

ROAD DEVELOPMENT AGENCY (RDA)



ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) REPORT

REHABILITATION OF 214 KM MUTANDA TO MWINILUNGA ROAD

NORTH WESTERN PROVINCE, REPUBLIC OF ZAMBIA

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LIST OF ABBREVIATIONS AND ACRONYMS

Abbreviation	Full Term
AfDB	African Development Bank
BOQ	Bill of Quantities
CBD	Convention on Biological Diversity
CEMP	Construction Environmental Management Plan
CLO	Community Liaison Officer
DAI	Direct Area of Influence
DBST	Double Bituminous Surface Treatment
DRC	Democratic Republic of Congo
DNPW	Department of National Parks and Wildlife
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EMA	Environmental Management Act No. 12 of 2011
ESMP	Environmental and Social Management Plan
ESIA	Environmental and Social Impact Assessment
ESF	Environmental and Social Framework (World Bank)
ESS	Environmental and Social Standard (World Bank)
ESPB	Environmental and Social Project Brief
FGD	Focus Group Discussion
GBV	Gender-Based Violence
GIS	Geographic Information System
GMA	Game Management Area
GRM	Grievance Redress Mechanism
GRZ	Government of the Republic of Zambia
HH	Household
IAI	Indirect Area of Influence
IFC	International Finance Corporation
ISS	Integrated Safeguards System (AfDB)
LRP	Livelihood Restoration Programme
LTI	Lost Time Injury
LTIFR	Lost Time Injury Frequency Rate
NHCC	National Heritage Conservation Commission
NGO	Non-Governmental Organisation
NWP	North Western Province
OHS	Occupational Health and Safety
OS	Operational Safeguard (AfDB)

Abbreviation	Full Term
PAP	Project-Affected Person
PM10	Particulate Matter diameter $\leq$ 10 micrometres
PPE	Personal Protective Equipment
PPV	Peak Particle Velocity (mm/s)
RAP	Resettlement Action Plan
RDA	Road Development Agency
RoW	Right-of-Way (30 metres)
RTSA	Road Transport and Safety Agency
SBST	Single Bituminous Surface Treatment
SEA	Sexual Exploitation and Abuse
SEP	Stakeholder Engagement Plan
STI	Sexually Transmitted Infection
TOR	Terms of Reference
WARMA	Water Resources Management Authority
ZBCL	Zulu Burrow Consulting Limited
ZEMA	Zambia Environmental Management Agency
ZIEA	Zambia Institute of Estate Agents
ZMW	Zambian Kwacha
ZAWA	Zambia Wildlife Authority

GLOSSARY OF TERMS AND ACRONYMS

The following extended glossary lists all significant acronyms, abbreviations, and technical terms used in this ESIA document, the companion ESMP, and the Resettlement Action Plan. Terms are listed in alphabetical order.

Acronym / Term	Definition
AAV	Aggregate Abrasion Value — measure of aggregate resistance to abrasion; used in DBST pavement design specification
AfDB	African Development Bank — multilateral development bank; ISS applies if AfDB co-finances project
ALD	Average Least Dimension — aggregate quality measure for bituminous surface treatment
AoI	Area of Influence — geographic area within which project may cause significant impacts
AASHTO	American Association of State Highway and Transportation Officials — standard for road material compaction tests
BPMRP	Borrow Pit Management and Rehabilitation Plan — site-specific plan required for each borrow pit before extraction commences
BOD	Biochemical Oxygen Demand — measure of organic pollution load in wastewater
BOQ	Bill of Quantities — itemised schedule of construction works and quantities for pricing by Contractors
CBNRM	Community-Based Natural Resource Management — programme approach for community stewardship of natural resources
CBD	Convention on Biological Diversity — international treaty requiring biodiversity protection
CBR	California Bearing Ratio — standard measure of sub-grade and sub-base material strength for road pavement design
CEMP	Construction Environmental Management Plan — site-specific plan prepared by the Contractor implementing the ESMP
CEEC	Citizens Economic Empowerment Commission — Zambia government body providing SME financing
CITES	Convention on International Trade in Endangered Species — regulates trade in threatened species
CLO	Community Liaison Officer — ZBCL staff member responsible for community consultation, GRM, and PAP welfare
CSP	Corrugated Steel Pipe — culvert material used for smaller drainage crossings
DAoI	Direct Area of Influence — 30 m RoW plus 2 km buffer zone for this project
DBST	Double Bituminous Surface Treatment — the preferred pavement surface type for this project
DRC	Democratic Republic of Congo — neighbouring country; shares border with Zambia at Mwinilunga
DNPW	Department of National Parks and Wildlife — Zambia wildlife conservation regulatory authority
EHS	Environment, Health and Safety — IFC Environmental, Health and Safety Guidelines referenced in ESMP

Acronym / Term	Definition
EMA	Environmental Management Act No. 12 of 2011 — primary Zambian environmental legislation
EN	Endangered — IUCN Red List threat category; one level below Critically Endangered
EPT	Ephemeroptera, Plecoptera, Trichoptera — aquatic insect orders used as water quality bioindicators
ESF	Environmental and Social Framework — World Bank environmental and social policy framework (2018)
ESMP	Environmental and Social Management Plan — operational implementation plan for ESIA mitigation measures
ESPB	Environmental and Social Project Brief — preliminary screening document superseded by this full ESIA on RDA direction of 15 May 2026
ESS	Environmental and Social Standard — one of ten standards within the World Bank ESF
FGD	Focus Group Discussion — qualitative research method used in community consultations
GEF	Global Environment Facility — multilateral fund financing biodiversity and environmental programmes
GBV	Gender-Based Violence — violence directed against a person on the basis of their gender
GIS	Geographic Information System — digital mapping and spatial data analysis tool
GMA	Game Management Area — wildlife management area adjacent to national parks; regulated by DNPW
GPS	Global Positioning System — satellite navigation used for field surveys and asset mapping
GRM	Grievance Redress Mechanism — formal process for raising and resolving project-related complaints
GSP	GBV Service Provider — NGO or agency engaged to provide GBV survivor support services
HMA	Hot Mix Asphalt — high-performance road surface type (assessed and not selected for this project)
IDF	Intensity-Duration-Frequency — rainfall analysis used for hydraulic design of drainage structures
IFC	International Finance Corporation — World Bank Group private sector arm; IFC Performance Standards referenced
ILO	International Labour Organization — UN agency setting international labour standards; core conventions binding on Zambia
ISS	Integrated Safeguards System — AfDB environmental and social policy framework (2013)
IUCN	International Union for Conservation of Nature — maintains global Red List of threatened species
LC	Least Concern — IUCN Red List category; not currently threatened
LRP	Livelihood Restoration Programme — structured programme to support livelihood recovery of displaced PAPs

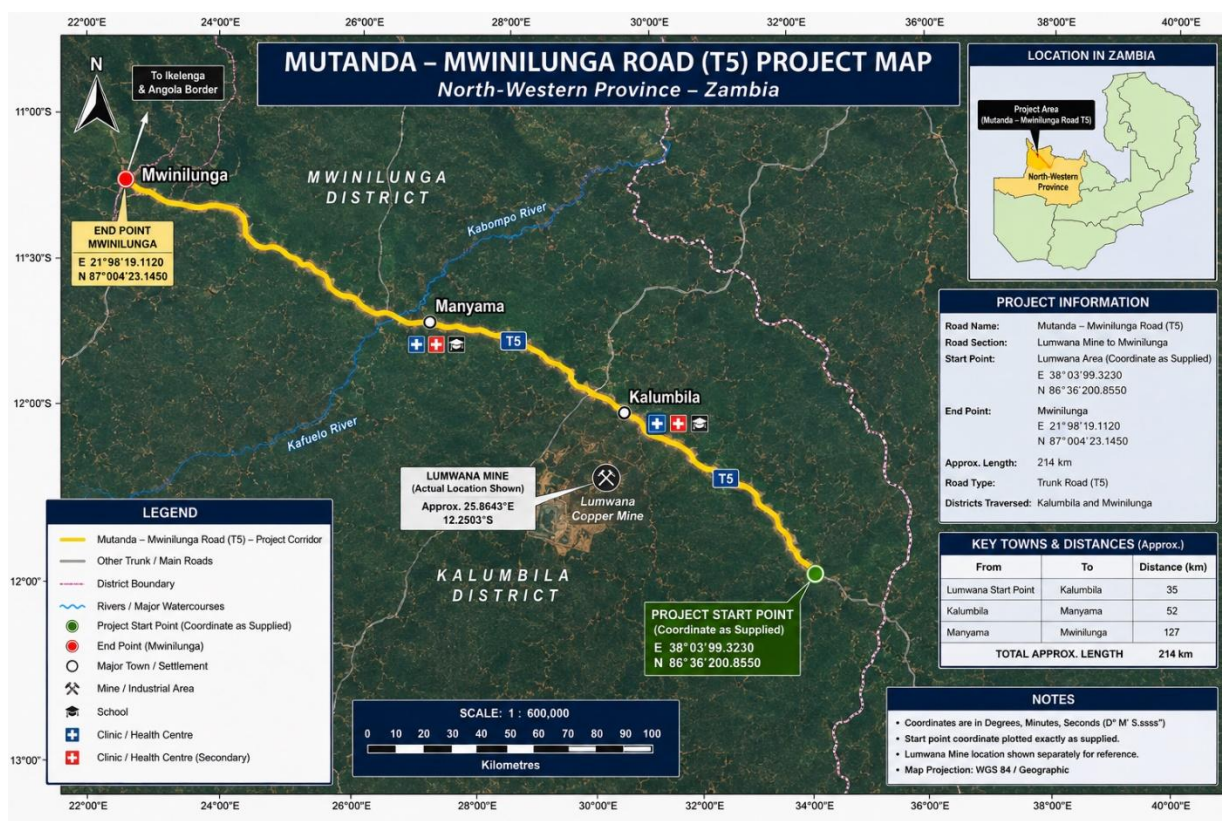
Acronym / Term	Definition
LTIFR	Lost Time Injury Frequency Rate — standard OHS metric: number of lost-time injuries per million hours worked
MDD	Maximum Dry Density — standard for compaction specifications; typically expressed as % of MDD at optimum moisture content
NHCC	National Heritage Conservation Commission — Zambia regulatory authority for cultural heritage
NT	Near Threatened — IUCN Red List category; close to qualifying as threatened
NTFP	Non-Timber Forest Product — products from forests other than timber (mushrooms, caterpillars, fruits, honey, medicinal plants)
NWP	North Western Province — the province in which the project corridor is located
ODK	Open Data Kit — digital field data collection platform used for PAP census and surveys
OHS	Occupational Health and Safety — worker safety management
OS	Operational Safeguard — AfDB ISS policy instrument (OS1–OS5)
PAP	Project-Affected Person — any person directly and adversely affected by the project
PPE	Personal Protective Equipment — safety equipment required to be worn by workers
PPV	Peak Particle Velocity — measure of ground vibration from blasting; key metric for blast impact assessment
PS	Performance Standard — IFC environmental and social policy standards (PS1–PS8)
PSV	Polished Stone Value — measure of aggregate resistance to polishing; used in road surface aggregate specification
PWAS	Public Welfare Assistance Scheme — Zambia government social protection programme
RAP	Resettlement Action Plan — document governing compensation and livelihood restoration for all PAPs
RCP	Reinforced Concrete Pipe — culvert material for larger drainage crossings
RDA	Road Development Agency — project proponent and implementing agency
RoW	Right-of-Way — legal road corridor; 30 m for Main Road T5 Mutanda-Mwinilunga
RTSA	Road Transport and Safety Agency — Zambia road traffic and safety regulatory authority
SADC	Southern African Development Community — regional integration body
SASSCAL	Southern African Science Service Centre for Climate Change and Adaptive Land Management — climate data source
SBST	Single Bituminous Surface Treatment — thinner pavement alternative to DBST (assessed and not selected)
SEA	Sexual Exploitation and Abuse — prohibited under project Code of Conduct; zero tolerance
SEP	Stakeholder Engagement Plan — plan governing all project stakeholder consultation activities
SSD	Stopping Sight Distance — road geometry standard for minimum horizontal and vertical sight distance
STI	Sexually Transmitted Infection — health risk from worker influx; addressed in ESMP

Acronym / Term	Definition
	HIV/AIDS programme
T5	Main Road T5 — national road classification for the Mutanda-Mwinilunga corridor
TEVETA	Technical Education, Vocational and Entrepreneurship Training Authority — Zambia vocational training authority
TOC	Table of Contents
TSP	Total Suspended Particles — air quality monitoring parameter
TSS	Total Suspended Solids — water quality monitoring parameter
UNCCD	United Nations Convention to Combat Desertification
UNFCCC	United Nations Framework Convention on Climate Change
UNHCR	United Nations High Commissioner for Refugees
VCT	Voluntary Counselling and Testing — HIV/AIDS testing service provided at contractor camps
VDC	Village Development Committee — community governance structure in Zambia
VU	Vulnerable — IUCN Red List threat category; facing high risk of extinction
WARMA	Water Resources Management Authority — Zambia water regulatory authority
WCD	Works Contract Documents — civil works contract document reference for this project
WHO	World Health Organisation — provides international standards for air quality, water quality, and noise referenced in ESMP
WiPC	Works-in-Progress Certificate — contract administration document
ZANACO	Zambia National Commercial Bank — major Zambian commercial bank
ZBCL	Zulu Burrow Consulting Limited — project preparation and supervision consultancy
ZEMA	Zambia Environmental Management Agency — lead environmental regulatory authority in Zambia
ZIEA	Zambia Institute of Estate Agents — professional body licensing property valuers for RAP compensation
ZPPA	Zambia Public Procurement Authority — public procurement regulatory body

1.0 EXECUTIVE SUMMARY

ES.1 Project Overview and Location

This Environmental and Social Impact Assessment (ESIA) has been on behalf of the Road Development Agency (RDA) of the Republic of Zambia. It assesses the potential environmental and social impacts of the proposed rehabilitation of approximately 214 kilometres of the Mutanda to Mwinilunga Road (Main Road T5) in North Western Province, Zambia. The Mutanda-Mwinilunga Road is a nationally significant transport corridor connecting the Copperbelt Province to Mwinilunga District at the border with the Democratic Republic of Congo (DRC). Running approximately 214 km westward through Manyinga and Mwinilunga districts, the road traverses a predominantly rural landscape characterised by miombo woodland, seasonal wetlands and dambos, numerous river crossings, and dispersed rural communities of the Luvale, Luchazi, Mbunda, and related peoples. The road has not received significant rehabilitation for an estimated 15 to 20 years and suffers from severe pavement deterioration, blocked drainage infrastructure, and significant safety hazards.



ES.2 Project Description

The rehabilitation project involves: full pavement reconstruction including sub-base and base course replacement, wearing course application (Double Bituminous Surface Treatment — DBST), and shoulder construction; rehabilitation and replacement of drainage infrastructure including an estimated 400 to 600 culvert structures, rehabilitation of all roadside drainage channels, and bridge rehabilitation or replacement at structurally deficient crossings; earthworks and road geometry corrections; borrow pit operations (estimated 50-70 sites along the corridor); contractor camp establishment and operation; and installation of roadside furniture and road safety features. The construction period is estimated at 18 to 24 months, with a peak workforce of approximately 300 to 500 workers. A minimum 30% local labour target has been established.

ES.3 ESIA Process

This ESIA was prepared following a formal scoping process initiated in July 2026, conducted in accordance with the Environmental Management Act No. 12 of 2011 (EMA), ZEMA Environmental Impact Assessment Regulations (Statutory Instrument No. 28 of 1997), World Bank Environmental and Social Framework (ESF), and the African Development Bank Integrated Safeguards System (ISS). Scoping consultations were conducted with RDA, ZEMA, NHCC, DNPW, WARMA, all relevant District Councils (Mwinilunga and Kalumbila), traditional authorities, community groups, women's organisations, and NGOs active in North Western Province. Specialist studies conducted include ecological and biodiversity surveys, hydrological and drainage assessment, cultural heritage walkover survey, socioeconomic baseline surveys, preliminary PAP census, and GBV risk assessment.

ES.4 Key Findings Summary

The ESIA identifies significant positive and adverse potential impacts across the project lifecycle. The table below provides a structured overview of the principal findings.

Impact	Phase	Pre-Mitigation	Post-Mitigation	Chapter
Physical Displacement & Resettlement	Pre-Construction	HIGH	LOW (with RAP)	Section 8
Biodiversity & Miombo Habitat Loss	Construction	HIGH	LOW	Section 6 & 6
Watercourse Sedimentation	Construction	HIGH	LOW	Section 6 & 6
Disruption of Natural Drainage & Wetlands	Construction	HIGH	MODERATE	Section 7
Soil Erosion from Earthworks	Construction	HIGH	LOW	Section 7
Community Road Safety (Construction)	Construction	HIGH	LOW	Section 7
HIV/AIDS & STI Transmission from Worker Influx	Construction	HIGH	LOW	Section 7
GBV and Sexual Exploitation & Abuse (SEA)	Construction	HIGH	LOW	Section 7
Cultural Heritage Damage	Pre-Const & Construction	HIGH	LOW	Section 7
OHS Risks from Heavy Plant	Construction	HIGH	LOW	Section 7
Noise and Vibration	Construction	MODERATE	LOW	Section 7
Air Quality and Dust	Construction	MODERATE	LOW	Section 7
Invasive Species Establishment	Construction & Operation	MODERATE	LOW	Section 7
Induced Deforestation (Operation)	Operation	MODERATE	MODERATE	Section 7
Waste Management	Construction	MODERATE	LOW	Section 7
Improved Connectivity & Market Access	Operation	—	POSITIVE (High)	Section 7
Enhanced Access to Health Facilities	Operation	—	POSITIVE (High)	Section 7
Local Employment & Skills Development	Construction	—	POSITIVE (High)	Section 7
Improved Drainage & Flood Reduction	Operation	—	POSITIVE (High)	Section 7

Significance ratings: HIGH (red) — significant impact requiring priority management; MODERATE (amber) — notable impact requiring standard mitigation; LOW (green) — minor impact manageable through good practice; POSITIVE — beneficial impact to be enhanced.

ES.5 Management Framework

A comprehensive Environmental and Social Management Plan (ESMP, ZBCL/ESMP/001/2026) has been prepared as a standalone companion document to this ESIA. The ESMP defines mitigation measures, monitoring requirements, institutional responsibilities, and estimated costs across all thematic impact areas. A full Resettlement Action Plan (RAP, ZBCL/RAP/001/2026) addresses physical and economic displacement. Both instruments will be incorporated as contractual obligations in civil works bid and contract documents.

ES.6 ESIA Conclusion and Recommendation

The ESIA concludes that the rehabilitation of the Mutanda-Mwinilunga Road is technically, economically, environmentally, and socially feasible, provided that the ESMP and RAP are fully and effectively implemented. The project will generate significant, long-lasting positive socioeconomic impacts — improved connectivity, market access, health service access, and economic opportunity — for communities in North Western Province. With full implementation of the mitigation measures identified, all pre-mitigation HIGH significance adverse impacts are assessed as reducible to LOW or LOWMODERATE post-mitigation significance. The one impact remaining at MODERATE residual significance in the operational phase — induced deforestation — reflects broader land governance challenges that require coordinated government action beyond the project's direct control. The ESIA Team recommends that the project proceed, subject to: ZEMA approval of this ESIA and ESMP; RDA finalisation of the RAP and verified completion of all compensation payments before any displacement; mandatory inclusion of the ESMP in civil works contracts; deployment of Community Liaison Officers and establishment of the Grievance Redress Mechanism (GRM) before construction commencement; and establishment of an independent environmental and social monitoring mechanism throughout the construction period.

ES.6 Environmental Baseline Summary

The 214 km project corridor traverses the North Western Province plateau landscape characterised by extensive miombo woodland (*Brachystegia-Julbernardia* dominant, covering approximately 45–55% of the corridor area), seasonally flooded dambos and wetlands (10–15%), smallholder agricultural land (8–12%), and existing road infrastructure and settlements. The province receives annual rainfall of 1,200–1,500 mm, strongly concentrated in the November–April wet season, creating a highly erosive environment during earthworks. The biodiversity baseline survey recorded over 200 bird species, numerous mammal species including African Elephant and Hippopotamus, and a rich herpetofauna. Nationally threatened bird species including the Black-cheeked Lovebird (*Agapornis nigrigenis*, VU) and Wattled Crane (*Grus carunculata*, VU) are known from habitats along the corridor. The project does not pass through any National Park, though the West Lunga National Park lies to the north in Mwinilunga District and improved road access may increase pressures on its buffer areas.

Hydrologically, the corridor crosses eight major permanent or semi-permanent watercourses including the Kabompo River (the largest crossing, requiring bridge replacement), the Manyinga River, the Dongwe, Lunga, Jimbe, and Nyamukele rivers. An estimated 400–600 culvert structures require replacement or rehabilitation along the full corridor, with multiple dambos representing hydrologically sensitive crossings requiring specialist design and dry-season-only construction practices. Groundwater from boreholes is the primary community water supply for the vast majority of rural communities along the corridor.

ES.7 Social Baseline Summary

The project corridor passes through four districts — Solwezi, Manyinga, Kabompo, and Mwinilunga — with a combined estimated corridor population of 500,000–600,000 people predominantly living in small, dispersed rural villages and homesteads. The dominant ethnic and linguistic groups are Luvale, Luchazi, Mbunda, Chokwe, and Lunda/Ndembu peoples. Livelihoods are predominantly subsistence and semisubsistence smallholder agriculture (cassava, maize, groundnuts) supplemented by fishing, hunting, charcoal production, and casual labour. The severely deteriorated condition of the T5 road is the single most frequently cited constraint on community economic development in all four districts, causing wetseason isolation of 3–5 months annually, high vehicle operating costs, and post-harvest losses from inability to access markets.

Access to social services is significantly below national averages. District hospitals are located in the four Bomas but transport for emergency medical care is severely constrained by road conditions during the wet season, contributing to North Western Province's above-average maternal and child mortality rates. Secondary school enrolment, particularly for girls, is below national averages partly due to transport constraints. The RAP preliminary census has identified an estimated 150–250 residential structures and numerous business premises, agricultural plots, and assets within the 30-metre RoW. Vulnerable groups — female-headed households (30–40% of rural households), elderly, disabled, and HIV/AIDS-affected households — have been identified and will receive specific additional assistance under the RAP.

ES.8 Impact Assessment Summary

The impact assessment identified a total of 47 distinct potential impacts across 10 thematic areas and all project phases. Of these, 15 were assessed as HIGH significance before mitigation, 22 as MODERATE, 4 as LOW, and 6 as significantly POSITIVE. With full implementation of the ESMP and RAP mitigation measures, 13 of the 15 HIGH pre-mitigation impacts are assessed as reducible to LOW post-mitigation significance; the remaining 2 reduce to LOW-MODERATE. One MODERATE pre-mitigation impact — operational-phase induced deforestation — is assessed as remaining at MODERATE post-mitigation significance, reflecting the limits of project-level intervention on broader governance and land use planning challenges. All 6 positive impacts are assessed as long-term and high-magnitude. The most significant adverse impact categories requiring priority management attention are: physical and economic resettlement of households and businesses in the RoW (HIGH pre-mitigation); GBV and SEA risk from workforce influx (HIGH); watercourse sedimentation from earthworks runoff (HIGH); biodiversity and habitat loss from vegetation clearance (HIGH); OHS risks from heavy plant operations (HIGH); and cultural heritage risk from excavation in archaeologically sensitive landscape (HIGH). All are addressed through comprehensive, implementable measures in the ESMP and RAP.

ES.9 ESMP and RAP Summary

A comprehensive Environmental and Social Management Plan (ZBCL/ESMP/001/2026) covering 10 thematic areas has been prepared as a companion document to this ESIA. The ESMP specifies 118 individual mitigation and management measures, 31 monitoring parameters with measurable indicators and standards, institutional responsibilities, reporting requirements, and an indicative budget in the range of USD 2.5–4.0 million. The ESMP will be incorporated by reference as a mandatory contractual obligation in the civil works contract documents. Non-compliance with the ESMP constitutes a contract breach entitling RDA to issue Stop Work Notices. A Resettlement Action Plan (ZBCL/RAP/001/2026) applying full replacement cost valuation and World Bank ESS5-compliant entitlements has been prepared for all PAPs. The RAP includes a Livelihood Restoration Programme for economically displaced PAPs, with a monitoring target of at least 80% of PAPs reporting restored or improved livelihoods at 12 months post-resettlement. No civil works shall commence in any section before compensation for all PAPs in that section has been verified as fully paid and physically displaced PAPs are relocated to acceptable alternative accommodation.

ES.10 Stakeholder Engagement Summary

Stakeholder engagement conducted during the ESIA scoping and preparation phases (May–June 2026) included: meetings with 9 government sector agencies; consultations with 4 district councils; traditional authority consultations with 5 chiefs and associated headmen; approximately 20 women's focus group discussions; 15 men's community focus groups; 4 youth group consultations; community information meetings in approximately 35 villages; and NGO and CBO consultations. The principal community concerns raised — fair and transparent compensation, employment and skills development, GBV/SEA from worker influx, cultural heritage protection, environmental management, and road safety — have been directly and comprehensively addressed in the ESMP and RAP. The full Stakeholder Engagement Plan (ZBCL/SEP/001/2026) and Consultation Register (Annex H) document all engagement activities.

ES.11 ESIA Team Conclusion

The ESIA Team concludes that the Mutanda-Mwinilunga Road Rehabilitation Project is technically, economically, environmentally, and socially feasible and should proceed, subject to satisfaction of the mandatory pre-construction conditions (primarily: ZEMA EIA Certificate; full RAP payment and relocation before works in each section; pre-construction cultural heritage survey completion; and CEMP approval) and maintenance of the construction and operational conditions set out in Section 9. The project will deliver transformative developmental benefits to communities in North Western Province that substantially outweigh the residual adverse environmental and social impacts, provided that the ESMP and RAP are effectively implemented throughout the project lifecycle.

2.0 INTRODUCTION

2.1 Background and Project Context

The Road Development Agency (RDA), operating under the Ministry of Infrastructure, Housing and Urban Development of the Republic of Zambia, has contracted Zulu Burrow Consulting Limited (ZBCL) to provide Consultancy Services for Detailed Designs, Tender Documents Preparation, and Construction Supervision for the Rehabilitation of approximately 214 km of the Mutanda to Mwinilunga Road in North Western Province, Zambia, under Contract RDA/CS/ONS/004/023. The Mutanda-Mwinilunga Road is classified as Main Road T5 under Zambia's national road classification system. The road runs from Mutanda town, located approximately 25 km south of Solwezi on the T3 trunk road, westward through Manyinga and Kabompo districts to Mwinilunga, the administrative capital of Mwinilunga District, near the border with the Democratic Republic of Congo (DRC). The total rehabilitation corridor covers approximately 214 km of road.

North Western Province, in which the entire project corridor is located, covers approximately 125,827 km² and is among the least densely populated of Zambia's provinces, with a population estimated at approximately one million. The province has significant natural resource wealth — including copper, cobalt, and other minerals in the Solwezi area, and extensive miombo woodland and river systems — but has historically lagged behind other provinces in infrastructure development and economic opportunity. Improved road connectivity is widely identified as a critical prerequisite for unlocking the economic and social development potential of North Western Province and improving the welfare of its dispersed rural communities. The Mutanda-Mwinilunga Road has not received significant rehabilitation for an estimated 15 to 20 years. The road currently suffers from severe pavement deterioration, failed drainage infrastructure, road flooding during the wet season, and significant safety hazards. The road becomes impassable or severely restricted for extended periods during the rainy season (November to April), effectively cutting off communities from markets, health facilities, and other services for several months each year. This infrastructure failure is a major constraint on economic development, agricultural market access, and social service delivery throughout the corridor and the wider province.

2.2 Purpose and Objectives of the ESIA

The purpose of this ESIA is to provide a comprehensive, systematic, and transparent assessment of the potential environmental and social impacts of the Mutanda-Mwinilunga Road Rehabilitation Project, and to identify the management and monitoring measures required to ensure that the project is implemented in an environmentally and socially responsible manner that meets Zambian regulatory requirements and applicable international standards.

The specific objectives of this ESIA are:

- To describe the existing environmental and social conditions (baseline) within the project area of influence, providing a quantified and documented reference against which project impacts are identified and assessed.
- To identify and predict the potential positive and negative environmental and social impacts of the proposed rehabilitation works during pre-construction, construction, and operational phases.
- To evaluate the significance of identified impacts using a transparent and systematic methodology, both before and after the application of mitigation measures.
- To identify and recommend practical, proportionate, and technically sound mitigation, enhancement, and management measures to avoid, minimise, restore, or compensate for adverse impacts following the mitigation hierarchy.
- To develop a comprehensive Environmental and Social Management Plan (ESMP) and Resettlement Action Plan (RAP) to guide project implementation and monitoring.
- To conduct meaningful, inclusive, and documented public participation with all relevant stakeholders throughout the ESIA process.

- To analyze reasonable alternatives to the proposed project and demonstrate the rationale for the preferred option.
- To address cumulative and transboundary impacts in the wider project context.
- To meet all requirements of Zambian national legislation (particularly the Environmental Management Act No. 12 of 2011 and SI 28/1997) and applicable international environmental and social standards.

2.3 Scope of the ESIA

The scope of this ESIA encompasses the direct and indirect impacts of the rehabilitation of approximately 214 km of the Mutanda-Mwinilunga Road (T5), including all associated works such as borrow pit operations, quarries, contractor camps, material stockpile areas, haul roads, and access roads. The ESIA covers three project phases:

- Pre-Construction: Site preparation, demobilization, land acquisition, PAP census, compensation, and resettlement; environmental baseline surveys; procurement; contractor mobilization.
- Construction: Earthworks, road works, drainage and bridge works, borrow pit and quarry operations, contractor camp and facility operations, community interactions, workforce management.
- Operation: Traffic operations, road maintenance, and long-term environmental and social outcomes post-rehabilitation. The geographical scope includes:
- Direct Area of Influence (DAI): The road corridor and construction footprint, including the existing 30-metre right-of-way and any temporary construction easements for borrow pits, haul roads, stockpile areas, and contractor camps.
- Indirect Area of Influence (IAI): Communities adjacent to the corridor that may be affected by induced development, changes in access, or worker influx; protected areas and sensitive habitats within approximately 5-10 km of the corridor; and water catchments contributing to monitored watercourses.

2.4 Relationship to Other Project Documents

This ESIA should be read in conjunction with the following companion project documents, all prepared by ZBCL under Contract RDA/CS/ONS/004/023:

- Environmental and Social Management Plan (ESMP) — Document Reference: ZBCL/ESMP/001/2026
- Resettlement Action Plan (RAP) — Document Reference: ZBCL/RAP/001/2026
- Stakeholder Engagement Plan (SEP) — Document Reference: ZBCL/SEP/001/2026
- Project Grievance Register and GRM Procedures — Document Reference: ZBCL/GR/001/2026
- Environmental and Social Project Brief (ESPB) — ZBCL/ESPB/001/2025 (superseded by this ESIA) The ESIA also references the draft design documents for the civil rehabilitation works (Works Contract Documents Reference: WCD-RH-214KM-MUTANDA-MWINILUNGA-ROAD-LOT-1-UNIK) and the Updated Draft Road Design Report submitted to RDA on 5 May 2025.

2.5 ESIA Team Composition

This ESIA has been prepared by a multidisciplinary specialist team assembled by Zulu Burrow Consulting Limited. The team composition and areas of expertise are set out in the table below.

Specialist	Qualifications	ESIA Contribution
Team Leader / Senior Environmental Specialist	MSc Environmental Science; 12+ years ESIA experience; ZEMA Registered Environmental Practitioner	Overall coordination; impact assessment; ESMP preparation; ESIA lead author
Social Development Specialist	MSc Development Studies; 10+ years RAP experience in Sub-Saharan Africa	Socioeconomic baseline; RAP preparation; stakeholder engagement lead
Ecologist / Biodiversity Specialist	MSc Ecology; 8+ years biodiversity surveys in Zambia; IUCN Red List assessor training	Biodiversity and vegetation baseline; habitat assessment; species surveys; impact assessment (biodiversity)
Resettlement Specialist	BSc Social Sciences; 9+ years RAP preparation for linear infrastructure projects	PAP census design and supervision; valuation oversight; entitlement matrix; RAP preparation
Cultural Heritage Specialist	MA Archaeology; 7+ years heritage assessment in Zambia; NHCC liaison experience	Cultural heritage walkover survey; NHCC consultation; Chance Find Procedure development
Gender and GBV Specialist	MSc Gender Studies; 6+ years GBV risk assessment for World Bank and AfDB-financed projects	GBV risk assessment; Code of Conduct development; GBV referral pathway design
Hydrologist / Water Resources Specialist	BSc Civil Engineering; 8+ years hydrology and drainage design in Southern Africa	Drainage baseline; watercourse crossings assessment; hydrology and water quality chapter
Community Liaison Officers (x2)	BSc Social Work; fluent in Luvale, Luchazi, and Mbunda; experience in community facilitation	Community consultations; focus group facilitation; PAP liaison; grievance intake during ESIA preparation

2.6 Report Structure

This ESIA report is structured across twelve chapters and supporting annexes, as follows:

1. Introduction — Background, objectives, scope, team, and report structure (this chapter). 2. Project Description — Detailed description of proposed rehabilitation works, construction methods, programme, and project area. 3. Policy, Legal, and Administrative Framework — Zambian legislation, national policy, international standards, institutional framework, and gap analysis. 4. Scoping and ESIA Methodology — Scoping process, key issues identified, impact assessment 5. Environmental and Social Baseline — Physical environment, biological environment, socioeconomic baseline, and cultural heritage. 6. Impact Assessment — Systematic identification, prediction, and evaluation of adverse and positive impacts across all thematic areas and project phases. 7. Analysis of Alternatives — No action, alignment, pavement standard, and material source alternatives. 8. Environmental and Social Management Plan Summary — Mitigation matrix, monitoring plan, institutional arrangements, reporting, and budget. 9. Resettlement Action Plan Summary — Eligibility, entitlement matrix, valuation, livelihood restoration, and monitoring. 10. Stakeholder Engagement and Public Participation — Consultation activities, issues raised, responses, and ongoing engagement commitments. 11. Cumulative and Transboundary Impacts — Assessment of cumulative and transboundary impacts and mitigation recommendations. 12. Conclusions and Recommendations —

Overall ESIA conclusions, conditions for project approval, and ESIA Team recommendation. Supporting annexes are listed in full at the end of this report.

2.7 ESIA Purpose And Scope

2.8 ESIA Process and Relationship to Other Project Documents

This ESIA is one of three mandatory environmental and social compliance documents prepared by ZBCL for this project. The three companion documents are:

- This Environmental and Social Impact Assessment (ESIA, ZBCL/ESIA/001/2026): The primary ESIA document assessing the full range of environmental and social impacts, establishing the management framework, and providing the basis for regulatory approval. Submitted to ZEMA for review and EIA Certificate issuance.
- Environmental and Social Management Plan (ESMP, ZBCL/ESMP/001/2026): The primary operational implementation document, specifying all mitigation measures, monitoring requirements, institutional responsibilities, reporting schedules, and the ESMP budget. Incorporated by reference as a mandatory contractual obligation in the civil works contract. Updated whenever significant changes in project scope or construction methods require.
- Resettlement Action Plan (RAP, ZBCL/RAP/001/2026): The primary document governing all physical and economic displacement, compensation, and livelihood restoration related to the project. Implemented prior to and during construction in each road section. Subject to independent monitoring and a formal completion audit. These three documents are mutually consistent and cross-referencing. Together they constitute the complete environmental and social compliance package for the project. In addition, the following specialist documents are being prepared as annexes or companion documents: Stakeholder Engagement Plan (SEP, ZBCL/SEP/001/2026); Non-Technical Summaries in English, Luvale, and Luchazi (ZBCL/NTS/001/2026).

2.9 Project Governance and Oversight Structure

The project governance structure is designed to maintain clear accountability for environmental and social performance throughout the project lifecycle, with appropriate escalation paths for non-compliance issues. The key governance relationships are:

- The Road Development Agency (RDA) is the project Proponent and holds ultimate accountability for ESIA compliance, RAP implementation, and ESMP performance. RDA's designated E&S Officer has day-to-day oversight responsibility and direct reporting lines to the RDA Planning and Design Director and the financing institution's environmental and social team.
- Zulu Burrow Consulting Limited (ZBCL) is the construction supervision consultant, responsible for day-to-day ESMP oversight on behalf of RDA. ZBCL's ESMP Supervisor (a senior environmental specialist) has authority to issue Stop Work Notices to the Contractor for non-compliance with the ESMP. ZBCL also holds responsibility for RAP implementation oversight, monthly E&S reporting, and stakeholder engagement through its CLO team.
- The Civil Works Contractor (to be appointed through competitive tender in 2027) is contractually obligated to implement the CEMP and all ESMP mitigation measures as a mandatory contractual obligation. The Contractor appoints a CEMP Manager and OHS Officer as named individuals responsible for day-to-day environmental and social compliance at all active work sites and contractor camps.
- An Independent Environmental and Social Monitor (appointed by RDA from a shortlist of qualified specialists) conducts quarterly compliance audits throughout the construction period and annual operational monitoring during the 5-year post-construction period. Audit reports are submitted directly to RDA and the financing institution, ensuring independence from the construction supervision team.
- The Zambia Environmental Management Agency (ZEMA) is the lead regulatory authority, responsible for reviewing and approving the ESIA and issuing the EIA Certificate, conducting

compliance inspections during construction, and taking enforcement action for any regulatory breaches.

2.10 ESIA Document Structure

This ESIA document is structured as follows:

- Section 2 (this chapter): Introduction — project background, ESIA context, team composition, document structure.
- Section 4: Project Description — detailed description of the rehabilitation works, construction methodology, workforce, and project schedule.
- Section 3: Policy, Legal, and Administrative Framework — national legislation, international standards, institutional responsibilities, permits and approvals register.
- Section 2: Scoping and ESIA Methodology — scoping process and issues, consultation methods, specialist study methodologies, data quality limitations.
- Section 6: Environmental and Social Baseline — physical environment (topography, geology, soils, climate, water resources, air quality); biological environment (vegetation, fauna, protected areas); socioeconomic baseline (demographics, livelihoods, land tenure, social services, gender, cultural heritage).
- Section 7: Impact Assessment — comprehensive impact assessment matrix for all identified impacts across all project phases; detailed discussion of key impact areas.
- Section 5: Analysis of Alternatives — no action; alignment; pavement design; drainage; material sourcing.
- Section 8: ESMP Summary — thematic overview; institutional responsibilities; non-compliance process; monitoring plan; OHS hazard register; CEMP requirements; GRM detailed process; ESMP budget.
- Section 8: RAP Summary — resettlement principles; scope; PAP categories; cut-off date; valuation; entitlement matrix; livelihood restoration; implementation timeline; monitoring.
- Section 2: Stakeholder Engagement — stakeholder identification; consultation activities; key issues and responses; ongoing engagement commitments; ESIA disclosure plan.
- Section 7: Cumulative and Transboundary Impacts — cumulative impact context; key cumulative impacts; transboundary impacts; climate change resilience assessment; carbon footprint.
- Section 9: Conclusions and Recommendations — ESIA conclusions; conditions for project approval; long-term monitoring framework; adaptive management; ESIA commitments register.
- Annexes A–T: Supporting specialist reports, management plans, consultation records, maps, and regulatory correspondence.

2.11 Key Definitions

Term	Definition as Used in this ESIA
Area of Influence (Aoi)	The geographic area within which the project may cause significant environmental or social impacts. For this project, the Direct Aoi is defined as the 30 m RoW plus a 2 km buffer zone on either side; the Indirect Aoi includes the full catchment areas of watercourses crossed by the road and the broader zones within which worker influx, road-induced land use change, and wildlife movement corridor effects may occur.
Cut-Off Date	The date on which the PAP census commences, publicly announced in advance. Persons with assets in the RoW on or before the cut-off date are eligible for compensation; new assets established after this date are not eligible. Purpose: prevents speculative new construction in the RoW after the census announcement.
Dambo	A seasonally flooded, grass-dominated valley bottomland typical of the North Western Province plateau landscape. Dambos are hydrologically critical

Term	Definition as Used in this ESIA
	(groundwater recharge, dry-season baseflow) and ecologically sensitive. The term is widely used in Zambia and in this ESIA in place of the more general term "seasonal wetland" where referring specifically to the North Western Province dambo landscape type.
DBST	Double Bituminous Surface Treatment. A two-layer bituminous chip seal road surface applied over a compacted granular base. The preferred pavement design for the Mutanda-Mwinilunga Road rehabilitation given its appropriateness for the road class, traffic volumes, and rainfall environment.
Full Replacement Cost	The cost of replacing an affected asset with an asset of equal utility and quality at current market prices, without any deduction for depreciation, salvage value, or transaction costs. The standard adopted in the RAP in compliance with World Bank ESS5.
GBV	Gender-Based Violence. Violence directed against a person on the basis of gender, including physical, sexual, and psychological harm. In this ESIA, GBV specifically includes Sexual Exploitation and Abuse (SEA) perpetrated by project workers against community members.
GRM	Grievance Redress Mechanism. The formal, structured process established by the project for community members, PAPs, and workers to raise concerns and complaints and have them addressed in a transparent and time-bound manner.
Miombo woodland	The characteristic woodland type of the Zambian plateau, dominated by <i>Brachystegia</i> and <i>Julbernardia</i> tree species with a diverse understorey. Covers approximately 45% of Zambia's land area and provides critical biodiversity, carbon storage, and livelihood services.
PAP	Project-Affected Person. Any person who is directly and adversely affected by the project — through loss of land, assets, income, or access to resources — as a result of the project's activities. The term includes both those physically displaced and those experiencing economic displacement without physical displacement.
RoW	Right-of-Way. The legal corridor reserved for the road and its associated infrastructure. The legal RoW for Main Road T5 (Mutanda-Mwinilunga Road) is 30 metres, being 15 metres on either side of the road centreline, as established under the Roads and Road Traffic Act, Chapter 464 of the Laws of Zambia.
SEA	Sexual Exploitation and Abuse. Within the project context: sexual exploitation refers to any actual or attempted abuse of a position of vulnerability, differential power, or trust for sexual purposes; sexual abuse refers to actual or threatened physical intrusion of a sexual nature. Both are prohibited under the project Code of Conduct with zero-tolerance dismissal and police referral.

2.12 Particulars of the Developer (Shareholders/Directors)

The project developer is the Road Development Agency (RDA), a statutory body established under the Public Roads Act No. 12 of 2002 of the Laws of Zambia. RDA is not a share-holding company; it is governed by a Board appointed in accordance with the Act and managed by a Director and Chief Executive Officer. The current Board Chairperson is Eng. Eugene Haazele whereas the current Director & Chief Executive Officer is Eng. Nelson Chuma

2.13 Developer's Physical Address and Contact Person

The Director
Road Development Agency
Corner Government/Fairley Road
P O Box 50003
LUSAKA

Contact: +260 955 555595

2.14 Track Record and Previous Experience of the Developer

RDA is the national agency responsible for the care, maintenance and construction of public roads in Zambia and has implemented major trunk, main and district road rehabilitation programmes nationwide, including donor-financed projects prepared under the environmental and social safeguard frameworks of the World Bank and the African Development Bank. [Insert: reference list of comparable completed road projects, with completion years, if required by the Agency.]

2.15 Proposed Project Implementation Date

Construction is programmed over approximately 24 months from contractor mobilization. The proposed implementation (commencement) date is May 2026 to be confirmed upon issue of the order to commence works], subject to issuance of the Decision Letter for this Environmental Impact Statement and fulfilment of financing conditions.

2.16 Scoping And ESIA Methodology

2.17 Scoping Process

Scoping identifies the significant environmental and social issues to be addressed in the ESIA, determines the appropriate scope, depth, and methodology of assessment, and establishes the Terms of Reference for the specialist studies required. Scoping was conducted as the mandatory first stage of the ESIA process in May to June 2026, in compliance with ZEMA EIA Regulations (SI 28/1997) and applicable international standards.

2.17.1 Desk Study

A comprehensive desk study was conducted by the ZBCL ESIA team, reviewing all available information relevant to the project area and proposed works. Documents reviewed included:

- Project design drawings and documents for the rehabilitation works (WCD-RH-214KM-MUTANDA-MWINILUNGA-ROAD-LOT-1-UNIK).
- The Environmental and Social Project Brief (ESPB) previously submitted by ZBCL to RDA and RDA's direction letter of 15 May 2026 directing a full ESIA.
- Topographic maps, satellite imagery, and GIS data for the project corridor and surrounding area.
- Available environmental data for North Western Province including published biodiversity records, hydrological data, land use and vegetation mapping, and climate data.
- Socioeconomic data from the 2022 Zambia Population and Housing Census, district-level data from Mwinilunga, Kabompo, Manyinga, and Solwezi District Councils, and published poverty and development data for NWP.
- ESIA reports and RAPs from comparable road rehabilitation projects in Zambia and sub-Saharan Africa, reviewed for relevant methodological approaches, impact findings, and management measures.
- Relevant national legislation and applicable international standards as described in Section 3.
- ZEMA project register and existing EIA Certificates for projects in North Western Province.

2.17.2 Scoping Consultations

Scoping meetings were conducted in May to June 2026 with all key government agencies, district authorities, traditional leaders, and community stakeholder groups. Agencies consulted during scoping included RDA Planning and Design Department, ZEMA EIA Division, Ministry of Infrastructure, Ministry of Lands and Natural Resources, NHCC, DNPW, WARMA, Zambia Forestry Department, Mwinilunga District Council, Kalumbila District Council. Community-level scoping consultations were conducted with traditional authorities, women's focus groups, men's community groups, and youth groups in settlements along the corridor. Details of all scoping consultations are documented in the Stakeholder Engagement Plan and Consultation Register.

2.17.3 Key Issues Identified During Scoping

The following table presents the key environmental and social issues identified through the scoping process, together with their assessment priority for this ESIA.

Issue Area	Key Concerns	Priority
Physical displacement and resettlement	Structures in 30m RoW; PAP numbers to be confirmed by census; vulnerable group identification	HIGH
Biodiversity and habitats	Miombo woodland clearance; wetland/dambo disturbance; wildlife corridor fragmentation; GMA proximity	HIGH
Surface water quality	Multiple river crossings; earthworks runoff sedimentation; fuel/chemical spill risks	HIGH
Community health and safety	Road safety during construction; HIV/AIDS and STI from worker influx; GBV/SEA risks	HIGH
Socioeconomic displacement and livelihoods	Crop and asset loss; business disruption; vulnerable PAPs	HIGH
Cultural heritage	Sacred sites; ancestral graves; sub-surface archaeological deposits	MODERATE
Soil erosion and land degradation	Earthworks on erodible sandy soils; borrow pit degradation; embankment erosion	MODERATE
Noise and vibration	Construction plant near settlements; blasting impacts	MODERATE
Air quality and dust	Earthworks and haulage dust near communities; borrow pit dust	MODERATE
Labour and OHS	Worker safety; child labour risk in supply chain; heat stress	MODERATE
Waste management	Camp solid waste; hazardous waste from plant maintenance	LOW-MODERATE
Cumulative and transboundary impacts	Other NWP road projects; DRC border effects; induced deforestation	MODERATE

2.17.4 Issues Scoped Out

The following potential issues were considered during scoping and determined to require no further detailed assessment, for the reasons stated:

- Air quality during operation: The rehabilitated, sealed road will generate substantially lower dust than the current deteriorated gravel surface. Operational air quality impact is assessed as positive, not adverse.

- Noise during operation: Traffic volumes on the rehabilitated road are not expected to generate noise levels exceeding WHO or national standards at distances greater than approximately 50 m from the road edge, given the rural setting and projected traffic volumes.
- Climate change mitigation: Construction-phase greenhouse gas emissions from plant and materials are not considered a significant issue relative to the scale of the project and regional context. The primary climate change issue — climate resilience of the design — is addressed in the design study and drainage design.

2.18 Impact Assessment Methodology

2.18.1 Impact Identification

Potential impacts were identified through the structured combination of: desk study review and comparison with similar projects; expert judgement of the multidisciplinary ZBCL ESIA team; checklist-based review of all project activities and environmental and social components; and stakeholder consultations including community focus groups, traditional authority meetings, and sector agency consultations. Impacts were identified systematically for each project phase (pre-construction, construction, operation) and for each environmental and social component covered in the baseline chapter, generating a comprehensive preliminary impact register that was reviewed and validated by the full ESIA team.

