply from the project would be highly welcome.
Charles wanyeki	kayole	He indicated that there would be no negative effect coming from the proposed project on the current water sources and the surrounding environment
Samuel njoroge	Kayole	Water rationing sometimes forces them to use untreated water that has affected them negatively. They don't have suitable chemicals for water treatment. Small tanks that they have, do not keep water for long

Gideon kamau	kayole	Proposes the project because will provide safe water for domestic uses. Enable equitable distribution to every household.
Patricia wairimu	Mirera	she buys water expensively, she proposes the project if that would reduce tariff and increase availability throughout the week
Joyce kamau	Mirera	she has small water tanks that do not sustain his family for longer period. Typhoid, Diarrhea has been on the rise for the last year
Beatrice wambui	Mirera	Water rationing affects her domestic operation and farming operations. she supports the project and confirms that there will be no environmental hazard that will arise from the proposed project

The summary results of the consultation were as follows:

From the various stakeholder discussions,

- it was clear that the project was in full gear and has maximum support
- They do not object the proposed project.
- All confirm that the proposed development will not cause any negative environmental impacts to community at large and to environment in general
- They do not have any conflict in terms of land ownership

CHAPTER NINE: DECOMMISSIONING

9.1 Overview

Like any other project, the facilities, such as turbines, storage tanks, pipes, generators, pylons and substations' equipment used in this Project will have a lifetime after which they may no longer be cost effective to continue operation. At that time, the project would be decommissioned and the existing equipment removed. Where possible the proponent may want to renew the systems components (replace existing project equipment with new project equipment on the same site). Decommissioning also occurs when proponent ceases to have an interest on the existing project or have other reasons that make it mandatory to leave the current project altogether.

When the project moves into the decommissioning stage, negative impacts that may result from decommissioning activities will have to be mitigated. Decommissioning may require external contractors. The components of negative environmental mitigation that will be addressed include; risk management analysis and emergency response. Implementation and monitoring of environmental, health, and safety issues with regards to legislations outlined in the legislative framework in chapter two of this report and the laws of Kenya will have to be put into consideration. It will also be necessary for the proponent to undertake comprehensive environmental audits and inspections before and after decommissioning and submit the respective audit reports to NEMA for evaluation and approval.

There are typically such requirements as personal protective equipment, maintaining a safe workplace, fire prevention, safe work practices, etc., as provided in the Kenya Safety Code and the Factories Act that the contractor must adhere to during decommissioning. Contractors are expected to comply with these requirements as a minimum. Contractor must avail his safety plans for the decommissioning work and this must be reviewed for compliance.

The contractor's best safety practices will then be incorporated into the decommissioning plan as appropriate. The activities that the contractor will have to keep abreast include checking of potential hazards and risks, development of a risk register (The risk register is an evergreen document that will be used and be updated on a continuous basis to identify and mitigate risks as they surface), contractor's personnel will be expected to regularly observe work practices and provide positive reinforcement and guidance to fellow employees, work practices that may be

considered to place employees or the environment at risk will be identified, evaluated, and modified as necessary to eliminate or substantially reduce the risk.

9.2 Project Decommissioning Design

The proponent shall plan, engineer and implement the decommissioning, demolition and cleanup of the facility and other associated structures. The proponent shall develop decommissioning designs so that hazardous and dangerous materials are safely removed and salvageable equipment and structures are protected before the remaining facilities are safely dismantled. The designs shall carefully consider reuse goals for the site and materials. It should however be noted that at the time of decommissioning of the project, a separate ESIA for decommissioning shall be necessary.

Existing Condition Evaluation

The first step in engineering a decommissioning project is to evaluate existing conditions and plan for appropriate handling of all site conditions, materials or structures. The considerations to be considered shall include:

- Developing an inventory of hazardous and solid wastes, underground Water pipes, storage tanks and other subsurface structures to assure proper management.
- Identification of electric utilities and communication systems to ensure that active site operations continue uninterrupted.
- Assessment of history structures and materials, which can be reclaimed to comply with preservation requirements (if applicable) and to maximize cost recovery.

