



GOVERNMENT OF THE REPUBLIC OF ZAMBIA



ROAD DEVELOPMENT AGENCY



CONSULTANCY SERVICES FOR DETAILED DESIGN, PREPARATION OF TENDER DOCUMENTS AND SUPERVISION OF REHABILITATING AND UPGRADING OF APPROXIMATELY 117 KM OF SOLWEZI TO KIPUSHI ROAD IN NORTH-WESTERN PROVINCE

ENVIRONMENT AND SOCIAL IMPACT ASSESSMENT REPORT

May 2026

EXECUTIVE SUMMARY

Border Way Limited plans the construction and operation of the Solwezi to Kipushi Road in Northwestern Province under a Public Private Partnership. The proposed development comes with a Toll Gate and Weigh Bridge at a location to be agreed with the local authority of Mushindamo district.

Borderway intends to invest about US\$500 million. The Solwezi to Kipushi project is promoted by the South West China Business Association who holds xx% shares under Borderway Limited, xx% shares held by the Zambian Government, x% shares are held by xxx Limited.

The objective of the project is the efficient and economical transportation of cargo' from the SADC region into the Katanga Copper Rich region of the Democratic Republic of the Congo (DRC).

Borderway Limited commissioned BCHOD Consulting Engineers to Conduct an Environmental and Social Impact Assessment for its proposed road development project and draw its Environmental Management Plans.

Regulations and Legislation

All legislation and regulations stipulated in this report are those relevant to this project. The legislation identified as critical to the implementation of this project are the following:

- The Environmental Management Act No. 12 of 2011 sections 29, 63, 46 and 59,
- The Environmental Management (Licencing Regulations) Part 3 Waste Management, Part 2 Air and Water
- Environmental Impact Assessment Regulations (Statutory Instrument No 28) of 1997 of the Environmental Protection and Pollution Control Act No 12 of 1990
- The Urban and Regional Planning Act Chapter 15,
- The Conversion of Title Act, The Local Government Act,
- The Explosives Act,
- The Water Resources Management Act No 12 of 2011,
- The Roads and Road Traffic Act 2002,
- The Public Private Partnership Act
- The National Heritage Conservation Commission Act No. 23 of 1989, and National Heritage Conservation Commission Amendment Act No. 13 of 1994
- Forest Act No 4 of 2015
- The Public Health Act. Cap 295

In addition to these, relevant international regulations and protocols will be considered.

The ESIA Study

The ESIA study was conducted and it consisted of the following phases:

- Scoping meetings
- Development of Terms of Reference;
- Review of documents and literature related to the project and in particular the Solwezi to Kipushi PPP road proposed operations;
- Socio-economic analysis of the neighboring settlements along project road
- A Biophysical Baseline study;
- Impact assessment of bio-physical and socio-economic environments; and
- Compilation of Social and Environmental Management Plans.

Project Activities

The project activities planned will include the following:

- Development of construction camp
- Site clearance and preparation
- Construction Phase
- Operational Phase

Identified Impacts and Mitigation measures

The potential impacts of the proposed Solwezi to Kipushi Road Project identified are as follows

The positive impacts:

- More cost-effective transportation of goods and services from the SADC region to the DRC markets.
- Significantly less wear and damage to the existing roads vehicles using the Solwezi to Kipushi Road.
- Less cost and responsibility for the Zambian Government, committed to maintain the public transport system, which fully supports the proposed construction model.

- Future direct access to the DRC markets.
- Stimulus to the growth of other potential and un-exploited opportunities, by enhancing the business case and providing cost effective transportation/export potential, i.e. a stimulus to the Zambian and Regional economies.
- Impacts on the local and National economy 9 increased income for the Government and the local authorities through payment of taxes and other levies
- Impacts on local community through creation of jobs and social welfare

The negative impacts:

- Impacts on land and soil
- Impacts on air quality
- Impacts on surface water
- Impacts on ground water
- Impacts on health and safety
- Loss of arable agricultural land for peasant farmers
- Impacts on Public Health and Safety
- Impacts on Land use and Ecosystem services.

Measures to mitigate the potential negative impacts of the construction and operations of the Solwezi to Kipushi where they arise have been recommended.

Environmental Management and Monitoring

In order to ensure successful implementation of mitigation measures, parameter monitoring and subsequent audits, Environmental Management Plans, Environmental Monitoring Plans and Social Management Plans have been proposed.

Principal Members of the Impact Assessment Team Comprised of the following:

Table 1: EIA Team

Company Name	Ng'andu Consulting Engineers
Civil Engineers & Team Leader	Eng George Sitali

Environmental Management Specialist	Mr. Albert L Mutale
Pavement Engineer	Eng Tresphor Musonda
Socio-Economic Baseline & Stakeholder Engagement	Mr David Chali
Natural Resource Specialist	Mr Jacob Tembo

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1.0 CHAPTER ONE INTRODUCTION AND BACKGROUND

1.1 Introduction

In line with the Zambian Government's vision of transforming Zambia from a landlocked country to a truly land linked country, the Southwest Chinese Business Association of Zambia proposes to upgrade the Solwezi to Kipushi Border Road (D271) in North-Western Province. The project road starts at T5/D271 junction (approximately 15km south - east of Solwezi town) and traverses in the northeasterly direction to Kipushi Border Post on the Zambia – Democratic Republic of Congo (DRC) Border. The existing road is a gravel road, which is presently in poor condition, therefore, the proposed project shall upgrade the road to bituminous standard. To ensure improved and efficient cross border trade at Kipushi Border Post, the project includes the development of a One-Stop Border (OSBP) Facility on the Zambian side. A similar facility may have to be developed on the DRC side of the border under a separate programme to guarantee maximum efficiency of operations.

The Solwezi to Kipushi road, is a critical link between Zambia and Congo DR which has been in a deplorable state for far too long, leaving it virtually impassable, especially during the unforgiving rainy season. Despite its poor state, it is a crucial link that holds immense potential for the communities residing in Mushindamo area and beyond. Moreover, it serves as an important trade route, connecting the North-Western Province of Zambia to the Democratic Republic of Congo (DRC), a critical market for Zambian businesses and nation intertwined with its neighboring counterpart in terms of commerce, culture, and history.

1.1 Project Rationale

The Solwezi to Kipushi road, is a critical link between Zambia and Congo DR which has been in a deplorable state for far too long, leaving it virtually impassable, especially during the unforgiving rainy season. Despite its poor state, it is a crucial link that holds immense potential for the communities residing in Mushindamo area and beyond. Moreover, it serves as an important trade route, connecting the North-Western Province of Zambia to the Democratic Republic of Congo (DRC), a critical market for Zambian businesses and nation intertwined with its neighboring counterpart in terms of commerce, culture, and history.

The Solwezi – Kipushi Toll Road (SKTR) Project will not only provide an alternative route for traffic transiting to and from Lubumbashi but also decongest Kasumbalesa Border Post which has been overwhelmed in the recent years. The project road will provide thousands of new jobs and business opportunities for Small and Medium Enterprises (SME's) in the North-Western, serving an estimated population of four million people in the surrounding areas. The proposed SKTR project road and border post will provide a fast and direct route to and from Lubumbashi. It is envisaged that Zambian SME's will develop various business enterprises in Agriculture, Manufacturing, Trading and professional services along this route with easy access to the vast population in and around Lubumbashi and beyond.

The project will therefore contribute to accelerated growth in the region and both on the Zambian and DRC sides. The project will further enhance economic and social activities in the project area and region, thus bringing development closer to the people.

The Southwest Chinese Business Association therefore, intends to deliver the project using the Private Partnership (PPP) approach with the Government of Zambia as a key stakeholder through the Roads Development Agency (RDA) and other regulatory government ministries and institutions.

The construction of the Solwezi to Kipushi road is a transformative endeavor that promises a wide array of benefits for the communities it traverses and the nations it connects. This section highlights the significant benefits that the road would bring, ranging from economic growth and trade expansion to improved access to essential services and enhanced regional integration. The development of this road holds immense potential to uplift the socio-economic landscape of the region and foster sustainable development.

The proposed project shall be undertaken using the PPP approach, an arrangement being encouraged and promoted by the Government of the Republic of Zambia for the development of key infrastructure. An efficient transport route linking Zambia and Congo DR will not only contribute to increased trade between the two countries but reduce transportation costs, provide employment opportunities and economic growth. This shall be achieved **without any financial contribution from the Treasury**. The project route also provides an alternative route that can be used during emergencies in case of a shutdown at Kasumbalesa.

Listed below are some of the specific key benefits that shall accrue because of the development of the project.

Facilitating Trade and Economic Growth

One of the most prominent benefits of the Solwezi to Kipushi road is its capacity to stimulate trade and drive economic growth. By improving connectivity and reducing transport costs, the road would unlock new opportunities for businesses in Northwestern Province and beyond, allowing them to expand their markets and reach a larger customer base. Enhanced trade would spur economic activity, generate employment opportunities, and contribute to the overall economic development of the province, country and region.

Improved Border Transit Times

As indicated, the average border crossing time at the Kasumbalesa Border Post averages around seven (7) days. The proposed border crossing time for the upgraded Kipushi road shall be 24 hours thereby giving a time saving of about six (6) days, on average. The time saving also represents a significant cost saving for the transporters. The provision of this alternative border crossing point will help contribute to the decongestion of the Kasumbalesa border. This point is discussed in more detail below.

Decongestion of the Kasumbalesa Border Post

The main access to the mineral rich Katanga Province of the DRC is by road, through the Kasumbalesa Border Post. The Southern Corridor accounts for a significant percentage of southern DRC exports and regional freight. A significant amount of goods are transported through Zambia to and from ports in Tanzania, Namibia, Mozambique and South Africa every year. As of December 2021, the estimated daily average number of heavy goods vehicles heading to Kasumbalesa Border Post was 1,400 truck per day. The high volume of traffic at Kasumbalesa border has resulted in the border post being overwhelmed and constantly congested. The resulting long queues stretch up to approximately 70km. The significant delays have had a negative impact on trade in both countries. The estimated capacity of the Kasumbalesa Border Post is about 300 trucks per day.

The Solwezi to Kipushi road will therefore provide an alternative for traffic seeking to avoid the heavily congested Kasumbalesa border, which is a major entry point between Zambia and the DRC. By diverting a portion of the trade traffic from Kasumbalesa to the Solwezi to Kipushi road, congestion at the border can be alleviated. This would result in smoother border operations, faster trade facilitation, and reduced waiting times for goods and services. Consequently, businesses would experience improved efficiency and cost savings, while trade between the two countries would be streamlined, promoting bilateral economic relations.

Revenue Generation for GRZ

The project development of the project shall contribute to the Treasury through the revenue share mechanism that shall be negotiated and agreed by the parties. Further, the project through the SPV shall pay other indirect taxes. The improved transit times imply that transporters would undertake more trips thereby increasing the revenue that would accrue to government in form of toll fees and border crossing charges.

Opening up of the project area

The project road will open up the area between Solwezi and Kipushi thereby attracting investment in areas such as agriculture, mining and tourism which remain unexplored. This will contribute to the improvement of the local economy and quality of life for the people in the project sphere of influence.

Improving Access to Essential Services

Access to essential services, including healthcare, education, and social amenities, is often limited in remote areas along the route of the Solwezi to Kipushi road. The development of this road would significantly improve access to these services, benefiting the local population. Medical personnel, teachers, and service providers would have enhanced mobility, enabling them to reach these communities more efficiently. This would result in improved healthcare delivery, quality education, and a better standard of living for the residents.

Strengthen trade between Zambia and DRC

The proposed route will provide diversified opportunities for Zambian and DRC's products to enter each other's market. The Government of the Republic of Zambia (GRZ) emphasises the need for Zambia and the DRC strengthen economic and trade ties by way of improving the road network connecting the two countries. The need to improve the road

linkage between Zambia and the DRC will provide trade routes for commodities and deliver efficient and effective communications between the two countries.

Enhancing Regional Integration

The construction of the Solwezi to Kipushi road would strengthen regional integration between Zambia and the DRC, fostering closer ties and collaboration. Improved connectivity would facilitate the movement of people, goods, and services, encouraging cultural exchange, tourism, and cross-border investments. This increased regional integration would contribute to the creation of a vibrant regional economy, promoting peace, stability, and shared prosperity.

Therefore, the benefits of the Solwezi to Kipushi Toll Road Project are far-reaching and multifaceted, encompassing economic growth, trade expansion, improved access to essential services, enhanced regional integration, and tourism development. By facilitating trade, reducing congestion, and fostering regional collaboration, this road project has the potential to uplift the socio-economic landscape of the region and improve the lives of the local population.

1.3 Objectives of the Project

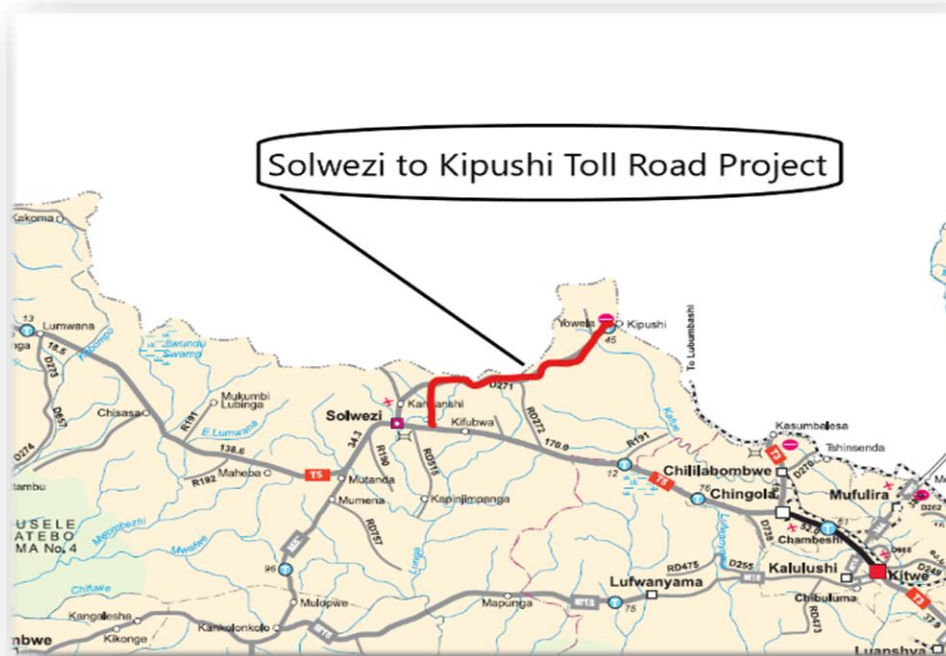
The major objective of the Environmental and Social Impact Assessment (ESIA) will be to undertake a detailed investigation of environmental and social conditions at sites along the proposed Solwezi to Kipushi Road. The immediate objectives are as follows:

- To identify all environmental issues relating to the proposed scope of works for rehabilitation of the Solwezi to Kipushi Road in Solwezi and Mushindamo districts of Northwestern Province;
- To liaise with the relevant government departments to determine requirements/processes to ensure compliance with the environmental regulations and legislation for the proposed rehabilitation works;
- To undertake the preparation of documentation in terms of the applicable environmental legislation for the authorization/permitting of the proposed project
- To identify the impacts of the proposed project on the nearest existing receptors;
- To proffer environmental and social mitigation measures for the identified project impacts for inclusion in the Environmental and Social Management Plan (ESMP).
- Produce an Environmental Impact Statement (EIS) for submission to the Zambia Environmental Management Agency (ZEMA) for consideration of the proposed project.

1.4 Project Overview and Description

The proposed road will provide an improved link between Solwezi and Kipushi Border Post. Error! Reference source not found. shows the project location and proposed route.

The proposed start point of the project is on the T005 south of Solwezi, approximately 600m away from the Kapijimpanga Police Post, and end point is at Kipushi border post, connecting with the N37 road DRC, which is an existing paved road.



1.5 The Proponent

The project will be funded by Southwest Business Association through a Special Purpose Vehicle (SPV) operating as Border Way Limited through a Public Private Partnership (PPP) with the Government of the Republic of Zambia through the Roads Development Agency of the Ministry of Infrastructure and Rural Development (MIRD)., The Ministry of Infrastructure and Rural Development is one of Zambia's ministries that are responsible for policy formulation and implementation pertaining to various developments of roads across the country. Shareholding of MIRD is as presented in table 1-1:

Table 1-1 Details of the Developer

NAME	NATIONALITY	POSITION	SHAREHOLDING (%)
South West China Business Association (Border Way Limited)	Chinese	shareholder	100
Roads Development Agency	Zambian	shareholder	

1.6 Developers Track Record

In addition to the proposed project, the Roads Development Agency (RDA) have also been involved in the development of the following projects:

- Construction of the T2 route from Ndola to Lusaka
- Construction of the Chinsali, Isoka, Nakonde (T002) Road
- Construction of the Chingola to Solwezi (T005) Road

Contact Person's Details

The Director & Chief Executive Officer

Road Development Agency
Corner Government/Fairley Road
P O Box 50003
Lusaka

Contact person – Eng. Yobe Mwalula, Director Planning and Design;

Contact No. - +260 211 253088/ 253801

Email – ymwalula@roads.gov.zm

1.7 Study Methodology

The methodology used for collecting data and information for this study involved field visits, literature review including legislation related to project implementation and community consultations. The ESIA process was undertaken in August to October 2025.

1.7.1 Review Existing Information and Legislation

This task includes review of the Environmental Management Act and its subsidiary legislation and other relevant Acts. Specifically, the study team reviewed previous studies done in the study area. This was to ensure that the designs were compliant or in conformity with laws of Zambia and District Development Plans. The following legislation and documents were reviewed:

- The Environmental Management Act No. 12 of 2011
- The Water Act Cap 198, and the Water Resources Management Act of 2011
- The Public Roads Act of 2002
- The Land Acquisition Act Cap 189
- The Occupational Health Act
- The Workers Compensation Act Cap 271 of 1994
- District Situation Analysis Report for Mushindamo 2022
- Integrated Development Plan – Solwezi 2022
- Demographic Health Survey
- Living Conditions Monitoring Survey
- 2022 Census of Population and Households

1.7.2 Initial Environmental Survey at Proposed Solwezi to Kipushi Route

This task involved collecting information along the Kenneth Kaunda International Airport road corridor and surrounding environs. The study team conducted field visits, where each member investigated specific necessary issues of concern. These involved on-site field inspections of the project sites to establish environmental and socio-economic baseline conditions on which impacts and their associated mitigation measures would be based.

1.7.3 Identification of Principal Impacts

The impacts of the proposed project were evaluated based on their magnitude and significance. Four groupings of impacts on the environment were identified, and these would be evaluated for the duration of the project, namely;

- a) Physical environment
- b) Biological environment
- c) Socio-economic environment
- d) Cultural environment

These impacts may be positive (beneficial) or negative (adverse) and would be classified as low, moderate or high, to the extent possible, their effects will be described in terms of environmental costs or benefits. These effects may be direct or indirect, short term or long term.

The impacts will be assessed for the following stages of the project;

- a) Pre-construction or Design Phase
- b) Construction Phase
- c) Operational Phase

It is important that the impacts are identified, defined, and evaluated early at the planning stage. This has been made possible through the scoping of these impacts and their implications which are pertinent to the proposed road rehabilitation project so that alternatives can be investigated and ensure that changes are incorporated at the design stage. Other measures were also identified that would be taken-into-account during the design and construction stages that would further enhance the environmental quality of the project.

1.7.4 Identification of Appropriate Mitigation Measures

The mitigation measures have been provided to reduce the effect of the proposed project on the surrounding environment. Wherever possible recommendations will be made to mitigate against impacts on the physical, biological, socio-economic, and cultural environment

1.7.5 Formulation of an Environmental and Social Management Plan

The report will include a plan for monitoring the implementation of mitigation measures during construction and operation. This will be in the form of an Environmental and Social Management Plan (ESMP) which will come with mitigation measures. The mitigation measures are meant to be included in the tender document to form part of the overall construction contract.

1.8 Project Cost and Implementation Date

Project construction works are expected to commence upon approval of the Environment and Social Impact Assessment (ESIA) by the Zambia Environmental Management Agency. The projected cost of the construction and rehabilitation works of the Solwezi to Kipushi is US\$ USD 500 million. The project is funded by the Borderway Limited through a Public Private partnership (PPP). The implementation of this Project is dependent on the approval of this Environmental and Social Impact Statement (ESIS).

2.0 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

The following institutional and regulatory framework will inform and govern the preparation of the EIS and subsequently the implementation of the project. The main policies/strategies and Institutional frameworks that are relevant to the project are listed below.

2.1 Policy, Plans and Strategic Framework

2.1.1 The National Conservation Strategy

The National Conservation Strategy (NCS) was adopted by the Government of Zambia in 1985, and led to the establishment of environmental legislation and institutions. The NCS provided guidance for the sustainable development of Zambia through the use and conservation of natural resources within a centrally planned and controlled economy. However, the strategy underwent a review process in 1994 led to the adoption of the National Environmental Action Plan (NEAP).

2.1.2 Zambia Vision 2030

The developmental vision of Zambia, to become a prosperous middle-income country by 2030, is elaborated in a document entitled Vision 2030. The Vision 2030 is founded on seven key basic principles. These principles are: (i) sustainable development; (ii) upholding democratic principles; (iii) respect for human rights; (iv) fostering family values; (v) a positive attitude to work; (vi) peaceful coexistence; and (vii) upholding good traditional values. The characteristics of the nation that Zambia is building can be described as follows:

- a. A common and shared destiny, united in diversity, equitably integrated and democratic in governance, promoting patriotism and ethnic integration;
- b. Devolved political systems and structures while retaining the roots and positive aspects of their own mould of social, cultural and moral values;
- c. A continuous path of ever refining, ever advancing and ever consolidating democratic dispensation and progressive adaptation from global best practices;
- d. Economically, socially and politically integrated within the sub-region, Africa and the rest of the world;
- e. Diversified and balanced and strong industrial sector, a modern agricultural sector and an efficient and productive services sector;

- f. Technologically proficient, fully able to adapt, innovate and invest using its human and natural resources;
- g. Strong and cohesive industrial linkages in the primary, secondary and tertiary sectors;
- h. Sustained high and increasing productivity levels with regard to every factor of production;
- i. Well-developed and maintained socio-economic infrastructure;
- j. A robust and competitive transport and communications network that services the region;
- k. Strong entrepreneurial capabilities, self-reliant, outward looking and enterprising, where nationals take advantage of potential and available opportunities;
- l. Exemplary work ethics, honesty, high human and ethical values, quality consciousness and the quest for excellence;
- m. A macroeconomic environment conducive for growth;
- n. Development policies consistent with sustainable environment and natural resource management principles;
- o. Access for all to good quality basic human necessities such as shelter, titled land, health and education facilities and clothing;
- p. Diversified education curricula that are responsive to the knowledge, values, attitudes and practical skill needs of individuals and society at large;
- q. Regional centre of excellence in health and education;
- r. Decent work opportunities that ensure respect for fundamental human rights and principles;
- s. Opportunities for all citizens to become resourceful and prosperous nationals;
- t. Decentralised governance systems; and,
- u. Safe and secure social environment.

Relevance: *This project addresses economic growth, productivity, technology and industrialisation*

2.1.3 Eighth National Development Plan

The Eighth National Development Plan is the vehicle that will deliver the broad objectives of Vision 2030 during the period 2022 -2026. The integrated approach recognises the multi-faceted and interlinked nature of sustainable development which

calls for interventions to be tackled simultaneously through a coordinated approach to implementing development programmes. The key development outcomes envisioned by this plan include economic diversification and job creation; poverty and vulnerability reduction; reduced developmental inequalities; enhanced human development; and an enhanced governance environment for a diversified and inclusive economy.

Relevance: *This project provides economic diversification, poverty reduction by creating jobs*

2.1.4 National Resettlement Policy - 2015

The policy aims to protect areas designated as resettlement land and provide for the welfare of persons resettled in order to achieve stability and sustained development and improved livelihoods. The policy has the following guiding principles:

- The Government shall ensure that guidelines and procedures regarding settler selection criteria are clearly spelt out.
- The size of the land allocated shall be commensurate to the ability of the settler to develop the land and/or be adequate to support an average family with basic subsistence food and reasonable surplus.
- Two (2) types of settlement patterns shall be promoted by the Government. The first is the dispersed type of settlement pattern where each settler has his own dwelling house and family on his farm. The second type is the concentrated settlement pattern where settlers' dwelling houses are clustered next to each other in communal /village setup.
- There is need to provide basic public services in resettlement schemes if settlers are to be attracted and encouraged to settle there.
- The Government will as much as practicable, encourage the use of the already existing ministries/institutions to carry out activities relevant to their respective mandates in the resettlement schemes. This also includes forging partnerships with all interested stakeholders including Cooperating Partners, the private sector and NGOs.
- Involuntary resettlement should be in line with the international human rights and humanitarian law as set out in the 1998 United Nations Guiding Principles on

Internal Displacement, which are recognized as an important international framework for the protection of internally displaced persons.

- Humanitarian and development aid to Internally Displaced Persons (IDPs) and other vulnerable populations should not place them in greater danger or empower those responsible for the violence, exploitation or abuse suffered by IDPs. External aid should not produce inequalities or dependencies, nor should it exacerbate local tensions.
- Involuntary resettlement should be avoided where feasible. Where population displacement is unavoidable, it should be minimised by exploring all viable project options.
- People unavoidably displaced should be compensated and assisted, so that their economic and social future would be generally as favourable as it would have been in the absence of the project or better.

Involuntary resettlement should be conceived and executed as part of the project. The full cost of resettlement and compensation should be included in the presentation of project costs and benefits.

Relevance: *Any displacement that might be triggered by the project will be guided by this policy.*

2.1.5 Agricultural Policy

The aim of the Agriculture Policy is to facilitate and support the development of a sustainable and competitive agricultural sector that assures food security at national and household levels, and maximises the sector's contribution to Gross Domestic Product (GDP).

The policy has the following specific objectives:

- To ensure national and household food security through an all-year round production and post-harvest management of adequate supplies of basic foodstuffs at competitive costs;
- To contribute to sustainable industrial development by providing locally produced agro-based raw materials;
- To increase agricultural exports thereby enhancing the sector's contribution to the National Balance of Payments;

- To generate income and employment through increased agriculture production and productivity; and
- To ensure that the existing agricultural resource base is maintained and improved upon.

Relevance: *Impacts of the project on any agricultural areas will be governed by this policy.*

2.1.6 National Energy Policy - 2019

The aim of the 2019 NEP is to achieve an optimal energy resources utilization to meet Zambia's domestic and non-domestic needs at the lowest total economic, financial, social, environmental and opportunity cost and establish Zambia as a net exporter of energy. A robust National Energy Policy is key in facilitating increased access to energy services. Zambia aspires to be a prosperous middle-income country by 2030. This will require the supply of energy services to Zambians as an input to their productive activities.

The NEP 2019 will guide Ministries and Institutions in the Zambian economy to meet the challenges of achieving access to reliable, sustainable and affordable energy services. The Policy provides guidance for the continued development of the energy sector essentially on the security, affordability, supply and utilisation of energy. The NEP 2019 is in line with the political, economic, social, technological and environmental changes that have occurred in the past decade. This policy seeks to ensure environmentally sustainable exploitation of the biomass resource, to expand generation and transmission capacity and also increase accessibility to electricity and private sector participation.

Relevance: *Supply of energy to the proposed project will be governed by this policy.*

2.1.7 National Policy on Environment - 2007

The National Policy on Environment was developed in 2007 to safeguard the environment and ensure the sustainable use of natural resources. The purpose of the policy is "to create an umbrella policy for the welfare of the Nation's environment so that socio-economic development will be achieved effectively without damaging the integrity of the environment or its resources".

The National Policy on Environment aims to achieve increased economic growth that is not damaging to the environment and natural resources. The policy recognises the need to develop and promote alternative energy sources to fuel-wood and technologies

to reduce the use of fuel-wood and enhance carbon-sinks. It offers strategic guidance on key economic sectors related to the environment.

Relevance: *This policy guides the planning for sustainability in development activities such as the proposed project.*

Compliance: *The developer will ensure that all sections of the policy are adhered to*

2.1.8 National Water Policy - 2010

The National Water Policy is the main policy framework for the water and sanitation sector in Zambia. The Policy was developed and adopted by the Government of the Republic of Zambia in 1994, and updated in 2010. The National Water Policy envisions “to optimally harnessing water resources for the efficient and sustainable utilization of this natural resource to enhance economic productivity and reduce poverty”. In order 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 outcome 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 equitable manner consistent with the social, economic and environmental needs of present and future generations.

Relevance: *The provision of water supply to the project is guided by this policy.*

Compliance: *The developer will ensure that all sections of the policy are adhered to*

2.1.9 National Industrial Policy - 2018

This policy aims to ensure the growth of industrial activity in the country especially for Micro, Small and Medium Enterprises. In addition, it serves as a framework for collaboration between the Government, private sector stakeholders and cooperating partners in the development of the Zambian Industrial Sectors. The policy aims to foster new industrial capacity, promote the diversification of production, facilitate the creation of inter-sectoral and inter-industry linkages, promote the establishment of cooperatives across value chains, promote the development of industry specific skills and facilitate the shifting of economic activity towards higher value-added activities to spur sustainable economic growth. This Policy focuses on eight (8) Manufacturing sub-sectors as priority drivers of Industrialisation. The priority sub-sectors are as follows:

- Processed Foods;
- Textiles and Garments;
- Engineering Products;
- Wood and Wood products;
- Leather and Leather Products;
- Mineral (metallic and non-metallic) processing and products (beneficiation);
- Pharmaceuticals; and
- Blue Economy

In addition to the eight priority sub-sectors, Construction, Agriculture, Tourism, Education, Energy, ICT and Health, will be the key supportive sectors.

Relevance: *The purchasing of engineering products for the construction phase will be guided by this policy.*

Compliance: *The developer will ensure that all sections of the policy are adhered to*

2.1.10 National Social Protection Policy - 2014

The overall objective of this policy is to contribute to the well-being of all
Zambians by ensuring that vulnerable people have sufficient income security to
meet basic needs and protection from worst impacts of risks and shocks. Specific
objectives are to:

- Reduce extreme poverty and destitution among vulnerable and poor households;
- Enhance food and nutrition security for vulnerable populations;
- Build the human capital of extreme poor households;
- Attain an all-inclusive and comprehensive Social Security System;
- Achieve Universal Health Coverage through Social Health Insurance for all, with a special emphasis on the Vulnerable and the marginalised population groups;
- Enhance access by poor and vulnerable populations to productive resources and skills;
- Promote employment opportunities and income generating activities for the unemployed and other vulnerable groups;
- Increase livelihood potential among vulnerable populations;
- Protect vulnerable populations from all forms of abuse, violence, discrimination, denial and neglect;

- Enhance the social status and progressive realization of the socio-economic and cultural rights of the excluded and marginalised;
- Safeguard and promote the realisation of the right to an adequate standard of living for people living with disabilities; and
- Ensure equitable access to opportunities by persons living with disabilities.

Relevance: *This policy ensures the consideration and protection of all social groups that will be impacted by the project, as well as the promotion of employment opportunities through the construction and operation phases.*

Compliance: *The developer will ensure that all sections of the policy are adhered to*

2.1.11 National Policy on Disability – 2012

An Act to continue the existence of the Zambia Agency for Persons with Disabilities and define its functions and powers; promote the participation of persons with disabilities with equal opportunities in the civil, political, economic, social and cultural spheres; provide for mainstreaming of disability issues as an integral part of national policies and strategies of sustainable development; incorporate a gender perspective in the promotion of the full enjoyment of human rights and fundamental freedoms by persons with disabilities; ensure accessibility by persons with disabilities to the physical, social, economic and cultural environment, and to health, education, information, communication and technology; provide for the regulation and registration of institutions that provide services to persons with disabilities and organizations of, and for, persons with disabilities; continue the existence of the National Trust Fund for Persons with Disabilities; provide for the domestication of the Convention on the Rights of Persons with Disabilities and its Optional Protocol and other international instruments on persons with disabilities to which Zambia is party, in order to promote, protect and ensure the full and equal enjoyment of all human rights and fundamental freedoms by persons with disabilities and to promote respect for their inherent dignity; repeal and replace the Persons with Disabilities Act, 1996; and provide for matters connected with, or incidental to, the foregoing.

Relevance: *This policy will guide the design and access points to ensure persons with disabilities have suitable ramps to all public facilities*

Compliance: *The developer will ensure that all sections of the policy are adhered to*

2.1.12 National Employment and Labour Market Policy – 2004

The main objective of the Employment and Labour Market Policy is to create adequate and quality jobs under conditions that ensure adequate income, protection of workers' and basic human rights.