2.18.2 Impact Significance Evaluation

Identified impacts were evaluated for significance using the multi-criteria system presented in the table below. Overall pre-mitigation significance was determined by combining expert judgement across the six criteria to produce a rating of HIGH, MODERATE, or LOW significance. Post-mitigation significance was then assessed assuming full and effective implementation of the mitigation measures specified in the ESMP.

Criterion	Definition	Rating Scale
Magnitude	Degree of change in the affected environmental or social receptor or component relative to the no-action baseline	Low / Medium / High
Extent	Spatial scale over which the impact occurs	Local (site-confined) / Sub-regional (corridor) / Regional (provincial) / National / Transboundary
Duration	Time period over which the impact persists after the causal activity	Short-term (<1 year) / Medium-term (1–5 years) / Long-term (>5 years) / Permanent
Reversibility	Whether the affected environment can return to its pre-impact condition after cessation of the causal activity	Reversible / Partially reversible / Irreversible
Probability	Likelihood that the impact will occur under the proposed project design and construction methods	Low (<30%) / Medium (30–70%) / High (>70%)
Sensitivity of Receptor	Vulnerability or ecological/social sensitivity of the affected receptor or environment	Low / Medium / High

Significance ratings used in the Impact Assessment Matrix (Section 7): HIGH — significant impact; assessment result = RED; requires priority mitigation and robust ongoing management. MODERATE — notable impact; assessment result = AMBER; requires standard mitigation measures. LOW — minor impact; assessment result = GREEN; manageable through good environmental and social

practice. POSITIVE — beneficial impact to be enhanced and sustained through appropriate management.

2.18.3 Mitigation Hierarchy

The mitigation hierarchy was applied systematically in the following order of preference for all identified adverse impacts, consistent with IFC Performance Standards and World Bank ESS1:

1. Avoid — Modify project design, alignment, or operational approach to prevent the impact from occurring (highest preference). 2. Minimize — Where avoidance is not practicable, implement measures to reduce the extent, magnitude, duration, or probability of the impact. 3. Restore — Where impacts are temporary or reversible, restore the affected environment or community to its pre-project condition after the impact cause has ceased. 4. Compensate or Offset — Where residual impacts remain after avoidance, minimization, and restoration, provide compensation to affected parties at full replacement cost, or biodiversity offsets for irreversible habitat losses.

2.18.4 Specialist Studies Conducted

The following specialist studies were conducted in support of this ESIA and are documented in specialist reports included as annexes to the Final ESIA:

- Ecological and Biodiversity Baseline Survey: Flora and fauna transect surveys along representative sections of the 214 km corridor; vegetation mapping; assessment of habitats of conservation significance including dambos, riparian zones, and miombo woodland; species records reviewed against IUCN Red List and CITES; report at Annex C of Final ESIA.
- Hydrological and Drainage Assessment: Watercourse crossing surveys; catchment analysis; dambo mapping and hydrological function assessment; flood risk assessment at key crossings; groundwater assessment; report at Annex D.
- Cultural Heritage Walkover Survey: Physical walkover survey for archaeological and cultural heritage features along the full corridor; community-led mapping of sensitive sites; NHCC consultation; report at Annex E.
- Socioeconomic Baseline Survey: Household surveys conducted with random sample from communities along the corridor; focus group discussions with women's groups, men's groups, and youth; assessment of livelihood systems, service access, and social dynamics; report at Annex F.
- Preliminary PAP Census: Identification and preliminary registration of households and assets within or adjacent to the 30m RoW; preliminary PAP count and categorization; to be completed as a full census in Months 3–4 of project implementation.
- GBV Risk Assessment: Assessment of GBV/SEA risks from worker influx; community vulnerability assessment; GBV service mapping in North Western Province; report at Annex G.
- Air Quality and Noise Desk-Based Assessment: Using available baseline monitoring data, construction activity emission factors, and dispersion modelling to assess construction-phase dust and noise impacts at sensitive receptors.

2.19 Scoping — Detailed Consultation Methodology

2.20 Detailed Consultation Methods

The following table describes in detail the seven consultation methods used during the scoping and ESIA preparation phases, the target stakeholders for each method, the objectives, and the process used to conduct each type of engagement. Full records of all consultations — including attendance lists, photographic records, and minutes — are maintained in the Consultation Register (Annex H of the Final ESIA).

Method	Target Stakeholders	Objectives	Process	Coverage	Period
Community	General	Initial disclosure	Community village	Approximately	May–

Method	Target Stakeholders	Objectives	Process	Coverage	Period
Information Meetings	community members in settlements along the corridor	of project scope, benefits, and ESIA process; identification of community concerns and preferences	meetings called through traditional authority (Headmen/Chief notification); held at village gathering point; conducted in local languages (Luvale, Luchazi, Mbunda as applicable); CLO present throughout; minutes and attendance records maintained	35 settlements	June 2026
Women's Focus Group Discussions	Women community members (primarily 18–55 years); purposively sampled for gender balance and diversity of livelihood types	Gender-specific concerns regarding GBV/SEA risk; women's agricultural land rights and compensation; impact on daily routines; women's employment interests	Single-sex focus groups (women only) of 8–12 participants; facilitated by female CLO or female social researcher; held in safe, private setting; conducted in local language; notes and summaries maintained (no individual attribution)	20 FGDs across all 4 districts	May–June 2026
Men's Community Focus Groups	Adult male community members; diverse livelihood backgrounds	Employment and skills development expectations; compensation expectations; environmental concerns; road safety; cultural	Single-sex focus groups of 8–12 participants; facilitated by male CLO; structured discussion guide with open prompts; notes maintained	15 FGDs across all 4 districts	May–June 2026
		and heritage concerns			
Youth Group Consultations	Young people (15–35 years) including unemployed youth, students, and young farmers; mixed sex where culturally appropriate	Employment and apprenticeship opportunities; skills training; road safety for young pedestrians and cyclists; environmental concerns; access to education with improved roads	Youth group meetings facilitated through existing community youth structures; facilitated by CLO; notes and attendance records maintained	4 meetings (one per district)	June 2026
Traditional Authority Consultations	Chiefs, Senior Headmen, and Indunas (traditional advisors and councillors)	Customary land governance and consultation process; sacred sites and grave locations; community employment expectations;	Individual meetings with each Chief and group meetings with Headmen; conducted through formal protocol including advance notice and appointment	5 Chiefs + associated Headmen (5 chiefdoms)	May–June 2026

Method	Target Stakeholders	Objectives	Process	Coverage	Period
		compensation process and cultural protocols; community consent for borrow pit siting	through VDC (Village Development Committee) channels; notes and signed attendance records maintained		
Government Agency and Sector Meetings	ZEMA, NHCC, DNPW, WARMA, Forestry, Ministry of Lands, RTSA, 4 District Councils, NWP Province Administration	Technical scope and procedural requirements; regulatory approvals process; specialist input on environmental and social issues; coordination with sector programmes	One-on-one agency meetings in Lusaka and provincial capitals; structured meeting agenda shared in advance; formal record of decisions and action points	9 sector agencies; 4 District Councils; 1 Provincial Administration meeting	May–June 2026
NGO and CBO Consultations	Health NGOs active in NWP; women's rights organisations; environmental NGOs;	GBV/SEA risk perspectives; HIV/AIDS programmatic context; biodiversity and	Semi-structured interviews and group discussions; meetings in Mwinilunga and Kabompo; notes	8 organisations	June 2026
	community development CBOs	ecosystem concerns; community development priorities; vulnerable group identification	and attendance records maintained		

2.21 Specialist Study Methodologies

2.21.1 Ecological and Biodiversity Survey Methodology

The biodiversity baseline survey was conducted using a standard transect-based survey methodology adapted to the miombo woodland and dambo landscape of North Western Province. Flora surveys used systematic 50 m × 2 m transects at 10 km intervals along the road corridor, with additional intensive surveys at representative habitat types (riparian zones, dambo margins, intact miombo patches). Each transect recorded all vascular plant species, estimated canopy cover, understorey density, evidence of disturbance, and presence of any commercially valuable or threatened species. Vegetation mapping used satellite imagery (Sentinel-2 10m resolution) analysed using supervised classification calibrated against ground-truth points from the field survey. Mammal surveys used camera traps deployed at 15 strategic locations along the corridor (weighted towards wildlife movement corridors and major water sources), running for 21 nights each; track and sign surveys along transects; and community knowledge interviews with hunters and traditional leaders. Bird surveys used point count methodology (25 m radius counts, 5 minutes per point, 50 points distributed across habitat types) conducted in the early morning (05:30–09:30) on three survey days per site. Herpetological surveys used active searching in appropriate microhabitats during the day and at night, combined with pitfall trap lines at selected locations. Aquatic ecology surveys at major river crossings included visual fish assessments, macroinvertebrate sampling using standardised kick-net methodology, and water quality measurements.

2.21.2 Socioeconomic Survey Methodology

The socioeconomic baseline survey used a stratified random sampling approach, with households sampled from a GIS-generated sample frame based on the 2022 Census enumeration area boundaries along the project corridor. The total sample size was 620 households, designed to achieve 95% confidence level with $\pm 5\%$ margin of error for key indicators at the district level. Households were surveyed using a structured questionnaire administered by trained enumerators in the household's primary language (Luvale, Luchazi, Mbunda, or English). The questionnaire covered: household composition, demographics, and health status; livelihood systems and income sources; land tenure and agricultural assets; access to education, health, water, and markets; road use patterns and wet-season access constraints; awareness of the project and consultation participation; and wellbeing and poverty indicators. Supplementary qualitative data was collected through 35 semi-structured key informant interviews with village headmen, school headteachers, health facility in-charges, and market traders, and through the 20 women's and 15 men's focus groups described in the consultation methodology above. Household survey data was entered into a ODK Collect database in the field and validated centrally before analysis using SPSS and R.

2.21.3 Cultural Heritage Survey Methodology

The cultural heritage survey used a three-stage methodology: (1) archival and literature review of published and unpublished archaeological and heritage records for North Western Province, including NHCC records, university research reports, and relevant grey literature; (2) physical walkover survey along the full 214 km corridor by a team of two archaeologists, recording all surface heritage features using GPS, photographic documentation, and standardised record sheets; and (3) community-led heritage mapping conducted by CLOs with village elders and traditional authorities in each chiefdom area, using participatory mapping methods to identify graves, sacred sites, and ceremonial areas not visible from the road. All survey data was integrated into a GIS heritage sensitivity map of the corridor, which identifies the following sensitivity zones: HIGH (confirmed heritage sites, grave clusters, active ceremonial areas) — strict exclusion zones applied; MODERATE (archaeologically sensitive areas based on landscape character, site type, and proximity to historical settlement) — enhanced monitoring and Chance Find Procedure required; and LOW (areas with low archaeological sensitivity based on landscape character and absence of surface features).

2.22 Data Quality and Limitations

The ESIA Team notes the following data quality considerations and limitations:

- The biodiversity baseline survey was conducted in May–June 2026, which is the dry season and the inter-season transition period. Wet-season surveys (November–February) typically record higher diversity for amphibians, reptiles, and some bird species. The dry-season survey provides a conservative baseline for these groups; seasonal variations are noted in the specialist report.
- The preliminary PAP census was conducted as a rapid assessment to inform the ESIA. A full census and socioeconomic survey for RAP purposes is being conducted in July–August 2026. Precise PAP counts and asset inventories will be reported in the Final RAP.
- Hydrological data for many of the smaller watercourse crossings along the 214 km corridor is limited; WARMA gauging station records are available only at the Kabompo River and two other stations. Hydraulic design for culverts and smaller bridges uses the Rational Method with regional rainfall intensity data; uncertainty in culvert sizing has been conservatively managed by adopting larger design openings where catchment data is limited.
- Cultural heritage survey completeness: the physical walkover survey covers all areas within approximately 50 m of the road centreline; heritage features beyond this zone but within the broader landscape may not have been captured. Community-led mapping has substantially extended the survey coverage beyond the walkover zone, but undocumented heritage remains possible in more remote or less accessible sections of the corridor.

2.23 Stakeholder Engagement And Public Participation

2.24 Introduction and Regulatory Requirements

Meaningful stakeholder engagement and public participation are fundamental requirements of the ESIA process under Zambia's Environmental Management Act No. 12 of 2011 (Section 31) and EIA Regulations SI 28/1997, and applicable international standards including World Bank ESS10 on Stakeholder Engagement and Information Disclosure, and AfDB ISS OS1. This chapter summarizes the stakeholder engagement activities conducted during the ESIA scoping and preparation phases, the principal issues raised by stakeholders, and how these issues are addressed in the ESIA, ESMP, and RAP. A full Stakeholder Engagement Plan (SEP, ZBCL/SEP/001/2026) and comprehensive Consultation Register (Annex H of the Final ESIA) are companion documents.

2.25 Stakeholder Identification and Mapping

A stakeholder identification and analysis exercise was conducted at project commencement, categorizing stakeholders into two principal groups:

- **Directly Affected Stakeholders:** Households and individuals within or adjacent to the 30 m RoW (PAPs); businesses along the corridor affected during construction or requiring relocation; traditional authorities with customary governance responsibilities in the project area; community members along the full 214 km corridor potentially affected by construction activities; and vulnerable groups identified through the socioeconomic baseline (female-headed households, elderly, disabled, child-headed households, HIV/AIDS-affected households).
- **Interested Stakeholders:** Government agencies (RDA, ZEMA, NHCC, DNPW, WARMA, Ministry of Lands, Forestry Department, RTSA); District Councils (Mwinilunga and Kalumbila); Provincial Administration of North Western Province; NGOs and CBOs active in health, gender, environment, and community development in NWP; local business and trader associations; schools and health facilities along the corridor; and the financing institution.

2.26 Consultation Activities Conducted

The following consultation activities were conducted during the scoping and ESIA preparation phases. All activities are documented in the Consultation Register (Annex H of the Final ESIA) with attendance lists, minutes, and photographic records.

Activity	Stakeholders Engaged	Period	Key Issues and Concerns
Inception meeting with RDA and ZEMA	RDA Planning and Design Department; ZEMA EIA Division	May 2026	Directive for full ESIA confirmed by RDA; ZEMA EIA procedural requirements discussed; schedule for scoping and ESIA delivery agreed; key scoping issues identified.
Sector agency consultations	NHCC; DNPW; WARMA; Ministry of Lands; Zambia Forestry Department; RTSA	May–June 2026	Heritage survey requirements and NHCC procedures; GMA proximity confirmation needed; water abstraction licence requirements; land acquisition procedures; Forest Clearance Permit requirements; road safety standards.
District Council meetings	Mwinilunga DC; Kalumbila DC,	May–June 2026	Local employment creation expectations; road safety during construction; contractor camp siting and community impact; maintenance of community access during works; local supplier and subcontractor preference.
Traditional authority	Chiefs Nyakulenga,	May–June	Compensation process and timeline;

Activity	Stakeholders Engaged	Period	Key Issues and Concerns
consultations	Kanongesha, Ntambu, Chibwika, and Ikelenge and associated Headmen	2026	sacred sites and ancestral graves near the road; expectations for community employment; contractor behaviour and community relations; customary land governance.
Women's focus group discussions	Women's groups from approximately 20 settlements along the corridor	June 2026	GBV and SEA risk from worker influx identified as primary concern; fair and direct compensation for agricultural land; employment opportunities for women; impact on water access and daily routines during construction.
Men's community focus groups	Male community members from settlements along the corridor	June 2026	Employment and skills training opportunities; fair and transparent compensation; road safety during construction; contractor camp proximity to villages; expected economic benefits.
Youth group consultations	Youth organisations in Mwinilunga, Kabompo, Manyinga, and Mutanda	June 2026	Employment and skills training for young people; vocational training access; environmental protection of woodland and rivers; road safety for young pedestrians.
Community information meetings	Approximately 35 villages and settlements along the 214 km corridor	June 2026	Project scope, timeline, and benefits; compensation eligibility and process; GRM operation and how to submit grievances; ESIA disclosure process and public comment period.
NGO and CBO consultations	Health NGOs; gender-based organisations; environmental groups; community development CBOs	June 2026	HIV/AIDS and GBV risk management; vulnerable group identification and support; biodiversity concerns; community health infrastructure; climate resilience of design.

2.27 Key Issues Raised and ESIA Responses

2.27.1 Compensation and Resettlement

Compensation and resettlement were the most consistently raised concerns across all community consultations, reflecting a high level of community awareness of the RoW clearance implications and deeply felt concerns about fair process and protection of community rights. Specific concerns included: the methodology for valuing affected structures and crops (with communities expressing fear of systematic undervaluation); the timeline for compensation relative to construction commencement (fear that construction would start before compensation is paid); recognition of customary land rights holders as equivalent to legal title holders; transparency of the compensation process; and fear that community members — particularly those with limited education or no documentation — would not receive their full entitlements.

These concerns are addressed comprehensively through the RAP, which applies full replacement cost valuation (no depreciation deductions), requires verified payment of all compensation before construction commences in each section, explicitly recognises customary rights holders as Category 2 PAPs equivalent to formal title holders, and assigns CLO support to every PAP throughout the process. Public disclosure of all compensation rates and entitlements is required before the census is closed.

2.27.2 Employment and Local Economic Benefits

Community members, traditional leaders, youth groups, and all four district councils expressed strong interest in and expectations for local employment during construction and preferential local supplier procurement. Communities expressed frustration with previous infrastructure projects in NWP where employment benefits largely accrued to workers from outside the province. The ESMP establishes a mandatory minimum 30% local labour target in the total workforce, with specific requirements for community advertising of vacancies through traditional authority structures, priority skills training for local recruits, and preference for local suppliers and subcontractors in procurement.

2.27.3 GBV, SEA, and HIV/AIDS

Women's groups and health-sector NGOs identified GBV and SEA risk from worker influx as their primary concern regarding the project, consistently and emphatically across all consultation venues. This concern is strongly supported by evidence from comparable infrastructure projects in Zambia and the region. These concerns are comprehensively addressed through the mandatory GBV Code of Conduct (zero tolerance for GBV/SEA, signed by every worker before starting work), the engagement of a designated GBV Service Provider with a confidential reporting channel operational before construction commences, CLO first-responder training for GBV incidents, mandatory monthly HIV/AIDS awareness sessions for all workers, and free condom provision and voluntary testing at contractor camps.

2.27.4 Cultural Heritage and Sacred Sites

Several traditional leaders and community elders raised concerns about the potential disturbance of ancestral burial sites, sacred trees, shrines, and ceremonial areas along the corridor, noting that some such sites may not be publicly visible or documented on official maps. These concerns are addressed through the community-led sacred site and grave mapping process incorporated into the pre-construction cultural heritage survey, the establishment of NHCC exclusion zones around all identified heritage features on construction drawings, the Chance Find Procedure, and the requirement for traditional leader and community consent before any works in the vicinity of identified sensitive sites.

2.27.5 Environmental Concerns — Biodiversity, Water, and Natural Resources

Environmental NGOs, community members dependent on river fisheries, and DNPW raised concerns about deforestation, river pollution, wildlife disturbance, and aquatic habitat degradation during construction. These concerns are addressed through the ESMP biodiversity and water management thematic areas, including strict clearance limits, mandatory revegetation, water quality monitoring, the anti-poaching Code of Conduct, and the invasive species management programme.

2.27.6 Road Safety

Community members, schools, district councils, and RTSA raised road safety concerns covering both construction-phase risks (heavy plant near communities and school children) and operational risks (higher vehicle speeds on the improved road surface). Construction-phase concerns are addressed through road safety traffic management measures at all active work sites. Operational concerns are addressed through speed calming features (rumble strips, speed humps, guardrails) at all settlements and school zones, pedestrian crossings, road safety education programmes with RTSA, and community awareness campaigns.

2.28 Ongoing Engagement Commitments

Stakeholder engagement will continue throughout the project implementation period through the following mechanisms:

- Monthly community liaison meetings conducted by CLOs in all project-affected communities, covering ESMP compliance, RAP implementation progress, GRM status, and construction schedule information.
- A Project Grievance Register and multi-tiered GRM operational and communicated to all communities before construction commences.

- Quarterly stakeholder forums including district councils, traditional leaders, and NGOs, providing structured updates on project progress and E&S performance.
- A second formal round of public consultations for the Draft ESIA disclosure period, with a minimum 30-day public comment period during which ZEMA receives written submissions.
- Annual community satisfaction surveys as an outcome indicator in the ESMP monitoring programme.

2.29 ESIA Disclosure Plan

The Draft ESIA will be publicly disclosed simultaneously with submission to ZEMA for review, through the following channels: hard copies deposited at RDA headquarters (Lusaka), all four District Council offices, ZEMA headquarters, and selected community reference points (schools, health centres, traditional authority offices) along the corridor; electronic copies on the RDA website and the financing institution's disclosure portal; non-technical summary documents in English, Luvale, and Luchazi shared with all traditional authorities and community leaders; and community radio announcements (Radio Mwinilunga, Radio Kabompo, and Copperbelt provincial radio stations) of the disclosure and public comment period. A minimum 30-day public comment period will be provided. All material comments received will be reviewed and addressed in the Final ESIA response matrix.

2.30 Stakeholder Issues And Responses Matrix

2.31 Comprehensive Stakeholder Issues and ESIA Response Matrix

The following table provides a comprehensive matrix of all significant issues raised during stakeholder consultations conducted May–June 2026, the stakeholders who raised each issue, when it was raised, and the specific ESIA, ESMP, or RAP provisions that address the concern. This matrix forms part of the public consultation response record required under ZEMA EIA Regulations and World Bank ESS10.

Issue Raised	Stakeholder(s)	When Raised	ESIA/ESMP/RAP Response	ESIA Reference
Compensation process is unfair or insufficiently transparent	Communities (multiple villages); women's groups; traditional authorities	All consultations	RAP entitlement matrix publicly disclosed; compensation rates posted at community notice boards and district offices; CLO assigned to every PAP; independent property valuer; GRM for all disputes; independent monitoring quarterly	RAP Section 2 (valuation); Section 6 (entitlement matrix); GRM procedures
Wet season road access must be maintained at all times during construction	Community members; health facilities; district councils	All consultations	Traffic Management Plan included in CEMP; one lane of traffic maintained at all active sections using flagmen; advance notice minimum 48 hours before any section access restriction; alternative routes or timing planned for emergency access	ESMP Section A (traffic management); CEMP Section 1
Environmental risks to rivers and fishing livelihoods	Fishing communities at major crossings; environmental NGOs; WARMA	Agency and community consultations	Turbidity monitoring at all active crossings weekly; dry-season-only in-stream works at major rivers; silt curtains; fish spawning exclusion November–January; riparian	ESMP Section C; monitoring plan

Issue Raised	Stakeholder(s)	When Raised	ESIA/ESMP/RAP Response	ESIA Reference
			exclusion zones; WARMA permits	
Fear that forest clearing will be excessive beyond what is needed	Traditional authorities; environmental NGOs; community members	Multiple consultations	Strict clearance limits to surveyed boundary marks only; independent verification of cleared area versus approved footprint monthly; Forestry Department engagement; reforestation of all cleared areas mandatory	ESMP Section E; CEMP Section 6
Workers will bring disease and disorder to communities	Women's groups; health sector NGOs;	All community consultations	HIV/AIDS programme; mandatory Code of Conduct; GBV Service Provider; worker accommodation at	ESMP Section G; Code of Conduct
	community elders		contractor camp (minimum 2 km from nearest settlement); Code of Conduct prohibition on commercial sex in communities; monthly community liaison meetings	
Local suppliers and service providers should get priority contracts	District Councils; traditional authorities; trader associations	District and community consultations	Local procurement preference in ESMP; Contractor required to advertise subcontracts and supply contracts locally before external procurement; CLO maintains local supplier register; quarterly local procurement report to RDA	ESMP Section J (local procurement); CEMP Section 11
Project should address existing community needs (schools, clinics, water)	Community members; district councils	Multiple community consultations	Road rehabilitation itself is the primary community benefit; project employment and procurement provides local income; coordination with district councils on community infrastructure investment; separate government budget allocation for social services development — not within scope of this road project; noted for district council development planning	ESMP Section J; District Council coordination minutes
Compensation paid for graves and cultural sites should follow community custom	Traditional authorities; community elders; NHCC	Traditional authority consultations	Community-led grave mapping before any demarcation; no grave or sacred site disturbed without family and traditional authority consent; NHCC oversight; all ceremonial costs borne by project; relocation only to community-chosen site	RAP Section 8.13; CHMP
Road safety during and after	Communities; schools; RTSA;	All consultations	Construction-phase TMP with flagmen, speed limits,	ESMP Section G; road design

Issue Raised	Stakeholder(s)	When Raised	ESIA/ESMP/RAP Response	ESIA Reference
construction must improve	district councils		pedestrian bypasses; school zone special measures; RTSA coordination on road safety standards; post-construction rumble strips, guardrails, school zone signs; road safety education programme with RTSA	standards
Women must have equal access to employment and compensation	Women's groups; gender NGOs	Women's FGDs; NGO consultations	20% female workforce target; compensation paid directly to asset holder regardless of gender;	ESMP Section J; RAP entitlement matrix
			women-only consultation options; CLO support for women navigating compensation process; gender-disaggregated monitoring	

2.32 Disclosure and Public Comment Period Plan

Following submission of the Draft ESIA to ZEMA, a formal 30-day public disclosure and comment period will be conducted in compliance with Section 31 of the Environmental Management Act No. 12 of 2011 and ZEMA EIA Regulations (SI 28/1997). The disclosure plan is designed to ensure that the broadest possible range of stakeholders — including those with limited literacy, limited internet access, and limited mobility — have genuine opportunity to review the ESIA and submit comments.

Physical copies of the Draft ESIA (full document) will be deposited at: RDA Headquarters, Lusaka; ZEMA Headquarters, Lusaka; Mwinilunga District Council offices; Kabompo District Council offices; Manyinga District Council offices; Solwezi District Council offices; and at the ZBCL project office in Solwezi. Digital copies will be made available on the RDA website (www.rda.org.zm) and on the financing institution's environmental and social disclosure portal. Non-technical summaries of the ESIA in English, Luvale, and Luchazi — written at a level accessible to non-specialist readers — will be distributed through all traditional authority offices along the corridor, printed and distributed at all community information sessions during the public comment period, and broadcast as audio summaries on Radio Mwinilunga and Radio Kabompo. The audio summaries will be produced by CLOs fluent in Luvale and Luchazi. Written comments may be submitted to: ZEMA Director of EIA (postal address and email on ZEMA website); RDA E&S Officer (direct email to be published with the disclosure notice); any District Council office; or any CLO (who will transcribe verbal comments and submit in writing). The deadline for receipt of comments is 30 days from the date of the formal ZEMA public notice. All material comments received will be reviewed, responded to, and incorporated into the Final ESIA response matrix. A summary of all public comments received and ZBCL's responses will be published on the RDA website within 30 days of the close of the comment period.

2.33 Community Liaison Officer Terms of Reference

The two Community Liaison Officers (CLOs) are among the most critical personnel for the project's social performance. Their Terms of Reference are summarised below to provide transparency to communities about their role and to set expectations for CLO engagement:

- Competency requirements: Fluency in Luvale and Luchazi (written and spoken); minimum secondary school education; demonstrated experience in community development or social work in North Western Province; female CLO appointed as one of the two positions to enable women's access to gender-sensitive support.

- Primary functions: Community consultation and information dissemination on all project activities, schedules, and changes; GRM intake, logging, and first-line resolution; PAP welfare support visits (monthly during construction, quarterly post-resettlement); GBV first-responder training and referral pathway management; worker-community liaison; traditional authority and district council liaison.
- Accountability: CLOs report to the ZBCL Social Specialist; monthly CLO activity reports submitted to ZBCL; CLO community engagement records maintained in the project Consultation Register; CLO contact details (phone numbers and community meeting schedules) publicly posted in all project-affected communities.
- Ethics and confidentiality: CLOs are bound by a professional Code of Conduct including confidentiality of PAP personal information; non-discrimination in provision of services; impartiality in GRM management; and mandatory reporting of any GBV incident to the GBV Service Provider within 4 hours of receipt of complaint.

2.34 Community Consultation — Detailed Meeting Summaries

The following section provides detailed summaries of four representative community consultation meetings conducted during the ESIA scoping and preparation phases in May–June 2026. Full minutes, attendance lists, and photographic records for all 35+ consultation meetings conducted are contained in the Consultation Register (Annex H of the Final ESIA). These summaries demonstrate the quality and depth of community engagement conducted, and document how specific community concerns have been integrated into the ESIA, ESMP, and RAP.

2.35 Community Information Meeting — Mwinilunga Boma

Date: 3 June 2026 | Attendees: 72 (38 women, 34 men); traditional authority representatives; district council officers; health facility staff; school headteachers

2.35.1 Issues Raised and ZBCL Responses

Issue Raised	Discussion and ZBCL Response
Road rehabilitation scope and timeline	Community members asked for clarity on when construction would start and how long it would take. CLO confirmed estimated construction start mid-2027, 18–24 months duration. Community expressed strong positive support for the project.
Employment expectations	Strong demand from youth groups and local men for employment. CLO explained the 30% local labour commitment and described the recruitment process through community notice boards and traditional authority channels.
GBV and worker behaviour	Multiple women raised concerns about worker behaviour in the community based on experiences with previous projects. ZBCL Social Specialist explained the GBV Code of Conduct, the GBV Service Provider, and the confidential reporting line. Women expressed appreciation that this had been thought about.
Sacred sites near the road	Headman Kakoma identified a sacred tree at the roadside near km 207 that must not be disturbed. CLO noted the location (GPS recorded) and confirmed it would be mapped as an exclusion zone.
Compensation for roadside businesses	Roadside traders asked about compensation for temporary business disruption during construction. ZBCL confirmed that access to all roadside businesses would be maintained throughout construction and that compensation for documented income loss would be paid where access is blocked.
Dust and noise from construction	Community members living near the road expressed concern about dust and noise. ZBCL explained water bowring, speed limits, and working hours

Issue Raised	Discussion and ZBCL Response
	restrictions.

2.36 Community Information Meeting — Kabompo Boma

Date: 5 June 2026 | Attendees: 58 (29 women, 29 men); Chief Kanongesha's representative; Kabompo District Council Environmental Officer; Rural Health Centre nurse-in-charge

2.36.1 Issues Raised and ZBCL Responses

Issue Raised	Discussion and ZBCL Response
Kabompo River bridge replacement	This was the dominant concern — the existing bridge is restricted to light vehicles and many community members rely on it to cross with produce and goods. ZBCL confirmed bridge replacement is included in the project scope and the crossing will be maintained during construction through a temporary crossing.
Fish spawning season protection	Fishing community representatives requested that no in-stream works occur during the November–January fish spawning season on the Kabompo River. ZBCL confirmed this is already included as an ESMP requirement.
Market access during construction	Traders who rely on weekly market at Kabompo asked how market access would be maintained. ZBCL confirmed that the Traffic Management Plan will maintain at least single-lane access at all times.
Graves near the road south of town	Three community elders identified a cluster of graves approximately 80 m south of the Kabompo Boma access road junction, within the RoW. CLO recorded locations (verbal description; GPS to be confirmed by community-led mapping).
School children safety	Headteacher of Kabompo Primary School expressed concern about heavy vehicle traffic near the school. ZBCL confirmed school zone speed humps, flagmen during school hours, and school safety liaison officer as ESMP requirements.
Women's compensation rights	Women's group leader asked specifically whether women who cultivate land would receive compensation even if the land title is registered to a male family member. ZBCL confirmed that the RAP pays compensation for crops and improvements directly to the person cultivating the land, regardless of who holds title.

2.37 Community Information Meeting — Manyinga Boma

Date: 8 June 2026 | Attendees: 44 (22 women, 22 men); village headmen from 6 villages; Manyinga District Council Social Welfare Officer

2.37.1 Issues Raised and ZBCL Responses

Issue Raised	Discussion and ZBCL Response
Remote village access during wet season	Remote village representatives from sections with no all-weather access reported up to 5 months complete isolation annually. Strong emotional support expressed for road rehabilitation. One elderly woman stated that her husband had died en route to hospital during the rainy season.
Borrow pit siting near	Communities asked that borrow pits not be sited close to villages due to

Issue Raised	Discussion and ZBCL Response
villages	noise, dust, and land loss. ZBCL confirmed that borrow pits must be minimum 500 m from the nearest dwelling and subject to environmental and social screening before approval.
Cassava market access	Farmers discussed the severe impact of wet season road inaccessibility on cassava prices. Farmers reported receiving 40–50% less per bag at farm gate during wet season compared to dry season when buyers can access villages.
Traditional ceremonies and construction scheduling	Chief Ntambu's representative asked that construction scheduling respect the Mukanda initiation season. ZBCL confirmed that construction noise near any active Mukanda site would be stopped during the ceremony period, and community notification of scheduled ceremony periods was requested.
HIV/AIDS programme details	The District Council Social Welfare Officer asked about the HIV/AIDS programme. ZBCL provided details of the mandatory monthly awareness sessions, VCT access at camps, and condom provision, and agreed to share programme information with the District Health Office.
Local supplier procurement	Community businesspeople asked how they could participate in supplying food, building materials, and services to the contractor. ZBCL explained the local procurement preference policy and agreed that a Local Supplier Registration exercise would be conducted before construction mobilisation.

2.38 Women's Focus Group — Mwinilunga District (combined session)

Date: 4 June 2026 | Attendees: 14 women; 25–52 years age range; mix of married, widowed, and single; subsistence farmers, fisherwoman, trader

2.38.1 Issues Raised and ZBCL Responses

Issue Raised	Discussion and ZBCL Response
GBV and SEA risk — primary concern	All 14 participants identified GBV risk from worker influx as their primary concern. Several described negative experiences with workers from a telecommunications project that worked in the area several years ago. Strong call for zero tolerance and strict camp rules.
Compensation paid directly to women	All participants agreed that compensation for crops must be paid directly to the woman who cultivates the field, not to a male household head who may use the money for other purposes. This is now incorporated in the RAP entitlement matrix.
Night safety near worker camps	Participants expressed concern about safety walking at night near contractor camp areas. ZBCL noted this concern for camp siting criteria (camps minimum 2 km from nearest settlement).
Water supply during construction	Several women noted that they currently collect water from streams near the road during the dry season. They asked that construction not block or pollute these streams. ZBCL confirmed water quality monitoring and access maintenance requirements.
Women's employment opportunities	Several participants expressed interest in employment, noting that the 20% female workforce target was positive but asked how it would be achieved given that most construction roles are traditionally male. ZBCL discussed the skills training programme and administrative and catering roles that women would be considered for equally.

Issue Raised	Discussion and ZBCL Response
Social cohesion concerns	Older women expressed concern that the influx of young male workers would disrupt existing social norms and relationships within communities. CLO committed to monthly women-only consultation sessions throughout construction as a monitoring and support mechanism.

2.39 ESIA Scoping Meetings — Consultation Record (July 2026)

Two ESIA scoping meetings were held in July 2026 to present the project and the proposed Terms of Reference to stakeholders and to obtain their input on the scope of the assessment. Scoping Meeting SM-01 was held at Mwinilunga Council Chambers on 10 July 2026 (14:00–16:30 hrs), and Scoping Meeting SM-02 at Shilenga Community Hall, Manyama, on 15 July 2026. Both meetings were facilitated by the Consultant's Environmental and Social Specialist, Mr Mwemena Mukonde, supported by the ESIA team, and were attended by district officials (including the District Commissioner and Council engineering staff), traditional leadership, community representatives and other stakeholders, with attendance recorded in signed registers. Full minutes of both meetings, the supervision team attendance record and a photographic record (including the signed community register) are annexed as proof of public consultation (Sections 11.17–11.19).

Principal issues raised and responses recorded:

- **Compensation and resettlement:** Stakeholders at both meetings sought assurance on compensation for properties, businesses and crops along the corridor, RAP timing and the cut-off date. It was confirmed that Government will undertake the RAP, valuation and compensation before construction affects Project Affected Persons.
- **Environmental nuisances:** Dust, noise, vibration and pollution during construction were identified as principal concerns; dust suppression (including watering of roads) will form part of the Contractor's Environmental Management Plan.
- **Borrow pits:** Communities requested proper management and rehabilitation of borrow pits and restoration of access roads after use; the commitment to manage and rehabilitate all pits was recorded.
- **Road safety:** Traffic safety during construction — particularly the safety of children in settlements along the corridor — and the management of deviations were raised; safety was emphasised as central to the project design.
- **Local employment and participation:** Preference for local labour and local subcontractors was encouraged, with approximately 30% of subcontract opportunities intended for local contractors.
- **Social infrastructure and services:** Requests were recorded for consideration of health facilities, street lights, roundabouts and bypasses, and for strengthened HIV/AIDS awareness programmes during construction.
- **Camp siting:** Traditional leaders and the Council offered to assist in identifying suitable contractor camp locations.
- **Engagement process:** Stakeholders requested adequate notice for future engagements and availability of the road design details to the community; the Consultant confirmed that regular meetings will continue throughout the project cycle.

These issues have been carried into the Stakeholder Issues and ESIA Response Matrix (Section 2.31) and inform the impact assessment (Section 7) and the ESMP commitments (Section 8).

3.0 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

3.1 Overview

This chapter provides a comprehensive review of the national policy, legislative, and institutional framework governing environmental and social assessment and infrastructure development in Zambia, and the applicable international standards relevant to the Mutanda-Mwinilunga Road Rehabilitation Project. Together, these form the legal and policy foundation for the impact assessment, mitigation, and management measures set out in subsequent chapters of this ESIA.

3.2 National Policy Framework

3.2.1 National Policy on Environment (2007)

Zambia's National Policy on Environment (NPE) of 2007 provides the overarching policy framework for environmental governance. The NPE is founded on principles of sustainable development, the precautionary principle, the polluter-pays principle, intergenerational equity, and public participation in environmental decision-making. It requires that environmental considerations be integrated into all sectors of national development planning, including infrastructure development. The NPE recognises the risks of road infrastructure projects to soils, water resources, biodiversity, and communities and requires that these be formally assessed and managed.

3.2.2 Eighth National Development Plan (8NDP) 2022–2026

The 8NDP identifies transport infrastructure as a key priority pillar for economic development and poverty reduction in Zambia, recognising the critical role of roads in connecting rural communities to markets and services and enabling national economic integration. The 8NDP commits to increased investment in road rehabilitation and maintenance while requiring that all infrastructure investments are implemented in an environmentally and socially responsible manner consistent with Zambia's sustainable development commitments. The Mutanda-Mwinilunga Road rehabilitation is aligned with 8NDP objectives.

3.2.3 National Gender Policy

Zambia's National Gender Policy requires that all development projects mainstream gender considerations throughout the project cycle and address the differentiated impacts of projects on women and men. The RAP and ESMP have integrated gender mainstreaming throughout, including genderdisaggregated consultation processes, women's representation in stakeholder engagement and decision-making structures, gender-inclusive employment and procurement targets, and GBV prevention as a mandatory project requirement.

3.2.4 National Road Safety Policy

Zambia's National Road Safety Policy, implemented through the Road Transport and Safety Agency (RTSA), establishes commitments for road safety on all classified roads. The rehabilitation design and operational management of the T5 road are required to include road safety features — including pedestrian crossings, guardrails, school zone speed calming, adequate signage, and road safety education — in compliance with RTSA standards.

3.3 Key National Legislation

3.3.1 Environmental Management Act No. 12 of 2011 (EMA)

The EMA is the primary environmental legislation in Zambia, establishing the Zambia Environmental Management Agency (ZEMA) as the lead regulatory authority for environmental management and EIA in the country. Key provisions of direct relevance to this project include:

- Section 28: Requires EIA for prescribed undertakings, which include road rehabilitation and construction projects of the scale proposed. No prescribed undertaking may proceed without ZEMA's EIA Certificate.
- Section 29: Requires submission of an Environmental Impact Statement (equivalent to this ESIA document) meeting ZEMA's prescribed content and format requirements.
- Section 31: Requires meaningful public participation as a mandatory component of the EIA process, with a minimum 30-day public comment period.
- Section 98: Prohibits discharge of pollutants to the environment without an Environmental Protection Order from ZEMA.
- Section 101: Requires prevention of soil degradation and requires restoration of degraded land.
- Part IX: Establishes environmental emergency response and liability requirements, including immediate reporting obligations for environmental incidents.

3.3.2 EIA Regulations — Statutory Instrument No. 28 of 1997 (as amended)

The EIA Regulations establish the procedural framework for EIA in Zambia. Road projects are classified as prescribed undertakings requiring full EIA. The prescribed procedural steps are: (1) Project Brief submission to ZEMA; (2) ZEMA scoping decision and Terms of Reference; (3) preparation of full Environmental Impact Statement; (4) submission to ZEMA with public participation report; (5) minimum 30-day public review period; (6) ZEMA technical review and decision; (7) issuance of EIA Certificate with conditions; (8) ESMP implementation as a condition of approval; and (9) post-project monitoring and compliance reporting to ZEMA.

3.3.3 Water Resources Management Act No. 21 of 2011

The Water Resources Management Act (WRMA) regulates water resource use and protection through the Water Resources Management Authority (WARMA). Provisions of direct relevance include requirements for water use licences for river sand abstraction, construction water extraction from rivers and boreholes, and pump irrigation; prohibitions on pollution of water resources; minimum environmental flow requirements for rivers; and requirements for WARMA consultation and permits for works in or adjacent to watercourses. All construction water sources for this project will require WARMA permits before abstraction commences.

3.3.4 Lands Act (Cap. 184) and Land Acquisition Act (Cap. 189)

The Lands Act governs land tenure in Zambia, recognising leasehold title over State Land and customary tenure under traditional authorities. All land in Zambia is vested in the President of Zambia; individuals hold leasehold interests for up to 99 years on State Land, or customary rights on customary land governed by traditional authorities. The Land Acquisition Act provides the legal basis for compulsory acquisition of land for public purposes, including road development, and establishes the right of affected persons to prompt and adequate compensation. A key gap between Zambian land law and international standards (World Bank ESS5) is addressed in the RAP gap analysis (see Section 3.6).

3.3.5 National Heritage Conservation Commission Act (Cap. 173)

The NHCC Act establishes the National Heritage Conservation Commission and provides for the protection and management of Zambia's cultural heritage resources. The Act prohibits development within designated National Monuments or Heritage Sites without prior written consent of the NHCC.

Critically, the Act requires notification to the NHCC upon discovery of any archaeological or heritage material during construction (Chance Find Procedure), and works must stop and not resume until the NHCC provides clearance. The NHCC must be consulted before commencement of any works in areas identified as archaeologically sensitive.

3.3.6 Zambia Wildlife Act (No. 14 of 2015)

The Zambia Wildlife Act regulates wildlife conservation and management, establishes National Parks and Game Management Areas (GMAs), and prohibits hunting, trapping, or collection of wildlife

species without licence. Consultation with the Department of National Parks and Wildlife (DNPW) is required where road works may affect wildlife habitats, movement corridors, or GMAs. Anti-poaching measures in the ESMP directly address obligations under this Act.

3.3.7 Forests Act No. 4 of 2015

The Forests Act regulates forest management, timber harvesting, and clearance of forest land. A Forest Clearance Permit from the Forestry Department is required where road rehabilitation involves clearance of classified forest land. All wood arising from vegetation clearance within the right-of-way must be disposed of in compliance with the Act, which prohibits burning without permit and regulates timber extraction. The Forestry Department must be consulted to confirm classified forest areas within the project corridor.

3.3.8 Occupational Health, Safety and Labour Legislation

Key labour and OHS legislation applicable to this project includes: the Occupational Health and Safety Act (Cap. 44) governing worker health and safety on construction sites; the Employment Act (Cap. 268) governing employment contracts, minimum wages, and working conditions; the Employment of Young Persons and Children Act (Cap. 274) prohibiting child labour; the Workers' Compensation Act (Cap. 271) governing compensation for work-related injuries; and the Prevention of Discrimination Act (Cap. 264) prohibiting workplace discrimination. The ESMP Labour and OHS chapter directly addresses all applicable provisions.

3.4 Institutional Framework

3.4.1 Zambia Environmental Management Agency (ZEMA)

ZEMA is the lead environmental regulatory authority in Zambia, established under the EMA 2011. ZEMA is responsible for EIA review and approval, issuance of EIA Certificates, environmental licensing, compliance monitoring and inspection, and enforcement action against non-compliant projects. ZEMA's EIA Certificate is a legal prerequisite for commencement of construction under this project. ZEMA must also be notified of any notifiable environmental incidents during construction.

3.4.2 Road Development Agency (RDA)

RDA is the implementing agency and project proponent, operating under the Ministry of Infrastructure, Housing and Urban Development. RDA was established under the Roads Act No. 12 of 2002 with the mandate to develop, maintain, and manage classified roads in Zambia. RDA holds ultimate institutional responsibility for ESIA compliance, and for ensuring that the ESMP and RAP are fully and effectively implemented through the construction supervision consultancy contract with ZBCL and the civil works contract with the Contractor.

3.4.3 Other Relevant Regulatory and Institutional Bodies

- Water Resources Management Authority (WARMA): Regulates water resource use and issues
- National Heritage Conservation Commission (NHCC): Regulates cultural and heritage resource management; issues clearances for heritage-sensitive areas.
- Department of National Parks and Wildlife (DNPW): Regulates wildlife conservation and protected areas; manages Game Management Areas.
- Zambia Forestry Department: Regulates forest clearance; issues Forest Clearance Permits.
- Ministry of Lands and Natural Resources: Land administration and oversight of land acquisition processes.
- Road Transport and Safety Agency (RTSA): Road traffic regulation, safety standards, and accident data.
- District Councils — Mwinilunga, Kabompo, Manyinga, and Solwezi: Local planning authority roles; land use planning; district health and education service delivery.
- Traditional Authorities (Chiefs and Headmen): Customary land governance; community relations; dispute resolution under customary law.

3.5 International Standards

3.5.1 World Bank Environmental and Social Framework (2018)

The World Bank Environmental and Social Framework (ESF), adopted in October 2018, establishes the World Bank's environmental and social requirements for all Bank-financed projects. The ten Environmental and Social Standards (ESS1-ESS10) relevant to this project address: assessment and management of environmental and social risks and impacts (ESS1); labour and working conditions (ESS2); resource efficiency and pollution prevention and management (ESS3); community health and safety (ESS4); land acquisition, restrictions on land use, and involuntary resettlement (ESS5); biodiversity conservation and sustainable management of living natural resources (ESS6); indigenous peoples (ESS7); cultural heritage (ESS8); and stakeholder engagement and information disclosure (ESS10). Where the World Bank ESF applies, the Bank's requirements are to be met throughout the project lifecycle.

3.5.2 African Development Bank Integrated Safeguards System (2013)

The AfDB Integrated Safeguards System (ISS), effective from 2013, comprises five Operational Safeguards (OS1-OS5) covering: environmental and social assessment (OS1); involuntary resettlement (OS2); biodiversity, renewable resources, and ecosystem services (OS3); prevention and control of pollution, hazardous materials, and resource efficiency (OS4); and labour conditions, health, and safety (OS5). Where AfDB co-financing applies, the more stringent of the Zambian national standard or the AfDB OS shall apply.

3.5.3 IFC Performance Standards and EHS Guidelines

The IFC Performance Standards on Environmental and Social Sustainability (2012) — PS1 through PS8 — and the IFC Environmental, Health and Safety (EHS) General Guidelines provide internationally recognised benchmarks for environmental and social risk management in private sector and infrastructure projects. The IFC EHS Guidelines for Construction and Operation of Roads provide specific technical guidance directly applicable to this project, including quantitative standards for noise, air quality, water quality, and OHS performance.

3.5.4 Other International Instruments

Other international environmental conventions and instruments relevant to this project to which Zambia is a signatory include: the Convention on Biological Diversity (CBD) — biodiversity protection obligations;

the Ramsar Convention on Wetlands — wetland protection obligations for internationally significant wetlands; the United Nations Framework Convention on Climate Change (UNFCCC) — climate change adaptation and mitigation; and the ILO Core Conventions on labour rights, child labour, and forced labour.

3.6 Gap Analysis: National Law versus International Standards

The table below identifies key gaps between Zambian national legislative requirements and applicable international standards, and the specific gap-filling measures adopted in this ESIA, ESMP, and RAP.