Facility demolition

The development of demolition plans shall consider the structural stability of the units being taken down, clearance of adjacent structures and rigging requirements. The proponent shall engineer the dismantling of the facility components, structures, demarcation of facilities taking care of neighboring facilities.

Preparations for the site re-use

Future site use is a key consideration because costs can be reused by understanding which components of the site have to be removed versus build over or around. Topography and backfilling needs will be efficiently addressed relative to future construction and storm water management.

Materials Recycling and Re-use

Materials that can be recycled, reused, or salvaged shall be identified and removal planned accordingly to capture financial benefits.

Integrated Safety design and Review

Safety for workers and the community is of great importance, and includes physical hazards, protection of water ways, and control of potential airborne hazards

CHAPTER TEN: CONCLUSION AND RECOMMENDATION

10.1 Conclusions

The Project will reliably meet the rapidly increasing water supply demands of the residents of kayole –mirera. The Project will directly contribute in achieving vision 2030 through improved water supply. It will improve the economic development in Kenya through the availability of a good quality water supply purposely for domestic use and creation of employment.

The Project's impact on the physical environment will be manageable, mostly short term construction-related impacts, which will be mitigated. The report has outlined mitigation measures in the EMP matrix in chapter Seven (7) to be implemented during the various project phases.

Given that the Environmental Impact Assessment undertaken under this Project, and considering the Project's strong economic justification, the Project satisfactorily meets environmental protection requirements provided that the mitigation, monitoring, and reporting programs are carried out.

Based on field work and consultations with the public and stakeholders, it was concluded that:

It is unlikely that the Project will have significant adverse social and environmental impacts. Most adverse impacts will be of a temporary nature during the construction phase and can be managed to acceptable levels with implementation of the recommended mitigation measures for the Project such that the overall benefits from the Project will greatly outweigh the few adverse impacts.

All the negative impacts will either be moderate or lesser in rating and could be easily mitigated.

10.2 Recommendations

The consultant recommends that the proposed project be implemented in compliance with all the relevant legislation and planning requirements of Kenya at all times. In line with this, the proponent and the contractor must take the legislative framework provided in this report into consideration, during and after the implementation of the project, as will be appropriate.

Replant vegetation on bare areas within the vicinity of the water supply project to prevent soil erosion. This will help in ensuring that the water supply project pipeline depth is not interfered with because of siltation, grass should be planted along the edge of the water supply project so as to help in controlling soil erosion.

REFERENCES

i. Kenya gazette supplement Acts 2000, Environmental Management and Coordination Act Number 8 of 1999. Government printer, Nairobi

ii. Kenya gazette supplement Acts Land Planning Act (Cap. 303) government printer, Nairobi

iii. Kenya gazette supplement Acts Local Authority Act (Cap. 265) government printer,Nairobi

iv. Kenya gazette supplement Acts Penal Code Act (Cap. 63) government printer, Nairobi

v. Kenya gazette supplement Acts Physical Planning Act, 1999 government printer, Nairobi

vi. Kenya gazette supplement Acts Public Health Act (Cap. 242) government printer,Nairobi

vii. Kenya gazette supplement number 56. Environmental Impact Assessment and Audit Regulations 2003. Government printer, Nairobi

APENDICES

Appendix 1 PICTORIAL SECTION

Appendix 2 Sample questionnaires for public participation

Appendix 3-9 minutes

Appendix 10-18 attendance lists for meetings

Appendix 19 merged drawing

Appendix 20 Geology report

Appendix 21 Lead Expert license

PICTORIAL SECTION









MINUTES FOR THE MEETING HELD ON 8TH JULY 2016 AT NAIVAWASS BOARD ROOM AT 10:50AM

Members present – Copy of attendance list attached.