The National Employment and Labour Market Policy is directed by the following principles:

- Equity: facilitation of equitable and freely chosen productive employment for all;
- Equality: remunerations that are equal for work of equal value;
- Responsiveness: a free and responsive labour market environment where players have no undue leverage against one another;
- Social Protection: a comprehensive social protection system for people of all walks of life to avoid all forms of destitution;
- Productivity: a productive work culture among the workforce;
- Social Dialogue: facilitation of continuous social dialogue among players on the Labour Market; and
- Sustainability: sustainable development through effective implementation of the National Employment and Labour Market Policy

Relevance: *This policy will guide the terms of reference for the contractor to ensure fair employment conditions during construction and operation.*

2.1.13 National Policy on Wetlands – 2018

The aim of the policy is to ensure the wise use of wetlands and their resources, and to create a comprehensive, stakeholder-based institutional and legal framework for their management.

The specific objectives are:

- To promote the integrity and natural productivity of wetland ecosystems and the maintenance of their functions and values to conserve their biodiversity;
- To promote their socio-economic development potential and contribution to the local and national economy;
- To strengthen the legal and institutional framework for their management;
- To promote a multi-sectorial approach to planning and management;

- To develop public education and awareness;
- To promote research, inventorying and monitoring of wetland resources;
- To conserve wetlands;
- To promote international action of national interest for the conservation of wetlands;
- To restore degraded wetlands;
- To promote community participation and ensure equitable sharing of benefits;
- To provide training and strengthen the capacity of wetland conservation institutions;
- To promote “new” and created wetlands.

Relevance: *This project does not impact any wetlands directly, however this policy will guide treatment of any impacts to wetlands as a result of expansion to utility lines and facilities in the future due to development.*

Compliance: *The developer will ensure that all sections of the policy are adhered to*

2.1.14 Draft National Fisheries Policy – 2009

The aim of the policy is to provide an overall national vision for the development of the sector. The National Fisheries Policy seeks to give substance to the national fisheries vision. The policy prescribes the institutional arrangements for the management of the fisheries sector and identifies relevant stakeholder institutions that will support implementation to address current concerns. The objectives of the policy are:

- To increase the quality and quantity of aquaculture production at both small-scale and industrial levels.
- To ensure and increase the production of a diversified range of fish products including finfish and crustaceans from aquaculture.
- To identify fishery areas with potential for live ornamental fish production and encourage development of aquarium fisheries;
- To increase fish production in small water bodies.

Relevance: *This project does not impact any aquaculture as there are no water bodies close to the project site. However due to the sensitive nature of this policy, it will be considered in the project development especially with respect to discharge of treated wastewater into drainage facilities which may eventually lead to water bodies with fish present.*

Compliance: *The developer will ensure that all sections of the policy are adhered to*

2.1.15 Draft Livestock Development Policy – 2012

The overall objective of the Livestock Development Policy is to promote increased and sustainable livestock production, productivity and management in order to ensure food security, income generation, creation of employment opportunities and a reduction in poverty levels. The following are some of the principles:

- The endeavour to create an economic environment which encourages individual initiative and self-reliance among the people and promote private investment.
- Inclusiveness in the formulation of development plans and programmes.
- The stimulation of agriculture, industry and technological development.
- The eradication of poverty and illiteracy.
- The institution of measures for disaster management and preparedness.
- Development and preservation of local languages.
- Protection to privacy.
- Protection of consumer rights.
- Protection of health, safety and economic interest.
- Access to information.
- Rights of the citizen to food, water, sanitation and a safe environment.
- Sustainable and productive management of land resources.
- Sound conservation and protection of ecologically sensitive areas.
- The respect of the integrity of natural processes and ecological communities including conservation of habitats and species.
- The sustainable exploitation, utilization, management and conservation of the environment and natural resources for the present and future generations.
- Protection of genetic resources and biological diversity.

Relevance: *This policy will be considered with respect to potential impacts to livestock which may graze close to the project area, specifically during construction and operation phase.*

2.1.16 National Land Policy - 2015

The objectives of the Draft National Land Policy are as follows:

- Ensure that boundaries are clearly marked in order to minimise border disputes.

- Prepare and update internal boundaries in order to promote national identity, fiscal, electoral administration and good governance frameworks.
- To address the land tenure constraints that impact social and economic development through the implementation of a comprehensive land policy.
- To implement measures that will ensure that leasehold land managed in an effective and sustainable manner.
- To strengthen customary land administration in order to guarantee security of tenure.
- To institutionalise public land tenure in policy and law.
- To protect and conserve commons lands, which are essential for the livelihood support, economic growth and for the overall well-being of a community.
- To regulate access to land by non-Zambians with a view to providing for access and use rights on land to non-Zambians while restricting ownership of land, both state and customary to Zambians only.
- To ensure accountability, transparency, monitoring and compliance to lease conditions to protect land rights and safeguard against environmental damage.
- To review the compulsory acquisition of land and other property.
- To improve security of leasehold tenure
- To achieve a gender sensitive, and a youth friendly land sector which is inclusive of persons living with disabilities and other socially marginalised groups.
- To strengthen the administration and management of land services.
- To clarify institutional mandates
- To create and maintain a professional, accountable, transparent and timely land registration system.
- To enhance efficiency and cost effectiveness of survey and mapping functions through commercialisation, notwithstanding the public need to provide all basic and control services.
- To prepare basic topographic maps at scales that conforms to policy needs and technological advances and regulate the preparation of Atlases and Tourist maps according to the law.

- To fix and record property boundaries through a variety of techniques, accuracies and costs.
- Implement a National Spatial Data Infrastructure (NSDI) framework.
- To maintain an accurate, gender-disaggregated and up-to-date land information for regional and urban land management.
- To implement an easy, equitable, transparent and cost effective land allocation system.
- To simplify taxes, improve collections and strengthen valuation capacity at all levels.
- Formalise land ownership in the country to create an asset base for the poor, promote a property market, expand financial intermediation and widen the municipal tax base.
- Strengthen valuation capacity at all levels of land administration and improve valuation systems and regulatory compliance.
- Prepare and update a national planning framework to guide national development planning proposals.
- To harmonise local land allocation policies and draw up plans for major urban expansions to provide land for housing in large tracts with plot layouts and trunk services (major roads and primary water supply and sanitation services) provided ahead of demand.
- To guide the identification of most suitable areas for location of various activities in rural areas in order to provide for orderly provision of essential services.
- To regulate with a view to eliminating the growth of unplanned areas through timely provision of shelter or serviced building plots.
- To institute forward planning of land for housing and publicise its availability.
- Enhance collaboration with Chiefs and Government to continually avail adequate land for resettlement purposes in all districts of the country.
- To improve smallholder access to secure ownership of agriculture land.
- Ensure optimal utilisation of the land resources through formulation of provincial, district and local land use policies that incorporate area-specific concerns and priorities.

- To manage land with a view to improving carbon storage by protecting grasslands, rangelands and forests to meet the food needs of a growing population and exports.
- To ensure that mining developers adopt principles of Free, Prior and Informed Consent of local people for decisions that may affect them.
- To ensure the preservation of land for future use.

Relevance: *This policy will be given due consideration in the design of the road, the land use plan, as well as the detailed design for the development.*

2.1.17 National Forestry Policy 2014

The current vision and policy on Forestry in Zambia is to attain the sustainable forestry management of all types of forests so as to enhance the contribution of forest products and services to the mitigation of climate, income generation, poverty reduction, job creation and to the protection and maintenance of biodiversity. The forest policy aims to reduce deforestation and forest degradation by focusing on increasing forest cover and enhance carbon stocks through integrated participatory forest management, improved law enforcement and private sector investment. It also provides for the domestication of international environmental agreements on the premise that forests play a key role in improving the global environment and sustainability. These include the United Nations Framework Convention on Climate Change (UNFCCC), Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), the Convention on Wetlands of International Importance, the Convention on Biological Diversity (CBD), the Convention to Combat Desertification and other relevant international agreements to which Zambia is a party

Relevance: *This policy will be considered in the positive and negative impacts of the site development, that is, positive with respect to improving access to electrical power thereby minimising need to tree cutting and charcoal usage, and negative in terms of any potential impacts to tree life impacted during construction works in the project site.*

2.1.18 National Waste Management Strategy

The overall goal of the National Waste Management Strategy is to improve the environmental quality of the Zambian environs through the development and implementation of an efficient and sustainable waste management system.

The objectives of the national waste management strategy are to:

- Minimise generation of waste ;
- Maximise the collection efficiency of waste;
- Reduce the volume of waste requiring disposal and maximise the economic value of waste; and
- Develop and adopt environmentally sound treatment and disposal methods and practices.

Relevance: *This policy will be considered when reviewing the impact of solid and liquid waste management of the development.*

2.1.19 National Environmental Action Plan

The overall objective of the National Environmental Action Plan is to integrate environmental concerns into Zambia's social and economic development planning process. The NEAP was prepared as a comprehensive plan to contain the increasing environmental degradation in Zambia.

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 Environmental Impact Assessment is made compulsory for major development projects in all sectors.

Relevance: *This policy will be considered when reviewing the impact of the development on improving the quality and standard of living of the local population.*

2.1.20 National Biological Diversity Strategy and Action Plan

In May 1993 Zambia ratified the Convention on Biological Diversity. By ratifying the Convention on Biological Diversity, Zambia has committed herself to fulfilling its objectives and recognises that a Biodiversity Strategy and Action Plan (BSAP)

is necessary in order to guide the country's future activities intended to achieve the objectives of the CBD in line with biodiversity conservation and usage. As part of the commitment to fulfil its objectives, Zambia developed the National Biological Diversity Strategy and Action Plan (NBSAP), which was finalised in 1998.

The 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;
- Sustainably manage and use Zambia's biological resources;
- Develop an appropriate legal framework and the needed human resources to minimise the risks of the use of Genetically Modified Organisms (GMO's).

Relevance: *This policy will be considered when reviewing the impact of the development on the natural environment.*

2.1.21 National HIV and AIDS Strategic Framework

The Revised National HIV and AIDS Strategic Framework (R-NASF) covers the period 2014 - 2016. It is a framework to guide implementation of the National HIV Multi-sectorial Response in Zambia.

The purpose of the framework is to:

- i. Provide an overall strategy for the planning, coordination and implementation of the multi sectorial national response based on available evidence;
- ii. Articulate national priorities, expected outcomes and targets that all stakeholders should work towards, based on their respective mandates, resources and comparative advantage;

- iii. Articulate an agreed framework for the implementation of the multi-sectorial response developed in partnership with civil society, private sector, public sector and development partner inputs that is in line with the three-ones principle (one strategy, one coordinating body and one M&E system); and
- iv. Provide a transparent framework to form the basis for reaching agreement with development partners on their technical and financial support and the management and coordination of the response.

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 decentralised response and mainstreaming HIV and AIDS;
- Improving the monitoring of the multi-sectorial response; and
- Integrating advocacy and coordination of the multi-sectoral response.

Relevance: *This policy will be considered when preparing the project health and safety plan to be utilised by the contractor to ensure mitigation of the spread of viruses from external contractors on local population and vice versa.*

2.2 LEGAL FRAMEWORK

2.2.1 The Environmental Management Act (EMA), No. 12 of 2011;

This Act is the principal environmental law in Zambia and provides for integrated environmental management and the protection and conservation of the environment and the sustainable management and use of natural resources. This law is the primary legal basis for undertaking environmental assessment for the proposed road upgrading project.

The EMA is implemented through subsidiary regulations including; Statutory Instrument (SI) No. 28 of 1997 Environmental impact Assessment (EIA) Regulations that provide for conducting of and reviewing of Environmental Impact Statements (EIS) or Environmental

Project Briefs (EPB); Statutory Instrument No 112 of 2013 waste management (Licensing of Transporters of wastes and waste Disposal sites Regulations that provides for licensing and regulation of transportation and Disposal of non-Hazardous wastes; Statutory Instrument no. 112 of 2013 water pollution control (effluent and waste water regulations) that provides for regulation of effluent discharges to the aquatic environment and specifies standard limits for specific pollutants in the effluent; Statutory Instrument no 112 of 2013 air pollution control (Licensing of gaseous waste and emissions Standards) that provides for licensing and regulation of gaseous emissions to the atmosphere; and Statutory Instrument No. 112 of 2013 hazardous waste Management Regulations that provides for licensing and regulation of solid hazardous waste transportation and the operation of a hazardous waste disposal site.

Compliance

The Act demands that before any project of this nature is implemented, an environmental assessment should be undertaken in The Developer in accordance with the provisions of the EMA. The Developer shall fully comply with requirements of this national regulation during implementation of the Solwezi to Kipushi Road Project via Mushindamo and this has been complied with through the development of this ESIS report.

2.2.2 The Environmental Impact Assessment (EIA) Regulations, Statutory Instrument No. 3 of 2026 which states:

“ A developer shall not implement a project for which a project brief or an environmental impact statement is required under these Regulations, unless the project brief or an environmental impact assessment has been concluded in accordance with these Regulations and the Council has issued a decision letter.”

Compliance

The regulations demand that a developer shall not implement a project for which an ESIA is required, unless the EIA has been concluded in accordance with these Regulations. The Developer shall fully comply with requirements of this national regulation during implementation of the proposed Solwezi to Kipushi Road via Mushindamo and it is doing this through the development of this ESIS report.

Wherever new borrow pits be opened for sourcing gravel, The Developer through Borderway will ensure that the Contractor will prepare Environmental Project Briefs (EPBs) for approval by ZEMA before commencing excavation.

The construction and operation activities of the road rehabilitation have the potential to cause leakages, oil spill or wash pollutants into the nearby storm water drain which may end into the natural streams. Therefore, management of the project will take into account the need to prevent pollution of the aquatic environment.

2.2.3 Hazardous Waste Management Regulations, Statutory Instrument No.112 of 2013

This applies to the control and monitoring of generation, collection, storage, transportation, pre-treatment, treatment, disposal, export, import and trans-boundary movement of hazardous waste/goods. This regulation compels anyone handling, storing and transporting hazardous waste/goods e.g. used oil from generators, to apply for a license and comply with conditions from the Zambia Environmental Management Agency and/ or the Energy Regulation Board.

Compliance

During the rehabilitation of the Solwezi to Kipushi Road Road, generation, collection, storage, transportation, pre-treatment and disposal of hazardous wastes (e.g. waste oil and bitumen) resulting from construction and operation

activities will require to be licensed under these Regulations. The Developer shall comply with requirements of this regulation by using services of a licensed company to dispose used oils and petroleum waste and this will apply to the project area in total

2.2.4 Waste Management Axt No 20 of 2018

This applies to the control and monitoring of generation, collection, storage, transportation, pre-treatment, treatment, disposal, export, import and trans-boundary movement of waste/goods.

Compliance

The Developer contractors, through the risk assessment, environmental, health, and safety guidelines, will manage all wastes generated during project implementation.

2.2.5The Tourism Act, CAP 155

This Act provides for the preservation of the country's natural endowments e.g. National Heritage sites and waterfalls etc., as assets of tourist attraction. The Developer will therefore act in a manner consistent with defined protected area management plans and also implement appropriate measures to promote and enhance the conservation aims of any protected areas during implementation of the proposed Solwezi to Kipushi Road via Mushindamo.

Compliance

The Developer shall adhere to the guidelines and regulations stipulated in the Act in the preservation and sustainable management of the country's natural resources such as heritage, cultural and historical sites including wildlife resources found in the project area.

2.2.7 The Forest Act, CAP 199 of 1999

This act provides for, among others, the participation of local communities, traditional institutions, non-governmental organisations and other stakeholders in sustainable forest management including conservation and use of forests and trees for the

sustainable management of forest ecosystems and biological diversity. Forest reserves are intended for the conservation and development of forest resources as well as providing protection to watersheds. The Developer will ensure that implementation of the proposed project is carried out in a manner which will conserve sensitive ecosystems along the road.

The Act also provides for the protection of tree species nationally whether located in a protected area or outside it. These are as follows:

- *Pterocarpus angolensis*(African Teak);
- *Azelaia quanzensis* (Pod Mahogany);
- *Baikiaea plurijuga* (Teak).

These tree species were found along the project road.

Compliance

The Act calls for protection of catchment areas and headwaters and take measures to control deforestation. The Developer shall comply with the provisions of this Act during project implementation to maintain and contribute to sustainable healthy eco-systems and promotion of biodiversity and growth of indigenous trees in the project area.

2.2.8 The National Heritage and Conservation Commission Act, 1986

The objectives of the National Heritage and Conservation Commission Act apply to development activities in game parks as augmented by section 22 of the Zambia Wildlife Act that prohibits removal or damage of any objects of prehistoric, historic or archaeological interest that exist in these protected areas.

Compliance

During the construction phase of the Solwezi to Kipushi Road via Mushindamo – particularly excavation activities for sand and gravel – The Developer shall ensure that any artefacts or objects of archaeological significance are preserved and presented to the National Heritage Conservation Commission. The Developer will work in close collaboration

with the National Heritage Conservation Commission and ensure safeguard of any findings in line with the provisions of the Act.

2.2.9 The Town and Country Planning Act, Cap 285

This Act provides for the control, use and change of land use zones and reservations for various purposes e.g. siting of work sites. It also provides for the compensation of those affected by planning decisions and regulated development subdivisions.

Compliance

The Developer will adhere to its provisions especially that some residents will be displaced including change of land use. The Developer shall comply with this law before project implementation by liaising with the traditional authority and other relevant Provincial Planning Authority in the project area.

2.2.10 The Public Roads Act, CAP 12 of 2002

The Public Roads Act provides for the establishment of the Road Development Agency 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.

Compliance

The Developer shall adhere to principles in this law by ensuring that no property in the project area is located within the limits of road reserves.

2.2.11 The Petroleum Act, CAP 424

This Act, among other things, regulates the conveyance and storage of petroleum, inflammable oils and liquids. The Developer and its contractors shall comply with regulations under this law during the transportation of fuel for construction equipment and generators. Where labour camps are located, the handling of refuelling activities will require adherence to environmental, health and safety practices.

Compliance

The handling of refuelling activities will require adherence to environmental, health and safety practices. The Developer shall comply with regulations under this law during the transportation of fuel for operational equipment and generators.

2.2.12 Energy Regulation Act, CAP 436

The Act provides for the establishment of procedures for the transportation, handling and storage of fuels to minimize negative environmental impacts. The Developer and its contractors shall comply with regulations under this law during transportation of fuel and will adhere to environmental, health and safety practices.

Compliance

The Developer shall comply with the Act's regulations on the transportation and storage of fuel and other lubricants at the site depots so as to adhere to environmental, health and safety practices.

2.2.13 National HIV/AIDS/STI/TB Council Act of 2002

The Act provides for the establishment of the HIV/AIDS/STI/TB Council whose functions include the coordination and provision of support to development, monitoring and evaluation of multi-sectoral response for the prevention and combating of the spread of HIV/AIDS/STI and TB in order to reduce the personal, social and economic impacts of HIV/AIDS/STIs and TB.

Compliance

The Developer contractors will promote STDs & HIV/AIDS awareness as well as distributing condoms among construction workers during project implementation.

2.2.14 The Water Resources Management Act of 2011, Cap 198

The Act has repealed the Water Act of 1948. The Act addresses inadequacies of the old Act and aligns the management of water to the basic rule and principles relating to water and the environment. Issuance of water rights is clearly provided for in the new legislation similar to

the 1948 Act. Unlike the repealed Act which mandated the Water Development Board (WDB) to issue water rights, the new one mandates the Water Resources Authority (WRA) to carry out the same function.

Compliance

The project will comply with the provisions of the Act by ensuring that storm water disposal structures intended to control runoffs from the road into the aquatic environment (both surface and groundwater) are part of the overall detailed designs for road rehabilitation.

2.2.15 Mines and Minerals Act, Cap213

The Mines and Minerals Act Cap 213 of 2006 regulates activities relating to mines and minerals operations including quarrying and provides for regulations for environmental protection during prospecting and mining activities and rehabilitation of the areas mined. It specifies the need for licences for quarrying activities, and requires that an environmental management plan to be prepared and submitted to ZEMA for approval, and specifies the need for compliance with the Forest Act and National Parks and Wildlife Act. Further, the Ministry of Transport and Communications, Environmental guidelines Section 7.6 (2) states that: "Contractors shall obtain licences from the Ministry of Mines to operate borrow areas" and 7.10 (6) states that "Contractors shall obtain mining licences for quarrying".

Compliance

In this project quarrying for gravel material will be carried out and rehabilitation of the quarries created in the process will be carried out based on the mitigation measures outlined in this document and in the subsequent Environmental Project Brief for a new borrow pit. THE DEVELOPER shall comply by abiding with the provisions of this Act.

2.3 INTERNATIONAL CONVENTIONS AND PROTOCOLS

Zambia is signatory to a number of international conventions and protocols aimed at addressing environmental concerns. Some of the conventions and protocols are:-

2.3.1 RAMSAR Convention

The Ramsar Convention (formally, the Convention on Wetlands of International Importance, especially as Waterfowl Habitat) is an international treaty for the conservation and sustainable utilization of wetlands, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value. It relates to "all areas where water is the primary factor controlling the environment and associated plant and animal life", thus including lakes. Wetlands are listed as "wetlands of international importance."

Compliance

The Developer will abide by the convention in implementing the project as part of the road passes through a Ramsar site.

2.3.2 The Montreal Protocol of 1987

The Montreal Protocol on Substances that Deplete the Ozone Layer was designed to reduce the production and consumption of ozone depleting substances in order to reduce their abundance in the atmosphere, and thereby protect the earth's fragile ozone Layer. It is an international treaty designed to protect the ozone layer by phasing out the production of numerous substances that are responsible for ozone depletion.

Compliance

The Developer will ensure that the protocol is adhered to by not using substances that deplete the ozone layer so as promote sustainable environmental management.

2.3.3 The Convention on International Trade in Endangered Species of Fauna and Flora (CITES)

CITES is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. It is an international agreement to which parties (States) adhere voluntarily. States that have agreed to be bound by the Convention ('joined' CITES) are known as Parties. Although CITES is legally binding on the Parties – in other words they have to implement the Convention – it does not take the place of national laws. Rather it provides a framework to be respected by each Party, which has to adopt its own domestic legislation to ensure that CITES, is implemented at the national level.

Compliance

CITES guidelines will be adhered to by the Developer during project implementation especially that the area is well endowed with wildlife species of fauna and flora of which some are vulnerable and endangered.

2.3.4 The Convention on Biological Diversity (CBD)

The Convention on Biological Diversity (CBD), known informally as the Biodiversity Convention, is a multilateral treaty. The Convention has three main goals:

- Conservation of biological diversity (or biodiversity);
- Sustainable use of its components; and
- Fair and equitable sharing of benefits arising from genetic resources.

Its objective is to develop national strategies for the conservation and sustainable use of biological diversity. It is often seen as the key document regarding sustainable development.

Compliance

The regulations of the convention provide the environmental legal framework which The Developer shall follow during project implementation so as promote the conservation of the area's biological diversity.

2.4 ADMINISTRATIVE FRAMEWORK

A number of institutions will have a regulatory and monitoring role on the project under various pieces of legislation.

2.4.1 Ministry of Green Economy and Environmental Protection

The recognition of the importance of environmental management in the development process led to the establishment of the Ministry of Environment and Natural Resources (now Ministry of Green Economy and Environmental Protection (MGEEP)). The MLNREP is the key institution entrusted with the formulation of environmental policies, pollution control, and natural resource conservation and is responsible for formulation and administration of land policy which includes land use planning. Moreover, the Ministry oversees operations of ZAWA while operations of the National Heritage and Conservation Commission are supervised under the Chiefs and Traditional Affairs. Tourism affairs are the responsibility of the recently created Ministry of Tourism and Cultural Arts.

The MLNREP carries out its mandate through the Zambia Environmental Management Agency (ZEMA), the Forest Department and Department of Planning and Information. The ZEMA's basic responsibility is quality control of the environment through enforcement of the EMA (2011). The Forest Department is responsible for licensing on wood harvesting for commercial purposes, manages the reservation of new forest areas, conducts forest inventory and mapping, manages plantation sites and prepares management working plans. The Department undertakes research in basic silviculture, measurement, tree improvement, forest protection and various aspects of timber processing. It also has an extension service, which deals with community forestry programmes and public education.

However, there are a number of other ministries and departments that have responsibility in environment related issues as shown below:

2.4.2 Ministry of Mines, Energy and Water Development

The Ministry of Mines, Energy and Water Development has a responsibility of regulating the mining of mineral resources, use of water resources and the development of energy sector in the country. The project area has a lake, two rivers and several seasonal streams, and as such the Ministry will be concerned with the pollution of water during the construction phase. Water pollution and related matters are the responsibility of the Department of Water Affairs.

The Department of Energy within the Ministry is responsible for regulating electricity generation, processing and transportation of fossil fuels. The Developer will implement the requirements of the Department by ensuring all the requirements of fuel handling are met by the contractors including the licenses for bulk storage and use of clean energy in project development.

2.4.3 Ministry of Local Government and Rural Development

Local Authorities are concerned with the health of local communities and the conservation of natural resources within the realm of their administrative influence. Functions of local authorities include approval of project plans and labor camps, sewage handling facilities, parking areas for project vehicles etc. The Developer will comply with local authority by-laws within the Council areas.

2.4.4 Ministry of Transport, Works, Supply and Communication

The Ministry of Transport, Works, Supply and Communication oversee construction and civil engineering activities to the extent that they should not adversely affect the environment. The Ministry is further concerned with maintaining waterways in passable condition. The Ministry will play a role in ensuring the environmental guidelines are implemented through their representative in the The Developer Board of Directors.

2.4.5 Road Development Agency (THE DEVELOPER)

The Road Development Agency (RDA) was established through the Public Roads Act No. 12 of 2002 to be responsible for the care, maintenance and construction of public roads in Zambia. This was aimed at removing the fragmentation and duplication in the planning and implementation of road projects. It is governed by a Board of Directors drawn from various stakeholder organizations.

The RDA is charged with the responsibility of developing the entire road network in the country covering rural, feeder, district, main, trunk and urban roads, through the implementation of programmes approved by the Committee of Ministers on Road Maintenance Initiative (RMI). The Agency undertakes programming, procurement, monitoring and overall supervision of all road works in the country.

The Environmental and Social Management Unit (ESMU) in the RDA is manned with 2 environmental scientists and two sociologists. They are responsible for ensuring that environmental management plans (EMPs) are implemented, and also carry out monitoring of activities on trunk, main and district roads.

2.4.6 National Road Fund Agency (NRFA)

In order to co-ordinate all funding to the road sector, Government has established a National Road Fund Agency. All resources are meant for the road sector from the Government, co-operating partners or private sector are channelled through the National Road Fund Agency. The Agency is now responsible for collection, disbursement, management and accounting of the National Road Fund, reporting through Ministry of Finance and National Planning, to the Committee of Ministers on Road Maintenance Initiative. The National Road Fund comprises fuel levy, road user charges, Government funding to Road and Road Transport Sector, donor funding and credits secured for the Road and Road Transport Sector.

2.4.7 Road Transport Safety Agency (RTSA)

The Department of Road Transport and National Road Safety Council has been merged to constitute a Road Transport Safety Agency. This Agency is under the Ministry of Communications and Transport. The Agency is responsible for implementation of policy on road transport and traffic management, road safety and enforcement of laws regulating road transport and safety in the country. In addition, this Agency is responsible for programming, procurement, monitoring and evaluation of road transport regulations and safety programmes approved by the Committee of Ministers on Road Maintenance Initiative.

3.0 PROJECT DESCRIPTION

3.1. Project Location

The starting point (Ch0+000) is considered to be at the junction of Chingola to Solwezi Road (T005) and Solwezi-Kipushi Road (D271) at Kapiji Mpanga Traffic Control Point in Solwezi area near Senior Chief Kapiji Mpang's Palace. The coordinates of the starting point of the project road are

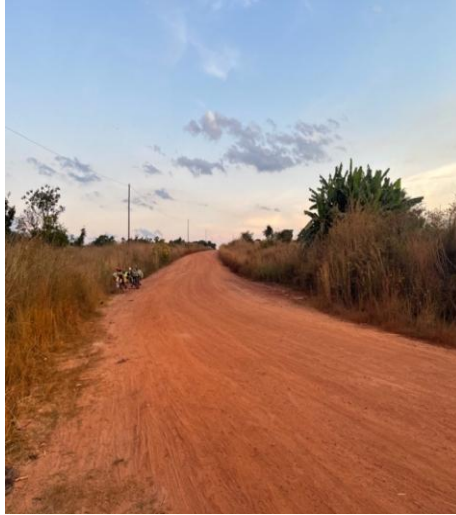
Table 3-1 GPS Coordinates for Project Road

ITEM	LOCATION		Latitude	Longitude
1	Start Point (Kapijimpanga Area)		12°12'9.73"	26°32'12"
2	End Point (Kipushi Border Post)		11°45'51"	27°14'50.57"

The road (D271) runs in a northerly and eastern direction for approximately 117 km until it terminates at Kipushi Border Post, the border between Zambia and the Democratic Republic of Congo (DRC). Along this portion of the route, the road comprises a single-lane gravel/earth track of varying width and traverses smaller villages and settlements located in Solwezi and Mushindamo districts. The project road starts at T5/D271 junction (approximately 15km south - east of Solwezi town) and traverses in the northeasterly direction to Kipushi Border Post on the Zambia – Democratic Republic of Congo (DRC) Border. The existing road is a gravel road, which is presently in poor condition, therefore, the proposed project shall upgrade the road to bituminous standard.



T005 Junction – Project start Chainage 1+500 point



Chainage 86 +000 – HGVs still using the Road



Approach to Kafue River bridge



Single lane Mushindamo River Bridge



Chainage 86 +000 – Section in poor condition



Kafue River Bridge



Kifubwa River culverts



Existing Border Post – immigration and customs Office

Figure 3-1: Project Road showing some key features

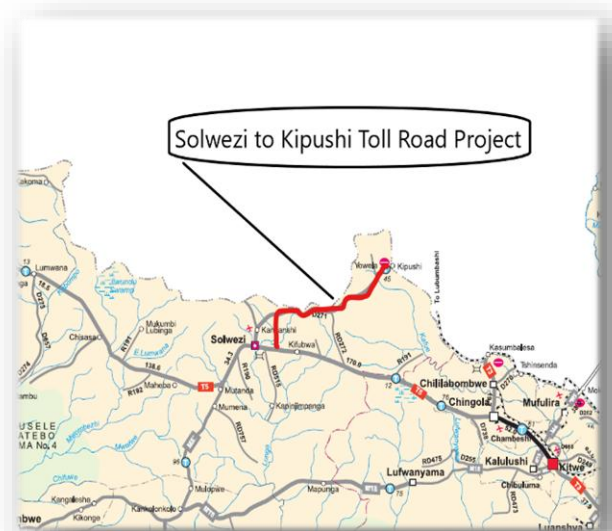
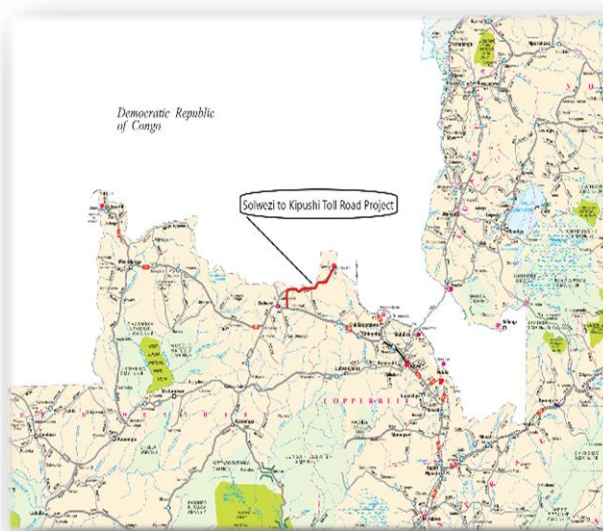


Figure 3-2 Map Project Road



Proposed Start Point



Proposed End Point

Figure 3-3: End of Project Road in Kipushi at Kipushi Bridge

The route traverses two districts, namely Solwezi from T005/km 0 to D271/km 55, Mushindamo from D271/km 55 to 101 (Kafue River) and Lwenge from km 101.6 to km 108 (Lwenge River). The total project length is 117 km.

3.2. Expected Area Of Influence(Aoi)

Although there are various ways of identifying the Area of Influence (Aoi), this study used the least data intensive methods, which involved using population data. Given that the 2022 census estimates that about 80% of the district population is involved in agricultural activities, it was considered that this method would represent a good proxy for data intensive methods. With this assumption, the expected areas of influence were identified in three bands as follows:

- Areas of full influence to include those areas served directly by the road;
- Areas of partial influence to include those areas served indirectly by the road;
- Areas of no influence to include those areas not served by the road.