Topic	National Standard	International Standard & Gap-Filling Measure
Compensation Valuation	Depreciated replacement value; no explicit full replacement cost requirement under Land Acquisition Act	World Bank ESS5 requires full replacement cost (no depreciation deduction, no transaction cost deductions). Gap-filled: RAP applies full replacement cost using current market surveys and ZIEA-licensed valuation.
Non-titled	No explicit entitlement in national law	ESS5 requires compensation for structures

Topic	National Standard	International Standard & Gap-Filling Measure
Occupants	for informal occupants or squatters	and assets (not land) for all occupants present before cut-off date regardless of tenure. Gap-filled: RAP includes all occupants present before census cut-off date as eligible PAPs.
Livelihood Restoration	No requirement beyond cash compensation under Land Acquisition Act	ESS5 and AfDB OS2 require livelihood restoration programmes for economically displaced PAPs. Gap-filled: RAP includes structured Livelihood Restoration Programme with income recovery monitoring.
GBV / SEA Prevention	No specific regulatory requirement for GBV prevention in construction projects	IFC PS2 and WB ESS4 require GBV prevention measures. Gap-filled: ESMP includes mandatory Code of Conduct, designated GBV Service Provider, and survivor-centred confidential referral pathway.
Outcome-Based Monitoring	Output-based compliance monitoring standard in national EIA practice	ESS1 requires outcome-based monitoring including measuring actual environmental and social conditions against baseline. Gap-filled: ESMP includes outcome indicators such as PAP livelihood recovery rate and community satisfaction surveys.
Disclosure Requirements	EIA disclosure under ZEMA procedural requirements (30-day comment period)	WB ESS10 and AfDB OS1 require broader information disclosure including accessible formats and local language summaries. Gap-filled: ESIA includes non-technical summaries in English, Luvale, and Luchazi; community radio announcements; and hard copy deposit at district levels.
Indigenous Peoples	No specific legislation for indigenous peoples in Zambia	WB ESS7 may apply where there are communities with characteristics of indigenous peoples (particularly regarding Basarwa or other minority groups along
		corridor). Gap-filled: Detailed social mapping in RAP to identify any such communities; culturally appropriate consultation methods applied.

In all cases where a gap exists between national law and applicable international standards, this ESIA, ESMP, and RAP apply the higher standard, consistent with the requirements of the financing institution and RDA's commitment to international best practice.

3.7 Legal Framework — Permits And Approvals

3.8 Permits and Approvals Register

The table below identifies all permits, licences, and regulatory approvals required for the project, the responsible issuing authority, the timing requirements, and the action party responsible for obtaining

each approval. This register will be maintained as a live tracking document throughout the project, with status updates in each monthly E&S Monitoring Report.

Permit / Licence / Approval	Issuing Authority	Timing	Requirements	Status	Responsible
ZEMA Environmental Impact Assessment Certificate	ZEMA	Required before construction commencement	This ESIA report and public consultation process	Required	ZBCL (on behalf of RDA)
Water Abstraction Licences (for all construction water sources)	WARMA	Before any water abstraction commences	Applications to be submitted during detailed design; WARMA requires site assessment	Required for each source	Contractor (coordinated by ZBCL)
Forest Clearance Permit	Zambia Forestry Department	Before vegetation clearance in classified forest areas	Application with vegetation survey of classified forest areas within RoW	Required for classified forest portions only	RDA / Contractor
Explosives Licence and Blasting Permit	Zambia Police Service (Explosives section)	Before any blasting activities commence	Application by licensed blasting contractor; site-specific permits per blast event	Required if rock blasting needed	Contractor (licensed blasting specialist)
NHCC Clearance for Heritage-Sensitive Areas	National Heritage Conservation Commission	Before works commence in heritage-sensitive areas identified in pre-construction survey	Pre-construction cultural heritage survey findings submitted to NHCC for review	Required for identified sensitive areas	ZBCL / Contractor
Borrow Pit Environmental Management Certificate (if required by ZEMA)	ZEMA	Before any borrow pit opens	Application supported by site-specific environmental assessment for each site	Required if ZEMA determination requires	Contractor (coordinated by ZBCL)
Land Access Agreements (temporary construction easements)	Ministry of Lands / Traditional Authorities	Before any temporary access to private or communal land beyond RoW	Negotiated with landholders and traditional authorities; compensation agreed	Required for all off-RoW temporary access	Contractor (coordinated by RDA/ZBCL)
Occupational Health and Safety Registration	Health and Safety Inspectorate (Ministry of Labour)	Before construction commencement	Site registration with OSH Inspectorate; appointment of certified Safety Officer	Required	Contractor

3.9 Compliance Obligations Register

The following compliance obligations, drawn from Zambian national legislation and applicable international standards, are of direct relevance to the Mutanda-Mwinilunga Road Rehabilitation Project and shall be tracked through the ESMP compliance monitoring system. This section provides additional detail on key obligations beyond the requirements summarised in Section 3.1–3.6.

3.9.1 EMA Section 98 — Prohibition on Environmental Pollution

Section 98 of the Environmental Management Act No. 12 of 2011 prohibits the discharge of any pollutant to the environment in excess of the standards prescribed by ZEMA. Specific compliance obligations for this project include: no fuel or chemical spill may be allowed to reach any watercourse or groundwater without immediate containment and remediation; all construction wastewater (including concrete washwater, vehicle washing, and camp grey water) must be collected and treated before discharge; no solid waste may be dumped in any watercourse, dam, drainage channel, or public land; and all emissions from construction plant must comply with Zambia's national ambient air quality standards as specified in the EMA and subsidiary regulations.

3.9.2 Land Acquisition Act (Cap. 189) — Prompt and Adequate Compensation

The Land Acquisition Act requires that any person whose land is compulsorily acquired for public purposes is entitled to prompt and adequate compensation. "Prompt" is interpreted as payment of compensation before physical displacement. "Adequate" is interpreted in this project, consistent with World Bank ESS5, as full replacement cost without depreciation deduction. Any dispute about the adequacy of compensation is subject to appeal to the Lands Tribunal under Zambian law. The RAP fully complies with these requirements while applying the higher international standard of full replacement cost.

3.9.3 NHCC Act — Chance Find Obligations

Section 18 of the National Heritage Conservation Commission Act requires immediate notification to the NHCC upon discovery of any archaeological, palaeontological, or heritage material during grounddisturbing works. Works must cease at the discovery site immediately upon discovery and may not resume until the NHCC provides written clearance. The Chance Find Procedure in the CEMP directly implements this obligation. Any violation of the Chance Find requirements constitutes a criminal offence under the NHCC Act and will result in immediate project suspension until NHCC determines appropriate remedial action.

3.9.4 Employment Act (Cap. 268) — Minimum Wage and Working Conditions

The Employment Act establishes minimum wages, maximum working hours, annual leave entitlements, and other conditions of employment applicable to all workers engaged on the project. The Act prohibits discrimination in employment on grounds of sex, race, religion, or tribe. All workers must have written employment contracts in a language they understand. The Labour Management Procedure in the Contractor's CEMP must detail how compliance with all provisions of the Employment Act is maintained, including provision of payslips, written contracts, and access to the dispute resolution procedures under the Industrial and Labour Relations Act.

3.9.5 International ILO Core Conventions

Zambia has ratified the core ILO Conventions on: freedom of association (No. 87); right to organise and collective bargaining (No. 98); forced labour (No. 29 and No. 105); minimum age and elimination of child labour (Nos. 138 and 182); equal remuneration (No. 100); and non-discrimination in employment (No. 111). All Zambia-ratified ILO conventions are binding on all employers in Zambia, including the Contractor and subcontractors. The Labour Management Procedure and employment practices on this project must comply fully with all ratified ILO conventions.

3.10 International Environmental Conventions

3.11 International Environmental and Social Conventions — Detailed Review

Zambia is a signatory to numerous international environmental, human rights, and labour conventions that create legal obligations for the Government and indirectly for project proponents and developers. The following table provides a comprehensive review of the key international instruments applicable to the Mutanda-Mwinilunga Road Rehabilitation Project, Zambia's ratification status, and the specific project provisions that address each instrument's requirements.

Convention / Instrument	Zambia Status	Relevance to Project and ESIA Compliance Mechanism
Convention on Biological Diversity (CBD), 1992	Zambia ratified 1993	Requires national biodiversity strategies and action plans; environmental impact assessment of projects likely to have significant adverse effects on biodiversity; integration of biodiversity conservation into sector planning. Directly applicable to this project through the biodiversity assessment requirements of the ESIA and the ESMP biodiversity management measures.
Ramsar Convention on Wetlands, 1971	Zambia acceded 1991	Requires wise use of all wetlands; identification and protection of internationally significant wetlands (Ramsar sites). No Ramsar sites are within the project's direct area of influence. The project corridor traverses numerous dambos of local and national significance; Zambia's commitment to wetland wise use is reflected in the ESMP dambo exclusion zone and dry-season-only works restrictions.
United Nations Framework Convention on Climate Change (UNFCCC), 1992	Zambia ratified 1993	Zambia's NDC under the Paris Agreement includes commitments to maintain and enhance forest carbon stocks and to reduce deforestation. The project contributes to NDC objectives through mandatory revegetation of all cleared areas and the operational-phase land cover change monitoring programme to detect and respond to induced deforestation.
Convention on International Trade in Endangered Species (CITES), 1973	Zambia acceded 1981	Regulates international trade in threatened species and their products. Directly relevant to the project through the presence of CITES Appendix I species (African Wild Dog, African Elephant, Nile Crocodile, African Rock Python) and Appendix II species (Guibourtia coleosperma, Leopard) along the corridor. The anti-poaching Code of Conduct and worker wildlife IEC directly address Zambia's CITES obligations.
United Nations Convention to Combat Desertification (UNCCD), 1994	Zambia ratified 1997	Requires programmes to prevent land degradation in dryland environments. Borrow pit rehabilitation obligations, revegetation requirements, and soil erosion management in the ESMP directly address land degradation prevention consistent with Zambia's UNCCD commitments.
ILO Convention No. 29 — Forced Labour (1930)	Zambia ratified 1964	Prohibits all forms of forced or compulsory labour. The Labour Management Procedure and employment contracts requirements in the ESMP directly implement this convention.
ILO Convention No. 87 — Freedom of Association (1948)	Zambia ratified 1996	Protects workers' rights to organise and join trade unions. All workers on the project have the right to organise without interference from the Contractor or ZBCL.
ILO Convention No. 138 — Minimum Age (1973)	Zambia ratified 1976	Sets minimum age for employment at 15 years generally (16 for non-hazardous work; 18 for hazardous work). The ESMP child and forced labour provisions directly implement this convention.
ILO Convention No. 182 — Worst Forms of Child Labour (1999)	Zambia ratified 2001	Prohibits the worst forms of child labour including forced labour, slavery, sexual exploitation, and hazardous work for children under 18. Zero tolerance enforced through ESMP and subcontractor audit requirements.

Convention / Instrument	Zambia Status	Relevance to Project and ESIA Compliance Mechanism
African Charter on Human and Peoples' Rights (Banjul Charter), 1981	Zambia ratified 1984	Guarantees rights to a satisfactory environment, cultural development, and economic development. Relevant to the project's duty to prevent environmental harm to communities and to ensure that compensation and resettlement processes respect the human rights of affected persons.

3.12 World Bank ESF Environmental and Social Standards — Compliance Summary

The following table provides a compliance summary against each of the ten World Bank Environmental and Social Standards (ESS1–ESS10) under the Environmental and Social Framework (2018). Where the World Bank ESF applies to this project, the requirements of each ESS are to be met throughout the project lifecycle.

ESS	Standard Title	Applicability to this Project	Key Compliance Measures
ESS1	Environmental and Social Assessment and Management	Fully applicable — road rehabilitation is a Category A/B project requiring full ESIA	This ESIA document; ESMP (ZBCL/ESMP/001/2026); Environmental and Social Commitment Plan (ESCP) to be agreed with World Bank during project appraisal; quarterly monitoring reports; independent monitoring
ESS2	Labour and Working Conditions	Fully applicable — project has construction workers, CLOs, specialist consultants	Labour Management Procedure in CEMP; written employment contracts; minimum wage compliance; OHS Plan; worker grievance mechanism; child and forced labour prohibition; freedom of association
ESS3	Resource Efficiency and Pollution Prevention	Fully applicable — construction activities involve significant potential for pollution and resource use	Fuel and chemical spill prevention and response; construction waste management; wastewater treatment at camps; energy efficiency in camp operations; WARMA-licensed water abstraction
ESS4	Community Health, Safety and Security	Fully applicable — construction activities near	Road safety traffic management plan; HIV/AIDS awareness programme; GBV Code of Conduct and Service Provider;
		communities create health and safety risks	community health and safety measures; emergency response procedures; security arrangements
ESS5	Land Acquisition, Restrictions on Land Use, and Involuntary Resettlement	Fully applicable — project requires clearance of 30m RoW with physical and economic displacement	RAP (ZBCL/RAP/001/2026); full replacement cost valuation; compensation before displacement; livelihood restoration programme; RAP monitoring and completion audit; gap filling (non-titled occupants treated as eligible)
ESS6	Biodiversity Conservation and Sustainable Management of Living Natural	Fully applicable — project traverses ecologically sensitive miombo woodland and wetland landscape	Biodiversity baseline survey; vegetation clearance limits; riparian exclusion zones; dambo management; wildlife underpasses; anti-poaching Code of Conduct; invasive species

ESS	Standard Title	Applicability to this Project	Key Compliance Measures
	Resources		management; operational land cover change monitoring
ESS7	Indigenous Peoples / Sub-Saharan African Historically Underserved Traditional Local Communities	Potentially applicable — social mapping to confirm whether any communities with IP characteristics are present along corridor	Community-led heritage mapping; culturally appropriate consultation methods; traditional authority consultation; results of social mapping to determine if dedicated IP engagement plan is required
ESS8	Cultural Heritage	Fully applicable — corridor traverses culturally sensitive landscape with graves, sacred sites, and archaeological potential	Pre-construction cultural heritage survey; NHCC exclusion zones; Chance Find Procedure; Cultural Heritage Management Plan; traditional authority consent for any heritage-sensitive works
ESS9	Financial Intermediaries	Not applicable — no financial intermediary involvement in project structure	N/A
ESS10	Stakeholder Engagement and Information Disclosure	Fully applicable — project has large and diverse affected stakeholder base	Stakeholder Engagement Plan; multiple consultation methods; community information sessions; GRM; ESIA public disclosure plan; non-technical summaries in Luvala and Luchazi; ongoing monthly community liaison

4.0 PROJECT DESCRIPTION

4.1 Project Overview

The proposed project involves the rehabilitation of approximately 214 km of the Mutanda to Mwinilunga Road (Main Road T5) in North Western Province, Zambia. The road corridor runs generally westward from Mutanda town through Manyinga District into Mwinilunga District, terminating at Mwinilunga Boma near the border with the Democratic Republic of Congo. The corridor passes through or near several significant settlements including Mutanda, Manyinga, Kabompo, and Mwinilunga, as well as numerous smaller villages and chiefdom administrative centres under the jurisdiction of multiple traditional authorities including Chiefs Nyakulenga, Kanongesha, Ntambu, Chibwika, and Ikelenge. The rehabilitation project is procured under Contract RDA/CS/ONS/004/023, with Zulu Burrow Consulting Limited (ZBCL) providing consultancy services for detailed designs, tender documents preparation, and construction supervision. The civil rehabilitation works will be separately procured through competitive tender following finalisation of ESIA, RAP, and detailed designs. Works Contract Documents reference: WCD-RH-214KM-MUTANDA-MWINILUNGA-ROAD-LOT-1-UNIK.

4.2 Current Road Condition

The existing road was originally gravel-surfaced and has not received significant rehabilitation for an estimated 15 to 20 years. A detailed condition assessment of the full 214 km corridor was conducted by the ZBCL design team during 2025 as part of the road design study. The principal deficiencies identified along the corridor are:

- Severely deteriorated gravel surface with extensive potholing, corrugation, and loss of camber across multiple sections, resulting in high vehicle operating costs, slow travel speeds, and road safety hazards.
- Failed road pavement layers in numerous sections, caused by repeated water infiltration through the unprotected gravel surface, combined with inadequate drainage infrastructure and the high rainfall environment of North Western Province.
- Blocked, silted, or collapsed culverts causing frequent road flooding and prolonged wet-season impassability at numerous crossing points along the 214 km corridor.
- Eroded and degraded roadside drainage channels (side drains, mitre drains, catch drains) in poor to failed condition along significant portions of the corridor.
- Reduced carriageway width due to shoulder erosion, loss of material, and vegetation encroachment in lower-traffic sections.
- Structurally deficient bridges, drifts, and low-water crossings at several locations that restrict heavy vehicle passage and are at risk of complete failure.
- Vegetation encroachment within the 30-metre right-of-way reducing sight lines and contributing to further pavement deterioration through root damage, moisture retention, and loss of drainage. The road is passable for most vehicle types during the dry season (May to October) but becomes severely restricted or completely impassable in many sections during the rainy season (November to April), effectively isolating communities from markets, health facilities, and other services for extended periods annually. This seasonal inaccessibility imposes severe economic and social costs on communities throughout the corridor.

4.3 Right-of-Way and Legal Status

The legal right-of-way (RoW) for Main Road T5 is 30 metres (15 metres either side of the road centreline) as established under the Roads and Road Traffic Act, Chapter 464 of the Laws of Zambia. In many sections along the 214 km corridor, the actual cleared and maintained width is substantially narrower than the legal 30-metre RoW, due to historical vegetation encroachment and the absence of adequate roadside drainage maintenance. Rehabilitation works will require clearance to the full 30-metre legal RoW width in most sections, to enable proper drainage construction, shoulder works, and future maintenance access. In urban, peri-urban, and settlement areas, the precise RoW boundary

requires formal survey during detailed design to establish with certainty. Any structures, assets, crops, or trees located within the legally designated 30-metre RoW are addressed through the Resettlement Action Plan (ZBCL/RAP/001/2026). No expropriation of land beyond the established 30-metre RoW is anticipated, except for temporary construction easements for borrow pits, haul roads, and contractor facilities, which will be subject to negotiated temporary access agreements with landowners and compensation for any damages.

4.4 Proposed Rehabilitation Works

4.4.1 Pavement Rehabilitation

Principal pavement rehabilitation works along the full 214 km corridor include the following:

- Full subgrade preparation and stabilisation in failed sections, including excavation and removal of unsuitable, water-damaged, or expansive subgrade material and replacement with approved selected granular fill, compacted to design specifications.
- Reconstruction of sub-base and base course layers using selected granular material from approved and inspected borrow pit sources, compacted to minimum 98% Modified AASHTO density.
- Application of a wearing course using Double Bituminous Surface Treatment (DBST) or an equivalent approved bituminous surface treatment on the reconstructed base layer, providing a sealed, all-weather road surface with a design life of 15 to 20 years with routine maintenance.
- Shoulder construction to a minimum 1.5-metre compacted gravel shoulder on each side of the carriageway, designed to support edge load distribution and drainage function.
- Road geometry corrections including vertical and horizontal alignment improvements at selected constrained and hazardous sections, subject to detailed design and environmental and social assessment of localised realignment options.

4.4.2 Drainage Infrastructure

Drainage rehabilitation is identified as the highest priority component of the works, given the role of drainage failure in the current pavement deterioration and wet-season impassability. Drainage works include:

- Replacement or rehabilitation of all failed or inadequate culverts along the 214 km corridor. Based on the preliminary design survey, an estimated 400 to 600 culvert structures require replacement, rehabilitation, or augmentation. Culvert sizes are designed for the 25-year return period flood flow for each contributing catchment.
- Construction of new culverts where drainage analysis identifies additional cross-drainage requirements not served by existing culvert infrastructure.
- Rehabilitation of all roadside drainage channels including side drains, mitre drains, and catch drains along the full corridor length, including lining of high-velocity sections to prevent erosion.
- Bridge assessments and rehabilitation or full replacement of structurally deficient bridges and drift crossings at identified locations. Full structural assessments of all bridges are being conducted as part of the detailed design study.
- Catch water drains and energy dissipators at high-erosion risk locations including cut slope bases and embankment toes.
- Drift improvements and low-water crossing upgrades where hydraulic analysis confirms adequacy, or replacement with culvert crossings where drifts are inadequate.

4.4.3 Earthworks

Earthworks required for the rehabilitation include:

- Cut and fill operations for road realignment at selected constrained sections, grade corrections to improve longitudinal drainage, and construction of side and catch drains.

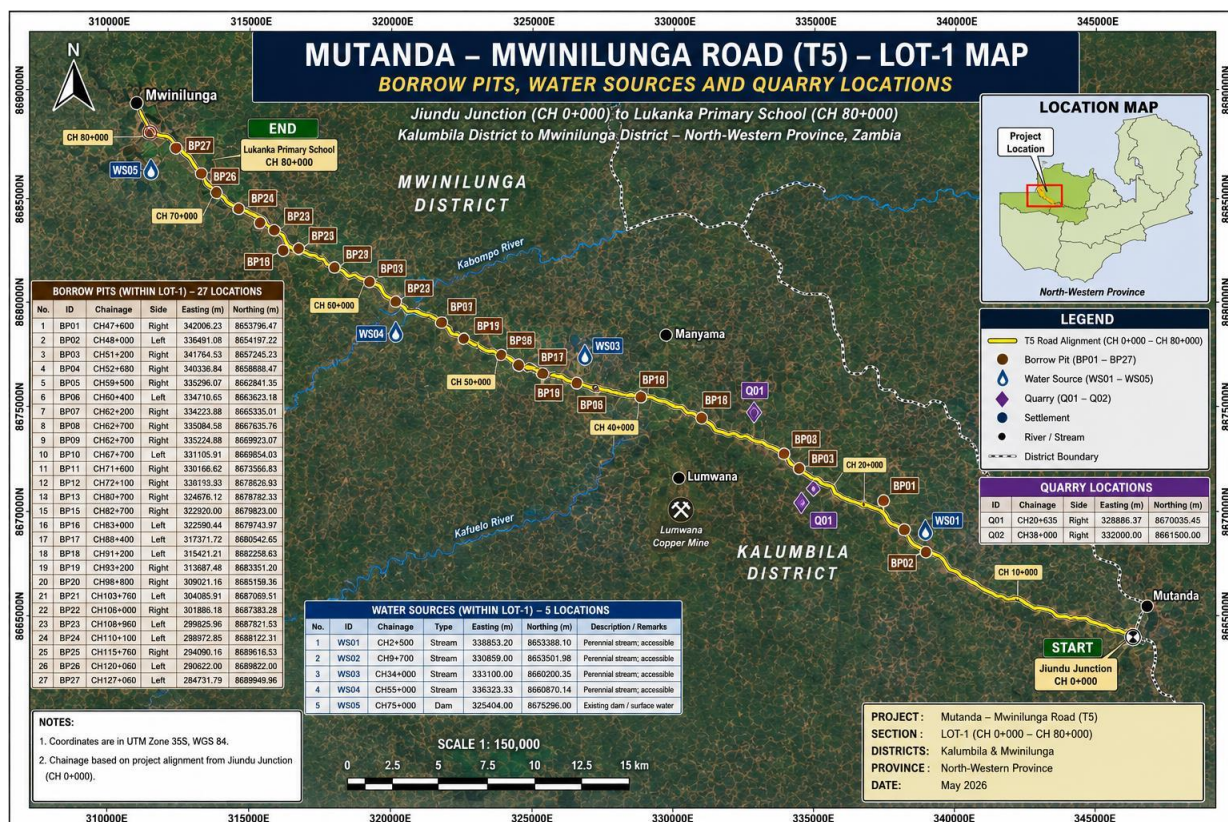
- Excavation of unsuitable subgrade material in failed sections and replacement with approved granular fill, including removal and off-site disposal of expansive black cotton soils where encountered.
- Embankment construction through low-lying, swampy, and dambo crossing sections where raising the road grade is required for drainage and wet-season access. Embankment design in sensitive wetland areas will minimise footprint while maintaining hydraulic connectivity.
- General grading and shaping of the existing carriageway and shoulders, camber reinstatement, and preparation for overlay works.

4.4.4 Borrow Pits and Material Sources

The rehabilitation requires substantial quantities of gravel, sand, and stone. Material sources will include:

- Roadside borrow pits: An estimated 27 borrow pit sites distributed along the first 80km (LOT-1) corridor are identified, each requiring a site-specific Borrow Pit Management and Rehabilitation Plan (BPMRP) approved by ZBCL before excavation commences. Potential borrow pit sites will be identified during detailed design, assessed for material quality, and subjected to environmental and social screening before approval.
- Rock quarries: Crushed stone and aggregate for drainage structures, concrete works, and where granular sub-base material quality requires supplementation. Licensed quarry operations subject to site-specific management plans.
- River sand abstraction: Licensed from approved sources subject to WARMA water use permits and site-specific management to control extraction quantities and protect bankside vegetation and aquatic habitats.

Below is a detailed map showing the locations of 27 burrow pit sites along the 80Km corridor for Lot-1 of the road construction.



A joint material and water source investigation was undertaken for the first 80 km (Lot-1) of the alignment, from Jiundu Junction (on the road towards the FQM mine, Kalumbila District) to Lukanka Primary School in Mwinilunga District. The first survey was conducted from 8 to 14 April 2026, with a follow-up joint verification on 16 July 2026 (08:00–15:00 hrs) attended by the Consultant's

representative (Zulu Burrow Consulting Limited) and the Contractor (Unik Construction Zambia Ltd). The investigation covered the entire 80 km alignment extending 200 m to both sides of the route, with reference to the preliminary design documents of the construction drawings. Its purpose was to identify the distribution, extraction and usage conditions of available material and water sources to meet project commencement requirements; detailed reserves and material quality will be further verified by professional technical personnel after the project department mobilises to site.

Table: Lot-1 Borrow Pit Register — Joint Material Source Investigation (2026)

Material Source No.	Location	Quality Testing	Estimated Reserves Area	Land Ownership	Extraction Conditions	Google coordinates	Maps UTM
1	CH47+600, Right side 950m	Test Pending	14,000 m ²	Community	Relatively good; existing access road available	E=342006.23 N=8653796.47	
2	CH48+000 Left side 4800m	Test Pending	20,566m ²	Customary Land	Access road Needs to work on it	E=336491.08 N=8654197.22	
3	CH51+200 Right side 640m	Test Pending	18,000m ²	Customary Land	Access road Needs to work on it	E=341764.53 N=8657245.23	
4	CH52+680 Right side 180m	Test Pending Already got the sample	56,966m ²	Customary Land	Access road needs rehabilitation	E=340336.84 N=8658688.47	
5	CH59+500 Right side 30m	Test Pending Already got the sample	9,567m ²	Customary Land	Access road to be worked on	E=335296.07 N=8662841.35	
6	CH60+400, Left side 30m	Pending test	8,000 m ²	Customary Land	Convenient	E=334710.65 N=8663623.18	
7	CH62+200 Right side 40m	Test Pending	15,285m ²	Customary Land	Access road needs rehabilitation	E=334223.88 N=8665335.01	
8	CH62+700 Right side 2000m	Test Pending	15,130m ²	Customary Land	Access road to be worked on	E=335084.58 N=8667635.76	
9	CH62+700 Right side 4000m	Test Pending	15,000m ²	Customary Land	Access road to be worked on	E=335324.88 N=8669923.07	
10	CH67+700 Left side 200m	Test Pending	15,000m ²	Customary Land	Access road to be worked on	E=331105.91 N=8669854.03	
11	CH71+600 Right side 200m	Test Pending	42,727m ²	Customary Land	Access road to be worked on	E=330166.62 N=8673566.83	
12	CH72+100, Right side 450m	Test Pending	9,800 m ²	Customary Land	Access road needs rehabilitation	E=330112.43 N=8673722.93	
13	CH77+600, Right side 260m	Test Pending	50,906m ²	Customary Land	Access road to be worked on	E=327285.50 N=8678626.93	
14	CH80+700, Right side 100m	Test Pending	6,800 + 3,500 + 2,500 m	Customary Land	Access road needs rehabilitation	E=324676.12 N=8678782.33	
15	CH82+700, Right side 40m	Test Pending	15,300m ²	Customary Land	Convenient	E=322920.00, N=8679823.00	
16	CH83+000 Left side 130m	Test Pending	20,537m ²	Customary Land	Access road to be worked on	E=322590.44 N=8679743.97	
17	CH88+400, Left side 20m	Test Pending	46,496 m ²	Customary Land	Convenient	E=317371.72, N=8680542.65	
18	CH91+200, Left side 20m	Test Pending	55,418 m ²	Customary Land	Access road to be worked on	E=315421.21 N=8682258.63	
19	CH93+200, Right side 130m	Test Pending	31,247 m ²	Customary Land	Convenient	E=313687.48, N=8683351.20	
20	CH98+800, Right side 50m	Test Pending	38,995 m ²	Customary Land	Access road needs rehabilitation	E=309021.16, N=8685159.36	

Material Source No.	Location	Quality Testing	Estimated Reserves / Area	Land Ownership	Extraction Conditions	Google Maps UTM coordinates
21	CH103+760, Left side 80m	Test Pending		Customary Land	Relatively good; existing access road available	E=304085.91 N=8687069.51
22	CH106+000, Right side 40m	Test Pending	15,349 m ²	Customary Land	Convenient	E=302553.35, N=8688254.54
23	CH109+600, Right side 50m / Left side 40m	Test Pending	11,000 m ² / 34,787 m ²	Customary Land	Access road needs rehabilitation	E=29891576, N=8689866.04
24	CH116+200, Right side 180m	Test Pending	24,000 m ²	Customary Land	Convenient	E=293549.25, N=8692699.65
25	CH119+660, Left side 100m	Test Pending		Customary Land	Relatively good; existing access road available	E=290590.30 N=8694292.48
26	CH125+400, Left side 60m	Test Pending	19,380 m ²	Customary Land	Access road needs rehabilitation	E=285947.01, N=8696296.93
27	CH129+600, Right side 190m	Test Pending	16,520 m ²	Customary Land	Convenient	E=282274.38, N=8698714.87

Table: Lot-1 Construction Water Source Register — Joint Investigation (2026)

Water Source No.	Location (Station / Lateral Distance)	Water Source Type	Water Quantity Status	Water Quality Status	Extraction / Intake Method	Google Maps UTM coordinates
1	CH50+900	Stream	Flow may be low during the dry season	Test Pending	Portable generator + Water pump	E=341265.92 N=8656669.29
2	CH58+600, Left side 1.1 km	Dam	Abundant	Test Pending	Portable generator + Water pump	E=334827.38 N=8661508.16
3	CH64+500 RHS 50m	Small stream	may be dry during the dry season	Test Pending	It can only be used during rain season	E=332941.29 N=8667226.62
4	CH65+200 LHS 3km	Stream	Abundant	Test Pending	Portable generator + Water pump	E=330328.30, N=8665661.86
5	CH77+800 LHS 100m	Stream	Abundant	In operation good water	Portable generator + Water pump	E=326869.03 N=8678552.55
6	CH91+200	Material Pit / Borrow Pit	Stagnant water may be dry during the dry season	Test Pending	Portable generator + Water pump	E=315421.21 N=8682258.63
7	CH98+200	River (Kabompo River)	Abundant	Test Pending	New access road required; Portable generator + Water pump	E=309407.14 N=8685187.78
8	CH114+000	River (Lumuwana River)	Abundant	Test Pending	New access road required; Portable generator + Water pump	E=295768.43 N=8691982.79
9	CH124+300	River	Abundant	Test Pending	New access road required; Portable generator + Water pump	E=287114.42 N=8696350.40
10	CH125+200	River	Abundant	Test Pending	New access road required; Portable generator + Water pump	E=286251.75 N=8696412.65
11	CH128+750	River	Abundant	Test Pending	New access road required; Portable generator + Water pump	E=282997.54, N=8698106.74

Crushed Stone Material Source (Quarry)

- **Locations:** (i) Lumwana East, 7 km to the right of station Km 35+220 (E=351587.57, N=8649520.01); (ii) 3.3 km to the left of station Km 65+200 (E=330551.02, N=8665967.30).
- **Traffic conditions:** An existing gravel access road is available but has not been maintained for a long time and becomes muddy in the wet season; rehabilitation of approximately 3.3 km of access road is required.
- **Topography and geomorphology:** The material source area features gentle undulations, a small slope and a rounded hilltop.
- **Reserve estimation:** Surface area approximately 60,000 m²; height approximately 3 m; effective depth and effective reserves pending investigation.
- **Blasting conditions:** No residential houses were found within a 300 m radius, indicating favourable blasting conditions.
- **Processing:** The site has ample space for stone crushing and processing equipment; there is no power supply on site, so diesel generators will be required.

Supporting materials from the investigation comprise on-site photographs of borrow pits and water sources, a location map of borrow pits and water sources (Google Earth), and quality test reports which remain pending laboratory analysis.

4.4.5 Roadside Furniture and Safety Features

Road furniture and safety installations will be provided along the full corridor including: road signs (warning, regulatory, and informational) in compliance with Zambia national road sign standards; guardrails at high-risk locations including bridge approaches, escarpments, and sharp curves; kilometre post markers at 1 km intervals; rumble strips and speed humps at settlement zones and school zones; solar-powered road reflectors at critical locations; and rest areas with parking and basic sanitation facilities at selected intervals along the 214 km corridor.

4.4.6 Contractor Facilities

The Contractor will establish the following facilities in support of construction operations:

- **Main contractor camp:** Providing accommodation for the peak construction workforce; offices and site laboratory; workshops and plant maintenance area; fuel storage with secondary containment;

recreation areas. The main camp will be located at a suitable site away from sensitive environmental areas, minimum 2 km from settlements, and subject to environmental and social screening and community consultation before establishment.

- **Satellite camps:** At remote or isolated working sections where daily travel from the main camp would be impractical, smaller satellite accommodation camps may be established, subject to the same environmental and social requirements as the main camp.
- **Material stockpile areas** at strategic locations along the corridor, with environmental controls for dust, drainage, and stability.
- **Concrete batching and mixing areas**, with appropriate environmental controls for washwater, waste material, and dust.
- **Equipment maintenance and refuelling areas** with impermeable surfaces, fuel bunding, drip trays, and spill containment equipment.

4.5 Construction Programme and Workforce

The construction period is estimated at 18 to 24 months from commencement of civil works mobilisation. Works will proceed simultaneously in multiple sections along the corridor to achieve the programme. The construction programme is structured to maximise the volume of intensive earthworks, subgrade preparation, and drainage works during the dry season months (May to October), while recognising that multi-year works will inevitably require some construction activity during the wet season. Robust environmental controls are required for all wet-season construction activities, particularly those involving earthworks and watercourse crossings. The construction

workforce is estimated to peak at approximately 300 to 500 workers across all active sections and the main contractor camp. A mandatory target of at least 30% of the total workforce recruited from local communities along the corridor has been established. Vacancies will be advertised through community channels, including traditional authority structures and local radio. Skills training will be provided to enable local recruitment for positions requiring competencies not immediately available locally. A gender-inclusive recruitment target of a minimum 20% female workers in the total workforce is established.

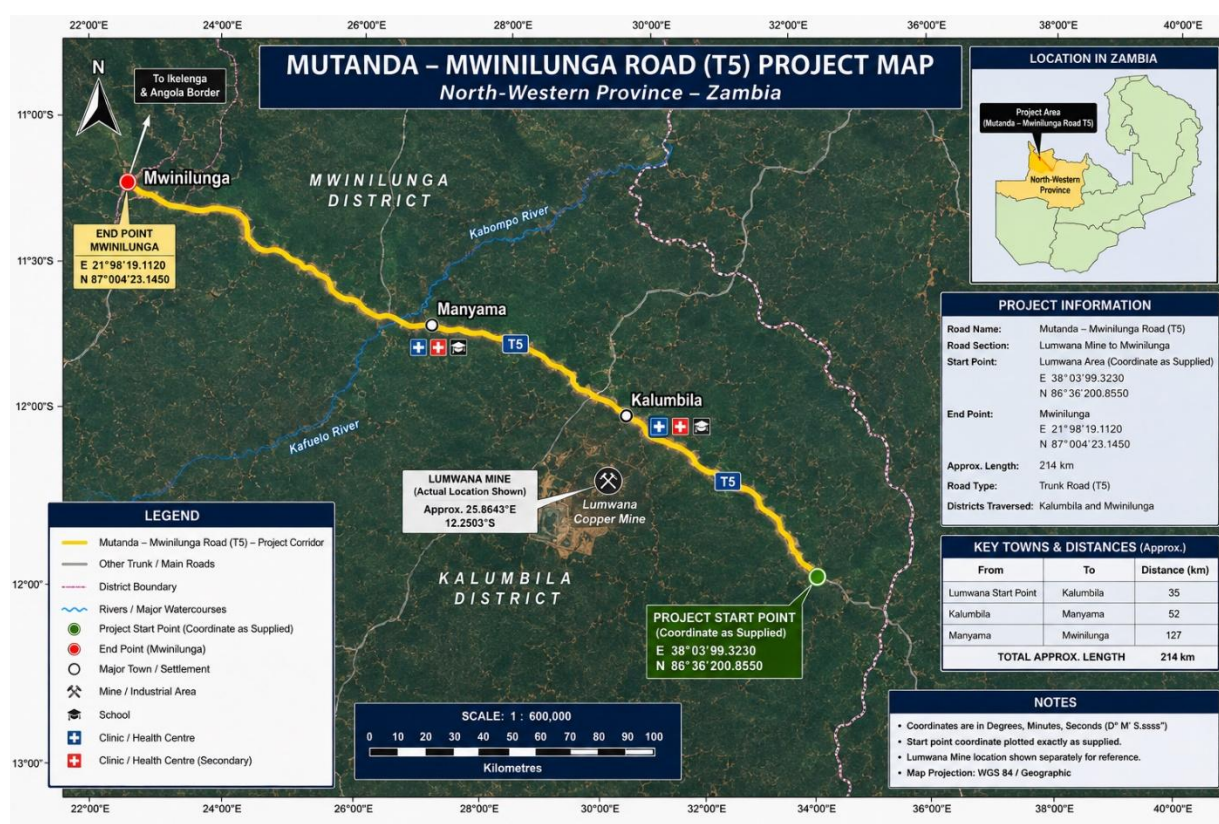
4.6 Project Location

The project corridor is located in North Western Province of Zambia, running from Mutanda town (approximate coordinates: 12°26'S, 26°08'E) westward to Mwinilunga Boma (approximate coordinates: 11°44'S, 24°25'E). The corridor passes through the chiefdoms and administrative areas of multiple traditional authorities and through or adjacent to the following significant settlements and administrative centres:

- Mutanda Town: The eastern terminus, a growing mining-service and commercial settlement approximately 25 km west of Solwezi on the T3 trunk road.
- Manyinga Boma: The administrative centre of Manyinga District, located approximately 80 km west of Mutanda along the T5 corridor.
- Kabompo Boma: Administrative centre of Kabompo District, approximately 145 km from Mutanda, at the confluence of the Kabompo and Lunga rivers.
- Mwinilunga Boma: The western terminus and administrative capital of Mwinilunga District, near the border with the DRC, approximately 214 km from Mutanda.

Below is the project location Map for the entire road corridor:

Figure 1: Project Location Map; Mutanda to Mwinilunga (T5 Corridor)



4.7 Project Cost and Financing

The rehabilitation of the Mutanda-Mwinilunga Road is a significant national infrastructure investment. The estimated civil works construction cost is K4 billion, reflecting the scale of works, the remoteness

of the corridor, and the comprehensive drainage rehabilitation required. Financing is from the Government of the Republic of Zambia.

4.8 Detailed Project Description

4.8.1 Location and Extent

The project road extends over approximately 214 kilometres through North-Western Province, from Mutanda located on the T5 west of Solwezi in the vicinity of major mining developments, to the district town of Mwinilunga. The corridor traverses rural settlements, smallholder agricultural land, woodland and trading centres, including Manyama and Kisansa, and terminates in Mwinilunga District, whose local authority is Mwinilunga Town Council. The corridor lies within areas administered under customary tenure by Lunda traditional authorities, alongside state land within townships and gazetted road reserves.

Road GPS Coordinates

Start point: Lumwana Mine, GPS Coordinates “E 38°03’99.3230, N 86° 36’200.8550” and end point at Mwinilunga, GPS Coordinate “E 21° 98’19.1120, N 87° 004’23.1450”

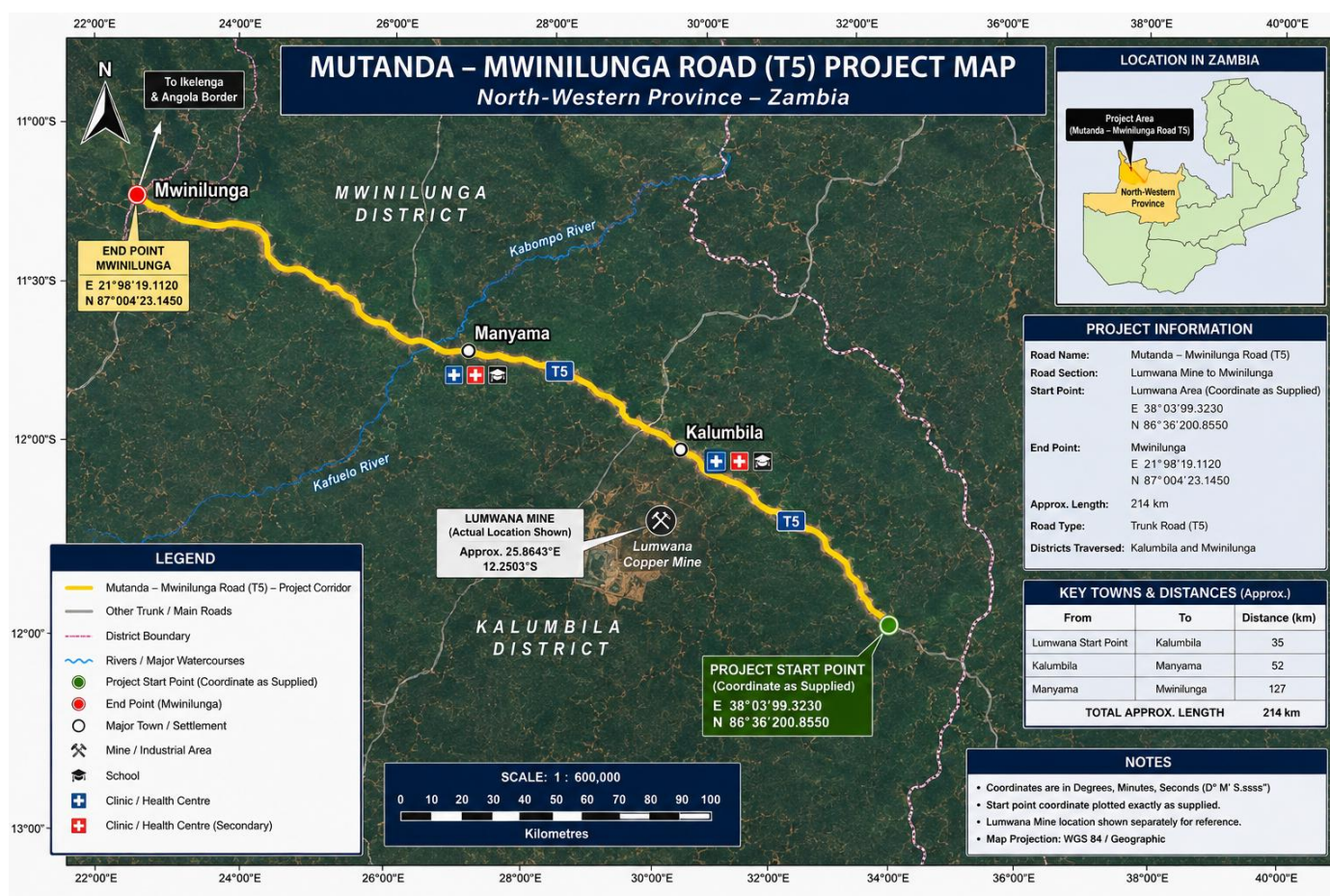


Figure 1: Project Location Map; Mutanda to Mwinilunga (T5 Corridor)

4.8.2 Design Standard and Right of Way

The road will be upgraded to a single carriageway bituminous standard designed for a service life of approximately 15 to 20 years, capable of carrying the heavy vehicle loading associated with mining and agricultural traffic. The carriageway will comprise two 3.5-metre traffic lanes with 2-metre shoulders on each side, giving a total formation width of approximately 11 meters. The right-of-way corridor (RoW) is expected to be approximately 30 to 50 meters on each side of the centreline (up to approximately 100 meters combined), within which structures will be assessed for the RAP; in built-up sections this bracket may in practice be narrowed to approximately 16 to 18 meters, with the final determination on closely-sited structures resting with the RDA following the team's structure survey. The design will incorporate drainage provision and, where possible, speed bumps and traffic lights at appropriate locations, and will address town sections, junctions and non-motorised transport needs. The RDA is assessing bridges and drainage crossings for inclusion in the works where required. Consultation at Mwinilunga recorded requests for street lighting, roundabouts and bypasses, and consultation at Manyama recorded requests for a dual carriageway or bypass at Manyama and equitable treatment of Manyama and Kisasa; the design team has confirmed the current design does not provide for a dual carriageway or bypass, and these requests have been referred to RDA for consideration, subject to budget availability. Consideration of township roads for Manyama and Kisasa, and sharing of the additional approximately 10 km of township roads between Mwinilunga and the neighbouring district of Kalumbila (following the precedent cited for the Kasempa road), has similarly been referred to RDA.

4.8.3 Construction Arrangements

The works have been packaged into three construction lots, each under a separate contractor, with construction supervision provided by ZBCL as Supervising Engineer across the entire 214 km, a role explicitly confirmed to stakeholders as extending to quality assurance and uniformity of standard across all three Lots in response to concerns raised at Manyama. The principal construction activities will comprise site clearance and topsoil stripping within the right-of-way; excavation of the existing formation to a depth of approximately 150 mm; earthworks including cut and fill; the opening and operation of borrow pits and quarries for the supply of gravel, crushed stone and other materials; haulage of materials along the corridor and access roads; backfilling in pavement layers followed by asphalt surfacing; construction of drainage structures and crossings; and reinstatement works. Traffic deviations will be established and managed during construction to maintain access for road users, with dust suppression on deviations specifically committed to through the issuance of water bowser trucks by each contractor working in the sections.

4.8.4 Ancillary Facilities

Each contractor will establish site-camps and work sites comprising offices, accommodation, workshops, equipment yards, batching and crushing plants, and fuel and bitumen storage. Camp locations will be identified in consultation with traditional leaders and the Council, as agreed during the Mwinilunga meeting, and the stakeholders request that permanent camp infrastructure be considered for community use beyond the construction phase where practical. Borrow pits will be operated under the required licenses and rehabilitated on completion, and access roads to borrow pits will be restored after use.

4.8.5 Workforce and Employment

The construction workforce will comprise skilled, semi-skilled and unskilled labour engaged by the contractors and their subcontractors. Recruitment of local labour will be encouraged, and approximately 30% of subcontract opportunities are intended for local participation where feasible, with women and youths specifically prioritized for employment opportunities and outside labour engaged only where local skills are unavailable, consistent with commitments made at both scoping meetings. Workforce management, including codes of conduct, worker accommodation standards and occupational health and safety, will be governed by the ESMP and each contractor's C-ESMP; consultation at Manyama specifically requested that the workforce be cautioned on conduct that could contribute to disease transmission or increased birth rates in host communities, and that abstinence be encouraged among project frontline workers.

4.8.6 Project Phases and Duration

The project comprises a pre-construction phase covering detailed design, the RAP census and valuation, land acquisition, compensation and site establishment; a construction phase expected to last approximately three years, a duration explained to stakeholders as reflecting not only construction activities but also the RAP process and seasonal stoppages during the rains; a defects liability period during which the contractors remain responsible for remedying defects and completing environmental reinstatement obligations; and the operational phase of the upgraded road. The ESIA will address all phases. Stakeholders at both meetings, and particularly the District Commissioner and Chiefs at Manyama, emphasized the importance of commencing works promptly and completing PAP settlement before construction affects them; the team confirmed the RAP team would return to the corridor within two weeks of the scoping meetings to begin the PAP inventory, with the RAP cut-off date to be announced once that process and compensation are complete.