Managing director –Naivawass

Agenda

1. Preliminaries
2. Confirmation of the previous meeting
3. Introduction of the project
4. Members' contribution
5. Environmental social impact assessment
6. Any other business

Min 1/16: preliminaries

The meeting was opened by a word of prayer from purity and the managing director called the meeting to an order

Min 2/16: Confirmation of the previous minutes

Since it was the first meeting there were no previous minutes, the stakeholders were informed about the meeting earlier and requested to avail themselves

Min 3/16: Introduction of the project

The project was introduced by MR Wahome, project manager, he introduced the project and the areas it targets to supply, the project is aimed at supplying quality water and at a cheap price and also address water shortage in the area

Min 4/16: Members' contribution

The members wanted the following to be addressed:

CONFLICTS ON WATER SUPPLY BUSINESSES - piping to be done at areas where any vandalisation can be noticed, this will enable the community to be able to identify points where in case of leakages they will notify the relevant authority on the same. The parties involved in water businesses may consider the project negative because it means the community won't rely on them for water

KWS CONCERNS:

- **Vegetation clearing-** the Kenya wildlife training institute representative raised the concern on the about the vegetation cleared during the project construction whereby the environment team suggested that the cleared vegetation will be replanted with consideration of endemic species in place
- **Animal disturbance-** during the project construction we aim at using machines that has little vibration or none at all to ensure that the wild animals are not disturbed in their natural ecosystem and that their habitats are not altered
- **Compensation on cleared vegetation -**since the project does not target to utilize a big area little trees will be cleared but since they are renewable resources they will be replanted again, and of the same species to ensure that the vegetation cover is maintained even after the project is complete, because as much as we promote conservation we also need to utilize our environmental resources sustainably without depleting them.

PANDA FLOWER FARM CONCERNS:

- **Time frame of the projects**-the panda group wanted to know how long the project will take and if there is a possibility of it starting soon because it is eagerly awaited by the community and the panda who donated the land
- **Possibility of using the borehole in future-**the panda group wanted to know if they will use the borehole in future or not
- **Benefits of the project to the community**-the**y** wanted to know the benefits accrued from the project because of the land donation and if they still incur any charges as the rest of other members who will be willing to connect the water
- **Land ownership-** it was still unclear on the conditions on the use of land and its ownership and the terms of transfer which was agreed that MR Wahome will seek further clarification about land ownership

Min 5/16: environmental social impact assessment

The issues relating to environment were presented by NEMA Lead expert, Mary Kamau, and the relevant legislations, policies and laws relevant to the project; the project has minimal detrimental effect to the environment and the surrounding. Since the project won't involve intense activities that will cause potential damage to the environment, the little negative impacts

will be mitigated, and ensure that ecosystem functions and processes are maintained. The project will also work and comply with legal and institutional framework relevant to the project

Min 6/16: any other business

The chief said that the community is happy about the project and that they are ready to have it

Min 7/16: Adjournment

There being no other business the meeting adjourned at 1.00 pm with a word of prayer from one of the member

Minutes taken by: Martin Kiambati Date..... Sign. 8/9/16

Minutes confirmed by: Mary Kamau Date..... Sign. 8/9/16.

Lead NEMA expert

Nema reg. No. 7071

MINUTES FOR THE MEETING HELD ON 7TH JULY 2016 AT MIRERA CHIEFS CAMP AT 10:30

Members present

Members absent with apology

Managing director –Naivawass

Agenda

7. Preliminaries
8. Confirmation of the previous meeting
9. Introduction of the project
10. Members' contribution
11. Representatives from the community
12. Any other business

Min 1/16: Preliminaries

The meeting was opened by a word of prayer from the community member, the chief called the meeting to order.