Thus, the number of total beneficiaries directly served by the road was estimated by applying the population density of the two districts where the project road is located, to the size of each project road's AOI. A project road's AOI is defined as a 5-kilometer wide area on both sides of the road plus half a circle with 5-kilometer radius on both ends of the road. In general, for many other projects, the AOI of a road project is defined as 15- kilometer-area on both sides of the road, but due to the scattered population of the project area, the size of AOI was appropriately adjusted to have a more realistic estimate of the number of beneficiaries.

This ESIA study the area within 5Km on both sides of the project road is considered a direct impact area/ zone of influence for primary impacts. However, secondary impacts could take on a wider spatial local, national or even regional extent. The 5km zone of influence was considered for this project based on most probable extent of direct impacts of especially the construction phase, namely: accidents, dust plumes, borrow areas, stone quarry operations, noise, sources of construction labour and social effects e.g. prostitution. The route and its zone of influence are shown in Figures 3.2 and 3.3 respectively.

This ESIA study considered a 5 km impact zone of influence for primary impacts. However, secondary impacts can take on a wider spatial local, national or even regional extent.

3.3. CURRENT CONDITION OF THE EXISTING ROAD

3.3.1. Existing Road Width Section 1: D271, km 0.0 to km 111.01

This section comprises the D271 and starts at the intersection with the T005 just outside the town of Solwezi and approximately 15 km east of Solwezi. The road (D271) runs in a northerly direction for approximately 45 km until it intersects with the D 289 in the town of Mushindamo at km 55+400.

Along this portion of the route, the road comprises a single-lane gravel/earth track with a varying width of between 6.2m and 8.0m (5.3m average). This indicates that the original road was most probably constructed to Class III or IV standard.

3.3.2. Major Road Defects

The main defects are severe potholing in areas where the road is relatively flat and erosion on the steeper sections. This is caused by inadequate drainage due to inadequate maintenance and shaping/blading of the road, which leads to water ponding on the road and the subsequent traffic induced formation of potholes.

Similarly, the longitudinal erosion of the road on steeper sections is also caused by inadequate drainage, where water cannot drain off the road and this causes the formation of erosion channels.



Chainage 86 +000 – HGVs still using the Road



Chainage 86 +000 – Section in poor condition

The last seven (7) km from the Wenge River Bridge traverses a clayey subgrade with deep ruts. The team inspecting the road had to park their vehicle at the border post since it would have been impossible to drive over this section. Interviews with border officials revealed that trucks transporting goods across the border can take days to cross this relatively short section of road.

On Section 1 between Solwezi and Mushindamo Turn Off, the existing gravel wearing course generally consists of either a laterite/ferricrete or quartzitic sandstone gravel. The road between Mushindamo Turn Off and Kipushi has a Clay surface consisting

mainly of loose material, but with lengthy sections where the road surface consists of a sandy material (possible exposed subgrade material).

It must be noted that the road generally follows the surrounding natural ground level (NGL) and is in many cases below the NGL and can therefore not drain adequately. The inlets of the existing minor pipe culverts are below the NGL and are sunk into the ground (i.e. drop inlet scenario). Side drains leading up to the inlets are generally overgrown and cannot drain into the inlets and therefore water drains onto the road.

The outlets of the minor pipe culverts are similarly below the NGL and trenches leading away from the outlets until they “daylight” are present in many instances. These trenches are heavily overgrown in most cases and impede their proper functioning. Mitre drains are evident along the road but are in many cases non-functional due to inadequate maintenance (i.e. overgrown and blocked).

3.3.3. Drainage Structures

3.3.3.1 Minor Culverts

Mitre drains are evident along the road but are in many cases non-functional due to inadequate maintenance (i.e. overgrown and blocked).

The distance between headwalls is inadequate to accommodate a Class II or Class IC road and it is recommended that the existing minor pipe culverts be replaced with minimum 900mm diameter pipe culverts or as required. Inlet and outlet structures (i.e. wingwalls, headwalls, apron slabs) are to be cast in-situ reinforced concrete and the culverts shall be delineated using hazard plates at road level.

3.3.2. Major Culverts

The existing major culverts generally cross formal rivers and in most instances consist of Armco pipe culverts with a diameter of 1.5m or greater. A few major culverts consist of 900mm diameter concrete pipe culverts. There are 3 major culverts and an inventory of major culverts and their rivers is tabled below.

The major culverts appear structurally and hydraulically adequate and are generally in a fair condition with relatively minor defects.

An exception to this is the Kafue River culvert where water is seeping through the bottom of the abutments. The downstream outlets of the culverts do not appear hydraulically efficient and prone to possible long-term erosion problems (rocky substrate). The upstream side (inlets) appears to accumulate debris such as tree trunks.

No handrails or balustrades are visible on most of the longer major culverts. The local inhabitants living in close vicinity of the major culvert structures were interviewed by the consultant's site staff to ascertain whether any of the culverts were prone to flooding during the rainy season (i.e. historical information).

It was established that only the culvert crossing the Kifubwa River (D271, km 3.2) has been overtopped in a particularly heavy rainy season in 2024 – 2025 by 150mm according to eyewitness accounts. Culverts were noted as the water level coming very close to the pipe soffit but not overtopping whilst all other remaining culverts appear to function appropriately during normal rainfall events. The hydraulic study conducted in section of this report summarises the findings in this regard.

All major culverts are too narrow to accommodate a Class II or Class IC road and appropriate replacements will have to be made. This has been

determined as part of the hydrological study. It is envisaged that most major culverts will be replaced with cast in-situ reinforced concrete box culverts.

Inlet and outlet structures (i.e. wingwalls, headwalls, apron slabs) are to be cast in-situ reinforced concrete and the culverts shall be delineated using hazard plates at

road level. Appropriate erosion/scour protection at inlets and outlets will be provided.



Kafue River Bridge (Km 101+300)



Kifubwa River culverts (Km 3+200)

Figure 3-5 Major Crossing Points

3.3.3. Bridge Survey

There are three existing bridges along the project route crossing the rivers: (i) Kifubwa River along D271 road at Km; 3+200 (ii) Kafue River Bridge along D271 at km 101+500; and (iii) Wenge River Bridge along D271 at Km 108+100.

Two bridges are of reinforced concrete with multiple spans and were inspected for signs of structural distress and/or hydraulic deficiencies in order to assess

their overall condition and the need for repairs and/or upgrading work. The Kifubwa river crossing is a culvert comprising Amco Pipes

The three bridges have decks, piers and abutments constructed in reinforced concrete. Structurally the decks, abutments and piers are all in good condition except for missing or about failing bearings.

The loading standard for all the existing three concrete bridges is not known.

At all three locations signs of some erosion of channels/stream beds and embankments were found as well as some scouring around piers and abutments/wing walls, but the overall picture is that the bridges are functioning well with no signs of high water levels being too close to the bridge deck or other hydraulic deficiencies.

The hydraulic design of the existing bridges is not available. With regards to the waterway inspection where no signs of excessive high-water levels were found as well as information collected on history of floods lead to the conclusion that the bridges have adequate discharge capacity.

3.3.4 Road Furniture Survey

No road side amenities in the form of lay bies or rest areas currently exist along the route. No public transport facilities (i.e. bus stops) exist currently along the route.

No road signage and other furniture were observed during the site visit and appropriate road markings and signage in accordance with the SADC Road Traffic Signs Manual will be provided as part of the design.

3.3.5 Utility Services Survey

Very little utility services were observed, with the exception of overhead electricity lines running parallel to the road between km 0.0 and km 4.6 (Solwezi) on the D271 and again between km 53.6 and km 75.6 on the in the Mushindamo area. Power lines cross the road at the following locations.

Various cellphone towers were observed along the route and these mainly occur between km 30 () on the D271 and Kipushi. Cellphone reception is available on the first 30km of the project road except in the vicinity of Mushindamo Turn-Off .

3.4. PROPOSED ROAD UPGRADING

3..4.1. Overall

The overall objective of the services to be provided by the Consultant, as stipulated in the Terms of Reference for the detailed engineering design, is to identify the most appropriate construction intervention upgrading of the existing D271 road from Solwezi to Kipushi via Mushindamo in order to assist the RDA and Border Way Investments to implement the proposed project in a cost-effective and environmentally friendly manner.

The project involves a full construction of the existing carriageway and demarcation of the road reserve of 100m (i.e. 50m on both sides of the existing centreline). The selected technical solutions shall include:

- Road Categorization;
- Road Geometrics;
- Junction Design;
- Road Safety Design;
- Road Furniture; and
- Utilities Designs.

3.4.2. Project lifespan (estimate)

The life span of the road will depend on a number of factors:

- Regular maintenances will sustain the road for many years, short of which it will be rendered useless within a couple of years; and
- At a certain stage the Government can decide to:
 - ✓ Abandon or divert the whole road otherwise a section of it. In such case the need for preliminary environmental assessment (PEA) will be called for; and

- ✓ Expand the road and therefore calling for one of the studies: PEA, EIA or environmental audit.

For a road such as this one it is not thought to come completely to an end and thus decommissioning might not take place. On the other hand the technical estimation for the proposed road life is 20 years, after that period the constructed carriageway road would need to be strengthened or re-constructed.

3.4.3. Road Categorisation

The section road from Solwezi to Kipushi road is an international trunk road designated as class T. Class T roads are the highest class of road in Zambia. The major function of Class T roads is to provide mobility (as opposed to access).

For purposes of the road design, the entire length of the project road has been divided into various categories on the basis of volume/type of traffic, number of lanes, terrain/topography. This is in terms of Rural and Semi urban. Most of the length along the project road is rural category (80%) and also most this length is available in longer stretches (20.5km, 27km, 43.5km and 50km). This indicates the carriageway proposal would be uniform continuously for majority of its length.

3.5. ROAD DESIGN

3.5.1. Design Concept

The design concept is to provide a high-speed road that allows safe and efficient movement of traffic with fully controlled access. Although the road will be designed for vehicles, the movement of pedestrians and bicycles along the road will be considered in the overall design.

3.5.2. Design Standard

The design follows SATCC standard code of design for the Geometric Design of Trunk Roads (Ed. Sept 1998) together with Recommendations on Road Design Standards – Geometric Design of Rural Roads (Ed. Dec. 1994) issued by Roads Department, Zambia. The design standards for the project road have been adopted

after reviewing the relevant latest Manuals, specifications and design guidelines (SATCC, AASHTO and Zambia Specifications).

3.5.3. Access Control

In consideration of the Class A category of the project road, full access control should ideally be exercised. However, the nature of development along the project road, is such that to restrict access in a major way would entail the demolition of many houses and other properties in order to provide the service roads which would be necessary to channel traffic to a reduced number of main junctions.

It is reasoned that a more appropriate solution would be to adopt a reduced level of control especially in built-up areas such as Kishela and Kamikuwo areas. Therefore, partial access control, as defined by the Road Design Manual, will be adopted. In effect access will be kept to the minimum consistent with optimal cost effectiveness and safety.

3.5.4. Road Reserve Width

The desirable road reserve width applicable for a Class T road is 100m while for D road is 60m, according to the Public Roads Act. Therefore 100m will be adopted for the D271 road section from Mushindamo to Kipushi while a 36m road reserve will be adopted for the D271 from Solwezi to Mushindamoi. However, the construction width is at maximum 28m from the Existing Centerline with an exception of a few locations of bridge approaches, Lay byes where the width is more.

Consultation with the Environmental Unit at Head Quarters for RDA confirmed the desire by the agency to have 100m and 60m road reserve for sections of the D271 respectively.

3.5.5. Design Speed

Most of the elements of roadway alignment and facilities will be largely influenced by the design speed. Based on the initial studies and understanding the preset route characteristics, the proposed design speed had been arrived and summarized below in Table 3-1.

Table 3-2: Proposed Design Speed for the proposed upgrading of the Solwezi to Kipushi road

Category of Road	Desirable Minimum Rural	Minimum
Rural	120 km/hr	80/60 km/hr
Semi Urban	100 km/hr	80/60 km/hr
Urban		60/40 km/hr

3.5.6. Geometric Design

The geometric design standard adopted for this road almost conforms to the Class I paved standard of the Zambian specification. Depending upon the selection criteria, various typical cross sections have been developed and adopted suitably for different segments of road.

The design concept is to provide the shortest route and a high-speed road that allows safe and efficient movement of traffic. Although the road will be designed for vehicles, the movement of pedestrians and bicycles along the road will be considered in the overall design.

The geometric design standard adopted for this road almost conforms to the Class IIC paved standard of the SATCC specification. The proposed cross-section of the road consists of:

- 36m Road reserve for D271 and 100m road reserve for T005;
- 10.8 m carriageway width (2 x 3.4m lanes with 2 x 1.5m surfaced shoulders and 2 x 0.5m gravel roundings);
- 2,5% cross-fall/camber for straights;
- 7% maximum cross-fall for fully developed super elevations;
- Camber and cross-fall < maximum of 4%; and
- Cut and fill batter slopes of 1:2 maximum.

The cross-section standard is dictated by safety issues more than anything else and safety must be the over-riding parameter. In general, the design speed of 100 km/hr

was selected but the speed will have to be reduced to 60 or 40 km/hr for sharper curves or along settlements or other similar sections. Rumble strips are provided in populated areas. The urban roads will follow existing alignments due to the built-up nature of the site. Regular speed humps at key locations such as schools; etc will provide traffic calming measures and serve as pedestrian crossing points.

The vertical alignment has been chosen to balance the cut to fill and minimize the spoil.

The stopping sight distance for the main road is set to be 150m according to flat terrain, increased to 215 m for the maximum grade of 5%. This combination allows for the most economical design with due attention to the safety of the road users.

Other details of the horizontal and vertical alignment are presented below, as well as in the construction drawings.

- Barrier sight distance 320 m
- Decision sight distance 300 m
- Passing sight distance 670 m
- Intersection sight distance 150 m
- Minimum horizontal curve radius 250 m – At times this had to be reduced to accommodate existing settlements and sharp curves
- Minimum Horizontal Curve length 200 m –At times this had to be reduced in order to create space for the existing settlements-
- Super elevation 4% Max due to sharp corners at
km/hr unless otherwise indicated 100
- Minimum length of vertical curve 180 m
- Maximum vertical gradient 6%

As the total ADT on this road is well below the limit for 60% passing opportunity along the entire road length, no allowance is made for the provision of passing lanes or climbing lanes.

The cross-sectional properties of the road are as follows:

- Camber 2.5%
- Maximum super elevation 4%
- Carriage way width 6.5 m
- Shoulder 1.2 m shoulder sealed and 0.3 m un sealed
- Side drain slopes 1:2 (1:3 when embankment is higher than 1m)
- Side batter slopes 1:2 in stable material

A severity index of 4.8 is used in order to determine the justification for crash barriers. In this case, crash barriers are set when the fill is more than 2 m, with fill side slopes of 1:3.

All intersections are treated as simple junctions with at least 150m of visibility on any side or approaches.

3.5.7. Earthworks

The subgrade condition is poor to fair, but water drainage is poor. Therefore, most of the road needs to be raised above the natural ground by minimum 400 and preferably 600 mm so that the pavement structure remains above wet zone of the ground. In addition, the relief and cross culverts are 900 mm diameter, which need at least 400 mm cover, bringing their invert to 1300mm below finished road levels. In light of the above, most of the road will be made of imported fill, except in few places where cut to fill from sides is possible.

Terrain Model is being developed which takes into account the earthworks required for this project. At preliminary stage, the following quantities of earthworks are estimated for this project:

- Remove top soil 300,000 m³
- Cut from borrow to Fill 550,000 m³

3.5.8. Structural Design

The pavement structure has been decided based on minimum practicable thicknesses, which will create a balanced pavement structure. The direction split

was not considered as the pavement structure for both ways is at a minimum design level and the traffic load one way or the other would not change the layer thickness designs.

The strength of the sub grade was determined using DCP, down to minimum depth of structural influence of sub grade, as well as laboratory verification of CBR values. The main road was divided into two sections where the sub grade material was investigated. There is a lack of good quality stone in the area; therefore, the most cost-effective pavement would consist of cement stabilized base on top of layers of earthwork which at the same time raise the road above the general surrounding terrain by 600 mm, which is preferred in order to keep the pavement layers as dry as possible. Similar approach will be taken to the urban roads.

The traffic analysis for this project revealed that the estimated traffic projection for the 20 year design life of the road is not in excess of 2 million ESA, falling within the T3 traffic class. Therefore, SATCC / AASHTO design procedure was used for the road. The following table shows the design of the road.

Table 3-3: Design Parameters of the project road

Section	Sub Grade Condition	Extra Fill from insitu cut	Sub base	Base
Section ONE 0+00 to 48+00	Mostly above 7 with 90 percentile	Required 375mm CBR 10	200 mm – Natural Gravel CBR 30	150 mm Cement stabilized with double seal 19/9.5 stone
Section TWO 48+00 to 109+00	Mostly above 10 with 90 percentile	Required 300mm CBR 10	200 mm – Natural Gravel CBR 30	150 mm Cement stabilized with double seal 19/9.5 stone
Urban Roads	Mostly above 7 with 90 percentile	Existing wearing course will be ripped to form subgrade	150 mm – Natural gravel CBR 30	150 mm Cement stabilized with 40mm AC

3.5.9 Bridges

The following considerations were analyzed in determining the bridge form.

1) Foundations

Road over river bridges must generally be founded on rock. If the rock level is shallow, the bridge can be founded on spread footings with the footings fixed into the bedrock by means of dowel bars. If the rock level is deeper, a pile or caisson foundation should be utilised. Geo-technical investigations at the sites are ongoing.

2) Hydraulic information

The hydraulic information for the bridges is summarized below:

Table 3-4: Hydraulic information for the bridges along the project road

Bridge	Effective catchment area (km²)	Design flood volume (m³/s)	Design flood level (m)
Kifubwa	430	25	1358.41
Mushindamo	256	30	1321.57
Kafue	440	40	1313.87

3) Bridge width

Each bridge cross-section consists of 2 lanes of 3.25m, a 0.5m edge strip/shoulder outside the yellow line to make the carriageway 7.5m wide. On either side of the shoulder is a 1.2m raised sidewalk. A 0.315m wide plinth on the outside of each sidewalk is required to fix the 0.475m wide concrete barrier. This gives a total bridge width of 10.85m. The approach road for 20 m each side of the bridges will form a transition between the bridge cross section and the road cross section.

4) Bridge height and length

Bridge height and length are mainly determined by the river hydraulics and vertical alignment standards. A minimum freeboard of 1.5m has been used with the given high water level for each bridge. The bridge height also depends on the vertical road alignment.

The minimum deck soffit levels and road surface levels for each of the design options can be seen in Section 5.3 below. The bridge lengths are recommended to be 12 m and 18m. A single span bridge is proposed at each location.

5) Design loading

The bridges are designed for the NA, NB36 and NC30-5-18 loads according to the SATCC: Code of practice for the design of road bridges and culverts.

The geographical area in which the bridge will be constructed is in an active earthquake area. Therefore, earthquake action will be designed according to the SATCC: Code of practice for the design of road bridges and culverts. Reinforcement detailing shall be done according to BS EN 1998-2: *Design of structures for earthquake resistance*. The structure shall be designed for an Earthquake Intensity according to the Modified Mercalli Scale of VII. This relates to a ground acceleration of 0,1g for a probability of 20 percent that the degree of intensity will be exceeded in 50 years. Refer to Appendix B: Earth quake risk in Africa: Modified Mercalli Scale (OCHA Regional Office for Central and East Africa Issued December 2007).

3.5.9. Bus Bay / Bus Stop

A standard design has been prepared for bus bays according to SATCC_GDTR as well as following RDA's instruction to segregate bus bays from the main traffic with raised island.

The layout of the bus bay comprises the following main features:

- 35m long entry and merging/exit tapers (lead-in and lead-out sections), positioning the bus bay 3.0m from the edge of the travelled way to accommodate the standard 2.0m wide shoulder and a 1.0m wide kerbed traffic island (raised/semi-mountable kerb type no. 7 with visibility painting/kerbface marking).
- 3.5m wide and 15m long bus bay (stopping area).
- 1.5m wide kerbed sidewalk (raised/semi-mountable kerb type no. 7 with visibility painting/kerbface marking) with 60mm thick concrete block paving.
- Passenger platform behind the sidewalk and with open-fronted shelter (approximate 4.5m x 1.8m plan dimensions and 2.5m height, of brick, stone or cement block walls, with side wall ventilation openings, corrugated iron roof and concrete bench).
- Pavement/surfacing of the bus bay is the same as for the Project Road.

3.5.10. Proposed Road Safety Improvements

In the detailed design stage care has been taken to incorporate the findings of the safety audit within the Scope of the Design study and the following aspects have been incorporated into the design. The road should be provided with appropriate and sufficient traffic signs and markings as per the requirements of specific locations. The summary of Improvement's incorporated in the design is briefed Table 3-4.

Table 3-4: Proposed Safety Improvements for the proposed dual carriageway

Safety Aspect	Improvements incorporated in Design
Geometric alignment	The scope of upgrading design did not allow for major realignments but the following provision has been made: • Vertical realignment of severe vertical crest and sag curves; • Vertical realignment of sag curves at dangerous bridge sites; • Horizontal realignment where appropriate;
Junction Layout	• Junctions have been designed to the appropriate standards. • Bus layby's and other layby's will be retained but improved to the required standard for width, length and safe exit and entry points.
Roads Signs	• All road signs will be replaced.
Road Markings	• All road markings will be to the required standard and the construction contract makes provision for the installation of road studs.
Guard Rails	• Guard rails will be installed where required.
Drainage and Bridge Structures	• All narrow structures will be widened and where required, bridges will be raised to accommodate the new vertical alignment.
Safety of non-motorised road users	• Separate footways will be constructed in the high density pedestrian areas of Kipushio areas. No provision is made for pedestrians in the rural environment.
Traffic Accidents and "Black Spots"	"Black spots" identified are as a result of either steep grades and urban areas and have been addressed as follows: • Separate pedestrian facilities in urban areas; • Speed bumps large settlement areas.
Road safety features	Road safety features to be installed include but are not limited to concrete safety barriers, kerbs, road signs, road markings, rumble strips, road humps and guardrails

3.5.11. Road Furniture

The condition of the existing road furniture was recorded during the visual assessment of the road and the subsequent safety measures are summarized below, together with recommendations for any improvements required.

3.5.11.1. Road signs and Markings

Road markings and signs perform the important function of guiding and controlling traffic on a highway. The markings serve as psychological barriers and signify the delineation of traffic paths and their lateral clearance from traffic hazards for safe movement of traffic. Road markings are therefore essential to ensure smooth and orderly flow of traffic and to promote road safety. RDA standard Practice for Road Markings and SATCC Specifications was used in the study as the design basis.

3.5.11.2. Speed Zoning

In large settlement areas such as Solwezi and Kipushi, a local speed limit of 60 km/h has been proposed, due to high pedestrian, cycle movements and Sub-standard horizontal geometry.

3.5.11.3. Fencing

Fencing of road reserve to prevent encroaching into the road reserve is a new concept which is yet to be considered by RDA. Currently, there are no measures in place to protect road reserve for the project road. Road boundary fencing is therefore desirable and the provision of fencing along the road reserve could be included in the final design drawings and documentation after discussion with RDA. This will significantly help to reduce the number of people encroaching the proposed road reserve.

3.5.11.4. Guardrails, Safety Barriers, Handrails

All the existing guardrails at the bridge approaches have fallen down as most of the wooden support posts have rotted away or the guardrails have been damaged in accidents. The guard rails are mostly badly rusted and all of them need to be replaced with new galvanized railings.

For the Solwezi to Kipushi Road Upgrading Project galvanised steel safety barriers (metal guardrails) with steel guardrail posts driven in the ground are included to replace guardrails at high fill sections and at bridge approaches.

Safety barrier/guardrail terminals with concrete anchor block are provided at the start and end of a guardrail section.

The safety barriers will be provided at outer edges of roadways wherever the embankment height is more than 2m in plain terrain and at bridge approaches.

3.5.11.5. Kilometer and Marker/Guide Posts

The details of kilometer posts are in accordance with RDA standard drawings. Kilometer posts are provided on both sides of the road i.e., independently for each direction of travel. Kilometer posts are located on the left-hand side of the road as one proceeds from the station from which the Kilometer count starts. The posts shall be fixed at right angles to the center line of the carriageway.

Marker Posts are intended to mark the edges of the roadway so as to guide drivers for the alignment ahead. Object markers are used to indicate hazards and obstructions within the vehicle flow path, for example, channeling islands close to the intersections. Posts shall be provided as per the details given in the drawings in accordance with the provisions of RDA Standard.

Marker posts are provided for all curves having lesser radius and posts are proposed on embankments of height more than 1.0m, bridge approaches before start of the guard rails.

4.0 PROJECT LIFE CYCLE

4.1. INTRODUCTION

For construction purposes, the project road from Solwezi to Kipushi via Mushindamo has been divided into two lots with Solwezi (55 Km) being Lot 1 and Mushindamo to Kipushi (56 Km) been Lot 2.

Throughout the course of constructing the two road sections, two types of manpower would be need. The first category will be engineers and others with relevant specialties such as surveyors, economists, environmentalist and sociologists. These will be charged with technical issues at the onset of the project and subsequent activities. Second will be casual and manual labour with or without skills who will serve as handymen throughout road construction. About 50 experts and 250 handymen will be employed during the Two-year road construction for each of the two lots.

4.2. Mobilization Phase

The time taken for the duration of mobilization phase will be about three months. For road construction the mobilization phase will include a number of activities including:

- Clearing sites all along the RoW;
- Identifying appropriate camping site(s) either as recommended by the ESIS or others depending on the bidder's preference¹;
- Constructing and using an appropriate camp;
- Purchasing equipment (otherwise owned by the construction company) including vehicles, bulldozers, excavators, vibrating rollers, concrete vibrators, , generators and others;
- Movement of construction materials e.g. sand, gravel, cement, stones, timber, iron bars, and others;
- Undertaking the initial works such as crushing of aggregates, locating site posts and disposal sites for waste materials.

¹ The sites taken other than those identified by the ESIS will require EPBs

4.3. ROAD DESIGN AND CAMP SITE ERECTION

The horizontal and vertical alignment will be determined at intervals of 25m along centreline, tangent points and other critical points as required. The vertical alignment is designed to take into account the hydraulic and soil conditions and the needs to raise the embankment.

The earthworks and pavement design is designed to carry traffic over a period of 20 years and in accordance with the Pavement and Materials Design Manual, 1999.

Other parameters to be considered during pavement design shall include: results of the pavement evaluation, soils and materials tests and other engineering treatments dictated by the available natural materials. Access roads joining the project road shall be paved up to the end of the road reserve taking cognizant of the environmental requirements.

The design of drainage structures involves all existing data and results of the field investigations for soils, foundations, hydrology, and other parameters. It is assessed and used as a basis for the design of drainage structures. Detailed hydraulic computation and structural designs are carried out and fully documented in the reports.

The Geometric design is devised bearing the following considerations:

- Based on the topographic survey and the design pavements, to improve the horizontal and vertical alignments as necessary and complying with the approved design standards appropriate to the traffic and engineering characteristics of the road;
- All possible accident black spots are identified and their design incorporated. Measures to improve dangerous locations are also identified. Improved layout and visibility at junctions, proper separation of pedestrians and cyclists from the vehicular traffic and the provision of pedestrian crossings, bus bays and parking areas are included in the design, where possible. Other measures include provision of wide shoulders in towns/villages and climbing lane on steep grades.

The traffic design is considered to:

- Determine appropriate growth rates per category of vehicles (i.e. light and heavy) using apt methods that are acceptable. Moreover, for each determined category the future traffic forecast for the next 10 to 20 years is provided;

- Detailed engineering design is carried out to specify necessary traffic control features. The design includes detailed traffic analysis as well as, where appropriate, design traffic forecasts for major intersections. Based on the traffic analysis, the intersection capacity and related traffic studies are conducted to determine the location of signs, signals as necessary, pavement markings, facilities for pedestrians and non-motorized traffic around populated areas and other control features;
- A detailed scheme for the management of the traffic flow is developed to ensure that vehicle and pedestrian movement is properly handled during the construction period. This plan includes details of the location and design of bypass lanes; temporary structures, barriers, signs, signals and other physical features necessary to accommodate traffic flow during construction. In addition to the design plan, a traffic operations plan detailing the construction sequencing, public information announcements, use of traffic control devices and other activities are designed to minimize traffic disruption.

4.4. Construction Phase

4.4.1. Introduction

With the purpose of carrying out road reconstruction effectively the agreements embedded in the contract together with the capability of the company awarded the contract should be observed. Worth mentioning the changes in the weather and sometimes local politics are likely to affect the speed and quality of construction.

4.4.2. Construction Overview

A pre-qualified contractor capable of carrying out roads construction will undertake construction of the road, and associated works. The construction will require a number of temporary facilities such as equipment & workshop yard, labour camp and site offices.

The Construction contract will be based on RDA conditions which stipulate that the Contractor must provide a performance bond as well as the following insurances:- • Insurance of Works and Contractors Equipment; and

- All-Risk Insurance.

4.4.3. Associated activities

Many activities will be done during construction of the road. These will comprise of:

4.4.3.1. Ground Investigations

Prior to actual construction works, the Contractor will undertake additional ground investigations over and above the one done by the Consultant. These additional ground investigations will be more elaborate. Samples from test pits will be subjected to both visual observations and laboratory tests.

4.4.3.2. Demolition and Site Clearance

This will include general site clearance of vegetation including their disposal. Where necessary, trees may be cut, their stumps removed and resulting holes backfilled. Where the road requires slight realignment, or there is need to clear the entire width of the road reserve, existing structures, which are in the way of the construction, will be demolished and disposed. This is likely to be intense in large settlement areas and especially at market places. The demolished elements will include brickwork, concrete, masonry blocks, metal (largely steel) and timber. The mitigation measures for the affected households have been proposed in the Resettlement Action Plan (RAP) being submitted together with this EIS.

4.4.3.3. Concrete Works

There will be concrete works at certain sections of the road that require reinforcement. In addition bridges and box culverts maintenance and replacement of all the 600mm pipe culverts other drainage structures will be required.

4.4.3.4. Earthworks

Earthworks operations will be for preparation of road sub grade and drainage, in addition to auxiliary works within the road corridor. Earthworks will include:-

- Site Survey and Setting out;

- Excavation by cutting into topsoil, normal soil, rock or artificial material. Trimming some excavated surfaces and disposing of excavated material(s);
- Filling to Embankment and General Filling with imported natural material other than topsoil. These natural materials include rock; sand and other approved naturally occurring materials;

- Scarifying, watering and compaction of fill layers or in situ road formation level; and
- Providing, placing and lapping geo textile materials.

4.4.3.5. Road Paving

The Roads Pavement

comprises of the following:

- • Construction of the carriageway;
- Precast Concrete Kerbs and Channels to act as restraint to road edges;
- Non-Illuminated Traffic Signs;
- Reflective Road Studs along centre line of carriageway; and
- Road Markings to designate carriageway from shoulders.

4.4.3.6. Duration of construction phase

In case there are not any developments to delay the construction of the two sections of the project road, the time for construction phase will be in the region of two (2) years.

4.4.3.7. Materials: Sources, types and amounts for construction

The materials to be used will be more or less those obtained during mobilization. The major ones will be sand, gravel, stones and others from borrow pits, and others like cement, timber and steel reinforcement bars from commercial dealers. Utilities such as water, energy and communication gadgets will be essential together with reflectors for slowing down speeding vehicles. Moreover more materials will be required such as grass and seeds or seedlings for containing soil erosion as well as iron or wood boards and iron bars for signposts.

Materials investigations and characterization was done and have covered the following important aspects:-

- Assessment of in-situ alignment soils for the purpose of carrying out pavement design based on traffic loading, base course type, and climate and subgrade strength as recommended by PMDM-1999;

- Investigations on existing and potential new borrow areas for the purpose of obtaining suitable materials for pavement layers which will be utilized for fill, subbase and base course lying;
- Investigations of potential existing and new quarry/stone sites which for obtaining suitable materials for surfacing and granular pavement layers including crushed stone road base and aggregates for concrete works; and
- Evaluation of potential sand and water sources in order to understand their physical and chemical suitability for concreting, mortar and pavement works.

