M.L PATON INVESTMENTS LIMITED

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE EXISTING AND PROPOSED EXPANSION OF THE AGRICULTURAL PROJECT ON FARM No. 10449, 11117 AND 11118 IN SERENJE DISTRICT

Physical Address:
Farm No.10449
Luwombwa Farm Block
Serenje

KEGS

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Promoting Environmental Sustainability

August, 2023

Prepared For

M.L Paton Investments Limited
Farm No.10449
Luwombwa Farm Block
Serenje
,

Prepared By

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EXECUTIVE SUMMARY

Introduction

M.L Paton Investment Limited was registered in 2006 and begun its operations in 2015 on three fields. These fields are collectively referred to as Tumba Hills Ranch. Two of these fields i.e. F/10449, F/11118 are partially developed and have individual areas of 495 and 422 ha respectively. Farm F/11117 is undeveloped and has a total area of 686ha. The main activities on the farm include cropping, cattle production and egg production. Despite the farm operations having begun in 2015, the project has not been subjected to an Environmental and Social Impact Assessment (ESIA) due to the magnitude of the activities on the farm. However, MLP intends to expand its agricultural activities. In its quest to comply with the laws, specifically, the Environmental Management Act (EMA) No 12 of 2011, MLP has initiated ESIA studies for its current farm operations and facilities as well as for the proposed expansion.

The proposed MLP project is located within the Luwombwa Farm Block which is located 60km on the northwest of Serenje CBD. It can be accessed via the main Luwombwa Farm Block access road, which turns off the Great North Road at Mulilima, 45 km northwest of Serenje town. The farm is 38km from the Mulilima turn off and is the farm on the right. It is at the tip of the Tumba Hills. The main crops grown on the farm include wheat, soya beans, seed maize. MLP also keeps cattle and layers for egg production to supply beef and eggs to the local community. The developer intends to expand farm activities to include 380 ha centre pivot irrigation to grow wheat, seed maize and soya beans, 30 ha orchard drip irrigation to grow citrus and nut trees, a slaughter house to facilitate the slaughter of 3 to 6 cattle per week, cold room for storage and cold chain of the animal carcass', fenced pastures for fattening cattle and other livestock, expansion of chicken houses for layers up to 1000 chickens, building of fish ponds to supply the local community, Pigsty, Horse stable, aloe vera, fish ponds, tree orchards and vegetable crops.

The coordinates for the location of the farm are shown in the table below:

	South	East
A	13^{0}7'55.46"	29^{0}54'28.02"
B	13^{0}8'11.86"	29^{0}55'1.14"
C	13^{0}8'47.07"	29^{0}55'39.40"
D	13^{0}09'24.94"	29^{0}56'21.85"
E	13^{0}10'34.36"	29^{0}56'52.65"
F	13^{0}11'5.48	29^{0}57'40.69"
G	13^{0}11'7.00"	29^{0}58'31.39"
H	13^{0}09'9.91"	29^{0}59'1.24"
I	13^{0}09'34.81"	29^{0}58'13.71"
J	13^{0}8'56.56"	29^{0}56'56.07"
K	13^{0}8'24.30"	29^{0}57'8.13"
L	13^{0}7'28.29"	29^{0}55'0.32"

Project Objective

The objective of the proposed project is to produce wheat, soya beans and seed maize in order to contribute to food security in the country. The farm also has potential for fruit crops such as Lemons, vegetable crops, aloe vera, avocado and an orchard.

This document is an Environmental and Social Impact Assessment (ESIA) for the Existing and Proposed Expansion of the Agricultural project in Serenje District of Central Province. This ESIA report has been prepared by Kasumwa Enviroconsult & General Supplies Limited

(hereafter referred to as "KEGS") for MLP to assess environmental and social impacts that will be associated with the implementation of the Existing and Proposed Expansion of the farming project in Serenje. The environmental assessment findings presented in this report provide a critical examination of issues considered important in fulfilling the requirements of a clean, sustainable and healthy environment. During the study, the environmental assessment team consulted key stakeholders, assessed the biophysical environment and socioeconomic environment of the project area.

The implementation of the project has to be conducted in accordance with international and national environmental laws and guidelines with the aim of promoting the positive impacts of the proposed project while minimizing the negative effects. In particular, this environmental and Social Impact Assessment (ESIA) has been carried out in accordance with the Environmental Management Act No. 12 of 2011 of the laws of Zambia, Operation Safeguards' of the Africa Development Bank (AfDB) and Performance Standards of the International Finance Corporation (IFC).

Shareholders

Name of Partner	Nationality	Address	Percentage ratio
Lara Hampton Cantley	British	Farm No.10449, Luwombwa Farm Block, Serenje	5%
Micheal Leslie Paton	Zambian	Farm No.10449, Luwombwa Farm Block, Serenje	95%

Regulatory framework and corporate requirements

A number of relevant local and international Acts and Regulations relating to environmental conservation and protection have been considered with respect to the existing and proposed expansion of the agricultural project by MLP. The legal framework and policy review conducted will guide in assessing the potential impacts of the proposed project. Below is a list of some of the national statutes relevant to the proposed project:

- Environmental Management Act No. 12 of 2011;
- Environmental Management (Licensing) Regulations (No. 112 of 2013);
- Water Resources Management Act No. 21 of 2011
- Forest Act No. 4 of 2015
- The Local Government Act No. 17 of 2019
- Zambia Wildlife Act No. 14 of 2015
- Employment Code Act No. 3 of 2019
- Mines and Minerals Act (No. 7 of 2015)
- Occupational Health and Safety Act (No. 36 of 2010)

International Policy Frame Work

Zambia is a signatory and party to so many international conventions and protocols. The following are some of the international conventions and/or protocols that will be reviewed during the EIA process:

- United Nations Framework Convention on Climate Change (UNFCCC) Ratified 1997

- Conversion on Control of Trans boundary Movements of Hazardous Wastes and their Disposal (1992)
- Convention Concerning the Protection of World Heritage (Ratified in 1972)
- Convention on Biological Diversity (Ratified in 1993)

Finally, once implemented, the agricultural project will provide much needed soya products, seed maize, beef, eggs, fish, vegetable crops, aloe vera and avocados and will contribute to solving the country's present supply problems; this will have a positive impact on the country's economy.

Analysis of Project Alternatives

Project Site Location

There are many areas in Zambia which can support agriculture but the process of obtaining the land is quite difficult. The current location has been chosen as that is where the owners have acquired land. The Royal Establishment together with the district council know the investor and are willing to have the project implemented in the area as soon as possible.

This current site is preferred as the developer has established good relationships with all stakeholders in the area. The option will take advantage of the already done preparatory works and sources of water for irrigation already exist.

Source of Power Alternatives

A number of options were considered in terms of surces of power. For example, in terms of energy supply, ZESCO and Solar power was preferred as opposed to use of generators. This is because use of generators tends to be very expensive in the long run as compared to power supplied by ZESCO.

Alternative fuel storage facilities

The amount of fuel to be stored at the farm will be minimal. Usually not much fuel would be stored at the farm. The preferred fuel storage facility / area will be concrete lined and bundled for safe storage fuel facility with reduced contamination risks to soil, surface water and groundwater in the event of a spillage.

Assessment of alternative sewerage Treatments

Portable Chemical Toilets: Sewerage management by portable Chemical Toilets has the advantage of using chemicals to kill bacteria however there is risk of spillage of chemicals during transportation; rupture of supply of chemicals leaving toilet unhygienic and this in not sustainable for long-term usage;

Connection Sewer system to the Local Authority: Connection Sewer system to the Local Authority will not be possible as the site is far away from the sewer line for Serenje district.

Soak Away and Septic Tank: Sewerage management by Soak Away and Septic Tank will be ideal. This system is already being used on the farm and hence it was chosen as the best option.

Alternative Water Supply

The area in which the existing and proposed expansion project is, is not serviced and therefore water will be from the river and bore holes that will be sunk at the site.

Do nothing option

The no project option was not preferred. This option was not chosen given the increasing demand for soya products in Zambia. The option would not have been commensurate to the scale of current demand and the need for MLP to contribute to employment creation in the area. The current demand for wheat, soya products, seed maize and orchard crops requires constant and sustainable supply to cater for the growing population within Zambia and beyond.

Environmental Baseline Study

The following paragraphs briefly describe the current baseline of each aspect considered in this ESIA as well as the main impacts of the Project on these elements of the physical, natural and socio-economic environment.

The **climate** in the Project Area is subtropical, with a rainy season that starts at the beginning of November and can last until the end of March. The mean annual temperature is 20°C with large daily ranges. With a surface of 280 hectares of land to be under pivots, the project will be too small to have any measurable impact on the local climate.

Water quality at the project site can be interpreted as good, since contaminations from upstream areas are is quite minimal. There are currently no sources of pollution in the Project Area itself.

The **dominant vegetation** types in the area are Miombo woodlands with strands of riparian vegetation along the water courses. Within the farm, where no cultivation has been done, the vegetation is somehow intact, whereas it is largely modified in the areas where cultivation has been done.

The **terrestrial fauna** identified is not restricted to the Project Area, and the habitats are not critical for the survival of species in the region. Given the fact that the area in its present state is thus not of major importance for the conservation of biodiversity, the negative impacts of the Project on terrestrial fauna are considered as rather minor.

Environmental Impacts

There are currently no sources of **air and noise** pollution in the Project Area, due to the absence of anthropogenic activities. During the construction phase, air and noise pollution are expected to increase, but will be restricted to that period and the construction sites. The Project will not have a major influence on the geology of the area.

Locally, the Project Area will undergo changes in **land use**, from a natural area mainly covered by native vegetation, to an agricultural field and residential area where the permanent structures are established.

The project will lead to loss of **vegetation** especially where clearing will be done. Although the Project will result in negative impacts on vegetation, considering that this vegetation and flora is common and widespread in the region, the Project will not lead to the disappearance of plant species or the destruction of unique habitats.

During the construction phase, the Project will lead to the **influx** of a sizable work force, with potential direct and indirect job opportunities, as well as the arrival of camp followers. This can have a significant positive impact on the local and regional economy, but can also lead to problems, such as conflicts between original inhabitants of the region and newcomers, conflicts of a cultural nature with people coming from outside the Project Area, as well as health issues, including sexually transmitted diseases, mainly related to prostitution.

Mitigation Measures

Many of the impacts mentioned above relate to the construction phase and can be mitigated by thoroughly implementing and monitoring the measures outlined in the **Environmental and Social Management Plan (ESM**P), with no or only minor negative impacts remaining.

Still, a number of measures addressing the major impacts of the Project require highlighting. These include:

- **Site rehabilitation** will have to be conducted on a continuous basis throughout the construction phase, with the aim of restoring habitats in all temporarily used areas, as well as ensuring that the overall impact on ecosystems and the landscape is reduced to a minimum.
- Good management of the **socio-economic** situation related to the project construction activities will minimise the negative impacts resulting from the influx of a large number of people in the area. This includes conducting recruitment outside of the Project Area, housing workers on site, organising transport of workers, setting up access controls and actively preventing camp followers from settling in the area.
- Only Zambian recommended chemicals will be used on the farm. All generated hazardous wastes will be disposed of according to Zambian legislation and international practice.
- MLP must characterize (including the quantity and quality) of all hazardous waste to ensure wastes are characterised, quantified and managed correctly.
- All hazardous wastes must be temporarily stored in a secure dedicated and function-built facility pending removal from site for final containment. Where possible, empty containers will be returned to suppliers. The facility will be lined (and bunded) with concrete and roofed to stop runoff or surface water contamination issues.
- It is recommended that soil contaminated with hydrocarbon should be immediately removed and disposed of at a soil bioremediation facility on site.

Impacts and Mitigation/Enhancement Measures

As the case is with most agricultural projects, implementation of this project will result in a number of impacts which will either be positive or negative and either directly or indirectly. Envisaged impacts in this project are as follows:

Impact	Mitigation/Enhancement Measures
Positive Impacts	
Impact	**Enhancement Measures**
Increased employment opportunities for locals	• Priority will be given to the local people. • Only skills that are not available within the local community will be sourced from other areas. • Skills base for the area will be increased by training the locals especially those skills that can be mastered within a short time. • Women and the vulnerable groups like widows to be given preference; • Ensure expectations are well managed and avoid strikes; and • Manage community relations well.
Improvement of the local economy	• Encourage construction workers to buy from the local communities • Procure all materials from the district if possible

	• The developer will support improvement of market facilities in the area
Increased opportunities for skills transfer	• Ensuring there is a skill transfer programme. • Categorise staff and each group to be supervised by dedicated skilled personnel to ensure on the job training. • Encourage on the job training through observation and trial under supervision.
Increased revenue base for the government	• MLP will adhere to all the tax requirements of the Government of the Republic of Zambia.
Negative Impacts	
Impact	**Mitigation Measures**
Air Pollution	• Water bowsers will be employed on site to suppress dust on all site roads. • Designated routes will be established on site for motor traffic. • Site workers will be issued with personal protective attire. • All the sand or soil heaps will be removed as soon as possible to avoid nuisance dust arising from prevailing wind. • All equipment and machinery will be regularly serviced
Noise Pollution	• All mobile vehicles and equipment will have noise reducers • All land preparation activities will take place during the day and any work during night-time will be communicated to the state authorities and local community
Surface and ground Water Pollution	• All maintenance will be done in workshops already existing in Serenje town. Minor repairs will be done on the farm in workshops paved with concreted. Hydrocarbon traps will be installed in the workshop drainage system.
Soil Contamination	• Regular servicing and maintenance of equipment and vehicles.
Soil erosion	• On the periphery some some indigeneous trees will be left to prevent soil erosion and in addition the crops to be grown will be perennial agriculture tree which will also prevent soil erosion.
Occupational and Public health safety risks	• Continue ensuring that labour and working conditions of contractors, subcontractors and MLP itself as well as the supply chain are within the requirements of the labour laws of Zambia and International Standards. • Continue implementing the established worker grievance system • Ensure compliance to Occupational Safety and Health standards throughout the project • All site workers will undergo Safety, Health, Environment and Quality assurance inductions before starting work and after leave break • All contractors to provide their own trained SHE Officers on site • Personal protective clothing to be supplied per worker

Hazardous waste generation	• All chemicals that will be used will be those approved by Zambian law. All wastes that cannot be recycled on the farming unit will be taken to the council designated dump sites in Serenje.
Landuse conflicts	• MLP will put up an effective grievance management mechanism. • MLP will ensure that all activities are confined to the farm area. • No settlements are within proposed area for the farm hence resettlements issues will not arise
Increased cases of HIV/AIDS sexually transmitted infections	• Implementing an extensive HIV/AIDs and STI education campaign among the local population, targeting not only youth but adults as well. Such a campaign shall be initiated immediately as soon as construction starts. • Implementing a comprehensive and on-going HIV/AIDS and STI education campaign targeting all workers hired for the project, both local and international. MLP will
Climate Change	• The proposed project involves planting of trees which will replace the cleared forest and the plantation trees will continue redressing the effects of climate change. • Where feasible, implement carbon emissions offsets elsewhere. This may include long-term preservation of mature trees and other vegetation types with high carbon stock in areas where the plantation will not be placed. • Maintain strips of vegetation (live fire breaks) between plantations to reduce loss of soil by erosion in the event of increased rainfall.

None of the negative environmental or social impacts identified relating to operations of the existing and proposed expansion of the agricultural farming project can be considered critical, irreversible or unprecedented. In general, the overall environmental and social risks were found to be manageable and of low significance.

Project Implementation Date, Cost of the Project and Project Lifespan

Most of the project components and activities are already in existence. Both the existing and proposed activities are being subjected to the ESIA study. The total cost of the project is US$450,000.

Once in full operation, the agricultural project will provide much needed soya products, seed maize, wheat, beef and eggs and will contribute to solving the country's present supply problems; this will have a positive impact on the country's economy. The project's duration will extend extensively, either due to its agricultural nature or until the developer alters their business model.

Conclusion

According to the results of the environmental and social baseline assessment conducted, it is evident that the existing and proposed expansion of the agricultural project in Serenje will result in overall economic growth and development thereby contributing to overall improvement of livelihood in the project area. The positive impacts of this project are more

sustainable and outweigh the negative impacts. Based on the level of detail and depth of the study, it is the view of the developer that all envisaged environmental and socioeconomic impacts have been adequately addressed within the limits of the current state of knowledge and reasonable practice.

General Recommendations

Occupational Safety and Health

Ensure that worker's occupational health and safety standards are maintained through capacity building, proper training, providing protection, clothing and managing their camps up to the required health standards.

Environmental audits and monitoring

Regular environmental audits should be carried out on the project in order to ensure compliance of the project with the mitigation measures outlined in the Environmental and Social Management Plan (ESMP).

Lara Paton
Director

EXECUTIVE SUMMARY (CHIBEMBA VERSION)

UKUSUPAWILA IMIBOMBELE YA MULIMO

Akampani ka ba ML Paton Investments Limited kalipoka impanga amaekita 495, 422 na 686 ku Luwombwa Farm Block. Aka Kampani kalembeshiwa ukulingana na mafunde ya mucalo ca Zambia ayalanda pa fya kucita nga mulelembesha akampani. Aka Kampani kalembeshiwa mu 2006. Pakutila ba MLP babombe ukulingana ne fi fwaika fya ba ZEMA, ba bulile ulutampulo ulyaku pekanya ESIA. Bachitile ifi pakuti bamone ifyo ubulimi bwabo ne milimo yaba pa farm ilekuma ifilengwa na Lesa elyo no bwikashi bwakuli iyi inchende. Pakuti abekala mushi abakuminweko benga kwata ifya kulandapo.

Famu yaba MLP yabela amakilomita 60 ukufuma pa Serenje Boma mu musebo wa Mkushi-Serenje Road. Ili famu lilabomfyako na menshi ukufuma mu kamulonga ka menshi aketwa Luwombwa. Pafyo balima saana soya, wheat na mataba. Kabili balateka ne ing'ombe isha nama ne inkoko isha ma ndanda.

Amafunde ya mukati ka calo ca Zambia calo conse nayakonkwa pa kubomba uyu mulimo. Ici nacicitwa pakuti amasanso nelyo ubonaushi tabucitilwe ku filengwa na Lesa. Yamo pali aya amafunde ni aya:

- Ifunde lilanda pa filengwa na Lesa (Environmental Management Act No. 12of 2013)
- Ifunde lilanda pa filengwa na Lesa (Licensing) Regulations (No. 112 of 2013)
- Ifunde lilanda pa menshi (Water Resource Management Act)
- Ifunde lilanda pa fimuti (Forest Act)
- Ifunde lilanda pa mfumu (The Chief's Act)
- Ifunde lilanda pa filengwa nama shamumpanga (Zambia Wildlife Act)
- Ifunde lilanda pa bumi bwa (Public Health Act)

Ili famu abene balibikamo nendalama ukucila chipendo cha ama milioni aya USD 450,000.

Aka akampani kalileta ubuyantanshi ukupitila mukwingisha abekala mushi amachito. Abaingila amachito bafika nakuchipendo ichachila pali 75. Abanono fye ababomfi bekala palya pene lelo abengi bafuma mumishi iyapalamana ne famu.

Mu mibombele yaba MLP, tamwaba ifinga lenga ukukowesha kwa mwela nangula ichongo. Ichikalamba saana icho bachita ba MLP, chakutema ifimuti pakuti babomfye umushili ku bulimi no kukula amayanda aya kwikalamo abantu. Ubu busanso tebukalamba saana pantu balakonka ifikomo ifyo babikako abalolekesha pa fya bumi bwa Mwela, amenshi ne nchende ya mu calo ca Zambia (Zambia Environmental Management Agency) elyo na bambi abashala.

Lara Paton
Director

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LIST OF ACRONYMS

ACRONYM	DESCRIPTION
AIDS	Acquired Immune Deficiency Syndrome
CBD	Convention on Biological Diversity
CMML	Christian Missions in Many Lands
CSO	Central Statistics Office
CSPs	Country Strategy Papers
DHID	Department of Housing and Infrastructure Development
EIA	Environmental Impact Assessment
EPB	Environmental Project Brief
ESIA	Environmental and Social Impact Assessment
EMA	Environmental Management Act
EMP	Environmental Management Plan
EPPCA	Environmental Protection and Pollution Control Act
ESMP	Environmental and Social Management Plan
EMSMP	Environmental Management and Social Monitoring Plan
ESAPs	Environment and Social Assessment Procedures
GPS	Global Positioning System
GRZ	Government of the Republic of Zambia
HIV	Human Immunodeficiency Virus
IESIA	Integrated Environmental and Social Impact Assessment
IFC	International Finance Corporation
ILO	International Labour Organisation
ITCZ	Inter-tropical Convergence Zone
IUCN	International Union for the Conservation of Nature
MLP	M.L Paton Investment Limited
NASF	National HIV and AIDS Strategic Framework
NEAP	National Environmental Action Plan
NCS	National Conservation Strategy
NPE	National Policy on Environment
NGOs	Non-Governmental Organisation
NHCC	National Heritage Conservation Commission
NRW	Non-Revenue Water
NWASCO	National Water Supply and Sanitation Council
OS	Operational Standards
PET	Potential Evapo-transpiration
PMC	Project Management Consultant
PSs	Performance Standards
RDA	Road Development Agency
RISPs	Regional Integration Strategy Papers
RMC	Regional Member Country
RTSA	Road Traffic and Safety Agency
UNCCD	United Nations Convention to Combat Desertification
UNFCCC	United Nations Convention on Climate Change
UNICEF	United Nations Framework International Children's Emergency Funds
WARMA	Water Resources Management Authority
WDCs	Ward Development Committees
WID	Women In Development
ZEMA	Zambia Environmental Management Agency
ZESCO	Zambia Electricity Supply Corporation Ltd.

1 INTRODUCTION

ML Paton Investment Limited was incorporated as a company limited by shares in 2006 but began its operations on the farm in 2015 on three fields all of which are collectively referred to as Tumba Hills Ranch. Two of these fields i.e. F/10449, F/11118 are partially developed and have individual areas of 495 and 422 ha respectively. Farm F/11117 is undeveloped and has a total area of 686ha.The main activities on the farm include growing of crops such as wheat, soya beans and seed maize, rearing of cattle and layers for beef and egg production respectively. The farm meets its water requirements by abstracting water from the Luwombwa river and is currently negotiating shares in the Luwombwa Dam project under the Luwombwa Irrigation Company.

The farm operations officially begun in 2015 with the building of labour houses, the main homestead and the construction of access roads. At the time when operations were beginning on the farm, Zambia had no legitimate environmental regulations and enforcing institutions. Owing to this and other factors, Environmental and Social Impact Assessments for the farm installations, constructions and activities were not done. Consequently, MLP intends to formalise its operations in terms of environmental regulations. MLP has embarked on an Environmental and Social Impact Assessment (ESIA) Study exercise of its existing and proposed expansion acticities as stipulated by the Environmental Management Act (EMA) No. 12 of 2011 of the laws of Zambia.

The sizes of the major components are as follows:

- A main House (15m x 9 m)
- Pump house (5m x 6m)
- A Workshop (10m x 6m)
- Five (5) Staff houses (4m x 5m)
- A Cattle Kraal (30m x 20m

Therefore, this report is an ESIA for the Existing and Proposed Expansion of the Agricultural Project by ML Paton Investments Limited to be carried out in Serenje.

This report has been prepared in order to comply with the Environmental Management Act No. 12 of 2011 of the laws of Zambia. A key purpose of this ESIA is to assess the environmental and social impacts of the existing and proposed expansion project, and develop mitigation measures that will be implemented during project operation. This ESIA intends to ensure that environmental concerns are integrated into project development, and suggests ways of preventing, minimizing, mitigating and/or compensating for possible adverse environmental impacts which may arise due to the development. The ESIA provides information about the proposed project and its development, the legal framework relevant to the project, and a summary of the baseline studies that have been conducted. The report also provides an assessment of impacts on the natural and social environment, and presents recommendations to mitigate these effects as part of an Environmental and Social Management Plan (ESMP).

1.1 Project Background

The Luwombwa Farm Block was established by the Government of Zambia to boost agriculture development in Serenje district. Most of the farms in the block are owned by individual commercial farmers. Despite there being many commercial farmers in the area,

most of the farms have not been developed to the level that the Government wanted. It has always been the desire of the Government that the area be developed to ensure food security at both local and national levels. The Zambian government also established another farming block called the Nasanga Farming Block to the north of the Luwombwa Farm Block.

In an endeavour to ensure that all its agricultural activities and related operations comply with the EMA, MLP intends to undertake an ESIA study for its operations at all three of its farms i.e. F/10449, F/11118 and F/11117. The aim of the study was to identify social economic and environmental impacts (positive and negative), extent and significance of these impacts, and propose measures to either mitigate or enhance the impacts. However, prior to commencing of the study, MLP engaged Kasumwa Enviroconsult and General Supplies Limited (KEGS) who carried out a scoping exercise on their behalf to facilitate development of TORs for the ESIA study. The scoping phase offered an opportunity for identification of potential environmental impacts. The TORs were prepared and approved by ZEMA
In light of this, MLP now seeks to submit the first draft EIS to ZEMA in accordance with the Environmental Management Act No. 12 of 2011.

1.2 Summary description of the project including project rationale

This project is agricultural in nature as it primarily involves crop production. The rationale behind the project is to produce agriculture crops while empowering local people with employment and farming knowledge. The crops grown on the farm include wheat, soya beans and seed maize. They also rear cattle for beef production and layers for eggs that are sold to the local community. The developer intends to expand their production to include fish ponds, tree orchards, aloe vera and vegetable crops.

The farm already has support infrastructure which include a workshop, pump house, cattle Kraal, five (5) staff houses and one main house,

1.3 Project Objective

The overall objective of the farm is to contribute to food security in the country and to operate profitably and sustainably through production of crops using labor intensive methods. Through this, MLP realizes its specific objectives of:

- Creating employment for the local population thereby enhancing household income and contributing to education of employees' children
- Disseminating farming knowledge and experience to employees and small scale farmers through training on job
- Practicing conservation and Precision farming to ensure good land management and produce food for Zambia at the lowest impact to the environment

1.4 Contact Details of Developer

Table 1-1: Contact details of developer

ITEM	DETAILS
Developer	M.L PATON INVESTMENTS LIMITED
Contact Person	Lara Paton
Designation	Director
Physical Address	Farm No.10449, Luwombwa Farm Block,Serenje
Mobile	+260973352049
Email	Larapaton80@gmail.com

1.5 Details of Shareholders

Table 1-2: Details of Shareholders

Name of Partner	Nationality	Address	Percentage ratio
Lara Hampton Cantley	British	Farm No.10449, Luwombwa Farm Block, Serenje	5%
Micheal Leslie Paton	Zambian	Farm No.10449, Luwombwa Farm Block, Serenje	95%

1.6 Company Description

M L Paton Investment Limited owns the three farms collectively referred to as Tumba Hills Ranch and was incorporated as a private company limited by shares on the 6th of July, 2006 (Appendix 1). The shareholders of the farm are Lara Hampton Cantley and Micheal Leslie Paton. The company primarily grows wheat and alternates between soya beans, or seed maize in the rain season. The farm also has herds of cattle amounting to 240 and has recently ventured into egg production. The farm has potential for avocados, aloe vera, vegetable crops and fish ponds.

1.7 Cost of the Project

The total cost of the project is USD450,000.

2 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

2.1 Introduction

This section discusses the relevant Institutional Policy and Legal Framework relating to ESIA. For this project the ESIA will be prepared in compliance IFC Social and Environmental Performance Standards, and in accordance with GRZ environmental law and regulations, in particular, the Environmental Management Act No. 12 of 2011 and in accordance with the requirements of the Environmental Impact Assessment (EIA) Regulations, Statutory Instrument No.28 of 1997.

2.2 National Safeguard Policies and Strategies

2.2.1 National Policy on Environment

The National policy on Environment (NPE) is the main policy that directs environmental management in Zambia. The policy is designed to create a complete framework for effective natural resource utilization and environmental conservation which will be sensitive to the demands of sustainable development. The specific objectives of the NPE are to:

- promote the sound protection and management of Zambia's environment and natural resources in their entirety, balancing the needs for social and economic development and environmental integrity to the maximum extent possible, while keeping adverse activities to the minimum;
- manage the environment by linking together the activities, interests and perspectives of all groups, including the people, nongovernmental organizations (NGOs) and government at both the central and decentralized local levels;
- accelerate environmentally and economically sustainable growth in order to improve the health, sustainable livelihoods, income and living conditions of the poor majority with greater equity and self-reliance;
- ensure broadly-based environmental awareness and commitment to enforce environmental laws and to the promotion of environmental accountability;
- build individual and institutional capacity to sustain the environment;
- regulate and enforce environmental laws; and
- promote the development of sustainable industrial and commercial processes having full regard for environmental integrity.

The policy strengthens the strategy to capacitate developers with adequate guidelines to safeguard the environment.

2.2.2 National Water Policy

The National Water Policy is the predominant policy framework for the water and sanitation sector in Zambia. The Policy was developed and accepted by the GRZ in 1994, and later updated in 2010. The National Water Policy envisages “to optimally harness

water resources for the efficient and sustainable utilization of this natural resource to enhance economic productivity and reduce poverty".

To achieve the national goal of increasing accessibility to reliable safe water by all sectors of the economy, the policy addresses two broad categories of water resources management and development. The major effect of the policy is to improve the management of water resources, institutional coordination and defined roles and responsibilities. The policy encourages the use of water resources in an efficient and impartial manner consistent with the social, economic and environmental needs of present and future generations.

Following the adoption of the National Water Sector Policy in 1994, the government implemented several strategies, including:

- *Strategy and Institutional Framework for the Water and Sanitation Sector (1995):* identifies the framework and arrangements for providing water and sanitation services by local authorities;
- *Environmental Sanitation Strategy (1998):* increases the awareness of sanitation in basic social services and outlines the strategy to provide sanitation services;
- *Peri-Urban Water Supply and Sanitation Strategy (2000):* targets water supply and sanitation services to urban low income communities, and;
- *Community Water Supply and Sanitation Strategy (2000):* primarily targets rural areas, but also peri-urban areas.

2.2.3 National Conservation Strategy

The National Conservation Strategy (NCS) formulated in 1985 has been the main policy document on the Environment and Natural Resources in Zambia. The NCS was prepared by the Government to manage natural resources and the environment in the context of a centrally planned and controlled economy. The Strategy's main goal is to: "satisfy the basic needs of all the people of Zambia, both present and the future generations, through the wise management of natural resources". The strategy establishes policies and devises plans and to fully integrate conservation into Zambia's social and economic development. It also aims to analyse trends and current issues to better anticipate problems and needs. The main objectives of the NCS are to:

- ensure the sustainable use of Zambia's renewable natural resources such as forests;
- maintain Zambia's biological diversity; and
- maintain essential ecological processes and life support systems in Zambia.

2.2.4 National Environmental Action Plan

The focus of the National Environmental Action Plan (NEAP) of 1994 is to identify environmental problems and issues, analyse their causes, and recommend necessary interventions. The NEAP was prepared as a comprehensive plan to hold the ever increasing environmental degradation in Zambia. The preparation of NEAP was as a result of Government's desire to update the NCS for the following reasons:

- the economy was undergoing a period of liberalization;
- the main NCS recommendations had been implemented;
- the technical information in the NCS needed updating; and
- there was a requirement by World Bank for a NEAP as a prerequisite for International Development Association (IDA) loan funding.

The NEAP is founded on three fundamental principles:

- the right of citizens to a clean and healthy environment;
- local community and private sector participation in natural resources management; and
- obligatory EIA of major development projects in all sectors.

The overall objective of the NEAP is to integrate environmental concerns into Zambia's social and economic development planning process.

2.2.5 National Biological Diversity Strategy and Action Plan

Zambia ratified the Convention on Biological Diversity in May 1993. As part of the commitment to fulfil its objectives, Zambia developed the National Biological Diversity Strategy and Action Plan (NBSAP), which was finalized in 1998. The main goals of the NBSAP are to:

- ensure the conservation of the full range of Zambia's natural ecosystems through a network of protected areas;
- conserve the genetic diversity of Zambia's crops and livestock;
- improve the legal and institutional framework and human resources to implement the strategies for conservation, sustainable use and equitable sharing of benefits from biodiversity management;
- sustainable management and use of Zambia's biological resources; and
- develop an appropriate legal framework and the needed human resources to minimize the risks of the use of genetically modified organisms.

2.2.6 National Forestry Policy

The mission statement of the forestry sector is to ensure sustainable flow of wood and non-wood forest products and services while at the same time ensuring protection and maintenance of biodiversity for the benefit of the present and future generations. The Policy is based on the following principles:

- ensure sustainable forest resources management;
- develop capacity of stakeholders in sustainable forest resources management and utilization;
- promote a participatory approach to forest development by developing close partnership among stakeholders;
- facilitate private sector involvement in forestry development;
- promote equitable participation by women, men and children in forestry development; and

- adopt an integrated approach, through intra and inter-sectoral coordination in forestry sector development.

2.2.7 National Decentralisation Policy

The National Decentralization Policy (established in 2002, launched in 2004) aimed at decentralising government responsibilities and functions to lower levels of government through 'devolution'. It reaffirms the local authorities as the institutions responsible for water supply and sanitation.

2.2.8 National HIV and AIDS Strategic Framework

The National HIV and AIDS Strategic Framework (NASF) 2006-2010 was built on the process of joint annual reviews and a broad consultative process with the cooperating partners. The management intent of the NASF is to:

- support coordinated, prioritised and knowledge-based scale up of the response;
- facilitate broad ownership of the response by all partners and practical partnerships for the implementation of the response;
- represent joint strategic direction of all Partners;
- enable the involvement of key sectors and decentralized levels in all stages of the process; and
- guide resource management at the strategic level.

The six themes of the NASF represent the cooperating partners' priority action areas and include:

- intensifying efforts for prevention of HIV;
- expanding treatment, care and support for people affected by HIV and AIDS;
- mitigating the socioeconomic impact of HIV and AIDS;
- strengthening the decentralized response and mainstreaming HIV and AIDS;
- improving the monitoring of the multi-sectoral response; and
- integrating advocacy and coordination of the multi-sectoral response.

2.2.9 National Gender Policy

On several occasions, the GRZ has been making attempts to mainstream gender in the different sectors of the country. In the 1980s, government adopted the Women in Development (WID) approach as a framework to incorporate gender issues into its development activities. For example, there was a WID desk at the then National Commission for Development Planning. In 1996, this approach was changed to the Gender in Development Division (GIDD). In the year 2000, the government launched the National Gender Policy which serves as a gender mainstreaming institutional framework for government ministries. In the year 2006, the government established the Ministry of Women's Affairs which was later changed to the Ministry of Gender and Development to oversee the gender mainstreaming activities in the country.

In order to resolve the problems pertaining to the provision of safe and clean water, and good sanitation which affects women more than men, government has put the following measures in the National Gender Policy: The Government will:

- promote and encourage the involvement of women in the decision making processes in the various projects;
- encourage partnerships between women and men in the implementation of projects;
- ensure use of gender friendly technology in agriculture to all members of the community especially persons with disabilities;

The above measures are the guidelines in the agriculture sector. It is expected that all government projects on agriculture will adhere to the requirements of the National Gender Policy of 2000 particularly in the incorporation of gender issues. However, there is no Act of Parliament to back the National Gender Policy and this is its major weakness as there is no legal recourse for not following its requirements. The composition of water committees is 50% women as a way of promoting participation of women in development activities in peri-urban areas. To ensure that there is equal representation of men and women during the implementation of any project, be it water or agriculture, the GIDD can be consulted at the project design level to design ways of equitably representing the interests of men and women in peri-urban areas. Examples of sectors that have taken gender equity measures are the Education and Lands Sectors. In government schools, during recruitment of pupils to grade one, the policy is that 50% should be female while at the university level, 25% of bursaries are reserved for female applicants. When land is advertised, 30% of all advertised land in the Ministry of Lands is reserved for female applicants (National Gender Policy 2000, Lands Policy 2005).

These examples could be adopted during the implementation of the commercial agriculture project in Serenje.

Implementation of the project will be in accordance with the requirements of the Gender policy. There are no specific measures to promote gender equality in the National Gender Policy. However, the Policy indicates that government will “promote and encourage involvement of women in decision making processes”. In the Ward Development Committees (WDCs), it is a standard requirement that the committee should have 50% women members. This applies to the zones within wards. These are gender inclusive initiatives from the wards and community based NGOs that are gender sensitive and are working with community projects. These have helped to build and institutionalize gender equality messages at the community level. During project implementation, the entry points for gender issues will be the WDCs. It is expected that they will suggest ways of promoting equal participation of men and women. It should be borne in mind that gender issues are not new in peri-urban areas and most structures there are gender sensitive and have their own policies on how gender equity is achieved in community projects. Therefore, to achieve the desired result, MLP will need to liaise with the WDCs on gender issues prior to commencement of the projects and together work out the best approach.

2.3 Organization and Institutional Framework

There are many institutions that may have a role in the implementation of the agriculture project by MLP. However, the main ones that will have a regulatory and monitoring role on the activities of the proposed project include:

- Zambia Environmental Management Agency (ZEMA)
- Water Resource Management Authority
- Serenje District Council
- Muchinda Royal Establishment

2.3.1 Zambia Environmental Management Agency

ZEMA, previously known as the Environmental Council of Zambia (ECZ) is the umbrella environmental institution in Zambia and the main lead agency on matters pertaining to environmental impact assessments (EIA). It is empowered by the Environmental Management Act (No. 12 of 2011) (EMA) to identify projects, plans and policies for which an EIA is necessary. The general functions of the ZEMA are to ensure the sustainable management of natural resources, the protection of the environment, and the control of pollution, as provided under Article 9(1) of the EMA. However, more specifically, the ZEMA serves inter alia to.

- Co-ordinate the implementation of activities of all government ministries, appropriate authorities and conservancy authorities in matters relating to the environment;
- Develop standards and guidelines relating to the protection of air, water, land and other natural resources;
- Provide for environmental monitoring and auditing as well as establishing and managing of the environmental fund;
- Develop and enforce measures aimed at preventing and controlling pollution;
- Advise the government on the formulation of policies on all aspects of the environment and make recommendations for the sustainable management of the environment;
- Advise on all matters relating to environmental conservation, protection and pollution control, including necessary policies, research investigations and training;
- Initiate, conduct and promote research, surveys, studies, training and investigations in environmental management;
- Identify projects, plans and policies that need environmental impact assessments;
- Monitor trends of natural resources, their use and impact on the environment and make necessary recommendations to the appropriate authority;
- Undertake general education programmes for the purpose of creating public awareness on the environment;
- Provide for public consultation in environmental decision – making and access to environmental information;

- Request information on proposed projects and advise stakeholders on projects, programmes, plans and policies for which environmental assessment is necessary; and
- Facilitate the implementation of international environmental agreements and conventions to which Zambia is a party.
- The services provided by the ZEMA specifically in relation to EIA studies include:
- Assisting the developer to determine the scope of EIA studies;
- Reviewing project briefs, terms of reference, and environmental impact statements (EIS) and decision-making;
- Disclosure of the EIS to the public through the media;
- Holding public hearing meetings to discuss the EIS with stakeholders;
- Conducting verification surveys of the affected environment;
- Monitoring the project once implemented;
- Conducting compliance audits of the project between 12 and 36 months after implementation; and
- General administration of all the Regulations under the EMA.

MLP will need to submit an EIA to ZEMA and will require approval from the ZEMA to undertake the proposed Project.

Compliance: MLP will prepare an ESIA and will adhere to directives from the agency.

2.3.2 Water Resource Management Authority

The Water Resources Management Authority (WARMA) was established with the Water Resources Management Act No. 21 of 2011. Its main purpose is to serve as the regulatory body for the management and development of water resources in the whole country and ensure equal access to water for the various stakeholders. Based on the principles of Integrated Water Resources Management (IWRM), WARMA also take gender and climate change dimensions into account to perform the following key organizational functions:

- Ensure the sustainable and rational utilization, management and development of water resources.
- Establish and maintain an integrated water resources management information system that is easily accessible by all users.
- Provide access to water resources of acceptable quality and quantity for various uses.
- Set standards and guidelines for undertaking water resources management and development.
- Provide comprehensive advice to the Minister responsible for water on policies for utilization, management and development of water resources.

Relevance: WARMA has oversight over the water use in Zambia.

Compliance: MLP will notify WARMA about the project and will adhere to directives from WARMA. It will need to obtain necessary permits to be able to use the water from the river and boreholes.

2.3.3 Serenje District Council

Councils are established under the Local Government Act. The functions of a District Council include town planning and pollution control.

Relevance: The proposed project is situated in Serenje District of the Central Province of Zambia. The Council has already been informed about the project during the scoping exercise and disclosure meetings.

Compliance: MLP will inform the local authority and seek approval of all the works being done during the implementation of the project.

2.3.4 Muchinda Royal Establishment

The proposed agriculture project is located within Senior Chief Muchinda's area. The Royal Establishment in the area is mandated to ensure that the developer follows the traditional and culture norms of the area and that the project be implemented for the benefit of the local people in the area.

Relevance: MLP will employ people from the local community in the area and will operate within the area. The Royal Establishment is very important in the issues of land.

Compliance: MLP will work closely with the Royal Establishment in the area to ensure that the project benefits the local community.

2.4 Zambian Legal Framework

A review was done of policies, institutional framework and legislation applicable to the project including statutory regulations that should be complied with as well as international conventions and guidelines to be followed in the preparation of the ESIA report. These as well as their relevance to the project include the following:

2.4.1 The Environmental Management Act, No. 12 of 2011

The Zambia Environmental Management Agency, through this Act ensures that adverse impacts by proposed developments are mitigated against. The Environmental Impact Assessment Regulations of 1997 were promulgated under the then Environmental Protection and Pollution Control Act (EPPCA). The regulation provides for the undertaking of either an Environmental Project Brief (EPB) or ESIA on any proposed development in protected areas or sensitive environments. In particular, EPBs are restricted to projects with minimal footprint and in less sensitive environments while ESIA is usually undertaken on large scale developments that are likely to have significant impact on the environment. ZEMA has granted that an ESIA be undertaken on the proposed development.

The Environmental Management Act clearly requires individuals and companies to ensure that they do not pollute the environment in the course of their activities. The act provides for the following as they specifically apply to MLP:

- Integrated Environmental Management
- Environmental Protection and Pollution Control for Water, Air, Waste Management, Pesticides and Toxic Substances, and Noise.

Part III Integrated Environmental Management

The following section applies to MLP:

Part III section 29(1), Environmental Impact Assessment, requires that "A person shall not undertake any project that may have an effect on the environment without the written approval of the Agency, and except in accordance with any conditions imposed in the approval."

Relevance: MLP is required to undertake an Environmental Impact Assessment before the project could commerce

Compliance: In accordance with Clause 29, MLP is submitting this Environmental Impact Assessment for review and decision by the Agency.

Part IV, Environmental Protection and Pollution Control, Division 1 - Pollution Control

The following section applies to MLP with regard to pollution control:

Section 32(1) Prohibition of discharges into the environment, requires that "A Person shall not, without a license discharge, cause or permit the discharge of, a contaminant or pollutant into the environment if the discharge causes or is likely to cause, an adverse effect."

Relevance: The project is unlikely to result in a continuous discharge of pollutants in the environment. However, accidental spillages may occur.

Compliance: MLP may require to apply for any discharge licenses as stipulated in the Environmental Management (Licensing) Regulation 112 of 2013

Section 35(1) Reporting of discharge into the environment, requires that "A person who discharges or causes or permits the discharge of a contaminant or pollutant into the environment in a manner or amount that is unlawful or that causes, or is likely to cause, an adverse effect shall:

- Immediately notify the agency
- Submit to the agency information relating to the quantity and quality of the discharge or emission; and
- Take all the practical steps to contain the discharge or emission and prevent, mitigate or remedy the adverse effects resulting from the discharges or emission, including removing the deposit.

Section 35(2), reporting of discharge into the environment, requires that "A person or a facility discharging or emitting a pollutant or a contaminant into the environment shall measure the levels of the discharge or emission and submit the results to the Agency in the prescribed manner."

Relevance: Though MLP is not required to obtain licenses for discharge. However, should accidental spillages occur that could end into the nearby streams, MLP will report any unlawful discharge, measure the level of discharge and submit the results to the agency.

Part IV Environmental Protection and Pollution Control, Division 6 – Noise

The following section applies to MLP with regards to prohibition of noise emission exceeding established standards:

Section 68 requires that "Subject to section sixty-nine, a person shall not emit noise in excess of the noise emission standard established pursuant to section seventy."

Section 69(1), requires that "Notwithstanding section sixty-eighty the Inspectorate may grant a permit allowing the excessive emission of noise under such terms and conditions as it may determine."

Section 69(2), requires that "where an exemption is granted under subsection (1), workers exposed to excessive levels of noise shall be adequately protected in accordance with the directives of the Agency."

Section 70(1) requires that "The Agency shall, in consultation with the relevant appropriate authorities:

- Set up a standard procedure(s) for noise measurement,
- Establish noise level and noise emission standards for construction sites, plants, machinery, motor vehicles, aircrafts, including sonic booms and industrial and commercial activities."

Relevance: Construction phase may generate some noise that may lead to noise pollution. The major source of noise will be due to vehicular movement and operation of equipment. This is not expected to be significantly high.

Compliance: MLP will undertake noise monitoring during the construction of the construction phase and compare the results with those obtained during the baseline noise results, where nonconformity is recorded, MLP will:

- Investigate the source of the noncompliance to determine the root cause
- Implement the corrective/preventive action
- Inform the agency about the noncompliance.

The Environmental Management Act No. 12 of 2011 has the following subsidiary regulation, The Environmental Management (Licensing) Regulation 112 of 2013. The regulation provides for the application of the following licenses:

- Application for an emission license
- Application for hazardous waste license

- Application for a pesticide and toxic substance license
- Generation and transportation of waste

Relevance: MLP is required to apply for operating permits

2.4.2 The Water Resource Management Act, No. 21 of 2011

This Act provides for the management, development, conservation, protection and preservation of the water resource and its ecosystem. Creates an enabling environment for adaptation to climate change; provides for the constitution, functions and composition of Catchment Councils. Provide for international and regional corporation for equitable and sustainable utilisation of shared water resources. This obtains extra importance in view of the fact that the contractor and the developer will be using water from perennial rivers.

Relevance and how they shall be complied with:

The sections of the Act that will be most relevant to the proposed project are those that relate to ambient standards, resource water quality monitoring and pollution of water resources found in Section 47 of the Act. Section 47(1) states that "The Authority shall, in collaboration with the Environmental Agency, recommend to the Zambia Bureau of Standards ambient water quality and control the pollution of any water resource''. In view of the Act, the developer will abide by the requirements of the act as far as the project is concerned.

2.4.3 The Public Health Act

This Act provides for the prevention of diseases, drainage, latrine and disposal of sewerage and transport systems.

Relevance and how they shall be complied with:

For the proposed development, this will cover matters such as dust emission, noise pollution and solid waste management, levels of hygiene and standards of general working environment. The developer will comply with the applicable regulation requirements.

2.4.4 Occupational Health and Safety Act No. 36 of 2010

The Occupational Health and Safety Act, No. 36 of 2010 establishes the Occupational Health and Safety Institute as a body corporate with perpetual succession and defines its composition, powers, and functions. The following sections are relevant to the proposed project:

Section 11. An employer of ten or more persons at any workplace shall establish a health and safety committee.

Section 16. (1) Notwithstanding any other written law, an employer shall:

- *Ensure, so far as is reasonably practicable, the health, safety and welfare of the employees of the employer at a workplace; and*

- *Place and maintain an employee in an occupational environment adapted to the employee's physical, physiological and psychological ability.*

Relevance and how they shall be complied with

The Act is relevant to the project as workers will be required on site. Compliance will be ensured through establishment of the Health and Safety Committee that will be presiding over matters as stipulated in the Act.

2.4.5 National Council for Construction Act, No. 10 of 2020

This Act provides for the establishment of the National Council for Construction and to define its functions; to provide for the promotion and development of the construction industry in Zambia; to provide for the registration of contractors; to provide for the affiliation to the Council of professional bodies or organisations whose members are engaged in activities related to the construction industry; to provide for the regulation of the construction industry; to provide for the establishment of the Construction School; to provide for the training of persons engaged in construction or in activities related to construction; and to provide for matters connected with or incidental to the foregoing.

Relevance and how they shall be complied with

The Act is relevant to the project as only registered contractors and are affiliated to the council will be considered for contractual works.

2.4.6 The Land Act of 1995

Under the Land Act of 1995, land has been divided into the following categories; state, local authority and traditional land.

Relevance and how they shall be complied with

The developer will manage the land according to the provisions of this Act. When it comes to transfer of land, MLP will follow the provisions as provided for by the Act.

2.4.7 The Local Government Act No. 2 of 2019

The Act provides for the establishment of councils in the districts, the functions of the local authorities and the local government system. The functions of the councils include city planning, pollution control and environmental protection in general.

Relevance and how they shall be complied with

In this particular project, where necessary, the concerned District Council will take part in concerned provisions as the jurisdiction falls in the district.

2.4.8 National Heritage and Conservation Commission Act of 1989

The act is responsible for the conservation of ancient, cultural and natural heritage, relics and objects of aesthetic, historical, prehistoric, archaeological or scientific interest by

preservation, restoration, rehabilitation, reconstruction, adaptive use and good management.

Section 28 (c i-vi): Entry on land for purposes of surveying

Section 35: Destruction of Heritage

Section 36: Actions to protect safety and avoid risk

Relevance and how they shall be complied with

The actual sites for the proposed project does not accommodate any features which have been confirmed to have cultural or heritage value; however, during site clearing and construction, any discoveries of possible ancient cultural, historical and natural heritage features will be reported to the National Heritage Society as per provisions of this Act.

2.4.9 Roads and Traffic Control Act No. 11 of 2002

The Act established the Road Transport and Safety Agency mandated to provide for a system of roads safety and traffic management.

Parts V to XIV of the Road and Road Traffic Act CAP 464 of the Laws of Zambia. It established the Road Transport and Safety Agency (RTSA) of which its main function is to implement policy on road transport, traffic management and road safety.

Relevance and how they shall be complied with

The project will use different vehicles on the road during site preparation, construction, operation and demolition. The developer/contractors will ensure the use of the road in accordance with these regulations. All vehicles/ trucks that will be used by the project will be tested to ensure they are road worthy.

2.4.10 Employment Code Act No. 3 of 2019

This Act provides the minimum conditions of service for permanent as well as casual workers. It further provides the minimum monthly wages for different categories of workers and defines workers who are exempted from the wage categories. The Act also classifies the ages of eligibility to perform various types of employment and generally provides for regulations governing the conditions of employment such as restrictions relating to work at night and hours of work.

Children are defined as those under the age of 15 and a young person is defined as someone between the ages of 15 and 18. Under the Act, both children and young people are prohibited from working on construction sites. The following parts of the Employment of Young Persons and Children (Amendment) Act apply to the implementation of the proposed project Section 4A.

(*1) Subject to subsection (2), a child shall not be employed in any covered worksite.*

(2) Notwithstanding subsection (1), a child aged between thirteen and fifteen years may be lawfully engaged in light work

Relevance and how they shall be complied with

The developer will employ people to work on this project who might be either permanent employees or on contract basis and will ensure that all recruited personnel on site or other works relating to the project are not minors i.e. below 18 years.

2.4.11 The Zambia Wildlife Act, No. 14 of 2015

Provides for the establishment, control and management of National Parks (NP) and for the conservation and enhancement of wildlife ecosystems.

Relevance and how they shall be complied with

The sites for the project activities are devoid of big game. However, the presence of small mammals, insects, amphibian, birds and reptiles cannot be ruled out. The project developer shall adhere to the provisions of the Act.

2.4.12 Workers Compensation Act, No. 10 of 1999

The act provides for the establishment and administration of a Fund for the compensation of Workers disabled by accidents or diseases contracted by workers in the course of their employment, and for the payment of compensation to dependants of Workers who die as a result of such accidents or diseases.

Part V Section 51(I) requires that, if an accident or disease occurs to a worker arising out of the course of employment and results in the worker's disablement or death, the worker, or if the worker dies, that worker's dependents shall be entitled to compensation in accordance with the provisions of this Act.

Relevance and how they shall be complied with

There is a possibility that some workers employed on this project, might be involved in accidents. In case of any accidents occurring to any worker, MLP and its contractors will treat such employees in accordance with these regulations. The developer will ensure that all its employees are registered as provided for under the Workers Compensation Act.

2.4.13 Urban and Regional Planning Act No. 3 of 2015

This act provide for development, planning and administration principles, standards and requirements for urban and regional planning processes and systems.

Relevance and how they shall be complied with

This act is relevant as the project will involve the building of structures on the farm in Serenje District and this requires permits from the council on the building plans. The developer will comply with this act by following standards and requirements of the act.

2.4.14 The Public Road Act CAP 12 of 2002

The Public Roads Act provides for the establishment of the Road Development Agency (RDA) responsible for the planning, management and coordination of the road network in

Zambia. Part III of this law prohibits road infringement by stipulating dimensions of road reserves within which no construction of any structures is allowed.

Relevance and how they shall be complied with

This Act is relevant as the project will lead to increased traffic volumes on the roads in the project area. The developer will comply with this act by consulting Road Development Agency in those place where the implementation of the project will affect or interrupt the road network system in the project area.

2.5 International Policy Frame Work

2.5.1 International Conventions

Zambia is a signatory and party to so many international conventions and protocols. The international conventions and/or protocols that are relevant to this project that were reviewed are listed in Table 2-1.

Table 2-1: International Environment Convention to which Zambia is Signatory

Convention	Description	Relevance to MLP Project
UNFCCC United Nations Framework Convention on Climate Change Ratified 1997	This aims at stabilizing greenhouse gas (GHGs) concentration in the atmosphere at the level that would prevent 'dangerous interference with climate'. It urges countries to take steps in reducing the GHGs.	Agriculture projects contribute to emission of greenhouse gasses through sources such as enteric fermentation, soil management, manure management and CO2 emissions from fossil fuel consumption. MLP will endeavour to use best technology and practices to reduce emissions of GHGs.
Rio Declaration on Environment and development.	It established important principles for sustainable development	This declaration is important in that it involves the use of natural resources in a sustainable way to ensure that future generation also benefit. MLP will implement the project in line with this declaration by trying to incorporate sustainability principles in all in all its operation
Conversion on Control of Trans boundary Movements of Hazardous Wastes and their Disposal (1992).	The convention aims at controlling and reducing transboundary movements of hazardous wastes and assist developing countries in environmentally sound management of the hazardous and other wastes they generate.	The project has the potential to produce hazardous waste. Since MLP will be involved in the export and import of several products, the company will ensure that there is no transboundary movement of hazardous waste and that management of such waste is done in accordance with the outcome of this conversion.
UNCCD Convention on Desertification Ratified : 1997	Convention established to combat desertification in those countries experiencing serious drought and/or desertification, particularly in Africa	This Convention has no bearing on the MLP projet as the project site is not prone to serious drought/desertification. But with irregularities in climate that have been experienced in recent years, MLP will be mindful of the provisions and requirements set therein
Ramsar Convention Convention on Wetlands of International Importance especially as Waterfowl Habitat. Ratified : 1975	The convention aims at protecting wetlands through sustainable utilisation of them. It addresses one of the most important issues in Southern Africa, namely the conservation of the countries water supplies, for both the use of the natural resources.	The project will have minimal impacts on wetlands as there are no areas designated as such in the project influence area.
African Convention on the Conservation of Nature and Natural Resources (Algiers, 1968), (Maputo, 2003)	To encourage individual and joint action for the conservation, utilization and development of soil, water, flora and fauna for the present and future welfare of mankind, from an economic, nutritional, scientific, educational, cultural and aesthetic point of view.	MLP will ensure the conservation of important habitats as well as habitat corridors to promote biological diversity. The EMP deals with these aspects of ensuring habitat diversity and sustainable utilisation of natural resources.