Min 2/16: Confirmation of the previous minutes

Since it was the first meeting there were no previous minutes, the members were called upon to attend the meeting on twitter and through announcement at church

Min 3/16: Introduction of the project

The project was introduced by MR Wahome, project manager, he introduced the project and the areas it targets to supply, the project is aimed at supplying quality water and at a cheap price and also address water shortage in the area

Min 4/16: Members' contribution

The community members wanted the following to be addressed:

- Consistence of water
- Source of labour during project construction
- Affordability
- Inequality on water supply and target area

Consistence of water- the community was assured on water consistence and that the project is aiming at supply water throughout

Source of labour during project construction- the unskilled labour will be provided by the community members that people are paid after completing their jobs

Affordability-the projects targets low income earners so as to be able to connect water at a lower fee

Inequality on water supply and target area- the people on the other end of Mirera (oasis) were having an issue that the lower side of Mirera had enough water hence they wanted the other side to be considered during the project cycle

Min 5/16: Representatives

The members suggested having them represented by some community members so as to be able to get relevant information about the project as well as give views on the same and if the water will be able to get into the tanks identified

Min 6/16: Any other business

The chief said that the community is happy about the project and that they are ready to have it

Min 7/16: Adjournment

There being no other business the meeting adjourned at 2.00 pm with a word of prayer from a community member.

Minutes taken by: Martin Kiambati Date.....Sign.....7/7/16.....

Minutes confirmed by: Mary Kamau Date.....Sign.....7/7/2016.....

Lead NEMA expert

MINUTES FOR THE MEETING HELD ON 4TH JULY 2016 AT AKAYOLE MARKET AT 4PM

Members present- attendance list attached

Members absent with apology

Managing director –Naivawass

Agenda

13. Preliminaries
14. Confirmation of the previous meeting
15. Introduction of the project
16. Members' contribution
17. Representatives from the community
18. Any other business

Min 1/16: preliminaries

The meeting was opened by a word of prayer from the community member, the chief called the meeting to order.

Min 2/16: Confirmation of the previous minutes

Since it was the first meeting there were no previous minutes, the members were called upon to attend the meeting on twitter and through announcement at church and other social places.

Min 3/16: Introduction of the project

The project was introduced by MR Wahome, project manager, he introduced the project and the areas it targets to supply, the project is aimed at supplying quality water and at a cheap price and also address water shortage in the area

Min 4/16: Members' contribution

The members wanted the following to be addressed:

- Consistence of water
- Who to incur the piping cost
- Source of labour during project construction
- Payment after work
- Affordability

Consistence of water- the community was assured on water consistence and that the project is aiming at supply water throughout

Who to incur the piping cost- the project will do some piping

Source of labour during project construction- the unskilled labour will be provided by the community members

Payment after work- the contractor will be given terms and conditions of work and above all ensure that people are paid after completing their jobs

Affordability-the projects targets low income earners so as to be able to connect water at a lower fee

Min 5/16: Representatives

The members suggested having them represented by some community members so as to be able to get relevant information about the project as well as give views on the same

Min 6/16: Any other business

The chief said that the community is happy about the project and that they are ready to have it

Min7/16: Adjourment

There being no other business the meeting adjourned at 5:30pm with a word of prayer from the community member (shosho)

Minutes taken by: Martin Kiambati Date.....Sign.....4/7/16.....

Minutes confirmed by: Mary Kamau Date.....Sign.....4/7/16.....

Lead NEMA expert

ANNEX 1

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT QUESTIONNAIRE FOR THE PROPOSED KAYOLE MIRERA WATER SUPPLY PROJECT

Our client (NAIVAWASS) is proposing a water supply project aimed at supplying water in kayole/mirera location. In connection with this; NAIVAWASS has contracted an EIA Expert registered with NEMA to carry out consultation and public participation through questionnaires for the proposed environment and social impact assessment

Therefore, as a key stakeholder and community member interested /affected party, we would like to get your opinions/ views on the proposed project

Name ofInterviewer:……..
Date ofInterview:……
Name of Respondent:……
Contact: address/Tel:……..
Position in the Household:……..
Sub county……
Name of Village:……

Please fill in the following questionnaire giving in your comments where necessary.