The following are estimated quantities of materials to be used for the upgrading works of the road from Solwezi to Kipushi via Mushindamo Road project:

Table 4-1: Material Requirements (Road Layerworks)

	D271 (111 km)	D271 (92.53 km)	TOTAL
19mm surfacing stone (m ³)	29 300	13 000	42 300
6.7mm surfacing stone (m ³)	10 500	4 600	15 100
Bitumen tack coat (70/100 penetration grade) (litres)	3 650 000	1 600 000	5 250 000
Fogspray (65% cationic emulsion) (litres)	1 700 000	750 000	2 450 000
Precoat (litres)	510 000	230 000	740 000
Crushed-stone base (m ³)	290 000	178 000	468 000
Subbase (m ³)	420 000	210 000	630 000
Upper selected layer (m ³)	360 000	160 000	520 000
Cut to fill (m ³)	2 350 000	205 000	2 555 000
Borrow to fill (m ³)	2 430 000	2 195 000	4 625 000

4.4.3.7.1. Borrow Pit Sites for Pavement Layers

Thirty (30) potential borrow pit sites were identified and had gravel samples collected for testing in the laboratory for compliance with the specifications given in the SATCC Standard Specification in accordance with their proposed use. Twenty (20) existing borrow pits were located for possible extension and a further 10 new/potential borrowpit sites were

identified for further investigation and separate Environmental Project Briefs (EPBs) will be prepared for each new borrow pit that shall be opened up in accordance with the Environmental Management Regulations.

Additional points of concern are as follows:

- Numerous existing borrowpits are close to settlements and villages and have been substantially mined.
- Extension potential may therefore be limited by the close proximity of dwellings.
- The existing borrowpits have been extensively mined and no overburden material has been retained for their rehabilitation. If these borrowpits are to be extended, their rehabilitation would only cater for the extended area, unless sufficient excess overburden material can be sourced from the extended area.
- The thickness of overburden material is limited in many instances and would result in inadequate amounts of material being available for the rehabilitation of the borrow pits.
- The thickness of good quality gravel appears thin in many instances with the gravel being underlain by inferior quality material (i.e. clays). This would result in an extensive borrowpit area to source the required amounts of material. Alternatively, the distance between borrowpits would have to be reduced to contain the borrowpit extent.
- Protected and undisturbed forest areas may also hamper the opening of new borrowpits but this will have to be confirmed with the relevant authorities.
- The sourcing of sand for use in concrete may prove difficult and could be constrained to alluvial deposits at river crossing, which may not be desirable from an environmental standpoint. The thick sandy overburden material in the southern section of the project (km 0 to km 100) may prove more suitable in this instance.

Figure 4-1 shows typical existing Borrow pits along the project road



Figure 4-1: Typical Existing Borrow Pits along the Solwezi to Kipushi Road Project

4.4.3.7.2. Fill Materials

Fill material will origin from cut in the existing road prism where the new road level will be lower than the existing road due to improvement of the vertical alignment required for compliance with the applicable design standard.

Further fill material will origin from cut in the existing road prism where existing cuts need to be widened due to the new width of the Project Road.

4.4.3.7.3. Sand

It is assumed that the requirement for natural sand for the Project will be relatively small, mainly for blinding material, mortar and some concrete. Normally the aggregate production produces excessive amounts of quarry dust, which may be used in lieu of natural sands.

The sand found at various borrowpits was found to be suitable for use as fine aggregate for concrete and can be blended with fine aggregate derived from the mechanical crushing of rocks in the quarries if required.

4.4.3.7.4. Crushed Rock

The initial site reconnaissance carried out in March 2025 identified six potential hard rock quarries as tabulated below.

A subsequent site visit with the consultant's engineering geologist and various meetings with local residents revealed an additional potential hard rock source

close to Kifubwa area. Sources no. 4, 5 and 6 in the previous table were discarded from further investigation due to environmental constraints.

The following four potential quarry sites were identified for further investigation and a drilling investigation is currently underway to prove these locations.

4.4.3.7.5. Sources of manufactured materials for road construction.

- **Cement-** Cement is easily available in the mainland, packed in 50kg bags and sourced from the factories by Chilanga Cement in Lusaka and Chilanga cement works in Ndola is the sources for supply of cement for the entire project requirements.
- **Reinforcement Steel-** M/S Good Time Steel (Zambia) Ltd and M/s UMCIL, Lusaka is the major source of steel for the entire project requirements. Strength and other properties of reinforcing steel to be confirmed by testing of samples in approved testing laboratories.
- **Bitumen-** Bitumen for road works is generally readily available from external suppliers. Therefore continuous supply to the project may be delayed or inadequate to meet the target progress. In such case option of importing bitumen and emulsion direct sources from South Africa and Zimbabwe. Bitumen properties need to be checked by testing representative samples in approved laboratories.

4.4.3.7.6. Transportation and handling of construction materials

Transportation and handling of materials will basically be done manually.

Machinery will be operated manually while feeding and controlling them will involve human realization and keenness. Materials will either be moved from borrow pits or obtained from the camp and then sent to the site under construction.

4.4.3.8. Construction Waste and Emission Inventories

4.4.3.8.1. Construction and Commissioning Waste Management

The Table below presents indicative characteristics of wastes that will be generated by the Proposed Project.

Table 4-2: Characteristics of Potential Project Waste

1. SOLIDS • Bituminous material; • Cement (Dust); • Paper and Cards; and • Plastic bottles, cans, drums & packaging bags (both polythene and biodegradable)	1. METALS • Welding Rods • Isolated Steel Piles Wasted Lengths • Copper (Electrical Wires etc) • Reinforcement steel
2. Aggregates • Vehicle parts; • Glass; • Rags and Oil Adsorbents; • Light bulbs and tubes; • Paint cans and brushes; • Stone and Rocks; • Tyres; • Cleared Trees & Branches; • Cleared undergrowth, shrubs etc; • Waste Timber; and • Concrete Shuttering.	2. SLUDGES • Grease; • Paint; and • Oil.
	3. LIQUIDS • Wash down water and drum water; • Leakage of fuels and bitumen • Oily water.
	4. DOMESTIC • Food

It is expected that the special specifications in the Tender Documents will obligate the contractor to dispose of different categories of waste appropriately.

In general, the contractor will be required to develop construction specific Waste Management Plans prior to the start of construction work. At the start of the construction contract, the contractor will undertake a waste minimization/treatment/disposal study, guided by the project waste management strategy. The study will identify and quantify the expected wastes and describe:- •
Proposals for reduction, treatment processing;

- Third parties to whom waste will be transferred for re-use;
- Liaisons with the local Councils to identify and document suitable council disposal sites, ground, landfill and incineration facilities;
- Other locations of landfills or waste storage sites to be adopted if local Council facilities are inadequate; and

- On site incineration facilities to be adopted if local Council facilities are inadequate.

The findings of the study will be used in the development of the construction waste management plans which must adhere to the Environmental Management (Licensing) Regulations, 2013-Waste Management. At a minimum, these plans will include:-

- A consolidated summary of the applicable regulations and restrictions governing the generation, handling, treatment and disposal of wastes generated during the construction/commissioning phases of the Project;
- Any permitting requirements for waste treatment or disposal;
- Detailed method statement for each element of the waste management handling, treatment and disposal process; and
- Any third party agreements for waste handling, transfer or disposal.

After construction of the road, the waste handling/disposal facilities established by the contractor under the construction program will be closed.

If a waste handling/disposal facility procured by the contractor is closed, the contractors will be required to ensure that it is appropriately de-commissioned (i.e. including capping of any disposal sites) and the surface will be re-instated according to the Project Reinstatement Strategy. If the facility is retained, it will be transferred to the proponent.

4.4.3.8.2. Release to the Atmosphere

Atmospheric emissions will be generated by the proposed roads project activities principally, during construction of road works. It is anticipated that the most significant components of such emissions will be combustion gases, specifically:-

- Nitrogen Oxides (NO_x);
- Carbon monoxide (CO);
- Sulphur Dioxide (SO₂);
- Particulate matter (PM);
- Volatile Organic Compounds;
- Aldehydes; and

- Secondary pollutants.

4.4.3.8.3. General Wastewater Disposal

Wastewater includes all water flows from the temporary site office, work sites and subsidiary operations such as vehicle and equipment washing.

Wastewater from temporary site office should be treated in a septic tank and related soak-a-ways.

Wastewater from the works will generally be from the roadside drains and during curing of concrete works. These wastewaters are not hazardous but should be monitored to ensure that they do not cause adverse effects.

4.4.3.8.4. Quantification of water demand

The major use of water will be for domestic purposes (drinking, washing clothes etc.) at the camp and watering of the road for dust reduction.

- Domestic Demand
 - ✓ ☐ Assumptions

1. Number of employees = 300people
2. Average water consumption = 45litres/capita.day
3. Duration of road construction (all phases)= 2 years

Domestic Water demand = $45 \times 300 \times 2 \times 365 = 9,855,000$ litres

- Road watering demand
 - ☐ Assumptions
 - 1. 10,000 litres tanker will water 2.5km of the road
 - 2. 10km of the road will be watered once per day, therefore 40,000l will be required per day.
 - 3. Duration of road construction (all phases)= 2 years

Water demand = $40,000L \times 365 \text{ days} \times 2 \text{ yrs} = 29,200,000$ litres

- **Other water demand**

These include water required for dust control in the quarries, borrow pits and to bring fill soil to optimum water content. This can be taken as 20% of the sum of domestic and road watering demand.

$$\text{Other demands} = (9,855,000 + 29,200,000) \times 0.2 = \mathbf{10,439,000 \text{ litres}}$$

- **Total Water Demand**

The total water needed is the sum of the demands above which is
39,639,000 litres

4.4.3.8.5. Quantification of wastes

- **Liquid waste**

Sewage will be the dominant liquid waste which will be treated by Septic tank – Soak Away system. Oil and grease will be produced but to a very small extent since the maintenance of the trucks and machines will be done in proper garages. Some of the oil produced will be used in the asphalt process to coat the aggregate

- **Sewage quantification**

✓ ☐ Assumption

1. 80% of the domestic water demand will become wastewater *Total Sewage will be* $= 0.8 \times 10,439,000$
 $= 8,351,200 \text{ litres}$

- **Solid waste**

In road construction projects the solid waste is mainly contributed by domestic wastes (camp site) such as food waste, papers, tins, glasses etc.

- **Domestic waste quantification**

✓ Assumption

1. Average Generation rate = 0.35kg/capita.day
2. Number of employees = 300people
3. Duration of road construction = 2 years

$$\text{Total domestic solid waste} = 0.35 \times 300 \times 2 \times 365 = 76,650 \text{ kg} = \mathbf{76 \text{ tons.}}$$

4.4.3.8.6. Construction waste quantification

Major wastes generation associated with the project construction and their treatment/ disposal methods are described in the table below:

Figure 4-3: Major waste and their treatment/Disposal Method

Activity	Waste type	Amount	Treatment/ Disposal Method(s)
Domestic activities at the composite	food waste, papers, tins, glasses, cloths, woods, metals	114,975 tons	Collected and disposed at the Dumpsite. Other option include burial and Burning as directed in Table 6 below
Site Clearance (1 to two meters on both sides of the road.	Trees and Shrubs	Not Significant	Sell or give to villagers to be used as source of energy
	Vegetable soil (top Soil)	Not Significant	This organic soil is full of manure, will be stockpiled to be used during planting of vegetation
Excavation of drains and foundation (Where applicable)	Spoil Soil	Not Significant	This soil shall be stock piled along the foundation trenches. The soils shall be used to reinstatement site at the end of the project
Actual Construction	Rubbles	Not Significant	Will be crushed and used to fill the pot holes at nearby areas
	Scrap metals	Not Significant	Sell to recyclers
	Timber	Not Significant	Sell to recyclers
	Cement bags	Not Significant	Sell to recyclers

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Figure 4-4 Management of Project Waste

Waste Type	Burial	Approved Dump
Food waste	Allowed	Allowed
Paper	Allowed	Allowed
Cloth	Allowed	Allowed
Wood	Allowed	Allowed
Metal1	Allowed	Allowed
Plastics2	Not allowed since there is approved dumpsite	Allowed
Tins	Allowed	Allowed
Glasses	Allowed	Allowed

4.4.3.8.7. Best practices in Waste Handling

Waste for Burial- Only inert materials or readily decomposable materials may be disposed by burial. Inert materials include materials such as brick or concrete debris. Readily decomposable materials include materials such as paper, cloth, wood, and vegetative waste. Best practices for burial include the following:

- No liquids or material containing liquids may be buried;
- No waste shall be buried below the water table or less than 1 meter above the water table;
- If the water table has seasonal fluctuations, this restriction applies to the highest seasonal water level;
- No waste shall be buried within 100 meters of a surface water body or water well;
- No waste shall be buried within 300 meters upgradient of a surface water body or water well;
- No waste burial site shall have a surface slope greater than 4:1 (horizontal to vertical);
- Waste burial sites shall be protected against future erosion;
- Local and district authorities (Solwezi and Mushindamo) must be notified of the locations of any waste burial sites;
- The locations should be identified with GPS coordinates. If appropriate, the chainages and offsets of the waste burial sites should be listed;
- All waste burial sites must be clearly marked around the perimeter indicating that the cover soil within the perimeter should not be disturbed;
- At the end of the project, the Contractor shall mark all of the waste burial sites on the As Built drawings. The Contractor shall also produce a single drawing with all of the waste burial sites marked, and with the coordinates listed in a table shown in the drawing; and
- The Contractor shall produce a record of the types and volumes of wastes buried at each site and the dates of operation for each site.

Waste for Removal-All waste that is to be removed from site of production will be taken to the various dump sites approved by the local authorities. RDA and the contractor shall ensure that there are no surface water bodies within 5km

of the boundaries of the dump. RDA and the Contractor shall further maintain a record of all wastes disposed in an approved dump. The record shall include the types and volumes of wastes disposed and the disposal location.

4.5. Operation and Maintenance Phase

The actual usage of the road is expected to commence after the construction works. The project road is under “trunk road” category and therefore will be directly managed by RDA. The design period is 20 years, after which re-surfacing will be needed. During this time, RDA will carry out routine maintenance by attending to pot holes, clearance of vegetation within the ROW (road reserve area) and monitoring.

The contractor will undertake pre-commissioning activities before the project road from Solwezi to Kipushi via Mushindamo road is opened to traffic and the public in general. Examples of pre-commissioning activities include road inspection for roughness and stability. Thereafter, the Regional Engineers office of the RDA will draw up a maintenance programme to ensure that the project road does not deteriorate.

4.5.1. Activities during Pre- Commissioning

4.5.1.1. Structural and Civil Engineering Works

These types of works are usually ready for use after construction and construction testing. These works will be commissioned if and when, their functionality can be substantially achieved.

As a part of the commissioning activity, the Consultant will prepare and finalize built drawings for the entire structural and civil engineering works.

4.5.1.2. Site Reinstatement

Prior to the commencement of the reinstatement program, the contractor will be required to develop a project specific reinstatement plan.

The reinstatement of the Project will be based on the following principles:-

- Disturbed areas which are not permanent works, will be reinstated to preconstruction conditions to the greatest practicable extent;
- Disturbed areas will be stabilized to protect the integrity of permanent works;
- Disturbed areas will be re-vegetated to achieve good and natural landscape ambience;
- Regular monitoring of reinstated areas will be undertaken until environmental requirements and goals have been achieved.

4.5.1.3. Timing of Reinstatement

Reinstatement of the Project area will be undertaken on a sequential basis dependent on the completion of construction and testing in each area. The site will be cleared of residual construction debris, construction signs and equipment as part of activities associated with reinstatement.

4.5.1.4. Site Clean Up

Prior to de-mobilization of construction personnel and equipment, cleanup activities will be carried out in accordance with environmental standards and industry best practice. Cleanup activities will consist of the removal and/or disposal of temporary structures, equipment, tools and excess material brought on site or generated during the construction and commissioning program.

4.5.1.5. Permanent Reinstatement

Permanent reinstatement will be undertaken in all the areas that have been subjected to disturbance by the roads and viaduct bridge construction.

To facilitate natural re-vegetation of disturbed areas, the separately stockpiled excavated material and topsoil will be spread back in the reverse order in which they were excavated.

The key reinstatement principles are summarized below:-

- Minimize reduction in soil quality and structure during construction;
- Reinstatement of all third party assets affected by project activities in accordance with the construction contract documents and other pre-entry agreements;
- Carry out site landscaping on the basis of a landscape plan prepared by a landscape professional;
- A target minimum cover of pre-existing ground vegetation established within one year of final reinstatement will be set;
- An aftercare monitoring and corrective action program will be developed and implemented based on examining the bio-restoration process periodically after reinstatement; and

Any fences, services, structures or other facility affected by the construction works will be repaired or replaced to a condition that is at least as good as that found prior to construction.

4.5.1.6. Duration of operation phase

A surfaced road is expected to last for many years so long as it is regularly maintained and the vehicles using the road carrying permissible weights. Nonetheless the *design period is expected to be 20 years*. In this regard the road should adopt a well-planned upgrading and maintenance programme. Everyone expects such conditions to prevail for many years and RDA is expected to observe that.

On the other hand because of a number of reasons the Government may wish to do one or several of the following:

- abandon a portion of the road and create another one or an alternative portion;
- divert the original course (long or short distances) and substitute it with a new one;
- expand the road because of increased number of traffic; and
- if worse comes to worse close the road completely in which case the decommissioning process will be carried out.

In whatever case any change done on the road or its neighbourhood the environment can be affected. Therefore, what is important is to carry out a quick environmental and social assessment before undertaking further action to gauge the degree of mitigation measures so far done and their secondary consequences. Similarly the new location of the road should be subjected to environmental and social assessment to predict the possible impacts. By doing such assessments the environment will minimally and negatively be affected. In order to be reliable, the ESIA's will be done taking cognizant of all the environmental dimensions and parameters. The scope of the study will bear environmental, the biophysical, social, economic and cultural components.

4.5.1.7. Materials: Sources, types and amounts

The materials to be used during operation will be fewer than those collected during construction. Even so, depending on the nature of the use, the care that

will be put in it, and the prevailing weather, the required materials may change from time to time or remain constant. The key ones will be sand, gravel, stones and others from borrow pits, as well as others like cement, timber and iron bars from commercial dealers. Utilities such as water, energy and communication gadgets will be essential together with reflectors for slowing down speeding vehicles.

Moreover more materials will be required such as grass and seeds or seedlings for containing soil erosion as well as iron or wood boards and iron bars for signposts. Trucks, bulldozers, motor graders, excavators, crushers, mixers and other equipment will be required.

4.5.1.8. Labour and Water

The envisaged activities during operational phase will be done by three categories of workers. Category one will be the Concessionaire and RDA's engineers who will be monitoring the technical problems associated with the road, the type of vehicles using the road and where necessary weighing them, and collecting information pertaining to the road's performance. In the same group will be the scheduled environmental and social management of the entire road project.

Another group is the casual labourers who will be doing activities as directed by the technical group of experts. This group will also maintain the road's good looks by cutting vegetation, clearing channels and doing other non-technical everyday jobs. Group three will be road inspectors including environmental monitors and auditors who will be coming once in a while to monitor and assess the status of the road and give recommendations and advices.

During the operational stage not much water will be required for the road's activities. By the same token water will be required at whatever time there are road maintenances or upgradings. Even so, water from the running streams will be used during the road checks and balances and for domestic upkeep.

4.5.1.9. Solid waste: types and amount

The solid waste to be produced during the operational phase does not differ significantly from that of the construction period. The only exception will be reduced cutting of the vegetative materials but other wastes will be increased. More shops will be built and market places established and thus contributing to more wastes particularly plastics, paper and small containers.

4.5.1.10. Liquid waste: types and amount

The liquid waste will continue to be produced albeit completion of the road because there will be more influx of people using the road. These will need toilet facilities at various centres, and they will increase consumption of water. Construction of latrine facilities along the road will cut down thoughtlessness.

4.6. Decommissioning and Abandonment Phase

4.6.1. Decommissioning

Decommissioning of the road is not foreseen, however, decommissioning of related facilities especially contractor's camps and workshops are inevitable. Further, decommissioning of quarries and borrow sites will be done upon completion of construction works.

4.6.2. Demobilization of the project

4.6.2.1. Introduction

Upon completion of the Contracted Work, the Contractor shall remove all of its tools, materials and other articles from the construction area. Should the Contractor fail to take prompt action to this end, the RDA, at its option and without waiver of such other rights as it may have, upon sixty (60) calendar days notice, may treat such items as abandoned property. The Contractor shall also clean areas where he worked, remove foreign materials and debris resulting from the contracted work and shall maintain the site in a clean, orderly and safe condition.

Materials and equipment shall be removed from the site as soon as they are no longer necessary to minimize the demobilization work after completion of the project. Before the final inspection, the site shall be

cleared of equipment, unused materials and rubbish so as to present a satisfactory clean and neat appearance.

All the camp sites will be built as temporary structures and these will also include the use of movable structures such as movable containers. All the temporary structures that can be beneficial to the community should be left to the local government for other uses in the area.

4.6.2.2. Duration of demobilization phase

Demobilization phase will take a minimum of six (6) months to complete the most pressing issues. Consequently whatever is done will need monitoring and environmental audit. These will be done as scheduled or planned in the Environmental Management and Monitoring Plan.

There will be two phases during demobilization including disbanding of the camp and decommissioning. During closure of the camp the solid wastes likely to be produced will include rubble, iron sheets, wooden materials (as roofing woods, door frames and panels). Unless it has been decided for the camp to be used for another purpose like school or dispensary, the produced wastes will still be used for building other houses. There will be racked vehicles which will need to be moved from that place. Contracts will be made between the Construction Company and collectors of scrapes for recycling. Otherwise, the materials will be treated as per Environmental Management and Monitoring Plan.

Unless the Government decides otherwise or there is a necessity for diverting the road or sealing off (closing) a portion of the road, it is unlikely to demobilize it. From the completion of construction the only probable solid waste to be encountered will be dug out materials from wrecked portions that require maintenance or upgrading.

4.6.2.3. Liquid waste: types and amount

Liquid waste to be realized during demobilization will more or less be like that during operation. The toilet facilities along the road will be

used by commuters and during demobilization there will not be any effect.

4.6.2.4. Legal Basis

For the components that will require decommissioning, the proponent (RDA) will prepare a written abandonment plan within 30 days of determining decommissioning. The Plan will detail how the decommissioning will be carried out.

The abandonment plan will be subject to approval by ZEMA. An Environment Project Report (EPR) will be prepared prior to implementation of this plan, to assess and minimize potential environmental and social impacts arising from the abandonment operations. This abandonment EPR Study will be submitted to ZEMA for consideration.

4.6.2.5. Technical Solutions for Abandonment

The exact details of how facilities will be abandoned will be determined prior to abandonment and agreed with the relevant authorities including ZEMA. Therefore it is not possible to determine at this stage exactly what techniques will be used. However this will be in accordance with recognized international standards.

4.7 Project Alternatives

The road ear-marked for upgrading is an existing road and therefore there are no alternatives to the route for the road. A second alternative route was investigated for the project as the TOR stipulated the upgrading of the existing route. This route starts at Mushindamo's Shafilundu Primary School taking a northern direction, joining the existing Solwezi to Kipushi Road at Kamikowa, then heading east for forty (40) kilometers terminating at Kipushi. This is the only other alternative to the proposed route..

This section therefore compares the environmental and social impacts of various widths within which road construction activities could be carried out. These alternatives are as follows:

- Alternative mode of Transportation;
- The "No Project Option";
- Adopting 36m and 100m road reserves width;
- Adopting a construction corridor that covers the construction width plus a verge either side of the road, and
- Pavement Alternatives.

4.7.1 Alternative mode of Transportation-Option 1

There are no alternatives to this road that fulfill the functions of providing relatively fast, cheap land transportation within the road corridor and beyond. The only other alternative is by air, which is unlikely to either complement or to substitute for road transport in this region.

It can be argued that alternative transport modes such as rail can be considered instead of upgrading the proposed road. However, this option would entail far higher capital cost compared to paving an existing gravel road.

For the foregoing reasons, this option is not tenable.

4.7.1 The “NO” project option-Option 2

The “NO” Project Option, or the “do nothing” alternative, is the current road which is associated with a number of adverse environmental and social impacts. One of the most significant impacts is the increase in road traffic accidents which have occurred as a result of poor road condition. Transit times will remain as is, and over time would become worse as the road deteriorate further.

Generally there would be no change with regard to impacts on water quality, vegetation, forests/trees, wetlands, visual impacts. No households would be affected as there will be no loss of land, property or crops. Infrastructure along the road would not be affected.

4.7.3 Adopting 36m for D271 and 100m road reserves width-Option 3

The 36m and 100m road reserves for D271 and T005 roads respectively were in force before the Public Roads Act of 2002 for all district and trunk roads. These road reserves extends 18m and 50m either side of the centreline for D271 and T005 roads respectively. This option assumes that all structures, property, crops and trees within these widths can or will be cleared for the purposes of construction, and no compensation need be paid as these reserves falls within the domain of the Road Development Agency.

In this case, it is estimated that approximately over 400 structures (owning structures, property and crops) within 18m and 50m of the centreline on both sides of the road for D271 road respectively will be affected and there will still be a substantial amount of vegetation and trees affected. The application of this road reserve width makes it relatively easy to control the Contractor’s activities when it comes to clearing the area for construction works.

4.7.4 Pavement Alternatives-option 4

The road sections were evaluated in terms of the following project alternatives:

Alternative 0:

Do minimum option, which involves routine maintenance in the form of periodic light blading, spot regravelling and regravelling of the existing road with a 125mm thick gravel wearing course (GWC) once the existing GWC reaches a minimum thickness

of 25 mm. No changes/improvements to the existing alignment or drainage structures are made.

Alternative 1:

Upgrading of the road sections to a modified All-Weather Class II gravel standard. This entails widening the carriageway to 10.8m and replacing and lengthening all drainage structures. Changes to the existing alignment are made were warranted in terms of the required geometric design standards. The existing bridge structures are to remain as is.

Alternative 2:

Upgrading the road sections to a modified Class IC bitumen standard using a modified Class W1 pavement structure (i.e. granular base / granular subbase). This entails widening the carriageway to 10.8m and providing 2x 3.5m wide surfaced lanes and 2 x 1.5m wide surfaced shoulders (bituminous double seal surfacing). Changes to the alignment are made were warranted in terms of the required geometric design standards and are to comply with a 100 km/h design speed. All drainage structures are to be replaced and sized in accordance with the hydraulic requirements. The existing bridge structures are to be replaced and are to be sized in accordance with the hydraulic requirements.

Alternative 3:

Upgrading the road sections to a modified Class IC bitumen standard using a modified Class W2 pavement structure (i.e. granular base / cemented subbase). This entails widening the carriageway to 10.8m and providing 2x 3.5m wide surfaced lanes and 2 x 1.5m wide surfaced shoulders (bituminous double seal surfacing). Changes to the alignment are made were warranted in terms of the required geometric design standards and are to comply with a 100km/h design speed. All drainage structures are to be replaced and sized in accordance with the hydraulic requirements. The existing bridge structures are to be replaced and are to be sized in accordance with the hydraulic requirements.

Alternative 4:

Upgrading the road sections to a modified Class IC bitumen standard using a modified Class W3 pavement structure (i.e. cemented base / cemented subbase). This entails widening the carriageway to 10.8m and providing 2x 3.5m wide surfaced lanes and 2 x 1.5m wide surfaced shoulders (bituminous double seal surfacing). Changes to the alignment are made were warranted in terms of the required geometric design

standards and are to comply with a 100 km/h design speed. All drainage structures are to be replaced and sized in accordance with the hydraulic requirements. The existing bridge structures are to be replaced and are to be sized in accordance with the hydraulic requirements.

The economic analysis reveals that Alternative no. 2 yields the highest economic benefit in terms of NPV and IRR for the base analysis and all six sensitivity scenarios.

This option entails upgrading the road sections to a modified Class IC bitumen standard using a modified Class W1 pavement structure (i.e. crushed stone base / crushed stone or granular subbase with CBR > 45%). This means widening the carriageway to 10.8m and providing 2x 3.5m wide surfaced lanes and 2 x 1.5m wide surfaced shoulders using a bituminous double seal surfacing. Changes to the alignment are made were warranted in terms of the required geometric design standards and are to comply with a 100 km/h design speed. All drainage structures are to be replaced and sized in accordance with the hydraulic requirements. The existing bridge structures are to be replaced and are to be sized in accordance with the hydraulic requirements.

The results indicate that upgrading the road sections to a bitumen surfaced standard is economically justified by yielding a positive NPV and an IRR greater than the discount rate. The only exception occurs when the expected GDP growth is reduced by 50% and results in both a negative NPV and an IRR below the discount rate for all alternatives. This would make the upgrade alternatives not viable in economic terms but it is however expected that the surfacing of the road will indeed generate greater economic activity in the region and result in higher than expected GDP growth.

Upgrading the road will results in an increase in initial construction or client costs but will have a long-term benefit by substantially reducing maintenance and road user costs during the 20 year analysis period.

CHAPTER 5: DESCRIPTION OF THE EXISTING ENVIRONMENT

5.1. Description of the Bio-physical Environment

5.1.1. Climate

5.1.1.1. Temperature and Humidity

The climate in the project area is typically subtropical with mean monthly temperature range between 15.8 to 15.9°C in June and July and 26.3°C in October. The average minimum temperature is 6.4°C in July and the average maximum is 34.1°C in October. The absolute maximum is above 38.3°C in August to December, reaching 40.2°C in October and the average relative humidity ranges from 32% in September to 74% in February.

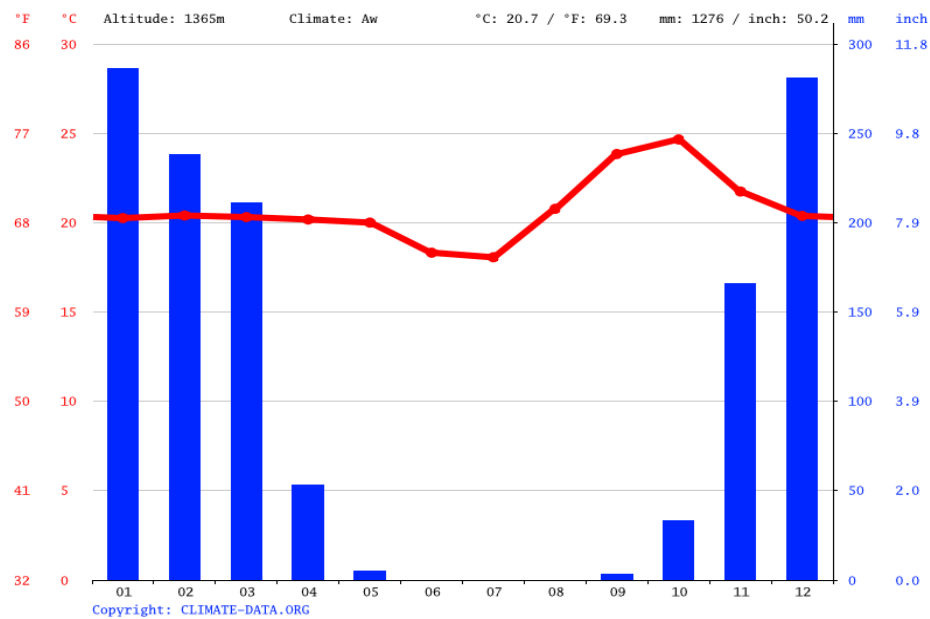


Figure 5-1 Monthly Average Temperature Solwezi Area

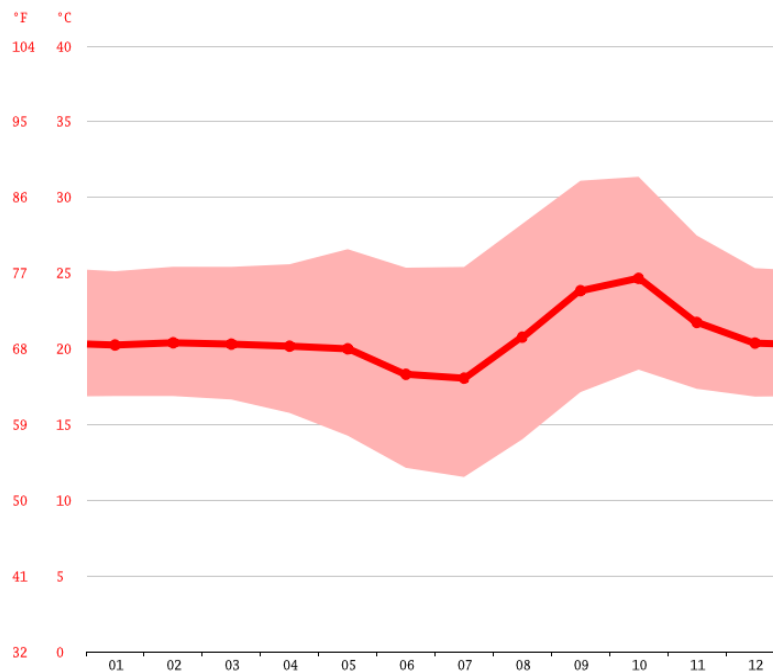


Figure 5-2 Average Monthly Humidity Solwezi Area

The mean annual evaporation is 2170mm. The rates range between 196217mm in August to November and 132-150mm in June - July. The mean evaporation exceeds mean rainfall during the wettest period November to March by a total of 25.6mm.