Convention concerning the Protection of the World Cultural and Natural Heritage Ratified : 1972	The Convention deals with the protection and continuity of cultural and natural heritage. Natural heritage are constantly under threat from not only traditional causes of decay but also from anthropogenic activities.	The convention has direct relevance to theMLP farm project, and aspect contained in the convention is dealt with in the EMP.
Convention Concerning the Protection of Workers Against Occupational Hazards in the Working Environment Due to Air Pollution	The Convention deals with the working environment: atmospheric pollution, noise and vibration and the impacts on the workers' health.	This convention has direct relevance to the MLP Farm project by MLP and aspect contained in the convention is dealt with in the EMP.
Stockholm Convention on Persistent Organic Pollutants Ratified: 1979	The objective of this Convention is to protect human health and the environment from persistent organic pollutants by prohibiting, phasing out as soon as possible, or restricting the production, placing on the market and use of such substances.	This convention has direct relevance to the Farm project by MLP and aspect contained in the convention is dealt with in the EMP.
Cartagena Protocol on Biosafety to the Convention on Biological Diversity	The objective of this Convention is to ensure an adequate level of protection for the transfer, handling and use of genetically modified organisms (GMOs) that may have adverse effects on the environment and human health, and specifically focusing on transboundary movements	MLP will not be making use of genetically modified organisms (GMOs) and thus is not affected by this Convention
Agreement on the Action Plan for Environmentally Sound Management of the Common Zambezi River System Ratified: 1987	The objective of this Convention aims to develop regional cooperation in the spirit of the Lagos Plan of Action and the Southern African Development Co-ordination Conference (SADCC), on environmentally sound water resources management of the common Zambezi river system and to strengthen their regional co-operation for sustainable development.	No direct bearing on MLP project. However, MLP must ensure that its activities regarding the farm project do not impact adversely on the sustainable use and development of the Luwombwa River System.

2.5.2 International Finance Corporation (IFC) Performance Standards Relevant to the Project

IFC requires its clients to apply the Performance Standards to manage environmental and social risks and impacts so that development opportunities are enhanced. The ESIA process also reviewed the Equator principles (EPs) and IFC guidelines to ensure that the implementation of the project follows international principles and guidelines. The Eps represent a voluntary set of nine principles based on World Bank and IFC standards, for assessing environmental and social impacts of projects in project financing. Based upon the ESIA assessment, the following IFC Guidelines and Performance Standards (PSs) were determined as applicable to the project:

Performance Standards (PSs)

- *PS1: Assessment and Management of Environmental and Social Risks and Impacts;*
- *PS2: Labour and Working Conditions;*
- *PS3: Resource Efficiency and Pollution Prevention;*
- *PS4: Community Health, Safety and Security;*
- *PS5: Land Acquisition and Involuntary Resettlement;*
- *PS6: Biodiversity Conservation and Sustainable Management of Natural Resources;*
- *PS 8: Cultural Heritage*

Table 2-2 outlines the relevance of the IFC Performance Standards to the project.

Table 2-2: IFC Performance Standards Relevant to the project

IFC Performance Standard	Description	Relevance to the MLP Farm Project
Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts	Underscores the importance of managing environmental and social performance throughout the life of project	MLP project will have environmental and/or social risks and/or impacts. MLP will establish and maintain a process for identifying the environmental and social risks and impacts of the dam project as outlined in paragraph 18 for competence requirements.
Performance Standard 2: Labor and Working Conditions	Recognizes that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers. The requirements in this has also being guided by those provided for by other requirements such as that of the International Labor Organisation (ILO) • ILO Convention 87 on Freedom of Association and Protection of the Right to Organize • ILO Convention 98 on the Right to Organize and Collective Bargaining • ILO Convention 138 on Minimum Age (of Employment) • ILO Convention 111 on Discrimination (Employment and Occupation)	MLP will employ a number of people to work on the farm. These workers will either be direct, contracted or supply chain workers. MLP will ensure that what is provided for in this performance standard is adhered to. In Zambia, the law recognizes workers 'rights to form and to join workers' organizations of their choice. MLP will not interfere with this right of workers in line with this PS2.
Performance Standard 3: Resource Efficiency and Pollution Prevention	Recognizes that increased economic activity and urbanization often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels.	This performance standard applies as MLP will use water resources for irrigation. There will also be sanitary water from residential areas though the volumes are negligible. Soil quality may be affected during the construction phase though pollution will be negligible
Performance Standard 4: Community Health, Safety, and Security	Recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. In addition, communities that are already subjected to impacts from climate change may also experience an acceleration and/or intensification of impacts due to project activities.	MLP will ensure that the equipment, machinery and other infrastructure element on the farm are designed, constructed, operated, and decommissioned in accordance with good international industry practice (GIIP), taking into consideration safety risks to third parties or Affected communities. The project will be located within the area designated for farm block development.

Performance Standard 5: Land Acquisition and Involuntary Resettlement	Recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood1) as a result of project-related land acquisition2 and/or restrictions on land use	Land was acquired from the state and there are no people having permanent structures within the project area. However, there a number of people living around the project area. MLP will ensure that the provisions of this performance standard are followed.
Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	Recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development	Part of the area will be cleared leading to the loss of flora and termite mounds, or 'termitaria'. The clearance will be confined to the areas that will be used for the fields and those that will be used for some infrastructure such as offices and houses. Clearing of vegetation will lead to loss of biodiversity.
Performance Standard 7: Indigenous Peoples	Recognizes that Indigenous Peoples, as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population.	No indigenous people as defined by IFC PS7 are affected by MLP project.
Performance Standard 8: Cultural Heritage	Recognizes the importance of cultural heritage for current and future generations. Consistent with the Convention Concerning the Protection of the World Cultural and Natural Heritage, this Performance Standard aims to ensure that clients protect cultural heritage in the course of their project activities	No cultural heritage will be affected by the proposed MLP project. The reconnaissance survey conducted so far indicates that there are some grave yards within the area proposed for the farm. Any heritage sites of feature that will be discovered during the implementation of the project will be reported to NHCC, MLP will adhere to the requirements of this performance standard.

3 PROJECT DESCRIPTION

3.1 Location

The proposed MLP project is located within the Luwombwa Farm Block which is located 60km on the northwest of Serenje CBD. It can be accessed via the main Luwombwa Farm Block access road, which turns off the Great North Road at Mulilima, 45 km northwest of Serenje town. The farm is 38km from the Mulilima turn off and is the farm on the right. It is at the tip of the Tumba Hills. The farm is bordered to the north by Sheriff farm, to the south by the Chikele river, to the east by Silverlands and some customary land and to the west by the Luwombwa river.

Table 3-1: Coordinates for the Project Site

	South	East
A	13^{0}7’55.46”	29^{0}54’28.02”
B	13^{0}8’11.86”	29^{0}55’1.14”
C	13^{0}8’47.07”	29^{0}55’39.40”
D	13^{0}09’24.94”	29^{0}56’21.85”
E	13^{0}10’34.36”	29^{0}56’52.65”
F	13^{0}11’5.48	29^{0}57’40.69”
G	13^{0}11’7.00”	29^{0}58’31.39”
H	13^{0}09’9.91”	29^{0}59’1.24”
I	13^{0}09’34.81”	29^{0}58’13.71”
J	13^{0}8’56.56”	29^{0}56’56.07”
K	13^{0}8’24.30”	29^{0}57’8.13”
L	13^{0}7’28.29”	29^{0}55’0.32”

The general location of Serenje district the project area in Zambia is shown in Figure 3-1.

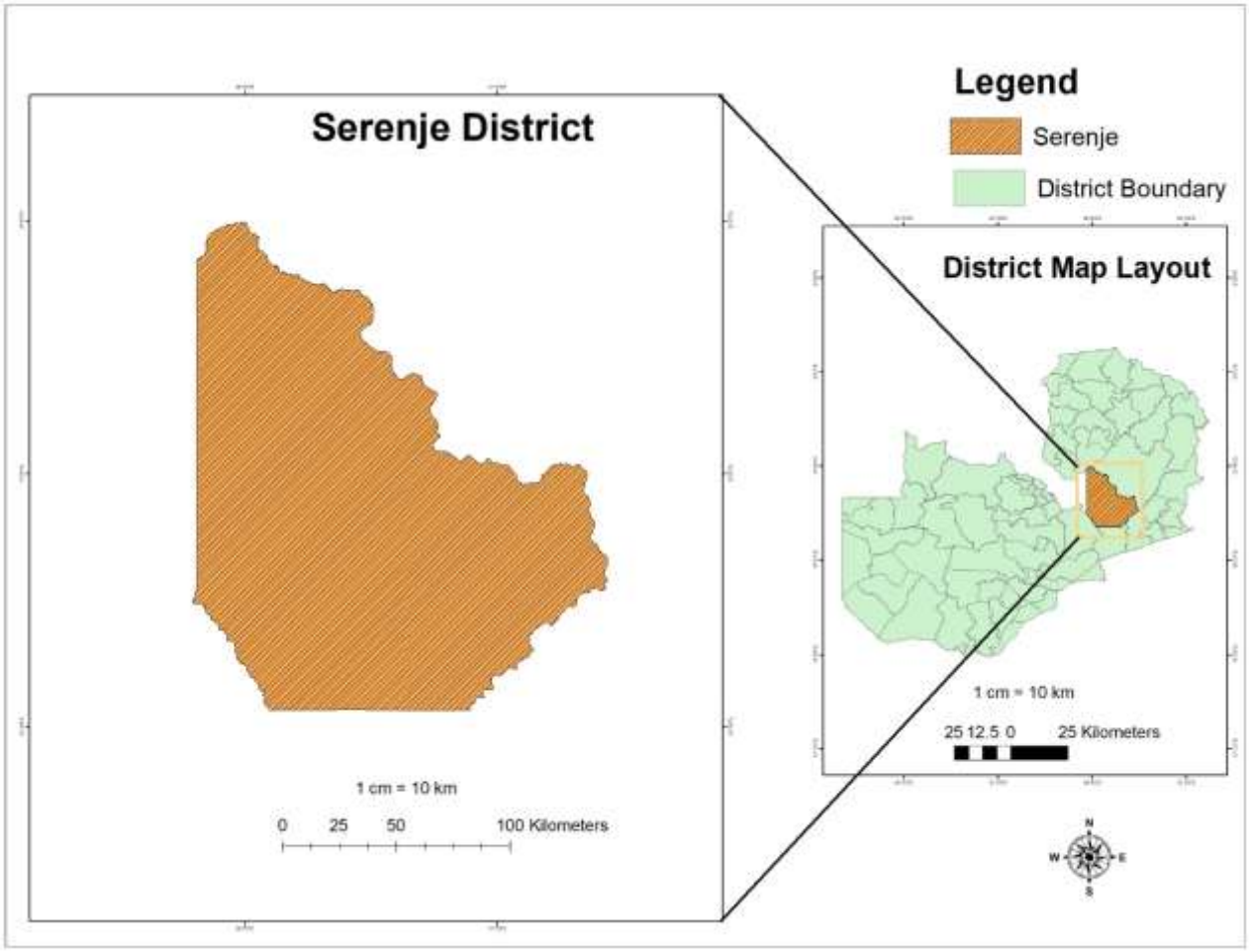

Figure 3-1: Location of Serenje District

Figure 3-2: Location of the project site

Figure 3-3: Layout of the Farms

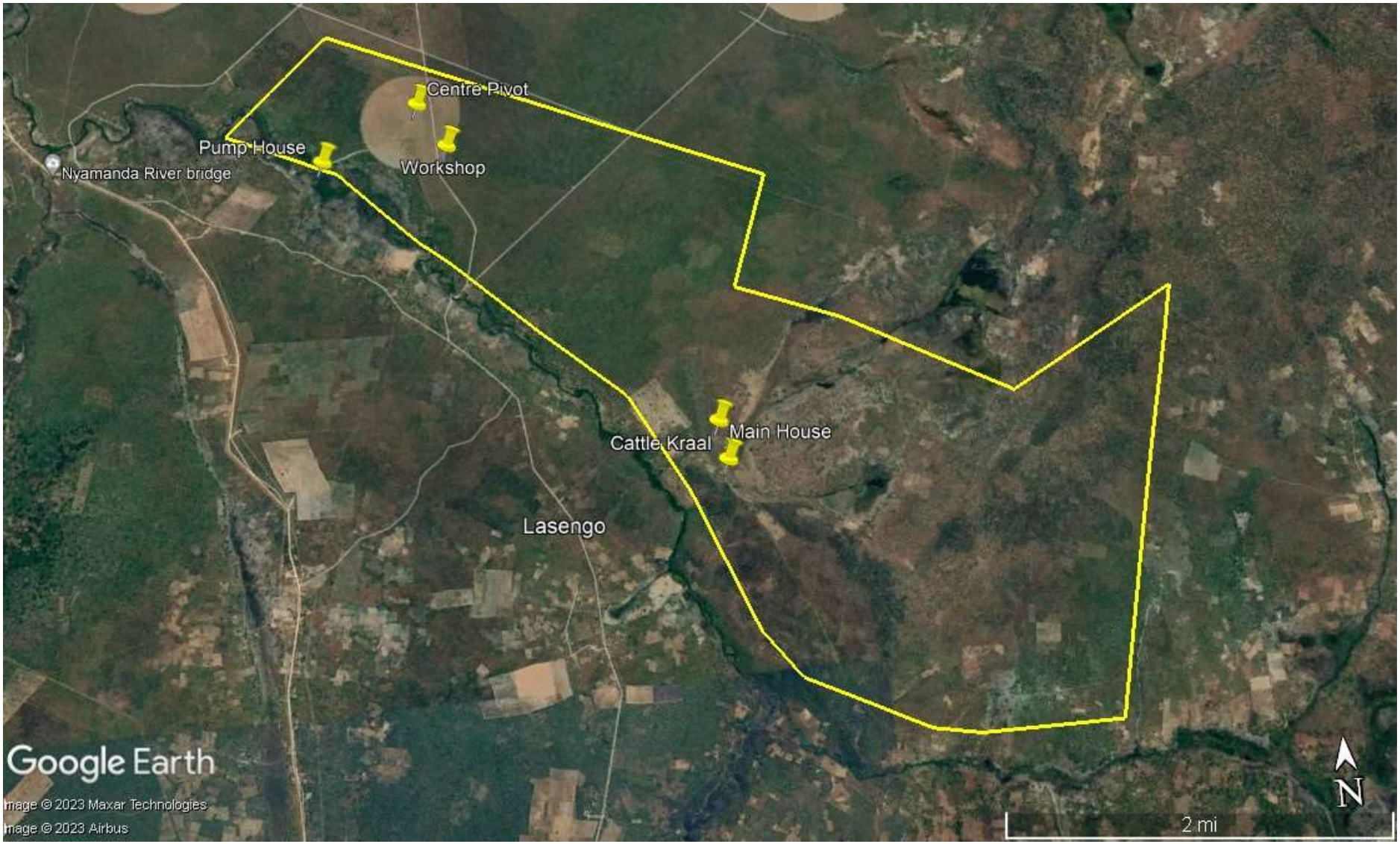

Figure 3-4: Layout of the Farm Facilities

3.2 Nature of Project

Generally, the project is agricultural in nature as its primary focus is on crop production. To complement these main farm activities, there are support facilities such as a grain storage shed, cattle kraal, pump house, equipment and houses. The farm has no dams but abstracts water from the Luwombwa river and is currently negotiating for shares in the Luwombwa river dam projects under the Luwombwa Irrigation Company.

3.3 Components and Activities

Farm 10449 and 11118 are partially developed whereas Farm 11117 is undeveloped. There are currently a few facilities already in place on Farms 10449 and 11118 for operations. The developer intends to utilise farm 11117 for pasture for the catte and sheep. The main components and/or facilities include:

- A main House (15m * 9 m)
- Pump house (5m *6m)
- A Workshop (10m Components * 6m)
- Five (5) Staff houses (4m * 5m)
- A Cattle Kraal (30m * 20m Production Capacity

3.3.1 Housing Units

The farm has a number of housing structures which include a main house, cottage, and Staff housing. Any clearing activities for this infrastructure is done within the confines of the designated area to avaoid extensive clearing of land. Trees around these areas help to minimize soil erosion.

Figure 3-5: Some housing units on the farm

3.3.2 Fields

The farm currently has 60ha under centre pivot irrigation and is currently clearing another 60Ha on Farm 10449. The projected expansion for centre pivot irrigation is 380ha. The current land under cultivation totals 120Ha and vegetation clearing is confined to these fields.

Reduced tillage or no till is practiced to minimize the disruption of soil structure, conserve soil organic matter abd reduce soil erosion. Crop residues are also returned to the soil whenever it is feasible to do so.

Figure 3-6: Some of the fields on the farm

3.3.3 Pump houses

The farm currently uses centre pivot irrigation for its main activity which is cropping. The farm has one (1) centre pivot that is fed by water from the Luwombwa River. To facilitate this activity, there is a pump houses that are strategically located. The water abstraction pipelines run from the pump stations to the field and are regularly maintained to prevent water loss. When trenches are dug for laying of these pipes, these are adequately backfilled.

Figure 3-7: The Pump Houses

3.3.4 Equipment

The farm uses a variety of equipment for its operations which includes 1 tractor and 3 disks. There is a possibility of acquisition of more machinery to facilitate farm operations. To ensure environmental sustainability, these will be regularly serviced to prevel=nt oil spills and records of maintenance will be kept.

3.3.5 Cropping

The main crops grown on the farm include wheat, seed maize and soya which are grown interchangeably. Crop rotation is practiced. The farm also has potential for vegetable crops, aloe vera and tree orchards. Table 3-2 presents the production per annum of each crop.

Table 3-2: Production per year per Crop

DESCRIPTION	AREA HA	SEASON	PRODUCTION/ YEAR (Tons)
Irrigated wheat	60	Winter	1900
Maize/seed maize	30	Summer	800
Soya beans	30	Summer	720

The crops for the proposed expansion will include vegetable crops, aloe vera and a tree orchard under drip irrigation. The approximate hectarage for these are as shown in Table 3-3. To sustain soil nutrients and promote environmental sustainability, crop rotation which will include some cover crops will be practiced. If viable, green manures or cover crops will also be utilized to maintain soils cover. The application of fertlisers will also be timed so as to only be done when the risk of nutrient runoff and volatilization is low.

Table 3-3:Approximate hectarage for expansions

Crop	Size(ha)
Aloe Vera	1.5
Lemon	10
Rhodes Grass	9
Tree Orchard	30ha

3.3.6 Cattle Production

The farm has about 240 cattle on the farm for beef production. The developer is currently growing the herd so it is only selling the steers at present. Approximately 16000kgs of beef are sold per year and it is projected that once the farm gets to 1000 heads of cattle, 96000kgs of beef will be produced per year. The developer also intends to build a slaughter house for about 3-6 cattle per week and cold room for storage and cold chain for animal carcasses in future to ensure value addition is done right at the farm including the establishment of pastures. A fenced pasture for fattening cattle and other livestock will be in place. The facility will be located considering the propagation of odors and distance to neighbours. Livestock pens will be maintained at an appropriate humidity to reduce the generation of dust. Compliance with veterinary and environmental regulations and precautions for waste, sludge, manure abd other by-products will ensure sustainability of this activity.

3.3.7 Egg Production

The farm currently has 250 layers laying at 96%. The developer intends to increase these to up 1000 chickens and will need to establish chicken houses for this purpose. All the eggs produced are being sold to the local community. Waste from these facilities is usually in the form of bedding material as well as manure. These are used to make compost after a careful consisderation of the presence of either hazardous chemicals or biological constituents. Once these are generated they are sited away from areas where they might contaminate surface and ground water facilities. A comprehensive waste and nutrient management plan will be in place.

3.3.8 Fish Ponds

The developer is proposing to construct 16 fish ponds (50m long x 50m wide x 1.5m deep) on Farm 11118. All the ponds will cover an area of 4 hectares. The type of fish that will be raised include the Red Breast Bream of the tilapia family indigenous to the Luwombwa River. The production capacity will be 50 tons per year and harvesting will be done every six months. The ponds will be approximately 500m from the river. The fish will be consumed at the farm by employees. Any excess production will be dried for sale.

3.3.9 Energy

The farm uses both Solar power(5kva) and diesel generator to meet its energy demands. The developer does not store any of the fuel on the farm.

3.3.10 Water

Domestic water

Water is pumped into a 5000litre tank for use in the house, and for the cattle and vegetable gardens. It is hoped that the water storage capacity can be increased to 20000litres to ensure enough water for all the animals and houses on the farm.

Water for irrigation

The developer currently has a permit from WARMA for the abstraction of 10,000 cubic metres per day for 180 days per year. The farm currently only uses half of this permit but hopes to fully use it by the end of the year.

3.3.11 Dams

The farm is involved with other farmers in the planning and building of the Luwombwa Dam Project through the Luwombwa Irrigation Company (LIC). Lara Paton will own shares in the dam when it is built.

3.3.12 Social aspects

From the socio-economic point of view, MLP mainly supports the local economy through employment creation. At present the farm has 10 permanents and 75 seasonal workers for cropping which is projected to increase to 25 permanents and 150 seasonal once the new pivot is installed. The livestock section currently has 15 employees. The contracted employees are 70% male and 30% female. They also assist in contributions for funerals when they occur within the community.

3.3.13 Waste Management

Sewerage:

All bathrooms operate using a septic tank, and covered soak-away system.

Crop Residues:

These are incorporated back into the soil to increase organic matter content in the soil, reduce evaporation, and help fix CO_2 in the soil.

Plastic Containers:

Chemical companies collect all plastic containers (ATS on behalf of another company for recycling).

Used Oils

These are stored in sealed drums outside the workshops, for delivery to (company, Licence to handle used oils).

Solid Waste and Litter

These are accumulated in Pits 2m deep. Once the pit is filled half way, it is burnt and covered with lime about half a meter from the top before covering with soil completely.

Household biodegradable Waste

Composted and incorporated into farm vegetable garden.

3.3.14 Chemical

Chemical Application

To protect and enhance crop production, the farm sparingly uses the following chemicals in selected fields:

- Herbicides: these include pre-emergence and post emergence herbicides. Pre emergence is applied to the soil to prevent all weeds and any other undesirable vegetation such as grasses from germinating. Post emergence herbicides is used to kill weeds after they germinate.
- Insecticides: Crops such as Soya bean and wheat are prone to attack from insects at almost any time of the season. To ensure that all crops are protected at all stages of their growth season, MLP will continue procuring only certified seed that are purchased from accredited suppliers and all growing plants threatened by insects is sprayed.
- Fungicides: is applied to kill or inhibit the growth of fungi that may cause damage to the crops on the farm.
- Fertilizers: these include Booster/ liquid fertilizers, organic fertilizers and inorganic fertilizers. All fertilizers are applied to ensure that the nutritional requirements of all the crops are met. In order to ensure that application of fertilisers do not pollute nearby streams, the following are done:
    - fields are largely situated away from the river system;
    - contours are utilised to retain water in the fields;
    - Fertilisation is not done at times when heavy rains are expected;
    - Good soil management, and minimum tillage to ensure maximum soil protection.

Storage and Handling of Agricultural Chemicals

The storage and handling of agricultural chemicals is one activity that can contaminate the environment, especially ground and surface water. However, if stored safely in a secure location, agricultural chemicals (pesticides and fertilizers) pose little danger to the environment. MLP will continue using the Best Management Practices (BMPs) for handling and storage of all the agriculture chemicals on the farm following the preparation of the ESIA.

Handling

To ensure that there is minimal contamination of the environmental from handling of chemicals, the following measures were put in place:

- *Protective Attire:* MLP has provided protective attire for all employees working with agriculture chemicals. The employees are being trained in the BMPs of handling and storage of agriculture chemicals.
- *Mixing and Loading Activities:* Extreme caution is usually taken when handling concentrated chemicals as spills could result in expensive hazardous waste clean-ups. The mixing and loading operations of pesticides has been located away from ground water wells and areas where runoff may carry spilled pesticides into surface water bodies. All mixing and loading areas have been placed close to storage facilities, to minimize the distance that chemicals are transported before filling the sprayers.
- *Equipment Calibration and Loading:* All application equipment have been properly calibrated and kept in good repair. All calibration has been done according to the measure of the number of pesticides per hectare.
- *Spill Clean-ups:* Chemical spills have been cleaned up immediately to avoid contamination of the water bodies.
- *Container Disposal:* before disposal, containers and bags have been cleaned and shaken out respectively. Liquid containers have been pressure rinsed and punctured. The container and bags will continue being transported to approved disposal sites. These types of waste will continue being disposed in accordance to established standards.
- *Record Keeping:* The Company has been keeping records of all chemicals used on the farm. These include records of all chemicals available and those that have been used in the past, what they are going /were to be used for, where and how they will/were disposed of. Record keeping is intended to ensure that all chemicals used on the farm are accounted for as a measure towards BMPs of handling and storage of these chemicals.

Storage

The following has been done for proper storage of agriculture chemicals:

- Storage facilities has been built to keep pesticides and fertilizers secure and isolated from the surrounding environment. These storage facilities have been located downslope away from the boreholes, wells and streams on the farm.
- Herbicides, insecticides, fungicides and fertilizers have been segregated and their respective labels kept during storage to prevent cross-contamination and minimize the potential for misapplication.

- All agriculture chemicals (pesticides and fertilizers) have been kept out of the way of activities that might rip open a bag or puncture a liquid storage container
- All chemicals maintained in their original well labelled containers, securely closed and regular inspections have been carried out for splits, tears, breaks, or leaks.
- Apart from handling chemicals, employees have been trained on the BMPs of storing agriculture chemicals.

No pesticides and herbicides that are under restriction according to local or international conventions (e.g. pesticides in Class I and Class II according to the WHO Classification of Pesticides by Hazard) has always been purchased. Additionally, products containing polychlorinated biphenyls (PCBs), e.g. certain lubricants, are not purchased.

4 ANALYSIS OF ALTERNATIVES

The project will be undertaken taking into account other viable alternatives that may achieve the desired objective of commercial farming in Serenje. The following alternatives were considered.

4.1 Project Site Location

There are many areas in Zambia which can support agriculture but the process of obtaining the land is quite difficult. The current location has been chosen as that is where the owners have land. The Chief and his people together with the district council know the investor and are willing to have the project implemented in the area as soon as possible.

4.1.1 Site Selection Alternatives

The alternatives for the site selection are:

- Option A: Select an Alternative Site, and
- Option B: Continue with proposed site.

Option A: Select an Alternative Site

This option would mean abandoning the current proposed project site. This alternative would entail purchasing an alternative piece of land or engaging another chief and district council for a piece of land with suitable characteristics for the agriculture. The developer has the land already and there is no need to start looking for other pieces of land whose acquisition process is difficult. The resultant effect of changing the site, assuming another site could be found in the area which is unlikely, would be to increase the timeframe and resources required to realize the development. The unpredictability of financial resources and the lag time required in acquiring and designing the development may also mean that the project may be unable to break even once implemented. This will make this alternative undesirable. The current land is able to support crop production because of generally fertile soils and availability of perennial streams in the area to support agriculture. The company has already spent nearly one year and significant amounts of capital to get the project to the point where it is today. Relocating of the project site would therefore disadvantage the developer.

Option B: Implement the project on the proposed site

This option would take advantage of the suitable environment for the soil type. The project will also take advantage of the already existing roads which will help good accessibility of the identified proposed project site. Proceeding with the option of implementing the project on the proposed site would make a contribution to the much needed development in the area. This will also contribute positively to the socio-economic growth of the community.

4.2 Assessment of alternative sewerage Treatments

Portable Chemical Toilets: Sewerage management by portable Chemical Toilets has the advantage of using chemicals to kill bacterial however there is risks of spillage of chemicals during transport; Rupture of supply of chemicals leaving toilet unhygienic and this in not sustainable for long-term usage;

Connection Sewer system to the Local Authority: Connection Sewer system to the Local Authority will not be possible as the site is far away from the sewer line for Serenje district.

Soak Away and Septic Tank: Sewerage management by Soak Away and Septic Tank will be ideal. The system will be constructed on the farm and that is what will be used for this project.

4.3 Alternative Water Supply

The following options were considered on the source of water for irrigation for the proposed new fields.

- Option A: Abstracting water from the Luwombwa River
- Option C: From boreholes

Option A

This option is to apply for 2.7 million cubic meters/year. This option was preferred as MLP has an existing water permit that could carter for the proposed project without applying for more water.

Option B

This option was not preferred as it is expensive to undertake.

4.4 Do nothing option

The no project option was not preferred. This option was not chosen given the increasing demand for wheat and soya products in Zambia. The option would not have being commensurate to the scale of current demand and the need for MLP to contribute to employment creation in the area. The current demand for wheat and soya requires constant and sustainable wheat and soya supply to cater for the growing population within Zambia and beyond.

4.5 Process/Technology Alternatives

The agriculture processes and technology (fertilizers, chemicals and machinery) to be used will be those commonly used in other commercial farms in the project area and in Zambia.

4.6 Methods of Irrigation Alternatives

A number of irrigation methods were considered. These methods include the following:

Flood Irrigation: This method involves the construction of substantial infrastructure in terms of irrigation Water pipelines and channels as well as major preparatory earthworks for fields in order to achieve the right levels and falls and therefore has a very high capital cost of development. The method is extremely wasteful in terms of water and the grading earthworks involved promote erosion and are not conducive to soil structure. The method also may result in a lot of negative environmental impacts if not handled well. This type of irrigation is not promoted in the country and is mostly used in very rare situations. An example is the new expansions to the Nakambala Sugar Farm, originally developed under flood irrigation, are now developed under Centre pivot. This option was not selected because of the disadvantages highlighted.

Drip Irrigation: This method of irrigation is water efficient. However, this type of irrigation is not suited to grain crops, is very expensive to implement and is best suited to intensive cultivation of crops such as coffee and fruit trees. The method was not selected as the right method of irrigation.

Overhead Sprinklers: This method, although a well tried and tested method, it is very expensive to operate and difficult to monitor as all aspects of management must be done manually. The method is considered inefficient and as old technology best suited to small holdings. The proposed farming project is a modern large-scale commercial farming project and such a method is not well suited to the activities being proposed.

Centre Pivot: This method is water efficient and erosion control friendly. The method is highly automated, easy to operate and monitor hence has the advantages stated above. Under this method the application of water is highly controlled and monitored. The main disadvantage is the high upfront capital cost involved although for areas above 20Ha the method is considered very capital efficient (DHEC, 2012). Given the nature of the intended project, being primarily extensive grain cropping, pivots are considered the most suitable method both from a financial as well as a management and water efficiency/erosion control perspective. This option was selected to be the best method of irrigation for the type of crops to be grown.

5 DESCRIPTION OF BASELINE ENVIRONMENT

5.1 Physical Environment

5.1.1 Climate

The climate in the area is strongly seasonal controlled largely by the north-south migration of the Inter-Tropical Convergence Zone (ITCZ) with seasons. The ITCZ migrates between the equator and the Tropic of Capricorn (23º S) between November and February. In winter, it is located over the northern tropics. The summer rains are brought by the southward migration of the ITCZ, and are characterized by thunderstorms, which are occasionally severe, with excessive lightning and sometimes hail. The project area lies in agro-ecological Zone III.

5.1.1.1 Temperature

The area generally experiences moderately cool temperatures with three distinct seasons. A dry, cold season from May to July with temperatures ranging from 13 to 22oc, a warm dry season from August to October with temperatures ranging from 15 to 35oC and a rainy season from November to April. Warm winter days are accompanied by cold nights. Minimum temperatures at times drop below 12°C especially between June and July

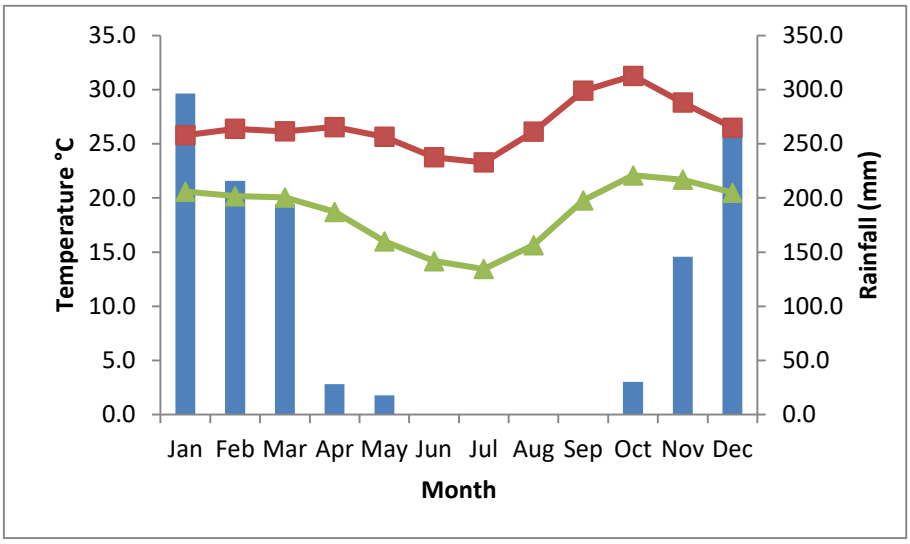

Figure 5-1: Maximum and Minimum Temperatures

5.1.1.2 Rainfall and Evaporation

Rainfall in the area starts by the end-of November, lasting until mid-April. The total length of the growing season at Mkushi is 135 days, with a mean annual rainfall of 1,161 mm. The closest meteorological station is Mkushi at an altitude of 1,384 metres above sea level. Summer rains commence in late October. The bulk of the rainfall occurs between November and March when more than 90% of the annual rainfall is

measured. The mean temperature between 1998 and 2011 has shown an increasing trend. The average evaporation recorded in the area is 4.7mm per year between 1997 and 2011. Potential Evapo-transpiration (PET) is highest in October (151 mm) and is more than mean monthly rainfall from May to October. During the rainy months December to March, evaporation is lower than precipitation.

5.1.1.3 Relative Humidity, Sunshine and Wind

According to data available at Mkushi Meteorological Station, the average relative humidity in the project area is 64% while sunshine is 7.8 hours. The suitability of the climate for the production of maize, soya and wheat is well proven in this area. The summer rainfall pattern fits well with the double cropping requirement for a dry April and September allowing for harvesting

5.1.2 Air Quality and Noise

Wind direction is predominantly from north-east to south-east in the project area while average wind speeds range from 1.4m/s in summer months to 0.8m/s in winter periods.

Serenje and in particular the project area, is a rural community setting with no industrial emissions. Modern technological findings attribute the increased mass loads of carbon into the atmosphere in the Sub-region to be from activities of charcoal burning, bush burning during land preparation for seasonal farming and wild fires. Air pollution arising from motor traffic is very insignificant.

5.1.3 Geology

The geology of Serenje district is of a complex nature. The basement rocks are overlaid by the Muva, Lower and Upper Roan, Mwashia Upper and Lower Kundelungu series. Large parts of these have been irregularly deposited and irregularly eroded over time. The Basement complex and the Muva system comprise a series of Schist, Quartzites, Gneisses and intrusion of Granite. On the Muva and Basement rocks are sedimentary rocks of the Katanga system which are considered to be of the late Pre - Cambrian age.

These are divided into three groups, which have a fairly well-defined sequence throughout the study area. The lowest of the three is predominantly arenaceous and is formed of conglomerates, sandstones and quartzites, where all the mineral ore deposited are said to occur. The second and upper group comprises dolomites, shales and limestone with thin beds of sandstones while the upper most group comprises inter-bedded argillites and dolomites.

The above-mentioned rock groups have undergone the process of structural folding forming a series of north-west/south-east trending anticlines and synclines plunging generally to the north-west. The subsequent erosion has removed the higher parts of these structures and the Katanga sedimentary rocks are now represented by a series of Pedi-plains composed of synclinal basins and anticlines.

Field observations indicate that most of the hills of the area consist mainly of quartzitic sandstones. Fine grained phyllitic siltstones and shales were located as scattered occurrences. Frequent shallow areas with laterite beds or gravelly topsoil or sheets are

observed in the whole Luwombwa Farm Block area especially towards the rivers at slope break. Quartzitic outcrops are common on hills (Figure 5-2).

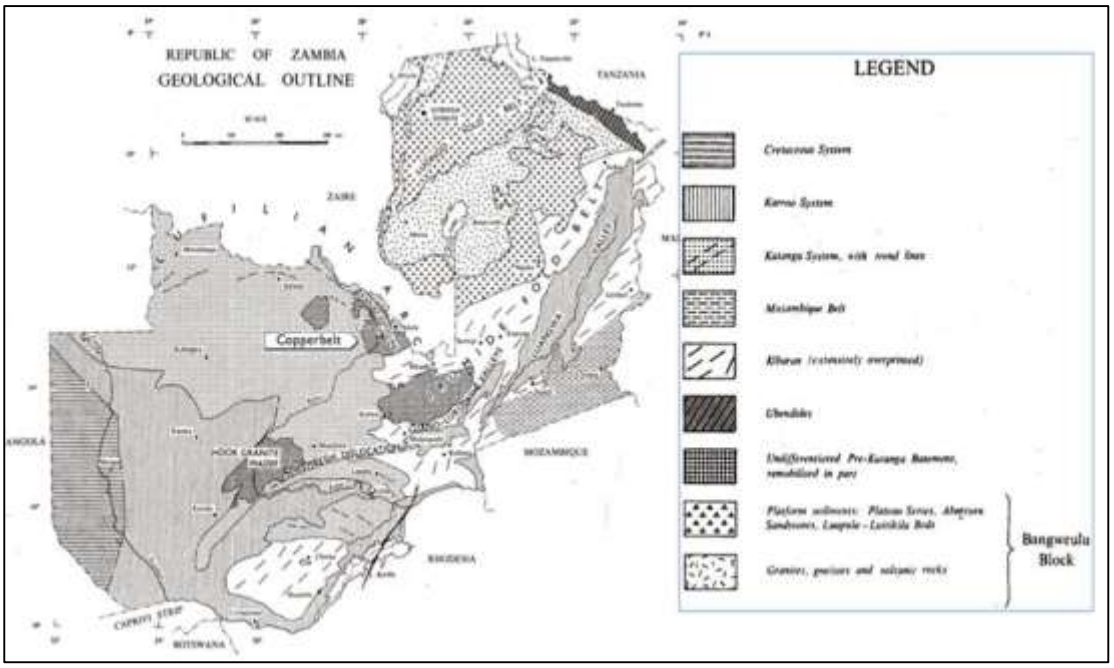

Figure 5-2: Geology Map of Zambia

5.1.4 Vegetation

The vegetation is largely a combination of *Brachystegia spp*. and *Julbernardia Paniculata*. The unique feature in the area is the prominent presence of Uapaca and Protea species, which tend to mask the qoriginal vegetation in some places. The Vegetation growth is largely retarded by the annual cutback for either Chitemene or caterpillar collection. The results are the appearance of secondary regeneration as the forests rarely reach their climax especially the *Brachystegia* and *Julbernardia species*. Chipya Woodland (B4) is the other type present here, which occurs largely on the dambo edges. At the Catchment of streams there is mainly trash group vegetation of *Syzygium, Combretum* and *Terminalia*. The miombo in this area goes through some sequences.

5.2 Biological Environment

The project will be implemented in the somehow green field environment of Serenje. The area is generally characterized by secondary forests mostly at regenerative stage. There is low fauna diversity due to the fact that the area has been cultivated before and most fauna species present in the area are small mammals and insects. However, there Isolated and intact habitats especially those along river/streams banks.

5.2.1 Methodology

The qualitative and quantitative method of analysis will be adopted with the team's professional and profound experience, the data collection and analysis will be very credible. Portable instruments such as tally counters, note pads will be used for assessing the socio-economic characteristics of the local population, while other specialized instruments such as handheld GPS, diameter tape, callipers, sunto, levels, steel tapes, pH meters, bark-gauge, floro-fauna atlases and computer

software packages will be used during specialized data collection. In flora and fauna assessments, the following principles will be followed as established by Nune (2008):

Flora data collect methods

Transects and quadrant method are the recommended survey method to assess flora species in an area of such as the one for the agriculture activities. Size of transect was 1000-meter-long and 10 meters wide. Quadrants having different dimensions, i.e., 1m x 1m for ferns, herbs and grasses, 20m x 20m for trees and shrub seedlings and 5m x 5m for saplings was laid along the centre at 50, 100, 150, and 950 meters for estimation of their relative abundance. Each species of tree, shrub and lianas greater than or equal to 10 cm diameter within 50 x 10 meter transect was listed and counted. Diameter at Breast Height (DBH) of each tree listed was measured. Height of each tree was measured using suntos. Four teams of data collectors were stationed in different parts within the project site and all teams were given data collection protocols so as to create uniformity in the data collection among the teams. Transects were laid down from the map and then in the field GPS was used to locate transects. All the tree species in the main plot were identified and recorded.

Attention was given to relatively naturally vegetated areas, in particular forest areas. Representative area for each site was sampled. The classified (stratified) map was used for the whole period. Therefore, the number of sample plots in each forest varied according to the size of each forest type identified. Sample plots were distributed proportional to the size of the area. The first sample plot was chosen randomly. It starts 50 meters from the edge of the forest to avoid “edge effect”. Along each transect line, the following information was collected:

- Tree, shrub and lianas
- Herbs and ferns
- Grasses
- Regeneration and saplings for trees, shrubs and lianas
- Number of dead trees

The tree species were identified using the “Know your Tree” book and the local people who were included in the assessment team.

Individual plants in the plots were observed in order to get information on the composition of the vegetation and the quality of the vegetation in the area in terms of:

- Size of individuals;
- Structure of the vegetation;
- Relative number of individuals;
- Species composition

Plant species were, as far as possible, identified in the field using tree identification field guides by Palgrave 1977, Storrs 1995, and Van Wyk and Van Wyk 2013. However, when identification was doubtful, specimens were collected for confirmation of identity in the herbarium.

5.2.2 Flora

Objectives of flora assessment

Different survey techniques were employed to assess the baseline fauna (including birds, mammals, reptile, amphibians and invertebrates) associated with each vegetation type found in the area. Methods that were used include:

- Point count;
- Play back calls;
- Transect walks;
- Direct search and observations;
- Indirect method (noticing the presence of foot prints, tracks, droppings, burrows or digging and evidence of feeding)

Community members were interviewed for the purpose of collecting data on the type of animals; location, distribution and frequency of occurrence. The following key questions were used to collect data on wildlife resources in the area:

- What types of animals (mammals, birds, reptiles, amphibians and insects) were once present in the area?
- What animals are found in the area today? and
- What has caused the changes in animal population structures?

For bird species, checklist of questions included:

- What type of migratory birds you usually see in the area?
- Do you notice any strange or extraordinary birds during certain seasons?
- Do you know their names?
- When do they appear and leave each season?

For insects or other invertebrates, we establish circular plots on the transect lines at predetermined interval and then identify and record all the biological organisms present. Other data collection methods involved searching and direct observation.

5.2.3 Flora data analysis

Abundance, Relative Frequency (RF), Relative Density (RD), Relative Basal Area (RBA) and Important Values (IV)

Excel will be used to analyze the data on flora. The species data will be used to determine species importance values (IV) and species richness. Importance values were calculated as adopted from DWAF (2005). Species important values are very important in determining the performance of the species in a given area.

For plants with dbh ≥ 5 cm

$$IV = \frac{[\text{Relative Frequency (RF)} + \text{Relative Density (RD)} + \text{Relative Basal Arear(RBA)}}{3}$$

$$RF = \frac{\text{Number of plots in which species is present}}{\text{Total Number of plots recorded}} x100$$

$$RD = \frac{\text{Number of stems recorded for species}}{\text{Number of stems recorded for all species}} x100$$

$$\text{Abundance} = \frac{\text{Total number of stems recorded for species}}{\text{Total number of quadrants in which the species occured}}$$

$$RBA = \frac{\text{Basal area of a species in a community}}{\text{Total basal arae of all specise in the community}} x100$$

Calculation of dominance

Indices

Dominance indices are weighted towards the abundance of the commonest species. Dominance indices were calculated for the commonest species. The dominance indices that were used included the following:

Information-statistic indices

a. Species Richness

Where: S = Number of species observed in the

N = Total number of individuals trees Observed

b. Shannon Index (Hs)

$H_s = -\sum p_i ln p_i$

Where:

Pi= Proportion of individuals found in the *i*th species and

ln= Natural logarithm

Specialized Flora and Fauna Assessments

Purpose of flora assessment:

To identify the botanical attributes of the assessment site, including:

- Compilation of species lists of all observed flora
- Mapping and describing the extent and type of native vegetation present
- The presence or absence of threatened species or communities
- High conservation value areas

To quantify the botanical attributes of the assessment site (if necessary), to:

- Identify the species and size class of scattered trees found within the site, and determine the ecological/habitat significance of each
- Map the locations of threatened flora species (if present), and indicate potential habitat for threatened species
- Refine suggested future flora surveys (using the assessment results)

Undertake a habitat hectare assessment of patches of native vegetation of differing quality and/or Ecological Vegetation Classes

5.2.4 Vegetation and Flora - General context

The vegetation of the Central province is covered mainly by single storied deciduous Miombo Woodland with limited areas of dry evergreens, swamps and riparian forests known as Mushitu, Chipya woodlands and savannah shrubs. This unique woodland often grows to form a closed-canopy. Degraded forest areas are common and are observed to have secondary grassland and juvenile re-growths of woody species across the land (Chidumayo, 1997).

Though the Ecoregion on the Central province has changed during the past century, the predominant vegetation type still remains the miombo woodland with its characteristic fire hard species composing mainly of Brachystegia, Julbernardia and Isoberlinia species which are generally depleted due to uncontrolled human activities (UNEP, 2013). Forest depletion can be attributed to charcoal production; planned and unplanned settlements; industrial and agricultural expansion activities. As a result of forest depletion, most big mammals have either been depleted or have fled the area hence- only small animals may be spotted in less protected areas. However, to-date, some large tracts of land exist, housing a sizeable number of large animals. UNEP (2013) provides a map showing the vegetation types for the Central Province where the project area lies (Figure 5-3).

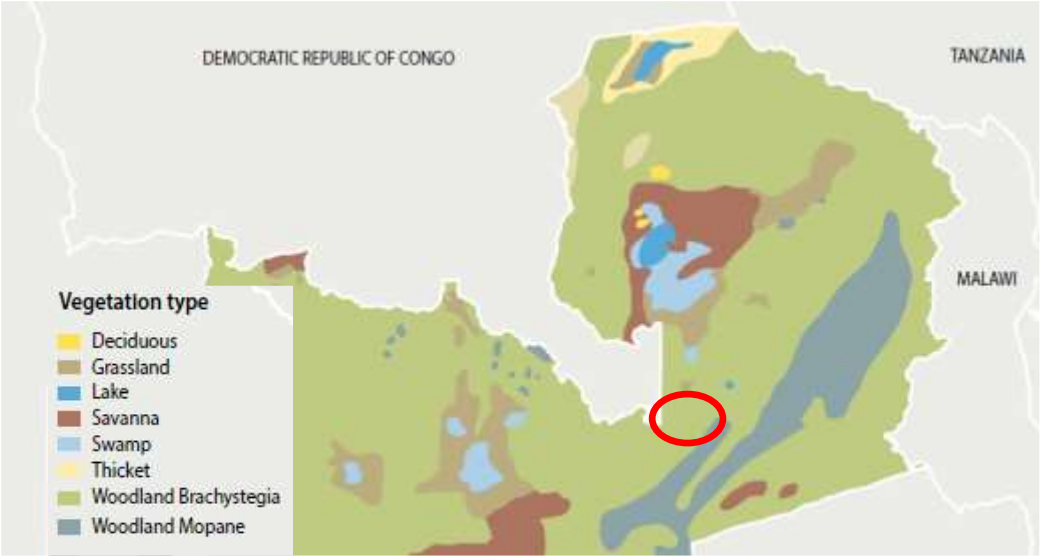

Figure 5-3: Vegetation map extract from the UNEP Atlas of Zambia

Source: UNEP, 2013

5.2.5 Vegetation and flora in the Project Area

The vegetation is largely a combination of *Brachystegia spp*. and *Julbernardia Paniculata*. The unique feature in the area is the prominent presence of Uapaca and Protea species, which tend to mask the original vegetation in some places. The Vegetation growth is largely retarded by the annual cutback for either Chitemene or caterpillar collection. The results are the appearance of secondary regeneration as the forests rarely reach their climax especially the *Brachystegia* and *Julbernardia species*. Chipya Woodland (B4) is the other type present here, which occurs largely on the dambo edges. At the Catchment of streams there is mainly trash group vegetation of *Syzygium, Combretum* and *Terminalia*. The miombo in this area goes through some sequences.

Relative Frequency, Relative density and Relative Basal Area

The species identified in the project area during the flora survey area shown in Table 5-1.

Table 5-1: RF, RD, RBA and IV

Species	RF (%)	RD (%)	RBA	IV (%)
Albizia antunesiana	29	4.7	12.5	33.3
Anisophyllea boehmii	29	1.2	50	29.7
Annona senegalensis	29	1.2	50	29.7
Baphia bequaertii	14	1.2	50	15.5
Brachystegia boehmii	57	4.7	12.5	62
Brachystegia floribunda	43	3.5	16. 7	46.4
Brachystegia longifolia	57	4.7	12.5	62
Brachystegia taxifolia	14	0.6	100	14.9
Byrsocarpus orientalis	14	0.6	100	14.9
Combretum molle	14	0.6	100	14.9
Combretum Zeyheri	29	1.2	50	29.7
Dalbergia nitidula	29	1.8	33. 3	30.3
Diplorhyncus condylocarpon	71	5.8	10	77.3
Erythrina abyssinica	14	0.6	100	14.9
Erythrophleum africanum	14	0.6	100	14.9
Faurea saligna	14	0.6	100	14.9
Flacotia indica	14	0.6	100	14.9
Hexalobus monopetalous	14	1.2	50	15.5
Isoberlinia angolensis	57	11.1	5. 3	68.3
Julbernardia globiflora	29	1.8	33.3	30.3
Julbernardia paniculata	86	12.3	4.8	98
Monotes africanus	43	2.3	25	45.2
Ochna pulcra	57	5.3	11.1	62.4
Ozoroa reticulate	14	0.6	100	14.9
Parinari curatellifolia	29	1.8	33.3	30.3
Pericopsis angolensis	57	6.4	9.1	63.6

Protea welwitschii	29	1.2	50	29.7
Pseudolachnostylis	57	2.9	20	60.1
Pterocarpus angolensis	14	1.2	50	15.5
Strychnos cocculoides	14	2.3	25	16.6
Swartzia madagascariensis	14	1.8	33.3	16
Syzygium cordatum	14	0.6	100	14.9
Uapaca kirkiana	43	7	8.3	49.9
Uapaca nitida	29	4.7	12.5	33.3

From Table 5-1, Julbernardia paniculata had the highest IV (98%) indicating that it is the most dominant species within the proposed farmland to be owned by MLP. The estimated total volume of wood to be cleared for the expansion project is 3.25m^3. Most of the trees within the area proposed for expansion are at regenerative stage with average diameter of 8-10cm.

Vegetation Types Identified

The predominant vegetation is a mosaic of miombo woodland and termitaria. This vegetation type is common throughout Zambia and in the Central Province. There are also some dambos that occur within the farm area. Riparian forests occur along the river banks. Most of the area within the farming unit has intact vegetation except in areas where cultivation has occurred.

Miombo woodland

Despite its large extent over much of central Southern Africa, it is nonetheless listed as a vulnerable vegetation type by the World Wide Fund for nature (WWF). The miombo within the farming unit area is very distinctive, although the dominants in some areas may change. The Julbernardia dominated miombo consist of Julbernardia/Brachystegia/Isoberlinia tree species. There are also areas where the vegetation has been disturbed due to agricultural activities that have been taking place within the area.

In total, 26 miombo releves were studied in order to determine the characteristics of this vegetation type within the entire farming unit area. From a total of 26 releves of this community type, 42 species were recorded. The most common and important of these are given in Table 5-2.

Table 5-2: Dominant species in the Miombo Woodland within project site

Species	% of Releves in which it occurs
Julbernardia paniculata	100
Brachystegia boehmii	65
Isoberlinia angolensis	58
Anisophyllea boehmii	40
Diospyros batocana	40
Parinari curatellifolia	33
Protea angolensis	33

Miombo Regeneration

According to Chidumayo (1997), natural regeneration of miombo woodlands is through seed, stumps (coppices) and roots. There are five factors that affect natural regeneration and these include: Canopy shading in selective felling systems; Inter-shoot competition-whereby only the dominant shoots contribute to the next generation; Capacity to regenerate (coppice) decreases with age and stem size; Late forest fires which kill seedlings and coppices; Cutting of seed bearers for wood fuel and saw logs and clearing for agriculture. Seed bearers are usually cut because of their bigger diameters and hence are preferred for timber as saw logs. This contributes to poor regeneration from seed.

Chitondo (1999) states that 100 years is regarded as the period needed for a tree in Miombo woodland, under natural conditions, to attain Diameter Breast Height (DBH) of 30cm. In terms of establishment period, the average is 8 years for both seedlings and coppices while in areas where cutting is selective and clear felled is 20 years and 60 years respectively. Normal establishment period for new crop is best regarded at 10 years when stool mortality and different sources of regeneration are taken into account.

Within the proposed farming unit area, about 20 tree species were observed to be regenerating. The average number of stems regenerating per hectare is 60 with *Julbernardia paniculata* (Table 5-3) having the highest (214) stems regenerating per hectare.

Table 5-3: Regenerating tree species in the farming unit area

SPECIES	COUNT	STEMS/HA
Albizia antunesiana	18	64
Annona senegalensis	3	11
Brachystegia longifolia	5	18
Byrsocarpus orientalis	39	139
Combretum molle	3	11
Diplorhynchus condylocarpon	32	114
Isoberlinia angolensis	35	125
Julbernardia paniculata	60	214
Ochna pulcra	5	18
Parinari curatellifolia	4	14
Pericopsis angolensis	6	21
Protea welwitschii	2	7
Pseudolachnostylis maprouneifolia	7	25
Rothmannia englerana	21	75
Strychnos cocculoides	7	25
Syzygium cordatum	3	11
Uapaca kirkiana	8	29

Riparian Forest

This vegetation type occurs along the rivers/streams. Dominant trees include *Syzygium guineense*, *Diospyros mespiliformis* and *Homalium abdessammadii*. Other characteristic trees and shrubs include *Garcinia livingstonei*, *Croton megalobotrys*, *Antidesma venosum*, *Kraussia floribunda*, *Rhus longipes*, *R. pyroides*, *Phoenix reclinata*, *Oncoba spinosa*, *Carissa edulis*, *Tetradenia riparia*, *Diospyros senensis*, *Warneckea sansibaricum*, *Canthium glaucum*, *Azanza garkeana*, *Vangueria infausta*, *Cleistochlamys kirkii*, *Hippocratea indica*, *Diospyros quiloensis*, *Crotalaria pallidicaulis*, *Cussonia spicata* and *Vepris zambesiaca*.