SECTION A ENVIRONMENTAL ASPECTS

1. Are you aware of the proposed project? Yes ☐ No ☐

(a) If yes, how did you get to know about the project THROUGH tick one

Friends ◯ Chief Baraza ◯ Neighbors ◯ Others specify……..

(b) Do you support the project Yes ☐ No ☐

Ifno

Explain……

……

……

(c) How do you expect to be affected by the project (please explain) tick one

Positive ◯

Negative ◯

Don't know ◯

Any other ◯

2) What is your main source of water?

River ◯

Borehole ◯

NAIVASHA WATER, SEWERAGE
& SANITATION COMPANY LTD.

Jonka Building
P. O. Box 321
Naivasha Kenya
Email: naivashawater@gmail.com
Tel: 020-2314807, 0705 877770
www.naivashawater.co.ke

TENDANCE LIST FOR THE MIRERA-SUSWA WATER SUPPLY PROJECT BARAZA HELD ON 7TH July 6, 6 AT THE CHIEF'S CAMP

NAME:	DESIGNATION:	ID NO:	TEL NO:	SIGN:
ELIZABETH WANJIRU KIMANI	MIRERA	21546095	0728782365	[illegible]
ANGELINA MURANI	MIRERA	31482205	0720027 65	[illegible]
Bernard Njenga Kariuki	"	23071839	0720962655	[illegible]
GRACE WANGUI	MIRERA	2938806	0706105966	Grace wangui
BETHSETA NJOROGE	MIRERA	11175918	0725993257	[illegible]
EDDA WANJIKU	MIRERA	21130036	0721365872	[illegible]
JANE NJOKI	MIRERA	11446363	0721147994	Jane
JOHN Ndwaru	MIRERA	5181713	0722569109	[illegible]
JANE WAIRIMU	MIRERA	27416724	0701325553	[illegible]
Joseph MACHARIA	Village Elder	7150725	0726666501	[illegible]
DAVID WANJALA	COMMUNITY	23309307	0725770364	[illegible]
Lucy Nyambura	MIRERA	8590676	0714739949	Lucy
ELIZABETH NJERI	MIRERA	26509688	0707616382	[illegible]
NADIA MURIITHI	MIRERA	0583862	0705945264	[illegible]
MARGRATE NYAKIO	MIRERA	7559413		[illegible]

NAIVASHA WATER, SEWERAGE
& SANITATION COMPANY LTD.

Jonka Building
P. O. Box 321
Naivasha Kenya
Email: naivashawater@gmail.com
Tel: 020-2314807, 0705 877770
www.naivashawater.co.ke

TTENDANCE LIST FOR THE MIRERA-SUSWA WATER SUPPLY PROJECT BARAZA HELD ON 7TH July 6, 16 AT THE CHIEF'S CAMP

O	NAME:	DESIGNATION:	ID NO:	TEL NO:	SIGN:
	KABA GEORGE	MIRERA	0091328	0725278510	
	JOHNSON NDIRITU KARIUKI	MIRERA	3643133	0725265556	
	MICHAEL NJUGUNA MAINI	MIRERA	0182900	0722655101	
	BENSON MWANGI	MIRERA	3642094	0713167670	
	IBRAHIM NGUGI	MIRERA	21711715	0724686217	
	JOHN KIMANI	MIRERA	13534953	0721773096	
	Beth mwangi	Mirera	5787422	0728801012	
	Dorcas Thuo	Mirera	0724635	0711559974	
	Hellen muthoni	Mirera	5491252	0721104353	
	Mildred Shenemo	Mirera	10298496	0726658988	
	Lavenda Shiyonzo	Mirera	"	0707290051	
	Alice Wawira	Mirera	11238888	0715027168	
	Samuel Musyoka	Mirera	11050580	0721347655	
	DANIEL M. MUGAMBI	MIRERA	327850	0716496579	

NAIVASHA WATER, SEWERAGE
& SANITATION COMPANY LTD.