4.9 Detailed Construction Methodology

4.9.1 Mobilization and Site Preparation

Construction mobilization will proceed in accordance with the approved mobilization programme, which shall be submitted to ZBCL within 14 days of contract award. The mobilization sequence is designed to ensure all environmental and social pre-conditions are met before any physical works commence. Specifically: the CEMP must be submitted and approved by ZBCL; all workers must complete safety and environmental induction training; CLOs must be deployed and the GRM operational; the GBV Service Provider must be under contract; and compensation must be verified as paid in each section before works commence there. Site preparation activities in each section include: survey pegging of the construction boundary and demarcation of all environmental exclusion zones; installation of environmental controls (silt fences, sediment traps) before any vegetation clearance; removal of existing road furniture and signage for safekeeping or disposal; vegetation clearance to the approved construction boundary using appropriate equipment (excavators and brush cutters, not burning); and topsoil stripping and stockpiling in designated areas before any earthworks operations commence.

4.9.2 Earthworks Sequence

The earthworks sequence for a typical road section is as follows: (1) topsoil strip to 150–200 mm depth and stockpile in designated windrows, protected from erosion with straw or jute matting; (2) excavation of unsuitable subgrade material (soft, waterlogged, expansive, or organic material) to the design depth, with unsuitable material hauled to designated disposal areas or borrow pit backfill subject to quality approval; (3) sub-grade preparation including scarification, moisture conditioning, and compaction to 95% MDD; (4) sub-base construction using approved granular material in 150 mm compacted layers; (5) base course construction using approved crushed aggregate or high-quality gravel in 150 mm compacted layers; (6) prime coat and bituminous surface treatment application by experienced specialist team; (7) shoulder construction in approved granular material; (8) drainage structure construction including culverts, side drains, mitre drains, and catch drains; (9) slope stabilisation and progressive revegetation.

4.9.3 Bridge and Culvert Construction

Bridge construction at major crossings follows the sequence: hydrological and geotechnical investigation; piling or foundation preparation; construction of substructure (piers, abutments, wingwalls) using in-situ reinforced concrete; erection of superstructure (precast beams, deck slab); waterproofing, expansion joints, bearings, and parapets; approach embankments and headwalls; riprap scour protection. Works in permanent rivers will use coffer dams or sandbag cofferdams to isolate the active work area from flow; work in permanent water is restricted to the dry season. Workers conducting in-stream works are required to have swimming competency, and life-saving equipment (life rings, throw ropes) are maintained at all active watercourse work sites. Culvert installation follows: removal of existing failed culvert or new excavation to design depth; bedding preparation with granular material; laying of pipe or box culvert units; haunching and backfilling in 150 mm compacted layers; headwall construction; outfall protection with riprap. All culvert installations are inspected by ZBCL before backfilling to verify line, level, joint quality, and structural condition.

4.9.4 Road Surface Treatment Application

Double Bituminous Surface Treatment (DBST) application sequence: cleaning and preparation of base surface; application of cutback bitumen or emulsion prime coat at the specified rate (0.8–1.2 l/m²); application of first bitumen layer using a calibrated bitumen distributor truck at the design temperature and rate (typically 1.2–1.6 l/m²); spreading of first chip layer using a calibrated chip spreader at the design rate; initial compaction with rubber-tyred rollers; application of second bitumen layer; spreading of second chip layer; final compaction. Bitumen temperatures must be within the specified range at point of application; works are not permitted in rain or when the road surface is wet. Excess aggregate is swept off the surface after 24–48 hours. The completed surface is inspected by ZBCL for voids, bleeding, segregation, and surface defects before acceptance.

4.10 Traffic Management During Construction

The road must remain accessible to traffic throughout the construction period. The Contractor shall prepare a Traffic Management Plan as part of the CEMP, covering: maintaining one lane of traffic flow at all active work sections using flagmen on alternating traffic control; clear signage 200 m in advance of each active section warning approaching traffic; safe pedestrian bypass routes at all settlements, maintained to a safe walking standard throughout construction; advance notification to communities and road users of section-level closure dates (minimum 48 hours); alternative routing advice for large vehicles at sections that cannot safely accommodate two-way traffic around the work face. During construction of major bridges, temporary bypasses or diversions may be necessary for periods of 1–4 weeks. Temporary ford crossings or Bailey bridges will be installed at bridge replacement sites to maintain traffic flow during the construction period. All temporary traffic diversions require CLO community notification and traditional authority consultation before implementation.

4.11 Environmental and Social Infrastructure Requirements

In addition to road rehabilitation works, the project scope includes the following environmental and social infrastructure requirements that are embedded in the civil works contract: restoration of all borrow pit sites to approved rehabilitation plans; installation of wildlife underpasses at identified wildlife movement corridor crossing points; installation of environmental monitoring infrastructure (river water quality monitoring access platforms at major crossings; borehole monitoring installations at selected community water supply boreholes); construction of temporary and permanent worker accommodation to ILO standards; and provision of camp wastewater treatment infrastructure.

4.12 Project Schedule

The indicative project schedule, subject to finalization following completion of detailed design and tender:

- ESIA and RAP preparation and submission to ZEMA: June–August 2026
- ZEMA public disclosure and comment period (minimum 30 days): September–October 2026
- ZEMA technical review and EIA Certificate issuance: October–November 2026
- Detailed design finalization and tender document preparation: July–October 2026 (concurrent with ESIA)
- Competitive tender process for civil works: November 2026–February 2027
- Civil works contract award: March 2027
- Contractor mobilization and RAP final payment verification: March–May 2027
- Civil works construction commencement: June 2027
- Targeted construction completion: December 2028 (18 months) to June 2029 (24 months)
- Defects liability period: 12 months following completion certificate
- RAP completion audit: No earlier than 12 months after final resettlement case closed

The construction programme will be developed in detail by the Contractor during mobilization and submitted to ZBCL for review and approval. The programme shall clearly identify the section-by-section sequence, anticipated wet-season construction activities and the associated environmental controls, borrow pit opening and closure schedule, and key milestone dates for ESMP compliance reporting.

4.13 Road Design Standards And Specifications

4.14 Summary of Key Design Standards

The table below summarises the principal design standards and specifications adopted for the rehabilitation works, drawn from the Updated Draft Road Design Report, the RDA Road Design Manual (2023 edition), and applicable international design standards. These design standards directly inform the ESIA assessment of project footprint, drainage impacts, and road safety outcomes.

Design Element	Design Standard / Specification	Application	Reference
Road Geometry — Horizontal Alignment	Minimum radius of horizontal curve on new alignment sections: 150 m (design speed 80 km/h); 80 m (design speed 60 km/h in constrained sections). Superelevation to be provided at all curves below 600 m radius. Sight distance to meet stopping sight distance (SSD) requirements per RDA Road Design Manual.	All new alignment and geometric improvement sections (4 locations)	Road Geometry Design Report (in progress)
Road Geometry — Vertical Alignment	Maximum longitudinal gradient: 8% on approach to bridge crossings; 10% in general sections; 12% in steep terrain. Minimum grade: 0.5% to maintain drainage function. Vertical curve lengths to meet stopping sight distance and comfort criteria.	Throughout corridor; specific steep sections near chainage km 55, km 132, km 189	Road Geometry Design Report
Carriageway Width	6.5 m carriageway (two 3.25 m lanes) in rural sections; 7.0 m in all peri-urban and settlement sections (to accommodate pedestrian and bicycle traffic). Wider carriageway at all intersection and junction areas.	Full 214 km corridor	Road Cross-Section Design
Shoulder Width	1.5 m compacted gravel shoulders each side in all sections; 2.0 m shoulders at bridge approaches and settlement entries. Shoulder material: minimum CBR 25 at 95% compaction.	Full 214 km corridor	Road Cross-Section Design
Side and Mitre Drains	Trapezoidal earth side drains with 0.5 m base width, minimum grade 0.3%; lining with concrete or grass where velocity exceeds 1.5 m/s or where soils are erodible. Mitre drains at 50–100 m intervals in level terrain; closer spacing on steeper grades.	Full 214 km corridor	Drainage Design Report
Culvert Design Standard	CSP or RCP culverts to pass 1:25 year return period design flood; hydraulic sizing per rational method with regional IDF curves; inlet control design for all culverts; minimum 600 mm diameter; headwall and wingwalls at all culverts; riprap outlet protection.	~400–600 culvert sites along full corridor	Drainage Design Report
Bridge Design Standard	Reinforced concrete design for all replacement bridges; design life 50 years; 1:100 year design flood with minimum 2 m freeboard; seismic design Zone 1 Zambia; deck designed for 45-tonne legal load limit; minimum 2-lane carriageway width.	8 major bridge/drift sites (see Section 6.4.7)	Structural Bridge Design Report (in progress)
DBST Pavement Specification	Aggregate: crushed stone 10–14 mm first layer, 6–10 mm second layer; aggregate quality: minimum PSV 50, AAV max 25, ALD max 25; bitumen: 80/100 penetration grade; application rates: bitumen 1.2–1.6 l/m ² per layer; aggregate 8–12 l/m ² per layer; ambient temperature >20°C required for application; no application in rain or on wet surface.	Full 214 km sealed surface	Pavement Design Report

Design Element	Design Standard / Specification	Application	Reference
Road Furniture and Safety	Road signs: Zambia RSM standard; chevron markers at all curves <300 m radius; guardrails: W-beam at bridges and escarpments; km posts at 1 km intervals; cat's eyes at all curves; rumble strips: 50 m approach to all settlements; speed humps (100 mm height, 3 m width): at school zones and high-pedestrian settlements; solar road studs at critical night-use locations.	Throughout corridor — see furniture schedule in design drawings	Road Furniture Design Schedule

4.15 Bill of Quantities — Principal Items (Indicative)

The following table provides an indicative summary of the principal bill of quantities items for the rehabilitation works, to assist in contextualising the scale and nature of construction activities and their associated environmental and social impacts. Quantities are preliminary and will be updated in the Final Design Report.

Item	Description	Estimated Quantity	Unit	Key Environmental Implication
1	Vegetation clearance and grubbing (full 30m RoW, 214 km)	~640	ha	Major impact driver — biodiversity and soil erosion
2	Topsoil stripping (150–200 mm average depth)	~960,000	m ³	Topsoil management critical for revegetation success
3	Bulk earthworks — cut and fill (pavement and drainage)	~1,800,000	m ³	Major erosion and watercourse sedimentation risk
4	Removal and disposal of unsuitable material (black cotton soils etc)	~350,000	m ³	Spoil disposal sites must be identified and managed
5	Borrow pit material extraction (sub-base and base course)	~900,000	m ³	15–25 borrow pit sites; major land disturbance
				and rehabilitation obligation
6	Culverts — supply and install (all diameters, all types)	~600	No.	400–600 culvert structures; key for drainage performance
7	Concrete (bridge structures, headwalls, culvert headwalls, drainage lining)	~45,000	m ³	Concrete washwater management; aggregate and sand sourcing
8	Bitumen (DBST, prime coat, tack coat)	~4,500	tonnes	Hazardous material transport and application management
9	DBST surface treatment — first and second layers	~1,500,000	m ²	Specialised application; weather-dependent; PPE for bitumen workers
10	Granular shoulders (compacted gravel)	~250,000	m ³	Additional borrow pit demand; shoulder

Item	Description	Estimated Quantity	Unit	Key Environmental Implication
				erosion management
11	Guardrails — standard W-beam on posts	~15,000	m	Road safety; installation at bridges and escarpments
12	Road markings (thermoplastic)	~1,500,000	m (linear)	Chemical application; weather conditions
13	Road signs (all types)	~2,500	No.	Procurement and installation; safety
14	Riprap (stone pitching for scour protection)	~35,000	m ³	Quarry sourcing; aquatic habitat management at crossings
15	Grass seeding and revegetation (all disturbed areas)	~800	ha	Seed mix certification; establishment monitoring

5.0 PROJECT ALTERNATIVES

5.1 Introduction

The analysis of alternatives is a fundamental requirement of the ESIA process under Zambia's EIA Regulations (SI 28/1997) and applicable international standards including World Bank ESS1. The objective is to enable project planners and decision-makers to evaluate whether the proposed project design represents the most environmentally and socially responsible approach to achieving the project's development objectives. This chapter considers five categories of alternatives: the No Action Alternative; alternative road alignments; alternative pavement design standards; alternative drainage and bridge construction approaches; and alternative material sourcing strategies.

5.2 No Action Alternative

The No Action Alternative assumes that the road rehabilitation project does not proceed and the Mutanda-Mwinilunga Road remains in its current severely deteriorated condition. Under this scenario, the following outcomes are anticipated over a 10-year assessment horizon:

- Progressive and accelerating pavement and drainage deterioration leading to complete unserviceability of significant sections within 5 to 10 years, based on the current rate of deterioration observed during road condition surveys.
- Continued and worsening community access constraints: the road is already impassable for 3 to 5 months per year during the wet season; this impassability will extend to 6 to 8 months or more without intervention.
- Continued economic underdevelopment of North Western Province due to the critical infrastructure connectivity gap, reinforcing the province's position as one of Zambia's least economically developed regions despite its natural resource wealth.
- No resettlement or construction-phase adverse impacts, but continuation of existing poverty, limited access to health and education services, high post-harvest losses, and elevated maternal and child mortality rates.
- Continued very high vehicle operating costs on the deteriorated road surface, constraining commercial activity and increasing the cost of service delivery for government. The No Action Alternative is assessed as the least preferred option from economic, social, and developmental perspectives. It is inconsistent with the Government of Zambia's Eighth National Development Plan (8NDP) commitments and with RDA's statutory mandate for road network management. The No Action Alternative has therefore been rejected. This conclusion aligns with the RDA's direction of 15 May 2026 to proceed with the full ESIA and RAP, and the Government's decision to invest in this project.

5.3 Alternative Road Alignments

The proposed rehabilitation works follow the existing road alignment for the vast majority of the 214 km corridor. Localised realignment options were assessed at sections where the existing alignment presents: severe geometric deficiencies (excessive grades, inadequate sight distances, sharp curves without superelevation); high flooding or waterlogging risk from inadequate alignment through dambo or floodplain areas; chronic erosion problems caused by adverse alignment relative to drainage patterns; or high PAP impact concentrations where minor realignment could significantly reduce resettlement impacts.

For each location where a realignment was assessed, alternatives were evaluated against a multi-criteria framework including: engineering performance (drainage adequacy, geometric standards, construction feasibility); environmental impact (particularly avoidance of wetlands, dambos, and sensitive habitats); social impact (structures affected and PAPs displaced); construction cost; and long-term maintenance requirements. In every case, the preferred alignment minimised both environmental and social impacts relative to feasible engineering alternatives. No new alignment corridors were assessed, as the project objective is the rehabilitation of the existing T5 road corridor

rather than new road construction. However, at four specific chainage sections identified during detailed design — at chainage km 35, km 89, km 143, and km 197 — minor realignments of between 100 and 500 metres in length were assessed and adopted as the preferred option on the basis that they significantly improve drainage function, avoid dambo crossings that were causing chronic road failure, and in the case of km 35, reduce PAP impacts by routing around a cluster of structures. These localised realignments are reflected in the RoW demarcation and the PAP census scope.

5.4 Alternative Pavement Design Standards

Five pavement design options were assessed for the full 214 km corridor:

- Option A — Rehabilitated gravel surface only: Re-gravelling of the existing road to its original gravel standard, without sealed surface treatment. Low capital cost, but very short design life (estimated 5 to 7 years under current traffic) and continued dust, wet-season accessibility, and high vehicle operating cost problems. Does not address the fundamental drainage failure driving pavement deterioration.
- Option B — Single Bituminous Surface Treatment (SBST): A thin, single-layer bituminous chip seal applied over the reconstructed base. Adequate for low-traffic rural roads but providing limited protection against heavy vehicle loads and the high rainfall conditions of NWP. Estimated design life 10 to 12 years with routine maintenance.
- Option C — Double Bituminous Surface Treatment (DBST): Two-layer bituminous chip seal applied over a fully reconstructed and compacted granular base. Appropriate performance for the road class, traffic volumes (estimated 200 to 500 AADT), and rainfall environment. Estimated design life 15 to 20 years with routine maintenance. Preferred option.
- Option D — Hot Mix Asphalt (HMA): Highest performance asphalt pavement. Very long design life (20+ years) but significantly higher capital cost, requires on-site bitumen plant (additional environmental impact), higher skilled labour requirement, and generally considered disproportionate for the current and projected traffic volumes on this road.
- Option E — Concrete pavement: Very high capital cost; impractical with available local materials and contractor capacity; extended construction period. Not appropriate for this project.

The preferred option — DBST on fully reconstructed base — was selected on the basis of: appropriate performance for the road class, traffic volumes, and NWP rainfall environment; adequate design life of 15 to 20 years; lowest life-cycle cost per vehicle-km among feasible options; compatibility with local contractor capacity and material availability; and lower construction environmental impact than HMA (no bitumen plant required). This decision is confirmed in the Updated Draft Road Design Report submitted to RDA.

5.5 Alternative Drainage and Bridge Approaches

Alternative materials and designs for drainage structures — including corrugated steel pipe (CSP), reinforced concrete pipe (RCP), and reinforced concrete box culverts — were assessed at each crossing location identified in the drainage survey. CSP was preferred for smaller openings (900 mm and below) due to lower cost, ease of installation, and adequate design life in the NWP environment. RCP and box culverts were preferred for larger hydraulic openings and at permanent watercourse crossings requiring structural durability. For bridges, options including concrete slab bridges, concrete T-beam bridges, and steel composite decks were assessed at specific locations; the preferred option at each site was determined by hydraulic clearance requirements, span length, foundation conditions, and constructibility with locally available materials.

5.6 Alternative Material Sourcing Strategies

Two principal alternative material sourcing strategies were compared:

- Option A — Multiple distributed borrow pit sites along the 214 km corridor (preferred): An estimated 15 to 25 borrow pit sites distributed along the corridor minimise haulage distances (reducing haulage truck traffic through communities and lowering fuel consumption and GHG emissions), reduce the concentrated environmental and social impacts of large-scale extraction

at a small number of sites, enable more manageable rehabilitation of smaller borrow pit areas, and provide flexibility in material selection. Each borrow pit requires a site-specific BPMRP.

- Option B — Small number of large centralised borrow pits: Potentially lower unit extraction cost but significantly higher haulage costs and impacts (more trucks on community roads, higher dust and noise, higher road damage), much larger individual pit areas requiring more complex rehabilitation, and concentrated social impacts near pit sites. Environmental impact assessment favours Option A. The distributed borrow pit approach (Option A) is confirmed as the preferred strategy. Commercial quarry material will supplement local borrow material where granular quality requirements cannot be met from roadside sources, and licensed river sand abstraction under WARMA permits will be used for concrete and mortar works.

5.7 Summary: Preferred Alternative

The preferred alternative — rehabilitation of the full 214 km corridor following the existing alignment with four localised geometric improvements, using DBST pavement on fully reconstructed drainagerehabilitated base, distributed borrow pit material sources, and comprehensive drainage rehabilitation — represents the best balance of technical performance, environmental and social impact minimisation, cost-effectiveness, and contribution to the project's developmental objectives. The ESIA Team concludes that this preferred alternative is technically, environmentally, and socially feasible, subject to full ESMP and RAP implementation as detailed in Section 8 and 9.

5.8 Alternatives — Detailed Assessment Matrices

5.9 Pavement Design Alternatives — Multi-Criteria Comparison Matrix

The following table provides the full multi-criteria comparison of all five pavement design alternatives assessed for the Mutanda-Mwinilunga Road, supporting the conclusion in Section 5.4 that DBST (Option C) is the preferred alternative.

Option	Est. Capital Cost	Pavement Type	Design Life	Performance	Social Impact	Assessment
No Action	0 (no road)	N/A — existing gravel fails	Nil	Continues to deteriorate; floods 3–5 months/yr	None — existing situation continues	REJECTED — unacceptable socioeconomic outcome; inconsistent with 8NDP; 0 environmental protection of road integrity
Option A: Re-gravel only	~USD 25–35M	Gravel only; no seal	Short (~5 yrs)	Still impassable in wet season; dust; high VOC	No displacement beyond current use	REJECTED — inadequate design life; does not resolve wet season inaccessibility; high whole-of-life cost
Option B: SBST	~USD 55–70M	Single bituminous chip seal	10–12 yrs	Improved but marginal for heavy vehicles in high rainfall	Minimal change from preferred option	REJECTED — inadequate design life for investment scale; performance marginal in NWP high-rainfall environment
Option C:	~USD	Double	15–20	All-weather	Moderate —	PREFERRED

Option	Est. Capital Cost	Pavement Type	Design Life	Performance	Social Impact	Assessment
DBST (PREFERRED)	90–120M (est.)	bituminous chip seal	yrs	access; safe; low VOC; low dust	30 m RoW clearance	— best life-cycle cost; appropriate performance; compatible with local contractor capacity
Option D: HMA Asphalt	~USD 150–190M	Hot mix asphalt	20–25 yrs	Excellent; overkill for traffic volumes	Same as DBST but larger asphalt plant footprint	REJECTED — disproportionate capital cost for traffic volumes; requires specialist plant;
						higher environmental impact
Option E: Concrete	~USD 220M+	Concrete pavement	30+ yrs	Excellent but inflexible; local expertise limited	Same as DBST	REJECTED — very high cost; impractical with available materials; extended construction period

5.10 Localised Alignment Alternatives — Assessment Details

The four localised realignment options adopted in the preferred project design are assessed in detail below, including the specific engineering, environmental, and social trade-offs considered in selecting each preferred alignment.

Location	Existing Alignment Problem	Proposed Realignment	Engineering Trade-off	Social Trade-off	Decision
km 35 — Nyakulenga dambo crossing	Existing alignment crosses the most hydrologically sensitive dambo on the corridor at a poor angle; repeated embankment failure; community reported 2+ months annual flood closure	60 m realignment to higher ground avoiding main dambo channel; reduces dambo embankment length by 40 m	No additional structures; savings on drainage; better approach angles	1 household structure displaced on new alignment vs 3 on existing; net RAP saving	PREFERRED — selected for design
km 89 — Manyinga East escarpment	Existing alignment on 13% grade with sharp bend at base; accident-prone; drainage failure on steep grade	200 m realignment to flatter gradient and improved horizontal curve radius	Requires additional 250 m ³ cut earthworks; minor additional vegetation clearance	No additional PAPs on realignment; reduces road accident risk for community	PREFERRED — safety improvement justifies minor additional earthworks
km 143 — Kabompo River	Existing road approaches the Kabompo River	180 m realignment to improve bridge	Improved drainage on approach;	2 structures on new alignment	PREFERRED — safety and hydraulic

Location	Existing Alignment Problem	Proposed Realignment	Engineering Trade-off	Social Trade-off	Decision
approach	bridge at a poor angle causing	approach angle; provides adequate	better bridge approach angle	requiring relocation; offset by	benefits outweigh minor
	sight distance restrictions	stopping sight distance		improved safety	additional relocation
km 197 — Mwinilunga urban fringe	Existing alignment passes through dense peri-urban settlement with multiple structures in RoW; narrow carriageway restricted by buildings	500 m realignment via available land to south; wider carriageway and pedestrian facilities on new alignment	100 m additional length; additional earthworks	Significantly reduces PAPs from 38 on existing alignment to 12 on new alignment; net community benefit	PREFERRED — major reduction in PAPs and improved carriageway geometry

5.11 Material Sourcing Alternatives — Detailed Assessment

The selection of material sourcing strategy has significant environmental implications given the scale of material demand (estimated 900,000 m³ granular fill and base material) for the 214 km corridor. The detailed assessment of material sourcing options considered: distance from extraction to use point (affecting haul road impacts and haulage fuel consumption and GHG emissions); extractable material volume at potential sites (affecting number of pits and per-pit environmental impact); material quality (affecting pavement performance and need for supplementary imported material); environmental sensitivity of potential extraction sites (affecting severity of habitat loss and rehabilitation challenge); and community proximity (affecting dust, noise, and social impacts of extraction operations). The preferred strategy — 15 to 25 distributed roadside borrow pits with supplementary quarry aggregate — was selected on the basis that: shorter haul distances reduce haulage traffic impacts on communities by an estimated 35–45% compared to centralised extraction; smaller individual pit sizes (4–8 ha each) are more manageable environmentally and easier to rehabilitate than large centralised pits; distributed extraction reduces the concentration of noise, dust, and social impacts; and the flexibility of multiple sourcing points provides resilience against material quality failures at individual sites. Each borrow pit site is subject to individual environmental screening, and any site with significant wildlife habitat, heritage, or community resource value is excluded from consideration.

5.12 Drainage Structure Alternatives — Key Bridge Sites

At the four most significant bridge replacement sites (Mutanda River, Manyinga River, Kabompo River, and Lunga River), alternative structural designs were assessed against the following criteria: hydraulic performance (ability to pass design flood without overtopping or excessive backwater); structural durability (design life; maintenance requirements); constructability with local contractor capacity and available materials; cost; and environmental impact during construction (particularly extent of in-stream works and disturbance to aquatic habitats). In all four cases, reinforced concrete designs (either slab bridges for shorter spans or T-beam or box girder for longer spans) were assessed as superior to steel alternatives on the basis of lower whole-of-life maintenance cost, superior durability in the tropical humid environment, and greater compatibility with the local construction industry's capabilities. Steel truss alternatives were assessed for the Kabompo River crossing given its large span, but were determined to offer no cost or performance advantage sufficient to offset the higher maintenance and corrosion protection requirements in the NWP climate.

6.0 ENVIRONMENTAL BASELINE STUDY

6.1 Introduction

This chapter describes the existing environmental and social conditions within the project area of influence, providing the reference baseline against which project impacts are identified and assessed. Data was collected through comprehensive desk study, field surveys, specialist studies, and stakeholder consultations conducted by the ZBCL multidisciplinary team during May to June 2026. Full specialist survey reports are included as annexes to the Final ESIA (Annexes C through G). This chapter provides an integrated summary of the baseline findings across the physical environment, biological environment, and socioeconomic and cultural heritage dimensions.

6.2 Physical Environment

6.2.1 Regional Setting and Topography

North Western Province is located in the northwest of Zambia, bordered by the Democratic Republic of Congo to the north and west, Angola to the west and southwest, and the Zambian provinces of Copperbelt, Central, and Western to the east and south. The province covers approximately 125,827 km² with a population estimated at approximately one million people, making it one of the most sparsely populated provinces in Zambia with an average population density of approximately 8 persons per km². The project corridor traverses the gently undulating plateau landscape of North Western Province, at elevations ranging from approximately 1,100 to 1,400 metres above sea level. The topography is characterized by broad, flat to gently undulating interfluvial areas covered by miombo woodland, which grade into gently sloping valleys and seasonal wetlands (locally known as dambos) along the numerous river and stream systems draining the plateau. Steeper slopes occur locally near river crossing points and ridgelines. The generally gentle terrain means that major earthworks are limited primarily to drainage crossings and swampy dambo sections, though the prevalence of seasonally waterlogged dambos presents significant engineering and environmental management challenges.

6.2.2 Geology and Soils

The geology of North Western Province is dominated by the Katangan Supergroup — Proterozoic metamorphic and sedimentary rocks including schists, quartzites, phyllites, and dolomites — which forms the basement of the region. The corridor is underlain predominantly by deeply weathered Katangan basement rocks and thick lateritic weathering profiles. The principal soil types along the 214 km corridor, based on field survey and available soil maps, are:

- Ferralitic soils (Oxisols/Ferralsols): Deep, red-brown to yellow-brown, highly weathered lateritic soils occurring on plateau surfaces and gentle slopes. These soils have moderate to low permeability, variable gravel content, and are moderately susceptible to erosion when vegetation is removed.
- Ferrallitic sandy soils: Lighter-textured soils occurring in some sections, with higher sand content and lower cohesion. These are highly erodible when stripped of vegetation and exposed to rainfall, presenting a significant erosion management challenge during earthworks. Identified in approximately 25–30% of the corridor.
- Hydromorphic soils (Gleysols/Vertisols): Seasonally or permanently waterlogged soils occurring in dambos and floodplains. These include dark grey to black expansive clays (locally called "black cotton soils") in some dambo areas, which are problematic for road subgrade construction due to their low bearing capacity when wet and shrink-swell behaviour.
- Alluvial soils: Sandy to loamy alluvial deposits along the banks of major rivers, with generally good drainage and moderate fertility. Sensitive to bank erosion and subject to periodic flooding. The highly erodible sandy soils found in significant sections of the corridor present a major erosion risk during construction-phase earthworks, particularly during the wet season. Careful earthworks management including progressive revegetation, silt fencing, and phased construction scheduling is essential.

6.2.3 Climate

North Western Province has a humid sub-tropical climate (Köppen classification: Cwa/Aw transitional) characterized by a distinct wet season (November to April) and dry season (May to October). The province receives among the highest annual rainfall in Zambia, with mean annual precipitation ranging from approximately 1,200 mm in the eastern sections of the corridor near Mutanda to over 1,500 mm in the northern Mwinilunga area. Rainfall is strongly seasonal, with over 90% of annual precipitation falling between November and April. The high rainfall intensity and wet-season concentration in a landscape with inherently erodible soils creates a particularly challenging environment for construction environmental management. Temperatures along the corridor range from mean daily maxima of 30 to 33 degrees Celsius during the hot, dry season (September to November) to 22 to 24 degrees Celsius during the cool dry season (June to July). Minimum temperatures in the cool season (June to July) can drop to 8 to 12 degrees Celsius overnight. Heat stress risk for outdoor workers is highest during September to November. Frost does not occur at the elevations found along the corridor.

Observed rainfall for the project region is characterised using daily records from Solwezi Meteorological Station, the nearest long-term synoptic station to the project corridor, covering 1 January 2016 to 30 April 2026 (3,731 daily observations). Monthly climatological statistics derived from this record are presented below; the full year-by-month record is provided in the annex (Solwezi Met Station Rainfall Records).

Table: Monthly Rainfall Climatology, Solwezi Met Station (2016–2026)

Month	Mean monthly rainfall (mm)	Max monthly rainfall (mm)	Mean rain days (≥1 mm)	Max daily fall (mm)
Jan	261.9	370.3 (2021)	20.0	98.5
Feb	345.0	1184.4 (2021)	17.5	130.0
Mar	207.7	311.8 (2026)	14.5	66.8
Apr	85.8	149.7 (2025)	7.4	63.2
May	2.3	13.8 (2025)	0.3	11.0
Jun	0.0	0.0 (2025)	0.0	0.0
Jul	0.0	0.0 (2025)	0.0	0.0
Aug	0.0	0.0 (2025)	0.0	0.0
Sep	0.7	3.9 (2023)	0.2	3.9
Oct	29.9	94.0 (2023)	3.1	48.2
Nov	143.1	245.9 (2025)	13.1	69.1
Dec	260.4	438.3 (2025)	17.6	129.0

Over the 9 complete calendar years of record (2016–2024), mean annual rainfall was approximately 1,312 mm, ranging from 928 mm (2024) to 2,100 mm (2021). Rainfall is strongly seasonal: 98% of all recorded rainfall fell in the November–April wet season, with June to September effectively dry. The record contains 47 days with falls of 50 mm or more, and a maximum recorded daily fall of 130 mm on 8 February 2021. These characteristics confirm the pronounced wet-season flood and erosion risk assumed in the drainage design, and support programming of earthworks and drainage construction within the May–October dry window.

6.2.4 Water Resources

The project corridor crosses numerous permanent and seasonal watercourses draining to both the Zambezi River system (to the south and west via the Kabompo River) and the Congo River system (to the north via the Luapula and tributaries). Major permanent river crossings requiring bridge or drift infrastructure along the corridor include:

- Mutanda River: Crossing approximately 10 km west of Mutanda town; perennial river draining to the Kabompo; moderate flow regime.
- Manyinga River: Crossing near Manyinga Boma at approximately chainage 80 km; major perennial river.
- Dongwe River: At approximately chainage 100 km; significant seasonal to perennial flow; wetland-associated crossing.
- Kabompo River: Major perennial river crossing at Kabompo Boma, approximately chainage 145 km; largest hydrological crossing on the corridor requiring detailed hydraulic design and potentially bridge replacement.
- Jimbe River, Lunga River, Nyamukele River: Further significant crossings in the western sections of the corridor approaching Mwinilunga. In addition to major river crossings, the corridor traverses numerous dambos — seasonally flooded, grass-covered valley bottomlands that are hydrologically critical features of the North Western Province landscape. Dambos serve multiple critical hydrological functions including: groundwater recharge during the wet season; dry-season baseflow maintenance to permanent streams; natural flood attenuation and storage; and maintenance of dry-season water tables that support rural boreholes and hand-dug wells. The careful management of dambo crossings is one of the most environmentally sensitive aspects of this project.

Community water supply along the corridor is predominantly from boreholes equipped with hand pumps, with supplementary abstraction from streams and hand-dug wells during the wet season. Piped water supply is limited to Mwinilunga Boma, Manyinga Boma, and Mutanda town. Water quality from boreholes is generally good, though some sources show elevated iron and manganese levels consistent with the ferrallitic geology. Groundwater contamination from road-associated pollution is an operational risk that the ESMP addresses through drainage design and monitoring requirements.

6.2.5 Air Quality and Noise Baseline

Baseline air quality along the 214 km corridor is generally very good, reflecting the low population density, minimal industrial activity, and predominantly agricultural and woodland land use. Particulate matter (PM₁₀) concentrations at representative monitoring points established during the baseline study are well below Zambia's National Ambient Air Quality Standard (150 µg/m³ 24-hour average) and WHO guideline levels. The primary anthropogenic source of air quality degradation along the road corridor is vehicle-generated dust from the severely deteriorated and unmaintained gravel road surface, which constitutes a notable existing adverse impact on roadside communities and road users that road rehabilitation will permanently resolve. Baseline noise levels at sensitive receptors (schools, health centres, residences within 50 to 100 metres of the road) along the corridor are characteristic of a quiet rural environment, with Leq levels typically in the range of 35 to 50 dB(A) at the nearest residences. These levels are well below the WHO recommended maximum outdoor noise level of 55 dB(A) for residential areas and below the national standard. The principal existing noise sources are periodic road traffic (mainly trucks), agricultural activity, and natural ambient sounds.

6.3 Biological Environment

6.3.1 Vegetation and Land Cover

The dominant vegetation type along the corridor is miombo woodland — the characteristically African woodland ecosystem dominated by trees of the genera *Brachystegia* and *Julbernardia*, with a diverse understorey of shrubs, forbs, and grasses. Miombo woodland covers approximately 45% of Zambia's total land area and represents one of Africa's most extensive tropical woodland biomes. It provides critical ecosystem services including: terrestrial carbon storage (estimated 60–80 tonnes of carbon per hectare in mature stands); watershed protection and maintenance of hydrological cycles; biodiversity habitat for a wide array of wildlife, birds, reptiles, and invertebrates; and provision of non-timber forest products (mushrooms, caterpillars, fruits, medicinal plants, honey, fuelwood, and building materials) that are critically important to rural livelihoods along the corridor. Based on the biodiversity baseline survey and satellite imagery analysis, the approximate land cover distribution along the 214 km corridor is estimated as follows:

- Intact to lightly disturbed miombo woodland: approximately 45 to 55% of the corridor area. The extent of genuinely intact woodland is higher in western sections of the corridor.
- Degraded or disturbed woodland: approximately 20 to 25%, reflecting the cumulative effects of agricultural clearing, charcoal production, fire regimes, and historical timber extraction.
- Dambos and seasonal wetlands: approximately 10 to 15%, representing the most hydrologically and ecologically sensitive land cover type along the corridor.
- Agricultural land (smallholder cultivation, fallows, gardens): approximately 8 to 12%, concentrated around settlements and along the road corridor.
- Settlement areas (villages, homesteads, commercial areas, schools): approximately 2 to 3%.
- Existing road surface, right-of-way, and associated bare ground: approximately 2 to 3%.

Riparian vegetation — including riverine forest, gallery forest, and wetland vegetation — occurs along the numerous watercourses within the project corridor and is of significantly higher biodiversity value than the surrounding miombo woodland, making it particularly sensitive to project-related disturbance.

6.3.2 Flora

The miombo woodland supports a diverse flora. Dominant tree species recorded during the biodiversity baseline survey include: *Brachystegia spiciformis* (Msasa), *Brachystegia boehmii* (Prince of Wales Feathers), *Julbernardia globiflora*, and *Julbernardia paniculata*, which characterise the dominant woodland structure. Associated woodland species of ecological and economic significance include: *Pterocarpus angolensis* (Mukwa — commercially valuable red timber, under significant logging pressure in NWP); *Azelia quanzensis* (Chanfuta); *Uapaca kirkiana* (Wild Loquat, important fruit species for communities and wildlife); *Parinari curatellifolia* (Mobola Plum); *Guibourtia coleosperma* (African Rosewood); and various *Combretum* and *Terminalia* species. Dambo and wetland vegetation is characterised by sedges (*Cyperus* spp., *Eleocharis* spp.), tall grasses (*Miscanthus junceus*, *Setaria* spp.), and a range of wetland forbs and aquatic macrophytes at the margins of permanent water bodies. Riparian gallery forest species include *Syzygium cordatum* (Waterberry), *Diospyros mespiliformis* (Jackalberry), and *Ficus* spp. No nationally or internationally threatened plant species confirmed as exclusive to the proposed construction footprint were identified through the preliminary baseline review, though the specialist biodiversity survey is being finalised and full species lists will be reported in Annex C of the Final ESIA. The abundance of commercially valuable *Pterocarpus angolensis* (Mukwa) within and adjacent to the RoW is noted as a species requiring specific management attention during vegetation clearance to prevent illegal timber extraction.

6.3.3 Fauna

The corridor supports a diverse fauna, particularly in the woodland and wetland habitats. Larger mammal species recorded or expected in the project area (based on survey records, DNPW databases, and community knowledge) include:

- African Elephant (*Loxodonta africana*): Present in the western sections of the corridor, particularly in Mwinilunga District and areas adjacent to Game Management Areas and the West Lunga National Park. Elephants are known to use wildlife corridors connecting protected areas, and the road corridor may cross or lie near such movement routes.
- African Buffalo (*Syncerus caffer*): Present in woodland areas; uses wildlife movement corridors.
- Eland (*Tragelaphus oryx*), Roan Antelope (*Hippotragus equinus*), Sable Antelope (*Hippotragus niger*): Present in woodland areas, particularly in western sections of the corridor.
- Leopard (*Panthera pardus*): Likely present throughout the woodland corridor; largely nocturnal and not commonly observed.
- Common Hippopotamus (*Hippopotamus amphibius*): Present in major rivers including the Kabompo and Lunga; potentially vulnerable to disturbance at bridge and crossing works.
- African Wild Dog (*Lycaon pictus*): Possibly present in western sections; wide-ranging species sensitive to road mortality.

- Various smaller carnivores, primates, rodents, and other species characteristic of the miombo-dambo landscape.

The project corridor is within the range of the Black-cheeked Lovebird (*Agapornis nigrigenis*), a Zambian endemic bird species listed as Vulnerable on the IUCN Red List, for which the miombo woodland of North Western Province provides important habitat. The corridor and surrounding areas support a rich avifauna overall, with the biodiversity baseline survey recording in excess of 200 bird species in the project area, including numerous miombo specialists. Reptiles and amphibians are diverse and well represented, particularly in wetland, dambo, and riverine habitats. Monitor lizards (*Varanus niloticus*, *V. exanthematicus*), various python and puff adder species, and diverse chameleon and skink assemblages are present. Amphibian communities in dambos are highly diverse, with multiple frog species completing their life cycles in seasonal wetlands.

6.3.4 Protected Areas and Sensitive Habitats

The project corridor does not pass directly through any designated National Park or Game Reserve. The West Lunga National Park is located to the north of the corridor in Mwinilunga District, with potential indirect impacts from improved road access including increased poaching pressure and habitat encroachment. Portions of the corridor in Mwinilunga District pass near or adjacent to Game Management Area (GMA) boundaries; the precise proximity of the road corridor to GMA boundaries is being confirmed through detailed GIS analysis for the Final ESIA. All identified dambos and seasonal wetlands along the corridor meet the criteria for locally significant wetland habitats under national and international classification systems and warrant protection from unnecessary disturbance. While none are currently listed as Ramsar Wetlands of International Importance, the Zambezi Floodplains and associated river systems in the wider region are internationally significant, and the project drainage management has implications for their condition. No designated Ramsar sites are within the project's Direct Area of Influence.

6.4 Socioeconomic Baseline

6.4.1 Demographics and Administration

The project corridor passes through portions of four districts in North Western Province: Solwezi District (eastern end near Mutanda town); Manyinga District (central sections from approximately chainage 30 km to 100 km); Kabompo District (from approximately chainage 100 km to 170 km, including Kabompo Boma); and Mwinilunga District (western sections from approximately chainage 170 km to Mwinilunga Boma at 214 km). The four districts have a combined estimated population of approximately 500,000 to 600,000 people based on the 2022 Zambia Population and Housing Census (final corridor-specific figures to be confirmed in the Final ESIA).

The population within the project corridor's Direct Area of Influence is predominantly rural, living in small dispersed villages and homesteads along and around the road. Population densities are low, averaging approximately 5 to 15 persons per km² in most sections of the corridor. The principal urban settlements along the corridor are Mwinilunga Boma (estimated population 25,000 to 30,000), Kabompo Boma (approximately 15,000 to 20,000), Manyinga Boma (approximately 10,000 to 12,000), and Mutanda town (approximately 15,000 to 20,000, including the mining service sector population). The dominant ethnic and linguistic groups along the corridor are the Luvale, Luchazi, Mbunda, and Chokwe peoples, with Ndembu and Lunda communities particularly represented in Mwinilunga District. The Luvale language is widely spoken as a lingua franca throughout much of the corridor, alongside Luchazi, Mbunda, and English. Community liaison and consultation in this ESIA has been conducted by CLOs fluent in Luvale, Luchazi, and Mbunda.

6.4.2 Livelihoods and Economy

The dominant livelihood system along the corridor is subsistence and semi-subsistence smallholder agriculture, supplemented by small-scale trade, fishing, hunting, charcoal production, and casual labour. The principal food crops are cassava (the staple crop throughout North Western Province, consumed as nshima, fufu, and various relishes), maize, sweet potato, groundnuts, beans, sorghum, and various vegetables and fruit. Cash income is generated primarily through sale of maize (in better-

endowed households), groundnuts, vegetables, charcoal, and fish. The severe deterioration of the Mutanda-Mwinilunga Road is consistently identified by communities, local authorities, and NGOs as the most critical constraint on agricultural market access, commercial activity, and economic development throughout the corridor. Wet-season impassability of 3 to 5 months per year effectively prevents farmers from selling produce to markets in Solwezi, Kitwe, and the Copperbelt during the harvest period, leading to post-harvest losses, depressed farm-gate prices, and inability to purchase inputs for the next season. Road rehabilitation is therefore expected to generate very significant and broadly distributed positive economic impacts.

Fishing is an important supplementary livelihood and protein source at major river crossings and in dambo areas, providing both household food security and cash income through local fish markets. The Kabompo River fishery is noted as particularly significant. Project works at river crossings will require careful management to avoid adverse impacts on fish populations and fishing community livelihoods.

6.4.3 Land Tenure

Land tenure along the project corridor is predominantly customary, with land allocated and administered by traditional authorities (Chiefs and Headmen) in accordance with customary law and practice. Formal statutory leasehold title on State Land is confined to the urban areas of Mwinilunga, Kabompo, and Manyinga Bomas and the Mutanda town area. The absence of formal land registration in most of the project corridor means that land rights are largely undocumented, presenting challenges for the resettlement process. The RAP directly addresses this by extending compensation eligibility to all customary rights holders (Category 2 PAPs) at the same level as formal title holders, and by requiring the formal recognition and documentation of customary rights through the PAP census process.

6.4.4 Access to Social Services

Access to social services along the corridor is significantly below urban Zambian averages, reflecting the dispersed rural population and the severe constraints imposed by the deteriorated road infrastructure:

- **Health:** District hospitals are located in Mwinilunga, Kabompo, and Manyinga Bomas. Rural Health Centres are distributed along the corridor, but transport of patients to higher-level facilities for emergency or specialist care is severely constrained by road conditions, particularly during the wet season. Maternal and child mortality rates in North Western Province are among the highest in Zambia, and improved road access to health facilities is expected to be a major positive impact of road rehabilitation.
- **Education:** Primary schools are widely distributed across the corridor area. Secondary schools are concentrated in larger settlements (Mwinilunga, Kabompo, Manyinga). Secondary school enrolment rates, particularly for girls, are below national averages, partly due to access constraints. Several primary and secondary schools are located directly adjacent to the road corridor and will require specific child safety management during construction.
- **Water:** Piped water supply is absent from rural communities along the corridor. Community water supply depends on boreholes equipped with hand pumps, supplemented by streams and hand-dug wells. Borehole functionality is variable; communities report that a significant proportion of boreholes are non-functional due to maintenance difficulties. The project will need to monitor impacts of construction activities on borehole water quality.
- **Electricity:** Grid electricity is absent from most rural communities along the corridor. Solar panels are used by some households and community facilities. Contractor camps will require self-sufficient power generation.

6.4.5 Gender and Vulnerability

Women along the project corridor bear primary responsibility for subsistence food production (particularly cassava cultivation and processing), water collection, firewood gathering, and childcare. Women's access to and control over productive land and cash income is often limited by customary

tenure arrangements and gender norms, making women particularly vulnerable to the adverse effects of displacement and land loss. Women's focus group discussions during the ESIA scoping phase identified GBV and SEA risk from worker influx as their primary concern regarding the project, reflecting experiences from other infrastructure projects in the region. Key vulnerable groups identified along the corridor through baseline socioeconomic surveys and community consultations include: female-headed households (estimated at 30 to 40% of rural households); elderly persons living alone or heading households; persons with physical or mental disabilities with limited mobility and livelihood options; child-headed households; HIV/AIDS-affected households facing health, income, and stigma burdens; and communities in the most remote sections of the corridor with the least access to government services and market infrastructure. The RAP includes specific additional assistance provisions for all vulnerable PAPs, and the ESMP tracks vulnerable group welfare as a dedicated monitoring indicator.

6.4.6 Cultural Heritage

North Western Province has a rich and living cultural heritage associated with the Luvale, Luchazi, Mbunda, Chokwe, Lunda, and Ndembu peoples. Cultural heritage resources of potential relevance to the project corridor, identified through community consultations and the preliminary cultural heritage survey, include:

- **Ancestral burial sites and graves:** Traditional communities bury deceased family members on or near their homesteads and agricultural land. Multiple burial sites have been identified within or adjacent to the road right-of-way through preliminary community consultations. Their precise locations are being documented through the cultural heritage survey and community-led mapping process.
- **Traditional sacred sites and shrines:** Associated with ancestral spirits, healing practices, and community identity. Sacred sites may include specific trees (including large, old *Brachystegia* and *Ficus* specimens), streams, rock outcrops, or specific landscape features. Several such sites are located near the road corridor, and their disturbance would cause significant cultural and spiritual harm to affected communities.
- **Mukanda and Wali initiation schools:** Seasonal ceremonial sites used for male (Mukanda) and female (Wali) initiation ceremonies, respectively. These sites are culturally highly significant and require careful management; construction work near active initiation sites during the ceremony season is prohibited.
- **Historical village sites and archaeological middens:** Long-occupied village sites may contain sub-surface archaeological deposits including pottery, iron-working remains, and other cultural material. The high archaeological sensitivity of the corridor is confirmed by the preliminary cultural heritage survey and will be addressed through the pre-construction heritage survey and Chance Find Procedure.

6.4.7 Key Watercourse Crossings — Summary Assessment

The ZBCL Hydrologist and drainage design team conducted detailed field surveys of all significant watercourse crossings along the 214 km corridor in May to June 2026. The table below summarises the key findings and proposed works at the eight most significant crossings. Full hydrological assessment results are reported in Annex D of the Final ESIA. Minor culvert crossings (estimated 400 to 600 structures along the full corridor) are addressed through the comprehensive culvert replacement and rehabilitation programme forming a core component of the rehabilitation works.