5.1.1.2. Rain Fall

According to the Meteorological Department, Zambia is divided into three agro-ecological (climatic) regions with rainfall being the key determining factor (Annex 5). Rainfall in Zambia generally decreases as one moves from the southern part of the country northwards. Region 1 receives an average annual rainfall of less than 800mm and comprise of low lying areas covering the Luangwa and Zambezi rift valleys. Region 2 receives rainfall of between 800 and 1,000 mm and covers Lusaka, Central, Southern, Eastern and Western Provinces. Region 3 is the high rainfall area receiving more than 1,000 mm of annual rainfall on average. This area mostly covers the northern parts of the country including Northern, North-western, Luapula and Copperbelt provinces.

The regional rainfall patterns associated with the above classification equally determine the duration of the growing season as follows:

- Region I: 80 – 120 days,
- Region II: 100 – 140 days and
- Region III: 120 – 150 days.

All the areas along the proposed project are located in agro-ecological region III

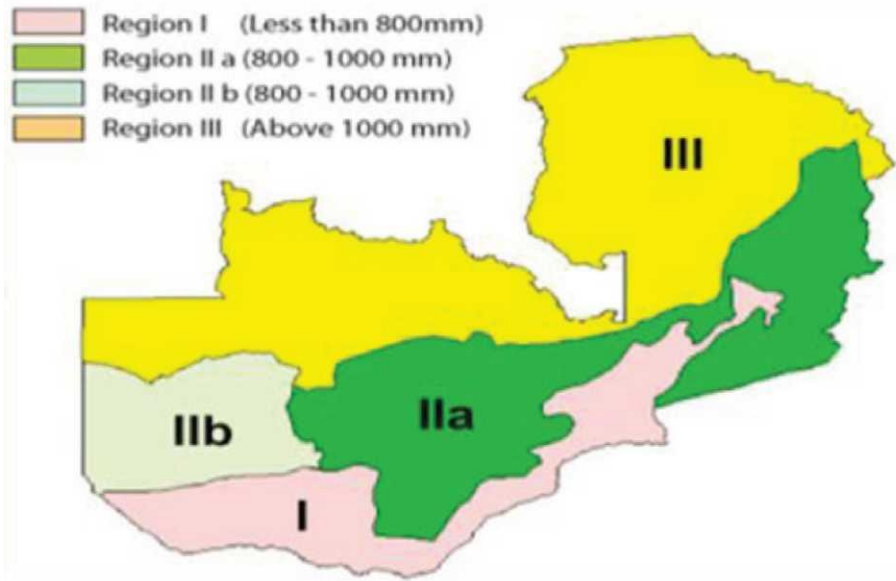


Figure 5-3 Zambia's Agro-Ecological Regions Map

whose average rainfall is above 1,100mm.

5.1.1.3. Wind Speed

The predominant wind direction is northeast and southeast with the mean wind speed ranging between 1.3m/s and 1.9m/s. However winds gusts can reach 3.0m/s. In the rainy season, northerly winds prevail ranging from north-west to east. Wind speeds can go up to 16 knots during the rainy season and can reach 21 knots at a time during storms.

5.1.2. Air Quality

No air quality, noise or vibrations have been monitored in the project area. The air quality meets the Class 1 and Class 2 standards as specified in the PRC Ambient Air Quality Standard (GB 3095-1996). However air quality was noted to be good with no foul smell and visibility was clear during the site inspection and there are currently no significant sources of air pollution in and around the project sites, but brick making in clay ovens, domestic fuel burning, veld burning, charcoal manufacturing and vehicle movement are sources of dust in the air. Interviews

with local residents equally revealed that there were no issues of concern with regard to air quality except for occasional smoke and dust from bush fires and wind gusts.

5.1.3. Noise

Much of the proposed route project has no any industrial activity at the moment. The noise that is experienced along the route comes from vehicular movements along the Solwezi to Kipushi road, subsistence farming community, and the border area.

5.1.4. Soil and Geology

5.1.4.1. Geology

The geology of the project area from Solwezi into Mushindamo is an extension of the richly mineralised Katanga system found on the Copperbelt. The Kansanshi group lies in areas close to Solwezi, and consists of crystalline rocks surrounded by sediments of the Bwana Mkubwa series. Areas close to the Kifubwa Stream are predominantly of the Basement Complex, comprising granite, gneiss and schists of sparing mineralisation, mainly malachite and copper sulphides.

Soils of the area are closely related to the geology. The soils found in this region are discussed below

a) Sandy Loams

These soils are closely related to the Bwana Mkubwa limestones, these are a series of calcareous, ferruginous sandstones. These soils occur in areas close to Solwezi and are visible on the river banks of the Kifubwa and Kabitaka.

b) Red Loams

The outcrops of the Middle Bwana Mkubwa limestones gives rise to “red” soils which are often heavy and are a good supporter of agriculture and the characteristic *Brachystegia* woodland. These soils predominate in areas away from streams, soils showing such characteristics are found in areas around the Kansanshi Mine turn-off.

Soils associated with this type of geology predominate along the proposed road corridor, these are mainly *red loams*, *sandy loams* and *pallid soils*. Often they show extensive occurrence of pisolitic laterites. These soils are relatively stable, and are

known to support agriculture, though laterites are not considered good for human settlement, hence they are left unoccupied, a condition that favours their use for construction purposes.

5.1.5. Hydrology and Drainage

Villages and farms along the route use both surface and groundwater for their water supply. Surface water is drawn from dams built across several streams that flow through the farms, and is mainly used for stock watering and irrigation. Settlements draw domestic water from boreholes provided by government and other development organizations, these range in depth from 30 to 40 meters to water level.

5.1.5.1. Hydrology: Solwezi to Mushindamo

The river systems of the Solwezi-Mushindamo through to Kipushi road corridor can be considered to be those that form part of the Kafue-Zambezi Watershed and its tributary system. At approximately 3.4 km, where the road intersects the Kifubwa Stream to 84km at Kingovwa stream the rivers and streams flow towards the north draining into the Kafue River. The Kafue river is intersected at Km 101+300, where it flows towards the south east, while the Lwenge river at Km 108+200 flows into the Kafue river. These river systems are perennial providing support to agricultural activities dotted along the road corridor.

The rivers and streams covered by the road corridor corridor are perennial, and all were flowing during the time of the field observation. The water quality is said to be good, as they are mostly clear and fast flowing with no visible source of contamination. It was further observed that the rivers covered under this section of the road corridor corridor are of importance to the local communities, as it is along the banks that vegetables and other crops are grown, a major source of income, while in some cases they are the sources of domestic water. Major settlements along the proposed road corridor corridor are located close to the rivers and streams, with most of them deriving their names from the same or vice versa.

Dambos and grasslands are widespread along the corridor, and these occur in areas of limestone, these are characterized by *Chipya*-like vegetation, with tree growth in some places. The dambos and grasslands provide suitable areas for cultivation of cash crops and also are good hunting grounds for small animals.

The rivers that cross the proposed road corridor from Chingola to Solwezi are listed in the table below.

Table 5-1: Hydrology along the proposed Solwezi to Kipushi road corridorway link Corridor

Name of River/ Stream	Distance from Chingola	Flow status
Kifubwa river	3.4 km	Perennial
Mushisi stream	36.5 km	Perennial
Mulonga	116 km	Perennial
Kafue river	101 km	Perennial
Lwenge river	108 km	Perennial



Figure 5-4: Pictures of Kafue River

5.1.6. Flora and Fauna

5.1.6.1. Flora for Solwezi-Mushindamo-Kipushi Corridor

The vegetation of Solwezi and Mushindamo is predominantly Miombo woodland which is dominated by trees of the genera *Brachystegia*, *Julbernardia* and *Isoberlinia*. This vegetation is virtually a western extension of the Chingola vegetation. The only variation from the Solwezi vegetation is occurrence of Kalahari woodland on the sands in the extreme southwest of the district.

There are basically eight (8) vegetation types that were observed along the road corridor, namely, Miombo woodland, Parinari forest, Lake basin chipya, swamp forest, grasslands, Riparian forest, Termitaria vegetation and bush groups and Kalahari woodland on sands. The woodlands are of significant importance to the region, as they have a number of ecological functions including providing habitat, soil protection, and overall they are a source of food, fuel, medicines fruits, seed, and honey.

Starting at 0km the stretch is covered with a primary miombo formation in admixture with either Grassland and or Swamp forests where rivers and streams occur. The Grassland is a prominent feature in Mutenda 42 km from Solwezi.

a) Miombo Woodland

The dominant vegetation covering roughly 90 per cent of the stretch is a single storey, deciduous, closed canopy woodland known as miombo. It is composed principally of Muombo –(*Brachystegia*), Mutondo(*Julbernardia*) and Mutobo-(*Isoberlinia*), which yield hard, heavy timber, suitable especially for mining. This woodland also supports beekeeping to local people.

b) Parinari Forest

The canopy of this vegetation is dominated by Mobola – (*Parinari excels*) and Musepa (*P. Curatellifolia*). Other species that may be found in the canopy are Water Berry- (*Syzygium guineense* ssp *afromotum*) with odd emergent *Entandrophragma delevoiyi*, *Marquesia macroura* and *Erythrophleum suaveolens*. The vegetation is predominantly along the Mushindamo to Kipushi stretch.

c) Lake Basin Chipya

This is characterised by the effects of fierce fires which consume the dense ground cover of tall Hyperrhenia grass (*Elephant Grass*) and other species which gradually kill out tree growth.

It is an open woodland with a discontinuous canopy whose composition is variable, but which particularly includes Muputu- (*Brachystegia spiciformis*) – Ordeal Tree (*Erythrophloeum africanun*), and Mubuta (*Brachystegia longifolia*) associations as well as pure stands of Mutobo (*Isoberliana angolensis*).

d) Swamp Forest

This is a closed evergreen canopy characterised by *Ilex mitis*, *Mitigyna stipulosa*, Water Berry (*Syzygium cordatum*), *Xylopia aethopica* and *X. rubescens*. The swamps are not extensive but provide a useful function in slowly building up peat, thus providing sponges, which help to regulate the flow of water. Swamps can be found in the Kafue river area.

e) Grasslands

This is greatly associated with the drainage lines. They are associated with the streams and rivers: flood plains of the larger rivers like the Kifubwa, Lwenge and the Kafue.

f) Riparian forest

Strips of fringing forests that occur along most of perennial streams lining the road. They are characterised by *Diospyros mespilliformis*, *Khaya nyasica*, *Parinari excelsa* and *Syzygium cordatum* associated with *Adina microphila*, *Bridelia micrantha* and *Faurea saligna*.

g) Termitaria vegetation and bush groups

This includes all forms of vegetation that are found on or around the bases termitaria. Three subtypes were observed:

Miombo termitaria, characterised by *Albizia amara*, *Boscia angutosifolia*, *Combretum molle*, *Commiphola mollis*, *Erythrina abyssinica* and *Zizophus macronata*.

Munga termitaria characterised by Large leaved false thorn (*Albizia harveyi*), Large fruited Bush willow (*Combretum imberbe*), False Marula (*Lannea stuhlmani*) and Musesi (*Markhamia acuminata*).

Protected Areas- There are basically four Protected Forest Areas (PFAs) along road corridor. These are:

5.1.6.3. Fauna

Game animals are not common along the road corridor. Some of the mammals known to occur along the woodlands of the road corridor are the following:

a) Miombo Woodland

- Bush baby – *Galago Crassicaudatus*
- Honey badger – *Mellivora capensis*
- Givet – *Vivera civelta*
- Giant rat – *Gricetomys gambianus*

5.1.6.3.1. Avi-Fauna

Most bird species found along the road corridor are catholic in their habitat preference; notable among them are the following:

- Guinea fowl
- Francolin
- Green pigeon
- Quail

5.1.6.3.2. Aqua Fauna

Almost all the rivers and larger streams have small to medium sized fish such as Tilapia Species, Silver Barbel (*Schilbe mytus*), Green headed bream (*Oreochromis machrochir*), Multi bar cithara (*Hemigrammocharax*), Slender robber (*Rhabdalestes maunensis*) Johnstons topminnow (*Aplocheilichthys johnstoni*) Striped top minnow (*Aplocheilichthys katangae*) Yellow belly Bream (*Serranochromis spp*) Squeaker (*Synodontis macrostoma*)

5.2. Description of the Socio-economic Environment

5.2.1. Solwezi District Profile

Solwezi District is an administrative district in Zambia's North-Western Province, functioning as the provincial capital with the town of Solwezi serving as its administrative headquarters. It covers an area of 3,336 square kilometers, the district recorded a population of 334,377 in the 2022 Zambian census, reflecting rapid growth driven primarily by mining inflows. It has also intensified pressures on housing, services, and environmental management in the region.

5.2.1.1. Land Ownership, Tenure and Zoning

In general, all land in Zambia is vested in the hands of the president, who holds it on behalf of the citizens. The commissioner of lands administers land and the natural resources there in on behalf of the President of the Republic of Zambia.

- Agricultural land;
- Forest Reserves. These are under pressure because of human settlements and tree cutting;
- Urban land with human settlements; and
- Mining.

5.2.1.3. Economic Activities

The local economy centers on large-scale copper mining, anchored by the Kansanshi Mine operated by First Quantum Minerals, a major copper producer contributing significantly to Zambia's national output. This mining boom has spurred urbanization and infrastructure demands, though Mining, major economic activities of Solwezi are as listed below

- Agriculture
- Forestry
- Trade and Industry
- Service Provision

5.2.1.3.1. Mining and Quarrying.

Copper and Cobalt mining are the major mining activities taking place in the district. Quarrying for building and river sand take place often with no control

from the local authorities. Quarrying has created its own set of problems which include those that modify the landscape and those which create favourable conditions for diseases vectors such as mosquitoes because of the stagnant water in the ditches in which they breed.

5.2.1.3.2. Fisheries and Agriculture.

The overall agricultural sector policy is to facilitate and support a sustainable and competitive agricultural sector in order to assure food security at national and household levels and maximize the sector's contribution to Gross Domestic Product (GDP).

Farming systems include commercial farming which is done on not less than 10 hectares, emergent farmers on 2 to 10 hectares and small scale farmers working on 2 hectares of land or less. Apart from growing crops, the farmers also rear animals.

Kafue River and its tributaries are some of the fisheries in the district, but are not able to supply the district with large amounts of fish. Perennial streams and dambos create potential for fish farming in the district. The district has fifty-eight (58) fish farmers with a total of 106 fish stocked ponds. (DSA 2022)

5.2.1.3.3. Forestry, Non-wood Products, Wildlife and Tourism

Protecting, conserving and managing forest resources are the responsibility of the Forestry Department. Its main activities are based on protection and forest extension.

Economic activities taking place in the forestry sector include harvesting of commercial non-wood and wood products. Timber harvesting takes place although on a small scale because the forests are depleted of wood suitable for timber.

Although the tourism industry for the local and international clientele is not developed presently.

5.2.1.3.4. Growth of Informal Sector

The mining industry is experiencing growth in the project region through formal and artisanal mining, as a result all major activities revolve around this key sector. This has obviously contributed to an increase in the number of people who are currently participating in the formal sector that support the mining industry. Many are also participating in informal activities to make an important contribution towards maintaining their livelihood. Reasons for these extensive moonlighting appears to be twofold. Firstly, First Quantum Limited through Kansanshi Mine has made it possible for the local community to earn relatively improved incomes, in real terms, for most families to survive on. Secondly, employees are probably motivated to acquire land for peri-urban agriculture in locations surrounding Solwezi and Mushindamo, where the project road passes. Kifubwa Ward falling under Solwezi, is one such area where economic activity such as the Mukulumpe Farm is a major agricultural undertaking.

5.2.2. Mushindamo District Profile

Mushindamo District is an administrative district in North-Western Province, Zambia, established in 2016 through Statutory Instrument No. 39 of 2016 by separating it from Solwezi District to enhance local governance and development. As of the 2022 Zambian census, it has a population of 65,649 people, with a predominantly rural demographic of 94.3%. The district spans approximal 10,407 square kilometers and is strategically located along the Chingola–Solwezi Road and Solwezi–Kipushi Road, facilitating links to mining areas in the Copperbelt and cross-border trade with the Democratic Republic of Congo. Administratively, Mushindamo is divided into five traditional chiefdoms—Mulonga, Kalilele, Musaka, Kikola, and Mujimanzovu—and eight wards, including Musaka, Mujimanzovu, Mulonga, Kalilele, Kilumba, Kangwena, Mapunga, and Kikola. It falls under the Solwezi East Constituency and is governed by the Mushindamo Town Council, established via Statutory Instrument 45 of 2016, which promotes public-private partnerships for sustainable growth. The district's economy is anchored in its abundant natural resources, with key sectors including mining of copper, gold, manganese, and other minerals; commercial agriculture on fertile soils supporting crops, livestock, and agro-processing; and services such as logistics, transport, real

estate, and emerging tourism focused on ecotourism, conservation, and cultural heritage

5.2.2.1. Land Ownership, Tenure and Zoning

In general, all land in Zambia is vested in the hands of the president, who holds it on behalf of the citizens. The commissioner of lands administers land and the natural resources there in on behalf of the President of the Republic of Zambia.

The Mushindamo Town Council as a supreme authority at district level reserves the right to recommend to the state and in particular to the commissioner of Lands, the rightful candidate to be allocated land. Land use in Kalulushi is in three categories:

- Agricultural land;
- Forest Reserves. These are under pressure because of human settlements and tree cutting;
- Urban land with human settlements; and
- Mining.

5.2.2.2. Population and Settlement

According to the 2022 Census of Population and Housing, Solwezi had a population of 337,334. The district has slightly more female (170,551) than male 163,826. The estimated average annual population growth rate of the district is 8.6% percent between 2010 and 2022. Of this population, 305,027 lives in the urban parts of the district, while 29,350 reside in the rural areas. The huge difference in population could be attributed to high migration to the urban in search of economic opportunities.

On the other hand Mushindamo district has a population of 65,335 inhabitants (32,849 male and 32,486 female), according to the 2022 Zambian Census conducted by the Zambia Statistics Agency. The district's population density stood at 6.3 persons per square kilometer across its 10,407 km² area, with an average annual growth rate of 5.0% from 2010 to 2022.

5.2.2.3. Economic Profile around the Project Area

The people that have settled around Solwezi project area are involved in a varied number of economical activities to sustain their livelihood. Mining, Fishing and Agriculture are the main activity in the area.

The economically active population or labour force is defined as all persons aged 12 years and over of either sex whose main economic activity status is to supply their labour force for the production of economic goods and services (CSO, 2004). It is composed of the employed and the non-employed persons. It includes all those who are working, those who are unemployed but seeking employment and not working but available for work.

The total unemployment rate for Solwezi district (15.8%) which is higher than that of the province (9.3%) but lower than the national unemployment rate of 3.8%. The unemployment rate decreased from 15% in 1990 to 6.4% in 2019 while unemployment rate for males and females decreased from 16.5% to 14.6% to 4.1% and 2.3% respectively.

Solwezi district has a total number of 57 community schools, 116 basic schools, 6 secondary schools, one skills training centre, one trades school, one college of education and 15 pre schools.

5.2.2.3.1. Trade and Industry

There are a number of trading activities taking place in the two districts such as selling clothes, groceries and agriculture produce. Most of the trading is centered on the agricultural sector. Liberalization had a negative impact on agricultural markets. There was no organized marketing system, which contributed to the exploitation of farmers by unscrupulous business people. Producers and traders are now organizing themselves into groups, to help address some of the problems they are facing. Examples of these are Chawama Multi Purpose Association (CMPA), Zambia National Farmers Union (ZNFU) and Solwezi District Business Association (SDBA).

Chawama Multi Purpose Association is involved in buying and processing honey. Zambia National Farmers Union is involved in agriculture related activities and Solwezi District Business Association is involved in business, micro financing and HIV/AIDS sensitization.

Unlike the agricultural sector, liberalization has had a positive impact on the business sector as it has encouraged a people to engage in business ventures.

5.2.2.3.2. Industry

Industry is mainly made up of timber manufacturing and small milling (hammer mills). There is no milling plant in the district. This has encouraged the proliferation of hammer mills.

5.2.2.3.3. Communication

All the mobile service providers (Airtel, MTN and ZAMTEL) are present in the district though coverage of their networks across Solwezi and Mushindamo districts.

Solwezi receives television signal, while Mushindamo has limited signal in most locations along the project road. A community radio station has recently been opened.

5.2.2.3.4. Water and Sanitation

Urban water supply is provided by North Western Water and Sewerage Company (NWWSC) The company has obtained ten years water rights from National Water and Sanitation Council (NWASCO).

Solwezi has a total of 335 wells and boreholes. The yield of most wells is in the range of 0.91/s maximum to 0.031/s minimum. Most of these wells have water throughout the year.

Solwezi Municipal Council is responsible for refuse collection and disposal in the township. Unfortunately, due to financial problems, refuse is rarely collected ending up on the streets. The service is currently limited to the urban areas of Solwezi and Mushindamo.

5.2.2.3.5. Health

There are 43 health institutions in the district. These include:

- 3 Mission Health Centers
- 35 Government Health Centers
- 3 Zambia National Service Health Centers
- 1 Health Border Post
- 1 General Hospital (Level 2)

The District Health Management Team (DHMT) is expected to start running the Out-Patient Department (OPD) at the General Hospital. It will be known as the Hospital Affiliated Health Centre (HAHC). Since there is no district hospital, the General Hospital is used for first referral cases.

Drugs supply is generally good in the district. All the health centers receive their drugs through the Rural Health Centre (RHC) drug kits. The district also has two health inspectors.

DHMT is also involved in environmental health activities. These are mostly in promotive and preventative activities. Some of the information collected by District Health Board in 2020 covered figures on the population that had access to safe water supply, uses of other sources of water such as shallow wells, streams etc, used flush toilets, pit latrines and bushes, use of electricity, solar energy and charcoal/firewood. Environmental Health Technicians are also involved in the inspection of premises such as villages, schools, offices, markets, grinding mills, offices, Rural Health Centre, stalls plate racks, pit latrines, refuse disposal pits, churches, trading shops, compounds, incinerators, colleges, public toilets, rest houses and rodent control. Others include, private clinics, police cells, bars, water works/plants, bus stations, guest houses, restaurants, butcheries, hair salons, barber shops, slaughter slabs and the prison.

5.2.3. Social Economic Analysis of the Immediate Road Project Environment

A socio-economic assessment of the communities within the vicinity of Solwezi to Kipushi via Mushindamo road project area was conducted by filling a checklist attached in appendix 3. The areas surveyed were Ngosa, Boso, Mutenda, Kimasal and Mushitala. The objectives of the assessment were to:

- To capture demographic data;
- To capture health factors affecting the community;
- To capture household socio-economic status such as land ownership, family income and general source of livelihood;
and
- Assess the social impacts of the project.

5.2.3.1. Settlement Patterns

The immediate environment is composed of village settlements and family homesteads which have settled along both sides of the road corridor joining Solwezi, Mushindamo and Kipushi. These are distributed as follows:

- Family homesteads and nineteen village settlements along the 173km road corridor from Solwezi to Mushindamo up to Kipushi, North-Western Province; and
- Family homesteads and about twenty-eight village settlements along the 254.1km. Solwezi-Lumwana road corridor, which passes through an area of both commercial and subsistence agriculture connecting Solwezi to Lumwana in Northwestern Province. The table below gives a detailed picture of the settlements.

5.2.3.1.2. Settlements along the Solwezi-Mushindamo-Kipushi corridor

Communities along the Solwezi-Kipushi road corridor are defined in terms of a cluster of village settlements and family homesteads. Two tribal groups occur in the area, these are the Kaonde and the Lunda, each representing its own cultural and traditional set-up. No settlements will be resettled from their homesteads. However should there be any family needing resettlement a Resettlement Action Plan will be formulated.



Figure 5-5: A village along T005/D271



Figure 5-6: A typical village in the project area

5.2.3.2. Economic Environment

5.2.3.2.1. Markets

Eleven communities have at least one market each in the area. In these markets, household goods and services in addition to food items can be found. However, in almost all the settlements, the markets are constructed with wooden structures. In some cases, businesses are conducted in the open environment and under the trees. There are no lock-up stalls in the area.

5.2.3.2.2. Land Ownership and Use

The system of land ownership in some settlements is communal in nature. In some communities especially where a number of ethnic groups exist the land is owned by the host community (original settlers) while other settlers maintain tenancy status. The implication of this system for the success of the Road is that there is need to identify the host community (land owners) anytime some form of consultation is to be done so that discussions are carried out only with the right group of people.

5.2.3.2.3. Social Structures

The different tribes in all the surveyed sites are matrilineal tribes, and an individual takes his or her mother's clan. A village in all the sites is usually a grouping of matrilineally related men and women with their wives, husbands and unmarried siblings and children, under the authority of a headman – which literally means 'owner of the village'. A headman is the intermediary between the village community and the chief and has authority to allow distant relatives and strangers or newcomers to take residence in the village. However, the primary group in each village is the matrilineal extended family. Although the Village Registration and Development Act (Republic of Zambia 1971) provides for establishment of an elected Village Productive Committee (VPC) as a forum for village community participation in decision-making and development, the finding of the study show that headmen in all the surveyed sites prefer to appoint their own matrilineal relatives to assist them in decision-making.

Households constitute a village and the closest local meaning of 'household' in all the surveyed sites and according to the participants to this study, a household refers to a man, his wife children and their relatives living at the same building site. An important aspect of the households in the surveyed sites, which has land tenure and livelihood implications, is the institution of polygamy. Polygamous men do not usually live with all their wives on one building site. They

alternate their residence between their wives' villages. Thus the institution of *polygamy* adds an extra dimension to the definition of the household in the surveyed sites, because sometimes a household is spatially dispersed. In this case, the man is an accepted member of all the villages in which his wives reside and is entitled to a building site and land to cultivate in each respective village. Except for polygamous households, a household has one main granary managed by a wife and the custom of all members eating from one pot is practised.

5.2.3.3. Socio-cultural and Political Structure

The study area is a mixture of tribal groupings. The communities on both sides the Chingola-Solwezi road corridor who are in Chingola are mainly a composite of retired and retrenched ex-ZCCM workers of different tribal descent. These have an urban cultural orientation and use Bemba as a local language on one hand. The proposed road corridor also passes through two chiefdoms. These are Chief Kalilele of the Lamba and Chief Kapijimpanga of the Kaonde.

5.2.3.4. Archaeological, Cultural and Historical Sites

The Solwezi to Kipushi via Mushindamo road did not show any location of archaeological and historical significance. However, the rich historical mining activities in the area are worth noting, thereby requiring further investigations.

5.2.3.5. State of Social Infrastructure

5.2.3.5.1. Educational Institutions

Primary schools are fairly well spread over the project area. Over 69% of the settlements have such facilities while 31% do not have at all. Secondary schools exist in only 25% of the settlements. None of the settlement in the Project has any form of tertiary institution.

5.2.3.5.2. Roads

Majority of the Communities are located along the Right of Way (ROW). As a result, they enjoy good road facilities. For others less fortunate, they are connected to each other by earth road,

constructed and maintained by the various local government councils. Other settlements however, are linked by poor road network and thus largely inaccessible.

5.2.3.5.3. Health Facilities

About 17.3% of the communities have access to hospitals, Over 31.0% of the communities have one form of clinic, Rural Health Center or the other providing health services for people in the localities (**Plate 4.16**). A total of 51.7% do not have any form of health facility.

5.2.3.5.4. Electricity

Only 13.7% of localities have electricity such communities include Kifubwa Ward, and though a power line just runs parallel to the ROW. The other settlements in the project area representing 86.3% do not have any form of electricity supply. People in these areas depend on solar lighting, lanterns, wood, kerosene and other forms of energy for domestic use.

5.2.3.5.5. Transportation

Vehicles (cars, buses, pick-ups and lorries) are used as means of transportation between settlements. Bicycles and Motorcycles are also widely used in the area especially for conveying farm produce to various localities. are hardly used.

5.2.3.6. Economic Activity

All the surveyed sites along the project road are predominantly rural and therefore are dominated by agricultural production, mostly small-scale subsistence farming of traditional crops. The results of the survey in all the sites indicate that few if any households can meet all their needs through one activity. The key characteristic of livelihood strategies is that a *combination* of activities and resources are used. People seek to balance the time, resources and risk allocated to various activities, so that, in total, the wide range of needs are met. Obviously, they will prioritize essential needs hence some activities. The strategies

employed adapt constantly to changing situations, and hence are *dynamic*. Another essential point is that there is enormous *variation* between households, areas, and years, in the type and balance of activities undertaken.

The main strategies used however, include subsistence agriculture (crops, livestock), fishing, wage employment, cash remittances, and “wild” natural resources, including trees, grasses, nuts, fruits, and medicinal plants. Wildlife and tourism enterprises are currently small but growing additional elements. The most ubiquitous activity is agriculture -- virtually all households in all the sites grow crops. However, it is noticeable both from literature review and field interviews that although almost all residents of the project areas identify agriculture as their main *activity*, *it is only some who* rely on it as their main source of *income*. This indicates the inadequacy of agriculture as a source of cash income and widespread dependence on off-farm income. But it also shows that even those who have other main sources of income still regard agriculture as a core activity.

Another key characteristic to note about the local economy of the surveyed sites is that there is heavy but variable dependence on natural resources. Dependence on rivers and floodplains is evident from both literature reviewed and field interviews. In addition to agriculture, many households rely on wild natural resources as well, especially for female-headed households and poor households, with severely limited options for obtaining food and basic necessities; It should however be noted that quantifying the contribution made to livelihoods by any resource or economic activity is difficult.

The border area of Kipushi is predominantly dependent on cross-border trade into agricultural produce, groceries and livestock, targeting the lucrative market in the Democratic Republic of the Congo (DRC) mining town of Kipushi. Additionally, the border is an access point for transit goods from the SADC region into DRC.

5.2.3.6.1. Crop Production

The type of farming is subsistence and characterized by low external inputs, very little cash inflow, use of manual labor and bartering of the produce with other household items. Cassava and Maize are the main grains cultivated, with legumes and vegetables as an addition. Cassava is the main staple food followed by maize, and production has increased over the last few years due to government support of the sector.

Analysis of the field data overall indicate that close to 90% of farms in the surveyed sites only have one field, which are usually less than 5ha, with average field size of under 2ha. However, other sources the DACO offices in the districts indicate larger field sizes and assume on average that 10% of farming households in the surveyed sites have a cropping area of less than 5ha, 60% have 5-10ha, and 30% have over 11 ha, although these are *cleared* rather than *planted* area, but still indicates a significant difference.

Discussion with farmers in the surveyed sites reviewed that crop production provides households with many benefits and the following are some of the benefits, which were identified:

- **Limited cash incomes:** Surplus grains are sold (by a small proportion of farmers) or used to produce products (tombo--beer brewed from sorghum for example) for sale or in-kind trade. Other farmers identified cash cropping as the “main source of income. However, it is clear from the discussion held that when oxen, land, labour and good conditions are available, significant income from sale of surplus grain can be earned by a fair proportion of farmers. Income from beer brewing is likely a significant source of income, particularly to households with few other cash sources.
- **Savings:** Staple grains are also stored (with risk of spoilage) for future consumption or sale.

Consultation and discussion also revealed that the main inputs to crop production in the communities visited are labor (particularly women's labor). These determine the area that can be planted and

tended. Use of mechanised and commercial inputs (fertilisers, irrigation, tractors) is low, not only because of limited availability and affordability, but because farmers adopt a low-risk approach ("low-input low-output"). A farmer investing in a costly practice to obtain higher yields loses that investment if adequate rain does not fall or if markets for surplus grains cannot be accessed. Instead, most farmers minimize risk by incurring minimal capital and operational costs and emphasizing drought tolerance.

The significance of crop production in surveyed sites, as a major source of livelihoods and income is demonstrated by the fact that crops were consistently ranked first in the importance of incoming resources or activities, in participatory discussions at household and community level, although this varies considerably between households. However, it was not easy for the study team to establish how significant crop production is in terms of maintaining food security and meeting or minimizing cash needs through sale of surplus grains.