Within the study area, a total of 10 riparian releves were studied to assess the characteristics of this vegetation type. From a total of 10 releves of this community type, 28 species were recorded. The most important of these are given in Table 5-4. The forest type is fairly well represented within the project area; it has not been extensively impacted by human activity, apart from some areas of the Luwombwa and its tributaries that are near the community settlements which have been affected by agriculture and fire. Very few studies have been conducted on the forest species and as a result it is difficult to identify, even though this is an important vegetation type within the project area. Riparian forest occurs along the banks of the rivers (Table 5-4).

Table 5-4: Dominant species in the Riparian forest

Species	% of releves in which it occurs
Syzigium cordatum	57
Costus spectabilis	35
Harunguana madagascariensis	29
Syzygium guineense	25

Termitaria

Termite mounds or termitaria are common within Zambia and occur within several different vegetation types (White 1983). They themselves contain such a different set of vegetation than the surrounding landscape that they are, in fact, vegetation types themselves (White 1983).

Termitaria (termite mounds) are not common within the farming unit area. From a total of 10 releves of this community type, only 12 species were recorded. The most common and important of these are given in Table 5-5.

Table 5-5: Dominant Species within the termitaria

Species	% of releves in which it occurs
Boscia angustifolia	75
Pavetta schumanniana	61
Costus spectabilis	48

Cussonia arborea	45

Threatened species

The plant species mentioned in the previous section are generally common (Storrs, 1995) and very widespread and are not under any listed threat (Bingham 2011). No protected species were found during the Consultant's field investigations in October/September 2019.

5.2.6 Fauna - General context

All wildlife in Zambia is protected under the Zambia Wildlife Act No. 14 of 2015. In this context, wildlife is defined as all wild animals or species of birds which are found in Zambia in a wild state and vegetation which is indigenous to Zambia and grows naturally without cultivation. Thus, conservation and protection of species is assigned based on the provisions of this Act. However, specific national conservation action plans / programmes exist for several highly threatened species, including the elephant, wild dog, rhinoceros, tortoise, snouted crocodile and lion.

Terrestrial fauna in the Project Area was characterised based on the main habitats occurring in the region, the existing literature and field investigations conducted by the Consultant.

5.2.7 Fauna - Project Area

Terrestrial fauna habitats in the Project Area include riparian forest, Brachystegia woodlands and specialised habitats such as dead wood (Ansell, 1978). Occurring habitat types were defined based on the findings from the vegetation investigations, as well as the existing literature (Ansell 1978; Sinclair and Ryan 2010; Schmidt 2006).

To further characterise these habitats and the species they are likely to harbour, the Consultant conducted field investigations in October/September 2019. In addition to interviews with people familiar with the local fauna, a variety of field investigation techniques were employed, including ground transects and trap lines. These were set in different areas representing the major habitat types.

Transects were set up in each habitat and rocks and litter turned over in search of terrestrial macroinvertebrates, amphibians and reptiles. All species encountered were identified based on morphological features using field guides (Schmidt 2006; Schiotz 1999; Weaving 2000).

To survey small mammals, standard Sherman traps were placed every five meters on the ground along 60 m transects. The traps were exposed for 24 hours at each site and checked every morning. All were baited with oats and peanut butter. All specimens trapped were identified based on their morphological features (Kingdon 1997, Kingdon et al. 2013) and assigned to their habitats of occurrence. Ground transects were traversed on foot and road in search of signs and presence of large mammals in the major habitat types.

For birds, point transects where established and observations were made from 15:00 - 17:00 hrs. Birds where identified based on their morphological features described by Sinclair et al. (2002) and Sinclair and Ryan (2010).

Interviews with selected local community members who are familiar with the local fauna were conducted, with the aim of identifying species occurrences that the aforementioned methods did not cover sufficiently. In addition, relevant literature was reviewed (Ansell 1978; Schiotz 1999; Pinhey 1973; Schmidt 2006) to account for species occurrence.

Mammals

The project area falls within Luwombwa farm block and is devoid of big game. However, some mammals such as rabbits, *Cricetomys gambianus* and some mice species (*Steatomys pratensis*, *Saccostomus campensis*, *Grammomys cometes* and *Mastomys natalensis) were present.* Others include *Xerus inauris (*Bush Squirrel), *Cercopithecus aethiops* (Vervet monkey) to mention but a few.

Avifauna

For birds, point transects where established and observations were made in the morning and afternoon. Birds where identified based on their morphological features described by Sinclair et al. (2002) and Sinclair and Ryan (2010). The identified bird species are shown in Table 5-6. There were a total of 11 bird species observed in the project area. The most abundant is *Cisticola juncidis* (Fan-Tailed Cristicola).

Over 750 bird species are found in Zambia. There are 3 breeding endemic species and 16 species considered to be globally threatened that can be found in Zambia (www.birdlife.org/datazone) and these are listed in Appendix 4D. The list presented in Table 5-6 shows the diversity of avifauna that was observed and heard and includes bird species that have been seen by the local people who were interviewed during the survey period.

Table 5-6: List of birds observed and sounds heard in the area

No	Scientific name	Common name	Status
1.	*Muscicapa striata*	Spotted Flycatcher	LC
2.	*Bucorvus leadbeateri*	Southern Ground Hornbill	LC
3.	*Lybius torquatus*	Black-collard Barbet	LC
4.	*Pogoniulus chrysoconus*	Yellow-fronted Tinkerbird	LC
5.	*Dendropicos namaquus*	Bearded Woodpecker	LC
6.	*Mirafra rufocinnamomea*	Flappet Lark	LC
7.	*Hirundo rustica*	European Swallow	LC
8.	*Oriolus larvatus*	Black-headed Oriole	LC
9.	*Corvus albus*	Pied Crow	LC
10.	*Turdoides jardineii*	Arrow-marked Babbler	LC
11.	*Phyllastrephus terrestris*	Terrestrial Brownbul	LC
12.	*Cossypha heuglini*	Heuglin's Robin-Chat (White-Browed Robin-Chat	LC
13.	*Sylvia borin*	Garden Warbler	LC
14.	*Cisticola juncidis*	Zitting (Fan-tailed) Cisticola	LC
15.	*Terpsiphone viridis*	African Paradise-Flycatcher	LC
16.	*Lanius collaris*	Common Fiscal Shrike	LC
17.	*Laniarius aethiopicus*	Tropical Boubou	LC
18.	*Dryoscopus cubla*	Black-backed Puffback Shrike	LC
19.	*Cinnyricinclus leucogaster*	Violet-Backed (Plum-coloured) Starling	LC
20.	*Zosterops senegalensis*	African Yellow White-Eye	LC

No	Scientific name	Common name	Status
21.	*Cinnyris venustus*	Variable (Yellow-Bellied) Sunbird	LC
22.	*Cinnyris talatala*	White-Bellied Sunbird	LC
23.	*Cinnyris cupreus*	Copper (Coppery) Sunbird	LC
24.	*Cinnyris manoensis*	Miombo Double-Collared Sunbird	LC
25.	*Chalcomitra amethystina*	Amethyst (Black) Sunbird	LC
26.	*Chalcomitra senegalensis*	Scarlet-Chested Sunbird	LC
27.	*Anthreptes longuemarei*	Western Violet-Backed Sunbird	LC
28.	*Ploceus bicolor*	Forest weaver	LC
29.	*Ploceus cucullatus*	Village (Spotted-Backed) Weaver	LC
30.	*Anaplectes melanotis*	Red-headed weaver	LC
31.	*Ploceus velatus*	Masked Weaver	LC
32.	*Centropus senegalensis*	Senegal Coucal	LC
33.	*Quelea*	Red-billed Quelea	LC
34.	*Euplectes orix*	Southern Red-bishop	LC
35.	*Euplectes afer*	Yellow-Crowned (Golden) bishop	LC
36.	*Euplectes capensis*	Yellow Bishop (Cape/Yellow-Rumped widow)	LC
37.	*Spermestes cucullata*	Bronze Mannikin	LC
38.	*Uraeginthus angolensis*	Blue Waxbill	LC
39.	*Estrilda astrild*	Common Waxbill	LC
40.	*Vidua macroura*	Pin-tailed Whydah	LC
41.	*Urocolius indicus*	Red-faced Mousebird	LC
42.	*Colius striatus*	Speckled Mousebird	LC
43.	*Halcyon senegalensis*	Woodland Kingfisher	LC
44.	*Halcyon albiventris*	Brown-headed Kingfisher	LC
45.	*Halcyon chelicuti*	Striped kingfisher	LC
46.	*Streptopelia decipiens*	African Mourning Dove	LC
47.	*Pycnonotus tricolor*	Dark-Capped (Black- Eyed) Bulbul	LC
48	*Streptopelia semitorquata*	Red-Eyed Dove	LC
49.	*Streptopelia capicola*	Cape Turtle (Ring-Necked) Dove	LC
50.	*Turtur chalcospilos*	Emerald-Spotted Wood-Dove	LC
51.	*Oena capensis*	Namaqua Dove	LC
52.	*Treron calvus*	African Green Pigeon	LC
53.	*Bubulcus ibis*	Cattle Egret	LC
54.	*Poicephalus suahelicus*	Grey-Headed Parrot	LC
55.	*Poicephalus meyeri*	Meyer's (Brown) Parrot	LC
56.	*Macrodipteryx vexillarius*	Pennant-Winged Nightjar	LC
57.	*Merops pusillus*	Little Bee-Eater	LC
58.	*Coracias caudatus*	Lilac-Breasted Roller	LC
59.	*Halcyon leucocephala*	Grey-Headed Kingfisher	LC
60.	*Dicrurus adsimilis*	Fork-Tailed Drongo	LC
61.	*Muscicapa adusta*	African Dusky Flycatcher	LC
62.	*Nilaus afer*	Brubru	LC
63.	*Sylvietta rufescens*	Long-Billed Crombec	LC
64.	*Camaroptera brevicaudata*	Grey-Backed Camaroptera	LC
65.	*Tauraco schalowi*	Schalow's Turaco	LC
66.	*Prinia subflava*	Tawny-Flanked Prinia	LC
67.	*Coturnix delegorguei*	Harlequin Quail	LC
68.	*Emberiza cabanisi*	Cabanis's Bunting	LC
69.	*Dendropicos griseocephalus*	Olive Woodpecker	LC
70.	*Dendropicos fuscescens*	Cardinal Woodpecker	LC
71.	*Gallinula chloropus*	Common Moorhen	LC
72.	*Amaurornis flavirostra*	Black Crake	LC
73.	*Elanus caeruleus*	Black-winged Kite	LC
74.	*Pytilia afra*	Orange-Winged (Golden-Backed) Pytilia	LC

No	Scientific name	Common name	Status
75.	*Lagonosticta nitidula*	Brown Firefinch	LC
76.	*Lagonosticta rubricata*	African (Blue-billed) Firefinch	LC
77.	*Actophilornis africanus*	African Jacana	LC
78.	*Cypsiurus parvus*	African Palm Swift	LC
79.	*Hirundo rustica*	Barn (European) Swallow	LC
80.	*Cercropis cucullata*	Greater Striped Swallow	LC
81.	*Cercropis abyssinica*	Lesser Striped Swallow	LC
82.	*Motacilla aguimp*	African Pied Wagtail	LC
83.	*Haliaeetus vocifer*	African Fish-Eagle	LC
84.	*Milvus migrans*	Black Kite	LC
85.	*Micronisus gabar*	Gabar Goshawk	LC
86.	*Ardea melanocepha*	Black-headed Heron	LC

We did not observe any threatened bird species in the area during the survey period. However, it is important to note that some globally threatened bird species that have been observed in Zambia can possibly be found in the project area even if they were not seen during the survey period. These include Slaty Egret (*Egretta vinaceigula*), Grey Crowned Crane (*Balearica regulorum*), Wattled Crane (*Bugeranus carunculata*), Lappet-faced Vulture (*Torgos tracheliotos*), Hooded Vulture (*Necrosyrtes monachus*), White-backed Vulture (*Gyps africanus*), Secretarybird (*Sagittarius serpentarius*), Martial Eagle (*Polemaetus bellicosus*), Madagascar Pond Heron (*Ardeola idea*), Bateleur (*Terathopius ecaudatus*), Lesser Flamingo (*Phoeniconaias minor*) and White-headed Vulture (*Trigonoceps occipitalis*). Some of the bird species observed in the area during the survey period are shown in Table 5-4 below.

Figure 5-4: Bird observed in the around and within the project area

(a) *Euplectes hordeaceus*; (b) *Cinnyricinclus leucogaster*; (c) *Meropus pusillus*, (d) *Melaenornis pammelania*; (e) *Cisticola juncidis*, (f) *Pycnonotus barbatus* (g) *Prinia subflava* and (h) *Lonchura cucullata*

Reptiles

152 species of reptiles (lizards, snakes and tortoises) have been recorded in Zambia. There are no records of reptiles endemic to Zambia. Nonetheless, the 2015 Fifth National Report for the United Nation Convention on Biological Diversity (CBD), the Ministry of Lands, Natural Resources and Environmental Protection (MLNREP) reveals that there are 156 species of reptiles and 45 of them are considered rare as they have been recorded from only one locality (MLNREP 2015).

We did not see any reptiles during the survey period. This should not mean that there are no reptiles in the area. Reptiles are such organisms that are difficult to spot in the field. Reptiles that can possibly be found in this area are majority of lizards, some

tortoise, agamas, geckos, chameleons and skinks. The list of reptiles presented in Table 5-7 is derived from the interviews done with the local people for the frequently seen reptiles in the area.

Table 5-7: Reptiles that are frequently seen in the project area

No.	Scientific Name	Common Name	Status
1.	Acanthocerus atricollis	Southern Tree (Black-necked) Agama	LC
2.	Bitis arietans	African Puff-adder	LC
3.	Dendroaspis polylepis	Black Mamba	LC
4.	Dispholidus typus	Boomslang	LC
5.	Naja nigricollis nigricincta	Black–necked Spitting Cobra	LC
6.	Natriciteres olivacea	Olive Marsh Snake	LC
7.	Pelomedusa subrufa	Marsh Terrapin	LC
8.	Python natalensis	Southern African Python	VU
9.	Stigmochelys pardalis	Leopard Tortoise	LC
10.	Varanus niloticus	Nile Monitor lizard	LC

Fish and amphibians

At the time of the survey, we did not see any fish species. However, 490 species of fish consisting of 24 families that have been recorded in Zambia (MLNREP 2015). The family Cyprinidae is the second largest group and has 82 species. Other economically important families are Mormyridae (20 species), Characidae (17 species), Bagridae (18 species), Clupeidae (5 species) and Claridae (15 species). Based on the interviews with the local people, fish species that are caught in the area include Catfishes (Suborder: Siluroidei) which are locally known as “Mulonge” and species of the genus Barbus commonly known as Misenga.

During the sampling period we did not see any amphibians. There are 74 species of amphibian that are found in Zambia and 13 species are rare as they have been recorded from one locality (MLNREP 2015. Only one species is known to be endemic to Zambia and Malawi with the possibility of the species to occur in Democratic Republic of Congo and eastern Angola. The endemic species is called *Hyperolius kachalolae* (Kachalola Reed Frog) and the Nyika Dwarf Frog (*Bufo nyikae*) due to its restricted range (found in Nyika plateau).

The fish species present in the Luwombwa River and other rivers within the project area include *Tilapia rendallii*, *Clariasngamensis*, *Orechromis machrochir Luciolates stappersii* and *Ctenopoma multispinis*. Tilapia rendallii, Clariasngamensis, Orechromis machrochir Luciolates stappersii and Ctenopoma multispinishis data was collected through interviews with local people in the area.

Insects

Approximately 6,135 species of invertebrates occur in Zambia of which 69 species are endemic and 14 are threatened (MLNREP 2015). Some groups of insects were observed in the area. Some of these insects are of economic value to the local people who collect them for food. Insects that are beneficial to the local people include honey

bees (*Apis mellifera),* termites *(Microtermes goliath)* and various species of grass hoppers and edible caterpillars.

lists insect species observed in the area. Other groups of insects that can possibly be found in the area include spiders, mites, millipede, centipedes, worms and scorpions.

Table 5-8: Insect species observed in the project area

	Scientific name	Order/Family	Common name
1	*Apis mellifera*	Hymenoptera	Honey bee
2	*Microtermes goliath*	Isoptera	Termite
3	*Dorylus helveolus*	Formicidae	Ants
4	*Solenopsis spp.*	Formicidae	Red ants
5	*Belonogastar junceus*	Vespidae	Wasp
6	*Helicopris spp.*	Scarabaeidea	Dung beetle
7	*Anopheles spp.*	Culicidae	Mosquito
8	*Musca domestica*	Diptera	House fly
9	*Brachytrypas membraneus*	Orthoptera	Giant cricket
10	*Cicadetta spp.*	Cicadidea	Cicada

Invertebrates

The assessment of the biodiversity and abundance of invertebrates was mainly characterized by the hand capturing method and use of areal nets during the walk in transect in the project area. Photos of seen invertebrates were taken and the number recorded. More than 8 species of invertebrates were observed in the area and some of these are shown in Table 5-9.

Table 5-9: Invertebrates observed in the area

Scientific Name	Common Name	Abundance	IUCN Status (IUCN, 2015)
Theba piasana	White garden snail	10	Threatened
Anisoptera stalus	Dragonfly	20	Threatened
Caelifera	Grasshopper	20	Least concern
Eurema brigitta,	Butterflies	5	Least of concern
Carabidea	Beetles	10	Threatened
Julus terrestris	Millipedes	15	Not shortlisted
Carpenter vagus	Black Carpenter ants	50	Vulnerable

5.3 Description of Socioeconomic Environment

5.3.1 Land Tenure and Land Use

In Zambia, land has since time immemorial been held under customary tenure, until the 1960s when freehold and leasehold tenure systems were introduced. Of the total land mass of the country amounting to 752,614km^2, customary land is estimated to cover over 85% and the remaining state land is estimated at slightly over 6%. Leasehold tenure is usually held on land that is also known as state land. Under these two categories, there is reserve land that is allocated to nature, forest, and wildlife sanctuaries. Land administration in Zambia is governed by several Acts:

- Land Act – Under this Act, Land is divided into state, local authority and traditional land. The traditional authorities (Chiefs) have rights over the traditional land (customary land). Provides for the allocation and alienation of land.
- Land Acquisition Act - provides for the compulsory acquisition of land
- Local Government Act - provides for control of land by Local Authorities or city or municipalities.

Land Acquisition and procedures

The law provides for the acquisition of land by individuals or organisations who want it for various uses. Individuals or organisations can obtain customary or state land following the procedure outlined below:

If acquiring customary land:

- An individual will approach the chief in whose area the said land falls and obtain consent/recommendation (written) from the Chief /Chieftainess.
- A qualified surveyor will be engaged to produce survey diagrams for the said piece of land.
- The survey diagrams are submitted to the City Council for approval by full council meeting.
- Thereafter, the application is recommended to the Commissioner of Lands in the Ministry of Lands, Natural Resources and Environmental Protection for offer letter and subsequent issuance of title deed.

If acquiring state land, only the last three points above apply.

5.3.2 Population

The population censuses which are conducted every ten years in Zambia are the major source of demographic information. According to the 2022 Census of Population and Housing, Zambia's population was 19,610,769 in 2022, having increased from 13,092,666 in 2010. The total male population sood at 9,603,056 while females totaled 10,007,713.

The population of Central province increased from 1,307,111 in 2010 to 2, 252, 483 in 2022. The average growth rate for the district was 4.5% for the period 2010-2022. Serenje District had a population of 158,192 in 2022 an increase from 117,880 in 2010. The average growth rate was 2.5%, the lowest for the province (Table 5-10).

Table 5-10: Population Size for Central Province

Central Province	2010 Population			2022 Population		
	Male	Female	Total	Male	Female	Total
Chibombo	99,127	100,409	199,536	208,352	212,963	421,315
Chisamba	52,028	51,955	103,983	80,358	80,470	160,828
Chitambo	24,051	24,810	48,861	49,393	51,210	100,603
Kabwe	98,781	103,579	202,360	143,892	155,314	299,206
Kapiri Mposhi	115,513	117,035	232,548	184,685	186,383	371,068
Luano	12,929	12,619	25,548	33,649	33,030	66,679
Mkushi	64,607	64,379	128,986	104,290	104,345	208,635
Mumbwa	85,942	87,369	173,311	165,103	167,134	332,237
Ngabwe	10,641	10,597	21,238	21,443	20,661	42,104
Serenje	58,319	59,561	117,880	79,075	79,117	158,192
Shibuyunji	26,527	26,333	52,860	45,864	45,752	91,616
Total	**648,465**	**658,646**	**1,307,111**	**1,116,104**	**1,136,379**	**2,252,483**

Source: Zambia Statistics Agency (ZAMSTATS), 2022

Growth Rate, Population Density and Distribution

Zambia's population grew at an average annual rate of 3.4% in the 2010-2022 inter-censal period compared to a growth of 2.8% in the 2000-2010 period (CSO, 2010). The average population growth rate in the project catchment area had a growth rate of 2.5% between 2010 and 2022, lower than the national rate for the same period. For individual districts in the area, growth rates ranged from 2.5% (Serenje) to 8.3% (Luano) as shown in Table 5-11.

Table 5-11: Population growth rate

Province, District	2010 Census	2022 Census	Average Growth Rate
Central Province			
Chibombo	199,536	421,315	6.4
Chisamba	103,983	160,828	3.7
Chitambo	48,861	100,603	6.2
Kabwe	202,360	299,206	3.3
Kapiri Mposhi	232,548	371,068	4.0
Luano	25,548	66,679	8.3
Mkushi	128,986	208,635	4.1
Mumbwa	173,311	332,237	5.6
Ngabwe	21,238	42,104	5.9
Serenje	117,880	158,192	2.5
Shibuyunji	52,860	91,616	4.7
Total	**1,307,111**	**2,252,483**	**4.6**

Source: Zambia Statistics Agency (ZAMSTATS), 2022

5.3.3 Administration

The existing project is located in Serenje District. In terms of district administration, the District Commissioner administers public affairs and development. The District Commissioner facilitates the coordination of central government activities as well as harmonizing these functions with those of the Local Authority in order to ensure effective implementation of development programmes in the District. The District

Commissioner is also the head of civil service in the District and all Heads of Government Departments report to his office on administrative matters. He chairs the District Development Coordinating Committee meetings.

The District Council is the supreme decision making body at District level. The council formulates local policies and approves district development plans. It also discharges municipal functions including refuse collection, street cleaning and lighting, promotion of public health, maintenance of roads, etc.

The council consists of democratically elected councilors representing their electorate in the wards, and management, which implements Council policies. The Council works hand in hand with the District Development Coordinating Committee.

In terms of its political make-up, Serenje District has three constituencies (Chitambo, Muchinga and Serenje) and Chitambo constituency where the project is located has seven (7) wards namely Lulimala, Mpelembe, Chipundu, Luwombwa, Chalilo, Chitambo and Muchinka.

Figure 5-5: District Administrative Offices

1.1.1.1 Traditional Government and Administration

In Zambia, traditional governance is and has always been an important aspect of the way of life of people. According to the Zambian Constitution, the Institution of Chief shall exist in any area of Zambia in accordance with the culture, customs and traditions or wishes and aspirations of the people to whom it applies. The Chiefs Act provides for recognition, appointment and functions of chiefs. Some of the roles of chiefs include safeguarding traditional values and customs, administration of land, prescribing rules and regulations for the governance of social behaviour and arrangement of customary marriages and protection for the community

5.3.3.1 Settlement Patterns and Traditional Authority

The majority of the population in the immediate project area lives in rural areas in small villages (family homesteads/ household groups). A village is made up of many households in a defined geographical area under the leadership of a Village Headman. A group of villages in a given defined geographical area make up a Chiefdom, which is headed by a Chief and, in some cases Senior Chief. Village headmen report to the Chief in their area. Senior Chiefs and Chiefs are assisted by senior headmen and Chief's advisors (indunas) and headmen. Group leaders and village headmen also form part of the Leadership Structure. The traditional leaders are the custodians of customs and cultural and traditional norms. They act as arbitrators in terms of disputes as well as judges when crimes of a traditional or customary nature are committed. Chiefs administer issues of local importance such as local development, related to water, health and sanitation and land allocation and use. The chiefs can authorize headmen in their respective area areas to allocate land under their jurisdiction to existing population and to new comers in the area. Settlements within the farm include workers houses. However, villages on customary land are almost 2 km from the farm as the farm is almost bordered by other commercial farms in the area.

Figure 5-6: Typical houses in the vicinity of the project area

Figure 5-7: View of Serenje Town Centre

5.3.4 Economic Activity

The major economic activity in Serenje conforms to most rural districts in Zambia, which are mostly dispersed with a lot of isolated homesteads. Settlements of subsistent farmers are a major characteristic of the socio-economic system of the area whose main land acquisition is by traditional or customary process and lacks legal documentation (MACO, 2009). In the context of the proposed area for the Luwombwa agriculture project, most of the area is devoid of many settlements except for a few who have settled within the area proposed for the agriculture project. However, the Serenje district houses a number of big commercial farmers.

The area also houses the famous Nasanga Farm Block. This is earmarked to be developed into a commercial farming block. Many investors who initially obtained the land in the block have since left leaving the area undeveloped. The people living near the project area and those who are found within the project area grow maize for consumption and selling to Food Reserve Agency. The main crops grown in the area is maize, millet, sweet potatoes, cassava to mention but a few.

Figure 5-8: Some of the economic activities in the area

5.3.5 Education and skills

The majority of the population around the project area generally have access to basic education. Table 5-12 shows some of the schools within the district.

Table 5-12: Some of the schools in Serenje

School	Grades
Serenje Technical School	10 - 12
Ibolelo High School	8 – 12
BOMA School	1 – 9
Kamwala Basic School	1 – 9
Miselo Kapika Primary School	1 – 7

The schools located in the outskirts of town close to the project area include Chimupati and Chikubula schools along the great north road between Serenje turn off and Mulilima, Chibobo and Mafwasa primary school. The enrolled percentage for grades 1 – 9 for boys and girls is 54.7% and 45.3% respectively. For grades 10 – 12, the enrolment percentage for boys and girls in the district is 67.8% and 32.2% respectively (GRZ, 2008).

5.3.6 Health

The health institutions in Serenje include Serenje District Hospital, Malcom Moffat Health Centre located in town. The nearest health facility to the project area is the

Chibobo health post which handles small cases. Most cases are usually referred to the district hospital.

Figure 5-9: The District Health Office

5.3.7 Religion

The predominant religion in the area is Christianity, including the Jehovah's Witnesses, United Church of Zambia, Methodist Church, New Apostolic Church and Seventh-day Adventist (SDA). Most of the people in Serenje are Christians.

5.3.8 Sources of Water and Energy

Water supply in most of the villages in the project area is from the rivers and streams. Sometimes water is taken directly from the streams, but more often shallow wells are dug. There are, however, also protected wells and sometimes boreholes with hand pumps in certain villages near the project area. Some households within the project area have Water pipelines. The streams include the Milumbe, Kalengo, Muchinka and the Luwombwa River itself. Firewood is the most common source of energy for cooking. In addition, a few households use charcoal.

5.3.9 Heritage Sites

There are no heritage sites within the project area. According to the survey carried out by the ESIA study team and the consultation with National Heritage Conservation Commission (NHCC), the existing project area does not have any features which have been confirmed and classified as one with cultural or heritage value. However, during site clearing and land preparation, any discoveries of possible ancient cultural, historical and natural heritage features will be reported to the NHCC for appropriate activation so that such can be classified.

5.4 Limitations to the ESIA Study

The scope of this ESIA study covered social, cultural and ecological aspects. However, the study had its limitations. One of the limiting factors regarding ecological aspects

was that the field surveys only covered flora and fauna species encountered during the survey period following the rainy season. Although flowering had finished for many plant species, there were few flowering plants observed. Therefore, there was a high possibility that some plants and animal species were missed as the survey was done just in one season. The ideal situation is to sample in all the seasons of the year so as to cater for those species that are visible in a particular season. This is because no season specific survey can be expected to encounter all the fauna or flora occurring within a project area. The other limiting factor was inadequate hydrological data for the project area. Very little secondary data was available and generating primary data requires field work for a number of hydrological years which was not possible under this study.

6 ASSESSMENT OF ENVIRONMENTAL IMPACTS

The project is likely to have a number of positive and negative environmental and socio-economic impacts. This section identifies, assesses and discusses these impacts. Impacts were identified and assessed based on the significance and likelihood following the information gathered during the desk study and project site survey which included field visits that were undertaken in September 2021. The impacts are discussed according to whether positive or negative or both in section 6.1. The identified impacts are for all the project phases and i.e. site preparation and construction, operational and decommissioning and closure phases.

6.1 Project Impacts' Identification

The ESIA has predicted and evaluated anticipated impacts using acceptable standard methods of impact prediction and evaluation. Constant reference to a checklist of project activities was made. The study team used several approaches such as brainstorming and use of checklists and matrices to identify the main sources and establish the potential impacts from the proposed main project activities. Public participation and consultation with some of the community and stakeholders were conducted to reduce uncertainty (Appendix 3).

6.1.1 Impacts on Biophysical Environment

Positive Impacts on the Biophysical Environment

Given that operational activities at MLP typically involves vegetation clearing and related environmental disturbances, the ESIA study established that no worthwhile positive impacts on the biophysical environment are envisaged. However, MLP has left several areas with vegetation within the farm to conserve and protect biodiversity

Negative Impacts on the Biophysical Environmental

Different project phases at MLP will have or already had different impacts on the bio-physical environment. Site preparation phase; the operational phase and; decommissioning and closure phase all have different impacts with overlaps in certain aspects. The negative impacts of the project on the Biophysical environment are discussed below.

Negative Impacts that have already occurred

a) Soil contamination

During implementation, some project components have posed a threat of soil contamination. Regarding this threat, the main likely sources are:

- Leakages and spills of fuels and oils from the vehicles and equipment used at the farm.
- Fertilizers, pesticides and other agricultural chemicals used on site;
- Mishandling of sewage (waste water) and other forms of waste generated on site mainly from housing units;
- Hydrocarbons spills/leakages at the workshop on site.

b) Ground and surface water contamination

Of the streams of waste generated on MLP, none of the waste poses a high threat to water resources contamination. If not properly constructed, septic tanks/pit latrines are likely to contaminate ground water.

Additionally, there are chances that fertilizers and pesticides used may cause pollution of water bodies if carried off to nearby surface water bodies by runoff. These chemicals may percolate the soils thereby compromising the integrity of ground water resources in the area.

In an event of a major leak or spill from the diesel tank on site, there are chances that spills can flow into the nearby surface water bodies. The tank is well secured.

c) Ecological fragmentation

Abstracting of water could lead to fragmentation of the aquatic ecology on site. This may result in restricted movement of aquatic fauna and most likely loss of spawning areas and migratory routes for some species. `MLP has water permits from WARMA and the amount of water allowed is so minimal and does not have significant negative impact on the aquatic live in the river.

In terms of terrestrial ecosystems, clearing of vegetation in selected areas for cropping and establishment of farm facilities has equally fragmented the ecosystem. This has similar consequences as aquatic ecosystem fragmentation.

d) Chemical pollution

Mishandling, spillages and leaks of agricultural chemicals such as fertilizers, herbicides, insecticides and crop yield preservatives may cause chemical pollution of natural resources on site.

e) Increased stress on ground and surface water resources

To meet farm water requirement, water is abstracted from both ground and surface sources for use on the farm for irrigation. Currently, some pump stations exist on site. These activities increase pressure on local water resources and if not controlled may result in lowering of the local water table.

f) Generation of Green House Gases (GHGs)

Use of machinery on site that uses fossil fuels equally contributes to this effect.

g) Waste generation on site

Different streams of waste are generated from the various components of the project. The main sources of waste expected on site are:

- Chemical packages for fertilizers, pesticides and other agricultural chemicals
- Domestic waste from the housing compound on site
- Waste water mainly sewerage from housing compound and offices
- Used oil from equipment repair at the workshops

h) Air pollution

Equipment that are used on site emit gases such as NOx and SOx. This contaminates the local atmosphere.

i) Change in landscape character and visual amenity

The Project has a visual impact on the landscape. Clearing of vegetation, construction/erection of support facilities has greatly changed the existing landscape

6.1.2 Impacts on the Socieconomic Environment

Positive Impacts on the Socioeconomic Environment

a) Employment creation

At present the farm has 10 permanents and 75 seasonal workers for cropping which is projected to increase to 25 permanents and 150 seasonal once the new pivot is installed. The livestock section currently has 15 employees. The contracted employees are 70% male and 30% female. MLPs recruiting process is subject to approval and registration by NAPSA.

b) Support to local and national economy

MLP pays levies to local authorities in Serenje. It also remits corporate tax at national level. The farm also procures some required materials/services for its operations locally, thereby empowering local contractors/businesses.

The expectation is that the increase in employment levels and trade activities in the district will directly boost revenue collection by ZRA through VAT and sales tax. Corporate income taxes paid by MLP including PAYE, NAPSA and Personal levy paid by its employees will further boost national coffers.

Additionally, because of the readily available disposable income as a result of employee salaries, additionally, demand for consumables such as groceries and food items have increased thereby supporting the local economy.

c) Improved literacy levels

MLP supports schools such as Chengelo. This has increased literacy levels in the area especially given that there are no government schools near the project area.

d) Improved health care services

To ensure good health of its employees, their families and surrounding communities, MLP supports nearby clinics.

e) Multiplier effects

The increase of socio-economic activities in the area has led to several more economic multiplier effects such as creation of numerous indirect jobs through support services like transportation, food processing industries; agricultural equipment/input supplying firms

Negative Impacts on the Socioeconomic Environment

a) In-migration

The influx of people in the area seeking employment and other opportunities relating to the project is expected during expansion of expansion works if it happens in future. This may increase pressure and demand for resources such as housing, groceries and food items. This may disadvantage some locals who might not be able to afford the hiked prices of commodities.

Additionally, because immigrants come from different areas with varying backgrounds and beliefs, the conservative moral fiber and beliefs of the locals may be diluted or compromised.

b) Increased risk of HIV/AIDS transmission and Public Health issues

As mentioned in (I) above, the project may have led to in-migration and consequently increase in local population. In terms of community health, the following concerns/impacts are likely to occur:

- Increased transmission of STIs including HIV/AIDS which are usually associated with improved livelihoods, higher levels of disposable incomes and changes to the population
- Increased risk of transmission of communicable diseases such as TB and sanitary ailments – due to in-migration of people

However, this impact is insignificant.

c) Increased ambient noise levels and vibrations

Noise levels during operation certain equipment and machinery may increase noise in the area. Noise and vibrations can be a nuisance to both communities and workers. However, this impact is highly localized and not significant.

d) Reduced Road Traffic Safety

The project has led to increased traffic movements in the area as a result of trucks and cars transporting materials to and from the site. This has the potential to affect communities living along the road network by increasing the risk of road traffic accidents that may result in injuries or even fatalities. This impact is very minimal

e) Loss of Livelihood. There will be no loss of livelihood as the land belongs to the developer and has been under their ownership for a long time.
f) Loss of Access routes. There will be no loss of access routes as it is an already existing site.
g) Loss/ Restriction of access to common resources (e.g. waterfront, forest). This impact will not occur. Most of the project activities are already existing and are within the land that belongs to MLP.
h) Loss of Customary Rights. The project will take place on state land on land belonging to MLP so no customary land is to be lost.
i) Damage to Agriculture/Fisheries. There is no impact on agriculture/ fisheries under this project.
j) Loss of Amenity Values. The project will have no impacts on amenity values
k) Loss of Ethnicity (Culture and Traditions). The project will not lead to a loss of ethnicity.
l) Peoples health and wellbeing. The generation of hazardous waste from the farm activities such as pesticides can affect workers and even nearby communities. Air emissions from burning of crop waste,solid waste and other residues may negatively affect communities.

6.2 Impact Assessment Criteria

The impact assessment criteria, outlined in the following sub-sections, have been applied to the assessment of each of the proposed Project elements during construction and operation stages. Evaluation of environmental and social impacts within this ESIA are considered against the baseline (including its value/sensitivity). In addition to the Key Principles provided

by ZEMA, and as a basis for assessing environmental impacts, the methodology applied to this ESIA has been developed using a combination of the criteria, methodology and guidance provided by international requirements/best practice.

The ZEMA principles are as follows:

Nature and magnitude of the intended activity and the existence of similar projects at the site or similar sites;

Extent of the impact of the proposed project;

Location of the project and the nature of the surrounding environment and nearby residential clusters

The ESIA methodology has been adopted in combination with ZEMA requirements on ESIA content. The following factors were considered in classifying each potential impact generated by the Project as presented in Table 6-4:

- **Frequency:** Occurrence of activity producing the impact, e.g. continuous, intermittent or a single event/less than once per year;
- **Likelihood:** Probability of impact occurrence (e.g., 100%, 50%, 0%);
- **Extent:** Spatial extent of the impact (e.g. within 2km of site boundary, outside the Project site but within 20km, within 200km, within Zambia, outside Zambia;
- **Duration:** Extent in time of the impact. Short term impact (less than the life of the project), medium term impacts (equal to the lifetime of the Project) and long term impacts (greater than the lifetime of the Project);
- **Magnitude:** Impact magnitude defined in relation to the limit criterion specified by ZEMA or international standards where available;
- **Type of impact:** Positive or negative effect; direct or indirect action;
- **Potential significance:** A combination of all the factors described in the preceding bullet points is used to determine the type and significance of potential impact prior to mitigation. This is defined as low, medium or high.

Table 6-1 presents the terminology used throughout Section 6 to describe and rank environmental and social impacts according to the categories defined above. Figure 6-1 presents how these criteria are combined in order to assess the significance of the potential environmental and social impacts identified

Table 6-1: Terminology used to describe environmental and social impacts

Category	Terminology	Definition
Scope of Impact(1)		
Frequency	**Frequent** **Infrequent** **Rare**	**Uninterrupted or on a daily basis** **Once or more per day** **Less than once per day** **Single event/less than once per year**
Likelihood	**Certain** **Likely** **Unlikely** **No impact**	**Impact possibility estimated to be 100%** **Impact possibility estimated as between 50% and 99%** **Impact possibility estimated as < 50%** **Zero estimated possibility of impact**
Extent	**Local**	**Within 2 km of the Project site**

	Provincial **Regional** **National** **International**	**Outside the Project site but <20 km away** **Outside the Project site but < 200 km away** **Within Zambia** **Outside Zambia**
Duration	**Short** **Medium** **Long**	**Less than the life of Project** **The life of project** **Greater than the life of Project**
Magnitude(2)	**Very low** **Low** **Medium** **High** **Very high**	**Defined in relation to the limit criterion where available, e.g.:** **Very low: Parameter < 10% limit criterion** **Low: Parameter 10 to <50% limit criterion** **Medium: Parameter 50 – 100% limit criterion** **High: Parameter 100 – 200% limit criterion** **Very High: Parameter > 200% limit criterion.** **Or, for qualitative assessments:** **Very low: No degradation/adverse alteration to resource/receptor** **Low: Minor degradation/adverse alteration to resource/receptor** **Medium: Moderate degradation/adverse alteration to resource/receptor.** **High: Significant degradation/adverse alteration to resource/receptor.** **Very High: Permanent degradation/detrimental alteration to resource/receptor.**
Type of Impact		
Effect	**Positive** **Negative**	**Beneficial impact** **Adverse impact**
Action	**Direct** **Indirect**	**Impact caused solely by activities within scope of Project** **Impact which does not result directly from by activities within the scope of Project, but which has a connection with the Project's presence.**
Potential Significance		
Significance	**Low** **Medium** **High**	**Any low magnitude impact, or medium magnitude impact that is unlikely to occur or is of short duration.** **Any medium magnitude impact that is certain or likely to occur and of medium or long duration. Also, any high magnitude impact that is unlikely to occur, of short duration, or local in extent.** **Any high magnitude impact that is certain or likely to occur, of medium or long duration, and regional in extent.**
(1) (2)	**All terms are characteristics of the impact(s). For example, duration refers to duration of impact, not the activity causing it.** **As indicated, the impact magnitude for some environmental aspects can be defined in relation to the limit criterion specified by ZEMA or international regulations, or best practices when national standards are not available. However, in the absence of definitive quantitative criteria, a qualitative assessment of the magnitude is used relating to the impact type.**	

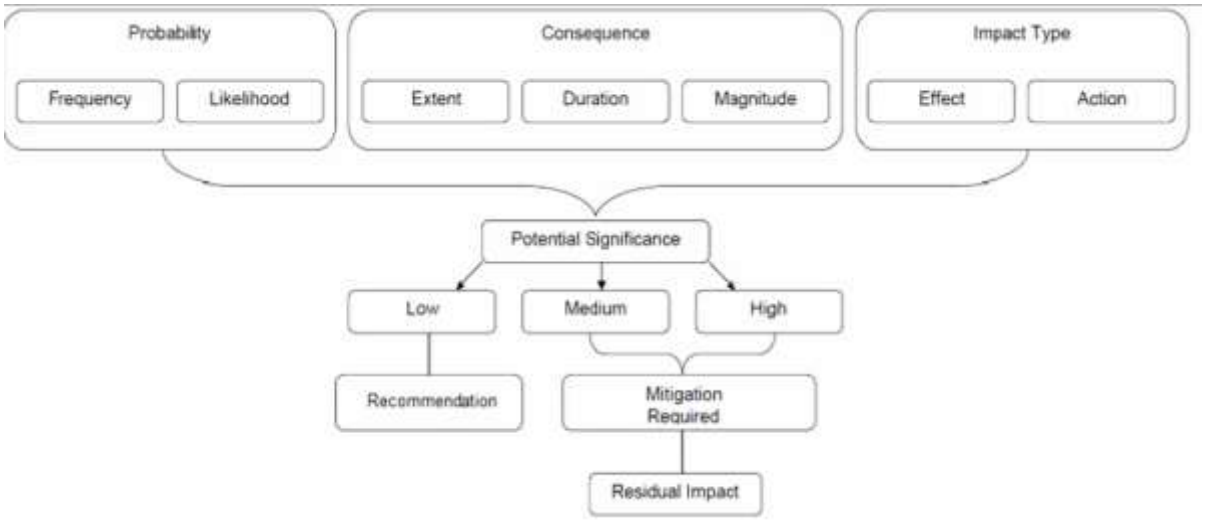

Figure 6-1: Combination of ESIA Criteria Used to Assess the Potential Environmental Impacts Identified

6.3 Impact Assessment Reporting

The findings of the assessment process for each environmental aspect are presented in sections 6-7 with the significance of any predicted environmental impacts being defined as Low, Medium or High. Impacts predicted as being of medium to high significance are then assessed against appropriate mitigation measures to predict the residual impact significance.

Table 6-2: Example of Impact and Mitigation summaries

Impact	Potential Significance	Mitigation Measure	Significance after Mitigation
Increase in Vehicle movement will result in potential road traffic accidents during Construction	High	A structured approach to traffic management and vehicle standards should be specified and safety measures should be implemented. Ensure the transport plan for the Project is developed and implemented during the lifetime of the project. Establish pedestrian routes within the construction area to be used by workers;	Medium

6.4 Mitigation Measures and Reporting

Two types of mitigation measures are identified in this ESIA Report in order to alleviate or manage the potential impacts identified:

- Type 1: Measures to be taken to manage potential impacts considered to be of medium or high significance. Following application of these measures, residual impacts are expected to be lower.

- Type 2: Recommended measures that could be taken to manage impacts classified as low/insignificant. These measures can be considered as good management practices.

6.5 Evaluation of Impact Significance

The significance of the identified impacts was determined by combining the perceived frequency of occurrence of the source of impact; the duration of the impact; the severity of the impact; the spatial extent of the impact; and the sensitivity of the area being impacted upon. The sections below give a detailed description of how each of the aspects was assessed.

6.6 Ranking of the Significance of Impacts

The significance of the impacts was ranked by taking into consideration four main factors namely: -

- Duration of the Impact: Which defines whether the impact is temporal or permanent;
- Spatial extent of the impact: Which defines the area to be affected by the impact;
- Severity of the Impact: Which is the severity/benefit or simply the state or extent of the badness of the impact. It takes into consideration among other things, sensitivity of the area being impacted upon; and
- The likelihood of occurrence: Which looks at the probability of the impact occurring and frequency of occurrence where it occurs.

The four criteria above were ranked with scores assigned to each as presented in Table 6-3. To come up with the overall significance of the impact, the scores for each impact were considered in two categories namely “effect” (which comprises duration, special extent and severity) and “likelihood of occurrence”. The total scores recorded for the ‘effect’ and ‘likelihood’ were then read off from the matrix table presented in Table 6-4.

Table 6-3: Ranking of evaluation criteria

EFFECT	**DURATION OF IMPACT**		**SCALE**
	Short Term	Confined to construction phase	1
	Medium Term	Up to three years	2
	Long Term	3 to 20 years	3
	Permanent	Above 20 years	4
	SPACIAL EXTENT OF THE IMPACT		
	Localised	At localised scale covering a few hectares	1
	Study Area	Programme area including immediate environment	2
	Regional	District or provincial level	3
	National	Country level	4
	International	Beyond national boundaries	5
	SEVERITY		
	Slight	Little impact	1
	Moderate	Moderate impact	2
	Severe	High impact	3
	Very severe	Very high impact	4
LIKELIHOOD	**LIKELIHOOD OF OCCURENCE**		
	unlikely	Will not Occur	1
	May Occur	There is a small chance of this impact	2
	possible	The likelihood of this impact occurring is probable	3
	Certain	The likelihood is that this impact will definitely occur	4

Table 6-4: Ranking of evaluation criteria matrix

LIKELIHOOD		EFFECT													
		3	4	5	6	7	8	9	10	11	12	13	14	15	16
	1	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	2	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	3	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	4	7	8	9	10	11	12	13	14	15	16	17	18	19	20

Table 6-5: Description of overall significance ratings

Significance Rating	Description	Score Range
LOW	**This refers to an impact with acceptable effects for which mitigation is desirable but not essential. The impact by itself is insufficient to prevent programme approval. Effects from these impacts do not go beyond medium term**	**4 to 7**
MODERATE	**Impacts for which mitigation measures are required though impact cannot prevent programme approval. The impacts can extend up to long term**	**8 to 11**
HIGH	**This is a serious impact which, if not mitigated, may prevent programme approval (if negative). These impacts can result in major and usually long-term effects to the environment**	**12 to 15**
VERY HIGH	**This is a very serious impact which if negative may, by itself, be sufficient to prevent programme implantation. This type of impact results in permanent change and usually has no mitigation measures**	**16 to 20**

6.7 Summary of Impacts

The identified impacts are summarised in Table 6-6. The overall significance of impacts, based on the above evaluation criteria, is presented.

Table 6-6: Impacts of the Biophysical Environment during the Project Phases

Impact	Impact Description	Impact Evaluation								
		Frequency	Likelihood	Extent	Duration	Magnitude	Effect	Action	Sensitivity	Significance
Impacts on Biophysical Environment										
Air pollution	Field preparation may generate dust. These may lead to dust emissions with the potential to disturb the local air quality.	Infrequent	Likely	Local	Short term	Low	Negative	Direct	High	High
Soil pollution	Pollution of soil may result from accidental spillages of oils and other hydrocarbons from construction equipment	Infrequent	Unlikely	Local	Short term	Low	Negative	Direct	Medium	Medium
Soil erosion and sedimentation	Soil disturbance due to land preparation and movement of vehicles and other machinery. These disturbances expose the soils to a very high risk of erosion especially during rainy and windy seasons. Soil erosion is a serious problem as it has the potential interfere with water quality directly through increasing turbidity levels, siltation and indirectly from contaminants carried with or attached to eroded soil particles.	Infrequent	Unlikely	Local	Short term	Low	Negative	Indirect	Low	Low
Noise levels	The results of the noise measurements carried out showed that the noise levels in the project area are very low (range 20.3 to 27.5 dBs < 85dBs ZABs standard). Noise	Infrequent	Likely	Local	Short term	Low	Negative	Direct	Medium	High

Impact	Impact Description	Impact Evaluation								
	occur during operation of equipment and machinery is highly localised.									
Water Pollution	Contamination of ground and surface water may also result from spent oils, oil leakages and spillages from not well-maintained machinery and equipment during both the operation and decommissioning phase	Infrequent	Unlikely	Local	Short term	Low	Negative	Direct	High	Low
Stress on water resources	Abstracting water from the river may impose some stress on water resources.	Frequent	Unlikely	Local	Long term	Low	Negative	Direct	Medium	Low
Generation of Waste and Hazardous Materials	Some amounts of waste such as battery acid, fuels, used batteries, used oils, used containers and brake fluid though will be in very minimal amounts. With well-maintained machines and equipment, these may not be a problem.	Frequent	Unlikely	Local	Short term	Low	Negative	Direct	Medium	Medium
Destruction of Vegetation, Wildlife and Wildlife Habitat	About 60 ha is already cleared on the farm and another 60ha is to be cleared for the installation of additional centre pivots. This was initially under forests. The clearing may have impacted the biodiversity in the area.	Rare	Unlikely	Local	Short term	Low	Negative	Direct	Low	Medium
Archaeology and Cultural Resources	Farming operations may cause damage to Archaeology and Cultural Resources	Rare	Unlikely	Local	Short term	Low	Negative	Direct	Low	Low
Land use change	The land use was initially forest but has been converted to agriculture	Infrequent	Unlikely	Local	Medium term	Low	Negative	Direct	Low	Low
Impacts on Socioeconomic Environment										

Impact	Impact Description	Impact Evaluation								
Improved local economy	Generation of business opportunities to local contractors and individuals in the area	Frequent	Likely	Local	Medium term	High	Positive	Direct	High	High
Increased employment opportunities	At present the farm has 10 permanents and 75 seasonal workers for cropping which is projected to increase to 25 permanents and 150 seasonal once the new pivot is installed.	Frequent	Likely	Local	Medium	High	Positive	Direct	High	High
Public Revenue/ Taxes	MLP contributes revenue in terms of taxes for both the central and local authorities.	Frequent	Likely	Local	Medium	Low	Positive	Indirect	High	High
Accelerated urban Development and Infrastructure	The project has contributed to the urban development within Serenje.	Frequent	Likely	Local	Medium	Low	Positive	Indirect	High	High

7 ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

7.1 Environmental and Social Management Plan (ESMP)

This Environmental and Social Management Plan (ESMP) (Table 7-1) represents MLP's commitment to address and manage the potential negative and positive impacts associated with the existing and proposed expansion activities for the agricultural activities and defines the standards and guidelines to be achieved in terms of environmental legislation, policy and standards. The ESMP involves the protection, conservation and sustainable use of the various elements or components of the environment. The ESMP for the proposed project provides all the details of project activities, impacts, mitigation measures, time schedules, costs, responsibilities and commitments proposed to minimize environmental impacts of activities, including, monitoring and evaluation and environmental audits during implementation and decommissioning phases of the project.

The ESMP is a very important output of an ESIA since it provides the framework or checklist for project monitoring and evaluation/audit. Mitigation measures provided in this section are aimed at making changes in any of the following ways: project materials, raw materials, project sites to mention but a few. The main objectives of the ESMP are to:

- Ensure the project is compliant with applicable national environmental and social legal requirements;
- Identify the required mitigation measures that are needed in order to reduce negative impacts and enhance positive ones;
- Ensure that all mitigation measures and recommendations identified during the environmental impact assessment are incorporated into documents that are referenced and expanded if necessary during the various phases of the project;
- Outline the mitigating/enhancing, monitoring, consultative and institutional measures required to prevent, minimize, mitigate or compensate for adverse environmental and social impacts and/or to enhance project related beneficial impacts;
- Address human resource requirements to ensure implementation of the ESMP is possible.

To achieve the above, the ESMP ensures that:

1. ***During project planning and design***, all mitigation measures identified in the ESIA that can be incorporated into the planning and design of the project are considered during the detailed planning and design phase.
2. ***During construction*** all constraints, restrictions and actions required to minimize construction related impacts are implemented.
3. ***During commissioning and operation***, detailed operating procedures are developed so that all constraints, restrictions and actions required to minimize

impacts caused by commissioning and operation are developed, implemented and monitored for all aspects of the project.

4. ***During the life of the project,*** continue to enhance positive impacts and ensure mitigation for negative impacts. An important component of this monitoring, evaluation and communication of findings, and adherence to the principle of continued improvement.
5. ***During decommissioning,*** detailed procedures are developed to ensure that the project area is rehabilitated to an acceptable and previously agreed-to level.

The ESMP is an umbrella plan that describes the management of environmental, health and safety (EH&S) matters and that will be complemented and augmented by a number of sub plans as described in this report.

7.1.1 Implementation of Environmental and Social Measures

Ultimately, the Project Owner MLP is responsible for the implementation of all environmental and social mitigation measures identified and described in the ESIA. However, these measures can be grouped in two main categories as follows, for which responsibilities will be organised differently:

- Measures directly related to construction of facilities on the farm: Implementation of most if not all of these measures will be attributed directly to the Contractor (and the Contractor will have to make sure, if the case arises, that his sub-contractors will also comply with them). In these cases, MLP's responsibility will mainly be the control and monitoring of the Contractor's performance. The relevant measures – and sub-plans to be prepared – for this category are described in Section 7.3.1.
- Measures not related to construction activities and/or the construction site: Here, the Owner will be directly responsible for implementation, which will be done either by the Project Implementation Unit (PIU), the Owner's Engineer or a third party (but usually not the contractor) specially appointed by the Owner for this purpose.

7.1.2 Summary of Main Impacts and Mitigation Measures

In this ESIA Report, environmental risks and impacts likely to emanate from Project elements or Project related activities were described. This Section takes up the synopsis of the impacts, with their importance, and lists the required or proposed mitigation measures, where such measures seem necessary for minimising the impact as far as possible or reducing the risk to an acceptable level. The mitigation measures for impacts with 'medium' to 'high' significance have been summarised in Table 7-1.

7.1.3 Overall Impact Evaluation

The main conclusions of the analysis in this Report are the following:

- Most impacts are rather small and easily mitigated, if mitigation is required at all

- There is no impact of the category "strong negative, mitigation not possible", which would have to be considered as a no-go for the project.

7.2 Environmental and Social Monitoring Plan

Monitoring of all the environmental protection measures described in the ESMP has to be carried out in the way outlined. The aims of monitoring are the following:

- To check on compliance with the conditions set forth and standards to be met;
- To inform the relevant authorities on observed cases of non-compliance;
- To propose corrective measures for such cases;
- To check on the success of these measures.

The environmental and social monitoring plan is described in Table 7-2.