Crossing	Chainage	Hydrological Character	Current Structure	Proposed Works	Key Issues
Mutanda River	~km 10	Permanent; perennial; seasonal flood risk	Existing drift (failed condition)	Replace with concrete bridge; design flood 1:100 year return period; minimum 2 m freeboard	Preliminary design complete; hydraulic model in progress; bridge span estimated 30–

Crossing	Chainage	Hydrological Character	Current Structure	Proposed Works	Key Issues
					40 m
Unnamed dambo crossing 1	~km 25	Seasonal wetland; hydromorphic soils; groundwater seepage	Blocked culverts; embankment settlement	Rehabilitate and augment culverts; geotextile embankment reinforcement; longitudinal drainage improvements	High sensitivity wetland; dry season works only; minimum 15 m exclusion zone
Manyinga River	~km 78	Major permanent river; fish spawning habitat	Existing bridge (structurally assessed poor)	Bridge replacement — concrete T-beam; minimum 1:100 year design flood; fish passage maintained	Structural assessment complete; bridge replacement in design; no dry-season works restriction but fish spawning exclusion Nov–Jan
Dongwe River dambo system	~km 98–104	Complex dambo system 6 km long; high groundwater table	Multiple failed culverts; chronic embankment flooding	Comprehensive culvert replacement programme; dambo crossing embankment redesign; French drains; vegetation stabilisation	Most complex hydraulic challenge on corridor; specialist wetland engineering input required
Kabompo River	~km 143	Major perennial river; fishing community at crossing; hippo and crocodile presence	Single-lane timber bridge (deteriorated; restricted to light vehicles)	Major bridge replacement — design ongoing; preliminary span	Largest infrastructure item on project; most complex
				80–100 m; seismic design required	procurement; may require specialist bridge contractor
Lunga River	~km 178	Permanent river; scenic gorge setting; potential archaeological sensitivity	Drift crossing; seasonal impassability	Drift rehabilitation or replacement with low-water bridge; subject to hydraulic analysis	Heritage survey required at crossing location; community consultation regarding crossing type preference
Jimbe River	~km 195	Perennial; moderate flow; riparian forest	Existing culverts undersized	Culvert replacement with larger capacity; protect riparian forest in approach earthworks	Riparian vegetation protection a priority; fish spawning exclusion zone applies
Nyamukele River	~km 208	Perennial; near Mwinilunga Boma; community water source	Culvert (good condition)	Maintain and monitor; minor rehabilitation only	Near urban area; enhanced water quality monitoring

Crossing	Chainage	Hydrological Character	Current Structure	Proposed Works	Key Issues
					required; community notification before any works

Design standards for all drainage structures: culverts designed for minimum 1:25 year return period; major bridges for 1:100 year with minimum 2 m freeboard; sensitive ecological crossings (dambos and wetlands) designed with fish passage and minimum structural footprint in water.

6.5 Species of Conservation Significance — Mammals

The following table lists key mammal species of conservation significance recorded or expected in the project area, based on the biodiversity baseline survey, DNPW species distribution databases, and IUCN Red List spatial data. IUCN threat categories: CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least Concern. CITES = Convention on International Trade in Endangered Species.

Common Name	Scientific Name	IUCN/CITES Status	Occurrence in Project Area	Project Risks	Mitigation
African Elephant	<i>Loxodonta africana</i>	LC (CITES App. I)	Western sections	Vehicle collisions;	Wildlife underpasses;
			(Mwinilunga District); wildlife corridors	habitat fragmentation; increased poaching from improved access	anti-poaching measures; wildlife warning signs; DNPW coordination
African Buffalo	<i>Syncerus caffer</i>	LC	Woodland and dambo areas throughout corridor	Vehicle collisions; hunting pressure	Speed limits; anti-poaching Code of Conduct
Hippopotamus	<i>Hippopotamus amphibius</i>	VU	Major rivers (Kabompo, Lunga, Dongwe)	Disturbance at river crossing works; boat traffic on rivers	Dry season only in-stream works; DNPW notification for river works
Leopard	<i>Panthera pardus</i>	VU	Woodland areas; nocturnal	Habitat fragmentation; road mortality	Wildlife underpasses; nighttime speed limits
African Wild Dog	<i>Lycaon pictus</i>	EN (CITES App. II)	Possibly western sections of corridor	Road mortality; habitat fragmentation	Wildlife underpasses; anti-poaching
Roan Antelope	<i>Hippotragus equinus</i>	LC	Miombo woodland areas	Hunting by workers; vehicle collisions	Anti-poaching; worker wildlife Code of Conduct
Sable Antelope	<i>Hippotragus niger</i>	LC	Woodland areas	Hunting by workers; habitat disturbance	Anti-poaching; worker wildlife Code

Common Name	Scientific Name	IUCN/CITES Status	Occurrence in Project Area	Project Risks	Mitigation
					of Conduct
Common Chimpanzee	<i>Pan troglodytes</i>	EN (CITES App. I)	Possible far western sections	Extreme habitat sensitivity; poaching for bushmeat	Pre-clearance survey; DNPW consultation; zero-tolerance bushmeat prohibition

6.6 Key Bird Species of Conservation Significance

The following table presents key bird species of conservation significance identified through the biodiversity baseline survey and available ornithological records for North Western Province. The project corridor supports a rich avifauna; only species with project-relevant conservation significance are listed here. Full species lists will be presented in Annex C of the Final ESIA.

Common Name	Scientific Name	Conservation Status	Habitat / Location	Project Risks	Mitigation
Black-cheeked Lovebird	<i>Agapornis nigrigenis</i>	VU — Zambian endemic	Miombo woodland — NWP endemic	Habitat loss; cage-bird trade stimulated by improved access	Strict clearance limits; IEC on lovebird protection for workers
Pel's Fishing Owl	<i>Scotopelia peli</i>	LC but declining	Riverine forest at major crossings	Riparian vegetation clearance; disturbance at river crossings	Riparian exclusion zone; pre-clearance survey
African Fish Eagle	<i>Haliaeetus vocifer</i>	LC	Major permanent rivers	Disturbance during bridge works; fish population changes	Dry season river works; fish habitat protection
Wattled Crane	<i>Grus carunculata</i>	VU	Dambo and wetland habitats	Dambo disturbance and drainage alteration	Dambo exclusion zones; dry season works in wetlands
Shoebill	<i>Balaeniceps rex</i>	VU	Wetlands in north-western sections possibly	Wetland disturbance during construction	Pre-clearance survey; dambo management plan
African Broadbill	<i>Smithornis capensis</i>	LC — miombo specialist	Dense miombo woodland	Woodland clearance	Strict clearance limits; woodland revegetation
Zambezi Indigobird	<i>Vidua codringtoni</i>	LC — NWP range	Miombo woodland with waterways	Riparian habitat disturbance	Riparian exclusion zones

6.6.1 District-Level Socioeconomic Profile Summary

The table below provides a comparative summary of key socioeconomic indicators for the four districts traversed by the project corridor, based on the 2022 Zambia Population and Housing Census, districtlevel administrative data, and ZBCL baseline socioeconomic survey data (June 2026). Data will be updated and disaggregated in the Final ESIA using full household survey results.

District	Pop. in Corridor Area (est.)	Health Facilities	Education	Borehole Coverage	Electricity	Primary Livelihoods
Mwinilunga District	~120,000	1 District Hospital (Mwinilunga General)	6 full secondary schools; 42 primary schools	85%	Limited to Mwinilunga Boma; most rural areas off-grid	Major formal trading centre; DRC cross-border trade; timber
Kabompo District	~80,000	1 District Hospital (Kabompo General); 4 Rural Health Centres	2 secondary schools; 28 primary schools	78%	Off-grid rural areas; limited solar	Fishing (Kabompo River); cassava; maize; small trade
Manyinga District	~60,000	1 District Hospital; 3 Rural Health Centres	1 secondary school; 18 primary schools	72%	Off-grid; generator at district level	Subsistence agriculture; charcoal; limited market access
Solwezi District (eastern end only)	~35,000 in project corridor area	Serviced by Solwezi General Hospital (25 km from Mutanda)	Access to Solwezi secondary schools	90% (urban); lower rural	Partial grid access near Mutanda	Mining services; commercial agriculture; trade corridor

6.6.2 HIV/AIDS Baseline

North Western Province has an HIV prevalence rate estimated at approximately 10 to 13% among adults (15 to 49 years), which is broadly consistent with the Zambian national average of approximately 12% but represents a significant public health burden. HIV prevalence is higher along major road and trade corridors than in more isolated rural areas, reflecting the role of mobility and social mixing in HIV transmission. The Mutanda-Mwinilunga corridor, as a major provincial transport route, is expected to have HIV prevalence in the higher range of the provincial estimate, particularly in settlement areas near the road. The baseline HIV situation is a primary driver of the ESMP's mandatory HIV/AIDS awareness programme for construction workers, and of the requirement for free voluntary testing and counselling (VCT) services at contractor camps. The monthly awareness sessions, free condom provision, and active engagement of the district health system are designed to prevent the well-documented pattern of increased HIV transmission along infrastructure project corridors.

6.6.3 Gender Baseline

Women in North Western Province face multiple intersecting constraints on their economic and social wellbeing. Customary land tenure systems typically vest primary land rights in male household heads, limiting women's independent access to and security of agricultural land tenure. Female-headed households — estimated at 30 to 40% of all rural households — often operate at higher levels of poverty and with lower access to formal financial services than male-headed households. Secondary school completion rates for girls are significantly below those for boys, reducing women's access to formal employment. Women's focus group discussions during ESIA consultation identified the following as primary concerns regarding the project in order of frequency of mention: (1) GBV and

SEA risks from worker influx; (2) fair and direct compensation for agricultural land (concerns about male household members receiving and controlling compensation payments for land that women cultivate); (3) employment opportunities for women; and (4) impact on daily routines and safety during construction. These concerns have directly shaped the ESMP and RAP provisions, including: the mandatory GBV Code of Conduct and GBV Service Provider; the requirement in the RAP for compensation to be paid directly to the person whose asset is affected (including women cultivating land regardless of formal land title); the 20% female workforce target; and the gender-disaggregated GRM.

6.7 Baseline — Detailed Technical Data

6.8 Detailed Climate Data Table

The following table presents a detailed summary of climate data relevant to project design and management across the three principal climate zones of the 214 km corridor, based on data from Zambia Meteorological Department stations at Mwinilunga, Kabompo, and Solwezi, supplemented by satellite rainfall data (CHIRPS).

Climate Parameter	Eastern (Mutanda)	Central (Kabompo)	Western (Mwinilunga)	Data Source	Relevance to Project
Mean annual rainfall (long-term average)	~1,200 mm (eastern/Mutanda area)	~1,400 mm (Kabompo)	~1,500 mm (Mwinilunga)	All station data	Informs drainage design; construction risk management
Peak 24-hour rainfall (return periods)	1:10 year: ~80 mm; 1:25 year: ~105 mm; 1:100 year: ~145 mm	Similar range	Higher end: 1:100 year ~165 mm	Regional IDF curves (Zambia Met Service)	Culvert and bridge hydraulic design standard
Wet season duration	November–April (6 months)	Same	November–April	Observed	Earthworks scheduling; construction programme
Dry season duration (construction window)	May–October (6 months)	Same	May–October	Observed	In-stream works restriction period
Mean maximum temperature	Sep–Nov: 30–33°C (hottest); Jun–Jul: 22–24°C	Similar range	Slightly cooler	Met station data	Heat stress management programme
Mean minimum temperature	Jun–Jul: 8–12°C	Similar	Slightly cooler	Met station data	Worker welfare; early morning work
					in cool season
Climate change projection (2050)	+1.2–2.0°C mean temperature increase; -5 to +10% change in annual rainfall (high uncertainty); more intense rainfall events likely	Similar	Higher rainfall uncertainty in north	IPCC AR6; SASSCAL climate data	Road design resilience; drainage capacity buffers

6.9 Detailed Soil Profile and Engineering Implications

The following table expands on the soil profile summary provided in Section 6.2.2, providing additional technical detail on soil properties and their specific engineering and environmental management implications for road rehabilitation construction. This information directly informs the ESMP soil erosion and earthworks management measures and the borrow pit siting criteria.

Soil Type	Location / Extent	Physical Properties	Hydrological Properties	Engineering and Environmental Implications
Ferralitic red-brown laterite	Plateau interfluves and gentle slopes; 45–55% of corridor	Moderate to good; coarse gravel to sandy loam; dense laterite crust in some horizons	Moderate water holding capacity; freely draining where gravel-dominant	Generally suitable subgrade and sub-base material; gravel layers potential borrow material source; maintain natural drainage to prevent saturation; reuse excavated material where quality permits
Sandy ferralitic (Arenosols)	Occur in ~25–30% of corridor; often in flat interfluves	Very low to low; loose fine to medium sand dominant; highly erodible when disturbed	Very low water retention; highly permeable; prone to deflation and rill erosion under rainfall	HIGHEST EROSION RISK on this project; intensive erosion control measures required; avoid earthworks in wet season wherever possible; immediate revegetation within 2 weeks of any disturbance; silt fences mandatory on all downslope drainage lines
Hydromorphic (Gleysols, seasonally waterlogged)	Dambos, valley bottoms, floodplains; 10–15% of corridor	Very low bearing capacity when wet; seasonally saturated; high clay content; shrink-swell behaviour (black cotton soils in some areas)	Seasonal waterlogging; low permeability; perched water table; important groundwater recharge function	Remove and replace with approved fill in road subgrade; dry season works only for embankment construction in dambos; geotextile reinforcement of embankments over hydromorphic soils; longitudinal French drains to intercept lateral seepage; not suitable as borrow material
Alluvial riverbanks and floodplains	Adjacent to major permanent rivers; typically <100 m wide bands	Variable; mixed sandy-loam to silty loam; low to moderate strength; erosion-prone bank faces	Moderately to freely draining when elevated; saturated near water table; naturally unstable banks in many reaches	Risk of bank erosion at bridge and culvert works; riparian vegetation protection mandatory; riprap bank protection at all disturbed riverbank sections; avoid bulk excavation in riparian zone

6.10 Vegetation Cover Mapping Results

Satellite imagery analysis using Sentinel-2 imagery (10 m resolution, August 2025 dry season image) calibrated against field survey ground-truth points produced the following vegetation cover estimates for a 5 km buffer zone around the 214 km road corridor:

- Dense miombo woodland (canopy cover >60%, understorey intact): approximately 18% of corridor buffer zone. Concentrated in western sections (Mwinilunga District) and in sections away from major settlements and the road. Highest biodiversity value.
- Open miombo woodland (canopy cover 30–60%, showing signs of selective logging or fire): approximately 35% of corridor buffer zone. Most prevalent land cover type. Moderate biodiversity value; recoverable with management.
- Degraded woodland and thicket (canopy cover <30%; shrub-dominant; heavily disturbed by charcoal, fire, and cultivation): approximately 18% of corridor buffer zone. Low biodiversity value; represents previously degraded habitat.
- Dambos and permanent/seasonal wetlands: approximately 12% of corridor buffer zone. High ecological and hydrological value; concentrated in valley systems between interfluvies.
- Active cultivation and recent agricultural clearance: approximately 10% of corridor buffer zone. Concentrated within 2 km of settlements along the road.
- Degraded and abandoned agricultural land (fallow and regenerating secondary growth): approximately 5% of corridor buffer zone.
- Settlement areas, bare ground, and road infrastructure: approximately 2% of corridor buffer zone. The mapping confirms that the vast majority of vegetation within the project's Direct Area of Influence is miombo woodland in varying condition, with significant areas of high-value intact or lightly disturbed woodland that will require careful management during RoW clearance. The 15 m riparian exclusion zones around all watercourses are an important tool for protecting the highest biodiversity-value habitats from construction disturbance.

6.11 Aquatic Ecology Baseline

Aquatic ecology surveys were conducted at five major river crossing sites during the June 2026 survey period. Key findings include:

- Fish species diversity: 34 fish species recorded across the five survey sites, with higher diversity at the larger permanent river crossings (Kabompo River: 22 species; Manyinga River: 18 species) and lower diversity at seasonal crossings. Economically important species recorded include various cichlids (*Serranochromis* spp., *Tilapia* spp.), catfish (*Clarias* spp., *Synodontis* spp.), and kapenta (*Limnothrissa miodon* in connected larger water bodies). No IUCN-listed fish species were confirmed at the survey sites, though the Zambian database for small river fish is incomplete.
- Macroinvertebrate diversity and EPT ratio: Macroinvertebrate samples from riffle habitats at the Kabompo and Manyinga River sites indicate good to excellent water quality (SASS5 score equivalent of 70–85, with EPT taxa well represented including Ephemeroptera, Plecoptera, and Trichoptera). This confirms the baseline water quality status and provides the reference against which any construction-related deterioration will be assessed.
- Riparian vegetation: Gallery forest is present at all five major river crossing sites, with varying width (10–60 m bank-to-bank). Riparian species of note include *Syzygium cordatum* (Waterberry), *Diospyros mespiliformis* (Jackalberry), and *Barringtonia racemosa* at the Kabompo River site. These riparian forests provide critical habitat for fish (shading, leaf litter food input, bank stabilisation) and for many bird species recorded during avian surveys.
- Aquatic habitat sensitivity: The Kabompo River crossing is assessed as the most sensitive aquatic habitat on the corridor due to its perennial flow, fish species diversity, active riverside fishing community, hippopotamus presence, and gallery forest quality. This site requires the most stringent aquatic habitat management measures, including cofferdam isolation, dry-season construction, and silt curtains maintained throughout.

6.12 Noise and Air Quality Baseline — Detailed Monitoring Data

Baseline noise and dust monitoring was conducted at five representative monitoring sites along the corridor in June 2026, covering a range of community and road-adjacent environments. Results are summarised below. All monitoring was conducted using calibrated equipment by trained environmental technicians.

- Noise monitoring at five sites: Leq (equivalent continuous noise level) over 1-hour periods at residences ranging from 35.2 to 49.8 dB(A), reflecting the quiet rural character of all monitoring sites. The highest recorded level (49.8 dB(A) at a roadside homestead in Manyinga settlement area) was associated with road traffic and agricultural activity. All measured levels are below the WHO outdoor guideline for residential areas (55 dB(A)) and the Zambia national standard for residential zones (60 dB(A) daytime). Construction noise from heavy plant will represent a significant increase above these background levels, particularly at the closer monitoring sites.
- Dust monitoring (PM₁₀) at five sites: PM₁₀ concentrations at roadside monitoring points range from 18 to 75 µg/m³ (24-hour average), with the higher values recorded at points adjacent to the heavily trafficked and heavily deteriorated gravel road surface where passing vehicles generate significant dust. All levels are below the Zambia national standard (150 µg/m³), though the road eliminates the road-surface dust source, representing a significant long-term air quality benefit for roadside communities.

6.13 Flora And Fauna Supplementary Tables

6.14 Key Flora Species — Detailed Table

The following table expands on the flora summary in Section 6.3.2, providing detailed information on key plant species of ecological, economic, and management significance along the project corridor. Full species lists from the biodiversity baseline survey are reported in Annex C of the Final ESIA.

Scientific Name	Common Name	Ecological Role	Occurrence	Status	Project Management Note
<i>Brachystegia spiciformis</i>	Msasa	Dominant miombo tree; nitrogen-fixing; wide canopy	Throughout corridor on well-drained soils	LC	None — widespread; important woodland structure species
<i>Brachystegia boehmii</i>	Prince of Wales Feathers	Deciduous miombo dominant; diagnostic species	Well-drained interfluvies throughout corridor	LC	None
<i>Julbernardia globiflora</i>	—	Co-dominant with <i>Brachystegia</i> in moist miombo	Moister soils; valley margins	LC	None
<i>Pterocarpus angolensis</i>	Mukwa / African Teak	High-value hardwood; red-brown timber; scarce due to logging	Scattered throughout miombo; declining	LC (but heavily exploited commercially)	Specific management measure in CEMP: no logging of Mukwa within or adjacent to RoW; all cleared specimens retained for community or handed to Forestry Dept
<i>Azelia quanzensis</i>	Chanfuta	Large deciduous tree;	Scattered; less common	LC (commercially)	Same as Mukwa — no commercial

Scientific Name	Common Name	Ecological Role	Occurrence	Status	Project Management Note
		high-quality timber	than formerly	exploited)	extraction during project
<i>Uapaca kirkiana</i>	Mobola plum / Wild loquat	Important wildlife and community fruit tree; nitrogen-fixing	Common throughout miombo understorey	LC	All cleared <i>Uapaca</i> specimens offered to communities as timber/firewood or replanted where feasible
<i>Parinari curatellifolia</i>	Mobola plum (large fruited)	Large canopy fruit tree; important to community	Throughout miombo, more common in	LC	Compensation at market value for any large fruiting
		diets and wildlife	wetter sections		trees cleared within RoW
<i>Guibourtia coleosperma</i>	African Rosewood	Large timber tree; CITES-listed; subject to commercial trade pressure	Western sections of corridor; wetter miombo	NT; CITES Appendix II	No commercial extraction; ZBCL to verify no <i>Guibourtia</i> timber leaves site without Forestry Dept authorisation; specific monitoring
<i>Syzygium cordatum</i>	Waterberry	Riparian gallery forest dominant; important bird food; bank-stabilising	Along all permanent watercourses	LC	15 m riparian exclusion zone protects majority of stands; replant cleared riparian sections
<i>Diospyros mespiliformis</i>	Jackalberry	Large riparian tree; important wildlife food; high-quality timber	Riparian zones at major crossings	LC	Same as above; replant after crossing works
<i>Cyperus</i> spp.	Sedges	Dominant dambo wetland vegetation; important hydrological function	All dambos along corridor	LC	Dry-season-only works in dambos; minimal dambo vegetation clearance beyond embankment footprint
<i>Miscanthus junceus</i>	Elephant grass / Tall dambo grass	Tall grass characteristic of dambo margins; important thatching material	Dambo margins throughout corridor	LC	Community resource — removed material offered to communities before disposal

6.15 Reptiles and Amphibians — Key Species

The following table presents key reptile species of project management relevance identified through the biodiversity baseline survey. North Western Province supports one of the most diverse herpetofaunas in Zambia; only species of direct management relevance to the project are listed here. Amphibian communities in dambos are diverse with multiple frog species completing breeding cycles in seasonal wetlands — their conservation is addressed through the dambo exclusion zone and dry-season works restrictions.

Common Name	Scientific Name	IUCN Status	Habitat / Occurrence	Project Risk	Mitigation
Nile Monitor	<i>Varanus niloticus</i>	LC	Rivers, dambos, and woodland throughout corridor	Disturbed and eaten; eggs collected	Anti-poaching Code of Conduct; worker wildlife IEC
Savanna Monitor	<i>Varanus exanthematicus</i>	LC	Woodland throughout corridor	Disturbed and eaten	As above
African Rock Python	<i>Python sebae</i>	LC; protected in Zambia	Woodland and dambo areas; near water	Killed on sight by many communities; road mortality increasing	Worker awareness training; road mortality monitoring
Puff Adder	<i>Bitis arietans</i>	LC	Throughout corridor; responsible for most snakebite deaths in Zambia	Accidental killing during earthworks; snakebite risk to workers	Snakebite first aid kit at all sites; worker safety training for working near vegetation
Leopard Tortoise	<i>Stigmochelys pardalis</i>	LC	Woodland and grassland throughout corridor	Road mortality; collection as pets	Road mortality monitoring; worker Code of Conduct (no collection of wildlife)
Nile Crocodile	<i>Crocodylus niloticus</i>	LC; CITES App. I	Major permanent rivers (Kabompo, Lunga, Manyinga)	Disturbance during in-stream works; poaching	River works safety protocol (worker warning); DNPW notification if large individuals encountered
Flap-Necked Chameleon	<i>Chamaeleo dilepis</i>	LC	Woodland understorey throughout corridor	Habitat loss from clearance	Strict clearance limits

6.16 Ecosystem Services Assessment

The environmental baseline analysis includes an assessment of the ecosystem services provided by the habitats along the project corridor, to contextualise the significance of habitat loss and degradation impacts. Key ecosystem services at risk include:

- Carbon storage and climate regulation: Intact miombo woodland stores approximately 60–80 tonnes of carbon per hectare in above-ground biomass, and an additional 20–40 tonnes per hectare in soil organic carbon. The approximately 640 ha of RoW clearance and 100 ha of borrow pit clearance releases carbon equivalent to approximately 45,000–70,000 tonnes CO₂e. Against a Zambia national forest carbon budget and NDC targets, this is a small but non-trivial release that will be partially recovered through mandatory revegetation of all cleared areas.
- Watershed protection and groundwater recharge: Miombo woodland and dambos together maintain the groundwater recharge processes that sustain dry-season river baseflows and community borehole water supplies throughout the corridor. Loss of woodland cover increases surface runoff and reduces groundwater infiltration. Dambo conservation — through the exclusion zone and dry-season works policies — is particularly important for maintaining groundwater recharge and dry-season baseflows.
- Non-timber forest products (NTFPs): Communities along the corridor derive significant nutrition, income, and cultural value from NTFPs including wild mushrooms (harvested August–

November, highly culturally significant and economically important in NWP), edible caterpillars (Mopane worms and *Gonimbrasia* spp., harvested November–March), wild fruits (*Uapaca kirkiana*, *Parinari curatellifolia*, *Diospyros mespiliformis*, *Landolphia* spp.), honey (wild bees and managed hives in woodland), medicinal plants (numerous species used by traditional healers along the corridor), and fuelwood and building materials. Loss of woodland within the RoW, while a small fraction of the total available woodland in the area, directly reduces the NTFP base for roadside communities and contributes cumulatively to the reduction of NTFP access as woodland is lost to charcoal production and agricultural expansion.

- **Soil erosion regulation:** Woodland root systems and leaf litter are the primary protection for the highly erodible soils of the corridor against rainfall erosion. Clearance of woodland significantly increases runoff rates and erosion risk; the ESMP soil management measures are designed to substitute for the natural erosion protection function of woodland during the construction period, through silt fences, topsoil management, and rapid revegetation.
- **Fisheries productivity:** Riparian and wetland habitats along the corridor support fisheries productivity through leaf litter input (food source for fish), shading (maintaining water temperatures within the tolerance of cold-sensitive species), bank stabilisation (preventing siltation of fish habitat), and provision of spawning habitat. The 15 m riparian exclusion zone is designed to maintain these ecological functions along all watercourses crossed by the road.

6.17 Heritage Resource Inventory Summary

The following categories of cultural heritage resources have been identified along the project corridor through the preliminary cultural heritage survey and community-led mapping. Full details are provided in the Cultural Heritage Survey Report (Annex E of the Final ESIA) and the Cultural Heritage Management Plan.

- **Ancestral burial sites and grave clusters:** Identified at 23 locations along the preliminary survey area in May–June 2026. Burial sites range from small family grave clusters (2–5 graves) to larger community cemeteries near village centres. Several grave clusters are located within or very close to the existing road edge and may be directly affected by RoW clearance. Community consultations indicate that additional graves may be identified through community-led mapping in the July–August 2026 full mapping exercise.
- **Traditional sacred sites (shrines, sacred trees, spirit-associated landscape features):** Identified at 11 locations through community consultations, including 3 specific sacred tree sites (large *Brachystegia* and *Ficus* specimens associated with ancestral spirits), 4 stream confluences with spiritual significance, and 4 hilltop or rock outcrops with ceremonial associations. None of these are visible from the road and would not have been identified through a walkover survey alone.
- **Mukanda and Wali initiation school sites:** 6 active or periodically active initiation sites identified in the approximate vicinity of the road corridor through traditional authority consultations. The locations of these sites are documented in the Consultation Register but are not publicly disclosed in this ESIA document, consistent with the cultural protocols of the affected communities.
- **Historical village sites with archaeological potential:** The landscape of North Western Province has been continuously occupied for at least 2,000 years. Many current and historical village sites contain sub-surface archaeological deposits including iron-working furnaces, slag and bloom, pottery assemblages, and food remains. The preliminary walkover survey identified surface expressions of archaeological material at 4 locations along the corridor. The Chance Find Procedure addresses the risk of uncovering archaeological material during earthworks at all sections of the corridor.

6.18 Detailed Socioeconomic Baseline

6.19 Livelihood Systems — Detailed Analysis

The following table provides a detailed analysis of the primary livelihood and income sources for communities along the project corridor, with specific attention to the relationship between road access

quality and livelihood value. This analysis demonstrates the magnitude of economic benefit that year-round road access will deliver to rural households and is the quantitative basis for assessing the significance of the positive economic impact of the road rehabilitation project.

Livelihood / Income Source	Nature and Role	Income Type	Value and Road Access Linkage
Cassava (all forms)	Primary food crop; cultivated by >95% of households	Cash and food	2,500–4,000 ZMW/bag equivalent (dried chips); subsistence value higher; extremely wet-season price-sensitive — poor road access causes 30–50% price collapse at peak harvest when buyers cannot access villages
Maize (improved varieties)	Secondary food crop; mainly Kabompo and Manyinga Districts	Cash (FRA + private traders)	Average 120–150 ZMW/50 kg bag at farm gate; road access constraint means farm gate price is 30–40% below roadside market price in wet season
Groundnuts	Important cash crop; nitrogen-fixing; soil health role	Primarily cash	High-value crop: 180–250 ZMW/kg for unshelled; 350–450 ZMW/kg for shelled; significant post-harvest loss due to wet season access constraints and inability to reach markets
Charcoal production	Major off-season income activity; woodland conversion pressure	Cash	60–120 ZMW/bag at roadside; 35–60 ZMW/bag at production point — road access markedly affects value; major cumulative deforestation driver
River fishing (Kabompo, Lunga, Manyinga rivers)	Important supplementary income and household protein source	Cash and food	Daily catch value varies: 50–200 ZMW/day for full-time fishers at peak; highly seasonal; road access critical for fish market access in wet season
Wild mushrooms (mainly Aug–Nov)	High-value seasonal NTFP; culturally and nutritionally important	Cash and food	75–150 ZMW/kg for dried Boletus or Termitomyces spp.; wet season road access critical for selling to roadside buyers
Edible caterpillars (mopane worms)	Seasonal NTFP; high protein; important income source Nov–March	Cash and food	50–120 ZMW/kg dried; again, market access during wet season critical; significant portion of annual household cash income
Labour — casual and skilled	Off-farm income; mining sector employment in Solwezi for some; construction and trade skills where available	Cash	Daily labour rate: 80–150 ZMW/day (unskilled); 200–400 ZMW/day (semi-skilled); skilled workers from mining sector earn higher; very uneven access to employment along corridor
Small-scale trade and vending	Roadside shops, market stalls, mobile trading	Cash	Highly variable; roadside businesses report 40–60% income decline during wet season when traffic reduces; road rehabilitation expected to increase turnover significantly
Honey (managed hives)	Growing income activity; ZBCL encountered multiple bee-keeping groups along corridor	Cash	60–180 ZMW/litre for raw honey; higher for processed; market access and road quality critical for reaching buyers in district towns

6.20 Community Health Baseline — Detailed Status

The following table presents detailed baseline data on key community health indicators along the project corridor, drawing on published North Western Province health data, district health office records, and ZBCL community health focus group findings. This baseline is essential for assessing both the positive health impacts of improved road access and the construction-phase health risks that the ESMP must manage.

Health Issue	Current Status and Road Access Linkage	Project Impact (Positive and Risk)
Maternal mortality	North Western Province maternal mortality ratio: estimated 350–450 per 100,000 live births (above national average of 278 per 100,000); significant portion attributed to inability to reach district hospital during wet season obstetric emergencies	Road rehabilitation provides year-round ambulance access; estimated potential contribution to reducing maternal mortality through improved access to emergency obstetric care
Under-5 mortality	NWP under-5 mortality rate above national average; contributory factor is delayed access to health facilities during wet season for febrile illnesses including malaria and diarrhoeal disease	Year-round road access to Rural Health Centres and District Hospitals expected to reduce severity of delayed-treatment outcomes
HIV/AIDS prevalence	Estimated 10–13% adult prevalence in NWP; higher along road corridors; construction workforce influx is a documented risk factor for transmission in host communities	HIV/AIDS prevention programme mandatory; VCT access at camps; condom provision; monthly awareness sessions; outcome monitored through district health data
Malaria	Highly endemic in NWP; wet season (Nov–Apr) peak; significant morbidity and mortality burden particularly for children and pregnant women	Construction camp malaria prevention (nets, IRS, RDT treatment); operational road access improves access to malaria treatment at health facilities
Tuberculosis	NWP has above-average TB prevalence; partly linked to poverty and limited healthcare access	Improved road access to TB diagnosis and DOTS treatment at district health facilities
Nutritional status	Acute malnutrition rates in rural NWP above national average; seasonal food insecurity during May–August dry season before next harvest; cassava dependence creates micronutrient gaps	Road rehabilitation improves market access for diverse foods; agricultural productivity improvements from better input access; NTS community information on nutrition diversity
Disability	Limited disability-specific services along corridor; rehabilitation facilities only at Mwinilunga and Kabompo Hospitals; transport to reach services major barrier	Year-round road access to disability services; special RAP provisions for disabled PAPs

6.21 Road Condition and Community Impact Baseline

To quantify the baseline impact of the current road condition on communities, ZBCL conducted structured interviews with 85 community members from settlements distributed across all 214 km of the corridor during the socioeconomic baseline survey in June 2026. Respondents were asked

specifically about their experience of road-related access constraints. Key findings from these interviews:

- Average wet season impassability: respondents reported an average of 16 weeks per year (range: 8–24 weeks) during which the road was impassable or only accessible with great difficulty for standard vehicles. This is broadly consistent with the ZBCL road condition assessment findings.
- Impact on farm-gate produce prices: 78% of respondents with agricultural surplus to sell reported receiving prices 25–50% below what they would expect if they could reach district markets directly. The median reported price differential between rainy-season farm-gate price and dry-season roadside market price was 38%.
- Emergency health transport: 62% of respondents reported at least one incident in the previous 5 years where a household member required emergency health transport that was significantly delayed or impossible due to road conditions. In 14% of cases, the respondent reported that the delay was believed to have contributed to a worse health outcome.
- Children's education access: 45% of secondary school-age children in rural communities more than 5 km from a district town were reported to be out of school at the time of the survey, largely due to transport barriers. Only 12% of out-of-school youth cited reasons other than transport or financial constraints.
- Willingness to contribute to road maintenance: When asked whether they would be willing to participate in community road maintenance activities if the road were rehabilitated, 87% of respondents said yes, reflecting the very high community value placed on road access. This provides a basis for establishing community-based routine maintenance arrangements with traditional authorities post-rehabilitation.

7.0 IMPACTS

7.1 Overview and Methodology

This chapter presents the systematic assessment of all potential environmental and social impacts associated with the rehabilitation of the 214 km Mutanda-Mwinilunga Road, organised by thematic area and project phase. The assessment covers adverse and positive impacts across the physical environment, biological environment, community health and safety, labour and occupational health, waste management, and socioeconomic and livelihoods dimensions. The assessment methodology is described in Section 2. Impacts are rated as HIGH (red — significant, requiring priority management and robust mitigation), MODERATE (amber — notable, requiring standard mitigation), LOW (green — minor, manageable through good practice), or POSITIVE (green — beneficial impact to be enhanced). Premitigation significance reflects impact magnitude without management; post-mitigation significance assumes full and effective implementation of the mitigation measures specified in the ESMP.

7.2 Comprehensive Impact Assessment Matrix with Mitigations

The following comprehensive impact assessment matrix covers all identified potential impacts across all thematic areas and project phases.

Potential Impact	Phase	Impact Description	Magnitude	Pre-Mitigation	Post-Mitigation	Key Mitigation Measures
A. AIR QUALITY AND DUST						
Dust from earthworks and unpaved haulage routes	Construction	PM10 dust generated by earthworks, grading, and heavy haulage vehicles on unpaved haul roads during dry season. Impacts community health and road user visibility near active work sites in dry conditions.	High	HIGH	LOW	Water bowser dust suppression programme on all earthworks sections and haul roads; 20 km/h speed limit on unpaved sections; community notification 48 hours before major earthworks; Euro III vehicle fleet.
Vehicle and equipment exhaust emissions	Construction	Exhaust emissions from heavy plant, haulage vehicles, and generator sets contribute to local air quality degradation near active work sites.	Medium	MODERATE	LOW	Euro III or higher emission standard for all vehicles and plant; engine idle-time limit of 3 minutes; regular vehicle servicing; maintenance log records; spot emission checks.
Dust from borrow pit operations	Construction	Dry season extraction at borrow pits generates significant fugitive dust	High	MODERATE	LOW	Site-specific dust management plan per borrow pit approved before

Potential Impact	Phase	Impact Description	Magnitude	Pre-Mitigation	Post-Mitigation	Key Mitigation Measures
		affecting nearby communities and workers. Borrow pit faces expose large areas of bare soil to wind erosion.				extraction; water spraying at extraction faces; speed limit 15 km/h at borrow pits; prompt revegetation of restored surfaces.
Dust nuisance to roadside communities, schools and health centres	Construction	Communities and sensitive receptors (schools, clinics) within 200 m of active earthworks sections are exposed to elevated dust concentrations during peak earthworks activity.	High	MODERATE	LOW	Community notification 48 hours before major earthworks near sensitive receptors; hoarding at school frontages; respiratory PPE for all workers; heavy earthworks scheduled outside school hours.
Improved air quality for roadside communities (POSITIVE)	Operation	Rehabilitated sealed road permanently eliminates the dust currently generated by vehicle traffic on the severely deteriorated gravel surface, a major existing adverse impact on roadside communities.	High	N/A	POSITIVE	Maintain road surface integrity; enforce speed limits in settlement zones; road maintenance programme ensures surface condition is preserved.
B. NOISE AND VIBRATION						
Construction noise from heavy plant and equipment	Construction	Heavy machinery (excavators, compactors, vibratory rollers, crushers, concrete mixers) generate significant noise affecting	Medium	MODERATE	LOW	Restrict noisy activities to 06:00–18:00 weekdays and 07:00–13:00 Saturdays; no heavy plant on Sundays or public holidays; community notification of
		communities, schools, and health facilities within 100 m of active work sites.				activity schedules; noise monitoring at nearest sensitive receptors.
Ground vibration and air	Construction	Rock blasting for cut sections	High	MODERATE	LOW	Pre-blast condition

Potential Impact	Phase	Impact Description	Magnitude	Pre-Mitigation	Post-Mitigation	Key Mitigation Measures
overpressure from blasting		and quarrying generates ground vibration (PPV) and air overpressure that can cause structural damage to buildings and cultural distress within 200 m of blast sites.				surveys of all structures within 200 m; safe standoff distances per Zambian explosives regulations; PPV monitoring; charge limits; no blasting within 500 m of cultural/sacred sites without NHCC approval.
Vibration from compaction equipment near structures	Construction	Vibrating compaction equipment operated within 15 m of existing structures can cause cracking or damage, particularly to earthen, brick, or poorly constructed buildings.	Medium	MODERATE	LOW	Minimum 15 m standoff for vibrating compactors near all structures; hand compaction within standoff zone; pre- and post-works photographic condition surveys of affected structures.
Noise affecting cultural or sacred sites during ceremonies	Construction	Construction noise during traditional ceremonies (Mukanda, Wali, funerals) causes cultural distress and community conflict, particularly at sites near the road corridor.	Medium	MODERATE	LOW	Community-led mapping of sacred and ceremonial sites; seasonal work restrictions communicated to Contractor; traditional leader engagement; work stoppages during identified ceremonial periods at sensitive sites.
Increased operational road traffic noise	Operation	Higher speeds and increased traffic volumes on the improved road increase ambient noise levels at roadside communities and sensitive receptors.	Medium	LOW	LOW	Enforce national speed limits; rumble strips and speed humps at settlements; plant roadside trees as noise buffer where feasible; community notification of expected speed and traffic changes.

Potential Impact	Phase	Impact Description	Magnitude	Pre-Mitigation	Post-Mitigation	Key Mitigation Measures
C. WATER RESOURCES AND DRAINAGE						
Sedimentation of rivers and streams from earthworks runoff	Construction	Eroded sediment from disturbed earthworks areas is delivered to watercourses through stormwater runoff, raising turbidity, smothering aquatic habitats, and impairing fisheries at all active river crossing sections.	High	HIGH	LOW	Silt fences, sediment traps, and check dams on all drainage lines adjacent to active earthworks; prompt stabilisation of cut slopes and embankments; revegetation within 2 weeks of earthworks completion in each section; turbidity monitoring downstream.
Fuel, oil, and chemical spill contamination of surface water	Construction & Oper.	Spills from fuel storage, vehicle refuelling, or chemical handling contaminate soils and surface or groundwater, with toxic effects on aquatic ecosystems and community water supplies.	High	MODERATE	LOW	Bunded fuel storage (110% capacity containment); emergency spill kits at all fuel areas; spill response procedure known to all site supervisors; no refuelling within 50 m of watercourses; spill incident register maintained.
Disruption of natural drainage patterns from road embankments	Construction	Road embankments and inadequately sized culverts block natural	High	HIGH	LOW	Adequate culvert design to pass minimum 25-year return period flood; no
		drainage flow paths, causing upstream waterlogging of agricultural land and downstream flooding of roads and communities.				blocking of seasonal drainage channels without approved diversion; post-construction drainage survey within 6 months; drainage maintenance schedule.
Wetland and dambo disturbance from	Construction	Works within dambos and seasonal wetlands disturb	High	HIGH	MODERATE	Construction works in dambos restricted to dry

Potential Impact	Phase	Impact Description	Magnitude	Pre-Mitigation	Post-Mitigation	Key Mitigation Measures
embankment works		sensitive hydrological units, alter wetland hydrology, compact organic soils, and may cause permanent loss of wetland function if inadequately managed.				season (May–October) only; minimum 15 m exclusion zone from dambo margins except at approved crossing points; cofferdam isolation for in-stream works; no placement of fill material in wetlands beyond engineered embankment footprint.
Wastewater from contractor camps and concrete batching	Construction	Untreated wastewater (grey and black water) from contractor camps and concrete washwater discharged to watercourses degrades water quality and harms aquatic ecosystems.	High	MODERATE	LOW	Waste stabilisation pond or package treatment plant at all contractor camps with effluent quality monitoring; concrete washwater contained in lined settlement pits; no discharge of untreated wastewater to natural drainage.
Improved drainage and reduced seasonal	Operation	Rehabilitated culverts and drainage channels dramatically	High	N/A	POSITIVE	Annual culvert inspection and clearing programme; post-
flooding (POSITIVE)		reduce seasonal flooding, restore access during the wet season, and reduce flood damage to agricultural land and property along the corridor.				rehabilitation drainage performance monitoring; RDA maintenance budget for drainage upkeep.
D. SOILS AND EROSION						
Soil erosion from exposed earthworks on erodible soils	Construction	Exposure of erodible sandy subsoils and stripping of vegetation during earthworks creates very high erosion risk	High	HIGH	LOW	Progressive revegetation within 2 weeks of earthworks completion per section; silt fences at base of disturbed slopes; topsoil

Potential Impact	Phase	Impact Description	Magnitude	Pre-Mitigation	Post-Mitigation	Key Mitigation Measures
		during wet season rainfall events. Rilling and gulying on embankments and cut slopes can cause rapid and significant land degradation.				stripped, stockpiled, and reapplied; phased earthworks programme to minimise simultaneous exposed areas; gabion protection on slopes > 1:2 gradient.
Land degradation at borrow pit sites	Construction	Borrow pit extraction removes topsoil, subsoil, and vegetation over significant areas, creating permanent land degradation and loss of productive land, water ponding hazards, and site safety risks without adequate rehabilitation.	High	HIGH	LOW	Site-specific Borrow Pit Management and Rehabilitation Plan (BPMRP) approved before each site opens; phased extraction with progressive rehabilitation; topsoil stockpiled and reapplied during restoration; revegetation monitored until 80% ground cover achieved; site fenced until establishment confirmed.
Slope instability on embankments and cut slopes	Construction	Poorly compacted or geometrically unstable embankments on waterlogged or weak subgrade soils may fail through slumping, landslip, or rotational failure, causing sedimentation and road damage.	Medium	MODERATE	LOW	Geotechnical testing of embankment foundation soils; slope design to stable gradients (1:1.5 minimum cut; 1:2 minimum fill); gabion or rip-rap toe protection where required; subsurface drainage behind embankments.
Compaction of agricultural soils in temporary construction zones	Construction	Use of agricultural land for temporary construction access, stockpiling, or work areas causes soil compaction, reduces agricultural	Medium	MODERATE	LOW	Identify and demarcate all agricultural land used temporarily; decompact and restore to original condition after use; compensate

Potential Impact	Phase	Impact Description	Magnitude	Pre-Mitigation	Post-Mitigation	Key Mitigation Measures
		productivity, and may damage crops if not managed.				landholders for any crop losses and income loss during occupation; pre-use condition survey.
Topsoil loss during excavation	Construction	Loss of topsoil during bulk excavation permanently reduces soil fertility on disturbed areas and impedes revegetation and long-term land productivity recovery.	Medium	MODERATE	LOW	Strip topsoil separately before sub-grade excavation; stockpile in maximum 2 m high windrows; protect stockpiles from erosion with straw or jute netting; reapply to all restored surfaces before revegetation.
E. BIODIVERSITY AND ECOSYSTEMS						
Loss of miombo woodland habitat through vegetation clearance	Construction	Vegetation clearance within the 30 m RoW removes miombo woodland and	High	HIGH	LOW	Restrict vegetation clearance strictly to the approved construction
		understorey habitat along the full 214 km corridor. Borrow pit clearance adds additional habitat loss beyond the RoW footprint.				footprint; no clearing beyond surveyed and pegged boundary marks; cleared wood chipped or stockpiled (no burning without permit); replant with indigenous species post-construction on all disturbed areas.
Disturbance to wildlife and wildlife movement corridors	Construction & Oper.	Construction noise, vehicle traffic, and human presence disturbs wildlife movement and habitat use. Improved road in operation increases road-kill mortality risk for large mammals using established corridors.	High	MODERATE	LOW	Pre-clearance wildlife walkover survey; Chance Find Procedure for wildlife encounters; mandatory anti-poaching awareness training for all workers; wildlife underpasses at identified movement corridor

Potential Impact	Phase	Impact Description	Magnitude	Pre-Mitigation	Post-Mitigation	Key Mitigation Measures
						crossing points; wildlife warning signs post-construction.
Disturbance to riparian and wetland habitats	Construction	Works in or adjacent to riparian zones disturb sensitive habitats of high biodiversity value, remove bank-stabilising vegetation, and may permanently alter channel morphology.	High	HIGH	LOW-MODERATE	Minimum 15 m riparian vegetation exclusion zone except at approved bridge and culvert crossing points; in-stream works dry season only; silt curtains at all active watercourse crossings; machinery access restricted to established crossing points.
Poaching and bushmeat hunting by	Construction	A peak workforce of 300–500	High	MODERATE	LOW	Mandatory anti-poaching Code of Conduct for
construction workers		workers living in remote woodland areas significantly increases hunting and poaching pressure on wildlife, including potentially threatened species.				all workers (signed at induction); zero tolerance policy for firearms, traps, snares, or live wildlife at camps or work sites; coordination with DNPW for joint anti-poaching patrols; dismissal for any poaching incident.
Invasive alien plant species establishment on disturbed verges	Construction & Oper.	Vegetation clearance and earthworks disturb native plant communities and create conditions ideal for invasive alien plant species to colonise road verges, with potential spread into adjacent natural habitats.	Medium	MODERATE	LOW	Use certified weed-free fill and topsoil; weed-free seed mixes for revegetation; quarterly invasive species surveys along the full corridor from Year 1; targeted manual or approved herbicide control for identified invasive species.