Jonka Building
P. O. Box 321
Naivasha Kenya
Email: naivashawater@gmail.com
Tel: 020-2314807, 0705 877770
www.naivashawater.co.ke

TTENDANCE LIST FOR THE MIRERA-SUSWA WATER SUPPLY PROJECT BARAZA HELD ON 7TH July 6, 16 AT THE CHIEF'S CAMP

)	NAME:	DESIGNATION:	ID NO:	TEL NO:	SIGN:
	Mathiba Mwangi	Mirera	1338630	0720335563	Mathiba
	Caroline Mwangi	Mirera	9566872	0727703827	Caroline
	PETER [illegible]		20182561	0725653845	
	FRANCIS WAWERU	Mirera	24817432	0725089	
	JOSEPH NJOROGE KARUGA	MIRERA	1420534	0720330434	
	MILKA WANJIKU WANGUI	MIRERA	22SH796	0726311139	

NAIVASHA WATER, SEWERAGE
& SANITATION COMPANY LTD.

Jonka Building
P. O. Box 321
Naivasha Kenya
Email: naivashawater@gmail.com
Tel: 020-2314807, 0705 877770
www.naivashawater.co.ke

DANCE LIST FOR THE MIRERA-SUSWA WATER SUPPLY PROJECT BARAZA HELD ON 7TH July 6, THE CHIEF'S CAMP

ME:	DESIGNATION:	ID NO:	TEL NO:	SIGN:
ABA GEORGE	MIRERA	0091328	0725278510	
SAMSON NDIRITU KARIUKI	MIRERA	3643133	0721265[illegible]	
MICHAEL NJUGUNA MWANIU	MIRERA	0182900	0722655101	
BENSON MWANGI	MIRERA	3642094	0713167670	
BRAHIM NGUGI	MIRERA	21711715	0724686217	
JOHN KIMANI	MIRERA	13534953	0721773096	
Beth mwangi	Mirera	5787422	0728801012	
orcus Thuo	Mirera	0724635	0711539974	
ellen muthoni	Mirera	5491256	0721104353	
dred Shememo	Mirera	10298496	0726658988	
enda shiyonzo	mirera	"	0707890951	
ice Wairimu	Mirera	11288388	0715007168	
amuel Musyoka	Mirera	11050580	0721347699	
ANIEL M. MUGAMBI	MIRERA	3275511	0716996579	

NAIVASHA WATER, SEWERAGE
& SANITATION COMPANY LTD.

Jonka Building
P. O. Box 321
Naivasha Kenya
Email: naivashawater@gmail.com
Tel: 020-2314807, 0705 877770
www.naivashawater.co.ke

TENDANCE LIST FOR THE MIRERA-SUSWA WATER SUPPLY PROJECT BARAZA HELD ON 7TH July 6, 6 AT THE CHIEF'S CAMP

NAME:	DESIGNATION:	ID NO:	TEL NO:	SIGN:
ELIZABETH WANJIRU KIMUTHIA	MIRERA	21546095	0728782365	[signature]
ANGELINA MUREITHI	MIRERA	31482205	0720027165	[signature]
Bernard Njenga Kariuki	"	23071839	0720962655	[signature]
GRACE WANGUI	MIRERA	2938806	0706105916	Grace wangui
BEATRICE NJOROGE	MIRERA	11175918	0725993257	[signature]
EDNA WANJIKU	MIRERA	21430036	0721365872	[signature]
JANE NJOKI	MIRERA	11146363	0721147994	Jane
JOHN Ndwaru	MIRERA	5181713	0722569109	[signature]
JANE WAIRIMU	MIRERA	27416724	0701325553	[signature]
Joseph MACHARIA	Village Elder	7150725	0726666501	[signature]
DAVID WANJALA	COMMUNITY	23309307	0725770364	[signature]
Lucy Nyambura	MIRERA	8340676	0714739949	Lucy
ELIZABETH NJERI	MIRERA	26509688	0707616382	[signature]
NADIA MUREITHI	MIRERA	0583862	0705945264	[signature]
MARGRATE NYAKIO	MIRERA	7559413		[signature]