Table 7-1: Environmental and Social Management Plan (ESMP)

Aspect	Project Component	Impact and significance before mitigation/ enhancement	Importance	Mitigation/Enhancement Measure	Remaining impact after mitigation/ enhancement	Related Sub Monitoring and Management Plans (S-MP)
Construction of farm facilities	Construction activities and transportation activities	Air pollution (pollution (dust, exhaust gases) mainly by nitrogen oxides (NOx) and Particulate Matter (PM10)	**high - negative** → impact, localised to construction site, and limited to the duration of construction	• Appropriate warning shall be given to the general public and drilling locations shall be appropriately secured before blasting. • All heavy equipment and machinery shall be fitted with air pollution control and noise dampening devices that are operating correctly and that can operate within the Zambian statutory requirements for the areas of operation (e.g. sensitive locations besides schools or open country). • Works contractor with PMC will conduct consultation with the community to warn of potential discomforts, contractor methods of reducing pollution and discuss additional methods households may wish to further reduce discomforts. • Use of a water bowser to reduce the amount of dust generated.	**Low negative** reduction of quantity of exhaust gas, dust; will be within legal limits	Environmental, Health and Safety Management and Monitoring of the Contractor Equipment Maintenance Management Plan Air Quality Management Plan
	Construction activities	Soil pollution	Negative	• The maintenance of machinery and equipment has to be done in workshops; liquids including cleaning water should be collected in tanks. • Storage of fuel and lubricants has to be in tight containers placed on sealed surfaces underneath a roof. The storage has to be equipped with all safety measures to prevent oil spilling including firefighting equipment. The area needs to be marked. • Sufficient quantities of oil absorbent have to be stocked and have to be easily accessible in case of an oil spill. The contaminated absorbent has to be disposed of properly. • Hazardous waste has to be stored in designated closed tanks or areas. • Solid waste generated during will be properly treated and safely disposed of only in demarcated waste disposal sites. • All activities which could contaminate the soil have to be carried out on sealed surfaces. If accidental spillage occurs, the contaminated soil has to be excavated and disposed of properly (final treatment or disposal shall be done by a suitably qualified company and in accordance with the Zambian Hazardous Waste Management Regulations of 2001).	small negative → reduced risk of soil contamination; unexpected spills and leakages will be treated properly and fast, the contamination of soil will be locally and due to clean-up mechanisms not spread into the surrounding or drained into the water and/or groundwater	Environmental, Health and Safety Management and Monitoring of the Contractor Equipment Maintenance Management Plan Waste Management Plan Hazardous Material Management Plan Pollutant Spill Contingency Plan
	Construction activities, movement of vehicles and heavy machines	Increased noise levels	Negative	• Use of mufflers, silencers, and screens to minimize noise from construction activities; • Vehicle movements and operation of loud machinery and equipment will be restricted to daylight hours.	None	Occupational Health and Safety Plan Health and Safety Management Plan during operation

Aspect	Project Component	Impact and significance before mitigation/ enhancement	Importance	Mitigation/Enhancement Measure	Remaining impact after mitigation/ enhancement	Related Sub Monitoring and Management Plans (S-MP)
Vegetation clearance	Construction area	Soil erosion Main risks: Soil erosion: • Creation of open and erosion-prone surfaces during construction phase (amongst others whilst levelling the ground of the project site). → In the absence of vegetation cover the soil will become more susceptible to erosion. • Small negative effect (visibility, change in morphology). While a natural process, erosion can locally be accelerated by the project.	Medium - Negative	• Fill should be compacted properly in accordance with the Specification. • Unsuitable and surplus excavated materials shall not be disposed to locations or in a way that it will subsequently be prone to erosion. • Protect slopes from erosion, where bare slopes are exposed as a consequence of the works limit the period of exposure to water or wind erosion and provide temporary or the designed slope protection at the earliest opportunity, measures shall include covering with sheeting, bioengineering (seeding and planting) geotextiles, gabion boxes and mattress, riprap and other physical measures that will hold unstable soil. • Minimise or protect areas of bare soil throughout the rainy season. • Precautions as necessary to prevent erosion of areas under construction throughout the rainy season including excavation/fill/etc. any areas that cannot be completed prior to the rains. • Planting with indigenous species. • Exposed areas shall be protected using conventional civil engineering structures in conjunction with bioengineering techniques similar to but not limited to those recommended above for slope protection. • In the short-term, either temporary or permanent drainage works shall protect all areas susceptible to erosion. Measures shall be taken to prevent ponding of surface water and erosion of slopes. Newly eroded channels shall be backfilled and restored to natural contours. • Restoring all areas used temporarily for the works immediately these areas are no longer required including borrow areas and temporary lay down areas.	Low - negative → The erosion prevention control measures during construction and operation will considerably reduce the soil erosion	Environmental, Health and Safety Management and Monitoring of the Contractor Erosion Control Plan Site Rehabilitation / Re-Vegetation Plan Excavation Spoil / Fill Management Plan
	Construction activities	Loss of wildlife habitat Especially in areas where there will be clearing of some regenerating trees	Medium – Negative Impact of minor importance since no critical natural habitats and area not of major importance for conservation of biodiversity	• Confine vegetation clearance to areas where structures will be built • Do not clear vegetation or damage vegetation outside of the worksite, do not cut trees, damage root system or lop branches without prior consent of local authority and forest department • No tree cutting during the nesting season. • If identified, rare, endangered, threatened or endemic species or their habitats to be persevered or transferred as per ZEMA instructions. • Avoid stock piling of materials on vegetated areas. • Monitor stockpiling. • Use of soil reinforcement where necessary to promote establishment of vegetation cover, biodegradable soil reinforcements can be used. • Works contractor responsible for vegetation until established.	Very small - none	Site Rehabilitation / Re-Vegetation Plan

Aspect	Project Component	Impact and significance before mitigation/ enhancement	Importance	Mitigation/Enhancement Measure	Remaining impact after mitigation/ enhancement	Related Sub Monitoring and Management Plans (S-MP)
Generation of non and hazardous waste	Construction and some operation activities	Water pollution Contamination of soil, water, health risk; due to: • Domestic waste (mainly during construction). • Liquid waste (from maintenance of all Lorries and construction machinery). • Hazardous waste (e.g. from maintenance of machinery).	Negative	• No solid waste, fuels or oils should be discharged into water flows. • Test water samples from dewatering operations for contaminants according to ZEMA, Zambia guidelines for discharge of effluents, which when exceeded, advice on appropriate discharge should be sought. • Hold and store sanitary and cleaning wastes in appropriate containers to be disposed of at approved sites. • Park vehicles preferably on paved platforms. • Fuel storages should not leak, and should be periodically monitored, and repaired or replaced when necessary. • Sites for cleaning, fueling and maintaining vehicles should be able to prevent leakage (e.g. paved). • Maintain fuel and clean vehicles and equipment at workshops/sites with adequate leakage prevention (e.g. impermeable surface, settlers and oil separator). • Storing hydrocarbons and hazardous materials on impervious ground under cover and constructing the storage area as a spill tray to avoid spread of accidental spills.	**small negative / none** appropriate waste handling measures result in minimisation of contamination of the environment and in improved health protection	Waste Management Plan Hazardous Material Management Plan
	Operation activities	Odours generated and released to the surrounding area during the process of chemical spray	Medium - Negative	• Ensure appropriate warning is given to the communities nearby • Apply when the wind is calm • The perimeter of the proposed site should be vegetated with trees and plants of varying heights thereby forming windbreaker and reduce dispersion of odour;	Low - Negative	Waste water management plan
	Operation activities	Contamination of nearby streams/rivers. There is a possibility of agriculture chemicals flowing into nearby rivers or streams	Medium - Negative	• Regular monitoring and sampling of the water of the the receiving water bodies;		Water pollution prevention plan, Monitoring plan

Aspect	Project Component	Impact and significance before mitigation/ enhancement	Importance	Mitigation/Enhancement Measure	Remaining impact after mitigation/ enhancement	Related Sub Monitoring and Management Plans (S-MP)
Handling, Storage and disposal of Hazardous Materials	Construction phase	Impacts on workers' health	Negative	• Storing hydrocarbons and hazardous materials on impervious ground under cover and constructing the storage area as a spill tray to avoid spread of accidental spills. • Providing safe ventilation for storage of volatile chemicals. • Restricting and controlling access to areas containing hazardous substances. • Site all workshops, depots, and temporary workers accommodation facilities in approved locations. • Using refrigerants and fire extinguishing agents in accordance with the 'Montreal Protocol'. • PPE for operatives. • Document safe disposal of hazardous or contaminated waste; including disposal sites and volumes. • Identify, in coordination with ZEMA as required, potential safe disposal sites for hazardous or contaminated waste. Investigate the environmental conditions of the disposal sites and prepare a recommendation for most suitable and safest site(s). • Designate disposal sites to be used in the project.	Small/None Once mitigation measures are implemented, remaining impact will be very small if none	Waste Management Plan Hazardous Material Management Plan
Movement of heavy trucks, vehicles and machines	Construction phase	Injuries to pedestrians, increased road traffic accidents	Negative	• All motorists will be encouraged to move within the speed limit. Adequate signage will be installed along the roads within the project area • Entry into the project area will be restricted to workers only • Contractor will ensure that alternative spaces in communities will be provided for public vehicles to stop and pick-up passengers safely	Small/None Once mitigation measures are implemented, remaining impact will be very small if none	Traffic management plan

Aspect	Project Component	Impact and significance before mitigation/ enhancement	Importance	Mitigation/Enhancement Measure	Remaining impact after mitigation/ enhancement	Related Sub Monitoring and Management Plans (S-MP)
Public consultation	Increased awareness about the project. All types of potential effects of the Project on the directly affected population. Knowledge about the Project by all interested parties.	Impact will be medium	Positive or negative	Providing good and timely information on the project: • information on ongoing and planned works • receiving of and dealing with complaints by affected or interested public • public disclosure of relevant documents	**mostly positive** adequate solving of any problems that might arise with any stakeholders	Public consultation and disclosure plan (public consultation and community relation management plan)
Occupational Health and Safety	Mainly Construction Phase and Operation Phase	Work accidents, occupational diseases (skin irritation, noise, etc.)	Negative	• Develop occupational health and safety procedures such as wearing of protective equipment, proper handling of hazardous substances, etc. • All workers have to use the relevant protective equipment (helmet, gloves, goggles, work boots, masks, ear plugs, etc.), provided free of charge. • All restricted plant facilities have to be labelled with caution signs, especially those with potential risk for workers. Label transmission line poles indicating danger, high voltage. • All construction areas shall be marked and fenced to avoid accidents involving unauthorised people. Fence off all areas such as excavation pits, quarries, etc. to prevent accidents. • First aid kits and facilities need to be available at the construction site for fast action if an accident occurs. Workers should be provided with First Aid Training. • Accessible consultation sheets for review in case of contingency or emergency situations. These should have phone numbers for police, fire fighters, Red Cross, personnel supervisor or project leader. • Prepare a scheme of the evacuation routes and where the fire extinguishers are located within the plant and place them at conspicuous places. • Maintenance of machinery (preventive and corrective; during construction and operation). • Assign a special area for food consumption during construction. • Workshops and camp site must have	none / small positive reduction of accidents, health protection, appropriate reaction in case an accident happens	Occupational Health and Safety Plan Health and Safety Management Plan during operation

Aspect	Project Component	Impact and significance before mitigation/ enhancement	Importance	Mitigation/Enhancement Measure	Remaining impact after mitigation/ enhancement	Related Sub Monitoring and Management Plans (S-MP)
Presence of the project in the area	Construction and Operation phases	Increased employment opportunities	Small - positive	• Workers will be employed locally, where possible, without discrimination of gender, race, religion, and for unskilled positions for low literate. • Avoiding conflicts with local communities by providing resources for worker requirements at works contractor's temporary operational sites. • Avoiding the potential spread of vector borne diseases and communicable diseases, such as STIs and HIV/AIDS by controlling the contact of workers with awareness programmes, and regulation. • Achieve 30% minimum target employment for women (including equal remuneration for similar work) jobs are targeted for women in order to promote and increase opportunities and participation for women during construction. • Opportunities will be for skilled, semi-skilled and unskilled positions	High - positive	Recruitment plan
	Construction and Operation phases	Enhanced business opportunities	Positive or negative	• Encourage workers to buy from locals	Mostly positive - impact will be high after enhancement measures	N/a
	Construction and Operation phases	Income to Suppliers and Contractors	Medium - Positive	• Source local materials, skills and services. These include plant (pump sets, switch gear, instrumentation and chemicals) steel and plastic, cement, sand, etc • Earth materials needed for construction, for example, aggregate (stones and sand) are obtained from quarry operations. Conscious or unwitting purchase of these materials from unlicensed operations indirectly promotes environmental degradation at illegal quarry sites and can cause medium- to long-term negative impacts. It should therefore be a contractual obligation for contractors to procure construction materials from quarries legitimately licensed by Serenje District Council and duly approved by ZEMA.	Mostly positive - impact will be high after enhancement measures	Procurement and contracting plan

Aspect	Project Component	Impact and significance before mitigation/ enhancement	Importance	Mitigation/Enhancement Measure	Remaining impact after mitigation/ enhancement	Related Sub Monitoring and Management Plans (S-MP)
	Construction phase	Pressure on Existing Resources	Medium - Negative	• Through inductions and tool box meetings, MLP will ensure that contractors are conversant with resource conservation practices in all project activities. Conservation awareness will focus on water use. • MLP will acquire water abstraction permits with conditions to guide the amount of water to be abstracted as per WARMA requirement. • Earth materials will be sourced from ZEMA-approved sources in a manner that reduces environmental and social impacts. Approved sources are known and easy to monitor and regulate by both the district local administration and ZEMA. • Catchment management plans are being developed with the aim of conserving and allowing recharge of water resources. • Water conservation measures will be encouraged: saving water is an efficient way of reducing the overuse of ground water resources. It is not only decreases the amount of the water withdrawn, but may also reduce the threat of pollution.	Small/None Once mitigation measures are implemented, remaining impact will be very small if none	None
	Construction phase	Creation of Wealth	Medium - Positive	• Encourage workers to support local business and services such as food vendors	Mostly positive - impact will be high after enhancement measures	N/a
Influx of workers to the area	Construction phase	Increased market for local goods	Positive	• Encourage workers to buy from local people for goods and services that area available in the area	Medium – positive after enhancement	N/a
	Construction phase	Increased conflict between workers and locals	Negative	• Preparing workers to avoid conflict situations through orientation and awareness programmes. • Avoiding damage to utilities by ensuring that vehicles and equipment are operated by trained personnel, and that operations are adequately supervised.	None	Public consultation and disclosure plan (public consultation and community relation management plan)
	Construction phase	Stress on public health facilities as there will be an influx of people looking for jobs	Negative	• Give first priority to local members of the community when employing • Support government programmes on health such as rehabilitation and construction of health facilities	None	Recruitment plan Public consultation and disclosure plan (public consultation and community relation management plan)

Aspect	Project Component	Impact and significance before mitigation/ enhancement	Importance	Mitigation/Enhancement Measure	Remaining impact after mitigation/ enhancement	Related Sub Monitoring and Management Plans (S-MP)
	Construction phase	Spread of communicable diseases	Medium - negative	• Health education on the dangers and prevention of communicable • Insert prevention intervention clauses in construction contracts. • Maximise employment of local labour for construction work. • Focus on behaviour change for workforce, not just raising awareness • Tailor messages to the general workforce, as well as men and women • Provide male and female condoms for construction workers. • Educate construction workers on how to avoid STI, to recognize common STI symptoms, and to seek treatment via confidential referral systems. • Publicize to workers the existence of anonymous VCT service (testing, pre-test, and post-test counselling). • Educate construction workers on how to avoid Opportunistic Infections, to recognize common Opportunistic Infections symptoms, and to seek treatment • The Contractor in collaboration with Ministry of Health shall take measures to educate and sensitise the labour force on the risks of communicable diseases (malaria, TBC, STDs, including HIV/AIDS etc.). How infections are transmitted, how to recognise symptoms, what should be done and on prevention measures. Male and female condoms shall be distributed to workers by the Contractor free of charge. • Overall good housekeeping contributes to maintain hygienic and safe conditions on the construction site.	Small - negative	Recruitment plan Public consultation and disclosure plan (public consultation and community relation management plan)

Table 7-2: Environmental and Social Monitoring Plan

Aspect	Impact	Mitigation/Enhancement Measure	Frequency of Monitoring	Time-Frame	Performance Indicator	Responsible Person	Cost (US$)
Construction of farm facilities	Air pollution (pollution (dust, exhaust gases) mainly by nitrogen oxides (NOx) and Particulate Matter (PM10)	• Appropriate warning shall be given to the general public and drilling locations shall be appropriately secured before blasting. • All heavy equipment and machinery shall be fitted with air pollution control and noise dampening devices). • Works contractor will conduct consultation with the community to warn of potential discomforts, contractor methods of reducing pollution and discuss additional methods households may wish to further reduce discomforts. • Use of a water bowser to reduce the amount of dust generated.	Weekly	Throughout construction phase	Digging and drilling done after appropriate warning is given	Contractor (Implementation)	10,000
	Soil pollution	• Regular servicing and maintenance of equipment and vehicles. • Contaminated soil shall be removed/treated immediately	Whenever it occurs	Throughout construction phase	Soil pollution within standard	Contractor (Implementation)	10,000
	Generation of noise	• Use of mufflers, silencers, and screens to minimize noise from construction activities; • Vehicle movements and operation of loud machinery and equipment will be restricted to daylight hours	Daily	Throughout construction phase	Noise level within standard	Contractor (Implementation)	15,000
	Disturbance to Archaeology/ Cultural Resources	• Close monitoring during construction to avoid accidental damage including damage from vibration. • Anything uncovered is reported to NHCC	Daily	Throughout construction phase		Contractor (Implementation)	10,000

Aspect	Impact	Mitigation/Enhancement Measure	Frequency of Monitoring	Time-Frame	Performance Indicator	Responsible Person	Cost (US$)
Vegetation clearance	Soil erosion	• Fill should be compacted properly in accordance with the Specification. • Unsuitable and surplus excavated materials shall not be disposed to locations or in a way that it will subsequently be prone to erosion. • Protect slopes from erosion, where bare slopes are exposed as a consequence of the works limit the period of exposure to water or wind erosion and provide temporary or the designed slope protection at the earliest opportunity, measures shall include temporary or permanent drainage including check dams and may also include covering with sheeting, bioengineering (seeding and planting) geotextiles, gabion boxes and mattress, riprap and other physical measures that will hold unstable soil. • Minimise or protect areas of bare soil throughout the rainy season. • Precautions as necessary to prevent erosion of areas under construction throughout the rainy season including excavation/fill/etc. any areas that cannot be completed prior to the rains. • Planting with indigenous species. • Exposed areas shall be protected using conventional civil engineering structures in conjunction with bioengineering techniques similar to but not limited to those recommended above for slope protection. • In the short-term, either temporary or permanent drainage works shall protect all areas susceptible to erosion. Measures shall be taken to prevent ponding of surface water and erosion of slopes. Newly eroded channels shall be backfilled and restored to natural contours. Check dams and/or drop structures with designed stilling basins will be provided on steep slopes. • Restoring all areas used temporarily for the works immediately these areas are no longer required including borrow areas and temporary lay down areas.	Weekly at active worksites and thereafter as necessary during the period of use but not less than quarterly.	Throughout construction phase		Contractor (Implementation)	5,000
	Loss of wildlife habitat	• Minimise damage to trees. • Do not clear vegetation or damage vegetation outside of the worksite, do not cut trees, damage root system or lop branches without prior consent of local authority and forest department • No tree cutting during the nesting season. • If identified, rare, endangered, threatened or endemic species or their habitats to be persevered or transferred as per ZEMA instructions. • Avoid stock piling of materials on vegetated areas. • Monitor stockpiling. • Plant appropriate seedlings, indigenous to the area to regenerate vegetation to pre-project state. • Use of soil reinforcement where necessary to promote establishment of vegetation cover, biodegradable soil reinforcements can be used. • Works contractor responsible for vegetation until established.	Weekly at active worksites and thereafter as necessary during the period of use but not less than quarterly	Throughout construction phase	Number of trees planted	Contractor (Implementation)	10,000
	Disruption to ecology and biodiversity	• Supporting revegetating and environmental programmes	Annually	Throughout operation phase	Number of environmental programmes supported	MLP (Implementation)	15,000

Aspect	Impact	Mitigation/Enhancement Measure	Frequency of Monitoring	Time-Frame	Performance Indicator	Responsible Person	Cost (US$)
Generation of non and hazardous waste	Water pollution	• No solid waste, fuels or oils should be discharged into water flows. • Test water samples from dewatering operations for contaminants according to ZEMA, Zambia guidelines for discharge of effluents, which when exceeded, advice on appropriate discharge should be sought. • Hold and store sanitary and cleaning wastes in appropriate containers to be disposed of at approved sites. • Park vehicles preferably on paved platforms. • Fuel storages should not leak, and should be periodically monitored, and repaired or replaced when necessary. • Sites for cleaning, fueling and maintaining vehicles should be able to prevent leakage (e.g. paved). • Maintain fuel and clean vehicles and equipment at workshops/sites with adequate leakage prevention (e.g. impermeable surface, settlers and oil separator). • Storing hydrocarbons and hazardous materials on impervious ground under cover and constructing the storage area as a spill tray to avoid spread of accidental spills.	Weekly	Throughout construction phase	Pollution within acceptable limits	Contractor (Implementation) ZEMA (enforcement)	Construction cost
Handling, Storage and disposal of Hazardous Materials	Impacts on workers' health	• Storing hydrocarbons and hazardous materials on impervious ground under cover and constructing the storage area as a spill tray to avoid spread of accidental spills. • Providing safe ventilation for storage of volatile chemicals. • Restricting and controlling access to areas containing hazardous substances. • Site all workshops, depots, and temporary workers accommodation facilities in approved locations. • Using refrigerants and fire extinguishing agents in accordance with the 'Montreal Protocol'. • PPE for operatives. • Document safe disposal of hazardous or contaminated waste; including disposal sites and volumes. • Identify, in coordination with ZEMA as required, potential safe disposal sites for hazardous or contaminated waste. Investigate the environmental conditions of the disposal sites and prepare a recommendation for most suitable and safest site(s). • Designate disposal sites to be used in the project.	Daily	Throughout construction phase	Number awareness programmes conducted	Contractor (Implementation) ZEMA (enforcement)	20,000
Abstraction of water	Stress on water resources	• Pump amount in accordance to the water permit from WARMA • Work closely with WARMA • Ensure that only permitted amounts of water is pumped • Monitor the pumping of the water from the lake so that it is within standard.	Monthly	Throughout operation phase	Pump permitted amounts	MLP (Implementation) WARMA (Enforcement)	3000

Aspect	Impact	Mitigation/Enhancement Measure	Frequency of Monitoring	Time-Frame	Performance Indicator	Responsible Person	Cost (US$)
Movement of heavy trucks, vehicles and machines	Injuries to pedestrians, increased road traffic accidents	• All motorists will be encouraged to move within the speed limit. Adequate signage will be installed along the roads within the project area • Entry into the project area will be restricted to workers only • Contractor will ensure that alternative spaces in communities will be provided for public vehicles to stop and pick-up passengers safely	Daily	Throughout construction	Incidents of accidents	Contractor (Implementation)	5000
Public consultation	All types of potential effects of the Project on the directly affected population. Knowledge about the Project by all interested parties.	Providing good and timely information on the project: • information on ongoing and planned works • receiving of and dealing with complaints by affected or interested public • public disclosure of relevant documents	Monthly and as when as the complaint occurs	Throughout construction	Number of consultation meetings held.	Contractor (Implementation)	8,000
Occupational Health and Safety	Work accidents, occupational diseases (skin irritation, noise, etc.)	• Develop occupational health and safety procedures such as wearing of protective equipment, proper handling of hazardous substances, etc. • All workers have to use the relevant protective equipment (helmet, gloves, goggles, work boots, masks, ear plugs, etc.), provided free of charge. • All restricted facilities have to be labelled with caution signs, especially those with potential risk for workers • All construction areas shall be marked and fenced to avoid accidents involving unauthorised people. Fence off all areas such as excavation pits, quarries, etc. to prevent accidents. • First aid kits and facilities need to be available at the construction site for fast action if an accident occurs. Workers should be provided with First Aid Training. • Accessible consultation sheets for review in case of contingency or emergency situations. These should have phone numbers for police, fire fighters, Red Cross, personnel supervisor or project leader. • Prepare a scheme of the evacuation routes and where the fire extinguishers are located within the plant and place them at conspicuous places. • Maintenance of machinery (preventive and corrective; during construction and operation). • Assign a special area for food consumption during construction. • Workshops and camp site must have	Daily	During construction and operation		Contractor (Implementation)	12,000

Aspect	Impact	Mitigation/Enhancement Measure	Frequency of Monitoring	Time-Frame	Performance Indicator	Responsible Person	Cost (US$)
	Risk of Accidents	• Contractor will adopt best transport safety practices (Journey Management Plans (JMPs)) with the goal of preventing traffic accidents and minimizing injuries suffered by project personnel and the public by: employing safe traffic control measures, including road signs and flagmen/traffic guides to warn of dangerous conditions and children crossings; and setting speed limits on all access roads in the project area will be 40km/h for light vehicles and 30 km/h for heavy vehicles. Through the JMPs, optimum routes from material storage areas to the construction sites will be identified to avoid sensitive receptors such as schools and hospitals.		Throughout construction	Journey management document	Contractor (Implementation)	20,000
Presence of the project in the area	Increased employment opportunities	• Workers will be employed locally, where possible, without discrimination of gender, race, religion, and for unskilled positions for low literate. • Avoiding conflicts with local communities by providing resources for worker requirements at works contractor's temporary operational sites. • Avoiding the potential spread of vector borne diseases and communicable diseases, such as STIs and HIV/AIDS by controlling the contact of workers with awareness programmes, and regulation. • Achieve 30% minimum target employment for women (including equal remuneration for similar work) jobs are targeted for women in order to promote and increase opportunities and participation for women during construction. • Opportunities will be for skilled, semi-skilled and unskilled positions	Monthly	Throughout construction	Number of locals employed	Contractor (Implementation)	Construction costs
	Enhanced business opportunities	• Encourage workers to buy from locals shops	N/a	N/a	N/a	N/a	N/a
	Changes in land use, i.e. from a natural area to tank sites in some areas. Establishment of new office blocks	• For mitigation measures regarding areas to be occupied temporarily or permanently by project structures and/or related activities, see entries for Vegetation • New facilities should be designed to be integrated in the landscape to the extent possible.	N/A	Throughout construction	Building within required standards	Throughout construction	10,000
Influx of workers to the area	Increased market for local goods	• Encourage workers to buy from local people for goods and services that area available in the area	N/a	N/a	N/a	N/a	N/a
	Increased conflict between workers and locals	• Preparing workers to avoid conflict situations through orientation and awareness programmes. • Avoiding damage to utilities by ensuring that vehicles and equipment are operated by trained personnel, and that operations are adequately supervised. • Informing the affected community of the schedule if utilities have to be moved or services are interrupted.	Monthly	Throughout construction	N/a	Throughout construction	N/a

Aspect	Impact	Mitigation/Enhancement Measure	Frequency of Monitoring	Time-Frame	Performance Indicator	Responsible Person	Cost (US$)
	Stress on public health facilities as there will be an influx of people looking for jobs	• Give first priority to local members of the community when employing • Support government programmes on health such as rehabilitation and construction of health facilities	N/a	N/a	N/a	N/a	N/a
	Spread of communicable diseases	• Health education on the dangers and prevention of communicable • Insert prevention intervention clauses in construction contracts. • Maximise employment of local labour for construction work. • Focus on behaviour change for workforce, not just raising awareness • Tailor messages to the general workforce, as well as men and women • Provide male and female condoms for construction workers. • Educate construction workers on how to avoid STI, to recognize common STI symptoms, and to seek treatment via confidential referral systems. • Publicize to workers the existence of anonymous VCT service (testing, pre-test, and post-test counselling). • Educate construction workers on how to avoid Opportunistic Infections, to recognize common Opportunistic Infections symptoms, and to seek treatment • The Construction Supervisor in collaboration with Ministry of Health shall take measures to educate and sensitise the labour force on the risks of communicable diseases (malaria, TBC, STDs, including HIV/AIDS etc.). How infections are transmitted, how to recognise symptoms, what should be done and on prevention measures. Male and female condoms shall be distributed to workers by the Contractor free of charge. • Overall good housekeeping contributes to maintain hygienic and safe conditions on the construction site.	regular intervals	throughout the construction period	Reduction in the spread of communicable diseases	Contractor (Implementation)	10,000

7.3 Description of the ESMP

The Environmental and Social Management Plan (ESMP) provides an overall approach for managing and monitoring environment and social issues during construction and operation. It describes the institutional framework and resource allocations required to implement the environmental and social management and monitoring plans for the Project.

7.3.1 Legal Framework

Section 2 of the ESIA Report provides a list of the relevant laws on protection of the environment, occupational health and safety.

Among the international standards for the commercial farming project are the International Finance Corporation (IFC) Policy, and Performance Standards on Social and Environmental Sustainability and the IFC EHS Guidelines (see Section 2 of this Report). The following Table lists the topics which are covered by the IFC EHS Guidelines and the relevant Management Plans which will have to be implemented for the agricultural project by the Owner and / or the Contractor(s).

Table 7-3: IFC EHS Guidelines which have been applied for the ESMP

General EHS Guidelines IFC	**Management plans to be implemented (discrete plans for construction and operation periods)**
1. Environmental	
1.1 Air Emissions and Ambient Air Quality	Air Quality Management Plan
1.2 Energy Conservation	
1.3 Wastewater and Ambient Water Quality	Wastewater Management Plan / Water Quality Monitoring
1.4 Water Conservation	
1.5 Hazardous Materials Management	Hazardous Material Management Plan, Explosives Management Plan
1.6 Waste Management	Waste Management Plan
1.7 Noise	Noise and Vibration Management Plan, Equipment Maintenance Management Plan, Explosives Management Plan
1.8 Contaminated Land	Pollutant Spill Contingency Plan, Site Rehabilitation Plan / Re-vegetation Plan
2. Occupational Health and Safety	Occupational Health and Safety Plan (OHSP)
2.1 General Facility Design and Operation	Site Maintenance and Housekeeping Plan as part of the OHSP
2.2 Communication and Training	Skills Development Plan, included in OHSP and other plans
2.3 Physical Hazards	Site Emergency Preparedness and Response Plan (included in OHSP), Explosives Management Plan
2.4 Chemical Hazards	Hazardous Material Management Plan, part of OHSP of the Contractor
2.5 Biological Hazards	Not applicable
2.6 Radiological Hazards	Not applicable

General EHS Guidelines IFC	Management plans to be implemented (discrete plans for construction and operation periods)
2.7 Personal Protective Equipment (PPE)	OHSP
2.8 Special Hazard Environments	OHSP
2.9 Monitoring	OHSP
3. Community Health and Safety	
3.1 Water Quality and Availability	Public Health, Water Quality Monitoring, Commercial Farming Operation Plan
3.2 Structural Safety of Project Infrastructure	Included in OHSP and other plans
3.3 Life and Fire Safety (L&FS)	OHSP
3.4 Traffic Safety	Traffic Management Plan
3.5 Transport of Hazardous Materials	Hazardous Material Management Plan
3.6 Disease Prevention	OHSP
4. Construction and Decommissioning	
4.1 Environment	Additional Plans to the above mentioned are the: Erosion Control Plan Excavation Spoil / Fill Management Plan Site Rehabilitation Plan / Re-vegetation Plan
4.2 Occupational Health & Safety	See above
4.3 Community Health & Safety	See above

MLP (Project Owner)

MLP will be responsible for the following:

- Overall responsibility for environmental performance of the project;
- Decision-maker on applicable policies to the project;
- Oversight supervisory role during the construction phase;
- Overall responsibility for ESMP implementation during the operation phase;
- Review reports of independent environmental monitoring consultants;
- Approve changes to the ESMP, as necessary, as part of an adaptive approach to environmental and social management of of the project;
- Shall appoint an Environmental Manager or Environmental Coordinator (ECO) to take care of environmental issues during Project implementation and a Safety Officer.
- Shall allow ZEMA Inspectors unrestricted entry to the project site at any reasonable time without making prior notice throughout the Project cycle.

Other Parties Involved

A number of government agencies will be involved in the Project, mainly by carrying out some regulatory and monitoring functions. The most important ones are shortly described Serenje District Council, ZEMA, Forestry Department and Water Resource Management Authority (WARMA).

8 DECOMMISSIONING AND REHABILITATION PLAN

The goal of decommissioning is to ensure that the project sites are left in a condition that is safe and stable, long-term environmental impacts are minimised and any future liability to the community and future land use restrictions are minimised. Several factors usually drive the process. The Decommissioning and Closure Plan shall be subjected to periodic review to update it with any possible change of business plans. The proposed closure cost estimates (stated in section 8.5) were based on the current market prices and costs of labour. These shall be updated with annual inflation and major economic changes.

8.1 Closure and Rehabilitation Objectives

Given the fact that the commercial farming project will be for a long time, the rehabilitation and closure objectives for this project will be as follows:

1. Compliance with relevant Zambian environmental legislation relating to close of such projects.
2. Identification of potential post closure uses of the land occupied by certain infrastructure in consultation with government authorities and land users;
3. Rehabilitation of disturbed land to a state that is suitable for its agreed post closure uses;
4. Rehabilitation of disturbed lands where temporal structures will be build:
    - Ensures that the area is physically stable and minimizes safety hazards;
    - Minimizes the opportunities for soil erosion to occur;
    - Facilitates compliance with applicable environmental quality objectives (air quality and water quality guidelines;
    - Reduces visual impact of the disturbed land;
    - Provides a self-sustaining solution with a minimum of post closure management.
5. Finding alternative livelihood strategies for workers whose jobs become redundant upon completion of construction and at closure;
6. Keeping relevant authorities informed of the progress of the decommissioning phase;
7. Submitting monitoring data to the relevant authorities as required;
8. Maintaining required pollution control facilities and rehabilitated land until and/or after closure.

8.2 Post-Closure Land Use

The project will identify potential post closure uses of the land occupied by the project infrastructure in consultation with government authorities, the surrounding landowners, land users and relevant traditional authorities. Generally, the contractor will ensure that the whole site is also subjected to progressive rehabilitation so that all areas where construction is completed are rehabilitated.

8.3 Post - Closure Monitoring

Surface and groundwater monitoring will continue until such time as it can be demonstrated that residual impacts have been reduced to an acceptable level. At least monitoring shall be conducted for whole period the project will be in operation. Following the completion of the rehabilitation programme monthly inspections will be carried out for a certain period of time especially around the areas that were directly affected by the project.

8.4 Post - Closure Maintenance

Any flaws identified during the post closure monitoring phase will be addressed by the post closure maintenance programme-by the project management;

Monitoring and maintenance will continue until a closure certificate has been issued by the authorities.

8.5 Cost of Decommissioning

The expected expenditure for the decommissioning and closure works is composed of costs for demolition and cleaning the site. It is expected that the cost of decommissioning will be about 20% of the project cost.

8.6 Validation of Decommissioning

At the completion of the decommission phase, MLP will produce a validation report to show that the decommissioning plan has been successfully implemented by confirming that there is no risk of environmental pollution and negative social impacts. The report will include the following:

- Disposal of raw materials;
- Disposal of waste;
- Decommissioning of plant and equipment;
- Disposal of obsolete equipment;
- Results of monitoring and testing; and
- The need for ongoing monitoring or investigations.

Table 8-1 summarises the decommissioning and closure impacts and their associated mitigation measures.

Table 8-1: Summary of Decommissioning and Closure Activities

Environmental. Comp.	Impact	Mitigation/Enhancement Measures	Frequency of monitoring	Performance Indicator	Responsible Person/ Entity
Biophysical Environment	Land degradation from disposal of decommissioning waste	Establish waste management priorities at the outset of activities based on an understanding of potential Environmental, Health, and Safety (EHS) risks and impacts and considering waste generation and its consequences	Weekly	Amount of accumulating waste Availability of a waste Management strategy	MLP
		Establish a waste management hierarchy that considers prevention, reduction, reuse, recovery, recycling, removal and finally disposal according to ZEMA guidelines			
		Preventing uncontrolled releases of hazardous materials to the environment or uncontrolled reactions that might result in fire or explosion			
		Provide education to workforce on hygienic conditions and behaviours	Daily	Amounts of solid waste disposed of	
	Pollution of Water resources	All solid waste (screenings) shall be adequately dried before disposal at a disposal site			
		Apply measures on Land degradation from disposal of decommissioning waste	Daily	Air Quality	
	Air pollution	For open area sources, including storage piles, use control measures such as installing enclosures and covers, and increasing the moisture content	Daily		MLP
		Implement dust suppression techniques	Daily		
		Avoid open air burning of solid waste			
	Noise and vibration	Plan activities in consultation with local communities so that activities with the greatest potential to generate noise are planned during holidays and off-peak periods of the day	Weekly	Noise levels Vehicle and machinery Maintenance records	
		Use noise control devices, such as temporary noise barriers and deflectors for impact and blasting activities, exhaust muffling devices for combustion engines including generators	Daily	Records and verifications from communities	
		Avoid or minimise project transportation through community areas	Daily	Records of damages	
		All workers involved in noisy works will be provided with Personal Protection Equipment (PPE)	Daily	Records of damages	

Environmental. Comp.	Impact	Mitigation/Enhancement Measures	Frequency of monitoring	Performance Indicator	Responsible Person/ Entity
		Where decommissioning activities result in damage, repairs/ restructure will be provided	Weekly	Records of repairs	
Socioeconomic Environment	Employment Creation	Prioritise employment opportunities to local community members and only outsourcing where labour is not locally available. This could be achieved if the contractor works with the local authorities	Weekly	No. of locals, women and vulnerable people employed on project	Contractor
		Women and the vulnerable groups like widows should be given preference;	Weekly		
		Ensure expectations are well managed and avoid strikes	Weekly		
		Manage community relations well	Weekly		
	Damage and disruption to adjacent services	Obtain up-to-date information on the locations of services that can be disturbed or damaged when works are being implemented	Weekly	Damages to infrastructure	
		Give notice to the owner of power and telecommunication cables, or other installations likely to be affected	Weekly	Notices to service providers	
		Exercise care not to damage or disrupt these services Daily	Daily	Communication impending disruptions	
		Where the above is not possible, the contractor shall liaise with the concerned authorities so that adequate measures to cushion the impact are put in place Daily	Daily	Communication impending disruptions	
		Informing customers of impending disruptions through media	Daily		
		Where services are disrupted, service providers shall make sure such disruptions are for the shortest possible time. This will be through adequate communication by the contractor with service providers	Daily	Communication impending disruptions	
	Economic displacement	All people to be affected by decommissioning will be informed about the planned activities in advance. They will also be informed about the plans for repairing the damages	Weekly	Records of meetings with PAPs; Records of Notices to PAPs	
		Where the project will result in economic displacement, repair / restructure of livelihood will be provided.	Weekly	Records of restructure / repair	
	Occupation Health and safety associated with the decommissioning of water supply facilities	Train workers in lifting and materials handling techniques and placement of weight	Monthly	Incidences of overexertion, injuries and illnesses	

Environmental. Comp.	Impact	Mitigation/Enhancement Measures	Frequency of monitoring	Performance Indicator	Responsible Person/ Entity
				Training reports	
		Plan work site layout to minimise the need for manual transfer of heavy loads	Weekly	Appropriateness of site layout, tools and work stations	
		Implement administrative controls into work processes such as job rotations, rest and stretch breaks	Daily	Record of administrative controls	Contractor
		Implement good house-keeping practices e.g., sorting and placing of loose decommissioning materials in established areas away from foot paths	Daily	Slips and falls	
		Clean up excessive waste debris and liquid spills regularly	Daily	Records of good house-keeping	
		Plan and segregate the location of vehicle traffic, machine operation, and walking areas, use of one-way traffic routes, establishment of speed limits, and onsite trained flag-people wearing high-visibility vests or outer clothing covering	Weekly	Accidents Appropriateness of site layout and safety measures	
	Community health and Safety associated with the decommissioning of commercial farming facilities	Restrict access to the site, through a combination of institutional and administrative controls including fencing and signage	Weekly	Accidents involving community members	MLP
		Remove hazardous conditions on decommissioning sites that cannot be controlled affectively with site access restrictions	Daily	Evidence of access restriction and no hazardous conditions	
		Notice will be given, in writing, to the local authority of the works to be undertaken including the required time to complete the works	Weekly	Accidents Records of notice	Contractor
		Fence, guard and light, during the night, the works at all times while the street is opened or broken up or obstructed	Daily	Evidence of fencing, lighting, road restoration and no decommissioning waste	
		Where it is anticipated that decommissioning works will disrupt movement, the contractor in liaison with the Serenje District Council will inform the public through the media at least 24hours before commencement of such works	Daily	Records of early warning to public	

Environmental. Comp.	Impact	Mitigation/Enhancement Measures	Frequency of monitoring	Performance Indicator	Responsible Person/ Entity
		In peri-urban areas, the contractors shall also coordinate with the WDCs so that announcements are conveyed by word-of-mouth (i.e. announcements in clubs, churches, mosques, schools and other public gatherings) and also through the use of megaphones	Daily	Displayed notices Evidence of alternative routes, warning signs, fencing, lighting, road restoration and no decommissioning waste	
		Where trenches are to be excavated in busy areas, the contractor will ensure such trenches remain open for very short periods of time. In these areas, the works shall also be scheduled during traffic off-peak periods like Saturday afternoons, Sundays and public holidays	Daily	Evidence of alternative routes, warning signs, fencing, lighting, road restoration and no decommissioning waste	
		Excavations will be sufficiently fenced with adequate warning signs and reflective tapes warning passers-by about deep trenches	Daily		

9 CONCLUSION AND RECOMMENDATIONS

9.1 Conclusion

This ESIA objectively assessed and evaluated impacts that may arise due to the existing commercial farming project. The drafting of this ESIA was based on the design information on the project which was provided by the design team who worked in conjunction with the ESIA team. The Mitigation measures and the Environmental Management and Monitoring Plan were formulated based on the level of detail and depth of the available information. In-depth analysis of the impacts revealed the following key findings:

- As all project activities will be confined within the boundary of the farm, no involuntary displacement and relocation of communities is envisaged;
- Most of the anticipated negative impacts are confined to the construction phase;
- For all major negative impacts like noise and air pollution, adequate mitigation
- Measures have been provided making the impacts manageable; and
- Most of the anticipated impacts in the operation phase are positive and bring out the desired results.
- The positive impacts of this project are more sustainable and outweigh the negative impacts.
- Based on the level of detail and depth of the study, it is the view of the developer that all envisaged environmental and socioeconomic impacts have been adequately addressed within the limits of the current state of knowledge and reasonable practice.

9.2 Recommendations

Occupational safety and Health

Ensure that worker's occupational health and safety standards are maintained through capacity building, proper training, providing protection, clothing and managing their camps up to the required health standards.

Environmental audits and monitoring

Regular environmental audits should be carried out on the project in order to ensure compliance of the project with the mitigation measures outlined in the Environmental and Social Management Plan (ESMP).

10 DECLARATION OF AUTHENTICITY OF THE REPORT

I do hereby attest that the information presented herein concerning the proposed commercial farming project by M.L Paton Investment Limited is correct and complete to the best of my knowledge.

Lara Paton
Director

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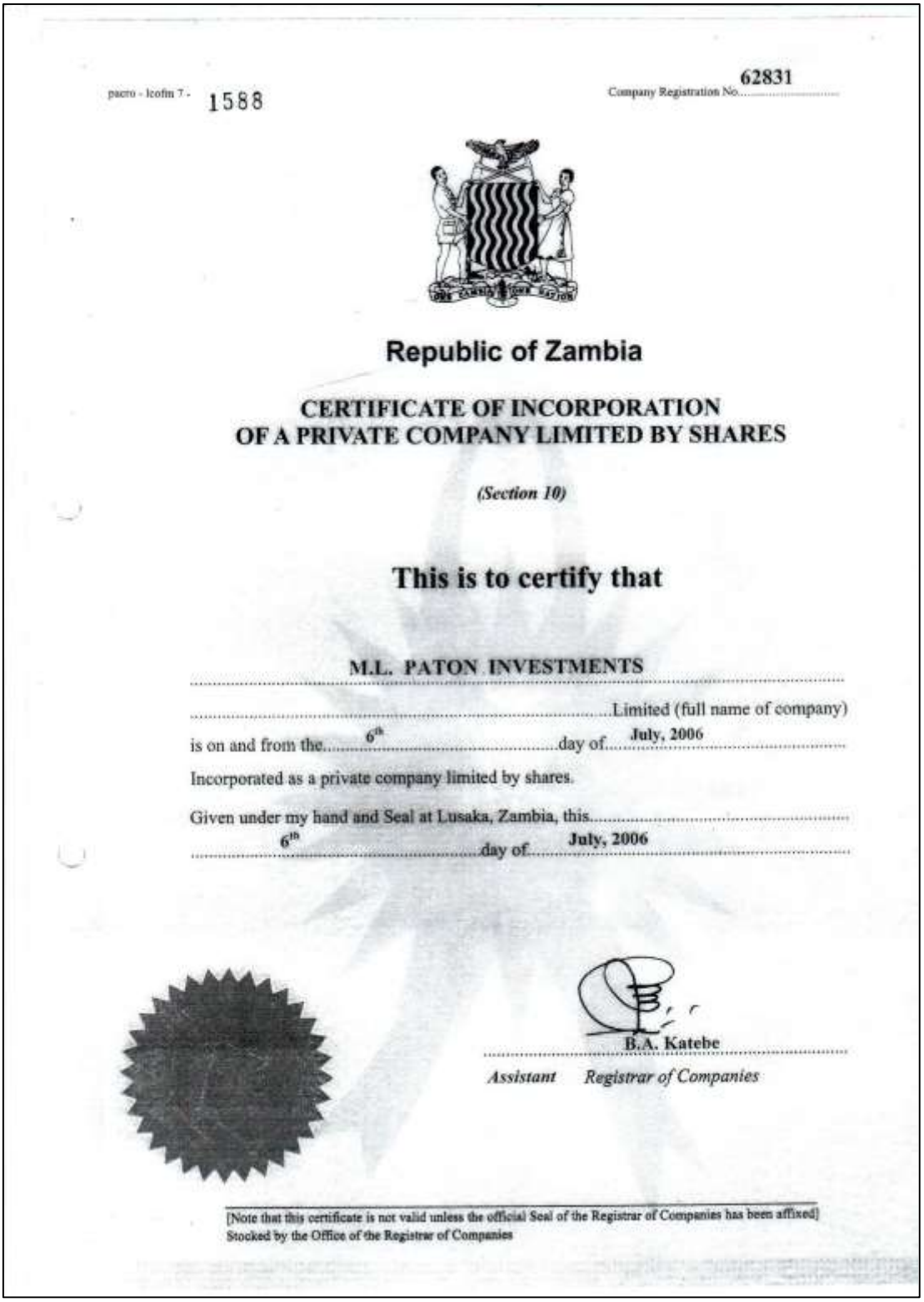
APPENDICES

Appendix 1: Company Certificate of Incorporation



pacro - lcofin 7 - 1588

Company Registration No. 62831

Republic of Zambia

CERTIFICATE OF INCORPORATION
OF A PRIVATE COMPANY LIMITED BY SHARES

(Section 10)

This is to certify that

M.L. PATON INVESTMENTS

Limited (full name of company)

is on and from the 6th day of July, 2006

Incorporated as a private company limited by shares.

Given under my hand and Seal at Lusaka, Zambia, this 6th day of July, 2006

B.A. Katebe

Assistant Registrar of Companies

[Note that this certificate is not valid unless the official Seal of the Registrar of Companies has been affixed]
Stocked by the Office of the Registrar of Companies

Appendix 2: Certificate of share capital

Companies Form 30
Companies Registration No. **120060062831**
Serial No.

Republic Of Zambia

REPLACEMENT CERTIFICATE OF SHARE CAPITAL

(Section 10)

This is to certify that M. L. PATON INVESTMENTS LIMITED has the nominal capital of K **20,000.00** divided into:

Number	Class	Value
20,000.00	Ordinary	1.00

Having varied its nominal share capital from a nominal share capital of **K 15,000.00** divided into:

Number	Class	Value
15,000.00	Ordinary	1.00

Given under my hand and seal at Lusaka, Zambia, this **20th** day of **September 2017**

PACRA

PATENTS & COMPANIES REGISTRATION AGENCY

P.C. Mwaba
Assistant Registrar of Companies

For further details relating to this business visit
http://www.pacra.org.zm

PACRA

Patents and Companies Registration Agency

Computer Printout - Local Company

Local Company	M. L. PATON INVESTMENTS LIMITED	Registration Number	120060062831
Date of Incorporation	06 day of July 2006	Date of FY End	17/08/2016
Registered Office	CHALATA FARM, CHALATA		
Postal Address	P. O. BOX 840041		
Town / City			
Country			
Certificate Signed By	B A KATEBE		
Phone			
Email			
Struck off/Ceased on			
Nominal capital	K 10000		
Number of Shares	10000		
Liability	Normal Company		
Articles Filed Date			
Amended Articles Filed Date			
Adopted Articles Filed Date			
Company Liquidated Date			
Company in Receivership Date			
Nature of Business			
Annual return			

120060062831

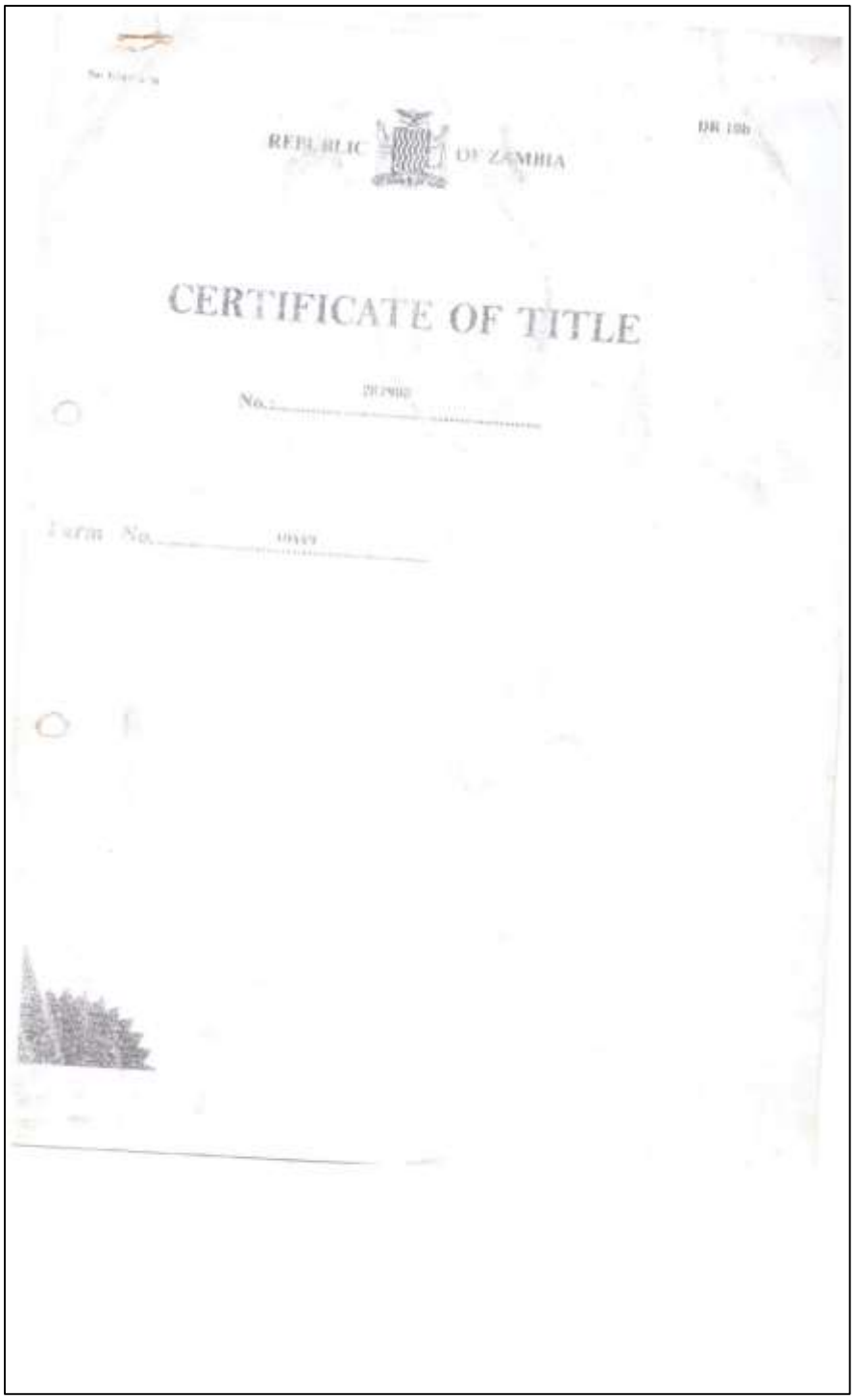
REPUBLIC OF ZAMBIA PATENTS AND COMPANIES REGISTRATION AGENCY
17 NOV 2016
OFFICE OF THE REGISTRAR OF COMPANIES AND BUSINESS NAMES LUSAKA

892

* - Information in this report can change any time.