Potential Impact	Phase	Impact Description	Magnitude	Pre-Mitigation	Post-Mitigation	Key Mitigation Measures
Induced deforestation from improved road access (RESIDUAL)	Operation	Improved road access facilitates increased agricultural clearing, charcoal production, and settlement along the corridor as market access improves. This induced land use change represents the most significant long-term biodiversity and ecosystem services impact.	High	MODERATE	MODERATE	Coordination with Forestry Department and NWP Planning Authority on land use planning; community forest governance strengthening; land cover change monitoring using annual satellite analysis; advocacy for Protected Area management capacity strengthening.
Aquatic habitat and fisheries disturbance at river crossings	Construction	Bridge and culvert works in permanent rivers temporarily disturb aquatic habitats, increase turbidity, and may affect fish spawning and juvenile recruitment.	Medium	MODERATE	LOW	Avoid in-stream works at major river crossings during fish spawning season (November–January); silt curtains at all active river crossings; cofferdam isolation for bridge pier works in permanent rivers; no fish or aquatic species collection by workers.
F. CULTURAL HERITAGE						
Damage to known archaeological or cultural heritage sites	Pre-Const. & Const.	Road works may encroach on ancestral burial sites, traditional sacred sites, or areas of archaeological significance identified along the 214 km corridor. Physical damage or disturbance of these resources causes irreversible loss of cultural heritage.	High	HIGH	LOW	Pre-construction cultural heritage survey along full corridor; identified heritage sites marked as legally binding exclusion zones on all construction drawings; NHCC clearance obtained; community consent required before any works near

Potential Impact	Phase	Impact Description	Magnitude	Pre-Mitigation	Post-Mitigation	Key Mitigation Measures
						graves or shrines; Cultural Heritage Management Plan prepared and approved.
Chance finds of archaeological material during excavation	Construction	Sub-surface archaeological deposits (including pottery, iron-working remains, historical structures, and human remains) may be accidentally	Medium	MODERATE	LOW	Chance Find Procedure in place before excavation starts; all workers trained in Chance Find Procedure at induction; immediate work stoppage upon any discovery;
		disturbed by earthworks activities across historically occupied landscape.				NHCC notification within 24 hours; works resume only after NHCC written clearance.
Disturbance of sacred sites and ceremonial areas	Construction	Construction noise, vibration, and worker presence near traditional sacred sites or active ceremonial areas causes cultural distress and potential community conflict with traditional authorities.	Medium	MODERATE	LOW	Community-led mapping of all sensitive sites before works; seasonal work restrictions near Mukanda and Wali sites during active ceremony periods; mandatory cultural sensitivity training for all workers; traditional leader sign-off before works near sensitive areas.
Loss of ancestral graves during RoW clearance	Pre-Const.	Ancestral burial sites within the 30 m RoW may require relocation. Unauthorised or insensitive handling of graves constitutes a serious cultural and social harm.	High	HIGH	LOW	Community consultation and family consent before any grave identified for potential relocation; traditional leader and NHCC oversight; community-prescribed ceremonial process for relocation; family receives

Potential Impact	Phase	Impact Description	Magnitude	Pre-Mitigation	Post-Mitigation	Key Mitigation Measures
						compensation and assistance; relocation to community-identified site.
G. COMMUNITY HEALTH, SAFETY AND SECURITY						
Road safety risks for communities during construction	Construction	Heavy construction plant and haulage vehicles operating on community	High	HIGH	LOW	Speed limits (15 km/h in communities); flagmen at all active sections within 100 m of residences;
		roads and in proximity to pedestrian zones creates significant accident risk, particularly for children near primary and secondary schools.				advance warning signs minimum 200 m from active work face; safe, signed pedestrian bypass routes maintained at all settlement crossings; school zone special measures including escort duty during school hours.
HIV/AIDS and STI transmission from worker influx	Construction	Influx of 300–500 predominantly male workers into rural communities is historically associated with increased HIV/AIDS and sexually transmitted infection transmission, driven by power imbalances and economic vulnerability in host communities.	High	HIGH	LOW	Mandatory HIV/AIDS and STI awareness programme for all workers before work commences; monthly awareness sessions at all camps; free condoms and voluntary testing access at camp; engagement of local health clinic for joint outreach; prohibition of commercial sex activities on project sites.
GBV and Sexual Exploitation and Abuse (SEA)	Construction	Power imbalances between workers and local community members, particularly women and girls, create	High	HIGH	LOW	Mandatory Code of Conduct for all workers (zero tolerance for GBV/SEA; signed before starting work); confidential

Potential Impact	Phase	Impact Description	Magnitude	Pre-Mitigation	Post-Mitigation	Key Mitigation Measures
		GBV and SEA risks. Economic dependency created by project employment dynamics increases vulnerability.				GBV reporting channel independent of line management; designated GBV Service Provider engaged and operational before construction
						starts; CLO GBV first-responder training; survivor-centred referral pathway.
Child safety risks near construction sites	Construction	Heavy plant operations and the presence of large numbers of male workers in communities near schools create serious safety and child protection risks.	Medium	MODERATE	LOW	Site perimeter fencing at all active work sites and contractor camps; children strictly prohibited from construction zones; child protection Code of Conduct provisions; CLO engagement with school headteachers on child safety; appointed school safety liaison at each school near active construction.
Community health impacts from contractor camp operations	Construction	Contractor camps generate wastewater, solid waste, and communicable disease risks for surrounding communities if inadequately managed.	Medium	MODERATE	LOW	Camp sited minimum 2 km from nearest settlement; adequate sanitation (minimum 1 toilet per 15 workers; 1 per 8 female workers); package wastewater treatment; pest and vector control programme; no discharge of untreated effluent to natural drainage; weekly camp

Potential Impact	Phase	Impact Description	Magnitude	Pre-Mitigation	Post-Mitigation	Key Mitigation Measures
						sanitation inspections.
Security and community tensions from worker influx	Construction	Influx of large, predominantly male workforce into rural communities	Medium	MODERATE	LOW-MODERATE	Worker Code of Conduct; provision of food, water, and fuel at
		can cause social tensions, resource competition (water, fuelwood, food), and cultural friction with host communities.				contractor camp to reduce external resource demand; monthly community liaison meetings with CLOs; worker-community grievance pathway; community complaints resolved within 5 working days.
Improved access to health facilities (POSITIVE)	Operation	Rehabilitated road dramatically reduces travel time and cost to district hospitals and health centres for rural communities currently isolated during the wet season.	High	N/A	POSITIVE	Road safety features protect access; road maintenance programme sustained; coordination with health sector to expand service delivery as access improves.
H. LABOUR AND OCCUPATIONAL HEALTH AND SAFETY						
OHS risks from heavy construction plant operations	Construction	Crush injuries, struck-by incidents, and runover fatalities from heavy construction plant are the leading cause of construction-related deaths and serious injuries in road projects.	High	HIGH	LOW	Site-specific OHS Management Plan approved before mobilisation; mandatory PPE for all workers (hardhats, high-visibility vests, safety boots, gloves, eye protection); equipment exclusion zones demarcated and enforced; daily pre-start safety briefing; OHS Officer present on all active sites.
Respiratory	Construction	Prolonged	High	MODERATE	LOW	Respiratory

Potential Impact	Phase	Impact Description	Magnitude	Pre-Mitigation	Post-Mitigation	Key Mitigation Measures
health from silica and PM10 dust exposure		exposure to construction dust without adequate respiratory				PPE (N95 masks minimum) mandatory at all dusty work
		protection causes serious long-term lung disease, including silicosis, particularly at borrow pit and quarry operations.				activities; dust suppression at work faces; pre-employment chest X-ray baseline; periodic respiratory health checks for all workers in dusty environments; OHS monitoring of dust levels.
Heat stress for outdoor workers	Construction	Outdoor workers during the hot season (September–November) when temperatures reach 30–33°C face significant heat stress risk, exacerbated by physical exertion and PPE.	Medium	MODERATE	LOW	Shade and drinking water at all work sites; heavy physical work scheduled for early morning (before 11:00) during peak heat months; heat stress awareness training for all supervisors; heat stress incident register; rest schedule enforced.
Child and forced labour in borrow pit supply chain	Construction	Local borrow pit operators or subcontractors may use child or forced labour without adequate oversight, particularly in remote locations where supervision is limited.	Medium	MODERATE	LOW	Minimum age verification for all workers (18 for hazardous work, 16 for non-hazardous); written employment contracts required for all workers; unannounced quarterly inspections of all subcontractor and borrow pit sites; ZBCL Labour Specialist reviews payroll records; zero tolerance dismissal for any child labour confirmed.

Potential Impact	Phase	Impact Description	Magnitude	Pre-Mitigation	Post-Mitigation	Key Mitigation Measures
Labour disputes and worker grievances	Construction	Poor communication, wage disputes, unsafe conditions, or discrimination by the Contractor can generate worker disputes that affect productivity and worker wellbeing.	Medium	MODERATE	LOW	Labour Management Procedure developed and implemented before mobilisation; worker grievance mechanism fully separate from community GRM; wages paid in compliance with Zambia Employment Act minimum; written employment contracts with all workers; monthly worker satisfaction survey.
Worker accommodation and camp conditions	Construction	Overcrowded or poorly serviced camp accommodation causes health risks (communicable disease), worker dissatisfaction, and is non-compliant with ILO standards.	Medium	MODERATE	LOW	Camp accommodation compliant with ILO standards (maximum 4 persons per room; natural ventilation; individual bed with mattress); separate accommodation areas for female workers; clean drinking water; adequate sanitation; monthly camp inspection by ZBCL.
I. WASTE MANAGEMENT						
Solid waste from contractor camps and work sites	Construction	Unmanaged solid waste from camps and work sites pollutes the environment, attracts vermin, and causes community health and aesthetic impacts.	Medium	MODERATE	LOW	Waste Management Plan; source segregation of organic, recyclable, hazardous, and general waste; licensed waste haulers for off-site disposal; no open burning of any waste;
						camp waste collection at minimum weekly;

Potential Impact	Phase	Impact Description	Magnitude	Pre-Mitigation	Post-Mitigation	Key Mitigation Measures
						licensed disposal site only.
Hazardous waste from plant maintenance	Construction	Used oil, fuel filters, batteries, hydraulic fluid, and chemical containers, if improperly disposed of, cause serious soil and water contamination.	High	MODERATE	LOW	Hazardous waste register maintained for all waste types; used oil collected in sealed, labelled containers for recycling or licensed disposal; banded hazardous waste storage area; only licensed hazardous waste contractor used; disposal manifests retained.
Construction waste and demolition debris	Construction	Concrete, asphalt, road base material, and other construction debris, if not properly managed, are dumped along the corridor or in natural drainage, causing environmental harm.	Medium	MODERATE	LOW	Crushed demolition material reused as engineered fill or sub-base where technically approved; inert waste disposed at licensed inert waste site; no disposal of any waste in watercourses, roadside ditches, or public land; waste volume tracking reported monthly.
Medical waste from camp first aid and health facilities	Construction	Medical waste (sharps, bloodied dressings, pharmaceutical waste) requires separate management to prevent infection	Low	LOW	LOW	Medical waste segregated and stored in clinical waste containers; licensed medical waste contractor for off-site disposal or incineration;
		transmission risk.				no medical waste in general waste stream; ZBCL monthly audit of medical waste management.

Potential Impact	Phase	Impact Description	Magnitude	Pre-Mitigation	Post-Mitigation	Key Mitigation Measures
J. SOCIOECONOMIC AND LIVELIHOODS						
Physical displacement of households and businesses	Pre-Construction	Structures (residential and commercial) located within the 30 m RoW require demolition and relocation. Physical displacement disrupts communities, social networks, and household welfare.	High	HIGH	LOW	Full RAP implementation with compensation at full replacement cost (no depreciation) before any displacement occurs; relocation assistance to all affected households; CLO assigned to support each physically displaced PAP; alternative accommodation available before original demolished.
Economic displacement — loss of agricultural land, crops, and trees	Pre-Construction	Loss of agricultural land within the RoW, including cultivated fields, fruit trees, and cash crops, causes income and food security losses for affected households.	High	HIGH	LOW	RAP entitlement matrix: compensation for all agricultural land, standing crops, and trees at full replacement cost; preference for land-for-land replacement for subsistence farmers; crop loss compensation paid before vegetation clearance in any section.
Impacts on vulnerable PAPs including female-headed, elderly,	Pre-Construction	Vulnerable PAPs face disproportionate difficulties during the	High	HIGH	LOW	RAP identifies all vulnerable PAPs at census stage; dedicated CLO
disabled, and child-headed households		resettlement process, including higher risks of impoverishment and inadequate compensation due to limited negotiating capacity.				assigned to each; additional assistance above standard entitlements; priority enrolment in Livelihood Restoration Programme; welfare

Potential Impact	Phase	Impact Description	Magnitude	Pre-Mitigation	Post-Mitigation	Key Mitigation Measures
						monitoring visits monthly during resettlement and quarterly thereafter.
Worker influx tensions and competition for local resources	Construction	Influx of 300–500 workers increases competition for food, water, fuelwood, and accommodation in rural communities with limited surplus, causing price inflation and social tensions.	High	HIGH	LOW-MODERATE	Contractor to supply all food, water, fuel, and accommodation from commercial sources to minimise community resource competition; local procurement priority for food supplies; Code of Conduct prohibits illegal purchase of community natural resources; monthly community liaison meetings to monitor and address tensions.
Disruption to local business operations during construction	Construction	Construction activities temporarily restrict access to roadside businesses, causing reduced customer footfall and income losses, particularly for businesses adjacent to active work sections.	Medium	MODERATE	LOW	Access maintained to all roadside businesses during works at all times; advance notice of any section-level closure minimum 48 hours; compensation for documented income losses where access is temporarily
						blocked; local procurement preference for construction supplies.
Unequal access to project employment benefits	Construction	Without proactive management, employment benefits may accrue primarily to workers from outside the project area, while	Medium	MODERATE	LOW	Minimum 30% local labour target in total workforce; vacancies advertised through traditional authority structures and

Potential Impact	Phase	Impact Description	Magnitude	Pre-Mitigation	Post-Mitigation	Key Mitigation Measures
		communities along the corridor bear the adverse impacts of construction.				community notice boards and radio; skills training programme for local recruits; gender target 20% female; monthly payroll review against targets.
Local employment and skills development (POSITIVE)	Construction	The construction project creates short-term employment for local workers and provides skills and trade qualifications that enhance long-term employability.	High	N/A	POSITIVE	30% local labour minimum; skills training including heavy equipment operation, carpentry, concrete works; trade test facilitation for qualified workers; local supplier procurement preference creates additional business income.
Improved economic connectivity and market access (POSITIVE)	Operation	The rehabilitated road eliminates the wet-season isolation of communities, dramatically reduces transport costs, improves market access for agricultural produce, and stimulates	High	N/A	POSITIVE	Road safety features to sustain safe use; RDA maintenance programme; district council coordination; monitoring of economic indicators along corridor in post-project period.
		broader economic development in NWP.				

7.3 Key Findings and Overall Significance

7.3.1 High Significance Pre-Mitigation Impacts

The following impacts are assessed as HIGH significance before mitigation, reflecting significant potential harm that requires priority management attention and robust mitigation measures in the ESMP: soil erosion and watercourse sedimentation from earthworks; disruption of natural drainage patterns and wetland disturbance; loss of miombo woodland and riparian habitat; damage to cultural heritage sites; physical and economic displacement of households and businesses; vulnerable PAP impacts; road safety risks during construction; HIV/AIDS and STI transmission; GBV and SEA from worker influx; and OHS risks to workers from heavy plant operations. With full implementation of

ESMP and RAP measures, all HIGH significance pre-mitigation impacts are assessed as reducible to LOW or LOW-MODERATE post-mitigation significance.

7.3.2 Residual Significant Adverse Impacts

The only impact assessed as remaining at MODERATE significance after mitigation is induced deforestation and land use change in the operational phase. This reflects the fact that the indirect effects of improved road access on deforestation rates and land conversion are driven by socioeconomic and governance factors that are largely beyond the direct control of the project. While the ESMP specifies coordination with land use planning and forestry authorities, the long-term outcome depends on the effectiveness of government land governance in North Western Province. This impact is addressed in the Cumulative Impacts chapter (Section 7) and requires long-term monitoring.

7.3.3 Significant Positive Impacts

The principal long-term positive impacts of the project are: improved connectivity and all-weather access for rural communities currently cut off during the wet season (assessed HIGH positive, long-term); enhanced access to health facilities with expected reduction in maternal and child mortality (HIGH positive, long-term); improved road safety for communities and road users on the rehabilitated surface (MODERATE-HIGH positive, long-term); short-term local employment and skills development for communities along the corridor during construction (HIGH positive, medium-term); improved drainage infrastructure reducing seasonal flooding of agricultural land and community areas (HIGH positive, long-term); and reduced vehicle operating costs stimulating commercial and agricultural activity (HIGH positive, long-term). These positive impacts are expected to substantially outweigh the residual adverse impacts, particularly over a 20-year assessment horizon.

7.4 Impact Assessment — Detailed Discussion

7.5 Detailed Discussion: Physical and Economic Resettlement

Physical and economic displacement of households, businesses, and asset holders within the 30-metre right-of-way is assessed as the highest priority social impact of this project, requiring the most intensive management attention. The displacement is unavoidable given the project objective of restoring the full legal right-of-way width along the 214 km corridor to enable adequate drainage construction and long-term maintenance access. The following sections discuss the key dimensions of this impact in detail.

7.5.1 Physical Displacement

An estimated 150–250 households currently occupy residential structures within the 30-metre legal right-of-way, based on the preliminary PAP census conducted in June 2026. The majority of these structures are informal earthen-brick or burnt-brick dwellings without formal title within the RoW. Many have been established progressively over many years as the road narrowed due to lack of maintenance. In several settlement areas — particularly in Mwinilunga, Kabompo, and Manyinga Boma peri-urban zones — a significant number of structures of higher construction quality (burnt-brick walls, iron sheet roofing, concrete floors) are located within the RoW. Physical displacement is the most traumatic form of project-induced impact, disrupting social networks, access to agricultural land, proximity to school and health facilities, and established community relationships. International evidence on resettlement consistently demonstrates that physically displaced households are at high risk of impoverishment without active livelihood restoration support, particularly in the first 12–18 months following displacement. For this reason, the RAP includes an active Livelihood Restoration Programme targeting all displaced households, with monitoring of livelihood recovery at 6 and 12 months post-relocation. The pre-construction ESMP monitoring programme will establish a household welfare baseline for all PAPs before displacement occurs, enabling post-resettlement welfare outcomes to be quantitatively assessed. This baseline will include: household income levels (self-reported); food security indicators; children's school enrolment rates; and subjective wellbeing ratings.

These indicators will be re-surveyed at 6, 12, and 24 months post-displacement to track welfare recovery and identify cases requiring additional support.

7.5.2 Economic Displacement — Agricultural Land

Agricultural land within the RoW is the most prevalent category of economic displacement impact along the rural sections of the 214 km corridor, where the road passes through smallholder farming landscapes. Cassava is the dominant crop in all four districts, followed by maize, groundnuts, sweet potatoes, and a variety of vegetables and legumes. Many households have established perennial cassava stands, fruit orchards, and vegetable gardens within or adjacent to the RoW that will be permanently lost through the construction process. The loss of agricultural land is particularly significant for households where the affected portion represents the majority of their cultivated area, which may occur where households settled close to the road on limited available customary land. The RAP includes a preference for land-for-land replacement where feasible — i.e. the project works with traditional authorities to identify alternative agricultural land of comparable quality and area for affected farmers. Where land-for-land replacement is not available, cash compensation at full replacement cost is provided, together with enrolment in the Livelihood Restoration Programme to ensure the PAP has access to seeds, tools, and extension support to re-establish agricultural production.

7.5.3 Vulnerable PAPs — Priority Management

The RAP vulnerability assessment identifies the following vulnerability criteria: female-headed households; elderly household heads (>65 years); persons with physical or mental disability limiting livelihood activities; child-headed households; HIV/AIDS-affected households with reduced labour capacity or healthcare costs; and households assessed as living below the Zambian national poverty line (approximately USD 1.90 per person per day PPP). An estimated 25–35% of all PAP households are expected to meet one or more vulnerability criteria based on the preliminary census findings. Vulnerable PAPs receive additional support beyond standard entitlements including: priority scheduling of compensation payment and relocation to ensure vulnerable PAPs are not left to the end of the process; dedicated CLO support (individual case management, not just group meetings) throughout the resettlement process; additional moving assistance (vehicles, labour, packing materials); longer transition period before alternative site must be vacated; priority enrolment in the Livelihood Restoration Programme; and monthly CLO welfare monitoring visits for 12 months post-resettlement. Any vulnerable PAP whose welfare is not recovering by the 6-month monitoring point is escalated to the ZBCL Social Specialist and RDA for a case-specific support plan.

7.6 Detailed Discussion: GBV and SEA Risks

GBV and Sexual Exploitation and Abuse (SEA) risks from workforce influx are assessed as the second highest priority social risk of this project and the most consistently raised community concern in consultations. The risk assessment is grounded in a substantial evidence base from comparable infrastructure projects in Zambia and the broader sub-Saharan African region, which consistently demonstrates elevated rates of GBV and STI transmission in communities hosting large infrastructure workforces.

7.6.1 Risk Drivers

The primary risk factors for GBV and SEA in this project context are: a predominantly male workforce of 300–500 workers, many of whom will be resident at contractor camps near rural communities for 18–24 months; significant economic power differentials between cash-earning workers and communities with very limited cash income; a remote rural setting with limited law enforcement presence; weak existing community-based GBV response capacity; and limited awareness among some community members of their rights and available recourse if GBV occurs. These risk factors are present across the full 214 km corridor but are most acute at contractor camp locations and in the remotest sections of the corridor.

7.6.2 Mitigation Measures — Code of Conduct

The mandatory Code of Conduct is the primary preventive measure for GBV and SEA. Every worker — including managers, supervisors, technical staff, skilled workers, labourers, and security personnel — must read, understand, and sign the Code of Conduct before starting work on site. Workers unable to read must have the Code explained in their language by a CLO, with signature or thumbprint as evidence of understanding. The Code prohibits: any sexual contact with community members mediated by payment, in-kind goods, or favours (regardless of apparent consent); solicitation of sexual contact with minors under any circumstances (zero tolerance, immediate dismissal, and police referral); touching, approaching, or following community members in a sexual or threatening manner; using language, signs, or imagery that is sexually demeaning to women or men; and consuming alcohol in public spaces in communities near work sites.

7.6.3 GBV Service Provider

A designated GBV Service Provider (GSP) is required to be under contract and operational — with a named contact person and a functioning confidential reporting channel — before any construction workers are deployed at any section of the corridor. The GSP provides: a survivor-centred confidential reporting channel (a dedicated phone line) accessible to all community members and workers 24 hours a day; immediate response to reported GBV incidents, including medical referral, psychosocial support, and legal advice; confidential case management; and quarterly reporting to ZBCL and RDA on the number and type of complaints received (aggregate, no identifying information). The identity of any survivor is never disclosed without their explicit consent. The project-level GBV referral pathway does not replace or bypass the survivor's right to report to the police.

7.7 Detailed Discussion: Biodiversity and Habitat Impacts

The assessment of biodiversity and habitat impacts is one of the most technically complex aspects of this ESIA, given the high biodiversity value of the miombo woodland and wetland landscape traversed by the 214 km corridor and the range of direct and indirect impact pathways.

7.7.1 Direct Habitat Loss from RoW Clearance

Vegetation clearance within the 30 m legal right-of-way along 214 km of corridor results in a clearance footprint of approximately 642 ha. Not all of this area currently supports valuable vegetation — the existing road surface and maintained clearances already occupy approximately 40–50% of the RoW in most sections. However, significant areas of miombo woodland, riparian forest, and dambo margin vegetation within the RoW will be cleared for the first time as the full 30 m RoW is established. The estimated net new vegetation clearance (beyond the currently cleared area) is approximately 280–350 ha. Borrow pit clearance will add a further estimated 80–120 ha of vegetation loss (assuming average borrow pit size of 4–8 ha across 15–25 sites). All borrow pit sites will be subject to site-specific biodiversity screening before approval, with sensitive habitats (riparian zones, dense miombo, dambo margins) excluded from consideration as borrow pit locations. All borrow pit areas will be revegetated and rehabilitated following extraction.

7.7.2 Indirect and Induced Habitat Impacts

The more significant long-term biodiversity impact may be indirect — through induced land use change along the improved road corridor in the operational phase. Evidence from comparable road improvement projects in southern Africa (including the Zambia-Tanzania Highway, the Great East Road, and various donor-funded feeder road projects in Zambia) consistently demonstrates that road improvement stimulates 15–40% higher deforestation rates within 5 km of the road over a 10-year period, driven primarily by in-migration of agricultural settlers, expansion of charcoal production catchment, and increased commercialisation of natural resource extraction that road access enables. For the Mutanda-Mwinilunga corridor, the induced deforestation risk is assessed as significant but not catastrophic, given: the limited agricultural land availability in the predominantly miombo woodland landscape; existing customary land governance systems under traditional authorities that retain capacity to regulate land allocation; and the relatively low in-migration pressure expected compared to peri-urban road corridors near major towns. Nonetheless, a long-term land cover change monitoring

programme using annual satellite imagery analysis is included in the operational ESMP as a mandatory measure, with results reported to RDA, NWP Provincial Planning Authority, and the Forestry Department. This creates an evidence base for adaptive management of forest governance alongside road management.

7.8 Detailed Discussion: Watercourse and Wetland Impacts

The project corridor crosses numerous rivers, streams, and dambos, making watercourse and wetland management one of the most technically demanding aspects of the ESMP. The hydrological baseline (Section 6.2.4) confirms that the project area sits within a high-rainfall, high-runoff landscape with naturally high turbidity during storm events, making it particularly sensitive to the additional sediment loads that construction earthworks can generate.

7.8.1 Sedimentation Risk Assessment

Sedimentation risk is highest during: the first wet-season rainfall events following vegetation clearance in each section (the "first flush" carries the highest sediment load from freshly disturbed soil surfaces); earthworks operations on highly erodible sandy ferrallitic soils in the approximately 25–30% of the corridor where these occur; dam, culvert, and bridge construction in permanent watercourses where coffer dam breaches or inadequate silt containment can result in acute turbidity pulses; and borrow pit operations adjacent to watercourse drainage lines.

The ESMP silt fence and sediment trap requirements — requiring installation of all drainage controls before any vegetation clearance or earthworks commence in each section — are designed to intercept the majority of construction sediment before it reaches watercourses. However, silt fences provide limited protection during extreme storm events; for this reason, earthworks scheduling to minimise the area of exposed soil during the wet season is a critical risk management measure that should be reflected in the construction programme.

7.8.2 Dambo Crossing Management

Dambo crossings require the most sophisticated environmental management of any construction activity on the project, given the combination of: high ecological sensitivity (dambos are critical groundwater recharge areas, support high amphibian biodiversity, and provide important dry-season water sources for communities and wildlife); highly erodible hydromorphic soils with very low bearing capacity when wet; shallow groundwater tables requiring careful dewatering management; and the hydrological connectivity of dambo systems that means impacts at one crossing point can propagate to adjacent catchment areas. All dambo embankment works are restricted to the dry season (May–October), and no dambo section may be left with bare, unprotected soil exposed at the onset of the rainy season in November. A specific Dambo Crossing Management Protocol is included as a subsection of the CEMP, covering pre-works drainage assessment, construction sequence, soil protection measures, and postconstruction hydrological monitoring.

7.9 Technical Impact Analysis — Hydrology And Soils

7.10 Hydrological Impact Analysis — Detailed Assessment

7.10.1 Baseline Hydrology and Construction-Phase Changes

The Mutanda-Mwinilunga corridor drains to two major river systems: the Kabompo River basin (flowing ultimately to the Zambezi) which receives drainage from the central and southern portions of the corridor, and the Luapula River system (flowing to the Congo River basin) which receives drainage from the northern Mwinilunga sections. This bi-directional drainage pattern reflects the location of the corridor close to the Congo-Zambezi watershed. The hydrological regime of both systems is characterised by strongly seasonal flows, with peak discharge events occurring in December–February following the peak rainfall period. Base flows in smaller watercourses are sustained primarily by groundwater discharge from the dambo systems and the weathered lateritic regolith.

Construction activities will alter the hydrological response of catchments draining across the road corridor in the following principal ways:

- Vegetation clearance increases surface runoff coefficients from approximately 0.3–0.5 (woodland) to 0.7–0.9 (bare soil), significantly increasing peak runoff rates from the cleared area for the duration of construction before revegetation establishes. For a typical 10 ha catchment contributing to a culvert, a doubling of the runoff coefficient increases peak flow by approximately 40–70% during a 1:25 year storm event, which may be sufficient to cause overtopping of inadequately sized existing culverts.
- Topsoil stripping reduces infiltration capacity of the stripped area to near zero (compacted subsoil has much lower hydraulic conductivity than topsoil), further increasing runoff from earthworks areas during rainfall events.
- Embankment construction across dambos and valley bottoms may partially or fully impede the sheet flow that characterises dambo hydrology, potentially causing upstream waterlogging of agricultural land and changes in the spatial extent of seasonal inundation. Culvert design through dambos must account for this sheet flow pattern — pipe culverts are generally inappropriate for dambo crossings; multiple culverts or box culverts providing large cross-sectional openings are preferred to maintain hydraulic connectivity.
- Soil compaction in earthworks areas reduces groundwater infiltration, potentially reducing recharge to the shallow aquifer that feeds community boreholes and dry-season river flows. The significance of this effect depends on the proportion of a given sub-catchment that is disturbed — for the relatively small RoW area compared to total catchment areas, the effect on total catchment-level groundwater recharge is expected to be small but may be locally significant adjacent to boreholes near the road. Post-construction, the sealed road surface will significantly increase surface runoff velocity and reduce infiltration within the road corridor. This is a permanent change in the hydrological character of the road surface. The design response — comprehensive roadside drainage that collects and controls this runoff, directing it to stable outfalls through energy dissipators to prevent erosion — ensures that the increased runoff velocity does not cause downstream erosion or flooding. Monitoring of drainage performance in the first two wet seasons after completion is required to identify and address any underperformance in the drainage design.

7.10.2 Groundwater Impact Assessment

Groundwater along the project corridor occurs primarily as shallow, unconfined aquifers hosted in the weathered regolith of the lateritic soil profile and in the alluvial sediments of river valleys. Boreholes in the corridor area typically reach water at 15–40 m depth. The primary threats to groundwater quality from the construction project are: fuel, oil, and chemical spills that reach the soil surface and percolate to the water table; leachate from improperly managed solid waste or camp wastewater; and nutrient contamination from camp wastewater if treatment is inadequate. The ESMP measures addressing groundwater quality risks — bunded fuel storage, spill response procedures, camp wastewater treatment, and a regular community borehole water quality monitoring programme — are designed to detect and respond to any groundwater contamination before it reaches community water supplies. The distance from major fuel storage areas to the nearest community boreholes is a key siting criterion for contractor camps, with a minimum 500 m separation specified between any fuel storage or hazardous material storage and the nearest community water supply borehole.

7.10.3 Dambo Hydrology — Detailed Management Approach

The dambos of North Western Province perform three primary hydrological functions of critical importance for the project's environmental and social impact management: (1) seasonal groundwater recharge — during the wet season, water infiltrates through the permeable dambo soils and percolates to the shallow aquifer, sustaining water tables throughout the dry season; (2) baseflow maintenance — during the dry season, the shallow aquifer drains slowly through springs and seepages at the margins of dambos, sustaining flows in perennial streams; and (3) natural flood attenuation — the flat, low-gradient topography and high storage capacity of dambos attenuates flood peaks during intense rainfall events, reducing downstream flood risk. The project's construction activities at the approximately 20–30 dambo crossings along the 214 km corridor represent the most

hydrologically sensitive activities of the works. The key risks are: physical disruption of dambo hydraulic connectivity through inadequately designed embankments; compaction of hydromorphic dambo soils that permanently reduces infiltration capacity and groundwater recharge; and permanent alteration of dambo drainage patterns if embankment construction alters the natural sheet flow across the dambo surface. The prescribed Dambo Crossing Management Protocol addresses these risks through: dry-season-only works; cofferdam isolation of active construction areas from flowing water; minimum construction footprint (embankments sized to the minimum practical cross-section); multiple culverts sized to maintain hydraulic connectivity; and immediate revegetation of all disturbed dambo margins following construction.

7.11 Soil Erosion — Quantitative Risk Assessment

A quantitative soil erosion risk assessment was conducted using the Revised Universal Soil Loss Equation (RUSLE) applied to representative sections of the project corridor, to estimate the order-of-magnitude sediment loads that could result from inadequate erosion control during construction and to calibrate the required density of erosion control measures. Key findings:

- Pre-construction annual soil loss rates: In miombo woodland on typical lateritic soils with 8% slope, the estimated pre-construction soil loss is approximately 0.5–2.0 tonnes/ha/year — well within the tolerable erosion range. This low pre-construction erosion rate reflects the protective function of woodland ground cover, leaf litter, and root systems.
- Without erosion controls — bare soil during wet season: The same slope in bare soil condition with active earthworks would have an estimated soil loss of 50–150 tonnes/ha/year, representing a 25–75x increase. For the approximately 640 ha of corridor-wide clearance area, total unmanaged sediment production could reach 32,000–96,000 tonnes per year — a massive increase in sediment delivery to watercourses.
- With ESMP erosion controls (silt fences, revegetation, phased works): Erosion control efficiency of 70–85% is achievable with well-installed and maintained silt fences. With a 75% efficiency assumption, managed sediment delivery to watercourses would be reduced to 8,000–24,000 tonnes/year — still significantly above background but within a range that can be further mitigated by watercourse management measures including turbidity monitoring with corrective action triggers.
- Key risk period: The highest erosion risk occurs during the first wet season following vegetation clearance in each section, before revegetated ground cover is established. The ESMP scheduling requirement — that no significant area of bare soil may be left exposed entering the November rainy season — directly targets this highest-risk period. Sections where earthworks cannot be completed before November must be protected with erosion matting and temporary grass seeding before the rains.

7.12 Cultural Heritage — Archaeological Sensitivity Assessment

The archaeological sensitivity of the 214 km project corridor has been assessed through a combination of landscape analysis, archival review, field walkover survey, and community knowledge interviews. The following section provides additional technical detail on the archaeological sensitivity assessment methodology and findings, supplementing the summary provided in Sections 6.4.6 and 6.6 of the ESIA.

7.12.1 Archaeological Landscape Character

The North Western Province plateau has been inhabited by Iron Age communities for at least 2,000 years, with evidence of settlement, agriculture, iron smelting, and long-distance trade networks documented at archaeological sites throughout the region. The dominant settlement pattern throughout this period has been characterised by small, dispersed villages that shifted location every 10–30 years as soils became depleted and new agricultural land was opened. This pattern of mobile settlement over millennia has resulted in a widespread distribution of archaeological deposits across the landscape, concentrated particularly on well-drained, elevated ground adjacent to water sources — precisely the landscape features that also attracted road routing. Iron smelting is of particular

archaeological significance in North Western Province. The region has a long tradition of iron production, and iron smelting furnaces, slag heaps, and bloomery remains are widely distributed across the province. These features are of high archaeological value as evidence of precolonial industrial technology and trade systems. They are often not visible at the surface and can be disturbed by road earthworks. The Chance Find Procedure is specifically designed to address this type of sub-surface archaeological deposit.

7.12.2 Heritage Exclusion Zone Specifications

Based on the pre-construction cultural heritage survey findings, the following exclusion zone specifications apply to identified heritage features along the corridor. These zones are marked as absolute no-go areas on all construction drawings:

- Ancestral grave clusters: Minimum 10 m exclusion zone around any identified grave cluster boundary; increased to 20 m for large cemeteries (>10 graves). No earthworks, vegetation clearance, or construction activity within the exclusion zone without NHCC written clearance and traditional authority/family consent.
- Sacred trees and shrines: Minimum 15 m exclusion zone around the trunk or structure centre. Where a sacred tree is within the construction footprint and avoidance is impossible, specialist traditional healer consultation and NHCC oversight required for any approach, with traditional ceremony conducted before any works.
- Mukanda and Wali school sites: Minimum 100 m exclusion zone during active ceremony periods (dates confirmed annually with traditional authority); 15 m at all other times. No construction noise within 500 m during active ceremony.
- Known iron smelting sites and archaeological midden areas: Minimum 20 m exclusion zone; no bulk earthworks within 50 m without prior archaeological test trenching approved by NHCC.

7.13 Cumulative And Transboundary Impacts

7.14 Introduction

Cumulative impacts result from the incremental effect of this project combined with the effects of other past, present, and reasonably foreseeable future actions in the same geographic area. Transboundary impacts are effects that extend beyond Zambia's national boundaries. Both are required to be formally assessed under World Bank ESS1 and AfDB ISS OS1. This chapter identifies and evaluates the most significant cumulative and transboundary impacts relevant to the Mutanda-Mwinilunga Road Rehabilitation Project.

7.15 Cumulative Impact Context

The following other development activities were identified and considered in the cumulative impact assessment, based on publicly available information on projects in North Western Province:

- Other road rehabilitation projects in North Western Province: The T3 Solwezi-Chingola road rehabilitation; the Solwezi-Kabompo road improvement programme; and the Kabompo-Chavuma road upgrading project. Together, these projects and the Mutanda-Mwinilunga rehabilitation will significantly improve NWP's road network and cumulatively increase access-related development pressures throughout the province.
- Ongoing and planned mining development in the North Western Province mineral belt: Large copper and cobalt mining operations in the Solwezi-Lumwana corridor are expanding, generating significant increases in heavy goods vehicle traffic on provincial roads and inducing substantial economic development along the corridor.
- Agricultural development and outgrower scheme expansion in NWP, which is expected to accelerate as road access improves, potentially driving increased deforestation for agricultural land.

- Refugee resettlement and host community presence in Mwinilunga District, related to ongoing population displacement from eastern DRC, creating additional demands on land, services, and natural resources.

7.16 Key Cumulative Impacts

7.16.1 Accelerated Deforestation and Habitat Loss

The most significant cumulative impact identified is accelerated deforestation and miombo woodland loss along the improved road corridor and in the wider province. The combination of this road project with other road improvements, mining-induced development, agricultural expansion, and charcoal production is expected to drive deforestation and land use change at a rate significantly higher than would occur without improved road infrastructure. Evidence from comparable road improvement projects elsewhere in Southern Africa consistently demonstrates that road access improvement is a strong predictor of increased deforestation rates in woodland-dependent landscapes. The cumulative loss of miombo woodland in NWP is a concern for: biodiversity (loss of miombo-specialist species habitat); carbon storage (Zambia's forest carbon commitments under the UNFCCC NDC); watershed protection (reduced groundwater recharge and dry-season baseflow maintenance); and rural livelihood sustainability (non-timber forest product availability). Cumulative mitigation requires strategic engagement with NWP Provincial Planning Authority and the Forestry Department to strengthen forest governance and land use planning alongside infrastructure development, and long-term satellite-based land cover change monitoring.

7.16.2 Cumulative Pressure on Wildlife and Protected Areas

The combination of improved road access, increased human settlement, agricultural expansion, charcoal production, and associated hunting and poaching is expected to cumulatively reduce wildlife populations and habitat connectivity in NWP. The West Lunga National Park and adjacent Game Management Areas face increased encroachment pressure as the improved road makes previously inaccessible areas more accessible. Cumulative mitigation requires coordination with DNPW on wildlife monitoring, anti-poaching enforcement capacity strengthening, and community-based wildlife stewardship programmes in communities adjacent to protected areas.

7.16.3 Cumulative Water Resource Pressures

Multiple infrastructure projects operating simultaneously in NWP create cumulative demand on local water sources for construction activities. Concurrent construction activities from multiple road projects could cumulatively stress community water supplies (boreholes and streams) during the dry season if not coordinated. Mitigation requires WARMA coordination on cumulative construction water use and licensing, and a requirement for monitoring of community borehole water levels and quality before and during peak construction.

7.16.4 Cumulative Socioeconomic Development (Substantially Positive)

The combination of this project with other road improvements and mining development will cumulatively drive significant socioeconomic development in NWP, which is a broadly positive cumulative outcome consistent with the Government's development objectives. However, cumulative development also brings risks of: increasing inequality between populations with access to economic opportunities and those without; urban drift from remote rural areas to emerging roadside settlements and district capitals; inadequate social service infrastructure keeping pace with growing and more mobile populations; and loss of traditional livelihood systems without adequate replacement.

7.16.5 Cumulative Health Risks

Concurrent deployment of large construction workforces on multiple road projects in NWP creates cumulative risks of HIV/AIDS and STI transmission in rural communities hosting multiple project workforces. Coordination between project-level HIV/AIDS programmes and the provincial and district health system is recommended to ensure consistent messaging, shared data on STI trends, and appropriate referral pathways.

7.17 Transboundary Impacts

7.17.1 Cross-Border Trade and Economic Development

The Mutanda-Mwinilunga Road terminates at Mwinilunga near the DRC border crossing. Road rehabilitation is expected to stimulate increased formal and informal cross-border trade between Zambia and the DRC, particularly in agricultural produce, manufactured goods, and natural resources. This is generally a positive economic impact for both countries and is consistent with COMESA and SADC regional economic integration objectives. Coordination with Mwinilunga District Council, the Department of Immigration, and DRC provincial authorities at the border crossing is recommended to ensure that the economic benefits of improved trade are maximised while managing risks.

7.17.2 Cross-Border Population Movement

Improved road access to Mwinilunga and the border area may increase cross-border population movements, including economic migrants and refugees from the DRC. Mwinilunga District already hosts a significant number of DRC-origin refugees and asylum seekers. Increased population influx may strain community land access, local resources, and social cohesion in Mwinilunga District, particularly in combination with the worker influx from construction. Coordination with UNHCR, the Department of Immigration, and Mwinilunga District Council is recommended.

7.17.3 Cross-Border Health Risks

Increased cross-border movement of people and goods may facilitate cross-border transmission of communicable diseases including HIV/AIDS, cholera, malaria, and emerging infectious diseases. Crossborder health coordination with DRC's Kongo Central and Kasai provincial health authorities and engagement with the WHO Zambia Country Office is recommended. No significant transboundary environmental impacts on shared water resources or air quality are anticipated from this project.

7.18 Cumulative Impact Mitigation Recommendations

The following mitigation measures are recommended to address cumulative and transboundary impacts, beyond the project-level ESMP measures:

- Engagement with NWP Provincial Planning Authority and the Zambia Forestry Department to develop and implement a provincial forest governance action plan alongside road improvement investments — recommended to be initiated during the ESIA finalisation period.
- Formal MOU with DNPW for joint wildlife monitoring and anti-poaching enforcement coordination in the corridor and adjacent GMAs, to be signed before construction commences.
- WARMA coordination meeting with all concurrent construction projects in NWP to establish a cumulative construction water use monitoring protocol before peak construction.
- Engagement with Ministry of Home Affairs, UNHCR, and DRC provincial health authorities on cross-border population movement management and health risk coordination.
- Long-term land cover change monitoring using annual satellite imagery analysis for a minimum of 5 years post-road opening, with results reported to RDA and NWP Planning Authority.
- District-level social planning support to Mwinilunga, Kabompo, and Manyinga District Councils to manage urbanisation and population growth at expanding settlements along the corridor, including investment in social service infrastructure capacity.

7.19 Cumulative Impacts — Climate Change Resilience

7.20 Climate Change Resilience Assessment

The Mutanda-Mwinilunga Road Rehabilitation Project has been designed to be resilient to the range of climate change projections applicable to North Western Province over the 20-year design life of the rehabilitated road. This section provides an assessment of climate change risks and the design responses incorporated to ensure the infrastructure investment is climate-resilient.

7.20.1 Climate Change Projections for North Western Province

Based on IPCC AR6 regional projections and the SASSCAL climate data portal for Zambia, the following climate change trends are projected for North Western Province over the period 2026–2050:

- **Temperature:** Mean annual temperature is projected to increase by 1.2–2.0°C by 2050 under RCP4.5 (medium emissions scenario) and 1.5–2.8°C under RCP8.5 (high emissions). This will increase heat stress risk for outdoor workers and may affect plant and vegetation growth rates for post-construction revegetation.
- **Rainfall — mean annual:** High uncertainty in projections for North Western Province. RCP4.5 projections range from -5% to +10% change in mean annual rainfall by 2050 relative to the 1985–2015 baseline. The balance of evidence suggests modest increases in annual rainfall in northern sections and potential decrease in southern sections of the province.
- **Rainfall — intensity and variability:** There is high confidence in projections of increased rainfall intensity (more extreme hourly and daily rainfall events) even where mean annual totals may not change significantly. Increased intensity increases peak runoff volumes from catchments and the hydraulic loading on culverts and bridges, increasing the risk of drainage overtopping and scour.
- **Dry season:** Potential for longer or more intense dry seasons in some years, increasing the dust management challenge during earthworks and potentially reducing groundwater recharge in dambos.

7.20.2 Design Responses to Climate Change

The following design responses have been incorporated to ensure the rehabilitated road is resilient to projected climate change impacts:

- **Increased drainage design return periods:** At major bridge crossings, the hydraulic design standard has been increased from the standard 1:50 year return period to 1:100 year, providing a 50-year buffer against the effects of climate-induced increases in peak flood flows. Culverts are designed to the 1:25 year standard with additional freeboard where catchment sensitivity warrants.
- **Climate uncertainty factor:** A 15% upward adjustment to the design flood discharges has been applied at all drainage crossings to account for the uncertainty in projected changes in rainfall intensity, consistent with recommended climate adaptation design practice for Zambia (RDA Roads Design Manual, 2023 edition).
- **Robust pavement drainage:** The comprehensive drainage rehabilitation (full culvert replacement, roadside drain rehabilitation, catch drains, and energy dissipators) is specifically designed to handle increased wet-season runoff volumes. A well-drained pavement is inherently more climate-resilient than the current failure-prone gravel surface.
- **Resilient pavement surface:** DBST seals the road against water infiltration, the primary driver of the current pavement failure under high rainfall conditions. A sealed surface is dramatically more resilient to high-rainfall climate scenarios than the existing permeable gravel.
- **Indigenous species revegetation:** Revegetation using local indigenous species (adapted to the NWP climate) is inherently more climate-resilient than using exotic species, which may be more vulnerable to temperature or rainfall shifts.

7.20.3 Climate Resilience Monitoring

A climate resilience monitoring protocol will be incorporated in the operational ESMP, tracking: annual peak flood discharge at major river crossings relative to design discharge; any drainage structure overtopping events and their return period estimates; pavement performance monitoring relative to rainfall and temperature data; and annual temperature and rainfall data at the nearest meteorological stations along the corridor. This data will inform any necessary adaptive management of the drainage and pavement systems during the 20-year operational period.

7.21 Carbon Footprint Assessment

While a full quantitative carbon footprint assessment is not a statutory requirement of the Zambian ESIA process, the following qualitative assessment of the project's greenhouse gas (GHG) profile is provided for completeness and in response to financing institution requirements. Construction-phase GHG emissions arise primarily from: fuel combustion by heavy construction plant and haulage vehicles (estimated at approximately 8,000–12,000 tonnes CO₂e over the 18–24 month construction period, based on estimated plant hours and fleet composition); bitumen production and transport (approximately 1,500–2,000 tonnes CO₂e); cement production for concrete structures (approximately 500–800 tonnes CO₂e); and worker transport and camp energy generation (approximately 300–500 tonnes CO₂e). Total construction-phase emissions are estimated at approximately 10,000–15,000 tonnes CO₂e. These emissions are typical for a road rehabilitation project of this scale and are not considered significant in the national context. Vegetation clearance within the 30 m RoW releases carbon stored in above-ground biomass. The estimated biomass loss from clearance of 30 m × 214,000 m = approximately 642 ha of vegetation (assuming average above-ground biomass of approximately 50 tonnes/ha for the mixed woodland/agricultural mosaic within the existing RoW) is approximately 32,000 tonnes of biomass, equivalent to approximately 16,000 tonnes of carbon (29,000 tonnes CO₂e). This is offset in the long term by replanting of cleared areas, though full carbon recovery may take 20–30 years for woodland species. Operational-phase GHG emissions from increased vehicle traffic are modest given the rural traffic volumes and will be more than offset by the significant fuel savings from reduced vehicle operating costs on the improved road surface (vehicles consume 20–30% less fuel on a well-maintained sealed road than on a heavily deteriorated gravel surface with the characteristics of the current T5 road). The net operational-phase GHG balance is likely positive (i.e. a net reduction in emissions per vehicle-km).

7.22 Cumulative Impacts — Project Interactions

7.23 Other Projects and Programmes — Interaction Assessment

The following table identifies the specific other projects and development programmes in North Western Province that interact with the Mutanda-Mwinilunga Road Rehabilitation Project in terms of cumulative environmental and social impacts, and specifies the coordination and mitigation measures required to manage these interactions.