NAIVASHA WATER, SEWERAGE & SANITATION COMPANY LTD.

Jonka Building
1st Floor
P. O. Box 321
Naivasha Kenya
Email: naivashawater@gmail.com
Tel: 050-2030438, 0729 895564

ATTENDANCE LIST FOR BARAZA HELD AT KAYOLE ESTATE ON KAYOLE-MIRERA WATER SUPPLY PROJECT ON 4TH JULY, 2016

S/No	Name	Designation	ID No	Contacts	Sign
1	Josphine Ndungu	CHIEF	11614362	0721270118	[illegible]
2	Lucy Wanjiru Ngare		5194664	0727-000467	Lucy
3	Esther Wanjiru		07875791	0729571351	EWanjiru
4	JANE WAGEREKA		11522542	0721469259	Wagereka
5	MARGARET MUGENDI		11372663	0726420802	[illegible]
6	MOSES KIAWERU		5782650	0710400669	[illegible]
7	PAUL MBUGUA		4930078	0710387504	[illegible]
8	ROBERT MUTURI		1763920	0721802415	[illegible]
9	JANE KIARUGURU		11653725	0721383389	[illegible]
10	NYAMBURA WA JOSEPH		. -	0716878748	NYA
11	Lydia Ibrahim		21519874	0726001117	[illegible]
12	Martha Muthoni Ngure		20675095	0720 84-8281	[illegible]
13	MOSES MUGO KAHATA		11465229.	0720659872	[illegible]
14	Margaret Wanjiru		21106848	0725501871	[illegible]
15	ESTHER KAHUGU		13384447	0721729485	[illegible]
16	VERONICAH WANJUGU		13209094	071457.938	Wanjugu
17	Njogu Kariuki		14283446	0723 524371	[illegible]
18	Peter Kamau		21879238	0723225770	[illegible]
19	Julius Njau		23040053	0724818344	[illegible]
20	JOSEPH MWAI		0478575	0723249042	[illegible]

NAIVASHA WATER, SEWERAGE & SANITATION COMPANY LTD.

Jonka Building
1st Floor
P. O. Box 321
Naivasha Kenya
Email: naivashawater@gmail.com
Tel: 050-2030438, 0729 895564

ATTENDANCE LIST FOR BARAZA HELD AT KAYOLE ESTATE ON KAYOLE-MIRERA WATER SUPPLY PROJECT ON 4TH JULY, 2016

S/No	Name	Designation	ID No	Contacts	Sign
1	Julius Kamau		11340150	0726748861	
2	PETER MUNGAI		10859905	0724961116	
3	DANIEL KIMANI NJOROGE		4908315	0722430609	
4	MATHEW G. W. MAIN		10875180	0724974458	
5	Grace Ndegwa		3065253	071166477	
6	LILIAN NJERI		22203239	0721694544	
7	HANNAH WANJIKU		11240502	0728375230	
8	Mary Kariuki		4554345	0721527201	
9	REBECCA NJAMBURA		23080190	0724461090	
10	SAMSON K. KAMAU		22697579	0718 297112	
11	ELIZABETH WAMBUI		22697579	0718 297112	
12	ERICK NJOROGE		22697579	0726728834	
13	WANJIKU NJUGUNA		12662559	0725802234	
14	FRANCIS KARARI MURAGE		11531412	0728812117	
15	Ruth M. Ndungu		0496043	0721101475	
16	HANNAH W. KAMAU		2954013	0700218544	
17	SUSAN NJOKI ~~Thuo~~ KAMAU		2940688	0725 579158	
18	NISERAH W. WAHOME		27015437	0710427704	
19	Samuel W. Njonge		3084138	0728042218	
20	MIRIAM MUMBI NDUBI		10653266	0725655525	

NAIVASHA WATER, SEWERAGE & SANITATION COMPANY LTD.