Two major constraints are clear from both the consultation process and the literature reviewed. The first of these relate to ***Low and variable yields***. Communities in the surveyed sites are prone to low yields including nutrient-poor soils, and high leaching rates, and damage from pests. As a result, even 'normal' climatic variation can result in complete crop failure or a minimal harvest, leaving a household in need of cash to buy food.

The second constraint relates to ***Limited Inputs***. Given the absence of mechanized implements in the affected communities, the main other constraints identified by the farmers, in as far as expanded production is concerned, are limited capacity to prepare land for planting (availability of traction) and weeding capacity (women's labor time, especially in floodplain areas). It is interesting to note however that, although cash investment in mechanization or irrigation is completely absent in the affected communities, many of those with cash incomes pay neighbours to work their fields. This indicates the

importance of maintaining staple crop production, and the benefits of a larger field size, and once household needs are met, every addition can be sold for cash.

5.2.3.6.2. Micro-enterprises

Several households engage in some form of micro enterprises. A microenterprise can be described as an income-generating venture owned by a family and run by or on behalf of that family.

Observations during the site visits revealed general characteristics for all the micro-enterprises and include the following characteristics:

- Low initial capital, low working capital and therefore, low income generated
- Members of a family or club contributed labor towards the microenterprise
- There was a general lack of business management skills
- Little or no credit had been sought for;
- Products were marketed in the village, sometimes on barter system; and
- Several micro-enterprises were run by women.

Whilst trade is widespread with some form of trading taking place in nearly in all the surveyed sites, industrial activities are very limited. Household goods and daily requisites (groceries) are the most commonly traded items. Others are farm produce of different types – grain (mostly maize, beans, millet, sorghum and groundnuts), tubers (cassava, sweet potatoes, Irish potatoes), cucurbits (pumpkins, and cucumbers) in the form of poultry, pigs and goats are also commonly traded. The target market for most of these products is the local people, while those living along the border take advantage of the thriving market in the DRC towns of Kipushi and Lubumbashi. However, some of the merchandise finds its way out of the local

markets e.g. the Food Reserve Agency would purchase maize and sell it out of town.

Small shops were also observed in nearly all the sites for selling consumer items. Items sold include drinks, fruit, cigarettes and other consumer items. No industrial activity of any kind exists within the project areas. This is mainly due to small and scattered population center hence, providing insufficient demand to warrant the supply.

Poor infrastructure development, particularly the Solwezi, Mushindamo Kipushi Road has equally contributed to commercial and industrial underdevelopment in the project areas. The surveyed sites are relatively remote and situated outside the administrative center of the two districts, and therefore, the availability of infrastructure and other facilities are very limited.

5.2.3.6.3. Employment

Over half of employees in the surveyed project areas are in government but the number of those in formal employment is smaller than the total population of the project area of influence. Most of the people in the project area are in informal employment mainly subsistence farming, and trading. In rural areas, especially in the surveyed sites, the majority of Government jobs are in schools and clinics, either as nurses, teachers, and extension officers.

Private sector opportunities are very limited, though may increase with unfolding development in the tourism industry and marketing links. Nongovernmental organizations (NGOs) are the other main, and increasing, source of jobs.

5.2.3.6.4. Average Income

Household incomes from agricultural produce such as cassava are low because of large distances to the markets. The surveys revealed that household income varies both seasonally and annually due to seasonal variations, accessibility to agricultural inputs and yield. Although annual household income was not ascertained from the survey questionnaires, the income was examined in relation to transport fares to establish the ability of the households to pay for travel and the frequency in which they

undertake the trips. Farming income was found to be less dependable since it is seasonal. From the various interviews of households along the proposed project area income from farming varies between ZK 50,000 – 150,000 (US\$ 2,630 to 7,894) per household, but not exceeding ZK 5,000,000 (US \$ 1, 000) per annum.

Some farmers were found to favour selling or bartering their produce in the village, cheaply or for less favourable terms than transporting their crops to market, which is costly.

6.0 ASSOCIATED AND POTENTIAL ENVIRONMENTAL IMPACTS

A checklist of associated and potential environmental impacts of the proposed project activities is presented in Table 9. The impacts have been classified according to the stage of the project at which these are anticipated to occur, highlighting the related project activity or activities.

Table 6-1: Checklist of Associated and Potential Impacts of Proposed Solwezi to Kipushi Project

Project Phase	Project Activity	Environmental Component	Associated/Potential Impact
Design	Land Acquisition	Soil, vegetation	Loss of land, loss of economic crops, decrease in incomes
Site preparation	• Site survey • Geo-technical tests • Bush clearing	Vegetation, Soil, Wildlife	Vegetation removal exposes soil to weathering conditions
Site Preparation	Clearing and Grubbing	Soil	• Damage to utilities, communication infrastructure (optic fibre lines) • Damage to power supply lines and other facilities along ROW
		Water system	☐ Change to water quality due to inflow of run-off and suspended solids
			• Changes in noise and exhaust fumes from excavator, increase in dust during dry season • Temporal road diversion and obstruction
	Top Soil Stripping	Soil and water systems	• Increase in turbidity due to exposure of soil surface to run-offs carrying sediment • Changes in drainage pattern due to change in topography and improper re-instatement
	Access Road Construction	Soil and water systems	☐ Change in water quality due to inflow of run-off with suspended solids
	Transport of material and equipment to site		• Road users would be exposed to more accident conditions due to increase in flow of heavy equipment • Temporary road diversion and obstruction

	Establishment of Contractors Camp	Vegetation, air, soil and water	- Domestic waste from the workers camp shall alter the local aesthetics and the soil quality - Domestic waste can alter water quality if dumped in water ☐ Odour
	Establishment of crusher plant	Noise, air, vegetation and water	- Increase in noise levels from crusher operations - Increase in dust due to release of particulate matter into local air sheds - Change in water quality due to run-off laden with suspended solids

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Project Phase	Project Activity	Environmental Component	Associated/Potential Impact
Construction			☐ Emission of exhaust gases from fuel combustion engines can alter the local ambient air
	Earthworks	Soil, vegetation, water	☐ Increase in turbidity due to exposure of soil surface to run-off carrying sediment ☐ Increase in dust due to release of particulate matter into the local air sheds ☐ Damage to utilities, communication infrastructure and power transmission lines
	Blasting and drilling	Noise, air, ground water	☐ Increase in noise levels ☐ Increase in the release of flying objects into the air ☐ Exposure of local ground water systems, resulting in ground water intrusion
	Borrow pit establishment	Soil, vegetation, water	☐ Increase in turbidity due to exposure of soil surfaces to run-off carrying sediment

			☐ Increase in flooding due to ponding of water in quarries and borrow pits ☐ Increase in dust due to release of particulate matter ☐ Loss of vegetation resulting from land clearing and excavation
	Road Construction	Noise, air, light, soil	☐ Increase in noise levels from construction equipment ☐ Release of dust into the air from asphalt plant operations ☐ Release of heat in to the air during laying of pavements.
	Site Removal and rehabilitation	Noise, soil, water	☐ Domestic and hazardous waste from workers camp can contaminate the soil and ground water ☐ Noise levels increased when removing redundant material from site
Operation	Road maintenance	Soil, vegetation, water, air	☐ Odour may result from improper handling of vegetative matter if dumped in water ☐ Hazardous waste from paint containers used in road furniture installation ☐ Increase in dust due to release of particulate matter in local air sheds

6.1 Environmental Screening

6.1.1. Basis of Screening

Bio-physical media considered to be of critical concern for the Solwezi to Kipushi Project are vegetation, geology and hydro-geology. This is in addition to socio-economic and health status of the host communities, or the Project Affected People. The screening undertaken for this project was based on the following:

- Knowledge of the project activities (surveying, clearing and grubbing, soil stripping, establishment of contractors camp, establishment of crusher plant, establishment of borrow pits and road construction, together with road maintenance.
- Knowledge of the equipment types and operational procedures related to road construction
- Information from literature survey, historical data and physical spot checks to assess water quality, air and climatology.

6.1.2. Screening Approach

A checklist of project activities and their potential impacts were subjected to comprehensive environmental impact assessment consistent with scale and complexity. The technique employed for rapidly assessing the Solwezi to Kipushi Project include the following:

- Identification of key impacts and their indicator parameters
- Determination of the magnitude and significance of impacts
- Evaluation of the importance of the impacts to decision makers
- Incorporation of concerns of host communities during consultations and the findings from socio-economic and health studies.

6.2. Impact Quantification and Determination of Significance of Impacts

The identified associated and potential impacts of the Solwezi to Kipushi Project have been Environmental Aspects and identifying significant environmental aspects/impacts.

Criteria and Ratings for identifying significant environmental impacts of this project are as follows:

Legal/Regulatory Requirement (L) – Is there a legal or regulatory requirement or a permit/licence required

0 – There is no legal/regulatory requirement 3 – There is a legal/regulatory requirement 5 – There is a permit required.

Risk (R)) What is the risk /hazard rating based on the Risk Assessment Matrix (RAM Tables xx and Medium/inter

1 = Low Risk

3 = Medium Risk

5 = High Risk

Environmental Impact Frequency (F) What is the frequency rating based on the Risk Assessment Matrix? 1 = Low frequency

3 = Medium frequency

5 = High frequency

Importance of affected Environmental Component and Impact (I) What is the rating of importance based on consensus of opinions

1 = Low importance

3 = Medium Importance

5 = High importance

Public Perception (P) What is the rating of public perception and interest in proposed project and impacts based on consultation with stakeholders?

1 = Low perception and interest

3 = Medium perception and interest

5 = High perception and interest

The significant potential impacts of the proposed project based on table xx were identified as those impacts in the checklist of table 6-1 that would satisfy the following criteria

(L+R+F+I+P)>15 Sum of weight of legal requirements Risk Factor, Frequency of occurrence, importance and public perception greater than or equal to fifteen

(F+I) is > 6 Sum of weight of frequency of occurrence and importance of affected environmental component exceeds the benchmark 6

P = 5 The weight of the public perception/interest in the potential impact exceeds 5

Table 6-2: Risk Assessment Matrix for Environmental Consequences

Consequence		Increasing Probability				
		A	B	C	D	E
Severity	Environment	Never heard of incident in road sector	Incident has occurred in road sector	Incident has occurred in project area	Happens several times per year in project area	Happens several times per year in the City
0	No effect					
1	Slight effect		Low			
2	Minor effect		Risk			
3	Localised effect			Medium	High	
4	Major effect			Risk	Risk	
5	Massive effect					

Table 6-3: Illustration of further definition of consequence – Severity Rating for Risk Matrix

Severity	Potential Impact	Definition
0	Zero Effect	No environmental damage, no change in the environment, no financial consequence
1	Slight Effect	Local environmental damage within the fence and within systems, Negligible financial consequence
2	Minor Effect	Contamination, damage sufficiently large to affect environment, Single exceedance of statutory or prescribed criteria, single complaint, No permanent

		effect on the environment
3	Localized Effect	Limited loss of discharges of known toxicity, Repeated exceedance of statutory or prescribed limit, Affecting neighbourhood
4	Major Effect	Severe environmental damage, Developer is required to take extensive measures to restore the contaminated environment to original state, Extended exceedance of statutory or prescribed limit
5	Massive Effect	Permanent environmental damage or severe nuisance extending over a wide area, A major economic loss, Constant high exceedance of statutory or prescribed limits.

Table 6-4: Further Classification of the Colour Coding of Significance Rating

Potential Impact of Activity	Colour Code of Significance	Total Rating Weight for All Criteria
Potentially High Significant Negative Impact		18 -24
Potentially Significant Negative Impact		12 – 17
Potentially Low Significant Negative Impact		7 - 12
Potentially Positive to No Significant Negative Impact		0 - 6

Table 6-5: Impacts significance ratings

Potential/Associated Impacts			Assessment Criteria					Total Score L+R+F+I+P	Sign Code	Category
Project Phase	Project Activity	Potential/Associated Impact	L	R	F	I	P			
Site preparation	Site survey	Removal of vegetation	3	3	3	3	3	12		Significant
	Geo-technical Investigations	Removal vegetation/wildlife migration	0	1	1	1	1	4		Not significant
		Soil strata inversion during backfilling	0	1	3	1	3	8		Not significant
	Clearing and grubbing	Removal of vegetation	0	1	3	3	3	10		Not significant
		Dust during clearing	0	1	3	3	3	10		Not significant
	Establishment of Contractors Camp	Removal of vegetation	0	1	1	3	3	8		Not significant
		Removal of soil and strata inversion during backfilling, soil contamination from diesel and oils	0	1	3	1	3	8		Not significant
		Removal of vegetation,	0	1	1	3	3	8		Not significant

	Establishment of crusher plant	Release of dust	0	1	1	1	3	6		Not significant
Construction	Earthworks	Removal of vegetation	0	1	3	3	3	10		Significant
		Increase in erosion and river turbidity	0	1	3	3	3	10		Significant
	Blasting and Drilling	Increase in noise levels	0	3	3	3	3	12		Significant
		Release of dust	0	1	3	1	3	8		Not significant
	Road Construction	Changes in water quality at crossing points, increase in TSP during dry season	3	1	3	3	3	13		Significant

Table 6-6 Impact Classification

Potential/Associated Impacts			Assessment Criteria					Total Score L+R+F+I+P	Sign Code	Category
			L	R	F	I	P			
Project Phase	Project Activity	Potential/Associated Impact								
		Obstruction/diversion of traffic	0	1	3	1	3	8		Not significant
	Transportation of	Soil contamination, increase in release of dust, soil	0	1	3	1	3	8		Not Significant

	construction material	contamination and loss of aesthetics								
		Diversion of traffic	0	1	3	3	3	10		No Significant
	Operation of machines and construction equipment	Changes in ambient air due to release of exhaust fumes	3	3	3	3	3	15		Significant
		Increase in ambient noise due to equipment and machinery operation	3	3	3	3	3	15		Significant
	Waste disposal	Soil and water contamination from improper disposal of solid and liquid waste	3	3	3	3	5	17		Significant
		Loss of aesthetics	3	3	3	3	3	15		Significant
	Site Removal and Rehabilitation	Soil and water contamination from improper disposal of solid and liquid waste, lossf aesthetics	0	1	1	3	3	8		Not Significant
Operation Phase	Traffic movement	Changes in ambient air due to release of exhaust fumes	1	3	1	3	5	13		Significant
		Increase in noise levels	1	3	1	3	5	13		Significant
	Road maintenance	Removal of vegetation	0	1	3	1	3	8		Not significant
		Soil contamination, increase in dust, increase in noise levels	3	3	3	3	3	15		Significant

	Waste disposal	Soil and water contamination from improper disposal of solid and liquid waste	3	3	3	3	5	17		Significant
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From the above, it is therefore apparent that activities of the Solwezi to Kipushi Project that would exert significant impacts based on the Risk Assessment Matrix and the ISO 14001 criteria are: Land acquisition, site survey, construction, operation and maintenance, waste disposal and decommissioning and rehabilitation. These activities would have effect on the air quality, noise, vegetation, soil and surface water. The table below summarises the indicator parameters of each identified environmental component.

Table 6-7: Indicator parameters of each identified environmental component

Project Phase	Project Activity	Potential/Associated Impact	Indicator Parameter
Planning/Design	Land acquisition	Loss of land, economic crops and livelihoods	Changes in economic activities
Site preparation	Route survey	Removal of vegetation	Plant density, wildlife density
		Loss of habitats	Plant density, state of habitats
	Geo-technical investigations	Loss of fertile lands	Soil fertility
	Clearing and grubbing	Soil strata interference during backfilling	Soil fertility
	Establishment of contractors camp	Loss of vegetation, soil contamination and disturbance	Plant density, soil fertility
	Establishment of crusher plant	Loss of vegetation, ambient air contamination and increase in noise levels	Plant density, air quality and noise level tolerance
Construction	Earth works	Changes in water quality at stream crossing points, increase in TSS during dry season. Temporary vehicular traffic obstruction/diversion at intersections	TSP, (air quality) DO TSS, TDS soil aggregates/density

	Blasting and drilling	Changes in air quality, increase in noise levels temporary vehicular traffic obstruction/diversion	Noise level, VOC, soil THC and noxious gases (CO ₂ , NO ₂ , SO ₂ and NH ₃)
	Road construction	Changes in air quality, contamination of water bodies at crossing points. Temporary vehicular traffic obstruction/diversion	Soil compaction, (air quality) TSS, TDS and noxious gases (CO ₂ , NO ₂ , SO ₂ and NH ₃)
	Transportation of construction material	Soil compaction, increase in rate of exposure to accidents, temporary obstruction of road or road diversion.	Soil compaction, CBR, frequency of road accidents during the construction phase
	Operation of construction	Changes in air quality due to exhaust gases, soil	Noise level, VOC, TSP, soil THC and
Project Phase	Project Activity	Potential/Associated Impact	Indicator Parameter
	machines and equipment	contamination from hydrocarbons, (fuel and lubricant leaks) and increase in ambient noise	noxious gases (CO ₂ , NO ₂ , SO ₂ and NH ₃)
	Decommissioning and rehabilitation	Soil contamination, loss of aesthetics and loss of air quality	Soil fertility, TSS, noxious gases (CO ₂ , NO ₂ , SO ₂ and NH ₃)
Operation and maintenance	Traffic movement	Changes in air quality due to exhaust gases, increase in rate of exposure to accidents, increase in noise levels	Noise level VOC, frequency of road accidents during road operation and noxious gases (CO ₂ , NO ₂ , SO ₂ and NH ₃)

	Road maintenance	Changes in air quality, contamination of water bodies at crossing points. Temporary vehicular traffic obstruction/diversion	Soil compaction, (air quality) TSS, TDS and noxious gases (CO ₂ , NO ₂ , SO ₂ and NH ₃)
	Waste disposal	Soil and water contamination from improper disposal of solid and liquid waste, loss of aesthetics and risk of accidents from improper handling of hazardous waste	Waste management procedures at site and THC in soil and water

6. MANAGEMENT OF IDENTIFIED IMPACTS

6.1 Enhancement of Positive Biophysical Impacts

The Developer will work in close collaboration with ZEMA and the RDA to reduce environmental degradation and enhance increased access to the area and the region through development of a sustainable development.

6.2 Mitigation of Negative Biophysical Impacts

6.2.1 Air Pollution

Appropriate interventions will be applied to limit the level of air pollution from both point source and fugitive dust/particulates emission sources as appropriate:

- Dust suppression by spraying water on dust roads and on active haulage routes and other areas with potential to generate dust;
- Enforcement of speed limits to 30 km/h to minimise on traffic induced dust emissions;
- Timely rehabilitation of disturbed areas by ground stabilization and profiling, placement of top soil and re-vegetation;
- Stabilisation of ground areas and materials prone to blowing; and
- Monitoring of dust levels for corrective action.

6.2.2 Hydrology

- The drainage design will take into account increased flows emanating from the ridges and hills, and consider potentially high and intense rainfall due to climate change. For example culvert diameters will be increased, and the number of culverts in vulnerable sections will also be increased.
- Drainage considerations such as rehabilitating culverts and installing appropriate drainage structures to direct road runoff away from the road in the road design will ensure that flow of water is not impeded from one side of the road to the other.
- Drainage features will be well designed, properly constructed and regularly maintained so that runoff does not accumulate by the side of the road, water that is drained off the road does not create gullies, and siltation of the structures does not occur. Drainage structures will therefore ensure safe final disposal of water and culverts will be self-cleansing.

- Along the flatter sections of road, and where the road crosses dambos and floodplains, e.g. at the swamps, the road will be raised, and culverts installed so that water can drain efficiently.

6.2.3 Land Degradation

Land degradation will be prevention and minimisation of land disturbance and waste generation. There will be need for the rehabilitation of disturbed areas and localisation of waste to areas of generation and designated collection points. Furthermore, all materials with use value such as scrap metal, wood, paper and plastic should be recycled or reused for other purposes. Any materials with no use value will be disposed of at designated waste disposal sites. Wastes will be segregated and safely contained in waste bins and waste bays awaiting disposal or removal for reuse/recycling. Non-usable wastes will be dumped at a dump sites to be established within the plant area with permission from ZEMA and the local authority.

6.2.4 Ground Water Pollution

Mitigation measures will include:

- Prevention of material spillage;
- Containing all wastes and spilled material;
- Disposing of wastes in designated disposal sites; and
- Cleaning up and remediation of all contaminated sites.

6.2.5 Pollution of Surface Water

The following measures will be implemented for management of waste waters to prevent/minimize pollution of surface water resources.

- Location of the plant/workshop will ensure a minimum distance of 500m from surface water bodies to avoid accidental pollution of water resources;
- Installation of a series of sediment and oil traps to ensure that plant washings and runoff water is cleaned of sediments and oils before discharge into the aquatic environment including regular servicing of sediment and oil traps for efficient operations;
- Bunding all open raw material storage areas to prevent washing away of stored materials;
- Localising all debris and other wastes and confining them in designated storage areas for appropriate disposal;

- Proper management of fuels to prevent spillage and the potential to contaminate ground with the possibility of wash down to surface water bodies;
- Washing of mobile equipment and machine parts should be done in designated wash bays equipped with impervious floors and containment. All drainage from wash bays should be passed through an oil trap prior to release into the site drainage network.
- Drainage systems from fuel storage facilities and other contaminating sources such as workshops will be isolated from storm water drains.
- During the rehabilitation of culverts and swamp crossings, an increase in sediment loads in the swamps is unavoidable. RDA will ensure that the Contractor controls the amount of material that is required to be laid onto the crossings, and that this material is applied carefully, and immediately compacted.
- Rehabilitation of the culverts and swamp crossings will be done during the dry season, wherever possible.
- Sediment loads in the rivers and streams will also be reduced by incorporating erosion control measures.
- Wastewater and sewage from the Contractor's Yard will also be disposed of properly so as to prevent pollution of water bodies. The Contractor will construct a septic tank at his yard and at the Workmen's Camp where all wastewater and sewage will be disposed of.

6.2.6 Loss of Productive Top Soil

- Removal and stockpiling of top soil for future re-profiling at the end of plant life.
- Minimizing land disturbance to absolutely required or designated areas.

6.2.7 Reduced Soil Stability

- Timely rehabilitation/stabilization of disturbed areas by undertaking activities such as paving, re-vegetation and proper landscaping.

6.2.8 Disturbed Landscape

- Proper planning and landscaping of all developed infrastructure to blend into the surrounding environmental setting.

6.2.9 Disturbance to wildlife

- Minimal destruction of habitat by avoiding land clearance of areas not necessarily needed for project development.
- Identification of the areas that can be maintained for development into conservation areas around the project area should be done.
- Fauna species found in the area should be relocated to safe areas within the District or elsewhere with the help of relevant Government Authorities.
- Disturbance to small animal/bird life due to clearance of vegetation, noise/dust/air/oil pollution will be mitigated through carefully controlled clearing.
- The workforce will be instructed not to harm any wildlife or birdlife, and penalties will be imposed on offenders.

6.2.10 Loss of Flora biodiversity

- Clearing of vegetation and trees will be strictly controlled: it will be limited to what is absolutely necessary, and will not be done indiscriminately.
- Clearing will be done manually or mechanically; the use of herbicides will be prohibited. RDA will ensure that the Contractor is diligent and undertakes proper supervision of the workforce.
- The workforce will be provided with alternatives to fuelwood and charcoal for cooking (e.g. by providing kerosene cookers), so that the pressure on fuelwood and charcoal will be reduced.
- After road improvement is complete, grass and trees will be replanted wherever vegetation has been inadvertently or unnecessarily destroyed. Trees will be planted along the roadside and the local councils will be asked to look after them.
- Areas of forest and fallow vegetation with higher species diversity will be protected to maintain flora and fauna in the area. Specific areas should be identified through specialist consultation during the construction phase.
- All large trees and vegetation within and around the project area will be maintained with as little disturbance as necessary.

6.2.11 Disturbance to Aquatic Life

- All drains carrying contaminants will be appropriately channelled for treatment prior to discharge to the aquatic environment.

- Management will ensure that appropriate treatment methods are applied and all effluents will be monitored for compliance with licensed limits before discharge.
- Land clearing will be limited to absolutely required areas and progressive rehabilitation and re-vegetation of disturbed sites will be undertaken;
- Careful choice of service routes by selecting less vegetated areas and alignment of routes along existing passages such as roads to limit opening up of virgin land.

6.2.12 Borrow Pits and Access Routes

- Borderway Investments and RDA should prepare layout plans for all access roads and shall obtain written consent from the headman or occupier of the land proposed for use. These will be submitted to the Environment Safety Monitoring Unit for approval. Environmental factors such as land use, presence of vegetation and trees, water bodies, houses etc. shall be taken into consideration when selecting the haul road so as to avoid/minimize impact on the environment and people.
- New borrow pits, detours and access routes areas will be identified in consultation with the local community and shall be subjected to the Environmental Management Unit for approval after preparation of EPBs. All access routes to materials sites will be planned ahead of construction and described in the tender documents. This will eliminate the creation of several routes to access one site, reduce damage to vegetation, reduce dust emissions and regulate access to borrow sites, thus enhancing safety
- Borrow pits will not be located in forests or forest reserves, or any National Park in accordance with the Forests Act Cap 199 and Zambia Wildlife Act of 1998.
- Borderway Investments and RDA will inform people living at or near the materials sites of the environmental implications of excavation at the time of selection of the sites. The owners of the site will be compensated for material borrowed. Owners of the land where the borrow pits are located will also be told of the options available to them after excavation, for example landscaping, terracing, reshaping (in the event they want to convert these to water storage facilities), planting and replacing vegetation/trees and/or fencing.

- Borrow pits will be landscaped, then reinstated or backfilled with overburden / topsoil. Separate stockpiles will be made for topsoil, overburden, gravel, etc.
- Borrow pits will be excavated such that drainage is controlled, and water is not allowed to accumulate. Any water that does collect will be pumped out and disposed off sensibly.
- All persons working on borrow pit sites will be issued with appropriate equipment, including overalls, hardhats, gloves, boots, ear muffs, goggles and nose masks.

6.2.13 Waste Generation

A number of waste streams are expected to originate from project. While the waste produced during the site preparation works will be of short duration, considerable amount of waste will continue to be produced during construction phase.

- The waste that is generated will have to be managed and disposed of appropriately in accordance with its waste classification.
- Excess excavated material generated by the Project will be disposed of within the designated area.

6.2.14 Impacts on Ecologically Sensitive Areas (Wetlands, Dambos)

- Physical disturbance to sensitive areas will be controlled by the Contractor who will instruct his workforce not to cut down wetland vegetation, unless it is essential for the construction/rehabilitation of swamp crossings.
- RDA will ensure that the Contractor controls the amount of material that is required to be laid onto the crossings, and that this material is applied carefully, and immediately compacted.
- Rehabilitation of the culverts and swamp crossings will be done during the dry season, wherever possible.
- Sediment loads in the rivers and streams will also be reduced by incorporating erosion control measures.
- RDA will ensure that the Contractor disposes of construction debris in a sensible manner and does not throw it into the swamps and rivers, or along the roadside.
- No borrow pits, hard stone quarries or diversions to go through Protected Areas such as Forest reserves.

6.3. Enhancement of Positive Socio-economic and Cultural Impacts

6.3.1 Infrastructure Development

The proposed project is contributing to the areas' infrastructure development. It will allow for sustained productivity and increased economic development to both the local and national level. It will also promote other infrastructure development in the region as it will be easy to access the area.

6.3.2 Support to the Local Economy

The contractor shall give preference to local suppliers of goods and services in Solwezi and Mushindamo, provided they meet the quality requirements at a cost not exceeding comparative advantage. This will be done with a view to supporting local economic development.

6.3.3 Employment Creation

The contractor will give preference to locals for unskilled jobs during the preparation and construction phases of the Solwezi to Kipushi via Mushindamo road upgrading project. This has far reaching implications on the survival abilities of the affected persons in view of the depressed employment opportunities in the project area due to its remoteness. More importantly, the contractor will be sensitive to gender disparities in employment and will therefore discriminate in favour of female and youth employment in less arduous jobs such as traffic control, cooking food for construction workers, collecting and disposal of garbage from camp sites. The Contractor will be asked to recruit local people, of which at least 25% should be women.

In order to increase employment opportunities in the project area, the local authorities will enhance training in self-help programmes in order to improve the quality of life of the local communities. Development of skills in welding, mechanical fitting and electrical is highly recommended.

6.3.4 Capacity Building and Skills Development

The project will contribute to capacity building and skills development of the people who will be employed through on-job training and interaction with other skilled personnel from different disciplines.

6.4 Mitigation of Negative Socio –economic and Cultural Impacts

6.4.1. Noise and Vibrations

Proposed mitigation measures must include:

- Adequate clearance between operational areas and public access areas including settlements;

- Putting in place and implementation of an appropriate warning system for blasting operations;
- Implementing an appropriate signage system to warn both workers and the public on noise and vibration hazards;
- To the extent possible, limiting noisy operations to day time only;
- Compliance with issued noise and vibrations limits; and
- Provision and enforcement of Personal Protective Equipment (PPE).

6.4.2. Dust Nuisance

- RDA will consider dust as an environmental concern in its planning and during execution of the works. The Contractor shall use plant and equipment conforming to international standards and directives on dust emissions.
- The Contractor will take all necessary measures to ensure that operation of all mechanical equipment and construction processes on and off the site shall not cause any unnecessary or excessive dust, taking into account all applicable environmental requirements.
- Wetting all haulage dust roads passing near settlements or commonly used by members of the public and dampening all work areas with potential to generate dust when conducting excavations and other land preparation works
- Providing a safe clearance area between settlements and work areas
- Provision of PPE such as respirators to workers in dusty areas and enforcement of PPE usage.
- Deviations close to schools and clinics should be avoided whenever it is possible, and
- Careful handling of materials to minimize on dust generation e.g. by limiting speed limits on dust roads.

6.4.3. Health and Safety Risks

Mitigation measures will include the following:

- Restrict public access to operational areas by putting appropriate signage;
- Construction of alternative roads where the usual roads have been blocked;
- Provision of appropriate PPE; and
- Proper marking of boundaries for the operational areas and associated facilities.

6.4.4. Mechanical and Traffic Accidents

- All workers will be trained and reoriented in occupational health and safety and applicable protocols should be firmly enforced.
- All workers should be provided with personal protective equipment. Only well qualified and experienced workers will be tasked to drive vehicles and operate machinery.
- An emergency response plan should also be put in place to guide response and minimise effect in case of an emergency situation.
- Haulage trucks using detours should adhere to speed limits

6.4.5. Impacts on Areas of Historical, Archaeological and Cultural Significance

- Though no specific sites have been identified in the areas earmarked for development, the project implementation team should consult headmen and other stakeholders in the project area on an on-going basis to ensure that any areas deemed culturally sensitive including shrines and burial places are identified and taken care of by isolation or other management options deemed appropriate by concerned parties.

6.4.6. Increased Risk of HIV/AIDS Transmission

- The contractor must promote HIV/AIDS awareness as well as circulating condoms among construction workers in order to reduce the spread of STIs and HIV/AIDS virus.
- The contractor should additionally outsource specialized services from hospitals/clinics and/or District AIDS Task Forces in the two districts of Solwezi and Mushindamo to help in sensitization and awareness creation
- The contractor should also invite community leaders to site meetings where sensitization in various aspects of project implementation including HIV/AIDS should be addressed. An awareness campaign will be initiated to sensitise the local communities on the risks of STDs/HIV/AIDS.

6.4.7. Influx of People to the Project Area

- The local leaders will be made aware that the influx of people into the project area may raise security concerns; they should therefore plan to address the security situation.
- The Contractor will also be encouraged to procure supplies from local sources to the maximum extent possible in the circumstances

- The influx of people to the project areas will be discouraged by giving priority in employment to local residents. To this effect, the Contractor will work with local authorities such as the Area Development Coordination Committees and the District Councils when recruiting locals.
- The District authorities and RDA should work closely with the Zambia Police Service to address negative vices such as crime.

6.4.8. Resettlement/Displacement of People

- All properties to be disturbed (houses, shops, field etc.) should be compensated to ensure that livelihoods of affected parties are not worsened but restored to a state similar to the original state or better.
- Affected parties should be engaged to reach consensus on applicable compensation. The traditional and civic leaders will also be involved in the process to ensure transparency. A Resettlement Action Plan) detailing all PAPs and properties to be disturbed has been developed to guide implementation of the resettlement process.