Project	Status	Cumulative Interaction with T5 Project	Mitigation / Coordination Measure
Solwezi–Chingola Road Rehabilitation (T3)	Under construction 2024–2026	Significant heavy goods vehicle traffic increase on T3 affects communities at Mutanda junction; increased truck traffic on shared haul routes; cumulative air quality and road safety impacts at Mutanda town	Coordination on traffic management scheduling; enhanced road safety at Mutanda intersection during concurrent construction periods
Solwezi–Kabompo Road Improvement	Planning phase; feasibility 2025	Concurrent planning creates opportunity for coordinated approach to biodiversity and natural resource management in NWP; shared baseline data; harmonised ESMP approaches	ZBCL to coordinate baseline data sharing with Solwezi-Kabompo ESIA team; joint workshop on cumulative deforestation risk management recommended
Lumwana/Kalumbila Mining Access Roads (privately funded)	Ongoing construction 2023–2026	Increased heavy vehicle traffic in Solwezi District; cumulative OHS risk from multiple construction workforces; cumulative GBV risk in Solwezi area	Limited direct interaction with Mutanda-Mwinilunga corridor; monitoring of Solwezi district HIV/AIDS data recommended

Project	Status	Cumulative Interaction with T5 Project	Mitigation / Coordination Measure
NWP Community WASH Programme (EU-funded)	Implementation 2024–2027	Positive synergy: WASH programme improving community water supply will supplement ESIA requirement for community borehole monitoring; existing boreholes and water infrastructure data from WASH programme useful for baseline	Coordination with WASH programme implementers for borehole infrastructure data; ensure road construction does not damage WASH infrastructure investments
West Lunga National Park Management Programme (DNPW/GEF)	Planning phase	Improved road access to Mwinilunga increases potential for wildlife management coordination between park and corridor communities; also increases poaching pressure risk	Formal MOU with DNPW; joint anti-poaching patrol coordination; community wildlife stewardship facilitation through corridor CLOs
DRC Kasai Province Infrastructure Development	Ongoing 2023–2026	Cross-border economic development will increase traffic volumes at Mwinilunga border	Monitor border crossing traffic growth relative to design traffic
		crossing; potential for increased informal/formal trade volumes exceeding current road design assumptions if DRC development accelerates significantly	assumptions; inform RDA of any projected traffic exceedances for consideration in maintenance planning

7.24 Strategic Environmental Assessment Context

The Mutanda-Mwinilunga Road Rehabilitation Project is one component of the Government of Zambia's broader North Western Province Transport Sector Development Programme, which aims to substantially improve road connectivity across the province by 2030. The absence of a Strategic Environmental Assessment (SEA) for the full NWP Transport Sector Programme means that the cumulative environmental and social implications of the full programme — including induced deforestation, cumulative biodiversity impacts, and cumulative resettlement across multiple road projects — are assessed individually in project-level ESIA's rather than at programme level. ZBCL recommends that RDA and the Ministry of Infrastructure, Housing and Urban Development commission a Strategic Environmental and Social Assessment of the full NWP Transport Sector Programme, to be completed before the next phase of NWP road investments commences. A programme-level SEA would enable: a comprehensive assessment of cumulative biodiversity and land use change impacts that cannot be adequately addressed at project level; development of a programme-level biodiversity offset strategy; a coordinated resettlement and livelihood restoration approach across all projects; and a framework for integrating land use planning and forest governance investments alongside transport infrastructure.

7.25 No Significant Transboundary Pollution Impacts

A preliminary screening for transboundary pollution impacts — specifically impacts on shared water resources with the Democratic Republic of Congo — confirms that no significant transboundary pollution impacts are expected from this project. The nearest shared watercourse with the DRC is the Zambezi River system, which receives drainage from the project corridor via the Kabompo River, at a distance of approximately 200 km downstream of the project area. Given the size of the intervening catchment and the dilution that occurs over this distance, project-scale construction-phase turbidity or pollution impacts at river crossings do not have the potential to cause measurable transboundary water quality impacts. This determination is consistent with the conclusions of comparable road ESIA

assessments in the region. Monitoring of project-corridor river quality at major crossings provides assurance against locally significant impacts.

8.0 ENVIRONMENT AND SOCIAL MANAGEMENT PLAN

8.1 Introduction

The Environmental and Social Management Plan (ESMP) is the primary operational instrument for implementing the mitigation, enhancement, monitoring, and institutional arrangements identified through the ESIA process. A full, standalone ESMP (Document Reference: ZBCL/ESMP/001/2026) has been prepared as a companion document to this ESIA and is incorporated into this report by reference as Annex J. This chapter provides a structured summary of the ESMP's principal components. The ESMP is organised across ten thematic areas corresponding to the key impact areas identified in Section 7. The ESMP shall be incorporated by reference in its entirety into the civil works contract documents, making compliance a mandatory contractual obligation for the Contractor. Non-compliance with ESMP requirements constitutes a contract breach entitling RDA to Stop Work and, in serious cases, contract termination.

8.2 ESMP Thematic Areas — Summary

Thematic Area	Key Mitigation Measures	Key Monitoring Indicators
A. Air Quality and Dust	Water bowser programme on all earthworks and haul roads; 20 km/h speed limit on unpaved sections; Euro III vehicle standards; community notification before major earthworks; respiratory PPE for all workers in dusty environments.	PM10 at sensitive receptors (weekly during earthworks); vehicle maintenance logs; dust complaints received; borrow pit dust management plan status.
B. Noise and Vibration	Working hours 06:00–18:00 weekdays; pre-blast community notification; blast vibration monitoring with PPV limits at nearest structures; no heavy plant Sundays or public holidays; vibration limits at cultural sites.	Noise at sensitive receptors (weekly); PPV at blast sites (per event); working hours compliance (weekly); community noise complaint register (monthly).
C. Water Resources and Drainage	Silt fences and sediment traps at all drainage lines adjacent to earthworks; bunded fuel storage (110% capacity); spill response procedure; no refuelling within 50 m of watercourses; dry-season-only wetland works; WARMA permits for all water abstraction.	River turbidity downstream of active crossings (weekly during wet-season works); spill incidents (continuous, reported monthly); drainage condition (quarterly); groundwater quality at community boreholes (semi-annually in operation).
D. Soils and Erosion	Progressive revegetation within 2 weeks of earthworks completion per section; separate topsoil stockpile and reapplication; site-specific Borrow Pit Management and Rehabilitation Plans (one per site); slope stabilisation with gabions and vegetation.	Erosion inspections on slopes and embankments (bi-weekly during construction); borrow pit revegetation progress (monthly); topsoil management records (at each earthworks area).
E. Biodiversity	Strict vegetation clearance limits to approved footprint; pre-clearance wildlife walkover survey; mandatory anti-poaching Code of Conduct; invasive species monitoring and control programme; wildlife	Area cleared versus approved footprint; wildlife chance finds; poaching incidents; invasive species surveys (quarterly from Year 1).
	underpasses at key corridor crossing points.	
F. Cultural	Pre-construction cultural heritage survey	Heritage survey completion status

Thematic Area	Key Mitigation Measures	Key Monitoring Indicators
Heritage	along full 214 km; NHCC exclusion zones on all construction drawings; Chance Find Procedure trained to all workers; community consent for any works near graves or shrines; Cultural Heritage Management Plan.	(pre-construction); exclusion zone compliance (monthly); chance find register (continuous); NHCC clearance documentation.
G. Community Health & Safety	Road safety management (speed limits, flagmen, warning signs); mandatory monthly HIV/AIDS awareness programme; mandatory GBV Code of Conduct signed by all workers before starting; confidential GBV reporting channel and GBV Service Provider; child safety plan; monthly community liaison.	Monthly accident register (fatalities, injuries, near-misses); HIV/AIDS sessions attendance (monthly); GBV complaint log (monthly, confidential); community grievance register (monthly); child safety incidents.
H. Labour and OHS	Site-specific OHS Plan approved before mobilisation; mandatory PPE with daily compliance checks; pre-employment and periodic health checks; minimum age verification for all workers; written employment contracts; worker grievance mechanism; camp sanitation standards compliance.	Lost Time Injury rate and LTIFR (monthly); PPE compliance rate (weekly spot checks); OHS incidents (weekly summary); child labour audit results (quarterly); worker grievances received and resolved (monthly).
I. Waste Management	Waste Management Plan with source segregation at point of generation; hazardous waste register and licensed disposal; no open burning of any waste; camp sanitation to ILO standards; construction waste reuse programme for inert material.	Waste volumes by category and disposal route (monthly); disposal manifests (monthly); hazardous waste register (monthly); camp sanitation inspection records (weekly).
J. Socioeconomic	Full RAP implementation with CLO support for all PAPs; 30% local labour minimum target; local supplier procurement preference; monthly community liaison meetings; SEP implementation; GRM operational before construction commences.	PAP compensation verified paid before displacement (continuous, reported monthly); local labour percentage (monthly payroll review); community consultation records (monthly); GRM resolution rate and average resolution time (monthly).

8.3 Construction Environmental Management Plan (CEMP) Requirements

The Contractor shall prepare a site-specific Construction Environmental Management Plan (CEMP) within 30 days of civil works contract award and prior to commencement of any construction activities on site. The CEMP must be reviewed and formally approved by ZBCL and RDA before contractor mobilisation commences. The CEMP shall include as a minimum: site setup and environmental controls plan; dust and air quality management programme; noise and vibration management including blast management; water and drainage management including spill response procedure; soil and erosion management including BPMRP for each borrow pit; vegetation and biodiversity management including wildlife pre-clearance procedures; cultural heritage management plan and Chance Find Procedure;

community health and safety plan including HIV/AIDS programme and GBV Code of Conduct; OHS Plan including PPE matrix and emergency response plan; waste management plan; labour management procedure; stakeholder engagement and GRM support procedures; and emergency

response and incident reporting procedures. The CEMP is a living document and must be updated whenever significant changes occur in construction methods, site conditions, or emerging issues.

8.4 Institutional Responsibilities

Institution / Party	ESMP Responsibilities	Phase
RDA Environmental & Social Officer	Overall ESMP oversight and accountability; ZEMA liaison; approval of monthly E&S reports; issuance of non-compliance notices to Contractor; authorisation of ESMP and RAP expenditure.	All phases
ZBCL ESMP Supervisor / Team Leader	Day-to-day ESMP implementation oversight; monthly field inspections of all active sections; preparation of monthly E&S Monitoring Reports; review and approval of Contractor CEMP; corrective action tracking and closure.	Pre-construction & Construction
ZBCL Environmental Specialist	Technical review of environmental monitoring data; specialist input on biodiversity, water quality, and air quality issues; preparation of specialist annexes and technical sections of monitoring reports.	Pre-construction & Construction
ZBCL Social Development Specialist	Stakeholder engagement and SEP implementation; RAP implementation oversight; GRM management; socioeconomic monitoring; gender mainstreaming; monthly community liaison.	Pre-construction & Construction
ZBCL GBV Specialist	GBV risk assessment; Code of Conduct training for all workers; management of GBV referral pathway; confidential GBV case oversight; monthly GBV report to RDA.	Pre-construction & Construction
Community Liaison Officers (CLOs x2)	Grievance intake, logging, and management; community consultation; PAP welfare liaison; worker-community liaison; monthly welfare monitoring visits; GRM report preparation.	Pre-construction through operation
Contractor CEMP Manager / OHS Officer	Preparation and implementation of CEMP; day-to-day OHS management on all sites; worker and camp management; site-level environmental compliance; incident reporting within 24 hours.	Construction
Independent Environmental & Social Monitor	Quarterly independent ESMP and RAP compliance audits; preparation of audit reports for RDA and financing institution; identification of non-compliances and recommended corrective actions.	Construction & Operation
ZEMA	Regulatory oversight; ESIA and ESMP approval; compliance inspections; enforcement action where required; recipient of notifiable incident reports.	All phases
NHCC	Approval and oversight of Cultural Heritage Management Plan; review and clearance for all chance find reports; archaeological clearance of heritage-sensitive areas before works.	Pre-construction & Construction
Financing Institution	Review and approval of ESIA, ESMP, and RAP; supervision missions; review of quarterly monitoring reports; environmental and social due diligence throughout project lifecycle.	All phases

8.5 Non-Compliance and Corrective Action Process

Where monitoring identifies non-compliance with the ESMP, the following escalation procedure applies:

13. ZBCL ESMP Supervisor issues a written Non-Compliance Notice to the Contractor within 24 hours of identification, specifying the non-compliance, the required corrective action, and a defined deadline (typically 5 working days for minor non-compliances; immediate for serious noncompliances). 14. If the Contractor fails to implement the required corrective action within the deadline, the RDA E&S Officer issues a formal Stop Work Notice for the affected activity. Works may not resume until ZBCL verifies corrective action completion. 15. Repeated or serious non-compliances are reported by ZBCL to ZEMA and, where applicable, to the financing institution within 48 hours. Serious non-compliances include: worker fatality; GBV/SEA incident; fuel spill into watercourse; damage to cultural heritage site; and commencement of displacement without prior compensation payment. 16. All non-compliances and corrective actions are recorded in the Corrective Action Register, which is a standing agenda item in monthly E&S monitoring reports. A non-compliance is formally closed only when ZBCL verifies completion of the required corrective action.

8.6 Reporting Schedule

Report Type	Content	Frequency	Submitted To
Monthly E&S Monitoring Report	ESMP compliance status; monitoring data; GRM summary; non-compliances and corrective actions; incident register	Monthly, within 10 working days of month end	RDA E&S Officer / ZBCL Team Leader
Quarterly Independent Audit Report	Independent ESMP compliance assessment; findings, non-compliances, and recommendations	Quarterly	RDA / Financing Institution
Quarterly RAP Progress Report	Compensation payment status; physical relocation progress; livelihood restoration programme enrolment and progress	Quarterly	RDA / Financing Institution
Semi-Annual E&S Progress Report	Consolidated E&S performance; trend analysis; updated risk register; outcome indicators	Semi-annually	RDA / Financing Institution
Annual E&S Performance Report	Full-year review; updated ESMP if required; annual outcomes assessment	Annually	RDA / ZEMA / Financing Institution
Notifiable Incident Report	Major spill, fatality, serious GBV incident, significant heritage chance find, or other notifiable event	Within 24 hours of occurrence	RDA / ZEMA / Financing Institution
ESMP Completion Report	Final ESMP implementation assessment; lessons learned; long-term monitoring recommendations	At project completion	RDA / Financing Institution

8.7 Indicative ESMP Budget

The table below presents the indicative ESMP cost structure. Contractor compliance costs are to be included in the Bill of Quantities (BOQ) preliminaries and priced by each bidder. ZBCL staff costs are within the consultancy contract budget. RDA-borne costs (independent monitoring, ZEMA fees, RAP contingency) must be separately budgeted in the project financial plan.

#	Cost Item	Basis	Party
1	ESMP Supervisor and Environmental	Full 18–24 month construction	ZBCL

#	Cost Item	Basis	Party
	Specialist (ZBCL)	supervision period	
2	Social Development Specialist and GBV Specialist (ZBCL)	Full construction period; GBV Specialist min. 6 months	ZBCL
3	Community Liaison Officers x2 (ZBCL)	Full construction period plus 12 months operation monitoring	ZBCL
4	Environmental monitoring (dust, water quality, noise, lab analysis)	Per monitoring event × frequency × duration × lab rates	Contractor / ZBCL
5	Contractor CEMP implementation (dust suppression, drainage, waste, OHS)	Included in Contractor BOQ preliminaries — must be priced at tender	Contractor
6	HIV/AIDS awareness and GBV programme	Per-worker induction + monthly sessions; condoms; GBV Service Provider contract (min. 24 months)	Contractor
7	Borrow pit rehabilitation (revegetation, landform restoration)	Per borrow pit site; BOQ line items priced at tender	Contractor
8	Pre-construction biodiversity survey and cultural heritage survey	Specialist consultant fees; field survey and reporting	ZBCL
9	Community consultations and stakeholder engagement	Travel, venue, translation, documentation, CLO field costs	ZBCL / Contractor
10	Independent E&S monitoring and quarterly audits	Independent specialist firm; quarterly + annual audit; travel	RDA
11	Emergency response equipment (spill kits, first aid)	Per active work site and per contractor camp	Contractor
12	ESMP and RAP reporting (monthly, quarterly, semi-annual, annual)	Staff time and preparation costs for full report suite	ZBCL
13	Contingency (15% of total ESMP implementation)	15% applied to items 1–12	RDA / Contractor
	TOTAL ESMP BUDGET (indicative)	To be finalised at ESMP approval and contract award stage — indicative range USD 2.5M–USD 4.0M	RDA / Contractor

8.8 Full Environmental and Social Monitoring Plan

The comprehensive monitoring plan below details all parameters to be monitored, the measurable indicators and applicable standards, the monitoring methods, locations, frequency, and responsible parties for the full project lifecycle. Monitoring data shall be compiled in monthly E&S Monitoring Reports submitted to RDA within 10 working days of each month end. The monitoring plan shall be reviewed and updated annually, or following any significant change in project scope or emerging environmental or social issue.

Parameter	Indicator & Standard	Method	Location	Frequency	Responsible	Report To
Ambient dust (PM10/TSP)	PM10 and TSP concentration ($\mu\text{g}/\text{m}^3$) versus Zambia Ambient Air Quality Standard (150 $\mu\text{g}/\text{m}^3$ 24-hr avg) and WHO guideline (50 $\mu\text{g}/\text{m}^3$ annual)	Portable calibrated dust meter (e.g. DustTrak); passive samplers at fixed locations	All settlements within 200 m of active earthworks; school and clinic frontages	Weekly during earthworks; bi-weekly during road surfacing	Contractor ESMP Supervisor	ZBCL/RDA monthly report; community notice boards
Vehicle	Euro III compliance	Document	All fuel	Monthly	Contractor	RDA quarterly

Parameter	Indicator & Standard	Method	Location	Frequency	Responsible	Report To
emission compliance	certificates and random visual smoke checks	review of registration certificates; random visual inspection of exhaust smoke opacity	depots and road access points; weekly random spot check on site		OHS Officer	report
Borrow pit dust	Visual observation; PM10 spot readings at nearest receptor	Portable dust meter; field observation; photographic record	All active borrow pit sites; nearest community receptor	Monthly	Contractor ESMP Supervisor	RDA/ZBCL monthly
Construction noise	Leq dB(A) at nearest sensitive receptor versus IFC/WHO limit (55 dB(A) residential, 45 dB(A) school in use) and national standards	Calibrated Class 1 or Class 2 sound level meter; minimum 10-minute Leq measurement	Schools, clinics, residences within 100 m of active work face; mobile monitoring follows active section	Weekly; immediately on receipt of noise complaint	Contractor ESMP Supervisor	ZBCL/RDA monthly report
Blast vibration (PPV)	Peak Particle Velocity (mm/s) versus limit: 5 mm/s at structures; 2 mm/s at cultural/heritage sites	Calibrated seismograph (minimum 3-axis); operated by certified blasting specialist	All structures within 200 m of any blast point; heritage sites within 500 m	Every blast event; record retained minimum 3 years	Blasting Specialist	RDA; NHCC (for heritage site events); Financing Institution
River turbidity downstream of earthworks	Turbidity (NTU) versus natural background upstream level; trigger: > 50 NTU above upstream background	Portable turbidity meter; in-situ measurement; grab samples for lab confirmation where triggered	Immediately downstream of each active watercourse crossing and active earthworks adjacent to drainage lines	Weekly during wet season earthworks; daily at major river crossings during active works	Contractor ESMP Supervisor	ZBCL/RDA monthly; ZEMA/WARM A immediately for exceedances
Fuel/chemical spill incidents	Number of spills; volume spilled; volume recovered; time to containment; remediation status	Spill incident log; photographic record; soil and water sampling at spill site and downstream if required	All fuel storage areas; all active refuelling points; watercourses downstream	Continuous; spills logged within 4 hours; summarised monthly	Contractor ESMP Supervisor	RDA within 24 hrs; ZEMA immediately for any spill reaching watercourse
Camp wastewater quality	Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS), faecal coliform versus EMA discharge standards	Composite sample from treatment plant effluent; accredited laboratory analysis	Contractor camp wastewater treatment plant effluent discharge point	Monthly	Camp Manager / ZBCL Environmental Specialist	ZBCL/RDA monthly; ZEMA quarterly
Community borehole water quality	pH; electrical conductivity; nitrates; hydrocarbons; faecal coliform; turbidity versus WHO potable water guidelines	Grab samples by trained community health worker supervised by ZBCL; accredited laboratory	Selected community boreholes within 500 m of road corridor (minimum 3 monitoring	Pre-construction baseline; then semi-annually during construction; annually during	RDA Environmental Officer / ZBCL	RDA; District Health Office; semi-annual E&S report

Parameter	Indicator & Standard	Method	Location	Frequency	Responsible	Report To
		analysis	boreholes per 50 km)	operation		
Slope and embankment erosion	Visual inspection for rilling, gully, slope failure, undermining; severity rating (none/minor/moderate/severe)	Visual inspection and photographic record; GPS location of any new erosion features	All cut slopes and embankments in each active section; all sections within 2 weeks of earthworks completion	Bi-weekly during construction; monthly for 12 months post-construction in each section	Contractor ESMP Supervisor	ZBCL/RDA monthly; corrective action within 5 days of any severe finding
Borrow pit rehabilitation progress	% area of each pit where rehabilitation is complete; vegetation cover density (% ground cover) versus target (>80% at 6 months)	Photographic survey from fixed photo points; area measurement using GPS or tape; species composition recording	All active and closed borrow pit sites	Monthly during active extraction; monthly for 24 months post-closure	Contractor ESMP Supervisor	RDA quarterly report; final rehabilitation completion signed off by ZBCL
Topsoil management	Volume of topsoil stripped versus volume reapplied; stockpile condition (erosion protection in place)	Site measurement; waste management records; field inspection	All earthworks areas in active sections	At each earthworks area — before and after	Contractor ESMP Supervisor	ZBCL/RDA monthly
Vegetation clearance vs approved limits	Area cleared (ha) versus approved construction footprint area (ha); any unauthorised clearance events	GPS boundary survey of cleared area; comparison with approved clearing demarcation pegs	All active construction sections along full 214 km corridor	Before clearance commences (demarcation); immediately after clearance in each section; random spot checks	Ecologist / ESMP Supervisor	RDA quarterly; any unauthorised clearance = immediate stop work
Invasive alien plant species	Presence/absence and estimated density (% cover) of target invasive species per transect	500 m transect surveys at 10 km intervals along road verge; species identification by trained surveyor	Road verge throughout 214 km corridor; priority areas around borrow pits and camp sites	Quarterly from Year 1 (first survey establishes baseline)	Ecologist	RDA annual E&S report; operational monitoring programme
Wildlife chance finds	Number of encounters with wildlife per month; species; location; response taken; NHCC notification timeliness	Incident register; photographic record where safe to do so	All excavation, clearance, and earthworks areas	Continuous — triggered by encounter; logged within 24 hours; reported monthly	ESMP Supervisor	NHCC immediately for protected species; RDA monthly
Anti-poaching compliance	Number of poaching-related incidents; firearms/traps discovered; disciplinary actions taken	Camp and site inspections; incident register; worker Code of Conduct review	All contractor camps, satellite camps, and work sites	Monthly unannounced inspections; all incidents reported within 24 hours	Contractor Manager / DNPW liaison	RDA; DNPW; Financing Institution

Parameter	Indicator & Standard	Method	Location	Frequency	Responsible	Report To
Heritage exclusion zone compliance	Number of works activities observed within defined exclusion zones; any unreported approach to heritage sites	Monthly inspection against exclusion zones marked on construction drawings; interview of site supervisors	All construction sections; focus on areas within 200 m of any mapped heritage site	Monthly; immediately when any concern is raised	Cultural Heritage Specialist / ESMP Supervisor	RDA; NHCC (for any exceedance)
Chance find response timeliness	Time from discovery to work stoppage; time from work stoppage to NHCC notification (target: <24 hours); time from NHCC notification to site clearance	Incident register; written records of notification and clearance; photographic record of find site	All excavation and earthworks areas	Continuous — triggered by find	ESMP Supervisor / NHCC	NHCC; RDA; Financing Institution
Road safety incidents	Number of road accidents (fatalities, serious injuries, minor injuries, near-misses) per month involving construction vehicles or affected by construction activities	Accident register; RTSA incident reports; site manager reports; community feedback	All active work sites and haulage routes; project-wide	Weekly collection; monthly summary and report	Contractor OHS Officer / CLOs	RDA; RTSA monthly; Financing Institution for any fatality within 24 hours
GBV/SEA incidents	Number of GBV/SEA complaints received; number referred to GBV Service Provider; average referral time (target: <24 hours); case resolution status	GBV complaint log (confidential); GBV Service Provider referral records; CLO reports	Project work sites and all project-affected communities	Continuous; monthly confidential summary report (no identifying information)	GBV Specialist / CLOs	RDA (confidential summary); GBV Service Provider; Financing Institution (confidential)
Community grievances	Number of grievances received; number resolved; number pending; average resolution time (target: ≤15 working days); escalation cases	Community Grievance Register; CLO monthly summary reports	All project-affected communities along 214 km corridor	Monthly	CLOs / GRM Coordinator	RDA/ZBCL monthly; Financing Institution quarterly
HIV/AIDS awareness programme	Number of sessions per month; cumulative workers trained; attendance rate; condom distribution volumes	Session attendance registers; training records; distribution records	All contractor camps and work site locations	Monthly (minimum one session per camp per month)	Contractor / Health Specialist	RDA quarterly report
Lost Time Injury (LTI) rate	Lost Time Injury Frequency Rate (LTIFR) per million person-hours worked; LTI count versus previous months	OHS incident register; hours worked records; LTIFR calculation per standard formula	All active work sites and contractor camps	Weekly data collection; monthly LTIFR calculation and reporting	Contractor OHS Officer	RDA monthly; Financing Institution quarterly; WARMA/OSH for notifiable injuries
PPE compliance	% of workers observed wearing all required PPE for their task (hardhats, HV vests, safety boots, appropriate respiratory and	Unannounced spot inspections; count of workers	All active construction sites; all contractor camps	Weekly unannounced inspections	Contractor OHS Officer / ZBCL ESMP Supervisor	RDA monthly; non-compliance triggers immediate

Parameter	Indicator & Standard	Method	Location	Frequency	Responsible	Report To
	eye protection)	compliant versus non-compliant; photographic record				corrective action notice
Child and forced labour	Zero incidents confirmed; all subcontractors and suppliers verified compliant	Document review (employment contracts, age verification records, payroll); unannounced site visits	All subcontractor worksites and labour sourcing locations	Quarterly unannounced audits by ZBCL Labour Specialist	ZBCL Labour Specialist	RDA quarterly; Financing Institution quarterly
Solid waste management	Waste volumes by category per month (kg); disposal route and destination; waste manifest records	Waste tracking register; disposal manifests and receipts; camp inspection visual assessment	All contractor camps and active work sites	Weekly visual inspection; monthly volume tracking and reporting	Camp Manager / Contractor	RDA monthly; disposal manifests to ZEMA on request
Hazardous waste management	Volume of hazardous waste per type per month; disposal contractor licence status; disposal manifests on file	Hazardous waste register; storage area inspection; disposal contractor licence check	All hazardous waste storage areas and disposal contractors used	Monthly record; quarterly disposal contractor licence verification	Contractor ESMP Supervisor	RDA monthly; ZEMA on request
Local labour employment	% local labour in total workforce per month; %	Monthly payroll analysis; HR	Contractor HR records	Monthly	Contractor HR Manager	RDA quarterly report
	female workers; skills training participants	records; training attendance logs	across all sites			
PAP compensation and livelihood recovery	% PAPs with verified compensation received before construction in their section; % PAPs reporting restored/improved livelihoods at 6 and 12 months post-resettlement	RAP payment records; CLO verification visits; household income survey (random 20% sample) at 6 and 12 months	All PAP households along 214 km corridor	Monthly (payment tracking); 6 and 12 months post-resettlement (income survey)	Resettlement Specialist / CLOs / Independent Monitor	RDA monthly (payment); Financing Institution (income surveys)
Community satisfaction	% community members reporting satisfactory engagement with project; satisfaction with CLO responsiveness; satisfaction with GRM resolution	Community satisfaction survey administered by trained CLOs (random 10% household sample)	All project-affected communities	Semi-annually	ZBCL Social Specialist	RDA semi-annual report; Financing Institution

8.9 Occupational Health and Safety — Detailed Hazard and Control Register

The following detailed OHS Hazard and Control Register identifies the principal construction hazards, their associated risks, and the required engineered and administrative control measures. This register forms the basis for the Contractor's site-specific OHS Management Plan (CEMP Section 9) and shall be reviewed and updated by the Contractor's OHS Officer at least monthly, or immediately following any incident. Risk level: CRITICAL = immediate fatality potential, priority control required; HIGH = serious injury potential; MODERATE = moderate injury potential.

Hazard	Potential Harm	Risk Level	Control Measures
Excavation and trenching	Cave-in; buried alive; falling material	HIGH	Benching or sloping minimum 1:1 gradient for excavations >1.5 m deep; timber shoring or hydraulic brace for trenches >1.2 m in confined conditions; spoil placed minimum 0.5 m from edge; daily inspection before entry; barrier tape and warning signs at all open excavations
Working at height (bridge works, embankment slopes)	Falls; dropped tools injuring workers below	HIGH	Guardrails on all scaffolding; safety harnesses for work >2 m height where no guardrail; barriers preventing access below active overhead work; tool lanyards; PPE (hardhats compulsory)
Heavy plant — excavators, bulldozers, dump trucks	Struck-by; runaway; crush; rollover	CRITICAL	Exclusion zone minimum 5 m radius around operating plant (extend to 10 m for large excavators); spotters for reversing in restricted areas; reversing alarms on all plant; no workers permitted to enter operating radius; daily pre-start safety check (checklist) and operator fitness-to-work check
Explosives handling and blasting	Premature detonation; blast flyrock; air overpressure; noise-induced hearing loss	CRITICAL	Licensed blasting contractor only; certified shot-firer; daily permits; pre-blast community and worker evacuation protocol; safe clearance distances maintained; electronic detonators preferred; PPE (ear protection, eye protection, hardhats) for all personnel
Fuel and chemical handling	Burns; fire; explosion; toxic inhalation; skin and eye contact	HIGH	Designated banded fuel storage; no smoking within 25 m; fire extinguishers at all fuel points; full PPE (gloves, eye protection, apron) for chemical handling; MSDS sheets available at all storage points; worker training in safe handling procedures before handling chemicals
Working in high temperatures	Heat stress; heat exhaustion; heat stroke	HIGH	Shade structures at all sites; cold drinking water minimum 1 litre per worker per hour in high heat conditions; heavy physical work before 11:00 and after 15:00 during September–November; supervisor training to recognise heat stress symptoms; Buddy system for high-risk work in isolated areas
Dust exposure (silica and PM10)	Silicosis; chronic obstructive pulmonary	HIGH	Engineering dust controls (water suppression at work faces) as primary control; respiratory PPE (N95 minimum for silica-generating activities; P100 for blasting and rock cutting);
	disease; asthma aggravation		pre-employment chest X-ray baseline; annual chest X-ray during sustained high-dust work; health monitoring records retained
Night work	Reduced visibility leading to	HIGH	Minimum 500 lux illumination at active night work areas; reflective PPE for all night workers;

Hazard	Potential Harm	Risk Level	Control Measures
	accidents; fatigue-related errors		fatigue management roster (maximum 12-hour shifts; minimum 8-hour rest between shifts); night work supervisor with OHS authority to stop unsafe operations
Working near watercourses (bridge and culvert works)	Drowning; leptospirosis; waterborne disease	MODERATE	Designated swimmer/water rescue competent person on duty for all in-stream works; life rings and throw bags at all watercourse work sites; rubber waders for wade-in work; prohibition of eating, drinking, or smoking near watercourses; hepatitis A vaccination recommended for in-stream workers
Electrical hazards (generators, site power)	Electric shock; burns; electrocution	HIGH	All temporary electrical installations by qualified electrician; RCCB/GFCI protection on all temporary power outlets; regular inspection of all portable electrical tools (3-monthly); lock-out tag-out procedure for any maintenance on electrical equipment; no unauthorised modifications to electrical systems

8.10 CEMP Detailed Content Requirements

The table below specifies the minimum content requirements for each section of the Contractor's Construction Environmental Management Plan (CEMP). The CEMP shall be submitted to ZBCL within 30 days of civil works contract award and approved by ZBCL and RDA before mobilisation. A CEMP that does not meet all minimum content requirements will be returned for revision; mobilisation will not be permitted until an approved CEMP is in place. The CEMP is a living document that must be updated at least annually, or immediately following any significant change in construction method, site conditions, or emerging environmental or social issue.

#	CEMP Section	Minimum Content Requirements	When Submitted	Responsibility
1	Site Setup and Mobilisation Plan	Site layout drawings showing: access points; exclusion zones for sensitive habitats, heritage sites, and community areas; fuel storage locations with containment; waste management areas; wastewater management; vegetation clearance boundary marks; drainage protection infrastructure. Vegetation clearance limits demarcated with pegs and tape before any clearance commences.	Pre-mobilisation — submitted with CEMP to ZBCL for approval	Contractor Site Manager / ESMP Supervisor
2	Dust and Air Quality Management Plan	Water bowser schedule (minimum twice daily on active earthworks in dry season); speed limit monitoring procedure; equipment maintenance programme with records; contractor fleet emission certificate records; community notification procedure for major earthworks; respiratory PPE provision and issue records.	Construction — operational before earthworks commence	Contractor ESMP Supervisor
3	Noise and Vibration Management Plan	Working hours enforcement procedure; blast notification procedure; vibration monitoring plan (seismograph operator; monitoring locations; trigger levels; response procedure); community	Construction — operational before any blasting or heavy plant	Contractor Blasting Specialist / ESMP Supervisor

#	CEMP Section	Minimum Content Requirements	When Submitted	Responsibility
		complaint response procedure for noise; noise monitoring log records.	works	
4	Water and Drainage Management Plan	Drainage protection installation schedule per road section; spill response procedure (spill kit locations; response steps; notification protocol; remediation requirements); fuel storage layout with bunding specification; watercourse crossing works dry-season schedule; WARMA licence copies on file; turbidity monitoring log.	Construction — operational before any earthworks adjacent to watercourses	Contractor ESMP Supervisor / Engineer
5	Soil and Erosion Management Plan	One Borrow Pit Management and Rehabilitation Plan per site (topsoil management; extraction sequence; rehabilitation sequence; revegetation species and schedule); topsoil	One per borrow pit — all submitted and approved before extraction	Contractor ESMP Supervisor
		management procedure; revegetation schedule and species list; erosion protection design for all cut slopes and embankments; borrow pit management log.	commences at each site	
6	Vegetation and Biodiversity Management Plan	Vegetation clearance limits map (showing all exclusion zones); pre-clearance wildlife survey procedure; Chance Find Procedure for wildlife; invasive species identification sheet; worker biodiversity IEC materials; anti-poaching declaration for all workers.	Before any clearance commences	Contractor Ecologist / ESMP Supervisor
7	Cultural Heritage Management Plan	Heritage exclusion zone map (all heritage sites identified in pre-construction survey marked as exclusion zones on construction drawings); Chance Find Procedure; community sacred site notification process; cultural sensitivity worker training records; NHCC contact details prominently posted.	Before any ground-breaking or excavation	Contractor / Cultural Heritage Specialist / NHCC
8	Community Health and Safety Plan	Road safety management plan per active section (speed limits; flagmen schedule; pedestrian bypass routes; school zone measures); HIV/AIDS programme (monthly session schedule; facilitator; content); GBV Code of Conduct (signed by all workers); GBV Service Provider contract and referral pathway; child protection measures; CLO contact list posted in all communities.	Before mobilisation and throughout construction	Contractor / GBV Specialist / CLOs
9	Occupational Health and Safety Plan	Site-specific OHS risk assessment; PPE matrix for each task; emergency response plan (site evacuation; medical emergency; fire response; spill response); incident reporting procedure (internal; RDA notification; WARMA/OSH notification for notifiable injuries); first aid kit locations and daily	Before mobilisation — submitted with CEMP for approval	Contractor OHS Officer

#	CEMP Section	Minimum Content Requirements	When Submitted	Responsibility
		check log; OHS notice board at all camps and main work sites.		
10	Waste Management Plan	Waste segregation procedure; waste storage area locations and specifications; licensed waste hauler contract details and schedule; hazardous waste register; disposal manifest template; medical waste management procedure; weekly camp waste inspection checklist.	Before camp establishment	Camp Manager / Contractor ESMP Supervisor
11	Labour Management Procedure	Recruitment procedure (local community advertising; skills training offer; minimum age verification; signed employment contracts); payroll compliance procedure (Zambia Employment Act minimum wage check); worker grievance mechanism (separate from community GRM); anti-child and anti-forced labour declaration; HR records retention procedure.	Before any workers are hired	Contractor HR Manager
12	Stakeholder Engagement and GRM Support Procedures	Community notification procedure and schedule for each phase; CLO consultation schedule; Grievance Register maintenance and monthly reporting procedure; GBV complaint confidential log procedure; traditional authority and community contact list; consultation venue and logistics arrangements.	Operational before construction mobilisation and throughout project	CLOs / ZBCL Social Specialist
13	Emergency Response Plan	Emergency contact list (RDA; ZBCL; ZEMA; nearest hospital; RTSA; police; fire; NHCC; DNPW); site evacuation procedure; fire response procedure; major spill response procedure (tiered based on spill volume and receptor sensitivity); medical emergency evacuation procedure; communication tree for 24-hour incident notification; monthly emergency drill.	Before any construction works commence; updated as site conditions change	Contractor OHS Officer / Camp Manager

8.11 Grievance Redress Mechanism — Detailed Process

The Project Grievance Redress Mechanism (GRM) provides a structured, time-bound, and accessible process for all stakeholders — community members, PAPs, workers, and others — to raise concerns, complaints, or queries about any aspect of the project. The GRM is designed to resolve grievances at the lowest possible level and as quickly as possible, while maintaining fairness, transparency, and accountability. The GRM complements but does not replace legal rights to seek redress through courts or regulatory bodies. The GRM is accessible through multiple channels: verbal or written submission to the CLO; phone calls to the dedicated CLO mobile numbers (publicised in all communities before construction commences); written submission to any of the four District Council offices; submission through traditional authority offices; and online or email submission where connectivity is available. All channels are accessible to illiterate community members through the CLO verbal intake option.

Step	Process	Responsible	Timeframe	Outcome and Documentation
Step 1: Grievance Intake	CLO at nearest community point (field, village meeting, CLO phone number, designated community liaison point, or written submission to nearest District Council office)	CLO or designated intake person	Immediate — same day	CLO logs grievance in Grievance Register within 24 hours of receipt. Confirms receipt to complainant within 2 working days. Assigns unique reference number. Categorises by type (environmental; social; compensation; GBV; labour; other).
Step 2: Initial Assessment and Response	CLO reviews grievance; consults ZBCL Social Specialist where needed; determines if within project scope; identifies responsible party for resolution	CLO / ZBCL Social Specialist	5 working days from receipt	CLO communicates preliminary assessment to complainant. If simple grievance resolvable at CLO level: attempts resolution and documents outcome. If complex or non-resolvable at CLO level: escalates to Step 3.
Step 3: Formal Review and Resolution	ZBCL ESMP Supervisor and Social Specialist review; involve Contractor where required; may involve traditional authority or community meeting; formal written response to complainant	ZBCL ESMP Supervisor / Social Specialist / Contractor	Total 15 working days from receipt	Written response provided to complainant documenting the decision, rationale, and any remedy offered. Complainant given minimum 10 working days to accept or reject the proposed resolution.
Step 4: Escalation to RDA	Complainant appeals to RDA E&S Officer if unsatisfied with ZBCL resolution; RDA conducts independent review	RDA E&S Officer	Within 15 working days of escalation	RDA provides written decision. Remedy implemented within agreed timeline monitored by ZBCL.
Step 5: External Recourse	Complainant may approach ZEMA, courts, or other external bodies at any time; project GRM does not restrict legal rights	External parties (ZEMA, Courts)	Per external body procedures	Project team cooperates fully with any external review. Complainant informed of external recourse options at all stages.
Special Track: GBV/SEA Complaints	All GBV/SEA complaints managed through separate survivor-centred confidential pathway; not through the standard GRM steps	GBV Service Provider / CLO GBV first responder	Immediate referral to GBV Service Provider — target within 4 hours of complaint	GBV complaints never disclosed to the accused person or line management; survivor consent required for all actions; safe referral to health, legal, and psychosocial support services; project-level disciplinary action parallel to survivor support.

8.12 ESMP — Supply Chain And Procurement Requirements

8.13 Supply Chain Environmental and Social Requirements

The Contractor is responsible for ensuring that all suppliers, subcontractors, and service providers engaged on the project comply with applicable environmental and social requirements. The following table specifies the E&S requirements for key supply categories. Compliance with supply chain requirements will be audited quarterly by the ZBCL ESMP team, with unannounced visits to subcontractor sites.

Supply Category	E&S Requirements for Procurement	Responsible	Timing
Fuel and lubricants	Licensed fuel suppliers; ZEMA-registered products; documentation of fuel quantities and specifications for OHS plan	Contractor	Before construction mobilisation
Aggregates and crushed stone	Licensed quarry operators; quality testing certificates for each batch; delivery manifests retained	Contractor	For each delivery
River sand	WARMA-licensed abstraction only; no unlicensed sand mining; daily volume records	Contractor	WARMA licence before first abstraction
Bitumen	Licensed bitumen suppliers; SDS sheets on file; compliant handling procedures; temperature monitoring during application	Contractor	Before surfacing works commence
Explosives	Licensed explosives supplier; licensed shot-firer; site-specific blasting permits per Zambia Police explosive regulations	Licensed Blasting Contractor	Before any blasting activity
Chemical admixtures and concrete additives	SDS sheets on file for all chemicals; ZEMA product registration confirmed; PPE protocol for handling	Contractor	Before first use of each product
Timber and wood products	Only timber from licensed legal sources; Forestry Department timber certificate; no timber from project clearance sold commercially without Forestry Dept approval	Contractor / ZBCL	For each timber procurement event
Waste disposal services	Licensed waste haulers for all off-site waste disposal; licensed landfill or licensed hazardous waste facility; disposal manifests retained for minimum 3 years	Contractor	Licensed hauler before first disposal
GBV Service Provider	NGO or agency with demonstrated GBV response competency in Zambia; formal contract with ZBCL/RDA; confidentiality provisions; 24-hour call line; referral pathway documentation	RDA / ZBCL	Contract signed before construction workers deployed
Community Liaison Officers (CLOs)	Fluent in Luvale and Luchazi (minimum); recruited from communities in the project area; trained in GRM, GBV first response, and consultation methods; formal ZBCL employment contract	ZBCL	Deployed before construction mobilisation
Medical waste disposal	Licensed medical waste contractor; incineration or equivalent licensed disposal; disposal manifests	Contractor	Licensed contractor before any medical waste generated
Property valuer (for RAP)	ZIEA-licensed property valuer; experience in Zambian rural land and crop valuation; demonstrable independence from Contractor	RDA	Before PAP census completed

Supply Category	E&S Requirements for Procurement	Responsible	Timing
	and from affected PAPs; approved by RDA and Financing Institution		

8.14 Emergency Response Procedures

Emergency response plans are required for the following emergency scenarios, each addressed in a specific sub-section of the Contractor's CEMP:

8.14.1 Fuel or Chemical Spill Response

Level 1 (minor spill, <50 litres, contained on impermeable surface): Contractor responds with on-site spill kit within 15 minutes; contains spill with absorbent material; disposes of contaminated material as hazardous waste; completes spill incident log within 4 hours. ZBCL notified within 24 hours. Level 2 (moderate spill, 50–500 litres, or any spill on permeable surface or near drainage): Contractor emergency response team mobilises within 30 minutes; excavates and removes contaminated soil; soil sample taken and dispatched to laboratory to determine contamination extent; ZBCL notified within 4 hours; ZEMA notified within 24 hours; remediation plan submitted to ZBCL within 48 hours. Level 3 (major spill, >500 litres, or any spill reaching a watercourse): All site activities cease immediately in affected area; emergency response team including ZBCL Environmental Specialist mobilises immediately; ZEMA notified within 2 hours by direct call to ZEMA Emergency Hotline; WARMA notified within 2 hours; emergency downstream water sampling; specialist environmental remediation contractor engaged within 24 hours; full incident investigation and remediation plan submitted to ZEMA and ZBCL within 5 working days.

8.14.2 Worker Fatality or Serious Injury

All construction sites must have a designated first aid responder and a first aid kit meeting Zambia OHS standards at all times during working hours. In the event of a worker fatality or serious injury (lost time >24 hours): immediately provide first aid and call for emergency medical evacuation; contact nearest hospital for ambulance or arrange immediate transport; notify ZBCL ESMP Supervisor within 1 hour by phone; ZBCL notifies RDA and Financing Institution within 4 hours; Contractor suspends all nonemergency works at the incident site; OHS investigation commences within 24 hours; notify Health and Safety Inspectorate (Ministry of Labour) within 24 hours for all fatalities and lost-time injuries above the national threshold; submit preliminary incident investigation report to ZBCL within 5 days; final root cause analysis report within 15 days.

8.14.3 GBV Incident Emergency Response

The GBV Service Provider maintains a 24-hour emergency response protocol. Upon receipt of a GBV complaint: the GBV Service Provider contacts the survivor within 4 hours; provides immediate medical referral if physical injury is reported; provides psychosocial first aid; advises on legal options (including police report); documents the incident with survivor consent, maintaining strict confidentiality of the survivor's identity. The project Contractor is notified in aggregate (no identifying information) within 24 hours. Disciplinary action against an identified perpetrator proceeds through the worker Code of Conduct process, led by ZBCL independently of the survivor support process. ZBCL files a confidential incident report with RDA and the Financing Institution within 48 hours.

8.14.4 Cultural Heritage Chance Find

Upon discovery of any potentially archaeological material, human remains, cultural objects, or unusual features during excavation: excavation and all earthworks within 10 m of the discovery site cease immediately; the discovery site is secured with barrier tape and a security guard if at risk of disturbance; the Contractor CEMP Manager is notified within 1 hour; ZBCL Cultural Heritage Specialist is notified within 4 hours; NHCC is notified within 24 hours with GPS location, photographs, and preliminary description; works at the discovery site do not resume until NHCC provides written

clearance. Community and traditional authority are informed of the discovery through the CLO within 48 hours. All chance finds are logged in the Heritage Chance Find Register maintained by ZBCL.

8.15 Construction Method Statements

8.16 Principal Construction Method Statements

The following Construction Method Statements summarise the key procedural requirements for the principal construction activities on the project. These method statements form the basis for the Contractor's CEMP and will be developed into detailed site-specific procedures during the preconstruction period. They set out the minimum environmental and social requirements that must be incorporated into each activity's site-level working procedures.