Printed By: cynthia kumbeni mwila Printed On: 17/11/2016

Appendix 3: Title Deeds



DR 1A

REPUBLIC OF ZAMBIA

No.:

Registered No.: 10449/2

THE LANDS AND DEEDS REGISTRY ACT

(Section 45)

CERTIFICATE OF TITLE

THIS Certificate, dated the THIRTEENTH day of FEBRUARY two thousand and FOURTEEN under the hand and seal of the Registrar of the Lands and Deeds Registry of Zambia WITNESSETH that PATON LARA of Mkushi in Zambia

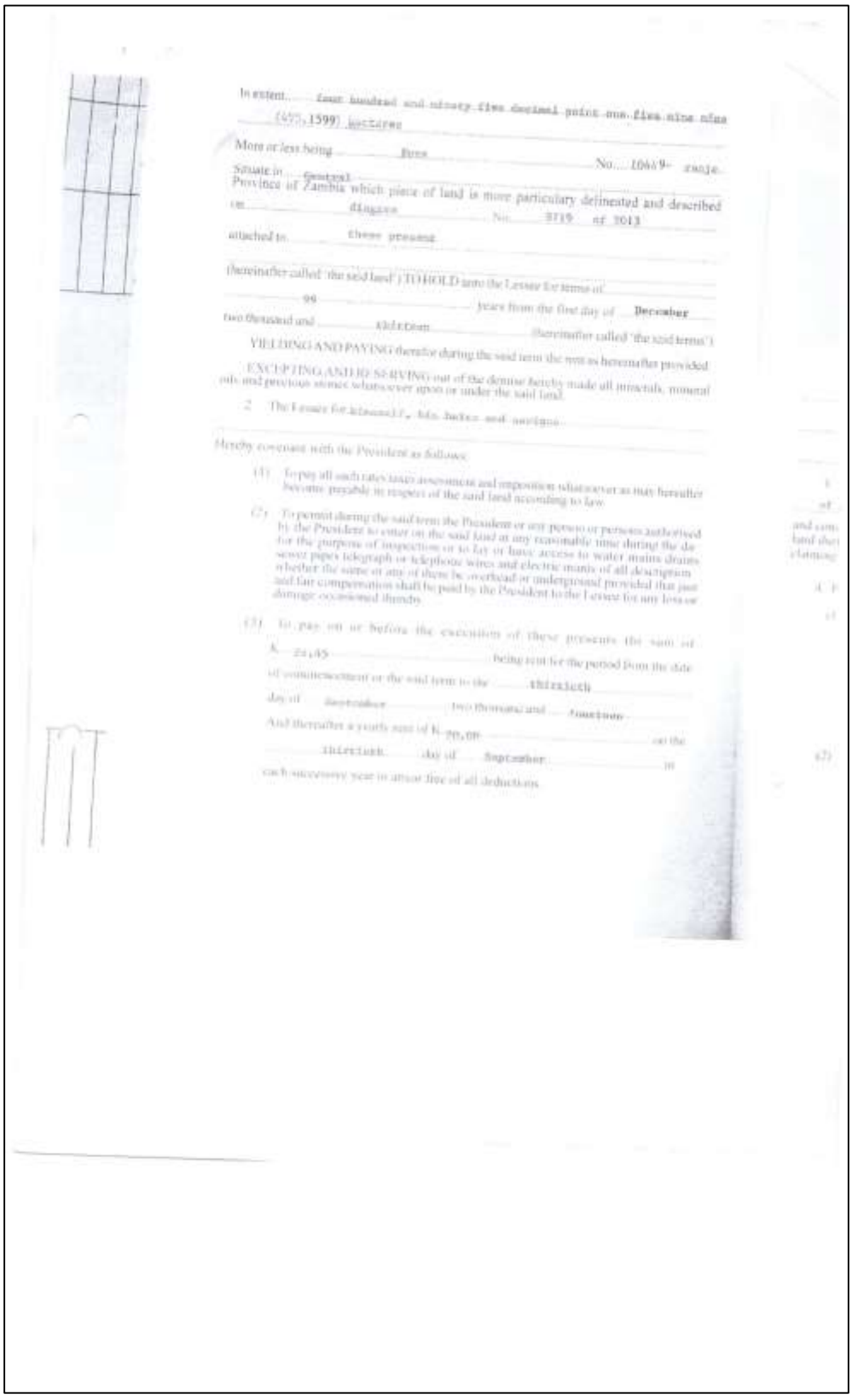
is a tenant or lessee for the unexpired residue of a term of 99 years from the first day of December, 20 13 (subject to such reservations, restrictions, incumbrances, liens, estates and interests as are notified by memorial underwritten or endorsed hereon) of and in ALL that

Piece of land in extent 495.1599 hectares more or less being Farm No. 10449 situate in the Central Province of Zambia which piece of land is more particularly delineated and described on Diagram No. 9719 of 2013 except and reserved all minerals oils and precious stones whatsoever upon or under the said land.......................................

Registrar

Memorials

...te of	Date of	Registered



In extent four hundred and ninety five decimal point one five nine nine (495.1599) hectares

More or less being Farm No. 10669- ragie

Situate in Central Province of Zambia which piece of land is more particulary delineated and described on diagram No. 3719 of 2013 attached to these presents

(hereinafter called "the said land") TO HOLD unto the Lessee for terms of 99 years from the first day of December two thousand and Eighteen (hereinafter called "the said terms")

YIELDING AND PAYING therefor during the said term the rent as hereinafter provided

EXCEPTING AND RESERVING out of the demise hereby made all minerals, mineral oils and precious stones whatsoever upon or under the said land

2 The Lessee for himself, his heirs and assigns

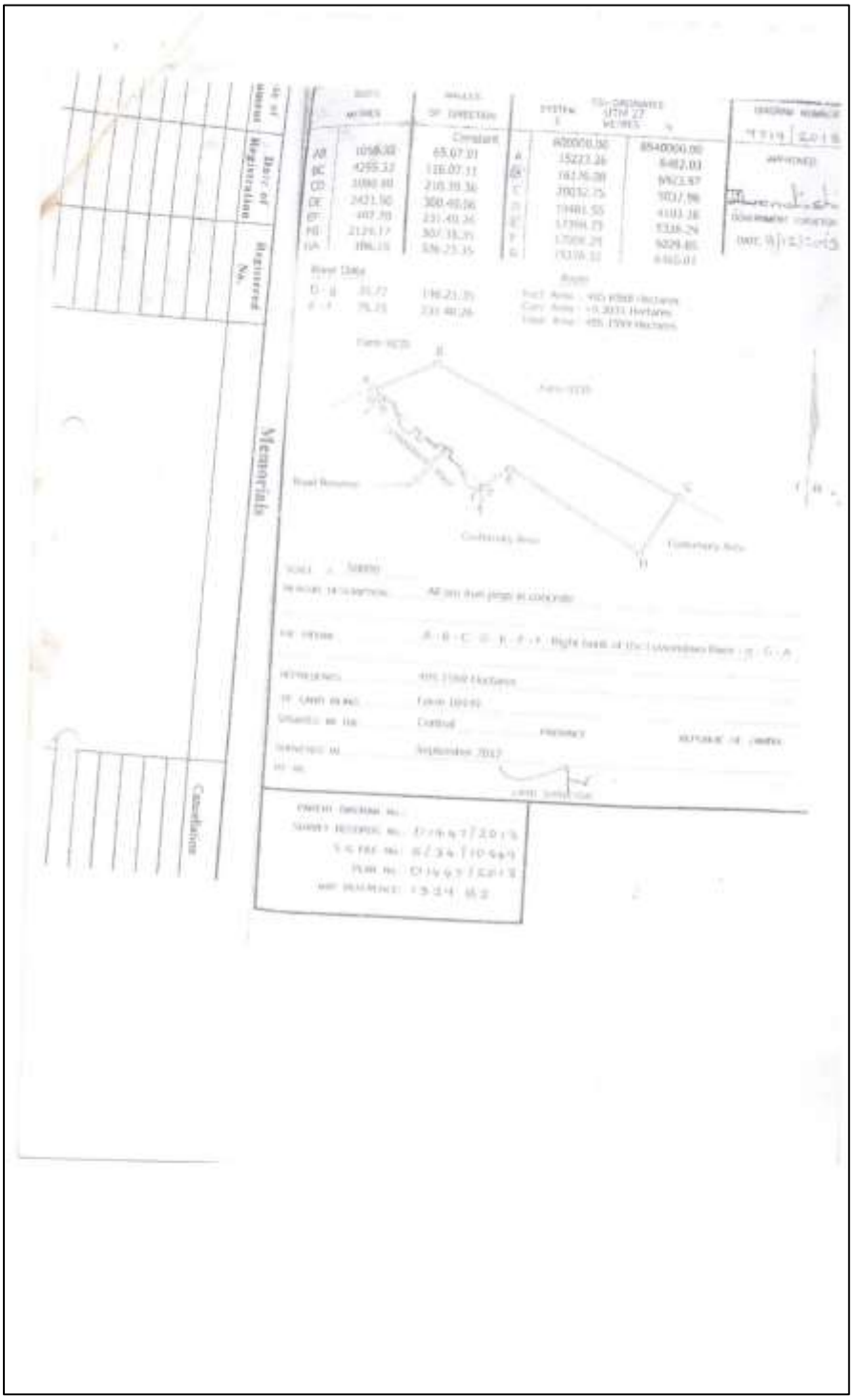
Hereby covenant with the President as follows:

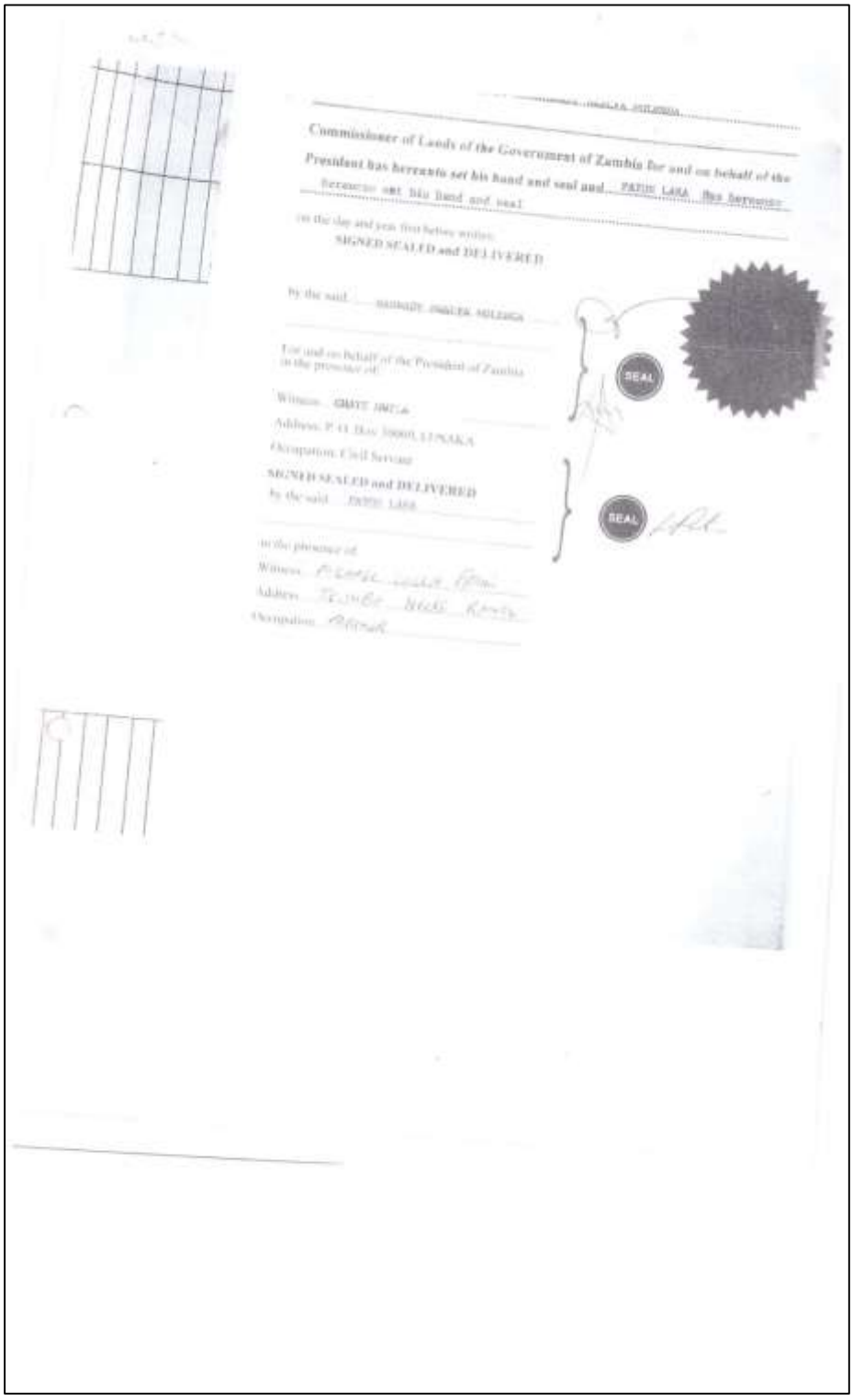
(1) To pay all such rates taxes assessments and imposition whatsoever as may hereafter become payable in respect of the said land according to law

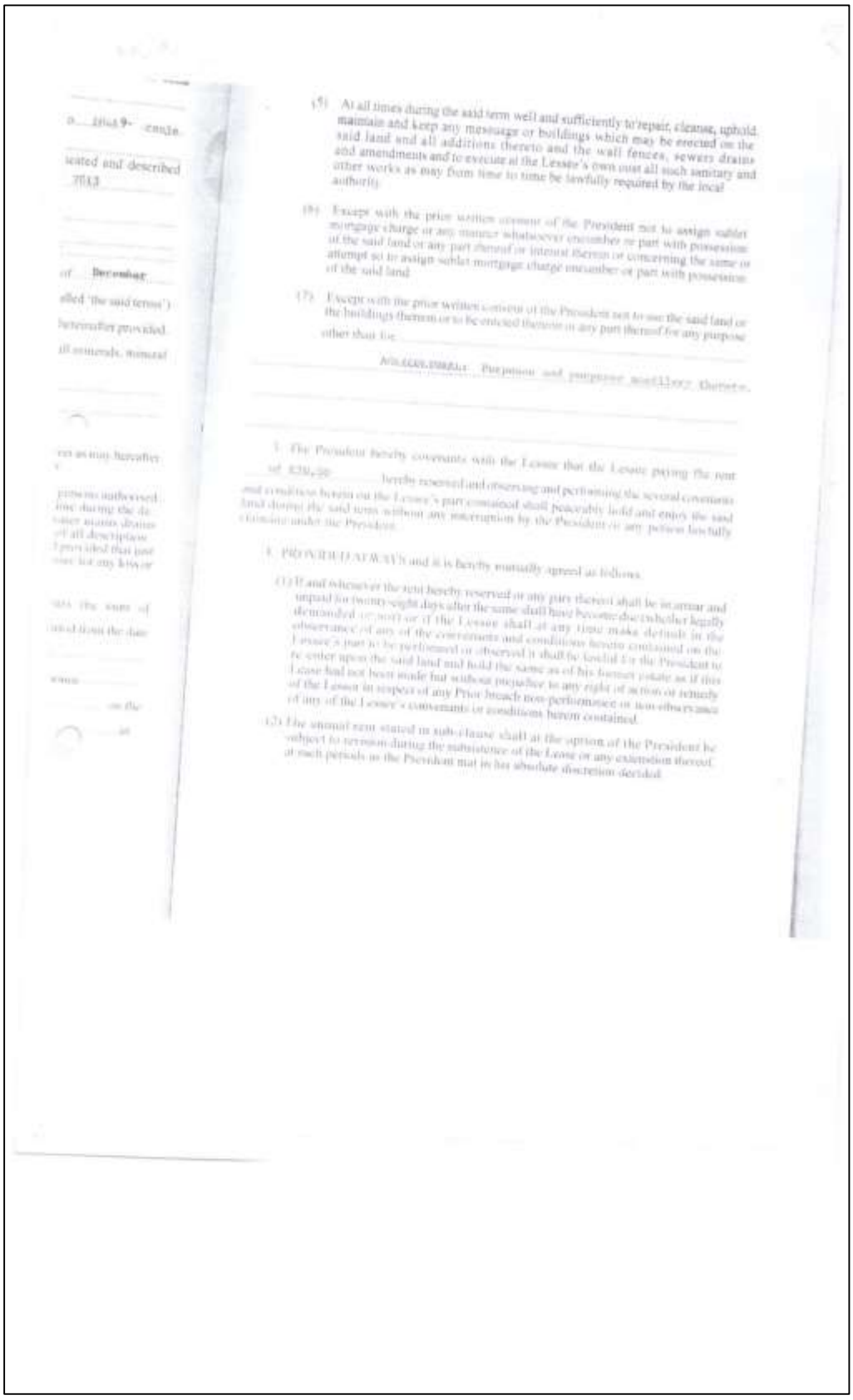
(2) To permit during the said term the President or any person or persons authorised by the President to enter on the said land at any reasonable time during the day for the purpose of inspection or to lay or have access to water mains drains sewer pipes telegraph or telephone wires and electric mains of all description whether the same or any of them be overhead or underground provided that just and fair compensation shall be paid by the President to the Lessee for any loss or damage occasioned thereby

(3) To pay on or before the execution of these presents the sum of K 24,145 being rent for the period from the date of commencement of the said term to the thirteenth day of September two thousand and fourteen

And thereafter a yearly sum of K 20,00 on the thirteenth day of September in each successive year in advance free of all deductions


Memorials
Date of Registration
Registered No.
Casuarinas


Commissioner of Lands of the Government of Zambia for and on behalf of the
President has hereunto set his hand and seal and PATSY LARA
SIGNED SEALED and DELIVERED
SEAL
SEAL



(5) At all times during the said term well and sufficiently to repair, cleanse, uphold, maintain and keep any messuage or buildings which may be erected on the said land and all additions thereto and the wall fences, sewers drains and amendments and to execute at the Lessee's own cost all such sanitary and other works as may from time to time be lawfully required by the local authority.

(6) Except with the prior written consent of the President not to assign sublet mortgage charge or any manner whatsoever encumber or part with possession of the said land or any part thereof or interest therein or concerning the same or attempt so to assign sublet mortgage charge encumber or part with possession of the said land.

(7) Except with the prior written consent of the President not to use the said land or the buildings thereon or to be erected thereon or any part thereof for any purpose other than the

Agricultural Purposes and purposes ancillary thereto.

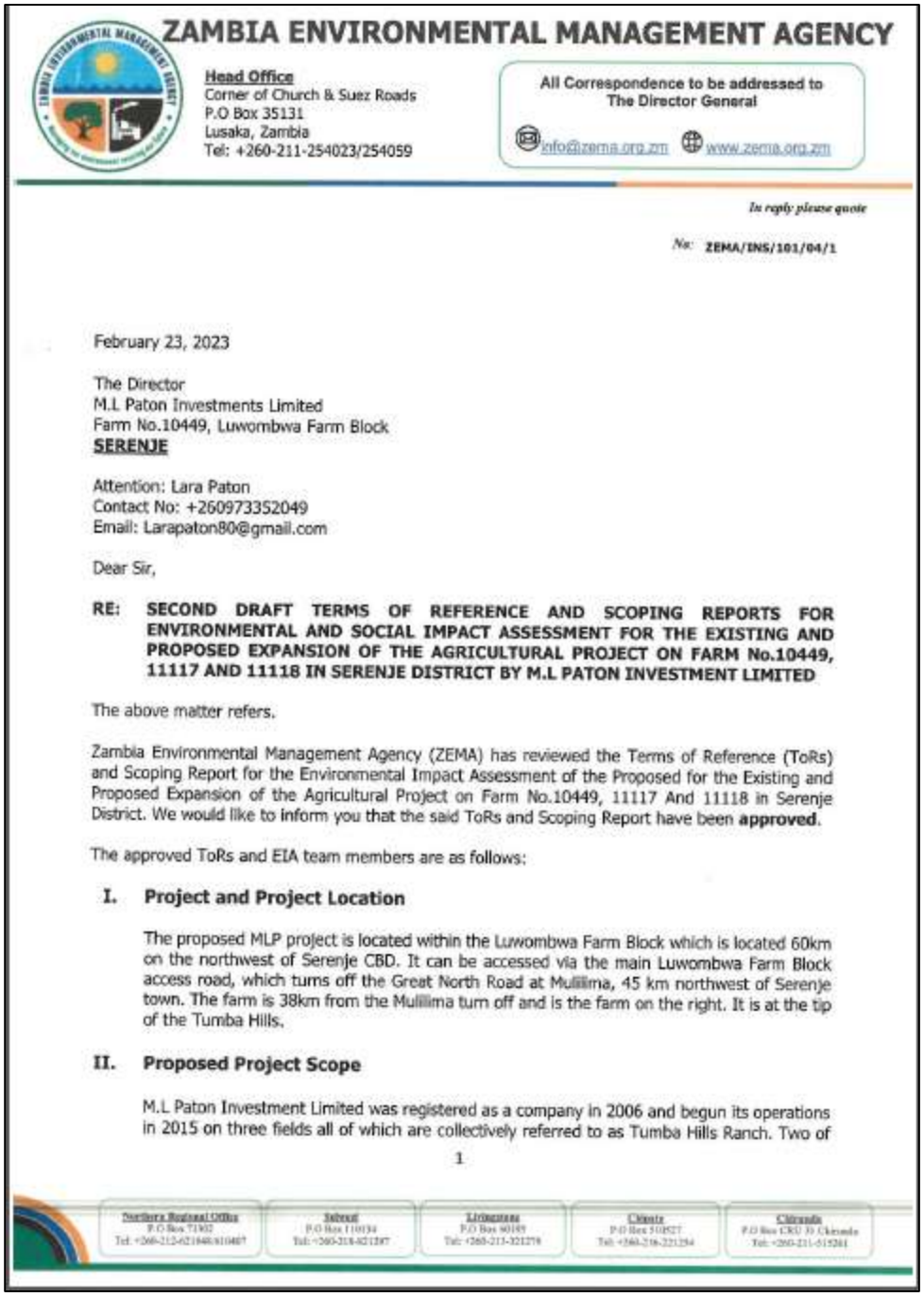
3. The President hereby covenants with the Lessee that the Lessee paying the rent of Kshs.20/- hereby reserved and observing and performing the several covenants and conditions herein on the Lessee's part contained shall peaceably hold and enjoy the said land during the said term without any interruption by the President or any person lawfully claiming under the President.

4. PROVIDED ALWAYS and it is hereby mutually agreed as follows:

(1) If and whenever the rent hereby reserved or any part thereof shall be in arrear and unpaid for twenty-eight days after the same shall have become due (whether legally demanded or not) or if the Lessee shall at any time make default in the observance of any of the covenants and conditions herein contained on the Lessee's part to be performed or observed it shall be lawful for the President to re-enter upon the said land and hold the same as of his former estate as if this Lease had not been made but without prejudice to any right of action or remedy of the Lessor in respect of any Prior breach non-performance or non-observance of any of the Lessee's covenants or conditions herein contained.

(2) The annual rent stated in sub-clause shall at the option of the President be subject to revision during the subsistence of the Lease or any extension thereof at such periods as the President may in his absolute discretion decided.

Appendix 4: Approval of Terms of Reference



ZAMBIA ENVIRONMENTAL MANAGEMENT AGENCY

Head Office
Corner of Church & Suez Roads
P.O Box 35131
Lusaka, Zambia
Tel: +260-211-254023/254059

All Correspondence to be addressed to
The Director General
info@zema.org.zm www.zema.org.zm

In reply please quote

No: ZEMA/INS/101/04/1

February 23, 2023

The Director
M.L Paton Investments Limited
Farm No.10449, Luwombwa Farm Block
SERENJE

Attention: Lara Paton
Contact No: +260973352049
Email: Larapaton80@gmail.com

Dear Sir,

RE: SECOND DRAFT TERMS OF REFERENCE AND SCOPING REPORTS FOR ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE EXISTING AND PROPOSED EXPANSION OF THE AGRICULTURAL PROJECT ON FARM No.10449, 11117 AND 11118 IN SERENJE DISTRICT BY M.L PATON INVESTMENT LIMITED

The above matter refers.

Zambia Environmental Management Agency (ZEMA) has reviewed the Terms of Reference (ToRs) and Scoping Report for the Environmental Impact Assessment of the Proposed for the Existing and Proposed Expansion of the Agricultural Project on Farm No.10449, 11117 And 11118 in Serenje District. We would like to inform you that the said ToRs and Scoping Report have been **approved**.

The approved ToRs and EIA team members are as follows:

I. Project and Project Location

The proposed MLP project is located within the Luwombwa Farm Block which is located 60km on the northwest of Serenje CBD. It can be accessed via the main Luwombwa Farm Block access road, which turns off the Great North Road at Mulilima, 45 km northwest of Serenje town. The farm is 38km from the Mulilima turn off and is the farm on the right. It is at the tip of the Tumba Hills.

II. Proposed Project Scope

M.L Paton Investment Limited was registered as a company in 2006 and begun its operations in 2015 on three fields all of which are collectively referred to as Tumba Hills Ranch. Two of

1

these fields i.e., F/10449, F/11118 are partially developed and have individual areas of 495 and 422 ha respectively. Farm F/11117 is undeveloped and has a total area of 686ha. The main activities on the farm include cropping, cattle production and egg production.

Major Project Components

The major components of the project are cropping, livestock, grain storage shed and housing. The details of these components are shown below:

- Fields- F/10449, 495ha F/11118, 422ha F/11117 – 686ha
- Grain storage shed
- Houses - 5 Staff houses and 1 Main House
- Pump House
- Cattle Kraal
- The developer also intends to expand their activities of include fish farming and growing of tree crops.

III. EIA Team Members

No	Name	Qualification	Specialization/Role in the project
1.	Mr.Robby Kasubika	• MSc Environmental Sustainability BSc Forestry • Certificate in Biodiversity and Landuse Modelling • Certificate in Meteorology Diploma in Forestry	The Team Leader shall be the overall lead for the undertaking of the assignment. He will plan and organise all the activities required for the successful completion of the assignment. As Team Leader, he will ensure the overall quality and completeness of the documents.
2.	Mrs. Chioni Phiri	• MSc Climate Change and Sustainable Development • BA Education - Geography	The Sociologist will be in charge of describing all aspects of the socioeconomic baseline, including quantitative data collection, qualitative data collection, data analysis and management. She will also organise the necessary stakeholder engagements as required. She will further identify and analyse social impacts and mitigation measures. Will coordinate all social aspects regarding the assignment
3.	Mr. Claired Kipuputwa	• MTech Forestry • BTech Wood Science & Technology • Certificate in Advanced Geographic Information Systems • BSc Wood Science & Technology	The expert will be responsible for the collection of data on air and noise.

2

4.	Dr. Dina Mambwe	• PhD Public and Development Management • MSc Agronomy • BSc Agriculture •	The expert will be responsible for the agriculture/agronomic aspects of the project.
5.	Mr. Tom Kamanga	• Bachelor's Degree in Forestry • Bachelor's Degree in Agriculture and Rural Development • Diploma in Forestry	The ecologist will describe the ecological aspects of the environmental baseline. He will also identify project aspects that are likely to impact the ecological environment and propose mitigation measures
6.	Ms Twange Maluba	• BEng Environmental Engineering	Will be responsible for environmental impact analysis and management
7.	Ms Mukonde Chuula	• B. ED Environmental Education	Will be responsible for social impact analysis and management

IV. Approved Terms of Reference

The approved TORs include the following specialist studies:

- Socio-economic and cultural Impact Assessment ;
- Geomorphology, Landform and Climatic Assessment;
- Surface And Groundwater Assessment
- Floristic & Vegetation Assessment
- Faunal Assessment;
- Air Quality and Noise Level Assessment;

Please do not hesitate to contact the undersigned should there be any issue herein that may require clarification

Yours faithfully,

Constantino Mwembela
Manager – Environmental Assessments
For/Director General
ZAMBIA ENVIRONMENTAL MANAGEMENT AGENCY

3

Appendix 3: Scoping Meeting

Appendix 3A: Copy Print Media Advert

PUBLIC NOTICE

SCOPING MEETING – ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

Tamba Hills Ranch (T/A M L Patel Investments Limited) intend to prepare an Environmental and Social Impact Assessment (ESIA) for their farm facilities located in Lawombwa Farm Block in Senior Chief Muchinda's area. The main purpose of preparing the ESIA is to make the farm activities comply with the provisions of the Environmental Management Act (EMA) No. 12 of 2011.

As part of the ESIA process, the owners of the farms invite all interested parties to a public consultation (scoping) meeting to air their views on the agriculture projects. Due to Covid 19, only invited key stakeholders will attend the physical meeting. Other may access the project details on www.kasumwa.com

Venue: **Villa Mbanandi Lodge**
Date and Time: **8th September 2021 at 09:00hrs**

For clarifications and further information, contact:
Betty Mwale
KEGS
Email kasumwa6@gmail.com
Mobile: +260 979319871 / +260 977528212/ +260 950540358

Appendix 3B: Photographs

Consultant explaining the ESIA process

The DAO giving open remarks

Audience at the meeting

A member of the audience during introductions

Appendix 3C: Scoping Meeting Minutes

MINUTES OF THE SCOPING MEETING

FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESMENT (ESIA) FOR COMMERCIAL FARMING PROJECT

Consultants and developer

Mr. Michael Paton	Director	MLP
Mr. Lara Paton	Director	MLP
Mr. Robby Kasubika	ESIA Consultant	KEGS
Mrs. Betty Mwale	ESIA Consultant	KEGS
Ms. Twange Maluba	ESIA Consultant	KEGS

Stakeholders Present - See appendix 1 of this minutes AGENDA

- National Anthem
- Opening Prayer
- Introductory of participants
- Opening Remarks
- Presentations of the Project and the ESIA process
- Plenary discussion - Collection of views and concerns regarding the proposed project.
- Concluding Remarks
- Closing Prayer

1. INTRODUCTORY REMARKS

The meeting was called to order at 09:30hrs, by Mr. Robby Kasubika (ESIA Consultant) who chaired the meeting. Mr. Kasubika welcomed members and encouraged participants to feel free and give comments or questions on any pertinent issues regarding the existing agriculture project by M.L Paton Investment Limited, Serenje District. Participants were further advised to focus their discussions on the agriculture project in order to help the developer to bring the said projects to compliance. Mr. Kasubika presented the agenda of the meeting (as indicated above) and informed the members present that the scoping meeting was mainly to present the project to the stakeholders and inform them of their role in the ESIA process. He also stated that the meeting provides stakeholders an opportunity to raise concerns and issues regarding the project. He then called upon the Acting DC to give the opening remarks.

2. OPENING REMARKS

The opening remarks were done by Mr. Kennedy Pezo, the District Administrative officer (DAO) representing the District Commissioner. In his welcoming remarks, the DAO highlighted that the project of that magnitude requires thorough stakeholder engagement to address any issues that may arise. He also mentioned that the DCs' office will support all developmental project including agriculture. He thanked the developer for coming to present the project to the stakeholders. He encouraged the stakeholders present to comment on the project and the ESIAS process.

3. PROJECT/ESIA PRESENTATION

The first presentation was done by Mrs Lara Paton, one of the Directors at M.L Paton Investment Limited. She explained that the farm operated under the name Tumba Hills Ranch and is actually three (3) separate fields. She further went on to highlight that the company is fully registered with regulatory bodies such as the Zambia Revenue Authority(ZRA), Water Resources Management Authority(WARMA) and other key agencies. She described the location of the farms and explained that the main crops grown on the farm are Wheat, Soya beans, Seed maize, and Sunhemp. The farm also has cattle for beef production and layers for eggs that are sold to local communities. The developer intends to expand the farm activities to include tree orchards and vegetable crops. She explained that the main source of water for the farm is the Luwombwa river for which the company has a permit from WARMA. She said that the farm currently has 10 permanent and 75 seasonal workers in the cropping section, and 15 employees in the livestock section.

The second presentation was done by Ms. Twange Maluba who is part of the team of ESIA Consultants. The purpose of this presentation was to explain the ESIA process and the importance of this scoping meeting being held. She explained the ESIA process and the role of stakeholders. She further informed stakeholders that the meeting was a requirement under the Environmental Management Act No.12, of 2011. She explained what the next step after the scoping meeting would be.

4. DISCUSSION

The concerns, demands and suggestions from the Stakeholders and some of the responses are shown in the table below.

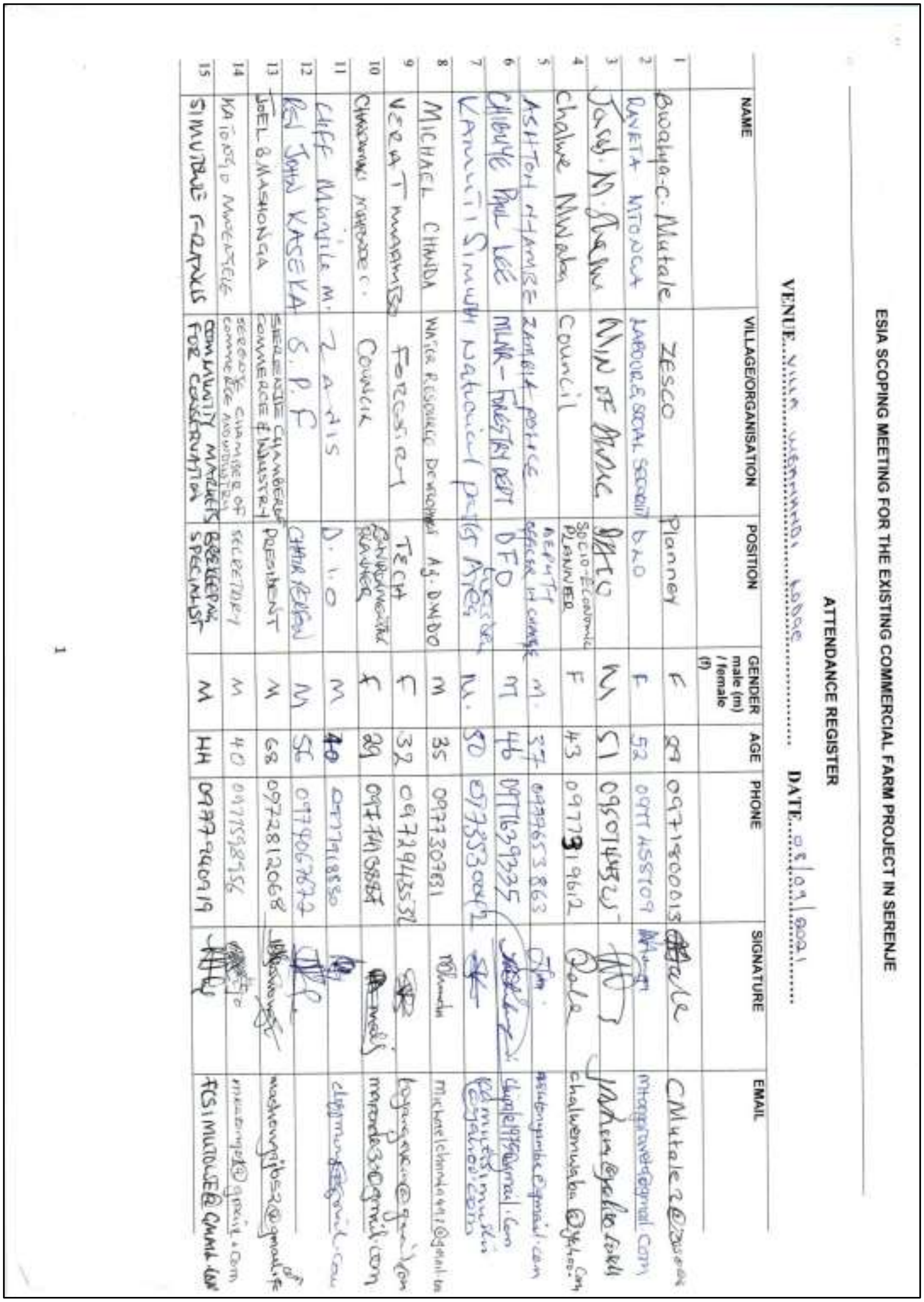
Name	Comments/ concerns	Response by Consultant or Developer
Francis Simutowe	• Concerned about the water source as the Luwombwa river supplies water to the Kasanka National Park. • How will the flora and fauna be protected? • On solid waste management, why is the waste burnt and buried?	*Consultant; WARMA allocates water taking into consideration Environmental flows. The EIA will ensure that precautionary measures are taken and will also cover all aspects of waste managements and protection of flora and fauna.*
James Mwamba	• EIA must address abstraction of water Concerned over loss and degradation of land	*Consultant: ESIA will cover all aspects to do with land management.*
Cecillia.B. Mutale	• With regards to your expansions such as the lemon orchard, how much power will be needed in kVA?	*Developer: The farm is currently connected to 30* kVA.
Chanda Makonde	• Heard that settlers will be affected. • Ensure that local authority is involved.	*Consultant:* The law stipulates that people must not be resettled. Developer has agreed to simply exclude. .
Chalwe Mumba	• Has concern over the other two farms that are not titled	*Developer:* Letters of recommendation are already available, only waiting for title deeds
Kamuti Simushi	• Concerned about the high number of commercial farmers abstractinfg from the Luwombwa River • Impact on the Kasanka National Park • Chemicals in the river tend to affect the Bird life that is reliant on the river	Consultant: the concerns are noted but can only be verified through empirical evidence. Scientific studies must be done to justify whether the activity in the Luwombwa Farm block is behind the said impacts
Paul L Chibuye	• Wanted to hear on issues related to land clearing and land degradation	*Consultant:* The ESMP will detail how vegetation will be managed
Cliff Munjile	• Wanted to hear on corporate social responsibility	*Developer*: MLP provides monetary support to local projects and supports schools by providing building material

5. Closing Remarks

Mr. Kennedy Pezo thanked the members of the audience and developer. He highlighted that government was committed to ensuring development in Serenje and was yearning for more investment to fulfil their promises to the people. Thanked participants for engaging in discussion and upholding transparency and accountability. Thanked all for attending the meeting.

Chairperson : Robby Kasubika	Signature	
Secretary: Twange Maluba	Signature	

Appendix 3D: Meeting attendance registers



ESIA SCOPING MEETING FOR THE EXISTING COMMERCIAL FARM PROJECT IN SERENJE

ATTENDANCE REGISTER

VENUE: VILLA WEMANDI LODGE DATE: 08/09/2021

	NAME	VILLAGE/ORGANISATION	POSITION	GENDER male (m) / female (f)	AGE	PHONE	SIGNATURE	EMAIL
1	Bwalya-C. Mutale	ZESCO	Planner	F	29	0971800013		CMutale2@zesco
2	RAVETA MTONGA	LABOUR & SOCIAL SECURITY	DLO	F	52	0977 458709		mtongaraveta@gmail.com
3	Jacob M. Shamu	MIN OF AGRIC	DAIO	M	51	0950744325		[illegible]
4	Chalwe Mwaba	Council	SOCIO-ECONOMIC PLANNER	F	43	0977319612		chalwemwaba@yahoo.com
5	ASHTON MTAMBE	ZAMBIA POLICE	DEPUTY OFFICER IN CHARGE	M	37	0979653863		[illegible]@gmail.com
6	CHIBUYE PAUL LEE	MLNR – FORESTRY DEPT	DFO	M	46	0977639335		[illegible]@gmail.com
7	KAMUTI SIMUSHI	National Parks	District Ranger	M	50	0973530042		kamutisimushi@yahoo.com
8	MICHAEL CHANDA	WATER RESOURCE DEVELOPMENT	Ag. DWDO	M	35	0977307831		michaelchanda[illegible]@gmail.com
9	VERA T MWAMBO	FORESTRY	TECH	F	32	0972943532		[illegible]@gmail.com
10	CHANDAMALI MAREBOE C.	COUNCIL	ENVIRONMENTAL PLANNER	F	29	0977493887		marende30@gmail.com
11	CLIFF Mungile M.	ZAMIS	D.I.O	M	40	0977918850		cliffmun[illegible]@gmail.com
12	Rev JOHN KASEKA	S.P.F	CHAIRPERSON	M	56	0979067672		
13	JOEL B.MASHONGA	SERENJE CHAMBER OF COMMERCE & INDUSTRY	PRESIDENT	M	68	0972812068		mashongajb52@gmail.com
14	KATONGO MWENTEIE	SERENJE CHAMBER OF COMMERCE AND INDUSTRY	SECRETARY	M	40	0977598956		[illegible]@gmail.com
15	SIMUTOWE FRANCIS	COMMUNITY MARKETS FOR CONSERVATION	BEEKEEPING SPECIALIST	M	44	0977940919		FCSIMUTOWE@GMAIL.COM

1

Appendix 4: Disclosure Meeting

Appendix 4A: Copy Print Media Advert

PUBLIC NOTICE

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT DISCLSOURE/ SCOPING MEETING

Tumba Hills Ranch (M L Paton Investment) has completed the preparation of an Environmental and Social Impact Assessment for its farm project in Serenje. In partial fulfilment of the ESIA process, the company invites stakeholders to a disclosure meeting. The purpose of the meeting is to disclose the findings of the ESIA study to stakeholders.

At the same meeting, there will be a presentation from the owners of PAG Sherriff Estates Limited who intend to prepare an ESIA for a commercial agriculture project in Serenje. The purpose of the presentation to provide stakeholders with an opportunity for stakeholders to raise concerns and issues that need to be taken into account during the ESIA study. The details of the meeting are as follows:

Venue: **Serenje Council Chamber, Serenje**
Date and Time: **Thursday, 29th August 2022 at 09:00hrs**

For further details please contact:
Ms Twange Maluba
Kasumwa Enviroconsult & General Supplies Limited
+260974382316
Email: kasumwa@gmail.com

Appendix 4B: Photographs

Consultant making a presentation

Audience at the meeting

Appendix 4C: Disclosure Meeting Minutes

MINUTES OF THE DISCLOSURE MEETING - Serenje

FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESMENT (ESIA) FOR THE ALREADY EXISTING FARMING PROJECT

Held at Villa

Mbanandi Lodge

29th August, 2022 – 09:00HRS

ATTENDANCE. Serengeti Investments Limited & Consultant

Miss. Mukonde Chuula	ESIA Consultant	KEGS
Miss. Twange Maluba	ESIA Consultant	KEGS
Michael Paton	Developer	ML Paton
Lara Paton	Developer	ML Paton

Stakeholders Present - See appendix 1 of this minutes AGENDA

- Opening Prayer
- Introduction of participants
- Opening Remarks
- Presentations of the Project and the ESIA Findings
- Plenary discussion - Collection of views and concerns regarding the proposed project.
- Concluding Remarks
- Closing Prayer

6. INTRODUCTORY REMARKS

The meeting was called to order at 09:30hrs, by Miss. Twange Maluba (ESIA Consultant) who chaired the meeting. Miss. Maluba welcomed members and encouraged participants to feel free and give comments or questions on any pertinent issues regarding the existing agriculture project by ML Paton in Serenje District. Participants were further advised to focus their discussions on the agriculture project in order to help the developer to bring the said projects to compliance. Miss. Maluba presented the agenda of the meeting (as indicated above) and informed the members present that the disclosure meeting was mainly to present the ESIA finidngs to the stakeholders. She then called upon the Miss. Vera Toyanga, who was standing in for the DC to give the opening remarks.

7. OPENING REMARKS

The opening remarks were done by Miss. Vera Toyanga, representing the District Commissioner. In her welcoming remarks, she highlighted that the project of that magnitude requires thorough stakeholder engagement to address any issues that may arise. She also mentioned that the DCs' office will support all developmental project including agriculture. She thanked the developer for coming to present the finding of the ESIA study to the stakeholders. She encouraged the stakeholders present to fully particiate in the discussion.

8. PROJECT/ESIA FINDINGS PRESENTATION

The spresentation was done by Ms. Twange Maluba who is part of the team of ESIA Consultants. The purpose of this presentation was to give a brief background of the project and then explain the ESIA findings. She further informed stakeholders that the meeting was a requirement under the Environmental Management Act No.12, of 2011.

She gave a brief overview on the background of the project. She explained that the ESIA study had been successfully completed and that the purpose of her presentation was to explain the findings of the ESIA study and the importance of the disclosure meeting. She showed the audience the step at which the project is in the ESIA process. She further explained that the specialist studies that were conducted took into consideration two (2) key parameters i.e. Biophysical and Socio-economic parameters. She went on to summarise the findings of the ESIA study.

She went on further to explain that an Environmental and Social Management Plan(ESMP) had been developed to mitigate or enhance any impacts arising from the operation and decommissioning phases of the project cycle. ML Paton are under obligation to develop their own sub plans specific to the operations at the farm. She then explained some of the impacts relating to the project and the proposed mitigation measures. Some of the impacts on the Biophysical environment discussed included Air, Soil and Water Pollution. Socio-economic impacts highlighted were the potential contamination of surface and groundwater resources from accidental spills and improper handling of chemicals. Lastly, she explained the benefits of the project and emphasized that the identified positive impacts of the project far outweigh the negative and so she saw no reason why the project cannot go ahead.

9. DISCUSSION

The concerns, demands and suggestions from the Stakeholders and some of the responses are shown in the table below.

Name	Comments/ concerns	Response by Consultant or Developer
Azory Chipanda	• On the mitigation measures for Air and Noise Pollution, the presentation only covered Air pollution. What about Noise?	Consultant: The EIA report outlines mitigation measures regarding noise but one of the interventions will include provision of noise dampening devices and ensuring adequate prior warning to nearby communities before works begin.
Vera Toyanga	• The presentation outlined that there was no sensitive flora in the project area. Accoding to the Forestry Act, as Forestry Department, we are the custodians of the forests. Was an assessment done for flora?	Consultant: The EIA guidelines provides for the need to engage key experts to carry out specialised assessments. A Flora expert was part of the EIA team and a detailed report is included in the assessment.
Mwale Hildah	• Does the farm have safety officers and how are dust emissions managed	Consultant: The farm currently has no safety officers but if this is a recommendation that arises through the EIA process, it will be implemented on the farm. Dust suppresions techniques such as a water bowser
Soft Tembo	• What is the current status of land ownership	Developer: We cuuurently have ownership of one farm and are in the process of obtaining titles for the other two.
Maponde C Chandanali	• How is waste at the farm managed?	Developer: Mos of the bio-degardable waste is made into compost. We are are also considering engaging the council to manage the waste that we are unable to recycle.

10. Closing Remarks

Miss. Vera Toyanga thanked the members of the audience and developer. She highlighted that government was committed to ensuring development in Serenje and was yearning for more investment to fulfil their promises to the people. Thanked participants for engaging in discussion and upholding transparency and accountability. Thanked all for attending the meeting.

Chairperson : Twange Maluba	Signature 
Secretary: Mukonde Chuula	Signature: 

Appendix 4D: Meeting attendance registers

ESIA DISCLOSURE MEETING FOR THE EXISTING COMMERCIAL FARM PROJECT

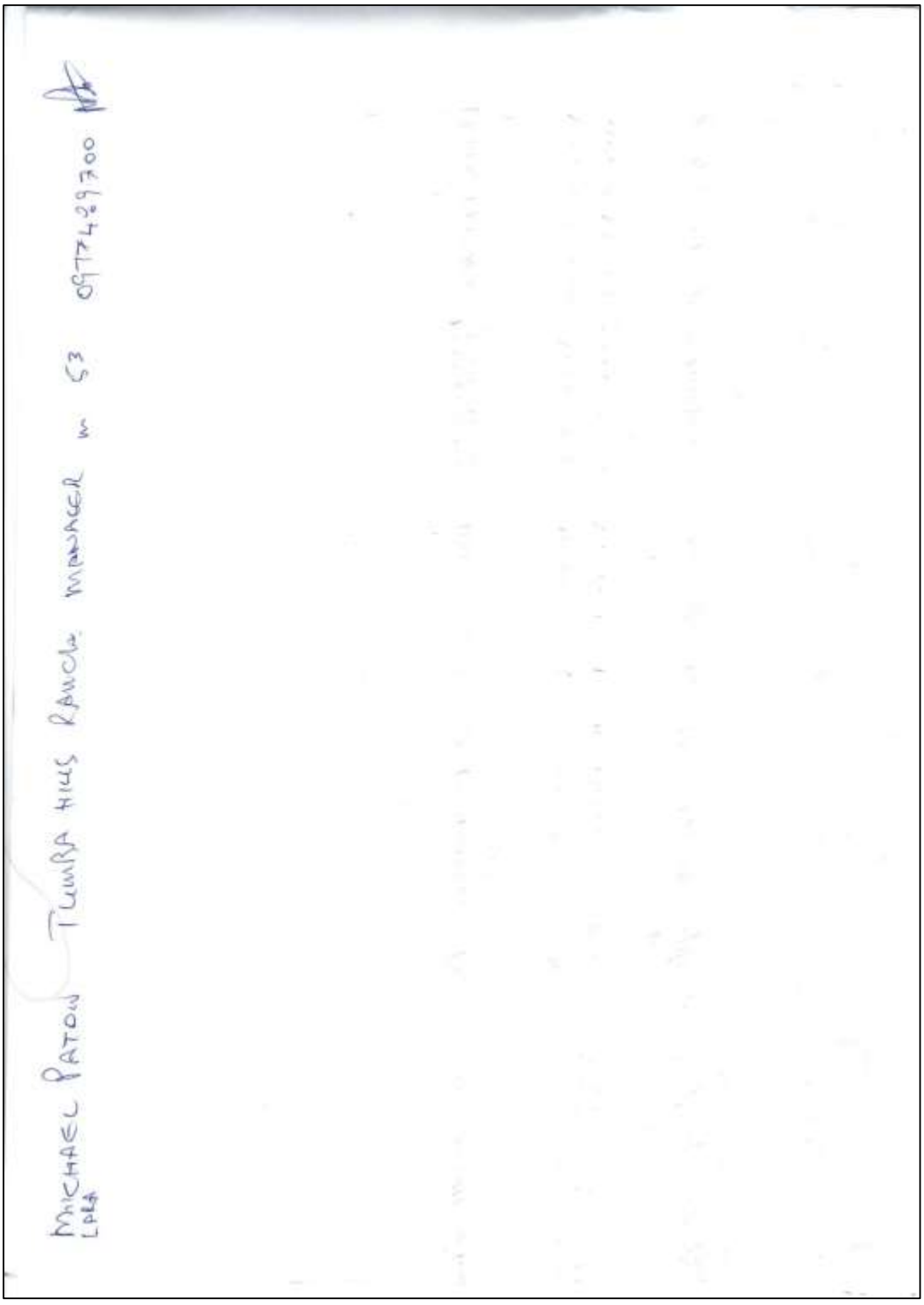
TUMBA HILLS RANCH

ATTENDANCE REGISTER

VENUE: VILLA MBANANDI DATE: 29/09/2022

	NAME	ORGANISATION	POSITION	GENDER male (m) / female (f)	AGE	PHONE	SIGNATURE	EMAIL
1	Emmy Zonde	MOCTA	Chiefs Affairs Office	F	50	0977241449		emmyzonde[illegible]@gmail.co
2	THERESA BWALYA	COMACO	Communications officer	F	32	0976406909		theresaclave312@gmail.co
3	MWALE HILDAH	METEOROLOGY	MET. ASSISTANT	F	36	0978 685594		hildahkangaxepemwale@gmail.com
4	ESTHER KAWANGA	DRUG ENFORCEMENT COMMISSION	INVESTIGATOR	F	35	0976459973		estherkawangacc@gmail.com
5	Dr Merody Pande	Ministry of Livestock and Fisheries	District Veterinary Officer	F	35	0979327889		[illegible]@gmail.com
6	AZURY CHIPANDA	FISHERIES	DAEO	M	32	0971161329		azorychipanda66@gmail.c
7	VERA T MWANZA	FORESTRY	TECHNICIAN	F	53	0972943552		[illegible]@gmail.com
8	SIMPSA DERICK	COOPERATIVES	D.C.I.C	M	40	0977780520		[illegible]2017@gmail.com
9	DAVID MUDENDA	AGRICULTURE	SAO	M	42	0975466658		[illegible]@yahoo.co.uk
10	Mponde C. Chandamali	Council	Environmental Planner	F	30	0977413887		mponde30@gmail.com
11	BRIGHTON HAMBA	COUNCIL	COUNCILLOR	M	49	0977723418		brightonhamba[illegible]@gmail.com
12	ASHTON MTAMBE	ZAMBIA POLICE	S.I.	M	35	0977653863		[illegible]@gmail.com
15	PSIAR Mumba	Prophets Fellowship	BISHOP	M	47	0976 356968		[illegible]@gmail.com
16	Sept Tembo	Senanga Town Council	Town Planner	M	32	0976046682		[illegible]@gmail.com
17	Petna Nabwenda	Education	DESO	F	52	0977489166		Nabwendapetna@gmail.com
	DOUG THOMPSON	PAG SHERIFF	PARTNER 1	M	44	0966 747959		JAKTFARMING@gmail.co

KEGS


MICHAEL PATON
LABA
TUMBA HILLS RANCH MANAGER
m 53
0977429300

Appendix 5A: List of possible aquatic plants that may be found in the wetland

Scientific Name	Common Name	Status	Habitat
Aponogeton desertorum	No common name	LC	Still/flowing waters
Limnophyton angolense	No common name	Not assessed	Slow-flowing waters, temporary flooded areas and wetlands
Wiesneria schweinfurthii	No common name	Not assessed	Permanent deep or slow-flowing waters, temporary pools and wetlands
Crinum macowanii	River Crinum, River Lily, Common Vlei-lily, Sabie Crinum, Cape Coast Lily	Not assessed	Damp grassland, Dambos, seasonally in shallow flooded-grassy areas alongside streams
Aponogeton junceus	No common name	LC	Shallow water, ephemeral pools, wetlands
Hydrocotyle bonariensis	No common name	Not assessed	Shallow water and river edges
Azolla filiculoides	No common name	Not assessed	Still or slow flowing water
Commelina diffusa	Climbing Dayflower, Birdbill Dayflower, Creeping Day Flower, Spreading Dayflower	LC	Stream Edges, slightly drier areas of seasonally flooded swamps and Dambos
Eleocharis atropurpurea	No common name	LC	Still or very slow-flowing water, drying pool margins
Eleocharis decoriglumis	No common name	LC	Shallow still or slow flowing waters, seasonal pools
Eleocharis dulcis	Chinese water chestnut	Not assessed	Grows in water, pond margins
Eleocharis naumanniana	No common name	Not assessed	Submerged, free-floating with emergent spikelets, Low nutrient water, still or slow flowing water
Fuirena umbellata	Yefen	LC	Still or slow flowing water, lake margins and wetlands
Schoenoplectus confusus	No common name	Not assessed	Open water, seasonal wetlands
Websteria confervoides	No common name	Not assessed	Submerged, free-floating, low nutrient water, still or slow flowing water
Elatine ambigua	No common name	LC	Seasonally or totally submerged along river edges, ponds, nutrient rich water on fine mineral soils
Utricularia inflexa	No common name	Not assessed	Shallow to deep waters, still water, slow-flowing water

Utricularia stellaris	No common name	Not assessed	Shallow to deep waters, still water, slow-flowing water
Bolbitis heudelotii	African water fern, creeping fern, and Congo fern	Not assessed	Attached to rocks in fast flowing water
Rotala myriophylloides	No common name	Not assessed	Grows as a turf in wet conditions, also submerged
Nymphoides indica	Water-snowflake	LC	Shallow to deep slow flowing water
Nymphaea divaricata	No common name	DD	Slow flowing water, nutrient poor water
Nymphaea lotus	No common name	Not assessed	Still or slow-flowing permanent or temporary water
Leersia hexandra	No common name	Not assessed	Floating on still or flowing water
Panicum parvifolium	No common name	Not assessed	Along streams, permanent water and shade tolerant
Ledermanniella tenax	No common name	Not assessed	Attached to rocks at water level, edge of fast flowing water, or in water spray
Persicaria decipiens	No common name	Not assessed	Emergent in still waters and wetlands
Ranunculus multifidus	African Buttercup	LC	Wetlands, along rivers and ditches
Bacopa floribunda	No common name	LC	Forms dense mats in marshy places, banks of streams and pools
Limnophila ceratophylloides	No common name	LC	Shallow to deep rivers, stream (slow to moderate flow), lakes, ponds
Limnophila bangweolensis	No common name	Not assessed	Shallow rivers, streams (slow to moderate flow), lake, ponds
Mimulus gracilis	No common name	LC	Moist places, still water and along riverbanks
Torenia thouarsii	No common name	Not assessed	Sometimes grows in water, along river edges, may grow on floating vegetation
Thelypteris confluens	Marsh Fern	Not assessed	Permanently wet areas, along river margins, may be locally dominant
Thelypteris interrupta	Hottentot Fern; Willdenow's fern	LC	Permanently wet areas, along river margins, may be locally dominant
Xyris anceps	No common name	Not assessed	Still or slow flowing river margins, wetlands, lakes
Xyris gerrardii	No common name	Not assessed	High altitude wetlands, along river margins