Jenka Building
1st Floor
P. O. Box 321
Naivasha Kenya
Email: naivashawater@gmail.com
Tel: 050-2030438, 0729 895564

ATTENDANCE LIST FOR BARAZA HELD AT KAYOLE ESTATE ON KAYOLE-MIRERA WATER SUPPLY PROJECT ON 4TH JULY, 2016

S/No	Name	Designation	ID No	Contacts	Sign
1	EUNICE N GITONGA		0480640	0726419222	
2	Mary Wanjiru Mwangi		~	0707329940	MARY
3	JOSPHINE MUTHONI		021221155	0713726159 0713720...	
4	SERAH NJAMBUI		12742266	0711398991	
5	Karanja Kungu	Resident	8621066	0723874229	
6	Nancy Wangui		24873627	0714050453	NK
7	James muhoti		0479352	0724850264 ~~0479352~~	
8	Simon Muchemi	Resident	5751813	0723-237354	
9	Esther Wambui	"	24098354	0716712049	
10					
11				1	
12					
13					
14					
15					
16					
17					
18					
19					
20					

Jonka Building
P. O. Box 321
Naivasha Kenya
Email: naivashawater@gmail.com
Tel: 020-2314807, 0705 877770
www.naivashawater.co.ke

NAIVASHA WATER, SEWERAGE & SANITATION COMPANY LTD.

TTENDANCE LIST FOR THE MIRERA-SUSWA WATER SUPPLY PROJECT STAKE HOLDERS MEETING ELD ON 8TH July, 2016 AT NAIVAWASS BOARD ROOM.

NAME:	INSTITUTION	DESIGNATION:	ID NO:	TEL NO:	SIGN:
Nathaniel Wahome	NAIVAWASS	Project Eng	21916047	0720 546 875	[signature]
Mary H Kamau	EIN LEAD EXPERT	LEAD EXPERT	23065949	0720232371	[signature]
Margaret Nyaguai	NAIVAWASS	Project dep	30198552	0718126740	[signature]
SAMSON KIOK	NAIVAWASS	Projects Supervisor	29992313	0721477012	[signature]
JULIET GATHU NGV	ENVIRONMENT EXPERT.	LEAD EXPERT ASS.	11911922	0722587656	[signature]
LUKAS NJUGHIRI	ENVIRONMENT	Assistant Researcher	29949989	0710279937	[signature]
PURITY KEMUNTO	ENVIRONMENT	ASSISTANT R.	28172320	0724071417	[signature]
JOSPHINE NDUNGU	HGA 0	CHIEF	11614362	0721290118	[signature]
Fridah Moraa	County Govt of Nkr.	Ward Admin-Lakeview	21756895	0726848244	[signature]
Jackson Warithe	County Government MCA Hellsgate	MCA Hellsgate	14450234	0717708178	[signature]
Nelson Otieno	KWSTI	Lecturer	10163	0720105374	[signature]
Martin Kiambati	Environmental	Assistant Researcher	28271223	0715562609	[signature]
Joseph Theuri	Naivawas	M.D.	2947930	0715148146	[signature]
CHRIS MBUGUA.	Kenya Flowers	Project's Coordinator	21637706 [illegible]	0719491239	[signature]
Mwbone Nyage	Ward Admin Hells Gate	County Gov of Nakuru	23128137	0722537308	[signature]

Appendix 19

Merged drawing will be include in the final copy submitted to NEMA.