6.4.9 Loss of land/livelihood

- All assets or resources which are sources of livelihood such as shops, tntembas, and agricultural fields will be compensated fully to the affected people before implementation of the project.
- Compensation to be paid for land and all property on land acquired for road construction works
- Restoration/ rehabilitation of land acquired temporarily for construction purpose
- Pay compensation for all crops removed/destroyed for clearing of carriageway, gravel pits and diversions

6.4.10 Loss of access routes

- Compensation to be paid for land temporarily acquired for road construction works including access routes
- Detours and access roads location shall be done in consultation with local people and shall take into account the existing land use in the settled areas

6.4.11 Impacts on Road Safety

During construction there will be some danger to road users due to construction traffic and the transportation of equipment. Road safety for motorists, cyclists and pedestrians may

increase during the construction and operation phases. Road diversions without clear advance warning, will pose a danger to the public during construction. There is also a concern of children and intoxicated adults coming close to the construction sites, or careless crossing of the road that may lead to fatal accidents.

After construction, it is expected that volume of construction traffic along the road will be reduced, but other vehicular movement is likely to increase.

Accidents may also occur between motorists and livestock, especially where the local communities keep livestock and frequently cross the road to access watering points or grazing land.

Mitigation

- The Contractor will develop a traffic management plan to implement measures for ensuring safe passage of traffic around and through the construction sites at all times.
- The Contractor will designate access routes to and from worksites, borrow pits and quarries. These will have to be approved by the Supervising Consultant.
- The Contractor will establish traffic and safety barriers and signs wherever needed. This includes warning signs along access roads as well as signs to direct and divert traffic.
- Prior notice will be given to the general public through notices at district headquarters and in the local media of expected disruptions to traffic.
- The Contractor will sensitise both the workforce and the road users in terms of hazards posed by construction traffic, and also risks to road safety resulting from an improved road. This will be done through conducting a road safety campaign.
- The design includes speed bumps and warning signs on approaches to major trading centres and towns, schools and hospitals along the project road.

6.4.12 Loss/restriction of access to common resources

There will be no loss to access to common resources such as water front and forests as the Contractor will liaise with the locals on areas of common community resources in terms of access and use. If such a situation arises, communities will be provided with alternative ways to access common community resources.

7. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

In this section, an environmental and social management plan has been prepared to cover all the phases of the project life: design, construction, operation and maintenance. The ESMP combines both the environmental and social mitigation plan and the environmental and social management plan.

The purpose of the Environmental Management Plan (EMP) is to present a structured approach for optimising beneficial impacts on the one hand while mitigating adverse impacts on the other. It has been prepared to render practical guidance to implementation of the proposed project in an environmentally friendly and socially acceptable manner. The construction contractor will thus assist RDA in implementing mitigation measures contained in the EIS to ensure environmental protection. In this regard, the EMP that is based on the EMA (2011) and (EIA) Regulations of 1997 together with RDA's draft Involuntary Resettlement Policy (2003) underscores responsibilities for RDA, the construction contractor, supervising consultant, GRZ agencies, NGOs and the affected community in safeguarding the environment in and around the project area.

The measures taken will as a matter of principle seek to:

- Reduce the harmful characteristics of impact sources by devising less harmful ways of effecting project activities
- Localise project impacts as much as possible by taking precautions in effecting project activities
- Explore ways and means of enhancing the resilience and regenerative/recovery capacity of impacted elements of the environment, and
- Streamline Better Management Practices including Cleaner Production as an integral part of project implementation.

7.1 Impact Enhancement and Mitigation Plan

Table 7-1 presents a summary of proposed positive impact enhancement and mitigation measures for identified negative impacts associated with project implementation.

7.2 The Environmental and Social Management Plan

Monitoring of the project's environmental performance will be carried out as a routine part of project implementation to observe changes taking place in the environment and assess the

effectiveness of the interventions put in place. This would help the timely administering of corrective management interventions to avoid occurrence of serious negative effects. The plan, indicated in Table 7-2 below, specifies:-

- Environmental Aspect (What needs to be managed?)
- Environmental Management Objective (Why does it need to be managed?)
- Management Action (How should it be managed?)

Table 7-1: Impact Enhancement and Mitigation Plan

Identified Impact	Mitigation Measure	Enhancement Measure
Loss of vegetation	• Build construction camps on degraded land; • Restrict un-necessary clearing of vegetation to within the designated areas. Land clearing should be limited to absolutely required areas and progressive rehabilitation and re-vegetation of disturbed sites will be undertaken; • All large trees and vegetation within and around the project area will be maintained with as little disturbance as necessary • Promote tree planting and other conservation programs	
<u>Soil Erosion</u>	• Avoid unnecessary clearing of the vegetation; • Sides of the drainage systems will be planted with grass or stone pitched and silt traps shall be put along drainage systems and the spoon drains will have scour checks; • Limit use of heavy machinery to only designated areas • Haulage roads will be consolidated to minimise erosion	
<u>Loss of Biodiversity</u>	• Minimal destruction of habitat by avoiding land clearance of areas not necessarily needed for project development. • Land clearing should be limited to absolutely required areas and progressive rehabilitation and re-vegetation of disturbed sites should be undertaken	
<u>Impacts on ecologically sensitive areas (Wetlands, Dambos)</u>	• Physical disturbance to sensitive areas will be controlled by the Contractor who will instruct his workforce not to cut down wetland vegetation, unless it is essential for the construction/rehabilitation of swamp crossings. • RDA will ensure that the Contractor controls the amount of material that is required to be laid onto the crossings, and that this material is applied carefully, and immediately compacted. • Rehabilitation of the culverts and swamp crossings will be done during the dry season, wherever possible. • Sediment loads in the rivers and streams will also be reduced by incorporating erosion control measures. • RDA will ensure that the Contractor disposes of construction debris in a sensible manner and does not throw it into the swamps and rivers, or along the roadside. • No borrow pits, hard stone quarries or diversions to go through Protected Areas such as a National Park or Forest reserve	

Identified Impact	Mitigation Measure	Enhancement Measure
	During construction works in National Parks or Forest Reserves, the Contractor will be accompanied by ZAWA or Forest Officers to ensure conformity to the protected areas guidelines	
<u>Land Degradation</u>	- Prevention and minimisation of land disturbance and waste generation. - Rehabilitation of disturbed areas and localisation of waste to areas of generation and designated collection points - Minimal disturbance of land by limiting land clearance to absolutely required areas. - Construction will blend with the natural environment and landscaping will conform to scenic beauty of the project area	
<u>Soil Contamination</u>	- Apart from breakdowns, all service, repair and maintenance of construction equipment will be restricted to a dedicated service areas in the construction camp; - Ensure that petroleum products dispensing points shall have drip pans and bund walls; - Storage of petroleum pollutants such as fuel, oil and chemicals must be done on sealed surface and that waste oil shall be stored in drums for proper disposal; - All waste such as paper and solids shall be collected and disposed of in a designated dump site. - A spill contingency plan will be available and enforced	
<u>Water Contamination (Surface & Ground)</u>	- Bunding all open raw material storage areas to prevent washing away of stored materials; - Localizing all debris & other wastes & confining them in designated storage areas for appropriate disposal; - Containing all wastes and spilled material; - Cleaning up and remediation of all contaminated sites. - Proper management of fuels to prevent spillage and the potential to contaminate ground with the possibility of wash down to surface water bodies; - Washing of mobile equipment and machine parts should be done in designated wash bays equipped with impervious floors and containment. All drainage from wash bays should be passed through an oil trap prior to release into the site drainage network.	

Identified Impact	Mitigation Measure	Enhancement Measure
	• All used oils should be contained in drums; • Drainage systems from fuel storage facilities and other contaminating sources such as workshops will be isolated from storm water drains	
<u>Dust Nuisance</u>	• Wetting all haulage dust roads passing near settlements or commonly used by members of the public • Dampening all work areas with potential to generate dust when conducting excavations and other land preparation works • Providing a safe clearance area between settlements and work areas • Provision of PPE such as respirators to workers in dusty areas and enforcement of PPE usage. • Deviations close to schools and clinics should be avoided whenever it is possible, and • Careful handling of materials to minimize on dust generation e.g. by limiting speed limits on dust roads.	
<u>Creation of Borrow Pits, Quarry Mine & Access Routes</u>	• Minimize damage to surrounding area and turn large borrow pits and quarries into dams • Environmental factors such as land use, presence of vegetation and trees, water bodies, houses etc. shall be taken into consideration when selecting the haul road so as to avoid/minimize impact on the environment and people. • Any new burrow areas will be identified in consultation with the local community and shall be submitted to the Environmental Management Unit for approval. • Detours, access roads and equipment park site location shall be done in consultation with local people and shall take into account the existing land use in the settled areas	
<u>Waste Generation</u>	• The “3Rs” philosophy of reuse, recycle and reduce will be adopted. All solid waste generated in the project site should be segregated at source into organic/biodegradable, metal, plastic, cardboard, hazardous so that it can be recycled, reused or disposed of at identified dump site.	

Identified Impact	Mitigation Measure	Enhancement Measure
	Wastes should be segregated and safely contained in waste bins awaiting disposal or removal for reuse/recycling	
<u>Noise & Vibrations</u>	- Putting in place & implementation of an appropriate warning system for blasting operations; - Implementing an appropriate signage system to warn both workers & the public on noise and vibration hazards; - Limiting noisy operations to day time only - Compliance with issued noise & vibrations limits.	
<u>Fragmentations of Fish habitat</u>	- Avoid blockage of water ways through culverts and bridges, to allow up-stream migration of fish to spawning sites and reduce fragmentation of fish habitats. - Reduce erosion which may lead to sediment and nutrient delivery to streams and wetlands, which may result in adverse impacts to aquatic habitats and species (e.g., fish, their prey, and other species).	
<u>Impact on Wildlife</u>	- Minimal destruction of habitat by avoiding land clearance of areas not necessarily needed for project development <u>Control clearing activities</u> <u>Workforce to be instructed not to harm wildlife/poach and penalties to be imposed on</u>	
<u>Impact on Aquatic Wildlife</u>	- Land clearing will be limited to absolutely required areas and progressive rehabilitation and re-vegetation of disturbed sites will be undertaken; - Careful choice of service routes by selecting less vegetated areas and alignment of routes along existing passages such as roads to limit opening up of virgin land	
<u>Displacement of Residents</u>	- Minimize damage whenever possible and compensate owners in unavoidable situations - All properties to be disturbed (houses, shops, field etc.) should be compensated to ensure that livelihoods of affected parties are not worsened but restored to a state similar to the original state or better. - Affected parties should be engaged to reach consensus on applicable compensation.	
<u>Demolition of Property</u>	Minimize damage whenever possible and compensate owners in unavoidable situations	

Identified Impact	Mitigation Measure	Enhancement Measure
	All properties to be disturbed (houses, shops, field etc.) will be compensated to ensure that livelihoods of affected parties	
<u>Spread of HIV/AIDs & STIs</u>	- Development of a workplace HIV/AIDS policy and all workers will be sensitized on HIV/AIDS, its transmission, effects, prevention and management on an on-going basis and free condoms will be placed in toilets. - Contractor to outsource specialized services from hospitals/clinics in the area in order to provide early diagnosis and hence treatment when required	
<u>Influx of people into Project Area</u>	- During the construction, skilled personnel will add on to the population of the local community. There is also a possibility that the community will receive an influx of labourers looking for employment which will further add on to the local population. Adopt selective employment opportunities targeting locals as a measure <u>The local leaders will be made aware that the influx of people into the project area may raise security concerns; they should therefore plan to address the security situation.</u>	
<u>Loss of Land</u>	- Minimize damage whenever possible and compensate owners in unavoidable situations - All assets or resources which are sources of livelihood such as shops, tu tembas, and agricultural fields will be compensated fully to the affected people before implementation of the project. • Compensation to be paid for land and all property on land acquired for road construction works	
<u>Occupational Accidents</u>	- All workers must observe safety standards; - All workers to be provided with proper construction equipment • An emergency response plan should also be put in place to guide response and minimise effect in case of an emergency situation.	

Identified Impact	Mitigation Measure	Enhancement Measure
<u>Public Health & Safety</u>	• Restrict public access to operational areas by putting appropriate signage; • Construction of alternative roads where the usual roads have been blocked; • Provision of appropriate PPE; • Proper marking of boundaries for the operational areas and associated facilities • Restrict public access to operational areas by putting appropriate signage;	
<u>Employment Opportunities</u>		• Offer competitive salaries, wages and contract terms to contractors and suppliers of goods and services • Give preference to local people in employment • <u>Recruit local people, of which at least 25% should be women</u>
<u>Enhanced Economic Activity</u>		• Give preference to local suppliers of goods and services in contract offering
<u>Capacity Building & Skills development</u>		• Develop and implement a robust human resource development program • Local authorities will enhance training in self-help programmes in order to improve the quality of life of the local communities
<u>Infrastructure Development</u>		• Participate in social infrastructure development including construction of roads, bridges, schools and health facilities in partnership with the local community and other development agencies • Prioritise local contractors in issuing contracts for infrastructure development
<u>Biodiversity Conservation</u>		• Enhance Biodiversity Conservation through provision of proper road infrastructure which will enhance effective management of protected areas by easily accessing the areas

Table 7-2: Environmental and Social Management Plan

Anticipated Impact	Objective	<u>Mitigation Measure</u>	<u>Indicator to be Monitored</u>	<u>Timeframe</u>	<u>Responsibility</u>
Dust effects	To control/minimise the generation of dust from the movement of haul trucks and other heavy equipment on the haul roads	Potential high impact noise activities, such as blasting, will be carried out as per approved blasting schedule	<u>Dust sampling and Analysis</u>	24 months	<u>RDA</u>
Contamination of Water sources	To prevent contamination of water from oil leaks, diesel, erosion debris to nearby water bodies	- Bunding all open raw material storage areas to prevent washing away of stored materials - Localizing all debris & other wastes & confining them in designated storage areas for appropriate disposal	Wastewater sampling and physical-chemical analysis	Before start of project and after commissioning of project	<u>RDA</u>
Impact on ecologically sensitive areas	To minimise disturbance in Wetland areas, National Parks and Forest Reserves	- Physical disturbance to sensitive areas will be controlled by the Contractor who will instruct his workforce not to cut down wetland vegetation, unless it is essential for the construction/rehabilitation of swamp crossings. - No borrow pits, hard stone quarries or diversions to go through Protected Areas such as a National Park or Forest reserve	Presence & status of ecologically sensitive species	Before start of project and after commissioning of project	<u>RDA</u>
Sexually Transmitted	To minimize the coy and	Development of a workplace HIV/AIDS policy	<u>New infections;</u>	<u>All the time</u>	<u>RDA, District AIDS Task Force</u>

Diseases (HIV/AIDS, STIs)	community engaging in unsafe and socially unacceptable sexual relationships	and all workers will be sensitized on HIV/AIDS, its transmission, effects, prevention and management on an on-going basis and free condoms will be placed in toilets	Number of people using condoms		
Noise and vibrations	To prevent Noise and vibration negative impacts on health, safety, comfort and structures and also ensure that communities are protected from disturbing noise levels	• Putting in place & implementation of an appropriate warning system for blasting operations • Implementing an appropriate signage system to warn both workers & the public on noise and vibration hazards • Limiting noisy operations to day time only • Compliance with issued noise & vibrations limits	Signage system to warn both workers & the public on noise and vibration hazards	<u>During preparation and construction phases</u>	<u>RDA</u>
Soil contamination	To prevent contamination of soils through oil and fuel spills	• Apart from breakdowns, all service, repair and maintenance of construction equipment will be restricted to a dedicated service areas in the construction camp • Ensure that petroleum products dispensing points shall have drip pans and bund walls. • Storage of petroleum pollutants such as fuel, oil and chemicals must be done on sealed surface and that waste oil shall be stored in drums for proper disposal.	No chemical spillages or leaks in un designated areas	Before start of project and after commissioning of project	<u>RDA</u>

		All waste such as paper and solids shall be collected and disposed of in a designated dump site.			
Waste generation	To minimize and reduce generation and accumulation of all waste	To remove all waste and dump it at designated dump sites	Quantities generated and management	<u>Solid waste - weekly & Liquid waste - continuous</u>	RDA
Soil erosion	To minimise loss of top soil	- To prevent soil erosion and siltation of water sources due to soil erosion of nearby drains and culverts; the sides of the drainage systems shall be planted with grass or stone pitched and silt traps shall be put along drainage systems and the spoon drains shall have scour checks. - Limit use of heavy machinery to designated areas - Avoid unnecessary clearing of the vegetation - Rehabilitate heavily disturbed areas	<u>Rehabilitated areas.</u>	<u>During design and construction phases</u>	RDA
Loss of vegetation	To minimize impact on vegetation during construction To conserve flora biodiversity	- To avoid unnecessary cutting and removal of vegetation - Restrict vegetation clearance to designated areas - Prohibit cutting trees for deviation and access road construction, unless it cannot be avoided. - Reforestation	Area of forest cleared to accommodate road Works; out 200 - 300 trees to be replanted in the Project area		
Loss of wildlife and its habitat	To minimize impact on wildlife	Minimal destruction of habitat by avoiding land	<u>Clearing on designated Project works</u>	Before start of project and after	<u>RDA & DNPW</u>

	and its habitat so as to protect it	clearance of areas not necessarily needed for project development	<u>Sensitization campaigns provided to workers on wildlife conservation</u>	commissioning of project	
Borrow pits and quarries	To reduce impact of loss of land and vegetation caused by excavation for gravel and other soils used in construction Increase in malaria	- Minimize damage to surrounding area and turn large borrow pits and quarries into dams - Rehabilitation of borrow pits	<u>Number of new sites opened up</u> Pools of water reduced	<u>Construction phase</u> <u>After road commissioning</u>	RDA
Loss of land and other property	To minimize effect of loss of land and other property owned by local communities	Minimize damage whenever possible and compensate owners in unavoidable situations	<u>Number of people compensated and/or resettled</u>	<u>During design and construction phases</u>	<u>Department of Resettlement</u>
Displacement of residents	To minimize damage or loss as a result of destruction structures	Minimize damage whenever possible and compensate owners in unavoidable situations	<u>Number of people displaced and compensated</u>	<u>During design and construction phases</u>	<u>Department of Resettlement & RDA</u>
Fragmentation of aquatic habitats (fish)	To minimize impact on aquatic ecosystem	- Avoid blockage of water ways through culverts and bridges, to allow up-stream migration of fish to spawning sites and reduce fragmentation of fish habitats. - Reduce erosion which may lead to sediment and nutrient delivery to streams and wetlands, which may result in adverse impacts to aquatic habitats and species (e.g., fish, their prey, and other species).	<u>Wetland areas affected by road rehabilitation</u>	<u>Before project implementation and after project commissioning</u>	<u>RDA & Fisheries Department</u>

Disturbed landscape	Maintaining the natural beauty of the landscape	Construction will blend with the natural environment and landscaping will conform to scenic beauty of the project area	<u>Rehabilitated landscapes</u>	<u>During construction phase and after project commissioning</u>	<u>RDA</u>
Occupational accidents, Safety and Health	To minimize accidents to workers during construction; To provide a conducive environment workers and the public	- All workers must observe safety standards - All workers to be provided with proper construction equipment - Conduct STD/AIDS awareness campaign and distribute condoms - Provide potable water for workforce	Number of reported cases of injury and occupation related illnesses	<u>During preparatory and construction phases</u>	<u>RDA</u>
Road Traffic Safety	To avoid loss of human life	Install speed warning signs before schools, clinics and large human settlements and rumble strips at traffic black spots	None/only a few casualties recorded	<u>All the time</u>	<u>RDA</u>
Employment Opportunities	To create employment opportunities for the communities within the project area	- Offer competitive salaries, wages and contract terms to contractors and suppliers of goods and services - Give preference to local people in employment	Number and proportion of locals employed Local contracted to supply services & goods	<u>During preparation and construction phases</u>	<u>RDA</u>
Influx of people into project area	To reduce on population boom and unemployment levels	- During the construction, skilled personnel will add on to the population. There is also a possibility that the community will receive an influx of labourers looking for employment which will further add on to the local population. - Adopt selective employment opportunities targeting locals as a measure	<u>Number of outsiders of the Project Area who have being employed</u> <u>Number of sensitisation meetings</u>	<u>During preparation and construction phases</u>	<u>RDA, Local Authority, Traditional Leadership</u>

		Sensitise locals on dangers of early marriages and pre-marital sex			
Enhanced Economic Activity	To improve road infrastructure which will lead to improved access to markets and open up business opportunities& enhancing commercial activities	Give preference to local suppliers of goods and services in contract offering	Livelihoods status Number of local suppliers given contracts	After project commissioning	RDA

7.3 Cost of Implementation of ESMP

Costs of implementation of proposed mitigation measures and monitoring have been estimated and are presented in Table 7-3 below. These costs do not include costs catered for in the Engineer's Estimate, compensation costs or costs associated with the relocation of utilities.

Table 7-2: Estimated cost of implementing the ESMP

<u>Estimated cost of implementing the ESMP</u>	<u>Estimated Cost (ZMW)</u>		
	<u>During Construction</u>	<u>1st Year of operation</u>	<u>Project Life (20 years)</u>
<u>Included in Engineer's Estimate</u> • <u>Diversions</u> • <u>Surface water drainage including culverts, side drains, mitre drains, catch water drains, etc.</u> • <u>Rehabilitation of borrow pits/land acquired for temporary construction purposes</u> • <u>Ancillary works including signage, road markings, railings</u> • <u>Supervision services</u>	<u>To be determined</u>		
<u>Compensation Costs</u> • <u>Land, Crops and Property, Disturbance Allowance</u> • <u>Relocation of water pipes, electricity lines, telecommunication facilities</u> • <u>Monitoring costs</u>	<u>To be determined</u>		
<u>Environmental and Social Mitigation Costs</u> • <u>HIV/AIDS awareness campaign</u> • <u>Awareness campaign over impacts from influx from people into project area</u> • <u>Environmental& Wildlife Conservation awareness campaign</u> • <u>Reforestation</u>	<u>250,000</u> <u>100,000</u> <u>200,000</u> <u>100,000</u>		
<u>Environmental & Social Monitoring over the 20 year period</u>	<u>60,000</u>	<u>120,000</u>	<u>300,000</u>

8.0 DECOMMISSIONING AND REHABILITATION PLAN

The Decommissioning and Rehabilitation Plan (DRP) outlines the procedures for the closure, decommissioning, and rehabilitation of the road project area upon its completion, or in the event of early termination of the project. The plan is designed to ensure that all activities are conducted in a manner that minimizes environmental and social impacts, restores the environment to its natural or agreed-upon state, and complies with all relevant legal, regulatory, and contractual obligations.

8.1 Objectives of the Decommissioning and Rehabilitation Plan

- Restoration of the environment: Ensure that all disturbed areas are rehabilitated and returned to a stable, productive state that is compatible with the surrounding environment.
- Minimization of environmental impact: Mitigate any residual impacts from construction, operation, and maintenance activities that could have long-term negative effects on the environment.
- Compliance with legal and regulatory requirements: Ensure all rehabilitation activities comply with relevant national and local environmental regulations, standards, and guidelines.
- Sustainable land use: Promote sustainable land-use practices for the areas affected by the project, including soil stabilization, vegetation restoration, and water management.

8.2 Decommissioning Activities

Decommissioning refers to the process of discontinuing project activities and removing all infrastructure, equipment, and facilities that are no longer needed. The following decommissioning activities will be undertaken:

- Demolition and removal of infrastructure:
 - Dismantle and remove any temporary structures such as accommodation units, workshops, storage areas, and construction camps.
 - Remove any permanent structures that are not required for the post-construction period, including bridges, drainage structures, and roads that are no longer in use.
 - Dispose of any construction waste material in an environmentally appropriate manner (e.g., recycling, landfilling, etc.).
- Removal of machinery and equipment:

- Dismantle and remove all construction equipment and machinery used during the project.
- Ensure that any hazardous waste from equipment is appropriately disposed of, including oil, fuel, and chemicals.
- Removal of hazardous materials:
 - Safely dispose of any hazardous substances, including oils, solvents, and chemicals used in construction and maintenance activities.

8.3 Rehabilitation Activities

Rehabilitation refers to the process of restoring the affected environment to its natural state or a condition that allows for sustainable land use. The rehabilitation plan will include the following activities:

- Soil and vegetation restoration:
 - Replanting native vegetation to stabilize soils, prevent erosion, and enhance biodiversity.
 - Use appropriate techniques for seedling planting and soil conditioning to promote successful growth of vegetation.
 - Where possible, restore local habitats to support wildlife.
- Water management:
 - Stabilize and rehabilitate disturbed drainage systems, ensuring that water flow patterns are restored and erosion risks are minimized.
 - Install sedimentation basins or other water management structures where necessary to protect surrounding water bodies.
- Land contouring and stabilization:
 - Where significant earthworks or excavations have occurred, restore the land contours to a natural state or re-contour to prevent erosion.
 - Ensure proper grading and compaction of soil to prevent land degradation.
- Waste disposal and recycling:
 - Ensure that all waste generated during decommissioning is disposed of properly, and recyclable materials are separated for reuse or recycling.
 - Prevent contamination of land and water resources through proper disposal methods.

8.4 Monitoring During Decommissioning and Rehabilitation

Monitoring will be essential to ensure that rehabilitation activities are successful and that the environment is adequately restored. The following monitoring measures will be implemented:

- Site inspections: Conduct regular site inspections to ensure that decommissioning and rehabilitation activities are being carried out according to plan and environmental guidelines.
- Vegetation monitoring: Track the success of replanting efforts by monitoring plant growth and soil stability.
- Water quality monitoring: Check for any impacts on nearby water sources as a result of the decommissioning process.
- Erosion monitoring: Monitor for signs of erosion in rehabilitated areas, particularly where earthworks were conducted.
- Community consultation: Engage with local communities to ensure that their concerns regarding rehabilitation and land use are addressed.

8.5 Post-Closure Land Use

Once the rehabilitation process has been completed, the land will be made available for post-project use. The following considerations will be taken into account:

- Sustainable agricultural use: The rehabilitated land may be made available for sustainable agricultural use, including agroforestry or community-based farming activities.
- Conservation areas: Some areas may be restored to enhance local biodiversity and establish conservation or recreational areas.
- Alternative land use: Where appropriate, the rehabilitated land may be repurposed for other community uses, such as ecotourism, or returned to natural habitats.

8.6 Decommissioning and Rehabilitation Schedule

The following schedule outlines the decommissioning and rehabilitation phases:

TABLE 8-1: DECOMMISSIONING AND REHABILITATION SCHEDULE

Activity	Time Frame
Demolition and removal of structures	Final month of project construction phase
Removal of machinery and equipment	Final month of project construction phase
Restoration of soil and vegetation	During and after decommissioning phase

Water management and land stabilization	During and after decommissioning phase
Waste disposal and recycling	Throughout the decommissioning phase
Monitoring and inspections	Ongoing during decommissioning and rehabilitation phases

9.0 CONCLUSION

The Solwezi to Kipushi (D271) via Mushindamo road project would benefit the population in the project area by having an improved road network which will reduce time of travel and hence cost of travel, it will also improve and address road safety issues. The project will also help the country's economy as the road will also be used to access Kipushi town in the Democratic Republic of the Congo (DRC) via the border at Kalindi. The planned rehabilitation of the road is of importance to the GRZ as part of promoting trade through regional integration. The road will also facilitate market integration of the project area's zone of influence with the rest of the country and Congo DR for export produce of agricultural products and contribute to the goal of improving the efficiency and capacity of the transport system to support economic growth and social development.

There would be increased hazards related to the road like increased accident occurrences due to increased traffic, high population growth leading to increased demand for land and its resources, high prevalence rate of STI/HIV/AIDS. Maintenance of the road and monitoring of key impacts will be important to ensure control of adverse impacts during operation. ZEMA and Borderway Investments working together with the RDA Environmental Unit will have a key role in compliance monitoring of the project. The project therefore is very important and with necessary positive outcomes which outweigh the negative impacts.

10. LARATION OF AUTHENTICITY

Borderway Investments Limited declares that this report is the corporation's original work, prepared for the purposes and objectives of the proposed project, and affirms that the contents of the report are authentic.

DESIGNATION: Chief Executive Officer

NAME:.....

SIGN:

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APPENDICES

Appendix 1 Minutes of Scoping Meetings

MINUTES OF THE SCOPE MEETING FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) STUDY FOR THE PROPOSED SOLWEZI TO KIPUSHI ROAD PROJECT MUSHINDAMO MEETING 18th SEPTEMBER 2025

PRESENT

Albert L Mutale	-	Environmental Specialist-BCHOD Consulting
Mr James Zulu	-	Environmentalist – BCHOD Consulting
Mr Bwalya Emmanuel		Socio-Economist – Freelance Expert
Mr Andrew Kalangwa	-	District Commissioner (Mushindamo)
Stakeholders	-	Mushindamo Town Council (community representatives), District Commissioner (Mushindamo), DPO, CDO, DoE, EPO, Dept of Forestry, MOH and interested and affected parties)

(See annex 1 for attendance register)

AGENDA

1. Opening Remarks (project overview)
2. Introduction
3. EIA Baseline Survey Presentation
4. Socio-economic Baseline and Impact presentation
5. EIA Procedure Presentation
6. Discussions / Contributions / Comments / Questions
7. Closing Remarks
8. Interaction (snacks and drinks to be served)

(See annex 2 for meeting agenda)

The meeting was called to order by the District Commissioner at 14:40hrs. He began by introducing the team to the audience and thanked them for being in attendance.

OPENING REMARKS

Mr A Kalangwa in his remarks provided a brief background of the proposed Solwezi to Kipushi Road Project and stated that it was important for the development of the district of Mushindamo and creating access to the Democratic Republic of the Congo (DRC) through this part of the country. He referred to an earlier missions made by Border Way the project proponent on the same project after initial investigations carried out in 2019. He explained that this process had the full blessings of the Government of the Republic of Zambia from the highest office in the land that of the Republican President. He called on those present to take keen interest in the expectations of stakeholders in the district, particularly as it related to the proposed route. This is considering that Mushindamo as a district would benefit more from the route whose start point was at Shafilundu Primary School, located approximately five (5) Kilometers west of Mushindamo Central Business District (CBD). Further, he highlighted the importance of following this route, as it had the potential of opening up the district particularly the southern parts of the district in Chief Mujimanzovus area. These developments, he indicated would introduce new dynamics to the environmental and socio-economic profile of the district. Therefore, he called upon the officers present to provide information that would help feed into the environmental assessment process.

Mr Mutale, the Environmental Specialist reiterated the overall objective of the Solwezi to Kipushi Road project as to have a good road linking Zambia to the Democratic Republic of the Congo (DRC) and to reduce the amount of time spent at the border, particularly with the congestion currently obtaining at Kasumbalesa Border Post in Chililabombwe district on the Copperbelt Province. He concluded his opening remarks by highlighting the purpose of the meeting as a scoping exercise vital to the ESIA process.

1st PRESENTATION (Environmental Baseline Survey) – Albert Mutale

The environmentalist gave a rundown of the baseline parameters that were being considered during the survey along the proposed alignments as follows:

- Geology
- Hydrogeology
- Hydrology
- topography
- Flora and fauna

- Climatology
- Soils
- Air quality
- Noise level

He began by describing the parameters that apply to the road between Solwezi to Kipushi such as climate, hydrology, hydrogeology and geology. He highlighted the following:

➤ **Bio-physical Conditions**

For climate and topography, he mentioned that the bio-physical conditions of Solwezi and the wider region were typical of the northern regions of Zambia, as the project area fell under Agro-ecological Region III , though there were some variations in conditions, but indicated that there were some critical resources to the proposed road project, such as the following;

- Forest resources, such as presence of protected forests
- Sources of water for the district, that included the Kifubwa, Wenge and Kafue Rivers
- No wildlife and availability of game sanctuaries was reported in the area

Also highlighted as important under these conditions were the climatic factors, and how these were likely to impact the project, particularly the high rainfall and its effect on run off.

➤ **Socio-Economic Conditions**

Under socio-economic conditions, an emphasis was made of the importance of a social impact assessment of the proposed Solwezi to Kipushi Road Project to ensure an accurate account of all social imperatives pertaining to the proposed project. Among the issues highlighted as critical were the following:

- People's livelihoods along the road corridor
- Culture
- Land tenure system
- Communities and how they are affected by the project activities
- Project activities that may result due to the project

- Spinoffs from the project

After the brief presentation by the environmental specialist, the attendees were called upon to make their views over the issues highlighted. Considering that the meeting was aimed at generating primary information for the ESIS, there was need for the stakeholders present to share their information through reports and profiles generated as part of baseline assessments.