Appendix 5B. List of threatened plant species found in Zambia based on Bingham et al 2017

DD (data deficiency), LR (Lower Risk) lc (least concern), VU (Vulnerable), nt (near threatened), EX (Extinct) EN (Endangered) and EXW (Extinct in the wild)

Family Name	Species Name	Endemic	Red data
Acanthaceae	*Justicia salvioides*		DD
Acanthaceae	*Duosperma fimbriatum*		DD
Acanthaceae	*Duosperma fanshawei*		DD
Acanthaceae	*Duosperma cuprinum*		DD
Amaranthaceae	*Pandiaka richardsiae*		LR-lc
Amaranthaceae	*Pandiaka confusa*		LR-lc
Amaranthaceae	*Celosia chenopodiifolia*		DD
Amaranthaceae	*Celosia richardsiae*		VU
Amaryllidaceae	*Crinum papillosum*		EN
Amaryllidaceae	*Crinum jasonii*		VU
Amaryllidaceae	*Crinum subcernuum*		DD
Amaryllidaceae	*Crinum binghamii*		LR-nt
Anacardiaceae	*Ozoroa kassneri var. rhodesica*		LR-lc
Anacardiaceae	*Ozoroa viridis*		DD
Anacardiaceae	*Ozoroa bredoi*		DD
Anacardiaceae	*Lannea schimperi*		DD
Anacardiaceae	*Lannea virgata*		LR-lc
Anacardiaceae	*Sorindeia juglandifolia*		DD
Anacardiaceae	*Lannea gossweileri var. tomentella*		DD
Anacardiaceae	*Rhus longipes var. schinoides*		LR-lc
Anacardiaceae	*Rhus ochracea var. saxicola*		DD
Annonaceae	*Uvariastrum hexaloboides*	Near-endemic	LR-lc
Annonaceae	*Uvaria edulis*		VU
Apiaceae	*Frommia ceratophylloides*		VU
Apiaceae	*Aframmi longiradiatum*		VU
Apocynaceae subfamilies Apocynoideae and Rauvolfioideae	*Adenium multiflorum*		VU
Apocynaceae subfamilies Apocynoideae and Rauvolfioideae	*Strophanthus angusii*		LR-lc
Apocynaceae subfamilies Apocynoideae and Rauvolfioideae	*Strophanthus eminii*		VU

Apocynaceae subfamilies Asclepiadoideae and Secamonoideae	*Ceropegia cataphyllaris*		DD
Apocynaceae subfamilies Asclepiadoideae and Secamonoideae	*Stapelia gigantea*		LR-lc
Apocynaceae subfamily Periplocoideae	*Raphionacme grandiflora*		DD
Aponogetonaceae	*Aponogeton stuhlmannii*		DD
Araceae	*Amorphophallus abyssinicus subsp. unyikae*		LR-lc
Araliaceae	*Schefflera abyssinica*		VU
Arecaceae	*Hyphaene petersiana*		DD
Asphodelaceae	*Aloe luapulana*		DD
Asphodelaceae	*Aloe esculenta*		EX?
Asphodelaceae	*Aloe veseyi*		DD
Asphodelaceae	*Aloe excelsa var. excelsa*		VU
Asphodelaceae	*Aloe milne-redheadii*		DD
Asphodelaceae	*Aloe bicomitum*		DD
Asteraceae	*Bidens oligoflora*		DD
Asteraceae	*Vernonia madefacta*		DD
Asteraceae	*Pleiotaxis angustirugosa*	Endemic	DD
Asteraceae	*Pleiotaxis oxylepis*	Endemic	VU
Asteraceae	*Vernonia tanganyikensis*		LR-lc
Asteraceae	*Vernonia najas*		VU
Asteraceae	*Vernonia mutimushii*		VU
Asteraceae	*Vernonia mushituensis*		LR-lc
Asteraceae	*Rastrophyllum pinnatipartitum*	Endemic	DD
Asteraceae	*Vernonia isoetifolia*		VU
Asteraceae	*Erythrocephalum scabrifolium*		VU
Asteraceae	*Vernonia helodea*		DD
Asteraceae	*Ageratinastrum palustre*		VU
Asteraceae	*Gutenbergia mweroensis*		VU
Asteraceae	*Emiliella luwiikae*	Endemic	DD
Asteraceae	*Gutenbergia spermacoceoides*		VU
Asteraceae	*Vernonia lycioides*		DD
Asteraceae	*Gutenbergia trifolia*		VU
Asteraceae	*Vernonia zambiana*		VU
Asteraceae	*Erythrocephalum dictyophlebium*		DD
Asteraceae	*Bidens rubicundula*	Endemic	VU
Asteraceae	*Bidens urceolata*		LR-nt
Balsaminaceae	*Impatiens limnophila*		LR-lc

Balsaminaceae	*Impatiens hydrogetonoides subsp. hydrogetonoides*		DD
Begoniaceae	*Begonia pygmaea*		DD
Bombacaceae	*Adansonia digitata*		LR-lc
Boraginaceae	*Cystostemon loveridgei*		DD
Boraginaceae	*Cystostemon mwinilungensis*		DD
Boraginaceae	*Cystostemon hispidissimus subsp. zambiensis*	Endemic	VU
Brassicaceae	*Coronopus integrifolius*		DD
Campanulaceae	*Wahlenbergia ramosissima subsp. richardsiae*		VU
Campanulaceae	*Wahlenbergia cephalodina*		DD
Campanulaceae	*Monopsis stellarioides*		LR-lc
Capparaceae	*Cleome macrophylla var. macrophylla*		LR-lc
Capparaceae	*Boscia cauliflora*		LR-lc
Capparaceae	*Maerua paniculata*	Endemic	VU
Chrysobalanaceae	*Maranthes floribunda*		LR-lc
Chrysobalanaceae	*Parinari excelsa*		LR-lc
Chrysobalanaceae	*Magnistipula sapinii*		LR-lc
Chrysobalanaceae	*Magnistipula butayei subsp. bangweolensis*	Near-endemic	LR-lc
Clusiaceae	*Garcinia volkensii*		LR-nt
Clusiaceae	*Garcinia smeathmannii*		LR-nt
Clusiaceae	*Psorospermum baumii*		LR-nt
Clusiaceae	*Psorospermum febrifugum*		LR-nt
Clusiaceae	*Garcinia livingstonei*		LR-nt
Clusiaceae	*Garcinia punctata*		LR-nt
Clusiaceae	*Garcinia pachyclada*	Endemic	LR-nt
Clusiaceae	*Garcinia huillensis*		LR-nt
Colchicaceae	*Gloriosa sessiliflora*		LR-lc
Combretaceae	*Combretum padoides*		DD
Combretaceae	*Meiostemon tetrandrus subsp. tetrandrus*		VU
Combretaceae	*Combretum celastroides subsp. celastroides*		LR-lc
Combretaceae	*Meiostemon tetrandrus subsp. australis*		VU
Combretaceae	*Pteleopsis pteleopsoides*	Endemic	VU
Combretaceae	*Combretum celastroides subsp. laxiflorum*		LR-lc
Combretaceae	*Combretum mweroense*	Endemic	VU
Commelinaceae	*Aneilema richardsae*		DD
Commelinaceae	*Commelina grandis*		DD
Commelinaceae	*Commelina pycnospatha*		DD

Connaraceae	*Burttia prunoides*		VU
Convolvulaceae	*Ipomoea protea*		DD
Convolvulaceae	*Merremia stellata*		DD
Convolvulaceae	*Ipomoea fanshawei*	Near-endemic	LR-lc
Convolvulaceae	*Ipomoea milnei*		DD
Convolvulaceae	*Ipomoea richardsiae*	Endemic	VU
Cucurbitaceae	*Trochomeria subglabra*		DD
Cucurbitaceae	*Cucumis humifructus*		VU
Cyperaceae	*Actinoschoenus repens*		DD
Cyperaceae	*Pycreus flavescens*		LR-lc
Cyperaceae	*Ascolepis pseudopeteri*	Endemic	DD
Cyperaceae	*Scleria lacustris*		DD
Cyperaceae	*Scleria delicatula*		DD
Cyperaceae	*Pycreus lanceolatus*		LR-lc
Cyperaceae	*Ascolepis trigona*	Endemic	DD
Cyperaceae	*Bulbostylis fimbristylidoides*		DD
Cyperaceae	*Scleria calcicola*		DD
Cyperaceae	*Ascolepis majestuosa*		DD
Cyperaceae	*Alinula malawica*		DD
Cyperaceae	*Scleria longispiculata*		DD
Cyperaceae	*Carex lycurus*		DD
Cyperaceae	*Scleria xerophila*		DD
Cyperaceae	*Scleria fulvipilosa*		DD
Cyperaceae	*Scleria zambesica*		DD
Cyperaceae	*Scleria lucentinigricans*		DD
Cyperaceae	*Scleria patula*		DD
Cyperaceae	*Scleria polyrrhiza*		DD
Cyperaceae	*Lipocarpha robinsonii*		DD
Cyperaceae	*Cyperus altochrysocephalus*		DD
Cyperaceae	*Cyperus kasamensis*		DD
Cyperaceae	*Cyperus robinsonii*		DD
Cyperaceae	*Cyperus zambesiensis*		DD
Cyperaceae	*Lipocarpha echinus*		DD
Cyperaceae	*Ascolepis lineariglumis var. lineariglumis*		LR-lc
Cyperaceae	*Ascolepis lineariglumis var. pulcherrima*	Endemic	DD
Cyperaceae	*Ascolepis ampullacea*		DD
Cyperaceae	*Schoenoplectus rhodesicus*		DD
Cyperaceae	*Scleria procumbens*		DD
Cyperaceae	*Pycreus poikilostachys*		DD

Cyperaceae	*Ascolepis pusilla*		DD
Cyperaceae	*Bulbostylis clarkeana*		LR-nt
Cyperaceae	*Pycreus atrorubidus*		DD
Cyperaceae	*Pycreus micromelas*		DD
Cyperaceae	*Volkiella disticha*		VU
Cyperaceae	*Scleria chlorocalyx*		DD
Dilleniaceae	*Tetracera alnifolia*		LR-lc
Dioscoreaceae	*Dioscorea praehensilis*		LR-nt
Dipterocarpaceae	*Marquesia acuminata*		VU
Dracaenaceae	*Sansevieria downsii*		VU
Ebenaceae	*Diospyros mweroensis*		DD
Euphorbiaceae	*Euphorbia williamsonii*		DD
Euphorbiaceae	*Monadenium friesii*		VU
Euphorbiaceae	*Monadenium hirsutum*		VU
Euphorbiaceae	*Monadenium pseudoracemosum var. lorifolium*		VU
Euphorbiaceae	*Monadenium pudibundum var. pudibundum*		VU
Euphorbiaceae	*Monadenium schubei (pax)*		DD
Euphorbiaceae	*Jatropha pachyrrhiza*		DD
Euphorbiaceae	*Euphorbia cooperi var. ussanguensis*		DD
Euphorbiaceae	*Euphorbia distinctissima*		VU
Euphorbiaceae	*Tragia prostrata*		VU
Euphorbiaceae	*Tragia micromeres*		VU
Euphorbiaceae	*Euphorbia debilispina*		EN
Euphorbiaceae	*Acalypha dikuluwensis*		DD
Euphorbiaceae	*Euphorbia fanshawei*		VU
Euphorbiaceae	*Euphorbia whellanii*		DD
Euphorbiaceae	*Euphorbia speciosa*		VU
Euphorbiaceae	*Euphorbia seretii var. variantissima*		DD
Euphorbiaceae	*Euphorbia platyrrhiza*		DD
Euphorbiaceae	*Euphorbia perplexa var. kasamana*		VU
Euphorbiaceae	*Euphorbia perplexa var. perplexa*		DD
Euphorbiaceae	*Euphorbia papillosicapsa*		DD
Euphorbiaceae	*Euphorbia mwinilungensis*		DD
Euphorbiaceae	*Euphorbia luapulana*		DD
Euphorbiaceae	*Euphorbia jubata*		DD
Euphorbiaceae	*Euphorbia inundaticola*		DD
Euphorbiaceae	*Euphorbia griseola subsp. zambiensis*		DD
Euphorbiaceae	*Croton gossweileri*		DD

Euphorbiaceae	*Euphorbia decidua*		DD
Euphorbiaceae	*Croton scheffleri*		VU
Euphorbiaceae	*Monadenium discoideum*		VU
Euphorbiaceae	*Sapium acetosella var. lineare*		DD
Euphorbiaceae	*Jatropha seineri var. tomentella*		EN
Euphorbiaceae	*Euphorbia fortissima*		DD
Euphorbiaceae	*Monadenium filiforme*		VU
Euphorbiaceae	*Tragiella friesiana*		VU
Fabaceae subfamily Caesalpinioideae	*Dialium angolense*		LR-lc
Fabaceae subfamily Caesalpinioideae	*Cryptosepalum exfoliatum subsp. puberulum*		DD
Fabaceae subfamily Caesalpinioideae	*Brachystegia puberula*		LR-lc
Fabaceae subfamily Caesalpinioideae	*Brachystegia michelmorei*		DD
Fabaceae subfamily Caesalpinioideae	*Aphanocalyx trapnellii*		VU
Fabaceae subfamily Caesalpinioideae	*Baikiaea plurijuga*		VU
Fabaceae subfamily Caesalpinioideae	*Bussea massaiensis subsp. rhodesica*		VU
Fabaceae subfamily Caesalpinioideae	*Cryptosepalum exfoliatum subsp. craspedoneuron*		DD
Fabaceae subfamily Caesalpinioideae	*Daniellia alsteeniana*		EN
Fabaceae subfamily Mimosoideae	*Cathormion altissimum var. altissimum*		LR-lc
Fabaceae subfamily Mimosoideae	*Entada chrysostachys*		LR-nt
Fabaceae subfamily Mimosoideae	*Pseudoprosopis fischeri*		VU
Fabaceae subfamily Mimosoideae	*Acacia galpinii*		LR-nt
Fabaceae subfamily Mimosoideae	*Acacia seyal var. fistula*		LR-lc
Fabaceae subfamily Mimosoideae	*Acacia rehmanniana*		DD
Fabaceae subfamily Mimosoideae	*Entada arenaria subsp. microcarpa*	Near-endemic	LR-nt
Fabaceae subfamily Mimosoideae	*Acacia hebeclada subsp. chobiensis*		LR-lc
Fabaceae subfamily Mimosoideae	*Albizia isenbergiana*		DD
Fabaceae subfamily Mimosoideae	*Parkia filicoidea*		LR-nt
Fabaceae subfamily Mimosoideae	*Acacia hockii*		LR-nt
Fabaceae subfamily Mimosoideae	*Acacia pilispina*		LR-nt

Fabaceae subfamily Mimosoideae	*Entada dolichorrhachis*	Endemic	VU
Fabaceae subfamily Mimosoideae	*Entada arenaria subsp. arenaria*		LR-nt
Fabaceae subfamily Mimosoideae	*Entada bacillaris var. plurijuga*		DD
Fabaceae subfamily Papilionoideae	*Pterocarpus tinctorius*		LR-lc
Fabaceae subfamily Papilionoideae	*Pterocarpus angolensis*		LR-lc
Fabaceae subfamily Papilionoideae	*Droogmansia pteropus var. axillaris*		VU
Fabaceae subfamily Papilionoideae	*Dolichos magnificus*		DD
Fabaceae subfamily Papilionoideae	*Dolichos filifoliolus*		DD
Fabaceae subfamily Papilionoideae	*Cordyla africana*		LR-lc
Fabaceae subfamily Papilionoideae	*Tephrosia coronilloides*		LR-lc
Fabaceae subfamily Papilionoideae	*Tephrosia kasikiensis subsp. chinsaliana*		VU
Fabaceae subfamily Papilionoideae	*Tephrosia muenzneri subsp. pedalis*		DD
Fabaceae subfamily Papilionoideae	*Crotalaria criniramea*		VU
Fabaceae subfamily Papilionoideae	*Crotalaria cylindrostachys*		LR-lc
Fabaceae subfamily Papilionoideae	*Crotalaria nuda*	Endemic	LR-nt
Fabaceae subfamily Papilionoideae	*Leptoderris goetzei*		LR-nt
Fabaceae subfamily Papilionoideae	*Aeschynomene bracteosa var. major*		DD
Fabaceae subfamily Papilionoideae	*Aeschynomene lateriticola*		VU
Fabaceae subfamily Papilionoideae	*Aeschynomene pseudoglabrescens*	Endemic	LR-lc
Fabaceae subfamily Papilionoideae	*Aeschynomene stipulosa*	Endemic	VU
Fabaceae subfamily Papilionoideae	*Tephrosia richardsiae subsp. erucifera*		LR-lc
Fabaceae subfamily Papilionoideae	*Tephrosia robinsoniana*		DD
Fabaceae subfamily Papilionoideae	*Crotalaria involutifolia*		LR-lc
Fabaceae subfamily Papilionoideae	*Crotalaria lachnocarpoides*		LR-lc
Fabaceae subfamily Papilionoideae	*Crotalaria lachnophora*		LR-lc
Fabaceae subfamily Papilionoideae	*Tephrosia zambiana*		DD
Fabaceae subfamily Papilionoideae	*Ophrestia unicostata*		DD

Fabaceae subfamily Papilionoideae	*Ophrestia breviracemosa*		VU
Fabaceae subfamily Papilionoideae	*Crotalaria lukafuensis*		LR-lc
Fabaceae subfamily Papilionoideae	*Crotalaria microcarpa*		LR-lc
Fabaceae subfamily Papilionoideae	*Crotalaria natalitia var. natalitia*		LR-lc
Fabaceae subfamily Papilionoideae	*Bobgunnia madagascariensis*		LR-lc
Fabaceae subfamily Papilionoideae	*Crotalaria nudiflora*		DD
Fabaceae subfamily Papilionoideae	*Crotalaria pallidicaulis*		LR-lc
Fabaceae subfamily Papilionoideae	*Crotalaria polytricha*		DD
Fabaceae subfamily Papilionoideae	*Crotalaria ringoetii*		LR-lc
Fabaceae subfamily Papilionoideae	*Microcharis spathulata*		DD
Fabaceae subfamily Papilionoideae	*Crotalaria shirensis*		LR-lc
Fabaceae subfamily Papilionoideae	*Crotalaria simoma*		VU
Fabaceae subfamily Papilionoideae	*Crotalaria sphaerocarpa subsp. sphaerocarpa*		LR-lc
Fabaceae subfamily Papilionoideae	*Crotalaria trinervia*		VU
Fabaceae subfamily Papilionoideae	*Crotalaria tristis*		DD
Fabaceae subfamily Papilionoideae	*Crotalaria umbellifera*		LR-lc
Fabaceae subfamily Papilionoideae	*Crotalaria vanmeelii*		DD
Fabaceae subfamily Papilionoideae	*Leptoderris nobilis*		LR-lc
Fabaceae subfamily Papilionoideae	*Baphia speciosa*	Endemic	VU
Fabaceae subfamily Papilionoideae	*Kotschya suberifera*		VU
Fabaceae subfamily Papilionoideae	*Kotschya prittwitzii var. parviflora*		LR-lc
Fabaceae subfamily Papilionoideae	*Kotschya longiloba*	Endemic	VU
Fabaceae subfamily Papilionoideae	*Kotschya imbricata*		DD
Fabaceae subfamily Papilionoideae	*Kotschya africana var. latifoliola*		VU
Fabaceae subfamily Papilionoideae	*Dalbergia acutifoliolata*		DD
Fabaceae subfamily Papilionoideae	*Dalbergiella nyasae*		LR-lc
Fabaceae subfamily Papilionoideae	*Desmodium fulvescens*		DD

Fabaceae subfamily Papilionoideae	*Indigofera emarginella var. longifoliolata*		VU
Fabaceae subfamily Papilionoideae	*Indigofera deightonii subsp. rhodesica*		DD
Fabaceae subfamily Papilionoideae	*Humularia submarginalis*		DD
Fabaceae subfamily Papilionoideae	*Humularia pseudaeschynomene*		VU
Fabaceae subfamily Papilionoideae	*Humularia minima subsp. flabelliformis*		VU
Fabaceae subfamily Papilionoideae	*Humularia minima subsp. minima*		VU
Fabaceae subfamily Papilionoideae	*Humularia kapiriensis var. repens*		VU
Fabaceae subfamily Papilionoideae	*Crotalaria goreensis*		LR-lc
Fabaceae subfamily Papilionoideae	*Vigna comosa subsp. abercornensis*		VU
Gentianaceae	*Faroa corniculata*		VU
Gentianaceae	*Exacum oldenlandioides*		LR-nt
Gentianaceae	*Canscora kirkii*		VU
Gentianaceae	*Sebaea clavata*		DD
Gentianaceae	*Faroa alata*		DD
Gentianaceae	*Sebaea perpusilla*		VU
Gentianaceae	*Sebaea africana*		DD
Gentianaceae	*Sebaea alata*		DD
Gentianaceae	*Faroa minutiflora*		DD
Gentianaceae	*Sebaea fernandesiana*		DD
Gesneriaceae	*Streptocarpus aff. michelmorei*		LR-lc
Hernandiaceae	*Gyrocarpus americanus subsp. africanus*		LR-lc
Hyacinthaceae	*Schizobasis angolensis*		DD
Hydrophyllaceae	*Hydrolea brevistyla*		DD
Hypoxidaceae	*Hypoxis cuanzensis*		DD
Hypoxidaceae	*Hypoxis filiformis*		DD
Hypoxidaceae	*Hypoxis goetzei*		EN
Hypoxidaceae	*Hypoxis villosa*		DD
Hypoxidaceae	*Curculigo pilosa*		VU
Iridaceae	*Moraea brevifolia*		LR-lc
Iridaceae	*Lapeirousia zambeziaca*		DD
Iridaceae	*Dierama longistylum*		DD
Iridaceae	*Gladiolus serenjensis*	Endemic	VU
Lamiaceae	*Pycnostachys verticillata*		LR-nt
Lamiaceae	*Tinnea coerulea var. coerulea*		LR-lc
Lamiaceae	*Tinnea gracilis*		LR-lc

Lamiaceae	*Tinnea aethiopica subsp. stolzii*		LR-lc
Lamiaceae	*Platostoma dilungense*		LR-nt
Lamiaceae	*Platostoma coeruleum*		DD
Lamiaceae	*Tinnea zambesiaca*		LR-lc
Lamiaceae	*Alvesia cylindricalyx*		DD
Lamiaceae	*Tinnea rhodesiana*		LR-lc
Lamiaceae	*Tinnea vestita*		LR-lc
Lamiaceae	*Tinnea apiculata*		LR-lc
Lamiaceae	*Tinnea antiscorbutica*		LR-nt
Lamiaceae	*Haumaniastrum glabrifolium*		LR-nt
Lamiaceae	*Leucas princei*		LR-nt
Lauraceae	*Beilschmiedia gilbertii var. glabra*		DD
Lentibulariaceae	*Genlisea pallida*		DD
Lentibulariaceae	*Genlisea glandulosissima*		DD
Linderniaceae	*Stemodiopsis glandulosa*		VU
Linderniaceae	*Crepidorhopalon bifolius*		LR-lc
Linderniaceae	*Crepidorhopalon tenuifolius*		VU
Linderniaceae	*Crepidorhopalon involucratus*		VU
Linderniaceae	*Craterostigma plantagineum*		DD
Loganiaceae	*Strychnos xantha*		LR-lc
Lythraceae	*Rotala gossweileri*		DD
Lythraceae	*Rotala myriophylloides*		DD
Lythraceae	*Nesaea purpurascens*		DD
Lythraceae	*Rotala fontinalis*		DD
Lythraceae	*Rotala submersa var. angustipetala*		DD
Lythraceae	*Rotala juniperina*		DD
Lythraceae	*Rotala dinteri*		DD
Lythraceae	*Nesaea robinsoniana*		DD
Malpighiaceae	*Triaspis lateriflora*		DD
Melastomataceae	*Dissotis caloneura var. pilosa*		DD
Melastomataceae	*Dichaetanthera erici-rosenii*	Near-endemic	LR-lc
Melastomataceae	*Antherotoma debilis*		DD
Melastomataceae	*Memecylon zambesiense*	Endemic	VU
Melastomataceae	*Dichaetanthera rhodesiensis*		DD
Melastomataceae	*Dissotis simonis-jamesii*	Near-endemic	LR-lc
Melastomataceae	*Dissotis glandulosa*		DD
Meliaceae	*Khaya anthotheca*		LR-nt
Meliaceae	*Entandrophragma delevoyi*	Near-endemic	VU
Meliaceae	*Entandrophragma caudatum*		LR-lc
Meliaceae	*Turraea zambesica*		LR-nt
Menyanthaceae	*Nymphoides milnei*		DD

Menyanthaceae	*Nymphoides tenuissima*		LR-lc
Molluginaceae	*Corrigiola paniculata*		DD
Moraceae	*Ficus burkei*		LR-lc
Moraceae	*Ficus bussei*		LR-lc
Moraceae	*Ficus usambarensis*		LR-nt
Moraceae	*Ficus ottoniifolia subsp. macrosyce*		LR-lc
Moraceae	*Ficus trichopoda*		LR-lc
Moraceae	*Ficus natalensis subsp. leprieurii*		LR-lc
Moraceae	*Ficus asperifolia*		LR-lc
Moraceae	*Ficus natalensis subsp. natalensis*		LR-lc
Moraceae	*Ficus petersii*		DD
Moraceae	*Ficus lutea*		LR-lc
Moraceae	*Milicia excelsa*		CR
Moraceae	*Ficus ingens*		LR-lc
Moraceae	*Ficus glumosa*		LR-lc
Moraceae	*Ficus fischeri*		LR-lc
Moraceae	*Ficus sansibarica subsp. macrosperma*		LR-lc
Moraceae	*Ficus dicranostyla*		LR-nt
Moraceae	*Ficus cyathistipula subsp. cyathistipula*		LR-lc
Moraceae	*Ficus craterostoma*		LR-lc
Moraceae	*Ficus capreifolia*		LR-lc
Moraceae	*Ficus salicifolia*		LR-lc
Moraceae	*Morus mesozygia*		LR-nt
Moraceae	*Ficus pygmaea*		LR-lc
Moraceae	*Ficus verruculosa*		LR-lc
Moraceae	*Ficus polita subsp. polita*		LR-lc
Moraceae	*Ficus abutilifolia*		LR-lc
Moraceae	*Ficus vallis-choudae*		LR-lc
Moraceae	*Ficus ardisioides subsp. camptoneura*		LR-lc
Moraceae	*Ficus polita subsp. brevipedunculata*		LR-nt
Moraceae	*Ficus exasperata*		LR-lc
Moraceae	*Ficus barteri*		LR-lc
Moraceae	*Ficus ovata*		LR-lc
Moraceae	*Treculia africana subsp. africana var. africana*		LR-lc
Moraceae	*Ficus nigropunctata*		LR-lc
Moraceae	*Ficus wakefieldii*		LR-lc
Moraceae	*Ficus stuhlmannii*		LR-lc
Moraceae	*Ficus persicifolia*		DD

Moraceae	*Ficus scassellatii subsp. scassellatii*		LR-lc
Myrsinaceae	*Embelia upembensis*		VU
Oleaceae	*Chionanthus richardsiae*		VU
Oleaceae	*Chionanthus niloticus*		DD
Orchidaceae	*Satyrium princeae*		VU
Orchidaceae	*Satyrium monadenum*		VU
Orchidaceae	*Orthochilus corymbosus*	Endemic	DD
Orchidaceae	*Eulophia katangensis*		LR-lc
Orchidaceae	*Liparis molendinacea*		DD
Orchidaceae	*Disa roeperocharoides*	Near-endemic	VU
Orchidaceae	*Angraecopsis gassneri*		DD
Orchidaceae	*Disa nyikensis*		VU
Orchidaceae	*Satyrium microcorys*		VU
Orchidaceae	*Disa ukingensis*		VU
Orchidaceae	*Disa verdickii*	Near-endemic	DD
Orchidaceae	*Disa welwitschii subsp. welwitschii*		LR-nt
Orchidaceae	*Disa dichroa*		LR-lc
Orchidaceae	*Disperis aphylla subsp. bifolia*		VU
Orchidaceae	*Disperis bifida*	Near-endemic	CR
Orchidaceae	*Disperis breviloba*		DD
Orchidaceae	*Disa cryptantha*		DD
Orchidaceae	*Brachycorythis pilosa*		LR-lc
Orchidaceae	*Brachycorythis mixta*		DD
Orchidaceae	*Disa caffra*		DD
Orchidaceae	*Holothrix tridactylites*		VU
Orchidaceae	*Angraecum geniculatum*	Endemic	DD
Orchidaceae	*Habenaria velutina*		LR-nt
Orchidaceae	*Habenaria tubifolia*		EN
Orchidaceae	*Habenaria tentaculigera*		LR-nt
Orchidaceae	*Nervilia kotschyi var. purpurata*		DD
Orchidaceae	*Platycoryne brevirostris*		VU
Orchidaceae	*Platycoryne isoetifolia*		LR-nt
Orchidaceae	*Platycoryne latipetala*		LR-nt
Orchidaceae	*Platycoryne micrantha*		LR-lc
Orchidaceae	*Platycoryne protearum var. recurvirostra*		LR-nt
Orchidaceae	*Platycoryne trilobata*		DD
Orchidaceae	*Platylepis glandulosa*		LR-lc
Orchidaceae	*Habenaria pubidens*	Near-endemic	VU
Orchidaceae	*Habenaria pasmithii*	Near-endemic?	VU

Orchidaceae	*Habenaria orthocentron*		DD
Orchidaceae	*Polystachya asper*		DD
Orchidaceae	*Polystachya erythrocephala*		DD
Orchidaceae	*Polystachya mafingensis*	Near-endemic	DD
Orchidaceae	*Polystachya moreauae*		DD
Orchidaceae	*Habenaria malacophylla*		LR-lc
Orchidaceae	*Habenaria macrura*		LR-nt
Orchidaceae	*Habenaria macrotidion*		DD
Orchidaceae	*Habenaria leucotricha var. recticalcar*		LR-nt
Orchidaceae	*Habenaria humilior*		LR-nt
Orchidaceae	*Disperis katangensis var. minor*		DD
Orchidaceae	*Habenaria holubii*		VU
Orchidaceae	*Habenaria hirsutitrunci*		LR-nt
Orchidaceae	*Habenaria hebes*		EN
Orchidaceae	*Nervilia renschiana*		DD
Orchidaceae	*Habenaria cirrhata*		LR-lc
Orchidaceae	*Habenaria binghamii*		VU
Orchidaceae	*Habenaria argentea*		LR-nt
Orchidaceae	*Eulophia saxicola*		DD
Orchidaceae	*Roeperocharis wentzeliana*		LR-lc
Orchidaceae	*Eulophia richardsiae*		DD
Orchidaceae	*Nervilia bicarinata*		LR-nt
Orchidaceae	*Malaxis maclaudii*		DD
Orchidaceae	*Habenaria sochensis*		LR-lc
Orchidaceae	*Satyrium shirense*		VU
Orchidaceae	*Malaxis katangensis var. pygmaea*		VU
Orchidaceae	*Tridactyle translucens*		DD
Orchidaceae	*Orthochilus holubii*		DD
Orobanchaceae	*Buchnera pulcherrima*	Endemic	DD
Orobanchaceae	*Buchnera cryptocephala var. mwinilungensis*		VU
Orobanchaceae	*Buchnera laxiflora*	Endemic	LR-lc
Orobanchaceae	*Buchnera trilobata*		LR-lc
Orobanchaceae	*Buchnera arenicola*	Endemic	DD
Orobanchaceae	*Buchnera nervosa*	Endemic	VU
Orobanchaceae	*Buchnera ebracteolata*	Endemic	VU
Orobanchaceae	*Buchnera crassifolia*	Near-endemic	DD
Orobanchaceae	*Alectra glandulosa*	Endemic	LR-lc
Orobanchaceae	*Alectra pubescens*	Endemic	LR-lc
Orobanchaceae	*Buchnera chisumpae*	Endemic	VU

Orobanchaceae	*Buchnera nitida*	Near-endemic	DD
Oxalidaceae	*Oxalis abercornensis*		DD
Oxalidaceae	*Biophytum richardsiae*		VU
Oxalidaceae	*Biophytum nyikense*		VU
Pandanaceae	*Pandanus livingstonianus*		VU
Passifloraceae	*Basananthe holmesii*		LR-lc
Passifloraceae	*Basananthe baumii var. baumii*		DD
Passifloraceae	*Basananthe baumii var. caerulescens*		LR-lc
Passifloraceae	*Adenia tuberifera*		VU
Passifloraceae	*Adenia repanda*		LR-nt
Passifloraceae	*Adenia ovata*		LR-lc
Passifloraceae	*Adenia erecta*		VU
Peraceae	*Clutia whytei var. monticoloides*		VU
Phyllanthaceae	*Phyllanthus caespitosus*		LR-lc
Phyllanthaceae	*Phyllanthus microdendron var. asper*		LR-lc
Phyllanthaceae	*Phyllanthus tenuis*		LR-lc
Phyllanthaceae	*Phyllanthus friesii*		DD
Phyllanthaceae	*Phyllanthus zambicus*		LR-lc
Phyllanthaceae	*Phyllanthus polyanthus*		LR-lc
Phyllanthaceae	*Phyllanthus xiphephorus*		DD
Phyllanthaceae	*Phyllanthus tener*		DD
Phyllanthaceae	*Phyllanthus martinii*		DD
Phyllanthaceae	*Phyllanthus pseudocarunculatus*		DD
Plantaginaceae	*Limnophila crassifolia*		DD
Poaceae	*Hydrothauma manicatum*		LR-lc
Poaceae	*Hyparrhenia anemopaegma*		LR-lc
Poaceae	*Panicum bullockii*		LR-lc
Poaceae	*Panicum perangustatum*		DD
Poaceae	*Brachiaria pungipes*		LR-lc
Poaceae	*Panicum phippsii*		DD
Poaceae	*Panicum pseudoracemosum*		LR-lc
Poaceae	*Digitaria bidactyla*		LR-nt
Poaceae	*Pogonarthria refracta*		LR-lc
Poaceae	*Eragrostis fimbrillata*		LR-lc
Poaceae	*Digitaria sacculata*		DD
Poaceae	*Digitaria procurrens*		DD
Poaceae	*Digitaria minoriflora*		DD
Poaceae	*Digitaria calcarata*		DD
Poaceae	*Brachyachne simonsii*		DD

Poaceae	*Eragrostis lepidobasis*		LR-nt
Poaceae	*Oreobambos buchwaldii*		CR
Poaceae	*Setaria homonyma*		LR-lc
Poaceae	*Eragrostis astreptoclada*		DD
Poaceae	*Eragrostis oligostachya*		LR-nt
Poaceae	*Setaria lindenbergiana*		LR-lc
Poaceae	*Digitaria tenuifolia*		LR-nt
Poaceae	*Eragrostis milnei*		LR-nt
Poaceae	*Eragrostis anacranthoides*		LR-lc
Poaceae	*Eragrostis punctiglandulosa*		VU
Poaceae	*Eragrostis spicigera*		LR-nt
Poaceae	*Eccoptocarpha obconiciventris*		LR-lc
Poaceae	*Eragrostis dentifera*		LR-nt
Poaceae	*Lophacme parva*		LR-lc
Poaceae	*Loxodera bovonei*		DD
Poaceae	*Diheteropogon microterus*		DD
Poaceae	*Eragrostis mariae*		LR-nt
Poaceae	*Eragrostis divaricata*		LR-lc
Poaceae	*Setaria pseudaristata*		LR-nt
Poaceae	*Setaria megaphylla*		LR-lc
Podostemaceae	*Leiothylax drummondii*		DD
Polygalaceae	*Securidaca longepedunculata*		LR-lc
Polygalaceae	*Securidaca welwitschii*		VU
Polygalaceae	*Polygala friesii*		LR-lc
Polygonaceae	*Oxygonum carnosum*		DD
Polygonaceae	*Oxygonum litorale*		DD
Portulacaceae	*Portulaca foliosa*		LR-nt
Primulaceae	*Anagallis rhodesica*		DD
Proteaceae	*Protea kibarensis subsp. cuspidata*		VU
Proteaceae	*Protea poggei subsp. mwinilungensis*		DD
Proteaceae	*Protea mafingensis*	Near-endemic	VU
Proteaceae	*Protea rupestris*		LR-nt
Rhizophoraceae	*Cassipourea fanshawei*	Endemic	VU
Rosaceae	*Prunus africana*		LR-nt
Rosaceae	*Hagenia abyssinica*		DD
Rubiaceae	*Pavetta redheadii*		VU
Rubiaceae	*Rytigynia adenodonta var. reticulata*		VU
Rubiaceae	*Fadogia tomentosa var. calvescens*		LR-lc
Rubiaceae	*Sericanthe andongensis subsp. andongensis var. andongensis*		LR-nt

Rubiaceae	*Rytigynia adenodonta var. adenodonta*		VU
Rubiaceae	*Sarcocephalus pobeguinii*		DD
Rubiaceae	*Fadogia chlorantha var. chlorantha*		VU
Rubiaceae	*Fadogia gossweileri*		DD
Rubiaceae	*Fadogia triphylla var. pubicaulis*		DD
Rubiaceae	*Fadogia luangwae*	Endemic	DD
Rubiaceae	*Spermacoce annua*		VU
Rubiaceae	*Spermacoce bangweolensis*	Endemic	VU
Rubiaceae	*Spermacoce perennis var. perennis*		VU
Rubiaceae	*Spermacoce perennis var. fimbriolata*		VU
Rubiaceae	*Spermacoce princeae var. mwinilungae*		DD
Rubiaceae	*Spermacoce samfya*		DD
Rubiaceae	*Fadogia triphylla var. gracilifolia*		LR-lc
Rubiaceae	*Fadogia schmitzii*		VU
Rubiaceae	*Fadogia variifolia*		VU
Rubiaceae	*Amphiasma redheadii*		DD
Rubiaceae	*Vangueria volkensii var. kyimbilensis*		DD
Rubiaceae	*Coffea mufindiensis subsp. lundaziensis*	Near-endemic	VU
Rubiaceae	*Fadogia tomentosa var. flaviflora*		DD
Rubiaceae	*Fadogia verdickii*		LR-nt
Rubiaceae	*Batopedina linearifolia*		EN
Rubiaceae	*Pentanisia confertifolia*		VU
Rubiaceae	*Pavetta subumbellata var. subumbellata*		VU
Rubiaceae	*Tapiphyllum cinerascens var. laetum*		LR-lc
Rubiaceae	*Tapiphyllum cinerascens var. richardsiae*		LR-lc
Rubiaceae	*Tapiphyllum cinerascens var. cinerascens*		DD
Rubiaceae	*Tapiphyllum cistifolium var. latifolium*		DD
Rubiaceae	*Tapiphyllum molle*		LR-lc
Rubiaceae	*Tapiphyllum rhodesiacum*		LR-lc
Rubiaceae	*Rytigynia sp. F*		DD
Rubiaceae	*Pavetta pygmaea*		DD
Rubiaceae	*Pavetta johnstonii subsp. breviloba*		VU
Rubiaceae	*Pachystigma micropyren*		DD
Rubiaceae	*Pachystigma albosetulosum*		DD
Rubiaceae	*Psydrax whitei*		VU

Rubiaceae	*Psychotria pumila var. subumbellata*		DD
Rubiaceae	*Otiophora angustifolia*		LR-lc
Rubiaceae	*Oldenlandia robinsonii*		DD
Rubiaceae	*Oldenlandia geophila*		VU
Rubiaceae	*Oldenlandia corymbosa var. corymbosa*		DD
Rubiaceae	*Psychotria mwinilungae*		VU
Rubiaceae	*Hallea stipulosa*		VU
Rubiaceae	*Rytigynia sp. A*		DD
Rutaceae	*Vepris mendoncana*		LR-lc
Rutaceae	*Vepris termitaria*	Endemic	VU
Rutaceae	*Vepris fanshawei*	Endemic	DD
Salicaceae	*Scolopia stolzii*		DD
Sapindaceae	*Blighia unijugata*		LR-nt
Sapindaceae	*Deinbollia fanshawei*	Endemic	LR-lc
Sapindaceae	*Eriocoelum lawtonii*	Endemic	LR-lc
Sapotaceae	*Chrysophyllum bangweolense*		LR-lc
Scrophulariaceae	*Selago thyrsoidea var. thyrsoidea*	Near-endemic	DD
Scrophulariaceae	*Micrargeriella aphylla*	Endemic	VU
Sterculiaceae	*Sterculia africana*		LR-lc
Sterculiaceae	*Sterculia quinqueloba*		LR-lc
Sterculiaceae	*Sterculia subviolacea*		LR-lc
Sterculiaceae	*Dombeya wittei*		VU
Sterculiaceae	*Triplochiton zambesiacus*		LR-lc
Sterculiaceae	*Sterculia tragacantha*		LR-lc
Tecophilaeaceae	*Walleria nutans*		LR-lc
Tecophilaeaceae	*Walleria mackenziei*		LR-lc
Tecophilaeaceae	*Cyanastrum johnstonii*		LR-lc
Tiliaceae	*Triumfetta tenuipedunculata*		LR-lc
Tiliaceae	*Triumfetta grandistipulata*		DD
Tiliaceae	*Corchorus saxatilis*		LR-lc
Tiliaceae	*Triumfetta reticulata*		DD
Turneraceae	*Streptopetalum luteoglandulosum*		VU
Urticaceae	*Pouzolzia bracteosa*		DD
Velloziaceae	*Xerophyta villosa*		LR-nt
Vitaceae	*Cissus fanshawei*		LR-lc
Vitaceae	*Cyphostemma nanellum*		DD
Vitaceae	*Cyphostemma tenuissimum*		DD
Vitaceae	*Cyphostemma saxicola*		LR-lc
Vitaceae	*Cyphostemma rotundistipulatum*		VU

Vitaceae	*Cyphostemma richardsiae*		LR-lc
Vitaceae	*Cyphostemma abercornense*		VU
Zamiaceae	*Encephalartos schmitzii*		VU
Zingiberaceae	*Siphonochilus pleianthus*		LR-nt

Appendix 5C: Endemic and threatened mammal species in Zambia

Ansell (1978) and Stuart *et al* (1990) have identified five (5) mammals known to be endemic to Zambia.

No	Scientific name	Common name
1	*Kobus leche smithemani*	*Black Lechwe*
2	*Kobus leche kafuensis*	*Kafue Lechwe*
3	*Connochaetes taurinus cooksoni*	*Cookson's Wildebeest*
4	*Giraffa camelopardalis thornicrofti*	*Thornicroft's Giraffe*
5	*Mus neavei*	*Pygymy mouse*

Threatened species of mammals found in Zambia.

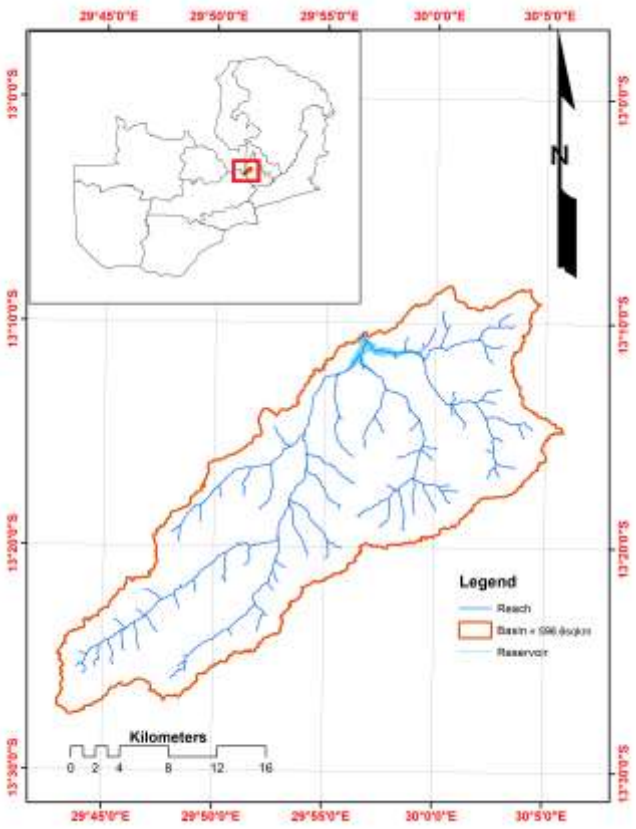
No	Scientific name	Common name
1	*Diceros bicornis*	*Black Rhinoceros*
2	*Loxodonta African*	*African Elephant*
3	*Lycaon pictus*	*Wild Dog*
4	*Hippotragus equinus*	*Roan Antelope*
5	*Kobus leche kafuensis*	*Kafue Lechwe*
6	*Kobus leche smithemani*	*Black Lechwe*
7	*Alcelaphus lichtensteini*	*Lichtenstein's Hartebeest*
8	*Plerotes anchietae*	*Broad Faced Fruit Bat*
9	*Crocidura ansellorum*	*Pygmy Shrew*
10	*Rhynchocyon cirnei*	*Checkered Elephant Shrew*
11	*Mus neavei*	*Pygmy Mouse*
12	*Beamys majer*	*Greater Hamster Rat*

Appendix 5D: Endemic and globally threatened bird species found in Zambia

Scientific name	Common name	Category
Lybius chaplini	Chaplin's barbet	VU (Breeding Endemic)
Pogoniulus makawai	White-chested Tinkerbird	DD (Breeding Endemic)
Agapornis nigrigenis	Black-cheeked Lovebird	VU (Breeding Endemic)
Egretta vinaceigula	Slaty Egret	VU

Balearica regulorum	Grey Crowned Crane	EN
Grus Carunculata	Wattled Crane	VU
Hirundo atrocaerulea	Blue Swallow	VU
Chloropeta gracilirostris	Papyrus Yellow Warbler	VU
Balaeniceps rex	Shoebill	VU
Torgos tracheliotos	Lappet-Faced Vulture	VU
Necrosyrtes monachus	Hooded Vulture	EN
Gyps africanus	White-Backed Vulture	EN
Bucorvus leadbeateri	Southern Ground Hornbill	VU
Polemaetus bellicsus	Martial Eagle	VU
Sagittarius serpentarius	Secretarybird	VU
Ardeola idae	Madagascar Pond Heron	EN
Trigonoceps occipitalis	White-Headed Vulture	VU

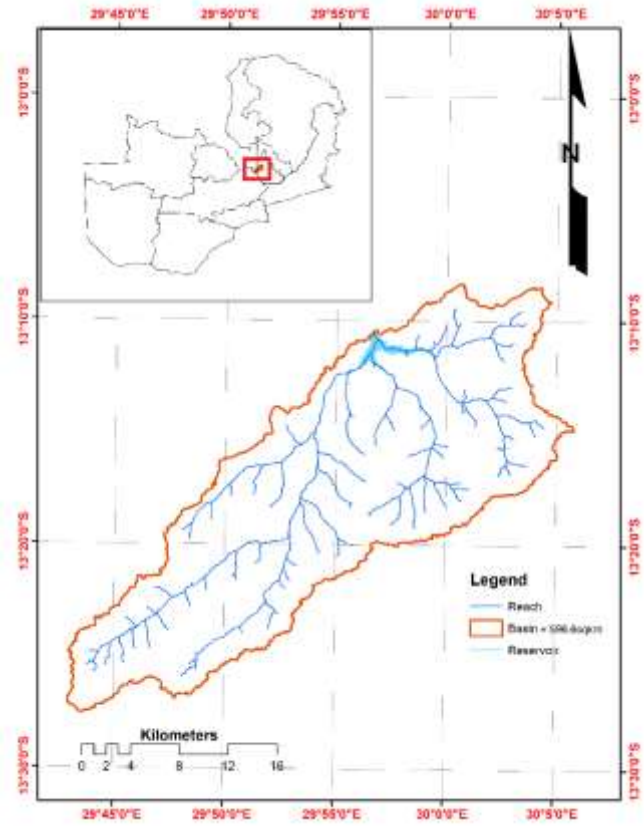
Appendix 6: Hydrological Report



HYDROLOGICAL ASSESSMENT FOR THE LUWOMBWA RIVER BASIN IN THE LUANGWA CATCHMENT

1.0 Catchment Extent & Characteristic

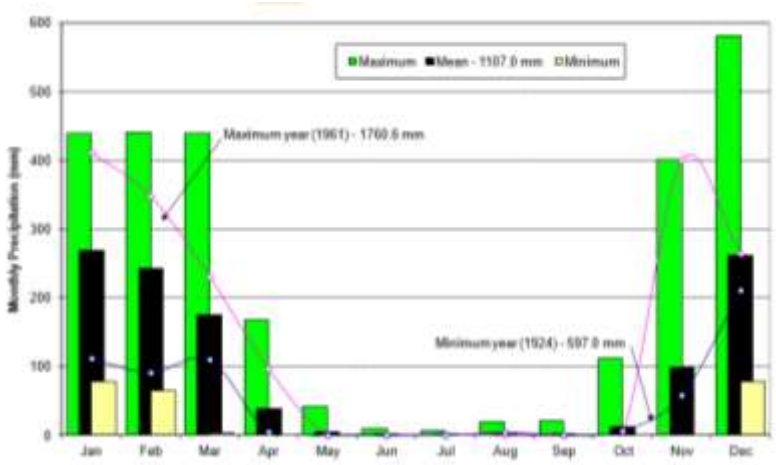
The project area falls on the Luwombwa River whose basin area with respect to the project site is of the order of 596.6 km^2 as shown in figure 1. Drainage is hill and plateau influenced and has highly dendritic river network patterns with the river reach falling from elevations of 1731 masl to 1284 masl, giving an average slope of 0.0069 along the main river. The river network in the area is ungauged with the closest gauging stations being on the Chiwefwe river located at Latitude: 13º37'09"S and Longitude: 29º24'02", and Mkushi River at Old Mkushi Bridge located at Latitude: 14° 22' 26" S and Longitude: 29° 22' 14" S. These gauged form part of the regional data available for validation/calibration of the model data run using the Soil Water Analysis Tool (SWAT) model for the hydrological assessment of the Luwombwa River. The Chibwefwe being closer to the project site with the river network being more naturalised than the Mkushi was considered.



Project Site Catchment Map

2.0 Rainfall

Serenje District has annual precipitation in the ranges of 597 mm to 1760.60 mm according to Zambia Meteorological Department and based on the extended precipitation series from 1920 to 2011 accessed from Climate explorer as represented in the rainfall graph in figure 2 and data given in Annex D. This gives a mean annual rainfall of the order 1100 mm.



Serenje District Rainfall Data – Source ZMD

3.0 Catchment Yield

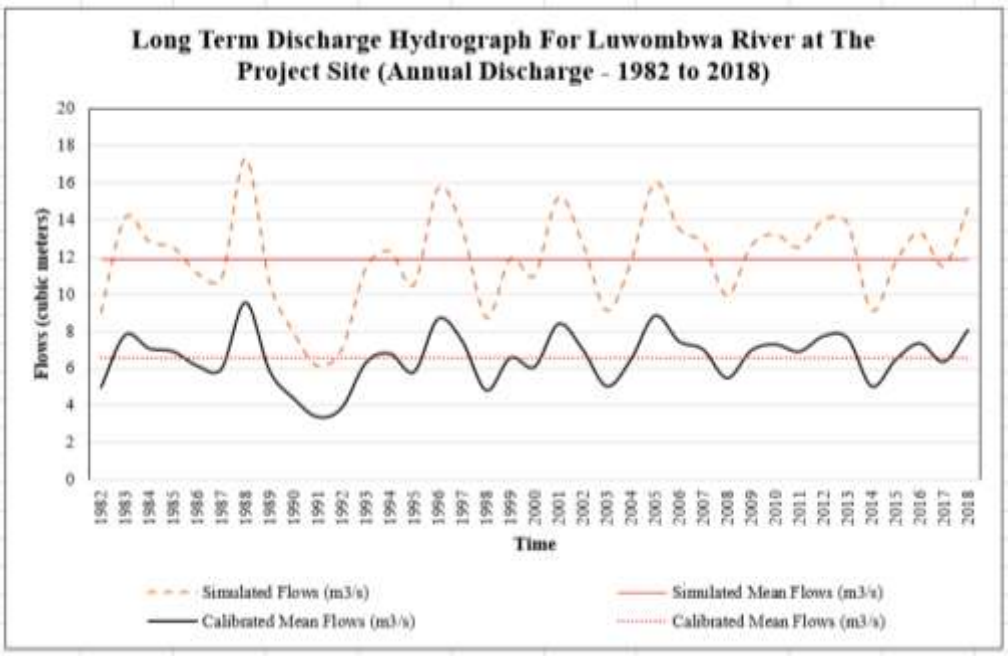
In the estimation of the catchment yield, the Soil and Water Assessment Tool (SWAT), was applied. This is because the Luwombwa River lacks long-term hydrological data because it is not gauged. The SWAT model is applicable as well as other hydrological approaches for assessment of hydrological studies in ungauged Basin. In validation of the assessment, the percentage Runoff and the Hot Deck infilling methods where used because these hydrological assessments/approaches are equally used in ungauged basins like the Luwombwa Basin.

3.1 SWAT Model

The Soil and Water Assessment Tool (SWAT) is a spatially semi-distributed and time continuous hydrological model which inputs Geographic Information System (GIS) data such as Digital Elevation Model (DEM) or topography, soil type, land use and sub-catchment characteristics which give a unique combination called the Hydrologic Response Unit (HRU) from which flows are routed to the outlet of the sub-catchment through a stream. Weather data which includes solar radiation, wind velocity, relative humidity, temperature and precipitation, which is the main driving weather function are fed in the model to generate the flows which are calibrated based on field/spot measurements.

In order to provide long-term hydrological data, the model was rum for a 36-year period (1982 - 2018) with flows generated and calibrated based on spot discharge measurements done over time. The hydrograph in figure 3 shows the simulated as well as calibrated flows over the hydrologic period under review based on results in Annex A.

From the compilation, the Mean Annual Runoff (MAR) of the Luwombwa River (calibrated) is of the order of 6.60 m3/s which translates 188,900,640 m3 (189 Mio m3)



Discharges on the Luwombwa River - Simulated and Calibrated over a 36-Year Period

The proposed reservoir is estimated to impound a volume of 52, 401, 985 m^3 (52 Mio m^3) at Full Supply Level, leaving 136 Mio m^3 (4.33 m^3/s) as an available resource for down-stream users.

3.2 The Percentage Runoff Method

According to FAO, the yield of a catchment is based on the expected Annual Runoff from the catchment. Based on the estimated Runoff Parentage of the Luangwa Catchment by JICA in the Water Resources Master Plan, it can be computed that 16.7% of the mean rainfall received over the catchment is available as runoff.

The computation is based on the formula,

Mean Annual Runoff (MAR) = A*P*C

Where; **A** is the Catchment Area; **P** is the Precipitation; **C** is the Runoff coefficient

The resultant Mean Annual Runoff (MAR) is indicated in table 1.

Mean Annual Runoff for the Project Area

Location	River/Stream	Catchment Area (km^2)	Mean Rainfall (mm)	Run Off Coefficient (%)	Mean Annual Runoff (m^3/yr)	Mean Annual Runoff (m^3/s)
Project Site	Luwombwa	596.9	1100	16.7	109,595,420	3.48

3.3 The Hot Deck Infilling Method.

This method is widely used for estimating flows in ungauged catchments based on the measured flows of a neighbouring catchment (Hirsh, 1979: Parrett et al, 1994).

The method employs the following expression;

Estimated Flow (X) = (Measured Flow (Q)*(Drainage Area (A)/Drainage Area (B)

Where X= Estimated flow (m^3/sec) of the ungauged stream

A= Area (km^2) of the ungauged stream, B= Area (km^2) of the gauged stream

In reference to a gauged station within the Region closer to the Catchment of the project site that has similar conditions with long-term hydrological monthly data (discharges), Chibefwe on the Chibefwe River is taken as a reference point with all historical hydrological data indicated in Annex B and C.

Estimated Annual Runoff for the Project Area

Observed Monthly Discharge – Chiwefwe at Mkushi Boma (1963-1995)						
Station	**River/Stream**	**Catchment Area (km^2)**	**Mean Runoff (m^3/s)**			**Mean Annual Runoff (m^3/yr)**
			Min	Mean	Max	
Chibefwe		187	0.87	1.595	2.32	50,299,920.00
Estimated Annual runoff for the Project Site						
Project Site	Luwombwa	596.6	2.78	5.09	7.40	160,475,573.60

3.4 Comparative Summaries

Based on the three methods in the hydrological analysis, the respective Mean Annual Runoffs (MAR in m^3/yr) and in m^3/s for the Basin will be in the ranges shown in table 3.

Comparative of flows using the three Methods

Method	**River/Stream**	**Catchment Area (km^2)**	**Mean Runoff (m^3/s)**			**Mean Annual Runoff (m^3/yr)**
			Min	Mean	Max	
SWAT		596.9		5.99		188,900,640.00
Percentage Runoff Method	Luwombwa	596.9		3.48		109,595,420.00
Rational Method	Luwombwa	596.6	2.78	5.09	7.40	160,475,573.60

4.0 Conclusion

It can be concluded that the Mean Annual Runoff for the project site is of the order 109 Mio m^3 (3.99 m^3/s) to 189 Mio m3 (5.66 m^3/s). Considering the proposed impoundment will be of the order of 52, 401, 985 m^3 (52 Mio m^3) at Full Supply Level, between 136 Mio m^3 (4.33 m^3/s) and 58 Mio m^3 (2.12 m^3/s) will be available for downstream water users.

ANNEX A: SIMULATED & CALIBRATED TERM DISCHARGES SERIES AT PROPOSED PROJECT SITE – LUWOMBWA RIVER – ANNUAL DISCHARGE (1982-2018)

Serenje District | Latitude: 13°10'41.50"S | Longitude: 29°56'41.58"E

River: Luwombwa | Northing: 8541207 | Easting: 819219

Basin: Luangwa/Lunsemfwa | Drainage area: 596.6 km^2 | Elevation: 1,297m asl

Discharge | Simulated/Calibrated | Unit:m^3/s

TIME Year	Simulated Flows (m^3/s)	Simulated Mean Flows (m^3/s)	Calibrated Flows (m^3/s)	Calibrated Mean Flows (m^3/s)
1982	9	11.9	4.991	6.599
1983	14.1	11.9	7.819	6.599
1984	12.8	11.9	7.098	6.599
1985	12.5	11.9	6.932	6.599
1986	11.1	11.9	6.155	6.599
1987	10.8	11.9	5.989	6.599
1988	17.3	11.9	9.594	6.599
1989	10.6	11.9	5.878	6.599
1990	7.9	11.9	4.381	6.599
1991	6.1	11.9	3.383	6.599
1992	7	11.9	3.882	6.599
1993	11.4	11.9	6.322	6.599
1994	12.3	11.9	6.821	6.599
1995	10.5	11.9	5.823	6.599
1996	15.7	11.9	8.706	6.599
1997	13.5	11.9	7.486	6.599
1998	8.7	11.9	4.824	6.599
1999	11.9	11.9	6.599	6.599
2000	11	11.9	6.100	6.599
2001	15.2	11.9	8.429	6.599
2002	12.7	11.9	7.043	6.599
2003	9.1	11.9	5.046	6.599
2004	11.7	11.9	6.488	6.599
2005	16	11.9	8.873	6.599
2006	13.5	11.9	7.486	6.599
2007	12.7	11.9	7.043	6.599
2008	9.9	11.9	5.490	6.599
2009	12.6	11.9	6.987	6.599
2010	13.2	11.9	7.320	6.599
2011	12.5	11.9	6.932	6.599
2012	14	11.9	7.764	6.599

2013	13.8	11.9	7.653	6.599
2014	9.1	11.9	5.046	6.599
2015	11.7	11.9	6.488	6.599
2016	13.3	11.9	7.375	6.599
2017	11.5	11.9	6.377	6.599
2018	14.6	11.9	8.096	6.599

ANNEX B: OBSERVED LONG TERM DISCHARGES SERIES AT CHIBEFWE RIVER – OBSERVED MONTHLY DISCHARGE (1963-1995)

Mkushi Boma — Latitude: 13°37'09"S — Longitude: 29°24'02"

Northing: 8,493,105 — Easting: 759,722

River: Chiwefwe — Basin: Luangwa/Lunsemfwa — Drainage area: 187 km^2 — Elevation: 1,253m asl

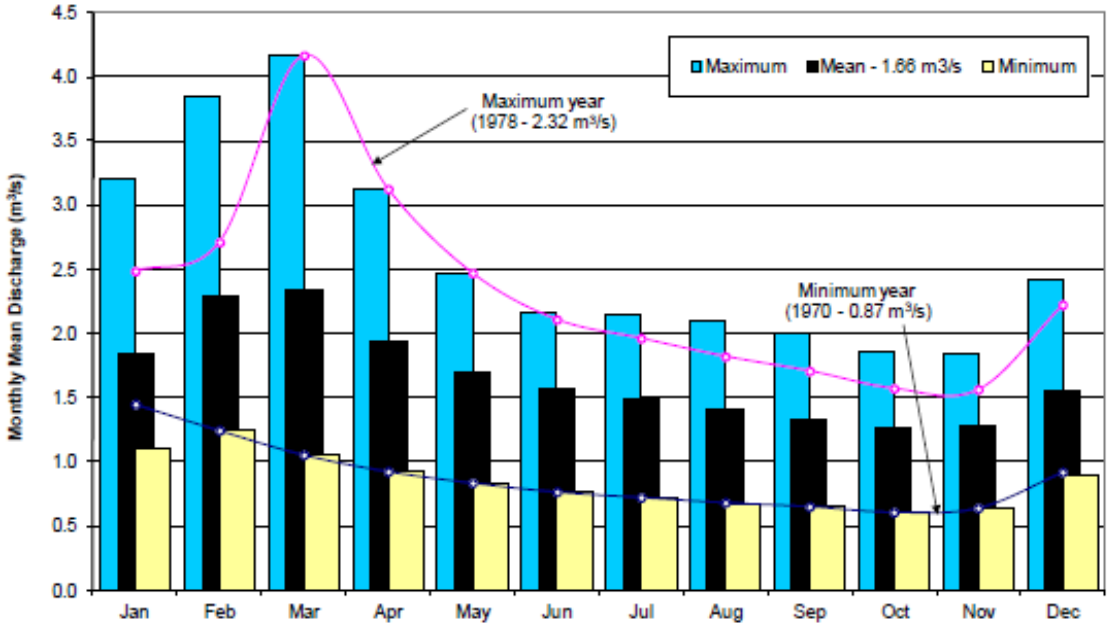
Discharge — Observed — Unit: m^3/s

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1963	-	3.06	3.21	2.48	2.11	1.91	1.73	1.60	1.47	1.34	1.39	1.78	
1964	1.66	2.13	1.89	1.53	1.45	1.36	1.34	1.23	1.18	1.07	1.14	1.23	1.43
1965	2.10	2.79	2.46	1.91	1.65	1.52	1.45	1.40	1.30	1.23	1.28	1.34	1.70
1966	1.38	2.28	2.56	1.90	1.70	1.68	1.57	1.48	1.43	1.34	1.30	1.38	1.67
1967	1.57	1.87	2.39	2.49	2.04	1.89	1.81	1.77	1.71	1.65	1.71	1.84	1.90
1968	2.03	2.64	2.56	2.30	2.19	2.16	2.13	2.10	2.00	1.85	1.67	2.42	2.17
1969	3.20	3.84	3.26	2.68	2.06	1.71	1.51	1.32	1.14	1.03	0.97	1.38	2.01
1970	1.45	1.24	1.05	0.92	0.83	0.76	0.72	0.68	0.65	0.60	0.64	0.92	0.87
1971	1.09	1.78	1.56	1.17	1.03	1.02	0.95	0.85	0.77	0.72	0.87	1.02	1.07
1972	1.79	1.54	1.67	1.40	1.20	1.11	1.06	0.98	0.90	0.87	0.80	0.89	1.18
1973	1.16	1.48	1.21	1.02	0.86	0.85	0.84	0.81	0.76	0.69	0.78	0.96	0.95
1974	1.72	3.03	3.41	2.35	1.86	1.61	1.47	1.32	1.23	1.20	1.31	1.66	1.85
1975	1.73	1.66	2.10	1.69	1.47	1.37	1.20	1.24	1.17	1.09	1.09	1.53	1.45
1976	1.88	1.98	2.32	2.17	1.83	1.60	1.49	1.40	1.33	1.32	1.46	1.74	1.71
1977	1.91	2.26	2.61	2.04	1.82	1.70	1.65	1.60	1.52	1.45	1.51	1.82	1.82
1978	2.48	2.71	4.17	3.12	2.47	2.11	1.96	1.82	1.70	1.57	1.58	2.22	2.33
1979	2.12	1.99	2.21	1.90	1.77	1.70	1.67	1.64	1.59	1.57	1.65	2.00	1.82
1980	2.08	2.66	3.44	2.67	2.24	2.11	2.00	1.90	1.80	1.78	1.84	1.99	2.21
1981	2.13	2.69	3.36	2.50	2.31	2.08	1.90	1.81	1.66	1.57	1.50	1.53	2.09
1982	1.78	3.07	-	-	1.57	1.46	1.39	1.32	1.23	1.18	1.20	-	
1983	1.64	2.22	1.73	1.50	1.43	1.35	1.29	1.24	1.17	1.13	1.12	1.47	1.44
1984	1.62	1.97	1.84	1.62	1.49	1.45	1.44	1.39	1.35	1.28	1.39	1.58	1.54
1985	1.80	2.84	2.19	1.78	1.64	1.42	1.37	1.27	1.17	1.11	1.21	1.41	1.60
1986	2.43	2.55	2.86	2.82	2.19	1.86	1.74	1.60	1.47	1.42	1.38	1.52	1.99

1987	1.83	1.70	-	-	-	-	-	-	-	-	-	-	
1988	-	-	-	-	-	-	-	-	-	-	-	-	
1989	-	-	-	-	-	-	-	-	-	-	-	-	
1990	-	2.35	2.13	1.92	1.73	1.58	1.50	1.45	1.38	1.28	1.28	1.58	
1991	1.74	1.93	1.77	1.53	1.45	1.35	1.34	1.31	1.23	1.24	1.30	1.54	1.48
1992	1.72	1.74	1.55	1.44	-	-	-	-	-	-	-	-	
1993	-	-	-	-	-	-	-	-	-	-	-	-	
1994	-	-	-	1.72	1.58	1.65	1.57	1.53	1.39	1.54	1.45	-	
1995	1.73	2.44	1.69	1.46	1.35	1.35	1.34	1.31	1.23	1.16	1.20		
Mean	1.84	2.29	2.34	1.93	1.69	1.56	1.48	1.41	1.32	1.26	1.29	1.55	1.66
MCM	4.94	5.54	6.27	5.00	4.53	4.05	3.96	3.77	3.42	3.37	3.33	4.15	52.33
mm	26.40	29.64	33.53	26.75	24.21	21.64	21.19	20.14	18.28	18.05	17.83	22.20	279.86
l/s.km^2	9.86	12.25	12.52	10.32	9.04	8.35	7.91	7.52	7.05	6.74	6.88	8.29	8.90
%	9.43	10.59	11.98	9.56	8.65	7.73	7.57	7.20	6.53	6.45	6.37	7.93	100.00
Min	1.09	1.24	1.05	0.92	0.83	0.76	0.72	0.68	0.65	0.60	0.64	0.89	0.87
Max	3.20	3.84	4.17	3.12	2.47	2.16	2.13	2.10	2.00	1.85	1.84	2.42	2.33
Co.Var	0.23	0.26	0.33	0.29	0.25	0.23	0.23	0.23	0.24	0.25	0.23	0.25	0.24

(-) represents missing data; Source – DWARD – Formerly Department of Water Affairs

ANNEX C: OBSERVED LONG TERM DISCHARGES SERIES AT CHIBEFWE RIVER – OBSERVED MONTHLY DISCHARGE (1963-1995) - GRAPHICAL



ANNEX D: OBSERVED MONTHLY PRECIPITATIION AT SERENJE

Precipitation at Serenje

Latitude: 13º09'00"S Longitude: 30º07'12"E

Station: Serenje Nothings: 78,544,179 Easting: 838,283

Basin: Luangwa Elevation: 1,410 masl

Precipitation Historic/Observed Units: mm

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1912											6.0	249.0	
1913	283.0	188.0	294.0	-	-	-	-	-	-	2.0	51.0	169.0	
1914	163.0	356.0	149.0	139.0	-	-	-	-	-	-	77.0	142.0	1,026.0
1915	203.0	263.0	188.0	88.0	-	3.0	-	-	-	-	70.0	198.0	1,013.0
1916	334.0	64.0	78.0	31.0	-	-	-	-	3.0	9.0	146.0	314.0	979.0
1917	211.0	201.0	186.0	116.0	11.0	-	-	-	-	17.0	199.0	406.0	1,347.0
1918	214.0	134.0	123.0	47.0	-	-	1.0	-	-	4.0	175.0	172.0	870.0
1919	258.0	158.0	168.0	15.0	4.0	-	-	-	-	28.0	105.0	303.0	1,039.0
1920	298.0	277.0	384.0	10.0	25.0	-	-	-	-	34.0	25.0	308.0	1,361.0
1921	291.0	362.0	246.0	49.0	6.0	-	-	-	2.0	18.0	170.0	298.0	1,442.0

1922	79.0	244.0	107.0	48.0	12.0	-	-	-	-	36.0	95.0	253.0	874.0
1923	234.0	209.0	262.0	27.0	12.0	-	-	-	-	6.0	135.0	421.0	1,306.0
1924	112.0	91.0	110.0	5.0	-	-	-	4.0	-	6.0	58.0	211.0	597.0
1925	349.0	211.0	395.0	53.0	-	-	-	-	6.0	66.0	137.0	158.0	1,375.0
1926	315.0	308.0	422.0	28.0	-	-	2.0	-	-	4.0	56.0	270.0	1,405.0
1927	211.0	208.0	101.0	10.0	-	2.0	4.0	-	-	8.0	9.0	216.0	769.0
1928	350.0	155.0	262.0	38.0	-	-	-	-	-	-	125.0	349.0	1,279.0
1929	267.0	147.0	200.0	51.0	-	-	-	-	-	41.0	67.0	274.0	1,047.0
1930	253.0	105.0	185.0	87.0	6.0	-	-	-	18.0	1.0	108.0	368.0	1,131.0
1931	284.0	225.0	63.0	6.0	-	-	-	-	-	3.0	81.0	339.0	1,001.0
1932	180.0	358.0	263.0	32.0	13.0	-	-	20.0	-	-	12.0	348.0	1,226.0
1933	301.0	193.0	89.0	8.0	-	5.0	-	-	-	13.0	115.0	235.0	959.0
1934	280.0	255.0	267.0	15.0	-	6.0	-	-	-	28.0	132.0	245.0	1,228.0
1935	223.0	140.0	119.0	37.0	-	-	-	2.0	1.0	-	101.0	86.0	709.0
1936	246.0	351.0	439.0	69.0	3.0	7.0	6.0	7.0	-	19.0	52.0	246.0	1,445.0
1937	406.0	344.0	37.0	31.0	-	-	-	-	-	-	89.0	237.0	1,144.0
1938	314.0	287.0	220.0	51.0	-	3.0	-	-	-	4.0	56.0	269.0	1,204.0
1939	357.0	255.0	185.0	39.0	17.0	2.0	-	5.0	8.0	17.0	80.0	319.0	1,284.0
1940	296.0	306.0	392.0	25.0	-	3.0	-	-	-	31.0	126.0	166.0	1,345.0
1941	329.0	283.0	252.0	6.0	-	-	-	-	-	2.0	156.0	240.0	1,268.0
1942	328.0	203.0	148.0	16.0	1.0	-	-	-	-	42.0	50.0	308.0	1,096.0
1943	439.0	330.0	180.0	34.0	-	-	-	-	-	-	62.0	171.0	1,216.0
1944	163.0	115.0	89.0	-	-	-	-	-	-	-	238.0	151.0	756.0
1945	335.0	284.0	211.0	1.0	2.0	-	3.0	-	-	1.0	87.0	124.0	1,048.0
1946	125.0	441.0	282.0	29.0	4.0	2.0	-		15.0	-	190.0	229.0	1,317.0
1947	219.0	129.0	263.0	44.0	3.0	-	-	-	-	16.0	86.0	228.0	988.0
1948	307.0	237.0	251.0	36.0	-	1.0	-	-	-	11.0	80.0	77.0	1,000.0
1949	232.0	135.0	139.0	20.0	34.0	-	-	-	-	5.3	89.7	372.6	1,027.6
1950	389.1	228.0	185.4	132.8	-	-	-			5.6	89.2	175.5	1,205.6
1951	225.3	127.0	196.6	-	-	-	-	0.3	3.8	34.5	119.9	349.0	1,056.4
1952	229.4	321.0	20.1	38.1	3.0	-	-	-	-	14.7	108.5	278.1	1,012.9
1953	245.9	306.8	124.2	34.0	-	-	-	-	-	-	110.0	318.3	1,139.2
1954	220.7	202.4	93.5	-	-	-	-		-	-	154.9	174.8	846.3
1955	294.1	307.1	185.7	48.3	1.5	-	-	0.5	3.0	2.0	88.9	305.8	1,236.9

1956	267.7	178.8	249.2	168.4	6.1	-	-	-	-	-	124.7	194.3	1,189.2
1957	310.1	372.9	106.2	22.1	14.7	-	-	1.3	-	2.5	6.4	566.7	1,402.9
1958	376.7	406.7	62.7	14.7	-	0.8	-	0.5	0.5	29.0	62.0	274.6	1,228.2
1959	77.7	440.7	125.0	30.7	1.3	-	-	-	2.3	11.4	51.3	581.4	1,321.8
1960	202.9	219.7	124.7	25.7	2.3	1.5	-	-	-	4.8	138.9	322.1	1,042.6
1961	411.5	348.5	231.1	96.8	0.3	-	1.0	-	-	6.9	400.1	264.4	1,760.6
1962	240.5	382.5	285.0	44.5	3.0	-	-	8.6	-	3.0	145.3	390.4	1,502.8
1963	262.1	205.2	214.9	10.9	-	-	-	-	0.5	35.3	114.6	163.3	1,006.8
1964	311.7	275.3	95.8	-	-	-	-	-	-	1.3	110.0	333.8	1,127.9
1965	337.1	351.5	137.9	1.0	-	-	-	-	1.3	11.7	96.3	230.4	1,167.2
1966	202.4	433.3	128.8	37.8	-	-	-	-	-	-	39.4	225.6	1,067.3
1967	242.8	294.6	223.5	65.8	1.0	-	-	-	-	-	119.9	226.3	1,173.9
1968	288.8	181.6	109.7	25.1	6.4	-	2.8	0.3	0.3	0.3	92.7	466.3	1,174.3
1969	321.6	313.4	285.2	50.3	-	-	-	-	-	38.4	18.3	290.8	1,318.0
1970	137.2	124.0	49.3	46.2	-	-	-	-	0.8	26.4	173.2	386.3	943.4
1971	411.0	224.8	81.5	28.4	6.4	-	-	-	4.3	4.3	150.9	368.0	1,279.6
1972	331.5	169.2	106.7	18.5	2.0	-	-	-	-	7.6	80.8	134.6	850.9
1973	142.7	336.2	121.0	35.4	0.5	-	-	-	1.3	30.4	129.1	279.9	1,076.5
1974	388.8	241.0	195.1	31.7	41.5	-	-	-	-	-	79.0	245.9	1,223.0
1975	257.4	163.8	152.2	10.3	-	-	-	-	-	-	29.1	199.6	812.4
1976	285.1	384.0	215.4	58.5	-	-	-	-	-	5.6	58.5	251.7	1,258.8
1977	330.9	195.4	103.6	6.2	-	-	-	-	5.6	8.2	92.5	333.3	1,075.7
1978	233.7	226.6	330.1	106.6	0.5	-	-	-	-	-	95.8	330.5	1,323.8
1979	76.8	248.5	183.0	45.5	-	0.2	1.0	-	-	56.0	181.9	283.0	1,075.9
1980	188.5	245.0	212.6	140.4	-	-	-	-	5.3	19.8	56.7	272.2	1,140.5
1981	123.3	174.4	189.9	26.5	-	-	-	-	-	0.5	86.4	102.8	703.8
1982	367.7	287.2	24.5	42.6	22.6	-	-	-	-	12.4	193.1	168.5	1,118.6
1983	295.0	240.3	37.8	21.8	10.2	-	2.5	0.1	-	-	55.8	242.6	906.1
1984	303.9	267.6	166.3	6.6	-			-	-	1.3	96.6	387.5	1,229.8
1985	231.4	299.4	146.1	68.2	2.0	-	-	1.8	-	13.7	143.4	231.4	1,137.4

1986	416.0	302.6	152.9	125.5	-	-	-	-	-	34.8	68.2	243.6	1,343.6
1987	436.6	142.4	134.5	29.0	-	-	-	-	-	21.4	102.9	197.2	1,064.0
1988	278.4	335.2	232.6	49.0	0.1	0.9	-	-	-	20.8	29.0	164.5	1,110.5
1989	394.5	201.7	187.1	27.7	-	-	-	-	-	4.5	60.8	317.2	1,193.5
1990	339.5	158.7	90.1	72.1	17.7	9.0	-	0.4	-	-	33.2	180.5	901.2
1991	313.2	193.7	45.3	47.1	9.8	-	-	-	-	48.6	74.9	236.9	969.5
1992	127.4	118.9	156.5	0.7	4.8	-	-	-	-	-	170.1	291.9	870.3
1993	389.7	261.1	185.9	57.3	-	-	-	-	-	-	156.1	99.7	1,149.8
1994	215.4	271.3	3.5	12.8	-	-	-	-	-	111.4	62.3	157.2	833.9
1995	185.9	152.0	68.5	7.7	-	-	-	-	-	3.6	28.6	179.1	625.4
1996	206.9	182.3	99.6	10.1	31.0	-	-	-	1.7	-	74.8	262.1	868.5
1997	257.7	266.3	55.9	111.2	-	-	2.3	-	21.0	5.9	145.0	383.2	1,248.5
1998	232.0	91.0	142.1	0.5	-	-	-	-	-	3.0	98.7	131.7	699.0
1999	238.1	270.5	333.8	4.8	-	-	-	-	-	-	67.8	170.9	1,085.9
2000	237.3	257.6	206.3	6.5	2.3	-	-	-	-	0.9	183.0	305.1	1,199.0
2001	363.0	221.1	178.4	47.1	-	-	-	-	-	-	-	229.2	1,038.8
2002	239.9	170.7	199.2	37.6	-	-	-	-	1.4	5.7	47.7	297.8	1,000.0
2003	112.8	259.6	187.1	72.6	-	-	1.9	-	-	29.3	24.6	139.6	827.5
2004	300.6	239.6	186.2	84.3	-	-	-	-	-	-	84.1	310.8	1,205.6
2005	346.0	106.0	83.0	-	-	-	5.0	-	3.3	-	15.6	513.6	1,072.5
2006	318.7	189.9	268.1	2.7	-	-	-	-	-	34.9	86.0	334.2	1,234.5
2007	361.8	246.4	107.1	15.3	-	-	-	-	2.7	11.7	-	-	
2008	185.4	223.0	72.2	-	-	-	-	-	-	0.5	121.4	201.9	
2009	291.5	400.7	254.4	31.6	-	-	-	-	-	0.5	189.3	170.3	1,338.3
2010	182.4	274.5	250.2	9.1	-	-	-	0.5	-	-	187.7	296.1	1,200.5
2011	235.0	132.0	266.2	25.1	-	-	-	-	-	-	-	-	
Mean	268.3	241.9	175.7	38.1	3.5	0.5	0.3	0.5	1.1	12.1	97.0	256.3	1,095.3
%	24.5	22.1	16.0	3.5	0.3	0.0	0.0	0.0	0.1	1.1	8.9	23.4	100.0
Min	76.8	64.0	3.5	-	-	-	-	-	-	-	-	-	597.0
Max	439.0	441.0	439.0	168.4	41.5	9.0	6.0	20.0	21.0	111.4	400.1	581.4	1,760.6

Source : Nov 1912 - Dec 1989 : GHCN Monthly Ver. 2 [NOAA-NCDC, 2014],
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3. The National Water Resources Master Plan in The Republic of Zambia – JICA (1995)
4. Zambia Meteorological Department (ZMD), 2018, Mkushi Annual rainfall data 1992-2017, Kabwe, Zambia Meteorological Department
5. Climate Explorer for Serenje District
6. Hydrologic Modelling System HEC-HMS User's Manual. U.S. Army Corps of Engineers, Hydrologic Engineering Center, Davis, CA, SCHARFFENBERG W (2015)
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9. National Oceanic and Atmospheric Administration (NOAA) - National Climatic Data Center (NCDC) [2014], "Global Historical Climatology Network (GHCN-Monthly)", Version 2, Website http://www.ncdc.noaa.gov/ghcnm/v2.php, 2014 (Also available at http://geekwright.com/modules/gwreports/index.php?tid=1).

Appendix 7: Water Quality Laboratory Analysis Report

GEO-ENVICON LTD

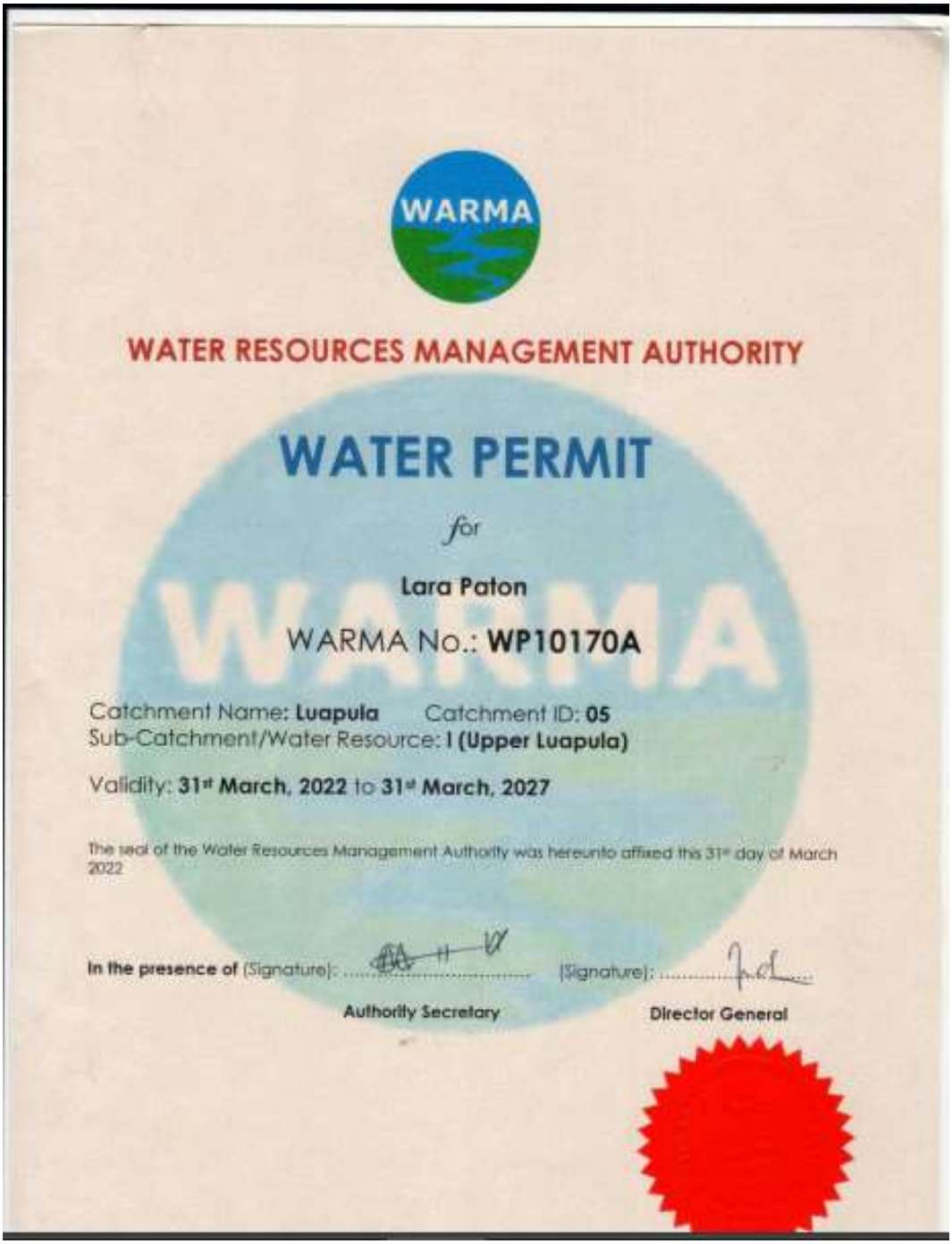
GEO-ENVICON LTD
ENVIRONMENT AND LAND SURVEYING CONSULTANTS
Room 1-10, Solidarity House, Oxford Road, Kitwe
P.O Box 22150 – Kitwe – Zambia Tele/Fax: 0212 221016 Cell: 0967701221
Environmental and analytical Services Department
CERTIFICATE OF ANALYSIS

CLIENT		DATE SUBMITTED
ADDRESS	ML Paton Investments Ltd	15.10.18
SAMPLE DESCRIPTION	Water	
SERVICES REQUESTED	Water analysis	No: Geo-RW181006

Parameter	Unit	Luwombwa River	Shekele Stream	Muchinka stream
pH		8.16	6.04	6.20
Turbidity	NTU	103	34	20
Conductivity	µS/cm	470	172.43	245.714
TSS	ppm	80	36	11
TDS	ppm	337	120	182
SO4	ppm	16	12	5
Cl	ppm	32	38	36
NO2	ppm	0.014	0.021	0.07
PO4	ppm	Nil	0.23	0.61
Ca-Hardness	ppm	5	24	22
Total Hardness	ppm	70	62	100
Ca	ppm	2.505	16.54	10.421
Mg	ppm	16.552	6.452	16.982
Cu	ppm	<0.01	0.03	0.01
Fe	ppm	<0.01	4.081	1.060
Pb	ppm	<0.01	<0.01	<0.01
Mn	ppm	0.003	<0.01	<0.01
Co	ppm	<0.01	<0.01	<0.01
Cd	ppm	<0.01	<0.01	<0.01
Feacal Coliform	#/100	79	0	121
Total Coliform	#/100	140	236	321

Authorising Officer's Approval:	Sign:	GEO-ENVICON LTD ENVIRONMENTAL & ANALYTICAL DEPT 18 OCT 2018 P.O. BOX 22150, KITWE
	Name: Stephen Chewe	
Designation	Head of Department - Environmental Engineer	

Appendix 8: Water Abstraction Permit



WARMA

WATER RESOURCES MANAGEMENT AUTHORITY

WATER PERMIT

for

Lara Paton

WARMA No.: **WP10170A**

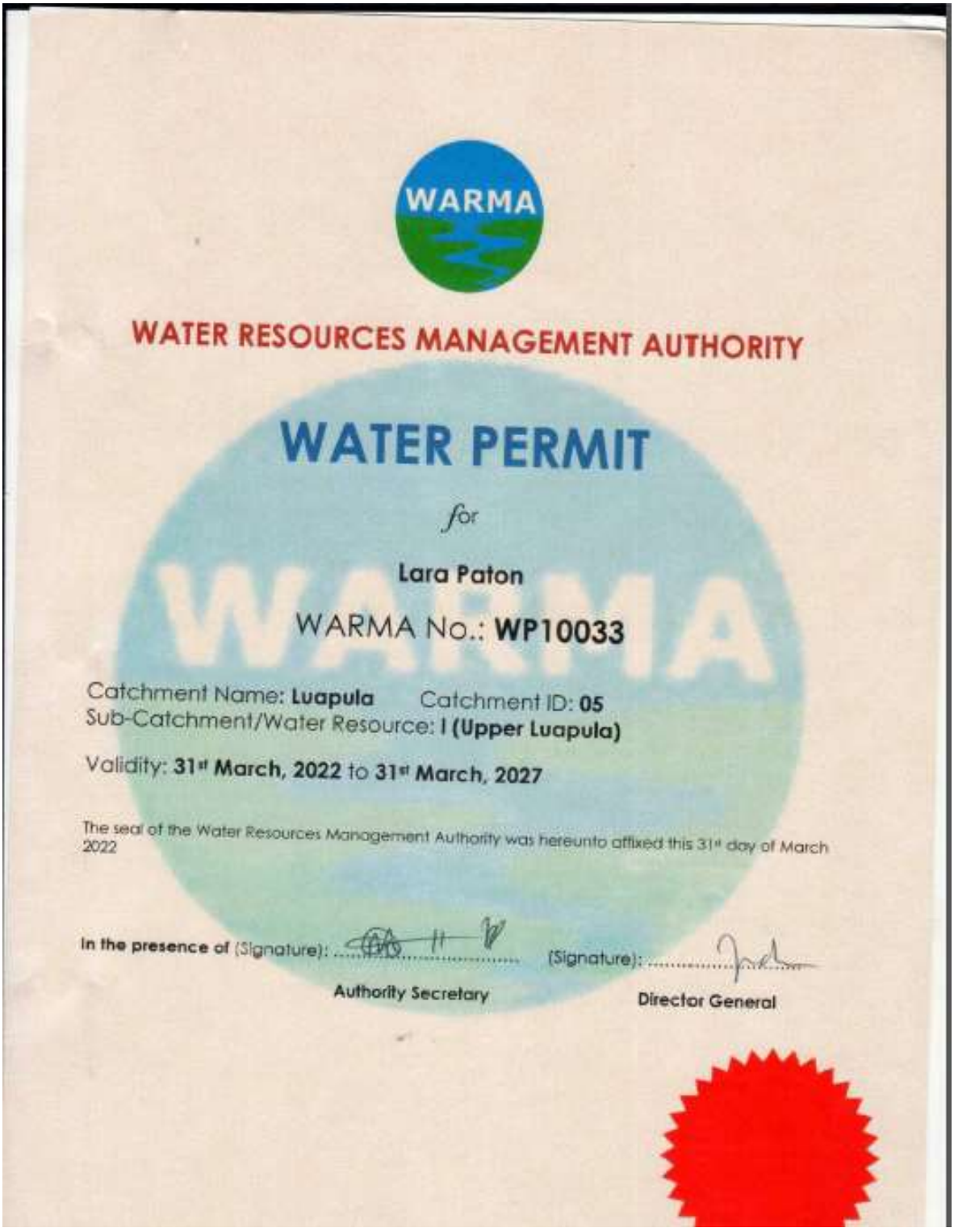
Catchment Name: **Luapula** Catchment ID: **05**
Sub-Catchment/Water Resource: **I (Upper Luapula)**

Validity: **31st March, 2022** to **31st March, 2027**

The seal of the Water Resources Management Authority was hereunto affixed this 31st day of March 2022

In the presence of (Signature): ..... (Signature): .....

Authority Secretary **Director General**



WARMA

WATER RESOURCES MANAGEMENT AUTHORITY

WATER PERMIT

for

Lara Paton

WARMA No.: **WP10033**

Catchment Name: **Luapula** Catchment ID: **05**
Sub-Catchment/Water Resource: **I (Upper Luapula)**

Validity: **31st March, 2022** to **31st March, 2027**

The seal of the Water Resources Management Authority was hereunto affixed this 31st day of March 2022

In the presence of (Signature): ..... (Signature): .....

Authority Secretary **Director General**

Appendix 9: Curriculum Vitae of Key Personnel

Name of Expert:	Robby Kasubika
Position:	Lead Consultant
Specialisation:	Environmental and Social Development Specialist
Total Years of Experience	18 Years
Country of Citizenship/ Residence:	Zambia
Date of Birth:	16.10.1973
Countries of Work Experience:	Zambia, South Africa, Malawi, Tanzania, Scotland
Language Skills:	English, Bemba, Nyanja, Tonga, Kaonde and Lozi
Computer Skills:	Microsoft Word, Excel, SPSS, ArcGIS, QGIS, MiniTab
Contact:	+260979319871, robbykasubika@gmail.com

Education:

Institution	Date	Degree(s) or Diploma obtained
University of Edinburgh, Edinburgh, Scotland, UK	2005	
Copperbelt University, Kitwe, Zambia	2001	BSc Forestry
ITC, Enschede, Netherlands	2006	Certificate in Biodiversity and Land use Modelling
ZASTI, Lusaka, Zambia	1996	Certificate in Meteorology
Zambia Forestry College, Kitwe, Zambia	1995	Diploma in Forestry

Summary of Experience:

Robby holds a Masters degree from the University of Edinburgh in Scotland. He has over 15 years working experience in Environmental and Social Impact Assessment (ESIA) and Preparation of Resettlement Action Plans (RAP). Robby specializes in ESIA preparation, RAP, land use planning and environmental governance. He has currently worked as local team leader for the development of a business case for improved land use and water resources project by WWF. Conducted a participatory natural resource management training for the Songwe River Transboundary Catchment Management (SRTCM) Project for communities in Malawi and Tanzania.

Worked as ESIA Team Leader in the preparation of an ESIA for Integrated Small Towns Water Supply and Sanitation Project in Mansa, Samfya, Mwense and Kawambwa (Funded by Africa Development Bank). He has recently worked on upgrading the ESIA and RAP audit for the Kafue Gorge Lower Hydro Power/Transmission Line Project in Chikankata by ZESCO, Kasanjiku Mini Hydro Power/Transmission Line project in Mwinilunga by Rural Electrification Authority (REA), Various Grid Extension projects in 28 districts (including Mushindamo district) in Zambia by REA, Preparation of a RAP for 14 households in Lufwanyama district, preparation of an ESIA for IFC funded dam project in Zimba district, and ESIA for IFC funded agriculture project in Serenje for Silverlands Zambia Limited. Robby was also lead consultant for the preparation of an ESIA for a modern shopping mall along the Great North Road near Heroes Stadium in Lusaka by NOVARE and Partners. Robby was team leader for the preparation of the Strategic Environmental Assessment (SEA) for the 100,000 hectares Luswishi Farm Block in Chief Shibuchinga's area of Lufwanyama district. ZEMA at times has engaged him as their resource person to train various stakeholders in environmental impact assessment and management. Robby has thorough understanding of the ESIA process in Zambia and the IFC Performance Standards on Environment Health and Safety and IFC requirements on resettlement programmes. Robby lectures in environmental management, research methods and resource assessment at the Copperbelt University in Kitwe.

Employment Record relevant to the assignment:

Period	Employing organization and your title/ position. Contact info for reference	Country	Summary of activities performed relevant to this Assignment
2006 - present	Copperbelt University Lecturer – Environmental Management For references: Professor Felix Kalaba, Dean – School of Natural Resources, kanungwe@cbu.ac.zm/kanungwe@gmail.com, +260 971771043, +260 961011783	Zambia	• Lecturing postgraduate in Landuse and Environmental Impact Assessment, Biodiversity Conservation and management • Lecturing undergraduates in Environmental Management, Forest Resource Assessment, Research Methods and Wildlife Resource Assessment • Research and consultancy • Supervision of undergraduate research projects
2004-2006	Forest Department Forest Extension Officer For references: Mr Ignius Makumba, Director, inmakumba@*gmail*.com, +260 966746841		• Designing Forest management plans for various forest reserves in Lusaka province • Carrying out forest awareness campaigns to promote sustainable management of forests • Monitoring and evaluation of forest community based projects implemented by the various district forest offices in the province
2001-2003	Meteorological Department Agrometeorologist For references: Mr Edson Nkonde, Director, chiluf@gmail.com, +260 950447111,		• Production crop-weather bulletins every after ten days for farmers • Participation in the vulnerability assessments and surveys that were conducted every year by the department in collaboration with World Food Programme (WFP) and Disaster Management Unit • Weather and Climate analysis and dissemination of daily weather forecasts

Membership in Professional Associations and Publications:

Institution	Registration/ Publication
	Membership No.
Environmental Education Association of Southern Africa	015534 NPO
Wildlife and Environmental Society of Zambia	
Forestry and Environmental Institute of Zambia	
Wildlife and Environmental Society of Zambia	
Population-Environment Research Network	

International publications and conferences (selection):

Year	Title	Author / Co-Authors	Reference
	Species-specific allometric models for estimation of the above-ground carbon stock in miombo woodlands of Copperbelt Province of Zambia	Kapinga, K; Syampungani, S; Kasubika, R Yambayamba, A & Shamaoma, H.	Journal of Forest Ecology and Management
2016	Energy Production from Forest and Agricultural Solid Waste	Kasubika, R., & Ng'andwe, P.	Book Chapter in Sustainable Livelihoods in the Green Economy

Year	Title	Author / Co-Authors	Reference
2016	Environmental Impacts of Industrial Renewable Energy Production	Ng'andwe, P., Kasubika, R., & Fushike, P.	Book Chapter in Sustainable Livelihoods in the Green Economy
2016	The implication of using a fixed form factor in areas under different rainfall and soil conditions for Pinus Kesiya in Zambia	Phiri, D., Phiri, E., Kasubika, R., Zulu, D., & Chisala, L.	Journal of Forest Science
2013	Drivers of Deforestation and Potential for Carbon Trading in Miombo Woodlands	Vinya, R., Syampungani, S., Kasumu, E.C., Kasubika, R. & Monde, C.	Book Chapter in Wooodlands: Structure, Species Diversity and Sustainable Management
2011	Preliminary study on the drivers of deforestation and potential for REDD+ in Zambia	Vinya, R., Syampungani, S., Kasumu, E.C., Monde, C. & Kasubika, R.	Consultancy Report for FAO
2008	Participatory Forest Resource Assessment Training Guide: Training Manual for WWF-SARPO Songwe River Transboundary Catchment Management Project (SRTCMP).	Kasubika, R. and P.W. Matakala	ISBN 978-9982-9942-2-5

Adequacy for the Environmental Related Assignments:

Detailed Tasks Assigned on Consultant's Team of Experts:	**Relevant Project Experience (From most recent):**
	- selected projects -
OVERALL RESPONSIBILITIES FOR : 1 Coordinating all activities of the ESIA 2 Managing ESIA Teams 3 Ensuring overall quality of ESIA reports 4 Review Existing environmental data 5 Developing environmental management plans 6 Review of environmental related regulations	**Environmental and Social Impact Assessment (ESIA)** *Year:* 2020 *Location:* Zimba, Southern Province, Zambia *Client:* Silverlands Ranching Limited *Main Project features:* Preparation of an Environmental and Social Impact Assessment for proposed water transfer canal from the Kalomo River to the dam on the farm *Position:* Local Lead Consultant - **Environmental and Social Development Expert**
	Environmental and Social Impact Assessment (ESIA) *Year:* 2019 *Location:* Mansa, Luapula Province, Zambia *Client:* Luapula Water and Sewerage Company *Main Project features:* Preparation of an Environmental and Social Impact Assessment for proposed Small Towns Water Supply and Sanitation Project *Position:* Lead Consultant - **Environmental and Social Development Expert**
	Environmental Project Brief (EPB) *Year:* 2019 *Location:* Samfya, Luapula Province, Zambia *Client:* Luapula Water and Sewerage Company *Main Project features:* Preparation of an Environmental Project Brief for proposed Small Towns Water Supply and Sanitation Project

Detailed Tasks Assigned on Consultant's Team of Experts:	Relevant Project Experience (From most recent):
	- selected projects -
7 Development of land resettlement plan where needed 8 Costing environmental components of the project	*Position:* Lead Consultant - **Environmental and Social Development Expert**
	Environmental Project Brief (EPB) *Year:* 2019 *Location:* Mwense, Luapula Province, Zambia *Client:* Luapula Water and Sewerage Company *Main Project features:* Preparation of an Environmental Project Brief for proposed Small Towns Water Supply and Sanitation Project *Position:* Lead Consultant - **Environmental and Social Development Expert**
	Environmental Project Brief (EPB) *Year:* 2019 *Location:* Kawambwa, Luapula Province, Zambia *Client:* Luapula Water and Sewerage Company *Main Project features:* Preparation of an Environmental Project Brief for proposed Small Towns Water Supply and Sanitation Project *Position:* Lead Consultant - **Environmental and Social Development Expert**
	Environmental and Social Impact Assessment (ESIA) *Year:* 2017 *Location:* Luangwa, Lusaka Province, Zambia *Client:* Luangwa Bridge Fish Farm Limited *Main Project features:* Preparation of an Environmental and Social Impact Assessment for proposed Fish Farm Project in Luangwa District *Position:* Lead Consultant - **Environmental and Social Development Expert** *Activities performed:* • Preparation of Scoping Report, Baseline Studies, • Compilation of the ESIA Report • Ecological Assessments • Preparation of Environmental Management Plan (EMP). • Submission of TORs, scoping report, draft ESIA and final ESIA to ZEMA • Meeting with ZEMA to discuss TORs and Scoping Report • Communicating with ZEMA on the progress of the whole ESIA • Attending to ZEMA concerns during site inspection • Periodical meetings with ZEMA inspectors on updates and issues concerning the project • Worked with ZEMA staff during public hearing for the project Prepare monthly summaries of onsite findings and any deviation from EMP and submitting to ZEMA
	Environmental Project Brief (**EPB)** *Year:* 2018 *Location:* Luwingu, Zambia *Client:* Ministry of Agriculture *Main project features:* Preparation of EPBs and associated EMPs for the Ntemba Luena Irrigation dam project *Position:* Lead Consultant - **Environmental and Social Development Expert**

Detailed Tasks Assigned on Consultant's Team of Experts:	Relevant Project Experience (From most recent):
	- selected projects -
	Activities performed:
	Environmental and Social Impact Assessment (ESIA) *Year:* 2014 *Location:* Kafue, Lusaka Province, Zambia *Client:* Luangwa Bridge Fish Farm Limited *Main Project features:* Preparation of an Environmental and Social Impact Assessment for proposed Integrated Fish Farming Project in Kafue District *Position:* Lead Consultant – **Environmental and Social Development Expert** *Activities performed:* • Preparation of Scoping Report, Baseline Studies, • Compilation of the ESIA Report • Preparation of Environmental Management Plan (EMP). • Submission of TORs, scoping report, draft ESIA and final ESIA to ZEMA • Meeting with ZEMA to discuss TORs and Scoping Report • Communicating with ZEMA on the progress of the whole ESIA • Attending to ZEMA concerns during site inspection • Periodical meetings with ZEMA inspectors on updates and issues concerning the project • Worked with ZEMA staff during public hearing for the project • Prepare monthly summaries of onsite findings and any deviation from EMP and submitting to ZEMA
	Environmental and Social Impact Assessment (ESIA) *Year:* 2017 *Location:* Serenje, Central Province, Zambia *Client:* Great North Ranching Limited *Main Project features:* Preparation of an Environmental and Social Impact Assessment for proposed construction of fish ponds on Sherrifs Estate in Serenje District *Position:* Lead Consultant – **Environmental and Social Development Expert** *Activities performed:* Preparation of Scoping Report, Baseline Studies, and Compilation of the ESIA Report, Preparation of Environmental Management and Monitoring Plan (EMMP)
	Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) *Year:* 2017 *Location:* Copperbelt Province, Zambia *Client:* Copperbelt Energy Corporation (CEC) *Main Project features:* Proposed 66kV Transmission line from Ndola Refinery Substation to Dangote Cement Plant in Masaiti District *Position:* Lead Consultant - **Environmental and Social Development Expert** *Activities performed:* • Preparation of Scoping Report, Baseline Studies, and Compilation of the ESIA Report, Preparation of Environmental Management and Monitoring Plan (EMMP). • Preparation of Resettlement Action Plan (RAP)

Detailed Tasks Assigned on Consultant's Team of Experts:	Relevant Project Experience (From most recent):
	- selected projects -
	• Submitting of TORs and scoping report to ZEMA on behalf of client • Following through with ZEMA on the progress on review of TORs, scoping report and draft ESIA • Meeting with ZEMA to discuss TORs and scoping report • Accompanying ZEMA inspectors during site inspection • Prepare monthly summaries of onsite findings and any deviation from EMP and submitting to ZEMA
	Environmental and Social Impact Assessment (ESIA) *Year:* 2013 *Location:* Zambia *Client:* Silverlands Ranching Limited *Main project features:* Preparation of an Environmental and Social Impact Assessment for the proposed construction of a Dam in Zimba District, Southern Province (14,000, 000 m^3) of water *Position:* Lead Consultant – **Environmental and Social Expert** *Activities performed:* • Preparation of Scoping Report, Baseline Studies, and Compilation of the ESIA Report, Preparation of Environmental Management and Monitoring Plan (EMMP). • Ecological assessment • Monitor compliance during construction. • Submission of TORs, scoping report, draft ESIA and final ESIA to ZEMA • Meeting with ZEMA to discuss TORs and Scoping Report • Communicating with ZEMA on the progress of the whole ESIA • Attending to ZEMA concerns during site inspection • Periodical meetings with ZEMA inspectors on updates and issues concerning the project • Biodiversity assessments • Prepare monthly summaries of onsite findings and any deviation from EMP and submitting to ZEMA • Communication with Multilateral Investment Guarantee Agency (MIGA) inspectors during site inspection since the project was IFC funded
	Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) *Year:* 2017-2020 *Location:* Zambia *Client:* Luwombwa Irrigation Company *Main Project features:* Preparation of an Environmental and Social Impact Assessment for the proposed Irrigation Dam and Preparation of Resettlement Action Plan (RAP) in Serenje District, Central Province *Position:* Lead Consultant - **Environmental and Social Development Expert** *Activities performed:* • Preparation of Scoping Report, Baseline Studies, and Compilation of the ESIA Report, Preparation of Environmental Management and Monitoring Plan (EMMP). • Monitor compliance during construction. • Preparation of Resettlement Action Plan (RAP)

Detailed Tasks Assigned on Consultant's Team of Experts:	Relevant Project Experience (From most recent):
	- selected projects -
	• Submission of TORs, scoping report, draft ESIA and final ESIA to ZEMA • Meeting with ZEMA to discuss TORs and Scoping Report • Communicating with ZEMA on the progress of the whole ESIA • Attending to ZEMA concerns during site inspection • Periodical meetings with ZEMA inspectors on updates and issues concerning the project • Prepare monthly summaries of onsite findings and any deviation from EMP and submitting to ZEMA
	Environmental and Social Impact Assessment (ESIA) **Name of the Project:** Environment and Social Impact Assessment for a proposed Modern Shopping Mall **Year:** 2016 **Location:** Lusaka, Zambia **Client:** Novare **Main Project features:** Preparation of an Environmental and Social Impact Assessment **Position:** Lead Consultant - Environmental and Social Development Expert **Activities performed:** • Preparation of Scoping report • Baseline studies • Compilation of the ESIA Report • Preparation of Environmental Management Plan (EMP). • Submission of TORs, scoping report, draft ESIA and final ESIA to ZEMA • Meeting with ZEMA to discuss TORs and Scoping Report • Communicating with ZEMA on the progress of the whole ESIA • Attending to ZEMA concerns during site inspection • Periodical meetings with ZEMA inspectors on updates and issues concerning the project • Monitor compliance during construction. • Prepare monthly summaries of onsite findings and any deviation from EMP and submitting to ZEMA
	Environmental and Social Impact Assessment (ESIA) **Name of the Project:** Environment and Social Impact Assessment for a proposed Modern Shopping Mall **Year:** 2016 **Location:** Wooodlands, Lusaka, Zambia **Client:** Vertigo Properties Limited **Main Project features:** Preparation of an Environmental and Social Impact Assessment **Position:** Lead Consultant - **Environmental and Social Development Expert** **Activities performed:** • Preparation of Scoping report • Baseline studies • Compilation of the ESIA Report • Preparation of Environmental Management Plan (EMP).