Mr. Ricky Siamatu, the Director of Engineering Services proceeded by providing a brief on Mushindamo district, its spatial extent, especially the eastern boundary, where it borders with Solwezi district. He identified Kifubwa Ward as the only part of the road corridor falling under Solwezi, while the rest of the wards were in Mushindamo. He described the route proposed for linking Kipushi starting at Shafilundu Primary School as critical to the local authority and the district as whole, in that it would open up settlements located along this stretch and that it would be shorter in distance by close to forty-five (45) kilometers compared to the other route starting in Solwezi.

He identified important chiefdoms in Mushindamo as Chiefs Mulonga, Chikola and Musaka. These three chiefs would be important when seeking consent for access to construction material along the project stretch.

Secondly, he informed the meeting that a strategic plan was in the process of being formulated, hence there was vast information being generated, most of which would be useful to the preparation of the ESIA. Thereafter, he called on the other unit heads to provide information on community development, environment planning and socio-economic development.

The District Planning Officer, Mr Pius Chifumpa in his submission echoed the issues raised by the other participants regarding environmental resources in the district. He cited indiscriminate harvest of forest resources as a concern, and that this was evident in all the five forests found along the Solwezi to Kipushi Road. He singled out the Forest in Mulonga Chiefdom where encroachment was heavy. Further, he described some of the key socio-economic sectors in the district, such as trade, services and agriculture, and these were poised for growth once connectivity to markets was improved, a spinoff from the road construction project.

The District Water Development Officer, Ms Tukiya Nshimbi provided a brief on water and other environmental resources of the district, identifying some villages along the road proposed for

upgrading as those affected in terms of access to potable water. She assured the meeting that the district had adequate surface water bodies in the Kafue and Wenge rivers located towards Kipushi and that these were perennial in character.

In concluding, Mr. Mutale informed the meeting of the EIA process that would be followed, it highlighted the following steps

:

- Preparation of ToRs
- Submission of Draft ToRs to ZEMA
- Submission of Final ToRs to ZEMA (if need be)
- Submission of Draft EIS (upon approval of ToRs)
- Submission of final EIS (if need be)
- Project inspection
- Decision letter

QUESTION AND ANSWER TIME

Question from District Forestry Officer on Management of Borrow Pits

The District Forestry Officer sought clarification on the provisions of the Environmental Management Act, as regards reinstatement of areas with borrow pits, since there was a growing trend of contractors abandoning the pits. This had become a hazard to members of the communities especially children, some of whom had drowned and resulted in loss of life.

Answer

The Environmental Specialist provided a brief on the management of borrow pits and quarries in road projects as provided for in construction contracts. He indicated that it was a requirement that sites where construction material was mined were fully reinstated to original state. Furthermore, he advised the local authority through the directorates of works and environment to strengthen their monitoring role over contractors as provided for in the ESMP, if the trend was to be reversed.

Question from District Social Welfare Officer

The District Social Welfare Officer, Ms Mujiga Kasapatu wanted to know what plans were in place to address issues of HIV/AIDS that would arise as a result of the road construction project, this is

considering there would be an influx of people moving to the villages close to the project stretch during construction works.

Answer

In response, the Environmentalist, Mr James Zulu pointed to the provisions of the Environmental Impact Assessment Regulations (SI 28 of 1997), where the Contractor is expected to employ people from the local community as much as possible, as a direct way of mitigating against the effects HIV/AIDS. Furthermore, he added that the Contractor's Environment and Social Management Plan (C-ESMP) would provide for the engagement of an HIV/AIDS specialist who would work with the District Aids Coordinating Advisor (DACA) to handle such matters

Question from the Labour Officer

The District Labour Officer, Mr Mwangala Mumbela wanted to know the role the plans the Contractor would put in place to ensure the local population benefitted from the project in terms of jobs and business opportunities.

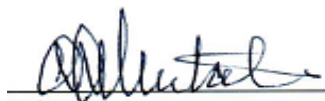
Answer

Mr Mutale referred the officer to the ESIA report which would normally identify job creation and business opportunities for local communities as positive impacts of the project. These impacts would be further enhanced by working in collaboration with the local leadership comprising both traditional and civic leadership in identifying youths to be engaged by the project. He added that this would promote skills transfer for the beneficiaries.

CLOSING REMARKS.

In his closing remarks, the District Commissioner thanked all in attendance for coming to the meeting and for the valid inputs they had made to the process and assured them that consultation would continue. This was more so that the local authority were an authorizing agent for the ESIA process, so their views would be considered critical. The meeting ended at 16:15hrs.

Name: **Albert L Mutale** Date 18th September 2025 Sign



**MINUTES OF THE SCOPE MEETING FOR THE ENVIRONMENTAL AND SOCIAL IMPACT
ASSESSMENT (ESIA) STUDY FOR THE PROPOSED SOLWEZI TO KIPUSHI ROAD
PROJECT SOLWEZI MEETING 18th SEPTEMBER 2025**

PRESENT

Albert L Mutale	-	Environmental Specialist-BCHOD Consulting
Mr James Zulu	-	Environmentalist – BCHOD Consulting
Mr Bwalya Emmanuel		Socio-Economist – Freelance Expert
Stakeholders	-	Solwezi Municipal Coun Council (community representatives, Council Secretary, DPO, CDO, DoE, EPO, Dept of Forestry, MOH and interested and affected parties)

(See annex 1 for attendance register)

AGENDA

9. Opening Remarks (project overview)
10. Introduction
11. EIA Baseline Survey Presentation
12. Socio-economic Baseline and Impact presentation
13. EIA Procedure Presentation
14. Discussions / Contributions / Comments / Questions
15. Closing Remarks
16. Interaction (snacks and drinks to be served)

(See annex 2 for meeting agenda)

The meeting was called to order by the District Planning Officer for Solwezi Municipal Council at 10:23hrs.

OPENING REMARKS

Mr Mutale in his remarks provided a brief background of the Solwezi to Kipushi Road Project and stated that it was important for the development of equal and accessible transport in this part of

the country. He provided a brief on the proposed Public-Private Partnership Model proposed for the project, highlighting some of its benefits. He referred to an earlier visit made by Borderway, the project proponents to the area, to underscore the importance the Government of the Republic of Zambia (GRZ) attached to the project. Furthermore, he indicated that the ESIS that would be produced on the project after an assessment would involve broad based consultations. He highlighted the importance of capturing information reflecting the current situation, especially that the proposed road alignment cut across vast areas of forests, water bodies, public infrastructure and communities. These developments, he pointed out could have had the potential of introducing impacts on the environmental and socio-economic resources of the area. Therefore, he called upon the officers present to provide information that would help feed into the environmental assessment process.

Mr Mutale reiterated the overall objective of the Solwezi to Kipushi Road project as to have a good road linking Solwezi to Kipushi, an important connection to the vast market of the Democratic Republic of the Congo (DRC). Furthermore, he indicated that this also meant that service provision along the road corridor would improve and that this would reduce the amount of time spent on the road by users. He concluded his opening remarks by highlighting the purpose of the meeting as a scoping exercise vital to the ESIA process.

1st PRESENTATION (Environmental Baseline Survey) – Albert Mutale

The environmentalist gave a rundown of the baseline parameters that were being considered during the survey along the proposed alignments as follows:

- Geology
- Hydrogeology
- Hydrology
- topography
- Flora and fauna
- Climatology
- Soils
- Air quality
- Noise level

He began by describing the environmental and social aspects of importance that applied to the road between Solwezi and Kipushi such as climate, hydrology, hydrogeology and geology. He highlighted the following:

➤ **Bio-physical Conditions**

For climate and topography, he mentioned that the bio-physical conditions of Solwezi and the wider region were typical of the northern regions of Zambia, as the project area fell under Agro-ecological Region III, though there were some variations in conditions, but indicated that there were some critical resources to the proposed road project, such as the following;

- Forest resources, such as presence of protected forests
- Sources of water for the district, that included the Kifubwa, Wenge and Kafue Rivers
- No wildlife and availability of game sanctuaries was reported in the area

Also highlighted as important under these conditions were the climatic factors, and how these were likely to impact the project, particularly the high rainfall and its effect on run off.

➤ **Socio-Economic Conditions**

Under socio-economic conditions, an emphasis was made of the importance of a social impact assessment of the proposed Solwezi to Kipushi Road Project to ensure an accurate account of all social imperatives pertaining to the proposed project. Among the issues highlighted as critical were the following:

- People's livelihoods along the road corridor
- Culture
- Land tenure system
- Communities and how they are affected by the project activities
- Project activities that may result due to the project
- Spinoffs from the project

After the brief presentation by the environmental specialist, the attendees were called upon to make their views over the issues highlighted. Considering that the meeting was aimed at

generating primary information for the ESIS, there was need for the stakeholders present to share their information through reports and profiles generated as part of baseline assessments.

Mr. David Kalumba, the Deputy District Planning Officer proceeded by providing a brief on Solwezi district, its spatial extent, especially the eastern boundary, where the Solwezi to Kipushi road passes. He Kifubwa Ward as the district boundary with Mushindamo, from where the road goes other wards before terminating at Kipushi Border Post where the boundary between Zambia and the Democratic Republic of the Congo (DRC) was located. He described the road corridor as one rich in agriculture, and forest reserves, five in number. The road corridor was described as one devoid of any wildlife and that no designated protected zones were there. In terms of water resources, he said the road corridor had a number of water bodies and that some of these were intersected by the project road, these included the Kifubwa, Kafue and Wenge all these were perennial. Groundwater was also a major resource on which communities depended for their domestic use. He described the forests along the road corridor as important resources as they attention provided protection for the upper Kafue River catchment, an important resource to Zambia. He assured the meeting that the local authority would be on hand to support the process of environmental assessment.

Secondly, he informed the meeting that a strategic plan was in the process of being formulated, hence there was vast information being generated, most of which would be useful to the preparation of the ESIA. Thereafter, he called on the other unit heads to provide information on community development, environment planning and socio-economic development.

The District Forestry Officer in his submission echoed the issues raised by the Planning Officer regarding environmental resources in the district. He cited indiscriminate harvest of forest resources as a concern, and that this was evident in the Chikola Forest, where encroachment on the resource was pronounced. He confirmed to the meeting that the predominant species in these forests were the Miombo genre and that these were of varying canopy levels. Further, he described some of the initiatives the Forest Department had embarked on to protect the resources.

The Environmental Planner, Ms Hellen Lukomona provided a brief on water and other environmental resources of the district, identifying some villages along the road proposed for upgrading as those affected. However, for purposes of construction water she identified the

Kifubwa and the Kafue as two important water bodies along the project stretch, these would be potential sources for both construction purposes and use for domestic purposes and that these would be adequate, particularly during the period the road goes through the area. she identified the forest resources considered critical as that in the section proposed for re-alignment, where she felt that the resource would be conserved if the contractor restricted clearing and grabbing to the actual road alignment. She concluded by assuring the meeting that the local authority would be fully involved in the supervision of borrow pit identification and reinstatement.

The Environmental Specialist, Mr. Mutale presented to the meeting on the process to be followed ESIA, it highlighted the following steps

:

- Preparation of ToRs
- Submission of Draft ToRs to ZEMA
- Submission of Final ToRs to ZEMA (if need be)
- Submission of Draft EIS (upon approval of ToRs)
- Submission of final EIS (if need be)
- Project inspection
- Decision letter

QUESTION AND ANSWER TIME

Question from Environmental Planner on management of borrow pits

The Environmental Planner sought clarification on the provisions of the Environmental Management Act, as regards reinstatement of areas with borrow pits, since there was a growing trend of contractors abandoning the pits. This had become a hazard to members of the communities especially children, some of whom had drowned and resulted in loss of life.

Answer

The Environmental Specialist provided a brief on the management of borrow pits and quarries on road projects as provided for in construction contracts. He indicated that it was a requirement that sites where construction material was mined were fully reinstated to original state once extraction had been exhausted. Furthermore, he advised the local authority through the directorates of Engineering and Environment/Public Health to take keen interest in the operation of borrow pits

and quarries, highlighting the importance of strengthening their monitoring role over contractors as provided for in the ESMP, if the trend was to be reversed.

Question from socio-economic planner

The Socio-economic Planner wanted to know what plans were in place to address issues to HIV/AIDS considering there would be an influx of workers coming from outside the area, moving to the villages during construction works.

Answer

In response, the Environmentalist pointed to the provisions of the Environmental Impact Assessment Regulations (SI 28 of 1997), where the Contractor is expected to employ people from the local community as much as possible, as a direct way of mitigating against the effects. Furthermore, the C-ESMP would provide for the engagement of an HIV/AIDS specialist to handle such matters, who would work closely with the District Aids Coordinating Advisor (DACA).

The DACA, who was present in the meeting reinforced this position indicating the interventions the district had embarked on to mitigate the effects of the AIDS pandemic.

Question from the Kifubwa Ward Development Committee Member

The WDC representative wanted to know the benefits the road construction project would bring to the local communities along the road construction stretch

Answer

Mr Mutale, the Environmental Specialist referred the WDC representative to the provisions of the EIA Regulations, which identified the local authorities as key authorizing agents in the ESIA approval process, where they would need to guide the ZEMA in arriving at a decision. Therefore, he advised that consultation on the proposed project would be continuous, where the WDC would be expected to play a role, and that he expected more collaboration, particularly in supervising the Contractor's borrow pits operations. Other benefits identified were employment for the local community, particularly the youth and female workers, highlighting that this would contribute to improved socio-economic conditions during the various phases of the project

Question from the Area Councillor for Kifubwa Ward

The Area Councillor, Ms wanted the Scoping Investigating Team to give a clear road map of the proposed road construction works, particularly that the rainy season was within two months, and how these would affect the works.

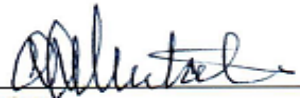
Answer

In response, the Environmental Specialist provided the key steps leading to the commencement of works, identifying linked tasks like approvals by regulatory bodies like ZEMA, WARMA and NCC before actual construction would begin. He assured the meeting that the process had already begun, as evidenced by the meeting they were attending, therefore, he assured her that some civil works could take place during the wet months (December, January, February and March) mainly construction of culverts and bridges.

CLOSING REMARKS.

In his closing remarks, Mr Mutale thanked all in attendance for coming to the meeting and for the valid inputs they had made to the process and assured them that consultation would continue. This was more so that the local authority were an authorizing agent for the ESIA process, so their views would be considered critical. The meeting ended at 12:15hrs.

Name: **Albert L Mutale** Date 18th September 2025 Sign



**MINUTES OF THE SCOPE MEETING FOR THE ENVIRONMENTAL AND SOCIAL IMPACT
ASSESSMENT (ESIA) STUDY FOR THE PROPOSED SOLWEZI TO KIPUSHI ROAD
PROJECT SOLWEZI MEETING 18th SEPTEMBER 2025**

PRESENT

Albert L Mutale	-	Environmental Specialist-BCHOD Consulting
Mr James Zulu	-	Environmentalist – BCHOD Consulting
Mr Bwalya Emmanuel		Socio-Economist – Freelance Expert
Stakeholders	-	Solwezi Municipal Coun Council (community representatives, Council Secretary, DPO, CDO, DoE, EPO, Dept of Forestry, MOH and interested and affected parties)

(See annex 1 for attendance register)

AGENDA

17. Opening Remarks (project overview)
18. Introduction
19. EIA Baseline Survey Presentation
20. Socio-economic Baseline and Impact presentation
21. EIA Procedure Presentation
22. Discussions / Contributions / Comments / Questions
23. Closing Remarks
24. Interaction (snacks and drinks to be served)

(See annex 2 for meeting agenda)

The meeting was called to order by the District Planning Officer for Solwezi Municipal Council at 10:23hrs.

OPENING REMARKS

Mr Mutale in his remarks provided a brief background of the Solwezi to Kipushi Road Project and stated that it was important for the development of equal and accessible transport in this part of

the country. He provided a brief on the proposed Public-Private Partnership Model proposed for the project, highlighting some of its benefits. He referred to an earlier visit made by Borderway, the project proponents to the area, to underscore the importance the Government of the Republic of Zambia (GRZ) attached to the project. Furthermore, he indicated that the ESIS that would be produced on the project after an assessment would involve broad based consultations. He highlighted the importance of capturing information reflecting the current situation, especially that the proposed road alignment cut across vast areas of forests, water bodies, public infrastructure and communities. These developments, he pointed out could have had the potential of introducing impacts on the environmental and socio-economic resources of the area. Therefore, he called upon the officers present to provide information that would help feed into the environmental assessment process.

Mr Mutale reiterated the overall objective of the Solwezi to Kipushi Road project as to have a good road linking Solwezi to Kipushi, an important connection to the vast market of the Democratic Republic of the Congo (DRC). Furthermore, he indicated that this also meant that service provision along the road corridor would improve and that this would reduce the amount of time spent on the road by users. He concluded his opening remarks by highlighting the purpose of the meeting as a scoping exercise vital to the ESIA process.

1st PRESENTATION (Environmental Baseline Survey) – Albert Mutale

The environmentalist gave a rundown of the baseline parameters that were being considered during the survey along the proposed alignments as follows:

- Geology
- Hydrogeology
- Hydrology
- topography
- Flora and fauna
- Climatology
- Soils
- Air quality
- Noise level

He began by describing the environmental and social aspects of importance that applied to the road between Solwezi and Kipushi such as climate, hydrology, hydrogeology and geology. He highlighted the following:

➤ **Bio-physical Conditions**

For climate and topography, he mentioned that the bio-physical conditions of Solwezi and the wider region were typical of the northern regions of Zambia, as the project area fell under Agro-ecological Region III, though there were some variations in conditions, but indicated that there were some critical resources to the proposed road project, such as the following;

- Forest resources, such as presence of protected forests
- Sources of water for the district, that included the Kifubwa, Wenge and Kafue Rivers
- No wildlife and availability of game sanctuaries was reported in the area

Also highlighted as important under these conditions were the climatic factors, and how these were likely to impact the project, particularly the high rainfall and its effect on run off.

➤ **Socio-Economic Conditions**

Under socio-economic conditions, an emphasis was made of the importance of a social impact assessment of the proposed Solwezi to Kipushi Road Project to ensure an accurate account of all social imperatives pertaining to the proposed project. Among the issues highlighted as critical were the following:

- People's livelihoods along the road corridor
- Culture
- Land tenure system
- Communities and how they are affected by the project activities
- Project activities that may result due to the project
- Spinoffs from the project

After the brief presentation by the environmental specialist, the attendees were called upon to make their views over the issues highlighted. Considering that the meeting was aimed at

generating primary information for the ESIS, there was need for the stakeholders present to share their information through reports and profiles generated as part of baseline assessments.

Mr. David Kalumba, the Deputy District Planning Officer proceeded by providing a brief on Solwezi district, its spatial extent, especially the eastern boundary, where the Solwezi to Kipushi road passes. He Kifubwa Ward as the district boundary with Mushindamo, from where the road goes other wards before terminating at Kipushi Border Post where the boundary between Zambia and the Democratic Republic of the Congo (DRC) was located. He described the road corridor as one rich in agriculture, and forest reserves, five in number. The road corridor was described as one devoid of any wildlife and that no designated protected zones were there. In terms of water resources, he said the road corridor had a number of water bodies and that some of these were intersected by the project road, these included the Kifubwa, Kafue and Wenge all these were perennial. Groundwater was also a major resource on which communities depended for their domestic use. He described the forests along the road corridor as important resources as they attention provided protection for the upper Kafue River catchment, an important resource to Zambia. He assured the meeting that the local authority would be on hand to support the process of environmental assessment.

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The District Forestry Officer in his submission echoed the issues raised by the Planning Officer regarding environmental resources in the district. He cited indiscriminate harvest of forest resources as a concern, and that this was evident in the Chikola Forest, where encroachment on the resource was pronounced. He confirmed to the meeting that the predominant species in these forests were the Miombo genre and that these were of varying canopy levels. Further, he described some of the initiatives the Forest Department had embarked on to protect the resources.

The Environmental Planner, Ms Hellen Lukomona provided a brief on water and other environmental resources of the district, identifying some villages along the road proposed for upgrading as those affected. However, for purposes of construction water she identified the

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The Environmental Specialist, Mr. Mutale presented to the meeting on the process to be followed ESIA, it highlighted the following steps

:

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- Project inspection
- Decision letter

QUESTION AND ANSWER TIME

Question from Environmental Planner on management of borrow pits

The Environmental Planner sought clarification on the provisions of the Environmental Management Act, as regards reinstatement of areas with borrow pits, since there was a growing trend of contractors abandoning the pits. This had become a hazard to members of the communities especially children, some of whom had drowned and resulted in loss of life.

Answer

The Environmental Specialist provided a brief on the management of borrow pits and quarries on road projects as provided for in construction contracts. He indicated that it was a requirement that sites where construction material was mined were fully reinstated to original state once extraction had been exhausted. Furthermore, he advised the local authority through the directorates of Engineering and Environment/Public Health to take keen interest in the operation of borrow pits

and quarries, highlighting the importance of strengthening their monitoring role over contractors as provided for in the ESMP, if the trend was to be reversed.

Question from socio-economic planner

The Socio-economic Planner wanted to know what plans were in place to address issues to HIV/AIDS considering there would be an influx of workers coming from outside the area, moving to the villages during construction works.

Answer

In response, the Environmentalist pointed to the provisions of the Environmental Impact Assessment Regulations (SI 28 of 1997), where the Contractor is expected to employ people from the local community as much as possible, as a direct way of mitigating against the effects. Furthermore, the C-ESMP would provide for the engagement of an HIV/AIDS specialist to handle such matters, who would work closely with the District Aids Coordinating Advisor (DACA).

The DACA, who was present in the meeting reinforced this position indicating the interventions the district had embarked on to mitigate the effects of the AIDS pandemic.

Question from the Kifubwa Ward Development Committee Member

The WDC representative wanted to know the benefits the road construction project would bring to the local communities along the road construction stretch

Answer

Mr Mutale, the Environmental Specialist referred the WDC representative to the provisions of the EIA Regulations, which identified the local authorities as key authorizing agents in the ESIA approval process, where they would need to guide the ZEMA in arriving at a decision. Therefore, he advised that consultation on the proposed project would be continuous, where the WDC would be expected to play a role, and that he expected more collaboration, particularly in supervising the Contractor's borrow pits operations. Other benefits identified were employment for the local community, particularly the youth and female workers, highlighting that this would contribute to improved socio-economic conditions during the various phases of the project

Question from the Area Councillor for Kifubwa Ward

The Area Councillor, Ms wanted the Scoping Investigating Team to give a clear road map of the proposed road construction works, particularly that the rainy season was within two months, and how these would affect the works.

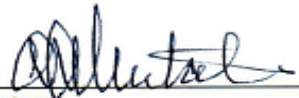
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CLOSING REMARKS.

In his closing remarks, Mr Mutale thanked all in attendance for coming to the meeting and for the valid inputs they had made to the process and assured them that consultation would continue. This was more so that the local authority were an authorizing agent for the ESIA process, so their views would be considered critical. The meeting ended at 12:15hrs.

Name: **Albert L Mutale** Date 18th September 2025 Sign

A handwritten signature in blue ink, appearing to read 'Albert L Mutale', written over a horizontal line.

**MINUTES OF THE SCOPING MEETING FOR THE ENVIRONMENTAL AND SOCIAL IMPACT
ASSESSMENT (ESIA) STUDY FOR THE PROPOSED SOLWEZI KIPUSHI ROAD PROJECT
AT KIPUSHI BORDER POST MEETING 19th SEPTEMBER 2025**

PRESENT

Albert L Mutale - Environmental Specialist-BCHOD Consulting

Mr James Zulu - Environmentalist – BCHOD Consulting

Mr Bwalya Emmanuel Socio-Economist – Freelance Expert

Stakeholders - Kipushi Border Post (Immigration Department, Zambia Revenue
Authority, Cross Border Market Association representatives

(See annex 1 for attendance register)

AGENDA

25. Opening Remarks (project overview)

26. Introduction

27. EIA Baseline Survey Presentation

28. Socio-economic Baseline and Impact presentation

29. EIA Procedure Presentation

30. Discussions / Contributions / Comments / Questions

31. Closing Remarks

32. Interaction (snacks and drinks to be served)

(See annex 2 for meeting agenda)

The meeting was called to order by the Environmental Specialist, at 16:30hrs. He began by introducing the team to the audience and thanked them for being in attendance.

OPENING REMARKS

Mr Mutale in his remarks provided a brief background of the Solwezi to Kipushi Road Project and stated that it was important for the development of equal and accessible transport in this part of the country. He provided a brief on the proposed Public-Private Partnership Model proposed for

the project, highlighting some of its benefits. He referred to an earlier visit made by Borderway, the project proponents to the area, to underscore the importance the Government of the Republic of Zambia (GRZ) attached to the project. Furthermore, he indicated that the ESIS that would be produced on the project after an assessment would involve broad based consultations. He highlighted the importance of capturing information reflecting the current situation, especially that the proposed road alignment cut across vast areas of forests, water bodies, public infrastructure and communities. These developments, he pointed out could have had the potential of introducing impacts on the environmental and socio-economic resources of the area. Therefore, he called upon the officers present to provide information that would help feed into the environmental assessment process.

Mr Mutale reiterated the overall objective of the Solwezi to Kipushi Road project as to have a good road linking Solwezi to Kipushi, an important connection to the vast market of the Democratic Republic of the Congo (DRC). This also meant that service provision along the road corridor would improve and that this would reduce the amount of time spent on the road by users. He concluded his opening remarks by highlighting the purpose of the meeting as a scoping exercise vital to the ESIA process.

1st PRESENTATION (Environmental Baseline Survey) – Albert Mutale

The environmentalist gave a rundown of the baseline parameters that were being considered during the survey along the proposed alignments as follows:

- Geology
- Hydrogeology
- Hydrology
- topography
- Flora and fauna
- Climatology
- Soils
- Air quality
- Noise level

He began by describing the environmental and social aspects of importance that applied to the road between Solwezi and Kipushi such as climate, hydrology, hydrogeology and geology. He highlighted the following:

➤ **Bio-physical Conditions**

For climate and topography, he mentioned that the bio-physical conditions of Solwezi and the wider region were typical of the northern regions of Zambia, as the project area fell under Agro-ecological Region III, though there were some variations in conditions, but indicated that there were some critical resources to the proposed road project, such as the following;

- Forest resources, such as presence of protected forests
- Sources of water for the district, that included the Kifubwa, Wenge and Kafue Rivers
- No wildlife and availability of game sanctuaries in the area

Also highlighted as important under these conditions were the climatic factors, and how these were likely to impact the project, particularly the high rainfall and its effect on run off.

➤ **Socio-Economic Conditions**

Under socio-economic conditions, an emphasis was made of the importance of a social impact assessment of the proposed Solwezi to Kipushi Road Project to ensure an accurate account of all social imperatives pertaining to the proposed project. Among the issues highlighted as critical were the following:

- People's livelihoods along the road corridor
- Culture
- Land tenure system
- Communities and how they are affected by the project activities
- Project activities that may result due to the project
- Spinoffs from the project

After the brief presentation by the environmentalist, the attendees were called upon to make their views over the issues highlighted. Considering that the meeting was aimed at generating primary

information for the ESIS, there was need for the stakeholders present to share their information through reports and profiles generated as part of baseline assessments.

The Immigration Officer, Zambia Immigration Department, Kipushi Border Post proceeded by providing a brief on the operations of the department at the border, especially as it related to movement of people on either side of the border, and cargo. He highlighted that operations of the border were driven by movement of cargo mainly mine related from Tanzania and the south, while some traffic was from within Zambia, predominantly fuel supplies to the mining town on the other DRC side. He described the border as relatively peaceful, where most of the trade between the two communities on either side of the border was at an informal level. However, he highlighted that cases of cross-border crime were being reported, this was in addition to the local crime perpetrated by unruly youths resident within the Kipushi border post settlement..

Secondly, he informed the meeting that news of the road construction project had elated the border staff, particularly with the installation of a One-Stop Border Post, saying this would definitely come with improved infrastructure at the border post.

The Officer in charge, Zambia Revenue Authority (ZRA) in his submission echoed the issues raised by the Immigration Officer regarding operations of the border post. He cited the poor state of the Solwezi to Kipushi as a major deterrent to increased revenue collection at the station, and that this was evident by the limited traffic movement using the border. He confirmed to the meeting that the conditions on the DRC were better than those on the Zambian side, as the mining town there had an all-weather road connecting Lubumbashi, while the town (Kolwezi) had full commercial services and better infrastructure. However, some transporters preferred using the Zambian side because of excessive expenses incurred through toll fees. Further, he highlighted that the road coming from Solwezi was preferred over the other coming directly from Mushindamo because of the impact it would have on services, as there were more communities along this stretch than the other road. Further, he reiterated that crime at the border was there but not that alarming..

The Market Community through the Secretary, Mr Peter Jivumpa provided a brief on the trade operations at the border town, identifying some of the key products as food stuffs, groceries, electronics. He described the situation in are as backwards compared to their colleagues on the other side of the border, citing poor infrastructure characterized by a non-functional water supply

and sanitation system. He was, however, hopeful that with an improved access to the area through the Solwezi to Kipushi there was a potential for improved service delivery by the Mushindamo Town Council. As for the inclusion of a One-Stop Border Post, Toll Gate and Weigh Bridge, the Association were all in agreement that all these would spur development and increase value for land and accommodation to cater for an increased staff level for manning these facilities. All these, they said would improve the socio-economic conditions in the area.

In concluding, Mr. Mutale informed the meeting of the EIA process that would be followed, it highlighted the following steps

:

- Preparation of ToRs
- Submission of Draft ToRs to ZEMA
- Submission of Final ToRs to ZEMA (if need be)
- Submission of Draft EIS (upon approval of ToRs)
- Submission of final EIS (if need be)
- Project inspection
- Decision letter

QUESTION AND ANSWER TIME

Question from Environmental Planner on management of borrow pits

The Immigration Officer sought clarification on the provisions of the Environmental Management Act, as regards the process that would be followed in undertaking the environmental assessment studies. This he felt needed to be fully appreciated by the stakeholders for them to effectively participate in the process.

Answer

The Environmental Specialist provided a brief on proposed approach to the assessment and the opportunities for people to participate. He indicated that the ESIA process was an inclusive approach where input of stakeholders was possible at scoping and public disclosure levels. Furthermore, he advised the market association to take advantage of the coming project to enhance their engagement with the local authorities for improved infrastructural service delivery

Question from socio-economic planner

The Officer in Charge ZRA wanted to know what plans were in place to address issues to HIV/AIDS considering there would be an influx of people moving to the villages during construction works.

Answer

In response, the Environmentalist pointed to the provisions of the Environmental Impact Assessment Regulations (SI 28 of 1997), where the Contractor is expected to employ people from the local community as much as possible, as a direct way of mitigating against the effects. Furthermore, the C-ESMP would provide for the engagement of an HIV/AIDS specialist to handle such matters, who would work closely with the District Aids Coordinating Advisor (DACA) of Mushindamo.

Question from the Planning Officer

The DPO wanted to know the role the local authority would play in the ESIA process.

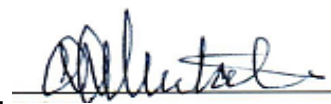
Answer

The Environmental Specialist referred the officer to the provisions of the EIA Regulations, which identified the local authorities as key authorizing agents in the ESIA approval process, where they would need to guide the ZEMA in arriving at a decision. Therefore, he advised that consultation on the proposed project would continue, and that he expected more collaboration, particularly in supervising the Contractor's borrow pits operations.

CLOSING REMARKS.

In his closing remarks, the Environmental Specialist thanked all in attendance for coming to the meeting and for the valid inputs they had made to the process, and assured them that consultation would continue. This was more so that the local authority were an authorizing agent for the ESIA process, while the Departments of Immigration and ZRA were key stakeholder, so their views would be considered critical. The meeting ended at 11:15hrs.

Name:...**Albert L Mutale** .Date:**19th September 2025**...Sign:...



Appendix 2 Images of Scoping Process

GALLERY OF IMAGES FROM SCOPING EXERCISE SOLWEZI TO MUSHINDAMO ROAD PROJECT

1	 Meeting with Heads of Dept at Mushindamo	 Mushindamo District Commissioner at Scoping Meeting
	 Key Informant Discussions Mushindamo CBD	 Km0+000 of the Solwezi to Kipushi



Mushindamo Parliamentary Office



Shafilundu Primary School Km 0+000 Mushindamo to Kipushi Road



Meeting with Solwezi Dept Heads



District Planning Officer stressing point at the Solwezi Scoping Meeting

Appendix 3 Google Image of Project Area (Start Point Km0+000 Kapiji Mpanga Area)



Appendix 3 Google Image of Project Area (End Point Km 117+200 Kipushi – Kalindi Area)