Detailed Tasks Assigned on Consultant's Team of Experts:	Relevant Project Experience (From most recent):
	- selected projects -
	• Submission of TORs, scoping report, draft ESIA and final ESIA to ZEMA • Meeting with ZEMA to discuss TORs and Scoping Report • Communicating with ZEMA on the progress of the whole ESIA • Attending to ZEMA concerns during site inspection • Periodical meetings with ZEMA inspectors on updates and issues concerning the project • Worked with ZEMA staff during public hearing for the project • Prepare monthly summaries of onsite findings and any deviation from EMP and submitting to ZEMA
	Environmental and Social Impact Assessment (ESIA) *Year:* 2016 *Location:* Northwestern Province, Zambia *Client:* Rural Electrification Authority (REA) *Main project features:* Preparation of an environmental and Social Impact Assessment for proposed Kasanjiku 590MW Mini Hydro Power Project in Mwinilunga District *Position:* Lead Consultant – - **Environmental and Social Development Expert** *Activities performed:* • Preparation of Scoping Report, Baseline Studies, and Compilation of the ESIA Report, Preparation of Environmental Management and Monitoring Plan (EMMP). • Biodiversity assessments • Submission of TORs, scoping report, draft ESIA and final ESIA to ZEMA • Meeting with ZEMA to discuss TORs and Scoping Report • Communicating with ZEMA on the progress of the whole ESIA • Attending to ZEMA concerns during site inspection • Periodical meetings with ZEMA inspectors on updates and issues concerning the project • Monitor compliance during construction. • Prepare monthly summaries of onsite findings and any deviation from EMP and submitting to ZEMA
	Environmental Project Briefs (EPB) *Year:* 2015 *Location:* Zambia *Client:* Rural Electrification Authority (REA) *Main project features:* Preparation of EPBs and associated EMP for thirteen grid extension sites (Mungwi, Kasama, Luwingu, Mpika and Kabwe, Mushindamo, Kabompo and Monze) *Position:* Lead Consultant - - **Environmental and Social Development Expert** *Activities performed:* • Coordinating the baseline assessment, Compilation of the various EPBs and associated EMPs. • Biodiversity assessments • Submission of draft EPBs and final to ZEMA

Detailed Tasks Assigned on Consultant's Team of Experts:	Relevant Project Experience (From most recent):
	- selected projects -
	• Meeting with ZEMA to discuss comments on draft EPBs • Communicating with ZEMA on the progress of the whole process • Attending to ZEMA concerns during site inspection • Communicating with ZEMA on behalf of the client on the progress of EPB review • Periodical meetings with ZEMA inspectors on updates and issues concerning the project • Monitor compliance during construction. • Prepare monthly summaries of onsite findings and any deviation from EMP and submitting to ZEMA
	Name of the Project: Environmental Project Brief for timber harvesting and processing projects in seventeen areas (some of the areas are Mpika, Shiwangandu, Mafinga, Chinsali, Isoka and Chama) **Year:** 2017 **Location:** Zambia **Client:** Various Companies (seventeen in total) **Main project features:** Preparation of EPBs and associated EMPs **Position:** Lead Consultant - **Environmental and Social Development Expert** **Activities performed:** • Coordinating the baseline assessment, Compilation of the various EPBs and associated EMPs. • Submission of draft EPBs and final to ZEMA • Meeting with ZEMA to discuss comments on draft EPBs • Communicating with ZEMA on the progress of the whole process • Accompanying ZEMA inspectors during site inspection/verification • Communicating with ZEMA on behalf of the client on the progress of EPB review • Periodical meetings with ZEMA inspectors on updates and issues concerning the project • Monitor compliance during construction. • Prepare monthly summaries of onsite findings and any deviation from EMP and submitting to ZEMA

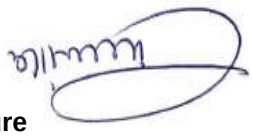
Detailed Tasks Assigned on Consultant's Team of Experts:	Relevant Project Experience (From most recent):
	- selected projects -
	Training in Environmental Impact Assessment *Year:* 2010 *Location:* Copperbelt Province, Zambia *Client:* **Zambia Environmental Management Agency (ZEMA)** *Main project features:* Training of Small-scale mining companies' staff in environmental impact assessment *Position:* Resource Person: Hired by ZEMA *Activities performed:* • Training of small-scale miners in Environmental Impact Assessment and Management. • Was one of the resource person on the training of small scale miners on EIAs. Topics covered - introduction to EIA and EIA process in Zambia • Developed training programme together with ZEMA staff • Compiled training materials together with ZEMA staff.
	Statutory Compliance Audit of the Luezi Dam Project *Year:* 2017 *Location:* Southern Province, Zambia *Client:* *Silverlands Ranching Limited* *Main Project features:* Environmental Audit of the Luezi Dam Project Zimba District *Position:* Lead Consultant – - **Environmental and Social Development Expert** *Activities performed:* • Meeting with ZEMA to discuss the audit process • Biodiversity assessments • Submission of audit report to ZEMA on behalf of the client
	Development of a Green Policy for the Bank of Zambia *Year:* 2017 *Location:* Zambia *Client:* Bank of Zambia *Position:* Consultant – Environmental Sustainability Expert
	Flora and Fauna Inventory for Solar Project Site *Year:* 2017 *Location:* Zambia *Client:* Copperbelt Energy Corporation (CEC) *Main project features:* Collecting baseline data on flora and fauna within the proposed for solar project site *Position:* **Ecologist** *Activities performed:* • Designing of data collection tools and Training of data collectors and data input clerks, Biodiversity assessments

Detailed Tasks Assigned on Consultant's Team of Experts:	Relevant Project Experience (From most recent):
	- selected projects -
	Preparation of Strategic Environmental Impact Assessment (SEA) *Year:* 2017 *Location:* Zambia *Client:* Ministry of Youth and Sports Development *Main project features:* Baseline data collection on socioeconomic and biophysical environment for a Youth Resettlement Programme *Position:* Lead Consultant - **Environmental and Social Development Expert** *Activities performed:* • Supervising, Designing of data collection tools and Training of data collectors and data input clerks. • Worked with ZEMA staff to develop the SEA report
	Socio Economic Survey For Resettlement Of Householders For An Agriculture Project *Year:* 2017 *Location:* Zambia *Client:* ECM Agri Limited *Main project features:* Collection of baseline data on socioeconomic status of the households in the project area *Position:* Consultant *Activities performed:* • Supervising Designing of data collection tools and Training of data collectors and data input clerks
	Resettlement Action Plan (RAP) *Year:* 2016 *Location:* Lufwanyama, Zambia *Client:* ECM Agri Limited *Main project features:* Preparation of the Resettlement Action Plan involving 14 households *Position:* Lead Consultant - **Environmental and Social Development Expert** *Activities performed:* • Conducting Scoping meetings, Negotiating compensations, Compilation of the RAP.
	Environmental and Social Impact Assessment (ESIA) *Year:* 2015 *Location:* Central Province, Zambia *Client:* Silverlands Zambia Limited *Main Project features:* Preparation of an Environmental and Social Impact Assessment for the proposed Conversion of Usage from Forestry to Row Cropping, Luwombwa Block, Serenje District *Position:* Lead Consultant - - **Environmental and Social Development Expert** *Activities performed:* • Preparation of Scoping Report, Baseline Studies, • Compilation of the ESIA Report, Preparation of • Environmental Management and Monitoring Plan (EMMP).
	Environmental Project Brief (EPB) *Year:* 2016 *Location:* Copperbelt Province, Zambia

Detailed Tasks Assigned on Consultant's Team of Experts:	Relevant Project Experience (From most recent):
	- selected projects -
	Client: Hocean Mining Company *Main project features:* Preparation of EPBs and associated EMP for proposed Mini Copper Smelter plants in Kalulushi District *Position:* Lead Consultant - **Environmental and Social Development Expert** *Activities performed:* • Coordinating the baseline assessment, Compilation of the various EPB reports and associated EMPs
	Environmental and Social Impact Assessment (ESIA) *Year:* 2015 *Location:* Central Province, Zambia *Client:* Silverlands Zambia Limited *Main Project features:* Preparation of an Environmental and Social Impact Assessment for the proposed Conversion of Usage from Forestry to Row Cropping, Luwombwa Block, Serenje District *Position:* Lead Consultant - **Environmental and Social Development Expert** *Activities performed:* • Preparation of Scoping Report, Baseline Studies, • Compilation of the ESIA Report, • Environmental Management and Monitoring Plan (EMMP).
	Updating of the Environmental and Social Impact Assessment (ESIA) *Year: 2015* *Location: Southern Province, Zambia* *Client: ZESCO* *Main project features: Updating of the Environmental Impact Assessment of Proposed Kafue Gorge Lower Power Station in Chikankata District* *Position: Local Experts Team Leader / Landuse Planner* *Activities performed:* • Updating of the ESIA, Flora and Fauna assessment, • Landuse assessment.
	Environmental and Social Impact Assessment (ESIA) *Year:* 2015 *Location:* Zambia *Client:* Induna Investment Limited *Main project features:* Preparation of an Environmental and Social Impact Assessment (ESIA) for the proposed Large Timber Concession Project in Kabompo District, Northwestern Province *Position:* Lead Consultant - **Environmental and Social Development Expert** *Activities performed:* • Preparation of Scoping report • Baseline studies • Compilation of the ESIA Report • Preparation of Environmental Management Plan (EMP). • Submission of TORs, scoping report, draft ESIA and final ESIA to ZEMA • Meeting with ZEMA to discuss TORs and Scoping Report • Communicating with ZEMA on the progress of the whole ESIA • Attending to ZEMA concerns during site inspection

Detailed Tasks Assigned on Consultant's Team of Experts:	Relevant Project Experience (From most recent):
	- selected projects -
	• Periodical meetings with ZEMA inspectors on updates and issues concerning the project • Worked with ZEMA staff during public hearing for the project • Prepare monthly summaries of onsite findings and any deviation from EMP and submitting to ZEMA
	Environmental Project Brief (EPB) *Year:* 2015 *Location:* Zambia *Client:* Rural Electrification Authority (REA) *Main project features:* Preparation of EPBs and associated EMPs for grid extension projects in sixteen sites (some of the sites are Chembe, Mpika, Shiwangandu, Kawambwa, Mungwi, Chinsali, Monze, Kasempa, Solwezi, Luampa, Kalomo, Kabwe etc) *Position:* Lead Consultant - **Environmental and Social Development Expert** *Activities performed:* • Compilation of the EPB Reports, • Preparation of Environmental Management and Monitoring Plan (EMMP) • Coordinating the baseline assessment, Compilation of the various EPBs and associated EMPs. • Submission of draft EPBs and final to ZEMA • Meeting with ZEMA to discuss comments on draft EPBs • Communicating with ZEMA on the progress of the whole process • Accompanying ZEMA inspectors during site inspection/verification • Communicating with ZEMA on behalf of the client on the progress of EPB review • Periodical meetings with ZEMA inspectors on updates and issues concerning the project • Prepare monthly summaries of onsite findings and any deviation from EMP and submitting to ZEMA
	Environmental Assessment Course *Year:* 2010 *Location:* Zambia *Client:* Barrick Lumwana Mining Company *Main project features:* Training of Lumwana Mining Company staff in environmental assessment *Position:* Team Leader *Activities performed:* • Vegetation assessment, Fauna assessment, Soil assessment, Climatic data collection, Water assessment

<table>
<tr><td>Detailed Tasks Assigned on Consultant's Team of Experts:</td><td colspan="2">Relevant Project Experience (From most recent):
- selected projects -</td></tr>
<tr><td></td><td colspan="2">Songwe River Transboundary Catchment Management Project
Year: 2008
Location: Malawi, Tanzania
Client: WWF
Main project features: Training of communities in participatory forest resource assessment
Positions held: Lead Facilitator
Activities performed:
• Training 35 persons (community members and government officers) in participatory forest resource assessment
• Prepared the Participatory Forest Resource Assessment Guide</td></tr>
<tr><td></td><td>Reference no.1</td><td>Professor Felix Kalaba Kanungwe
Designation: Dean, School of Natural resources, Kitwe, Zambia
Tel: +260 971771043, Email: kanungwe@cbu.ac.zm/ kanungwe@gmail.com</td></tr>
<tr><td></td><td>Reference no.2</td><td>Mr Ignius Makumba,
Designation: Director, Zambia Forest Department
Tel: +260 966746841, Email: inmakumba@gmail.com,</td></tr>
<tr><td></td><td>Reference no.3</td><td>Mr Edson Nkonde
Designation: Director, Zambia Meteorological Department
Tel: +260 950447111, chiluf@gmail.com,</td></tr>
<tr><td></td><td colspan="2">Declaration:
I confirm my intention to serve in the stated position and present availability to serve for the term of the proposed contract. I also understand that any wilful misstatement described above may lead to my disqualification, before or during my engagement.

 
Signature Date Signed: 01.08.2022</td></tr>
</table>

Name:	**Claired Kipuputwa**
Specialization:	**Environmental management expert**
Date of Birth:	22.08.1981
Country of Citizenship/ Residence:	Zambia

Education:

Institution	Date	Degree(s) or Diploma obtained
Nelson Mandela Metropolitan University, Saasveld, George, South Africa	2010	MTech Forestry
Nelson Mandela Metropolitan University, Saasveld, George, South Africa	2008	BTech Wood Science & Technology
Nelson Mandela Metropolitan University, Saasveld, George, South Africa	2007	Certificate in Advanced Geographic Information Systems
Copperbelt University, Kitwe, Zambia	2006	BSc Wood Science & Technology
University of Zambia	2001	Certificate in Sales & Marketing Management

Employment Record relevant to the assignment:

Period	Employing organization and your title/ position. Contact info for reference	Country	Summary of activities performed relevant to this Assignment
2010 - present	Copperbelt University Lecturer – Timber Structural Design & Construction, Wood Degradation & Protection, Pulp & Paper Technology For references: Dr Francis Munalula, HoD – School of Natural Resources, Francis.munalula@cbu.ac.zm, +260 960453039	Zambia	Lecturing in structural mechanics, structural design, wood-based panel technology, wood preservation and paper technology Research and consultancy Supervision of undergraduate research projects Carrying out forest awareness campaigns to promote sustainable management of forests Daily planning, implementation and supervision of sawmill, pol/timber treale/timber treatment, carpentry and logging operations.
2005-2006	Copperbelt Forestry Company as Assistant Production Manager:		

Membership in Professional Associations and Publications:

Institution	Registration/ Publication
Forestry and Environmental Institute of Zambia	

International publications and conferences (selection) :

Year	Title	Author / Co-Authors	Reference
2008	Use of Near-Infrared Spectroscopy to Predict Wood Properties	Kipuputwa CS, Louw JL	

Language Skills:

Language	Speaking	Reading	Writing
English	Excellent	Excellent	Excellent
Bemba	Very Good	Very Good	Very Good

Kaonde	Very Good	Very Good	Very Good

Some Consultancy Work Undertaken:

Environmental and Social Impact Assessment (ESIA)
Year: 2014
Location: Kafue, Lusaka Province, Zambia
Client: Luangwa Bridge Fish Farm Limited
Main Project features: Preparation of an Environmental and Social Impact Assessment for proposed Integrated Fish Farming Project in Kafue District
Position: Consultant – **Environmental Expert**
Activities performed:

- Preparation of Scoping Report, Baseline Studies and ESIA Report.

Environmental and Social Impact Assessment (ESIA)
Year: 2017
Location: Serenje, Central Province, Zambia
Client: Great North Ranching Limited
Main Project features: Preparation of an Environmental and Social Impact Assessment for proposed construction of fish ponds on Sherrifs Estate in Serenje District
Position: Consultant – **Environmental Expert**
Activities performed: Preparation of Scoping Report, Baseline Studies (soil and water sample collection) and writing of the ESIA Report

Environmental and Social Impact Assessment (ESIA)
Year: 2013
Location: Zambia
Client: Silverlands Ranching Limited
Main project features: Preparation of an Environmental and Social Impact Assessment for the proposed construction of a Dam in Zimba District, Southern Province (14,000, 000 m^3) of water
Position: Consultant – **Environmental Expert**
Activities performed:

- Preparation of Scoping Report, Baseline Studies, and Compilation of the ESIA Report, Preparation of Environmental Management and Monitoring Plan (EMMP).
- Ecological assessment
- Preparation of TORs, scoping report, draft ESIA and final ESIA to ZEMA

Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP)
Year: 2017
Location: Zambia
Client: Luwombwa Irrigation Company
Main Project features: Preparation of an Environmental and Social Impact Assessment for the proposed Irrigation Dam and Preparation of Resettlement Action Plan (RAP) in Serenje District, Central Province
Position: Consultant - **Environmental Expert**
Activities performed:

- Preparation of Scoping Report, Baseline Studies, and Compilation of the ESIA Report, Preparation of Environmental Management and Monitoring Plan (EMMP).
- Attending to ZEMA concerns during site inspection

Environmental Project Briefs (EPB)
Year: 2015
Location: Zambia
Client: Rural Electrification Authority (REA)
Main project features: Preparation of EPBs and associated EMP for thirteen grid extension sites (Mungwi, Kasama, Luwingu, Mpika and Kabwe, Mushindamo, Kabompo and Monze)

Position: Consultant - **Environmental Expert** *Activities performed:* • Participation in the preparation of baseline assessment and EPBs
Name of the Project: Environmental Project Brief for timber harvesting and processing projects in seventeen areas (some of the areas are Mpika, Shiwangandu, Mafinga, Chinsali, Isoka and Chama) **Year:** 2017 **Location:** Zambia **Client:** Various Companies (seventeen in total) **Main project features:** Preparation of EPBs and associated EMPs **Position:** Consultant - **Environmental Expert** **Activities performed:** • Participation in the baseline assessment, Compilation of the various EPBs and associated EMPs.
Environmental and Social Impact Assessment (ESIA) *Year:* 2015 *Location:* Central Province, Zambia *Client:* Silverlands Zambia Limited *Main Project features:* Preparation of an Environmental and Social Impact Assessment for the proposed Conversion of Usage from Forestry to Row Cropping, Luwombwa Block, Serenje District *Position:* Consultant - **Environmental Expert** *Activities performed:* • Preparation of Scoping Report, Baseline Studies, • Compilation of the ESIA Report, Preparation of
Environmental and Social Impact Assessment (ESIA) *Year:* 2015 *Location:* Central Province, Zambia *Client:* Silverlands Zambia Limited *Main Project features:* Preparation of an Environmental and Social Impact Assessment for the proposed Conversion of Usage from Forestry to Row Cropping, Luwombwa Block, Serenje District *Position:* Consultant - **Environmental Expert** *Activities performed:* • Preparation of Scoping Report, Baseline Studies, • Compilation of the ESIA Report,.
Environmental and Social Impact Assessment (ESIA) *Year:* 2015 *Location:* Zambia *Client:* Induna Investment Limited *Main project features:* Preparation of an Environmental and Social Impact Assessment (ESIA) for the proposed Large Timber Concession Project in Kabompo District, Northwestern Province *Position:* Consultant - **Environmental Expert** *Activities performed:* • Preparation of Scoping report • Participated in the Baseline studies writing of the ESIA Report • Worked with ZEMA staff during public hearing for the project
Environmental Project Brief (EPB) *Year :* 2013 *Location:* Zambia *Client :* Rural Electrification Authority (REA) *Main project features:* Preparation of EPBs and associated EMPs for grid extension projects in sixteen sites (some of the sites are Chembe, Mpika, Shiwangandu, Kawambwa, Mungwi, Chinsali, Monze, Kasempa, Solwezi, Luampa, Kalomo, Kabwe etc) *Position:* Consultant - **Environmental and Social Development Expert**

Activities performed:

- Preparation of the EPB Reports the baseline assessment, Compilation of the various EPBs and associated EMPs.

Expert's contact information: e-mail: clairedks@gmail.com phone: +260 973699711

CERTIFICATION

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualifications, and my experience.

Claired S. Kipuputwa 01.08.2022

Name of Expert Signature

Position Title	Ecologist
Name of Expert:	Tom Kamanga
Date of Birth:	13.04.1973
Country of Citizenship/ Residence:	Zambia

Institution	Date	Degree(s) or Diploma obtained
University of Zambia in association with Zambia Forestry College, Kitwe, Zambia.	2019	Bachelor's Degree in Forestry
AWM University College, Kitwe, Zambia	2012	Certificate in Psychosocial counselling
Wildlife Conservation School, Kafue National Park, Mumbwa, Zambia.	1996	Certificate in Environmental Education
Zambia Forestry College, Kitwe, Zambia	1995	Diploma in Forestry

EMPLOYMENT AND CONSULTANCY RECORD

Period	Employing organization and your title/ position. Contact info for reference	Country/ Town	Position	Summary of activities performed relevant to this Assignment
2013 - present	Copperbelt University **TECHNICIAN** – For references: Professor Felix Kalaba, Dean – School of Natural Resources, felix.kalaba@cbu.ac.zm, +260 971771043, Kitwe	Zambia Kitwe	**Technician**	• *Taking students for field practical in Botany tree identification and Forest Resources Assessments and Silvicultural operations.* • *Assisting in Research and consultancy works* • *Assisting lecturers during examination invigilation and teaching specified practical topics.* • *Preparation of samples for use by lecturers and students doing research programs*
2010-2012	Zambia Forestry College Mwekera Kitwe. **INSTRUCTOR** For references: Mr Fred Mulenga, Former Principal, fredmulenga@*gmail*.com, +260 966746841, Lusaka	Zambia Kitwe	**Instructor**	• *Lecturing Wood harvesting, Sawmilling, forest resources assessment.* • *Preparation and marking of tests, assignments and final exams for the courses taught.* • *Taking and organizing students for field operations.*

				• *Supervision of some final year students doing projects in forestry management.*
2008-2010	Copperbelt Forestry Company Kitwe- **Senior Manager** For references: Mr Johnson Sichinga, Director, chiluf@gmail.com, +260 950447111, Lusaka	Zambia Kalulushi	**Operations Manager**	• *Designing Plantation management plans in order to promote sustainability of forests and environment* • *In charge of logging, sawmilling, Engineering, Marketing of the station and thereby advising the Managing Director on how best to run the company.*
2006-2008	Wood processing Industries(WPI) Ndola- Senior Manager Refernce Director Mr RL Patel Tel: 650889	Zambia Ndola	**Plantation /Logging Manager**	• *In -charge of Plantation and wood harvesting activities at WPI.* •
1996-2006	Wood processing Industries(WPI) Ndola	Zambia Ndola	**Logging Supervisor**	• *In charge of Felling, Snedding, Crosscutting and Extraction of raw materials at the Plantation.*
February-March 2019	Luapula Water and Sewerage Company Ecologist For reference Eng. Kenneth Chense Managing Director 0966783385	Samfya Zambia	**Ecologist**	*Environmental Project Brief (EPB) for integrated small towns water supply and sanitation project* • *Flora and fauna surveys* • *Writing flora and fauna reports*
April-May 2019	Luapula Water and Sewerage Company Ecologist For reference Eng. Kenneth Chense Managing Director 0966783385	Kawambwa Zambia	**Ecologist**	*Environmental Project Brief (EPB) for integrated small towns water supply and sanitation project* • *Flora and fauna surveys* • *Writing flora and fauna reports*
May- 2019	Luapula Water and Sewerage Company Ecologist For reference	Mwense Zambia	**Ecologist**	*Environmental Project Brief (EPB) for integrated small towns water supply and sanitation project*

	Eng. Kenneth Chense Managing Director 0966783385			• *Flora and fauna surveys* • *Writing flora and fauna reports*
March-August 2019	Luapula Water and Sewerage Company Ecologist For reference Eng. Kenneth Chense Managing Director 0966783385	Mansa Zambia	**Ecologist**	*Environmental Social Impact Assessment (ESIA) for integrated small towns water supply and sanitation project* • *Flora and fauna surveys* • *Writing flora and fauna reports* • *Writing minutes for scoping and disclosure meetings*
January – March 2018	MINISTRY OF AGRICULTURE Aswell Lubungo, natashaphirilubungo@gmail.com	Luwingu, Zambia	**Flora Consultant**	*Environmental Project Brief (EPB) for the construction of Ntamba Luena Dam in Luwingu district, Northern Province*
July – February 2017	Luangwa Bridge Fish Farm Director: Mr. Jean-Marc de marcdelaminne@gmail.com	Luangwa, Zambia	**Flora and Fauna Consultant**	*Environmental and Social Impact Assessment (ESIA) for a fish farm project* *Flora surveys Social and economic surveys.* *Writings minutes during scoping and disclosure meetings.*
July-2012	Zenith Consulting Company Director: Steve Simwanza stevesimwanza@gmail.com	Kafue, Zambia	**Flora and Fauna Consultant**	*Environmental and Social Impact Assessment (ESIA) for an integrated fish farm project by Kafue Fisheries Limited* *Flora surveys Social and economic surveys.* *Writings minutes during scoping and disclosure meetings.*
February – April 2018	School of Natural Resources, Copperbelt University, Dr. G Kabwe, gkabwe@yahoo.co.uk, Kitwe	Kitwe, Zambia	**Flora specialist**	*Preparation of an EPB for the proposed Solar Project by Copperbelt Energy Corporation (CEC)* *Responsibility for review of the legal framework relevant to the project and flora survey*
December 2017 - update	School of Natural Resources, Copperbelt University, Dr. G Kabwe, gkabwe@yahoo.co.uk	Masaiti, Zambia	**Ecologist**	*Preparation Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) for 66kV Transmission Line Project by CEC*
July 2017 – August 2018	Kasumwa Enviroconsult & General Supplies Ltd Mrs Betty Mwale kasumwa@gmail.com	Serenje, Zambia	**Flora and Fauna Consultant**	*Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) for an irrigation dam*

				project by Luwombwa Irrigation Company *Conducting social and flora survey*
April – September 2017	Great North Ranching Limited Rodger Sherriff rogersherriff@gmail.com	Serenje, Zambia	**Flora Consultant**	*Environmental and Social Impact Assessment for the proposed expansion of centre pivots and construction of fish ponds* • *Coordinating the ESIA activities* • *Stakeholder engagement*

Membership in Professional Associations and Publications:

Institution	Membership No
Forestry Institute and Environment in Zambia	015534 NPO

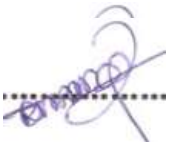
Language Skills:

Language	Speaking	Reading	Writing
English	Excellent	Excellent	Excellent
Bemba	Very Good	Very Good	Good
Tumbuka	Good	Good	Good

Expert's contact information: e-mail: tomkamanga@yahoo.com
Phone: +260 977883638/+260 965883688

CERTIFICATION

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualifications, and my experience.



Tom Kamanga 01.08.2022
Name of Expert

Curriculum Vitae

Name of Expert:		**Chioni Phiri**
Position:		**Social Expert**
Specialisation:		**Climate Change and Sustainable Development**
Total Years of Experience		**8 years**
Country of Citizenship/ Residence:		**Zambia**
Date of Birth	11-04-1989	**Nationality:** Zambia
Countries of Work Experience:	Zambia	
Language Skills:	English	
Knowledge of Local Language	Zambian languages (Chewa, Nyanja, Tumbuka and Bemba,	
Contact:	+260972580756, Email: chionindakasha@gmail.com	

Summary of Experience:
Chioni has over 5 years working experience in Environmental and Social Impact Assessment (ESIA) and Preparation of Resettlement Action Plans (RAP). She specializes in climate change, sustainable development, ESIA preparation, RAP, Landuse planning and environmental governance. Recently worked on several Water and Sanitation projects in Luapula province. She has also worked on other ESIA projects which include; hydropower, grid extension projects, transmission lines, dams, timber processing, shopping malls and factories. Chioni has thorough understanding of the ESIA process in Zambia and the IFC Performance Standards on Environment Health and Safety and IFC requirements on resettlement programmes. Currently, work as a Teacher of Geography at Chibolya Secondary School in Samfya.

Education:

Institution	Date	Degree(s) or Diploma obtained
Copperbelt University, Kitwe, Zambia	January 2018- to date	MSc Climate Change and Sustainable Development
University of Zambia, Lusaka, Zambia	2013	BA Education - Geography

Employment Record:

Period	Employing organization and your title/ position. Contact info for reference	Country	Summary of activities performed
2013 - present	Ministry of Education Chibolya Secondary School Teacher – For references: Charity Chongo Kasanda Headteacher 0977249016	Samfya, Zambia	• Formulating lesson plans and teach those plans to the entire class • Track student progress and present the information to parents • Create tests, create and reinforce classroom rules. • Supervision of study tours to conservation sites • Help design and supervision implementation of Geography projects by pupils
	Ministry of Education Rufunsa Girls Technical School Teacher – For references: Kwibisi Mukumbuta Deputy Headteacher		• Formulating lesson plans and teach those plans to the entire class • Track student progress and present the information to parents • Create tests, create and reinforce classroom rules. • Supervision of study tours to conservation sites • Help design and supervision implementation of Geography projects by pupils
January 2019- September 2019	Kasumwa Enviroconsult & General Supplies Limited Part Time - Consultant For reference: Robby Kasubika Director, robbykasubika@gmail.com/ kasumwa@gmail.com +260979319871	Serenje, Zambia	Preparation Environmental and Social Impact Assessment (ESIA) and RAP for large scale irrigation dam: • Community engagement • Review of agriculture policies relevant to the project • Compilation of the RAP
July 2018 – September 2018	Kasumwa Enviroconsult & General Supplies Limited Part Time - Consultant For reference: Robby Kasubika Director,	Mkushi, Zambia	Preparation Environmental and Social Impact Assessment (ESIA) for commercial farming project. • Community engagement

	robbykasubika@gmail.com/ kasumwa@gmail.com +260979319871		• Review of agriculture policies and other legislation relevant to the project
September 2019-January 2021	Kasumwa Enviroconsult & General Supplies Limited Part Time - Consultant For reference: Robby Kasubika Director, robbykasubika@gmail.com/ kasumwa@gmail.com +260979319871	Serenje, Zambia	Preparation of an Environment and Social Assessment (ESIA) for commercial farming project. • Community engagement • Review of agriculture policies and other legislation relevant to the project • Compilation of the ESIA
November 2019-February 2020	Kasumwa Enviroconsult & General Supplies Limited Part Time - Consultant For reference: Robby Kasubika Director, robbykasubika@gmail.com/ kasumwa@gmail.com +260979319871	Serenje, Zambia	Assessment ESIA commercial farming project. • Community engagement • Review of agriculture policies and other legislation relevant to the project • Compilation of the ESIA • Preparation of Scoping Report, Baseline Studies, • Compilation of the ESIA Report • Preparation of Environmental Management Plan (EMP).
February 2019-March 2019	Kasumwa Enviroconsult & General Supplies Limited Part Time - Consultant For reference: Robby Kasubika Director, robbykasubika@gmail.com/ kasumwa@gmail.com +260979319871	Samfya, Zambia	EPB for Integrated Small Towns Water Supply and Sanitation Project for Luapula Water and Sewerage Company (LpWSC) funded by AfDB: • Coordination of all the EPB activities • Preparation of Scoping Report, Baseline Studies, • Compilation of the EPB Report • Preparation of Environmental Management Plan (EMP).

			• Communicating with ZEMA on the progress of the whole EPB • Attending to ZEMA comments on the draft EPB
April 2019-May 2019	Kasumwa Enviroconsult & General Supplies Limited Part Time - Consultant For reference: Robby Kasubika Director, robbykasubika@gmail.com/ kasumwa@gmail.com +260979319871	Kawambwa, Zambia	EPB for Integrated Small Towns Water Supply and Sanitation Project for Luapula Water and Sewerage Company (LpWSC) funded by AfDB: • Preparation of Scoping Report, Baseline Studies, • Compilation of the EPB Report • Preparation of Environmental Management Plan (EMP). • Communicating with ZEMA on the progress of the whole EPB • Attending to ZEMA comments on the draft EPB
May 2019-May 2019	Kasumwa Enviroconsult & General Supplies Limited Part Time - Consultant For reference: Robby Kasubika Director, robbykasubika@gmail.com/ kasumwa@gmail.com +260979319871	Mwense, Zambia	EPB for Integrated Small Towns Water Supply and Sanitation Project for Luapula Water and Sewerage Company (LpWSC) funded by AfDB: • Compilation of the EPB Report • Preparation of Environmental Management Plan (EMP). • Communicating with ZEMA on the progress of the whole EPB • Attending to ZEMA comments on the draft EPB
March 2019-August 2019	Kasumwa Enviroconsult & General Supplies Limited Part Time - Consultant For reference: Robby Kasubika Director, robbykasubika@gmail.com/ kasumwa@gmail.com +260979319871	Mansa, Zambia	Environmental and Social Impact Assessment (ESIA) Integrated Small Towns Water Supply and Sanitation Project for LpWSC funded by AfDB: • Preparation of Scoping Report and Terms of Reference • Baseline Studies,

			• Compilation of the ESIA Report • Preparation of Environmental and Social Management Plan (ESMP) & ESMoP • Meeting with ZEMA to discuss TORs and Scoping Report
September 2019-December 2019	Kasumwa Enviroconsult & General Supplies Limited Part Time - Consultant For reference: Robby Kasubika Director, robbykasubika@gmail.com/ kasumwa@gmail.com +260979319871	Lufwanyama, Zambia	Preparation of a Resettlement Action Plan (RAP) for Chibuluma Mines Tailing Storage facility project • Community engagement • Crop surveys • Compilation of the RAP • Review of the legal framework
January 2018-March 2018	Kasumwa Enviroconsult & General Supplies Limited Part Time - Consultant For reference: Robby Kasubika Director, robbykasubika@gmail.com/ kasumwa@gmail.com +260979319871	Luwingu, Zambia	Environmental Project Brief (EPB) for the construction of Ntamba Luena irrigation Dam for Ministry of Agriculture • Community engagement • Livelihood assessments • Compilation of the EPB
April/2018-July/2018	Kasumwa Enviroconsult & General Supplies Limited Part Time - Consultant For reference: Robby Kasubika Director, robbykasubika@gmail.com/ kasumwa@gmail.com +260979319871	Chipata, Zambia	Environmental Project Brief for the proposed construction of a 7.0 Million Bulk Fuel Storage Facility for TAZAMA • Preparation of Scoping Report and Terms of Reference • Baseline Studies, • Compilation of the ESIA Report • Preparation of Environmental and Social Management Plan (ESMP) & ESMoP • Meeting with ZEMA to discuss TORs and Scoping Report

			• Communicating with ZEMA on the Periodical meetings with ZEMA inspectors on updates and issues concerning the project
July 2017 – February 2017	Kasumwa Enviroconsult & General Supplies Limited Part Time - Consultant For reference: Robby Kasubika Director, robbykasubika@gmail.com/ kasumwa@gmail.com +260979319871	Luangwa, Zambia	Environmental and Social Impact Assessment (ESIA) for a fish farm project • Preparation of Scoping Report and Terms of Reference • Baseline Studies, • Compilation of the ESIA Report • Preparation of Environmental and Social Management Plan (ESMP) & ESMoP • Meeting with ZEMA to discuss TORs and Scoping Report • Communicating with ZEMA on the progress of the whole ESIA

Reference no.1	Professor Felix Kalaba, *Designation:* Dean – School of Natural Resources, *The Copperbelt University, Kitwe, Zambia.* *Telephone:* +260 971771043/ +260 961011783*; Email:* kanungwe@cbu.ac.zm/kanungwe@gmail.com.
Reference no.2	Mr. Robby Kasubika, Director – Kasumwa Enviroconsult & General Supplies Ltd, 120, Geddes Street, Nkana East, Kitwe, Phone: +260979319871 Email: robbykasubika@gmail.com
Reference no.3	Dr. Vincent Nyirenda, Coordinator – Graduate Studies, School of Natural Resources Copperbelt University, P.O Box 21692, Kitwe, Phone: +260977352035, Email: vrnyirenda@hotmail.com,

	Declaration: I confirm my intention to serve in the stated position and present availability to serve for the term of the proposed contract. I also understand that any wilful misstatement described above may lead to my disqualification, before or during my engagement. Signature  Date Signed: **16.06.2022**

Curriculum Vitae

Name of Expert:	Dr. Dina M. Kaingu
Position:	Agronomist
Specialisation:	Land use Specialist
Total Years of Experience	12 Years
Country of Citizenship/ Residence:	Zambia
Date of Birth:	17.04.1981
Countries of Work Experience:	Zambia
Language Skills:	English, Nyanja, Bemba, Tonga, and Lozi
Contact:	+260973451461, dinapopo2000@yahoo.com

Education:

Institution	Date	Degree(s) or Diploma obtained
Stellenbosch University, Cape Town, South Africa	currently	PhD Public and Development Management
University of Life Sciences, Norway.	2017	Semester certificate (Research methods, Poverty, Academic writing and Ecology and society)
University of Zambia, Lusaka, Zambia	2009	MSc Agronomy
University of Zambia, Lusaka, Zambia	2005	BSc Agriculture

Summary of Experience:
Dina is in her final year of her PhD in Public development and management at Stellenbosch University. Her research focuses on land use in protected areas and how local communities benefit from the various land uses available and how the environment is in turn impacted She has over 12 years working experience in Land use suitability, with a bias towards soil science. Dina specializes in Land use suitability for specific purposes. She has worked as part of Environmental and Social Impact Assessment (EISA) teams to advice on the suitability of the soil for particular, including the Agricultural expansion project within Somawhe estates, Mpongwe district, Copperbelt Province.

Employment Record relevant to the assignment:

Period	Employing organization and your title/ position. Contact info for reference	Country	Summary of activities performed relevant to this Assignment

2011 - present	Copperbelt University- Lecturer (Plant and Environmental Management) For references: Professor Felix Kalaba, Dean – School of Natural Resources, kanungwe@cbu.ac.zm/kanungwe@gmail.com, +260 971771043, +260 961011783	Zambia	• Lecturing students in Agronomy and land use management courses (Soil science, crop science, and horticulture) • Research and consultancy • Community service • Supervision of undergraduate research projects • Conducting, analysing and interpreting soil chemical, biological and physical characteristics • Recommending crop suitability for various environments • Recommending soil amendment strategies to improve crop productivity • Recommending land use suitability
2008-2011	Zambia Agricultural Research Institute- Agricultural Research Officer For references: Mr Moses Mwale, Director, mwalemp@yahoo.com, +260 966766395		

Membership in Professional Associations and Publications:

Institution	Registration/ Publication
	Membership No.
• Agricultural Institute of Zambia	
• Soil Science Society of America	360063
• American Society of Agronomy	360063
• Crop Science Society of America	360063

International publications and conferences (selection) :

Year	Title	Author / Co-Authors	Reference
2019	Conservation and Livelihoods in Protected areas; a case study of Mumbwa Game Management Area	Dina Mambwe	Proceedings of the 2019 Land and Resource Governance Research Symposium
2013	The Agronomic Effectiveness of manure extracts of Tithonia and Comfrey	Mambwe, D. and O. A. Yerokun.	African Crop Science Society Conference, 14 - 17 th October, 2013. Entebe, Uganda
2007	An evaluation of spectroscopic and loss on ignition methods for estimating soil organic carbon in Zambian soils.	Yerokun, O.A., D. Mambwe and S. Chikuta	*International Journal of Agricultural Research*. 2: 965
2007	Influence of planting time and moisture availability on N and K requirement of paprika (*Capsicum annuum* L.). pp 173 – 174.	Yerokun, O.A., D. Mambwe and S. Chikuta	Proc. First Biennial Meeting of the Regional Universities Forum for Capacity Building in Agriculture, 23 – 27 April 2007, Mangochi, Malawi. RUFORUM Working Document No. 2.
2006	Effects of nitrogen and potassium application on growth and yield of paprika (Capsicum anuum L.).	Yerokun, O.A., Mambwe,D. and Chikuta, S.	*Zambian Journal of Agricultural Sciences*. 8(2):34-

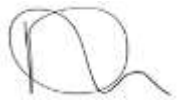
Adequacy for the Environmental Related Assignments:

Detailed Tasks Assigned on Consultant's Team of Experts:	Relevant Project Experience (From most recent): - selected projects -
OVERALL RESPONSIBILITIES FOR: Soil analysis and interpretation	**Environmental and Social Impact Assessment (ESIA)** *Year:* 2014 *Location:* Mpongwe, Copperbelt Province, Zambia *Client:* Somawhe estates, Mpongwe *Main Project features:* Preparation of an environmental and Social Impact Assessment report *Position:* Agronomist/ soil science Expert

Detailed Tasks Assigned on Consultant's Team of Experts:	**Relevant Project Experience (From most recent): - selected projects -**
Preparation of soils and crops section Recommending land use suitability of the project	**Activities performed:** Soil analysis interpretation Preparation of soils and crop section
	Environmental and Social Impact Assessment (ESIA) *Year:* 2014 *Location:* Kafue, Lusaka Province, Zambia *Client:* Luangwa Bridge Fish Farm Limited *Main Project features:* Preparation of an environmental and Social Impact Assessment report *Position:* soil science Expert **Activities performed:** Soil analysis interpretation Preparation of soils section
	Land use suitability assessment *Year:* 2011 *Location:* Mkushi, Muchinga Province, Zambia *Client:* *Zambeef PLC* *Main Project features:* Preparation of a report on the suitability of 2000 ha of land for growing palm oil trees *Position:* Lead Consultant – **Agronomist** **Activities performed:** Preparation of land use suitability report , Soil testing and analysis, Recommendations on palm oil tree management
	Songwe River Transboundary Catchment Management Project *Year:* 2008 *Location:* Malawi, Tanzania *Client:* WWF *Main project features*: Training of communities in participatory forest resource assessment *Positions held*: Lead Facilitator *Activities performed:* • Training 35 persons (community members and government officers) in participatory forest resource assessment • Prepared the Participatory Forest Resource Assessment Guide
Reference no.1	Professor Felix Kalaba Kanungwe Designation: Dean, School of Natural resources, Kitwe, Zambia Tel: +260 971771043, Email: kanungwe@cbu.ac.zm/ kanungwe@gmail.com
Reference no.2	Mr Moses Mwale, Designation: Director, Zambia Agricultural Research Institute Tel: +260 966766395, Email: mwalemp@yahoo.com,

Detailed Tasks Assigned on Consultant's Team of Experts:	**Relevant Project Experience (From most recent): - selected projects -**
Reference no.3	Prof O.A Yerokun Designation: Former Deput Vice Chancellor, Zambian Open University. Tel: +260977779506, oyerokun1@yahoo.com,

Declaration:
I confirm my intention to serve in the stated position and present availability to serve for the term of the proposed contract. I also understand that any wilful misstatement described above may lead to my disqualification, before or during my engagement.



Signature

Date signed: **06.06.2022**

Name of Expert:	Twange Maluba
Position:	Environmental Officer
Specialisation:	Environmental Engineering
Total Years of Experience	2 Years
Country of Citizenship/ Residence:	Zambia
Date of Birth:	25.04.1996
Countries of Work Experience:	Zambia
Language Skills:	English and Bemba
Computer Skills:	Microsoft Word, Excel
Contact:	+260974382316, twangemalubanachi@gmail.com

Education:

Institution	Date	Degree(s) or Certificate obtained
Copperbelt University, Kitwe, Zambia	2020	BSc Environmental Engineering
Luanshya Girls Secondary School	2013	Grade 12 Certificate

Summary of Experience:
Twange is a young professional with a degree in Environmental Engineering from the Copperbelt University. She has two years of work experience with a consultancy in carrying out Environmental and Social Impact Assessments (ESIAs) Some of her current work experience include collaborating on the preparation of an ESIA for the Zambia Water and Sanitation Project in Chingola, Mufulira and Chililabombwe for Mulonga Water Supply and Sanitation Company and the Integrated Small Towns Water Supply and Sanitation project in Mansa, Samfya, Mwense and Kawambwa, Preparation of an Environmental Project Brief for Xantium Dairies for the construction of a Biosecurity trench and the preparation of an Environmental Project Brief for China Henan International Cooperation Co. Limited(CHICO) for the establishment of a campsite in Chingola District.

Employment Record relevant to the assignment:

Period	Employing organization and your title/ position. Contact info for reference	Country	Summary of activities performed
March 2021 Ongoing	**Kasumwa Enviroconsult & General Supplies Limited** **Full Time – Environmental Officer** **For reference:** **Robby Kasubika** **Director,** **robbykasubika@gmail.com/** **kasumwa@gmail.com** **+260979319871**	**(Mufulira, Chingola, Chililabombwe), Zambia**	Environmental and Social Impact Assessment (ESIA) Zambia Water and Sanitation Project for Mulonga Water and Sanitation Company(MWSC) funded by European Investment Bank(EIB): • Technical Assessment of Project • Stakeholder Engagement • Baseline Studies including site verification • Compilation of the ESIA Report • Preparation of Environmental and Social Management Plan (ESMP) & Environmental and Social Monitoring Plan (ESMoP) • Meeting with ZEMA to discuss TORs and Scoping Report

January 2021-February 2021	**Kasumwa Enviroconsult & General Supplies Limited** **Full Time – Environmental Officer** **For reference:** **Robby Kasubika** **Director,** **robbykasubika@gmail.com/** **kasumwa@gmail.com** **+260979319871**	**Chingola, Zambia**	Environmental Project Brief (EPB) for China Henan International Cooperation (CHICO): • Preparation of Scoping Report, Baseline Studies, • Compilation of Environmental and Social Impact Assessment (ESIA) Report • Preparation of Environmental Management Plan (EMP). • Communicating with ZEMA on the progress of the whole EPB
January 2021-February 2021	**Kasumwa Enviroconsult & General Supplies Limited** **Full Time – Environmental Officer** **For reference:** **Robby Kasubika** **Director,** **robbykasubika@gmail.com/** **kasumwa@gmail.com** **+260979319871**	**Lufwanyama Zambia**	EPB for Xantium Dairies Zambia Limited: • Compilation of the Environmental and Social Impact Assessment Report (ESIA) Report • Preparation of Environmental Management Plan (EMP). • Communicating with ZEMA on the progress of the whole EPB • Attending to ZEMA comments on the draft EPB
March 2019-August 2019	**Kasumwa Enviroconsult & General Supplies Limited** **Full Time - Intern** **For reference:** **Robby Kasubika** **Director,** **robbykasubika@gmail.com/** **kasumwa@gmail.com** **+260979319871**	**Mansa, Zambia**	Environmental and Social Impact Assessment (ESIA) Integrated Small Towns Water Supply and Sanitation Project for LpWSC funded by AfDB: • Compilation of the ESIA Report • Preparation of Environmental and Social Management Plan (ESMP) & ESMoP • Meeting with ZEMA to discuss TORs and Scoping Report
May 2019-May 2019	**Kasumwa Enviroconsult & General Supplies Limited** **Part Time - Intern** **For reference:** **Robby Kasubika** **Director,** **robbykasubika@gmail.com/** **kasumwa@gmail.com** **+260979319871**	**Mwense, Zambia**	EPB for Integrated Small Towns Water Supply and Sanitation Project for Luapula Water and Sewerage Company (LpWSC) funded by AfDB: • Preparation of Scoping Report, Baseline Studies, • Compilation of the ESIA Report • Preparation of Environmental Management Plan (EMP).

			• Communicating with ZEMA on the progress of the whole EPB • Attending to ZEMA comments on the draft EPB
April 2019-May 2019	**Kasumwa Enviroconsult & General Supplies Limited** **Part Time - Intern** **For reference:** **Robby Kasubika** **Director,** **robbykasubika@gmail.com/** **kasumwa@gmail.com** **+260979319871**	**Kawambwa, Zambia**	EPB for Integrated Small Towns Water Supply and Sanitation Project for Luapula Water and Sewerage Company (LpWSC) funded by AfDB: • Compilation of the ESIA Report • Preparation of Environmental Management Plan (EMP). • Communicating with ZEMA on the progress of the whole EPB • Attending to ZEMA comments on the draft EPB
February 2019-March 2019	**Kasumwa Enviroconsult & General Supplies Limited** **Part Time - Intern** **For reference:** **Robby Kasubika** **Director,** **robbykasubika@gmail.com/** **kasumwa@gmail.com** **+260979319871**	**Samfya, Zambia**	EPB for Integrated Small Towns Water Supply and Sanitation Project for Luapula Water and Sewerage Company (LpWSC) funded by AfDB: • Coordination of all the EPB activities • Compilation of the ESIA Report • Preparation of Environmental Management Plan (EMP). • Communicating with ZEMA on the progress of the whole EPB • Attending to ZEMA comments on the draft EPB
Reference 01	**Mr. Robby Kasubika** **Director – Kasumwa Enviroconsult & General Supplies Ltd** **Phone: +260979319871** **Email: robbykasubika@gmail.com**		
Reference 02	**Dr. Cuthbert Casey Makondo** **Lecturer – Copperbelt University (Phone number: +260763665320)** **Environmental Engineering Department** **Email: simplycuthbert@live.co.uk**		

Declaration:
I confirm my intention to serve in the stated position and present availability to serve for the term of the proposed contract. I also understand that any wilful misstatement described above may lead to my disqualification, before or during my engagement.

Signature:  **Date Signed: 01.08.2022**

Name of Expert:	Mukonde Chuula
Position:	Environmental Officer
Specialisation:	Environmental and Social Management
Total Years of Experience	2 Years
Country of Citizenship/ Residence:	Zambia
Date of Birth:	15.08.1996
Countries of Work Experience:	Zambia
Language Skills:	English and Bemba
Computer Skills:	Microsoft Word, Excel
Contact:	+260972121373, mukondechuula3@gmail.com

Education:

Institution	Date	Degree(s) or Certificate obtained
University of Zambia, Lusaka, Zambia	2018	BSc Environmental Education
St Marceline's Secondary School	2013	Grade 12 Certificate

Summary of Experience:
Mukonde is a young professional with a degree in Environmental Education from the University of Zambia. She has two years of work experience with a consultancy in carrying out Environmental and Social Impact Assessments (ESIAs) and Preparation of Resettlement Action Plans (RAP). Some of her current work experience include collaborating on the preparation of an ESIA for the Integrated Small Towns Water Supply and Sanitation project in Mansa, Samfya, Mwense and Kawambwa, Preparation of an Environmental Project Brief for China Henan International Cooperation Co. Limited (CHICO) for the establishment of a campsite in Mufulira District. She also serves as Secretary for the Community Welfare Assistant Committee (CWAC).

Employment Record:

Period	Employing organization and your title/ position. Contact info for reference	Country	Summary of activities performed
March 2021 August 2021	**Kasumwa Enviroconsult & General Supplies Limited Full Time – Environmental Officer** **For reference:** **Robby Kasubika** **Director,** **robbykasubika@gmail.com/** **kasumwa@gmail.com** **+260979319871**	**(Mufulira, Chingola, Chililabombwe), Zambia**	Environmental and Social Impact Assessment (ESIA) Zambia Water and Sanitation Project for Mulonga Water and Sanitation Company(MWSC) funded by European Investment Bank(EIB): • Technical Assessment of Project • Stakeholder Engagement • Baseline Studies including site verification • Compilation of the ESIA Report • Preparation of Environmental and Social Management Plan (ESMP) & Environmental and Social Monitoring Plan (ESMoP) • Meeting with ZEMA to discuss TORs and Scoping Report
Ongoing from	**Kasumwa Enviroconsult & General Supplies Limited**	**Mufulira, Zambia**	Environmental Project Brief (EPB) for China Henan International Cooperation (CHICO):

February 2021	**Full Time – Environmental Officer** **For reference:** **Robby Kasubika** **Director,** **robbykasubika@gmail.com/** **kasumwa@gmail.com** **+260979319871**		• Preparation of Scoping Report, Baseline Studies, • Compilation of Environmental and Social Impact Assessment (ESIA) Report • Preparation of Environmental Management Plan (EMP). • Communicating with ZEMA on the progress of the whole EPB
August 2019- October 2020	**Kasumwa Enviroconsult & General Supplies Limited** **Full Time – Environmental Officer** **For reference:** **Robby Kasubika** **Director,** **robbykasubika@gmail.com/** **kasumwa@gmail.com** **+260979319871**	**Lufwanyama, Zambia**	Preparation of a Resettlement Action Plan (RAP) for Chibuluma Mines Tailing Storage facility project • Community engagement • Crop surveys • Compilation of the RAP • Review of the legal framework
January 2019- September 2019	**Kasumwa Enviroconsult & General Supplies Limited** **full Time - Consultant** **For reference:** **Robby Kasubika** **Director,** **robbykasubika@gmail.com/** **kasumwa@gmail.com** **+260979319871**	**Serenje, Zambia**	Preparation Environmental and Social Impact Assessment (ESIA) and RAP for large scale irrigation dam: • Community engagement • Review of agriculture policies relevant to the project • Compilation of the RAP
Ongoing from September 2019	**Kasumwa Enviroconsult & General Supplies Limited** **Full time - Consultant** **For reference:** **Robby Kasubika** **Director,** **robbykasubika@gmail.com/** **kasumwa@gmail.com** **+260979319871**	**Serenje, Zambia**	Preparation of an Environment and Social Assessment (ESIA) for commercial farming project. • Community engagement • Review of agriculture policies and other legislation relevant to the project • Compilation of the ESIA
Ongoing from November 2019	**Kasumwa Enviroconsult & General Supplies Limited** **Full Time - Consultant** **For reference:** **Robby Kasubika** **Director,** **robbykasubika@gmail.com/** **kasumwa@gmail.com** **+260979319871**	**Serenje, Zambia**	Assessment ESIA commercial farming project. • Community engagement • Review of agriculture policies and other legislation relevant to the project • Compilation of the ESIA • Preparation of Scoping Report, Baseline Studies, • Compilation of the ESIA Report

			• Preparation of Environmental Management Plan (EMP).
February 2019-March 2019	**Kasumwa Enviroconsult & General Supplies Limited Full Time - Consultant** **For reference:** **Robby Kasubika** **Director,** **robbykasubika@gmail.com/** **kasumwa@gmail.com** **+260979319871**	**Samfya, Zambia**	EPB for Integrated Small Towns Water Supply and Sanitation Project for Luapula Water and Sewerage Company (LpWSC) funded by AfDB: • Coordination of all the EPB activities • Preparation of Scoping Report, Baseline Studies, • Compilation of the ESIA Report • Preparation of Environmental Management Plan (EMP). • Communicating with ZEMA on the progress of the whole EPB • Attending to ZEMA comments on the draft EPB
April 2019-May 2019	**Kasumwa Enviroconsult & General Supplies Limited Full Time - Consultant** **For reference:** **Robby Kasubika** **Director,** **robbykasubika@gmail.com/** **kasumwa@gmail.com** **+260979319871**	**Kawambwa, Zambia**	EPB for Integrated Small Towns Water Supply and Sanitation Project for Luapula Water and Sewerage Company (LpWSC) funded by AfDB: • Coordination of all the EPB activities • Preparation of Scoping Report, Baseline Studies, • Compilation of the ESIA Report • Preparation of Environmental Management Plan (EMP). • Communicating with ZEMA on the progress of the whole EPB • Attending to ZEMA comments on the draft EPB
May 2019-May 2019	**Kasumwa Enviroconsult & General Supplies Limited Part Time - Consultant** **For reference:** **Robby Kasubika** **Director,** **robbykasubika@gmail.com/** **kasumwa@gmail.com** **+260979319871**	**Mwense, Zambia**	EPB for Integrated Small Towns Water Supply and Sanitation Project for Luapula Water and Sewerage Company (LpWSC) funded by AfDB: • Coordination of all the EPB activities • Preparation of Scoping Report, Baseline Studies, • Compilation of the ESIA Report • Preparation of Environmental Management Plan (EMP). • Communicating with ZEMA on the progress of the whole EPB • Attending to ZEMA comments on the draft EPB
March 2019-August 2019	**Kasumwa Enviroconsult & General Supplies Limited Full Time - Consultant** **For reference:** **Robby Kasubika** **Director,** **robbykasubika@gmail.com/**	**Mansa, Zambia**	Environmental and Social Impact Assessment (ESIA) Integrated Small Towns Water Supply and Sanitation Project for LpWSC funded by AfDB: • Preparation of Scoping Report and Terms of Reference • Baseline Studies, • Compilation of the ESIA Report

	kasumwa@gmail.com +260979319871		• Preparation of Environmental and Social Management Plan (ESMP) & ESMoP • Meeting with ZEMA to discuss TORs and Scoping Report
2017-2018	**Kalulushi General Hospital-intern- Health Promotion**	**Kalulushi, Zambia**	• Community health education and sensitization on selected environmental health issues • Monitoring food safety and hygiene • Clinical waste management produced by the Kalulushi General Hospital
Reference no.1	**Mr. Robby Kasubika, Director – Kasumwa Enviroconsult & General Supplies Ltd Room 92, Afcom House, Kitwe, Phone: +260979319871 Email: robbykasubika@gmail.com**		
Reference no.2	**Mr. Kondwani Kapinga (Lecturer- Zambia Forestry College) Phone number: +260 954 013235/+260 965 268215 Email: mwanzakonny@gmail.com, kondwanikapinga@yahoo.com**		
Reference no.3	**Mr. Timothy, K. Phiri (Lecturer/ Program coordinator) Phone number: +260977328864 Email: timothykamuzu@yahoo.com UNIVERSITY OF ZAMBIA**		
Declaration: I confirm my intention to serve in the stated position and present availability to serve for the term of the proposed contract. I also understand that any wilful misstatement described above may lead to my disqualification, before or during my engagement. Signature:  Date Signed: 28.10.2021			