Method Statement	Procedure	Timing
CMS-01: General Site Establishment and Mobilisation	Pre-commencement: CEMP approved; all pre-conditions verified by ZBCL. Mobilisation commences with main camp establishment at the approved site (environmental and social screening completed; community informed; Traditional Authority notified; Forest Clearance Permit for camp site if on classified forest land). Camp establishment sequence: land clearing (topsoil stripped and stockpiled; exclusion zones marked with permanent pegs and high-visibility tape); establishment of camp perimeter fence (2.4 m chain-link or equivalent, with locked gated entry); construction of accommodation (ILO-compliant; maximum 4 persons per room; separate male and female blocks; ablution blocks — minimum 1 toilet : 15 males; 1:8 females); installation of water supply (borehole with hand pump or rainwater harvesting; minimum 20 litres per person per day potable water); installation of wastewater treatment (waste stabilisation pond or package treatment plant; sized for peak camp population); solid waste management area (segregated bins for organic, recyclable, hazardous, and general waste; collection point accessible to licensed hauler); fuel storage area (minimum 110% bunded storage; fire extinguishers; spill kit; no smoking signs; minimum 30 m from any accommodation, 50 m from any watercourse). Worker induction programme commences before any construction activity: safety induction; environmental induction; social and Code of Conduct induction; HIV/AIDS induction. All inductions documented with sign-off sheet.	Main camp: established in Month 1 of mobilisation period; satellite camps as construction programme requires
CMS-02: Vegetation Clearance	Sequence: (1) Pre-clearance wildlife survey by Ecologist along section to be cleared; any protected species or significant wildlife encounters trigger work stoppage and ZBCL notification before clearance commences. (2) All exclusion zones (heritage sites, riparian zones, dambo margins, wildlife underpasses) are marked with permanent steel posts and high-visibility orange tape before any clearance equipment enters the section. (3) Contractor ESMP Supervisor and ZBCL Inspector jointly verify that all boundary marks are correct and complete before clearance commences. (4) Clearance equipment (excavators with mulching heads or brush cutters; no burning) operates strictly within the demarcated boundary. The boundary marks are checked daily by the ESMP Supervisor. (5) All cleared timber above 50 mm diameter is measured and offered to communities or to the Forestry Department before any disposal. Any commercially valuable timber species (Mukwa, Chanfuta, Guibourtia) requires Forestry Department notification before any disposal. (6) Stumps are removed to minimum 300 mm below ground surface at all	In each road section: clearance precedes earthworks by minimum 1 week to allow soil erosion controls to be established

Method Statement	Procedure	Timing
	earthworks areas; stumps in non-earthworks areas may be cut at ground level and treated with approved herbicide where regrowth would impede drainage. (7) Topsoil is stripped to minimum 150 mm depth immediately after clearance and stockpiled in designated windrows, maximum 2 m high, with erosion protection (straw mulch, jute netting or silt fence at downslope face). (8) At end of each working day, all freshly cleared and stripped areas are inspected by the ESMP Supervisor; any bare soil adjacent to watercourse drainage lines must have silt fences installed before close of work.	
CMS-03: Earthworks — Cut and Fill	Earthworks proceeds section by section in a rolling programme. Before any earthworks commence in a section: RAP compensation for all PAPs in the section must be verified as paid; vegetation clearance must be complete; topsoil must be stripped and stockpiled; silt fences and drainage controls must be installed; CEMP Manager confirms ready-to-excavate status to ZBCL in writing. Earthworks sequence for a typical cut section: survey setting-out of centreline, toe, and crest marks; bulk excavation using hydraulic excavators and dump trucks; progressive placement of cut material in designated fill areas or disposal areas as directed by the Engineer; daily inspection of cut slopes — any signs of instability (tension cracks, groundwater seepage, slope movement) immediately reported to Engineer and ESMP Supervisor; cut slopes protected by silt fences at toe before end of each working day; where cut intercepts groundwater or high seepage, French drain or subsoil drain installed within 24 hours to prevent slope saturation. Embankment construction sequence: sub-grade preparation; geotextile placement where specified (over hydromorphic soils); fill placement in maximum 200 mm loose layers; each layer compacted to minimum 95% MDD at optimum moisture content before next layer placed; moisture conditioning by watering or aeration as required; compaction testing minimum 1 test per 1,000 m² per layer; embankment slopes formed to design gradient and protected by silt fence at toe; progressive grass seeding and revegetation of completed embankment slopes within 5 working days of completion.	Concurrent in multiple sections; wet season earthworks minimised — construction programme to schedule intensive earthworks in dry season where possible
CMS-04: Culvert Installation	For each culvert replacement: (1) Survey and mark centreline and invert level; (2) Excavation: trench or open cut to design depth and width; bed preparation with granular bedding material; in waterlogged conditions, cofferdam or cut-off trench required to manage water; (3) Pipe laying: pipe units positioned to correct line and level; joints sealed per manufacturer specifications; (4) Haunching: granular material placed and compacted in 150 mm layers to springline of pipe; (5) Backfilling: compacted granular material in 150 mm layers from springline to finished sub-grade; minimum 300 mm compacted cover before any traffic; (6) Headwalls and wingwalls: formwork, reinforcement, and concrete pour; minimum 28-day cure before backfill; (7) Inlet and outlet protection: riprap or concrete apron as designed; (8) ZBCL inspection sign-off before backfilling to confirm pipe position, joint quality, and structural condition. In-stream culverts (where pipe crosses an active watercourse): sand bag cofferdam upstream to divert flow; works within isolated dry working area; silt curtain downstream of works throughout; removal of cofferdam and silt	Sequential progress along corridor; river crossing culverts in dry season only

Method Statement	Procedure	Timing
	curtain only after all concrete has been placed and temporary drainage established.	
CMS-05: DBST Surface Treatment Application	Pre-application requirements: base course must be tested and approved by ZBCL (CBR, flatness, density); weather forecast clear with minimum 48-hour outlook; no rain within previous 24 hours; ambient temperature minimum 20°C; bitumen transport vehicle calibrated. Application sequence: (1) Surface cleaning — blow or sweep to remove all dust and debris; (2) Priming — cutback bitumen or emulsion prime coat applied by calibrated bitumen distributor at specified rate (0.8–1.2 l/m ²); prime must cure minimum 24 hours before chip application; (3) First bitumen layer — 80/100 pen bitumen applied by calibrated distributor at specified temperature (150–170°C at nozzle) and rate (1.2–1.6 l/m ²); (4) First chip layer — 10–14 mm stone chips spread by calibrated chip spreader immediately following bitumen within 30 seconds; rubber-tyred roller compaction commences immediately; (5) First cure period — 24–48 hours before second bitumen layer; (6) Second bitumen layer — same specification as first at 0.8–1.2 l/m ² rate; (7) Second chip layer — 6–10 mm stone chips; rolling; (8) Sweeping — excess aggregate swept off after 24 hours; (9) Final inspection by ZBCL: void check, surface texture measurement, aggregate adhesion assessment. OHS for bitumen works: all workers handling bitumen must wear full PPE (heat-resistant gloves, eye protection, long sleeves, safety boots); first aid for bitumen burns must be available on site; no eating or drinking while handling bitumen; shower facilities at camp for end-of-shift decontamination.	Surfacing follows earthworks and drainage completion in each section by minimum 4 weeks; weather-dependent scheduling

8.17 Detailed Waste Management Framework

8.18 Comprehensive Waste Management Specifications

The following table specifies the required management approach for each waste stream generated by the project, in compliance with the Environmental Management Act No. 12 of 2011 and ZEMA solid waste management regulations. All waste management specifications must be incorporated in the Contractor's CEMP Waste Management Plan (CEMP Section 10). The Contractor is responsible for maintaining the Waste Register and retaining all disposal manifests for minimum 5 years after project completion.

Waste Type	Source	Management Requirement	Frequency	Responsible	Record Required
General municipal waste (food waste, packaging, paper, plastics)	Camp kitchen, accommodation, offices	Organic waste: composted at camp compost area or collected weekly by licensed municipal waste hauler; recyclables (plastic, glass, metal): segregated and collected by licensed recycler; residual: licensed landfill disposal only	Weekly collection minimum; no accumulation >7 days	Camp Manager	Disposed manifest retained per load; monthly waste tonnage report
Hazardous	Plant	Collected in sealed,	As	ESMP	Hazardous

Waste Type	Source	Management Requirement	Frequency	Responsible	Record Required
waste — used engine oil	maintenance workshops	labelled steel drums (minimum 205 litre); stored in banded hazardous waste store; licensed used oil recycler or hazardous waste disposal contractor	generated; maximum storage 30 days	Supervisor	waste register; disposal manifests
Hazardous waste — oil filters, rags, contaminated absorbents	Plant maintenance workshops	Sealed in labelled bags; stored in banded hazardous waste store; incinerated by licensed contractor or disposed at licensed hazardous waste site	As generated; maximum storage 30 days	ESMP Supervisor	Hazardous waste register; disposal manifests
Hazardous waste — fuel filters, empty chemical containers	Fuel storage areas; chemical mixing areas	Triple-rinsed and punctured before storage; stored in labelled containers; licensed disposal	As generated	ESMP Supervisor	Hazardous waste register
Batteries (vehicle and equipment)	Workshops; camps	Returned to licensed battery supplier or registered battery	When replaced	ESMP Supervisor	Disposal manifests
		recycler; no burial or burning permitted			
Wastewater — black water (sewage)	Camp ablution blocks	Treatment through waste stabilisation pond or package treatment plant; effluent quality monitoring monthly; no discharge below EMA standards	Continuous	Camp Manager	Monthly effluent quality test results; ZEMA reporting
Wastewater — grey water (showers, laundry, kitchen)	Camp facilities	Passed through grease trap (kitchen); combined with black water for treatment, or separate reed-bed treatment where system design allows	Continuous	Camp Manager	As above
Concrete washwater	Concrete batching areas	Collected in lined settlement pit minimum 10 m ³ ; concrete particles removed and disposed as inert waste at licensed site; settled water may be reused for concrete mixing if quality suitable; no discharge to natural drainage	After each batch	ESMP Supervisor	Monthly inspection of settlement pit condition
Demolition debris (concrete, asphalt, road base)	Demolition of existing structures and pavement	Crushed and reused as engineered fill, road base, or inert construction fill where technically	During demolition works	ESMP Supervisor	Waste volume records; disposal manifests

Waste Type	Source	Management Requirement	Frequency	Responsible	Record Required
		approved by Engineer; non-reusable inert material to licensed inert waste site; no disposal in watercourses or public land			for any off-site disposal
Medical waste — sharps, clinical waste	Camp first aid facility	Sharps in puncture-resistant containers; all clinical waste in clinical waste bags; disposal by licensed medical waste contractor (incineration);	As generated; maximum storage 14 days	Camp health worker	Disposal manifests; medical waste log
		medical waste never mixed with general waste stream			
Hydrocarbon-contaminated soil (from spills)	Anywhere on site	Excavated to visually clean limits and beyond; tested by accredited laboratory to confirm contamination levels; treated by in-situ bioremediation where volumes allow, or ex-situ disposal at licensed contaminated soil facility; ZEMA notification for Level 2 and 3 spills	Immediately on detection	ESMP Supervisor	Spill incident report; laboratory results; ZEMA notification records
Vegetation waste (cleared biomass)	Clearance zones along RoW and borrow pits	First offer to communities (firewood, building material); material not taken by communities — chip for mulch and use in revegetation, or stack and let decompose naturally; NO BURNING without Forestry Department written permit; large commercial-grade timber notified to Forestry Department	As generated	ESMP Supervisor	Clearance volume records; community distribution records

8.19 Community Health Programme — Detailed Plan

The Community Health Programme is a mandatory component of the project, addressing the primary community health risks associated with large-scale road construction in a rural Zambian setting. It is implemented by the Contractor with the oversight of ZBCL and the active support of the district health system.

8.19.1 HIV/AIDS and STI Prevention Programme

The HIV/AIDS and STI prevention programme applies to all workers (permanent and casual, including subcontractors) and is communicated to host communities through CLO-facilitated outreach. Programme elements: (1) Pre-employment HIV/AIDS awareness session (minimum 2 hours) conducted by qualified health educator before any worker commences work on site; (2) Monthly awareness sessions at all contractor camps (minimum 1 session per camp per month), covering HIV transmission and prevention, STI symptoms and treatment-seeking, relationships of mutual respect, and GBV prevention; (3) Free condoms available at all contractor camp clinics and ablution blocks throughout the construction period, refilled weekly; (4) Voluntary confidential HIV testing and counselling (VCT) available at each contractor camp clinic or through referral to nearest health facility, without requirement for disclosure to employer; (5) Referral pathway for workers diagnosed with HIV or STI to access antiretroviral treatment and ongoing care through the district health system; (6) Coordination with the District Health Office in each of the four districts for monthly data on STI consultation rates and HIV testing numbers, to track any programme-induced trend changes. The programme will be facilitated by a qualified health educator contracted for the full construction period, who rotates between all active work sites on a monthly basis. Camp supervisors receive two-day first-level health facilitation training to enable them to lead the monthly sessions between health educator visits. Attendance at awareness sessions is mandatory for all workers; attendance records are maintained and reviewed by ZBCL.

8.19.2 Malaria Prevention Programme

Malaria is endemic in North Western Province and is a significant health risk for construction workers, particularly those from non-endemic regions (Lusaka, Copperbelt) who may have lower acquired immunity. The malaria prevention programme includes: provision of insecticide-treated bed nets (minimum 1 per worker sleeping in camp); indoor residual spraying in all camp accommodation blocks at the onset of the rainy season (October) and again in January; prophylaxis advice and access to recommended prophylaxis for workers who have not previously lived in endemic zones; rapid diagnostic test (RDT) kits and treatment (artemisinin-based combination therapy — ACT) available at camp clinic for confirmed malaria cases; referral to district hospital for complicated or severe malaria cases; drainage of all standing water within and around camp areas weekly to eliminate mosquito breeding sites.

8.19.3 Community Health and Safety — Construction Traffic

The construction traffic management and road safety programme includes the following specific measures to protect community health and safety: all haulage routes used by Contractor vehicles through settlements must be subject to a Speed Management Plan approved by ZBCL before any haulage commences; the plan specifies speed limits, road condition requirements, and times of restricted haulage (no heavy vehicles through settlement areas during school start and end times of 07:00–08:00 and 12:30–13:30 and 16:30–17:30); school zones within 200 m of any active construction site receive dedicated flagmen during all school start and end times; advance warning signs are installed minimum 200 m before any active work face in or near a settlement; and a CLO maintains a road safety complaint log and reports any community road safety concerns to the ZBCL ESMP Supervisor within 24 hours for immediate investigation and corrective action.

8.20 Appendix: Air Quality Monitoring Data Recording Form

The following data recording form is used by the Contractor ESMP Supervisor and ZBCL Environmental Specialist for all air quality monitoring events. Completed forms are filed in the project E&S Records System and summarised in monthly E&S Monitoring Reports.

Field	Data Entry
Monitoring site ID and name	
GPS coordinates (decimal)	

Field	Data Entry
degrees)	
Date of monitoring	
Time of monitoring (start/end)	
Weather conditions (temperature °C; wind speed m/s; wind direction; cloud cover)	
Monitoring equipment model and serial number	
Calibration certificate reference and date	
PM10 reading (µg/m³) — hourly average	
TSP reading (µg/m³) — if measured	
Number of haulage vehicles passing during monitoring period	
Description of active earthworks within 500 m of monitoring point	
Any community complaints received at this location in previous 7 days	
Corrective actions required (Y/N); if yes describe	
Signature of ESMP Supervisor	
Signature of ZBCL Environmental Specialist (where present)	
Date of report submission	

8.21 Appendix: River Turbidity Monitoring Data Form

Used at all active watercourse crossings during construction. One form completed per monitoring event per crossing point. Immediately after any turbidity exceedance (>50 NTU above upstream background),

Field	Data Entry
Crossing name and chainage	
GPS coordinates of upstream monitoring point	

Field	Data Entry
GPS coordinates of downstream monitoring point	
Date and time of monitoring	
Rainfall in previous 48 hours (mm)	
Active earthworks within 100 m of watercourse (Y/N)	
Upstream turbidity (NTU)	
Downstream turbidity (NTU)	
Difference (NTU) — trigger if > 50 NTU above upstream	
DO (mg/L) — upstream and downstream	
Visual condition of watercourse (normal / turbid / discoloured / pollution suspected)	
Silt fence condition upstream (intact / damaged / bypassed)	
Sediment trap condition (effective / full / bypassed)	
Corrective action required (Y/N)	
Corrective action taken and timeframe	
Exceedance reported to ZBCL (Y/N); date/time reported	
ZEMA/WARMA notification required (Y/N)	

8.22 Appendix: Weekly OHS Site Inspection Checklist

Completed by the Contractor OHS Officer every week at each active construction section and contractor camp. Non-compliances are actioned immediately and reported in the monthly E&S Monitoring Report. Rating: C = Compliant; NC = Non-Compliant; N/A = Not Applicable.

#	Inspection Item	Specific Criteria	Rating (C/NC/NA)
1	Site access and perimeter	Construction site boundary clearly marked and secure; unauthorised access prevented; signage at all entry points	
2	Personal Protective	All workers wearing correct PPE for their task; hardhats,	

#	Inspection Item	Specific Criteria	Rating (C/NC/NA)
	Equipment	HV vests, safety boots minimum for all; task-specific PPE in use	
3	Plant and equipment	Pre-start safety checks completed and logged for all plant; defective equipment tagged out; safety guards in place; reversing alarms functioning	
4	Excavations	All open excavations >1.5 m depth shored or battered; barrier tape and warning signs around all open excavations; no unauthorised entry	
5	Working at height	Guardrails on all scaffolding and elevated platforms >2 m; safety harnesses worn where required; no working at height in high wind	
6	Lifting operations	Lifting gear certified and within test date; no persons under suspended loads; lift plan in place for complex lifts	
7	Electrical safety	All temporary electrical installations inspected; RCD/GFCI on all temporary power; no damaged cables or exposed conductors; lockout-tagout procedure in use	
8	Fuel and chemical storage	Bunded fuel storage (110% capacity); spill kits present and stocked; fire extinguishers present; no smoking signs posted; SDS available	
9	First aid	Fully stocked first aid kit at each active section and camp; trained first aider identified and present; emergency contact numbers posted	
10	Emergency response	Emergency evacuation procedure displayed; muster point identified; emergency contacts posted; fire extinguishers inspected within last month	
11	Noise management	Working hours compliance (06:00–18:00 weekdays; 07:00–13:00 Saturdays); ear protection worn near loud plant; community noise complaint log checked	
12	Dust management	Water bowser in use on earthworks sections; dust visible at nearest community (Y/N); corrective action if yes	
13	Worker welfare	Drinking water available at all work areas; shade structures present; rest schedule visible; no workers observed in distress	
14	Camp sanitation	Ablution blocks clean and functional; sufficient toilets per ILO standard; waste collection completed this week; no open waste or burning	
15	Child protection	No children observed on or near active work sites; school zone special measures in place where required	

8.23 Resettlement Action Plan Summary

8.24 Introduction

A full, standalone Resettlement Action Plan (RAP) has been prepared as Document Reference ZBCL/RAP/001/2026 and is incorporated by reference as Annex K of the Final ESIA. This chapter provides a structured summary of the RAP's key methodology, findings, eligibility framework, entitlement provisions, livelihood restoration approach, and implementation arrangements for integration in the ESIA record. All details, annexes, valuation reports, and compensation schedules are contained in the full RAP document. The RAP has been prepared in compliance with Zambia's Land Acquisition Act (Cap. 189), the Lands Act (Cap. 184), and applicable international standards

including World Bank ESS5 on Land Acquisition, Restrictions on Land Use and Involuntary Resettlement, and AfDB Operational Safeguard OS2. Where gaps exist between national legislation and international standards, the higher standard is applied in the RAP, consistent with the gap analysis presented in Section 3.

8.25 Resettlement Policy Principles

The RAP is guided by the following core principles drawn from Zambian law and applicable international standards:

- Displacement shall be avoided wherever possible through project design and alignment optimisation.
- Where displacement is unavoidable, it shall be minimised through careful design and localised realignment.
- All displacement shall occur only after compensation has been paid in full at full replacement cost and alternative accommodation is available and accepted by the PAP.
- No PAP shall be worse off as a result of the project; all PAPs are entitled to restoration of their pre-displacement living standards.
- Vulnerable groups shall receive additional support above standard entitlements.
- The resettlement process shall be participatory, transparent, gender-responsive, and fully documented.
- All PAPs, regardless of tenure status (including non-titled occupants present before the cut-off date), are eligible for compensation for assets and livelihoods affected.

8.26 Resettlement Scope and PAP Categories

The rehabilitation works require clearance of the full 30-metre legal right-of-way along the 214 km corridor, as well as temporary construction easements for borrow pits, haul roads, and contractor facilities. Primary resettlement impacts arise from:

- Residential structures located within the 30 m RoW: preliminary census data identifies an estimated 150 to 250 residential structures, though the full PAP census will establish the precise number.
- Commercial and business premises within the RoW, particularly in settlement and market areas.
- Agricultural land and perennial crops within the RoW along the rural sections of the corridor.
- Economically and commercially valuable trees (fruit trees, timber species) within the RoW.
- Communal infrastructure (boreholes, footpaths, community buildings) within the RoW.
- Graves and cultural sites requiring avoidance or relocation. Three categories of eligible PAPs have been established:
 - Category 1 — Formal Legal Rights Holders: Persons with statutory leasehold title or Certificate of Title within the RoW. Entitled to full compensation for land and all assets.
 - Category 2 — Customary and Traditional Rights Holders: Persons with recognised but unregistered customary land rights, the predominant tenure form along the corridor. Treated as equivalent to Category 1 for all compensation purposes, receiving full replacement cost for land and all assets.
 - Category 3 — Non-titled Occupants Present Before the Cut-Off Date: Persons occupying land without legal or customary claim, who are nonetheless present before the cut-off date. Entitled to compensation for structures and assets (not for land), plus full relocation assistance.

8.27 Cut-Off Date

The cut-off date for eligibility is the official commencement date of the full PAP census, which will be publicly announced in advance through all community channels, traditional authority structures, and community radio. All persons with assets within the RoW on or before the cut-off date are eligible for

compensation. No new developments undertaken after the cut-off date will qualify for compensation. The cut-off date announcement will be accompanied by information sessions in all affected communities explaining the eligibility framework and the consequences of establishing new structures or crops within the RoW after the cut-off date.

8.28 Valuation Approach

All assets will be valued at full replacement cost, defined as the cost of replacing the affected asset with an asset of equal utility and quality at current market prices, without any deduction for depreciation, salvage value, or transaction costs, in compliance with World Bank ESS5. Valuation will be conducted by a ZIEA-registered licensed property valuer appointed by RDA, using current market survey data for construction materials in the project area, Ministry of Agriculture crop and tree compensation schedules updated with current market surveys, and verified market values for land in each district along the corridor.

8.29 Entitlement Matrix

The table below summarises the entitlements applicable to each category of displacement impact under the RAP.

Type of Loss / Impact	Eligibility	Entitlement
Loss of residential structure (owner-occupier)	Owner-occupiers of any structure within the 30 m RoW, regardless of tenure status	Cash compensation at full replacement cost (new materials, current prices, no depreciation deduction), or in-kind replacement of equivalent quality; disturbance allowance (3 months rental equivalent); moving assistance (transport and manual labour costs).
Tenants of affected residential structures	Verified tenants of structures within the RoW present before the cut-off date	Minimum 3 months' rental allowance at current market rates in the project area; moving assistance; CLO support to identify alternative accommodation.
Loss of agricultural or cultivated land	All PAPs with customary or statutory rights to agricultural land within the RoW	Replacement land of equivalent quality and productivity identified by community and traditional authorities, where available; or cash at full market replacement rate per hectare based on current market surveys. Compensation for all standing crops at market value.
Loss of perennial trees and commercially valuable trees	All affected farmers and land users with trees within the RoW, including trees on untitled land	Cash compensation at market rate per species, age, and estimated yield — rates determined by Ministry of Agriculture crop compensation schedules supplemented by independent market survey. Replacement seedlings for all fruit and commercially valued species.
Loss of business / commercial structure and income	Business owners and operators within the RoW	Full replacement cost of structure; minimum 3-month business income compensation based on documented revenue surveys; relocation assistance; priority access to roadside trading sites post-rehabilitation.
Loss of communal land or communal resource access (water, pasture, forest products)	Community members with demonstrated access to communal resources affected by the project	Equivalent communal resource access restored by community consensus; community compensation fund where individual attribution is not practicable; facilitated through traditional authority and community decision-making process.

Type of Loss / Impact	Eligibility	Entitlement
Vulnerable PAPs (female-headed, elderly, disabled, child-headed households, HIV/AIDS-affected)	All PAPs identified as vulnerable in the PAP census using the vulnerability assessment criteria	All standard entitlements PLUS: additional relocation support (extended CLO assistance, dedicated transport, extended timeline for relocation if needed); priority enrolment in Livelihood Restoration Programme; individual support plans prepared; welfare monitoring visits monthly during resettlement and quarterly thereafter for 12 months.
Loss of cultural or sacred sites, ancestral graves	Affected communities and family groups; traditional authorities	Avoidance of all identified sites is the mandatory first option. Where avoidance is impossible after design review: community-guided relocation with traditional leader and NHCC oversight; all ceremonial costs borne by the project; relocation to community-identified site only with full family and community consent.
Loss of public infrastructure (boreholes, footpaths, community buildings)	Surrounding communities and local authorities	Full replacement and restoration of all affected public infrastructure to an equal or better standard; replacement must be fully functional and commissioned before the original is removed or demolished. Temporary provision of equivalent service during the transition period.

8.30 Livelihood Restoration Programme

In recognition that cash compensation alone is often insufficient to restore the livelihoods of economically displaced households — particularly those dependent on subsistence agriculture and natural resources — the RAP includes a structured Livelihood Restoration Programme (LRP) for all PAPs who lose primary livelihood sources. LRP components include: agricultural support package (improved seed varieties, basic tools, fertiliser, and access to extension services) for displaced farmers; small enterprise development support and facilitated access to microfinance for business operators; skills and vocational training to enhance employment opportunities in construction and post-construction sectors; priority access to construction employment for eligible PAPs as part of the 30% local labour target; and community-based natural resource management support to sustainably restore access to non-timber forest products and other ecosystem services. LRP outcomes are tracked against a household income recovery target of at least 80% of PAPs reporting restored or improved livelihoods compared to their pre-displacement baseline at the time of the RAP Completion Audit, conducted no earlier than 12 months after the final resettlement case is closed.

8.31 RAP Implementation Timeline

The RAP follows a section-by-section implementation approach aligned with the construction programme. The mandatory sequencing is: (1) PAP census and socioeconomic survey completion; (2) independent asset valuation; (3) Compensation Agreements signed with each PAP; (4) full compensation payment verified as received; (5) PAP achieves and accepts alternative accommodation; (6) minimum 4week stabilisation period; (7) civil works mobilise in the relevant section. Under no circumstances shall civil works commence in any road section before compensation for all PAPs in that section has been fully paid and verified. This principle is an absolute pre-condition for construction, enforced through the ESMP compliance monitoring system.

8.32 RAP Monitoring and Completion Audit

Internal monitoring will be conducted monthly by the ZBCL Resettlement Team and the RDA RAP Implementation Unit, with quarterly reporting to the financing institution. An independent monitor will

conduct quarterly audits of RAP implementation. A formal RAP Completion Audit by an independent specialist auditor will be conducted at the conclusion of all RAP activities, assessing whether all commitments have been fulfilled and whether PAP livelihoods have been restored or improved against the baseline. The Completion Audit report will be publicly disclosed on the RDA website and at all District Councils along the corridor.

8.33 RAP — Community Consultation And Appeals

8.34 Community Consultation on RAP Methodology

The RAP methodology — including the compensation valuation approach, entitlement matrix, cut-off date, and livelihood restoration programme — was developed through a participatory process involving communities, traditional authorities, district councils, and civil society organisations along the corridor. Community consultations specifically on the RAP were conducted in June 2026 as part of the ESIA scoping consultations, and a separate round of RAP-specific community information sessions will be conducted before the PAP census commences. Key community inputs that directly shaped the RAP design include: the request from women's groups that compensation for agricultural crops be paid directly to the person cultivating the land (regardless of who holds formal title), which is adopted in the RAP entitlement matrix; the request from traditional leaders that the community be involved in identifying graves and sacred sites for avoidance before demarcation of the construction boundary, which is adopted as the pre-demarcation community mapping process; the request from PAPs with informal tenure that they be treated equally to formally titled holders, which is adopted through the Category 2 and Category 3 entitlement structure; and the request for a local-language explanation of the compensation process and entitlements, which is addressed through the Non-Technical Summary documents in Luvala and Luchazi.

8.35 PAP Registration and Database

The full PAP census will be conducted by a team of ZBCL-trained field enumerators and CLOs in each district, using a standardised digital data collection instrument (ODK Collect). The census collects the following information for each identified PAP: full name and national registration card number; household composition and contact details; GPS-surveyed location of each affected asset; photographs of all affected structures; land use type and tenure status; crop and tree inventory; vulnerability assessment using the RAP vulnerability screening criteria; and consent for the information to be recorded in the PAP database. All PAP data is held in a secure, password-protected RAP database managed by ZBCL. Access is restricted to the RAP implementation team and RDA authorised personnel. No PAP personal data will be shared with the Contractor or any external party. The database tracks the full lifecycle of each PAP case from initial registration through to compensation payment verification, relocation completion, and livelihood monitoring outcomes. A PAP ID card is issued to each registered household as proof of registration, providing a reference number for all future interactions with the RAP team.

8.36 Compensation Payment Process

Compensation will be paid through the following verified process to minimise risk of loss, misappropriation, or non-receipt: 17. The licensed property valuer presents the valuation report to the PAP and explains the basis for the valuation, including the replacement cost calculations, in the PAP's language with CLO support. 18. The PAP reviews the valuation and may request a review if they disagree with the assessment. Any disputed valuations are referred to an independent review by a second licensed valuer within 10 working days.

19. The PAP and RDA sign a Compensation Agreement, which records the agreed compensation amount, the payment modality, and the PAP's acknowledgement of receipt. The Agreement is explained in the PAP's language and a signed copy retained by both parties. 20. Payment is made by bank transfer to the PAP's bank account wherever possible, to provide a verifiable payment record. Where the PAP does not have a bank account, the PAP is assisted to open a mobile money account (Airtel Money, MTN Mobile Money, or Zamtel Kwacha) for payment receipt. 21. Payment receipt is

confirmed by the CLO through a verification visit within 5 working days of the payment date. The CLO completes a Payment Verification Form confirming the PAP received and has access to the funds. 22. All payment verification forms are entered into the RAP database. A section is cleared for construction only when 100% of PAPs in that section have verified payment receipts on file. 23. Compensation amounts are disclosed publicly at each chiefdom level (aggregate amounts, not individual PAP amounts) to allow the community to verify that the compensation process is proceeding fairly. Any community member may raise a concern about the compensation process through the GRM.

8.37 Special Provisions for Graves and Sacred Sites

The avoidance, protection, and if unavoidable the relocation of ancestral graves and sacred sites is one of the most culturally sensitive aspects of the resettlement process. The following mandatory sequence applies to any grave or sacred site identified within or adjacent to the construction footprint: 24. Community-led mapping identifies all known graves and sacred sites before demarcation of the construction boundary. This mapping is conducted in partnership with traditional authorities and village elders, not by ZBCL staff alone. 25. Design review: all identified graves and sacred sites are flagged on construction drawings as mandatory avoidance zones. The Contractor and design team review whether minor design adjustments (alignment shifts, construction boundary adjustments) can avoid the grave or site entirely. Avoidance is the mandatory first option. 26. If avoidance is not technically feasible after genuine design review: formal consultation with the affected family (for graves) and/or traditional authority (for sacred sites) is conducted to explain why avoidance is not possible and to seek consent for alternative management (relocation or protection in place). 27. No grave or sacred site is relocated or disturbed without explicit consent from the affected family and/or traditional authority, NHCC notification and advice, and a traditional ceremony conducted according to community custom. All ceremonial costs are borne by the project. 28. Relocated graves are re-established at a site selected by the family, in accordance with community custom. The project provides all necessary physical and logistical support for the relocation process.

8.38 RAP — Vulnerability Framework And Livelihood Restoration

8.39 Detailed Vulnerability Assessment Framework

The vulnerability assessment framework applied in the RAP census identifies seven vulnerability categories, each with specific eligibility criteria and additional RAP provisions above standard entitlements. The framework draws on the Zambia Social Cash Transfer Programme targeting criteria, the World Bank ESS5 guidance on vulnerable groups, and the findings of the ZBCL socioeconomic baseline survey. Vulnerability status is assessed for each household during the PAP census interview by trained enumerators using a standardised vulnerability screening tool, and verified by CLO field observation.

Vulnerability Category	Definition / Criteria	Estimated Prevalence	Additional RAP Provisions
Female-headed households	Household head is a woman, widowed, divorced, separated, or with absent husband	~30–40% of rural PAP households based on census data	Priority compensation payment scheduling; dedicated female CLO support; women-only consultation options; compensation paid directly to female household head; priority LRP enrolment
Elderly household heads (>65 years)	Household head is aged 65 or above and has limited or no other income sources	~8–12% of PAP households	Simplified compensation process (CLO accompanies to bank; mobile money assistance); extended relocation timeline; assistance with physical moving; welfare monitoring monthly
Persons with disability	Household member with physical or mental	~3–5% of PAP households	Accessibility assessment of proposed alternative accommodation; adapted

Vulnerability Category	Definition / Criteria	Estimated Prevalence	Additional RAP Provisions
	disability significantly limiting livelihood capacity		compensation interview process; extended CLO support; physical assistance for relocation; monitoring for disability-specific welfare risks
Child-headed households	Household head is under 18 years of age	<1% but present	Child protection protocol: ZBCL Social Worker engaged; coordination with District Social Welfare Office; compensation held in trust; guardian assigned with welfare oversight; Children's Court involvement if required
HIV/AIDS-affected households	Household member(s) living with HIV/AIDS causing reduced labour capacity or significant health expenditure burden	~10–15% of PAP households based on provincial HIV prevalence	Confidentiality of health status strictly maintained; healthcare cost compensation factored into livelihood assessment; priority LRP enrolment for income recovery; referral to HIV/AIDS support services where requested
Extreme poverty households	Household below the Zambian national poverty line (approximately ZMW	~25–35% of PAP households estimated	Income and asset vulnerability weighting in compensation; priority access to LRP skills training and business development support;
	500 per person per month)		monitoring for signs of compensation misuse or household financial crisis post-compensation
Isolated/remote households with limited market access	Households in most remote sections of corridor with no access to markets or services for extended wet season periods	~5–10% of PAP households in remote sections	Compensation payment logistics that account for limited banking access (mobile money or agent banking); CLO field visit rather than office visit process; transport assistance for any required meetings

8.40 Livelihood Restoration Programme — Detailed Design

The Livelihood Restoration Programme (LRP) is a structured, time-bound programme of assistance to economically displaced PAPs, designed to ensure that all affected households achieve at least restoration of their pre-displacement livelihood levels within 12 months of resettlement. The LRP operates through six components, each targeting a different dimension of livelihood vulnerability:

LRP Component	Eligibility	Specific Measures	Timing	Responsible
Agricultural Support Package	All PAPs who lose primary agricultural livelihood land or crops (estimated ~60% of all PAPs in rural sections)	Seeds (improved cassava cuttings, certified maize, groundnut, bean seed); basic tools (hoe, machete, watering can); access to Ministry of Agriculture extension services for season 1 and season 2 after relocation; demonstration of soil preparation techniques for new plot	Within 30 days of relocation; in time for first planting season after displacement	ZBCL Livelihoods Officer; Ministry of Agriculture extension
Small Enterprise Development	PAPs who lose commercial/business	Business planning support; facilitated access to	Within 60 days of	ZBCL Livelihoods

LRP Component	Eligibility	Specific Measures	Timing	Responsible
and Business Support	premises or primary income from trading activities (estimated ~15% of PAPs in settlement sections)	ZANACO or CEEC microfinance products; linkage to Zambia Development Agency SME programmes; peer group networking with other business PAPs; market linkage facilitation	business displacement	Officer; partnered microfinance institution
Skills and Vocational Training	Economically displaced PAPs of working age (18–55 years) seeking alternative livelihood pathways; priority for vulnerable PAPs (female-headed, youth from displaced households)	Construction skills training offered by Contractor (civil construction, carpentry, concrete works, plant operation); facilitated access to TEVETA vocational training bursaries for priority PAPs; trade test facilitation for qualified trainees	Training within 3 months of relocation; concurrent with construction period where possible	Contractor (construction skills); TEVETA; ZBCL CLOs
Priority Construction Employment	All PAPs of working age along the corridor; preference for PAPs from physically displaced households and vulnerable categories	Priority inclusion in local labour recruitment for construction; first-round notification of all vacancies through CLO direct contact; skills testing for appropriate roles; preference for supervisory and skilled roles for PAPs with relevant experience	Concurrent with construction employment recruitment	Contractor HR Manager; ZBCL CLOs
Community-Based Natural Resource Management (CBNRM) Support	Communities adjacent to areas where natural resource access is reduced by construction or induced land use change	Support for community forest governance through Forestry Department CBNRM programme; facilitation of community access to ZPPA forest product licences; beekeeping development as alternative income in displaced woodland areas; linkage to Wildlife Act Community Resource Boards in GMA-adjacent areas	Year 1–3 post-road opening; concurrent with operational land cover change monitoring	ZBCL; Zambia Forestry Department; DNPW
Welfare Safety Net (Vulnerable PAPs only)	All PAPs assessed as vulnerable who have not achieved livelihood recovery by the 12-month post-relocation monitoring review	Case-specific additional support package designed in consultation with the PAP, their CLO, and ZBCL Social Specialist; may include: extended income support; repeat skills training; revised business plan; referral to government social protection programmes (Social Cash Transfer; PWAS)	Triggered at 12-month welfare monitoring review if recovery not demonstrated	ZBCL Social Specialist; RDA RAP team; Government social protection agencies

8.41 RAP Implementation Sequencing — Section by Section Approach

Given the 214 km length of the corridor, RAP implementation cannot be completed across the full corridor simultaneously. The section-by-section approach links RAP implementation directly to the construction programme: 29. At least 6 months before construction is planned to commence in any section: the PAP census and asset inventory for that section must be complete; independent valuation must be underway; and CLOs must be meeting with all PAPs in the section monthly. 30. At least 3 months before construction in a section: all compensation agreements must be signed; compensation payments must be initiated; and physically displaced PAPs must have identified and accepted their alternative relocation sites.

31. At least 1 month before construction in a section: all compensation must be verified as received by all PAPs; all physically displaced PAPs must be relocated to their alternative sites; and LRP enrolment must be confirmed for all economically displaced PAPs requiring it. 32. Construction may commence in the section only when ZBCL confirms in writing to RDA that all above conditions are fully satisfied. This confirmation is entered into the RAP database and Monthly E&S Monitoring Report. 33. After construction in each section: CLO welfare monitoring visits continue monthly for 6 months, then quarterly for a further 12 months. Income recovery surveys at 6 and 12 months postrelocation provide the data for the RAP Completion Audit. The section-by-section approach ensures that RAP obligations are met progressively alongside construction progress, rather than requiring completion of all RAP activities before any construction commences. However, the mandatory pre-condition — that all PAPs in a section are compensated and relocated before works commence in that section — is absolute and non-negotiable.

8.42 RAP Budget and Financing

The RAP budget is separate from the civil works construction budget and from the ESMP implementation budget. It is funded directly by the Government of the Republic of Zambia through RDA's budget allocation and, where applicable, by the financing institution as part of the project financing package. The indicative RAP budget components are:

#	Budget Item	Basis of Estimate	Party
1	Compensation for residential structures (all categories)	Unit replacement cost × estimated 200 structures average; final cost subject to full census and valuation	RDA (Government)
2	Compensation for agricultural land (all categories)	Market rate per hectare × estimated total affected area; subject to full census	RDA (Government)
3	Compensation for crops, trees, and perennial vegetation	Per-unit compensation rates × estimated numbers; subject to full inventory	RDA (Government)
4	Compensation for business premises and income loss	Structure replacement cost + 3-month income compensation; subject to full census	RDA (Government)
5	Compensation for communal resources and infrastructure	Replacement cost of affected community boreholes, paths, community buildings; estimated 15–25 items	RDA (Government)
6	Grave and sacred site management (avoidance, monitoring, relocation where unavoidable)	Ceremonial costs + professional services; case by case; estimated budget based on preliminary census	RDA (Government)
7	RAP implementation team — ZBCL Social Specialist, Resettlement Officer, CLOs, property valuer fees	Staff costs over full RAP implementation period (estimated 24–36 months)	RDA (within ZBCL consultancy)

#	Budget Item	Basis of Estimate	Party
			contract)
8	Livelihood Restoration Programme (all components)	Per-beneficiary costs × estimated 300–500 LRP participants	RDA / Financing Institution
9	Independent RAP monitoring and completion audit	Independent specialist fees × quarterly monitoring + 1 completion audit	RDA
10	RAP contingency (20% of items 1–9)	20% contingency to cover unanticipated PAPs, above-estimate valuations, and dispute resolution costs	RDA (Government)
	TOTAL INDICATIVE RAP BUDGET	Estimated range: USD 8–14 million (to be confirmed by full census and valuation)	RDA

8.43 Conclusions — Monitoring Framework And Adaptive Management

8.44 Long-Term Monitoring Framework

A long-term environmental and social monitoring framework is established for the operational phase of the rehabilitated Mutanda-Mwinilunga Road, covering the period from project completion through the first 5 years of operation. The operational monitoring framework is distinct from the construction-phase ESMP monitoring and focuses on the outcome indicators most relevant to long-term project sustainability:

8.44.1 Operational Phase Environmental Monitoring

- Land cover change monitoring: Annual satellite imagery analysis (minimum Sentinel-2 or equivalent 10 m resolution) for a 5 km corridor buffer along the full 214 km, tracking deforestation, wetland conversion, and land use change. Results compared against the pre-project baseline. Any area showing >5% net deforestation in a 12-month period triggers a formal review with the Forestry Department and NWP Planning Authority.
- Road drainage condition monitoring: Annual inspection of all culverts, bridge structures, side drains, and borrow pit restoration areas by the RDA maintenance team, with condition ratings and maintenance requirements recorded. Targets: >90% of culverts fully functional; >85% of borrow pit sites with >80% vegetation cover by Year 2 post-construction.
- Community water quality monitoring: Semi-annual water quality sampling at selected community boreholes along the corridor (minimum 8 monitoring points), tracking pH, conductivity, nitrates, hydrocarbons, and faecal coliform. Exceedance of any WHO potable water standard triggers investigation and remedial action.
- Wildlife monitoring: Annual wildlife transect surveys (camera traps plus track surveys) at identified wildlife corridor crossing points, tracking species composition and index of abundance relative to the pre-construction baseline. Significant declines in indicator species trigger review with DNPW.

8.44.2 Operational Phase Social Monitoring

- RAP completion audit: Independent audit of all RAP commitments, conducted no earlier than 12 months after the final resettlement case is closed. Measures: % of PAPs with verified compensation received; % of PAPs reporting restored or improved livelihoods (target ≥80%); welfare status of vulnerable PAPs relative to baseline; any outstanding disputes in the GRM.
- Road safety monitoring: Annual road accident data from RTSA for the T5 corridor, tracking fatalities, serious injuries, and pedestrian incidents. Target: road accident rate per vehicle-km at or below the national average for equivalent road class within 3 years of road opening.

- Community satisfaction monitoring: Annual community satisfaction survey (random sample) assessing: satisfaction with road condition; satisfaction with safety; perceptions of economic benefit; gender-specific indicators of benefit access. Significant dissatisfaction (>30% reporting dissatisfied in any category) triggers a community consultation to identify root causes.
- Economic impact monitoring: Baseline and follow-up surveys of key economic indicators along the corridor (agricultural produce market prices; truck operating costs; frequency of market access; business establishment rates in corridor settlements) at Year 1, 3, and 5 post-opening to document the economic development impacts of road rehabilitation.

8.45 Adaptive Management Framework

The ESMP and RAP are designed as adaptive management instruments — they are not static documents to be implemented once and filed. The adaptive management framework requires:

- Annual ESMP review: The ESMP is formally reviewed at the end of each calendar year by ZBCL and RDA, considering all monitoring data, non-compliance records, community feedback, and any changes in project scope or external context. The ESMP is updated where monitoring identifies that existing measures are inadequate or new risks have emerged.
- Trigger-based review: Any of the following events triggers an immediate out-of-cycle ESMP review: a worker or community fatality attributed to project activities; a GBV/SEA incident confirmed by the GBV Service Provider; a significant (>50 m) unanticipated cultural heritage discovery; a ZEMA enforcement action; or a financing institution non-compliance notice.
- Third-party audit: Independent environmental and social audits are conducted quarterly during construction and annually during the 5-year operational monitoring period. Audit reports are shared with RDA, ZEMA, and the financing institution, and publicly disclosed on the RDA website within 30 days of finalisation.
- Community feedback loop: The monthly CLO community consultations and annual community satisfaction surveys are explicitly designed as adaptive management inputs — community feedback received in these processes is reviewed by ZBCL and any necessary changes to ESMP implementation are incorporated in the next monthly E&S Monitoring Report.

8.46 ESIA Commitments Register

The following table provides a consolidated register of all formal commitments made in this ESIA, the ESMP, and the RAP. This register forms the basis for ESMP compliance tracking and independent audit. Commitments are numbered for reference in monitoring reports.

#	Commitment	Source Document	Responsible	Phase
C-01	ZEMA EIA Certificate obtained before construction commencement	ESIA Section 9; ESMP	RDA	Pre-construction
C-02	Full PAP census and socioeconomic survey completed along full 214 km corridor before construction in any section	RAP; ESMP	ZBCL / RDA	Pre-construction
C-03	All compensation paid at full replacement cost and verified as received by each PAP before construction in relevant section	RAP; ESMP	ZBCL / RDA	Pre-construction
C-04	Physically displaced PAPs relocated to acceptable alternative accommodation before original structure demolished	RAP	ZBCL / RDA	Pre-construction
C-05	Pre-construction cultural heritage survey completed along full 214 km corridor; NHCC clearances obtained for all heritage-sensitive areas	ESIA Ch.6 & 12; ESMP	ZBCL	Pre-construction

#	Commitment	Source Document	Responsible	Phase
C-06	Forest Clearance Permits obtained for all classified forest areas within the RoW	ESIA Section 3	Contractor / RDA	Pre-construction
C-07	WARMA water abstraction licences obtained for all construction water sources before abstraction commences	ESIA Section 3	Contractor	Pre-construction
C-08	GRM operational and communicated to all communities before construction mobilisation	ESMP; SEP	ZBCL / CLOs	Pre-construction
C-09	GBV Service Provider contracted and confidential reporting channel operational before any construction workers deployed	ESMP	RDA / Contractor	Pre-construction
C-10	CEMP reviewed and approved by ZBCL and RDA before mobilisation; all workers sign Code of Conduct before starting work	ESMP	Contractor	Pre-construction
C-11	Silt fences and sediment traps installed before vegetation clearance or earthworks in each section	ESMP	Contractor	Construction
C-12	Vegetation clearance restricted strictly to approved construction footprint; no unauthorised clearing beyond demarcated boundary	ESMP	Contractor	Construction
C-13	All in-stream works at major river crossings restricted to dry season (May–October) only	ESMP	Contractor	Construction
C-14	All dambo embankment works restricted to dry season; no bare soil surfaces exposed at onset of rains in November	ESMP	Contractor	Construction
C-15	Chance Find Procedure in place and all workers trained before any excavation commences	ESMP; CEMP	Contractor	Pre-construction & Construction
C-16	Monthly HIV/AIDS awareness sessions for all workers; free condoms at all contractor camps	ESMP	Contractor	Construction
C-17	Site-specific Borrow Pit Management and Rehabilitation Plan submitted and approved before each borrow pit opens	ESMP	Contractor	Construction
C-18	All borrow pits revegetated to >80% ground cover within 12 months of closure; final rehabilitation sign-off by ZBCL	ESMP	Contractor	Post-construction
C-19	Monthly E&S Monitoring Reports submitted to RDA within 10 working days of each month end	ESMP	ZBCL	Construction
C-20	Independent quarterly environmental and social audits	ESMP	RDA (independent)	Construction

#	Commitment	Source Document	Responsible	Phase
	conducted throughout construction period		auditor)	
C-21	RAP Completion Audit conducted no earlier than 12 months after final resettlement case closed; report publicly disclosed	RAP	RDA (independent auditor)	Post-construction
C-22	Annual satellite land cover change monitoring for minimum 5 years post-road opening	ESMP; ESIA Ch.11	RDA	Operation
C-23	Road safety features (speed humps, guardrails, pedestrian crossings, school zone signs) maintained functional throughout operation	ESMP	RDA	Operation
C-24	Community borehole water quality monitoring semi-annually during construction; annually during operation	ESMP	ZBCL / RDA	All phases
C-25	Annual wildlife transect surveys at identified wildlife corridor crossing points during 5-year operational monitoring period	ESMP	RDA / DNPW	Operation

8.47 Environmental And Social Commitment Plan

8.48 Environmental and Social Commitment Plan (ESCP) Framework

The Environmental and Social Commitment Plan (ESCP) will be prepared by RDA and agreed with the financing institution during project appraisal. The ESCP translates the commitments in this ESIA, ESMP, and RAP into a formal commitment instrument that is incorporated into the financing agreement. The following table presents the key elements of the ESCP framework, which will be developed into a full ESCP during the project preparation finalization period.

Ref	Commitment	Standard Reference	Responsible	Due Date / Milestone
ESCP-1	Implement and maintain this ESIA, ESMP, and RAP throughout the project	ESS1; ESS5; EMA 2011	RDA	Throughout project
ESCP-2	Obtain ZEMA EIA Certificate before construction	EMA 2011; SI 28/1997	RDA / ZBCL	Before construction mobilisation
ESCP-3	Establish and maintain a Grievance Redress Mechanism acceptable to the Bank	ESS10	RDA / ZBCL	Before construction mobilisation; maintained throughout
ESCP-4	Complete full PAP census, valuation, and RAP implementation; no civil works before compensation paid in each section	ESS5	RDA / ZBCL	Before construction in each section
ESCP-5	Prepare and implement a Labour Management Procedure in accordance with ESS2	ESS2	Contractor (CEMP); RDA oversight	Before mobilisation

Ref	Commitment	Standard Reference	Responsible	Due Date / Milestone
ESCP-6	Implement GBV Action Plan with Code of Conduct and GBV Service Provider	ESS4; Good Practice Note on GBV	RDA / Contractor	Before any workers deployed
ESCP-7	Conduct and implement a pre-construction cultural heritage survey; obtain NHCC clearances	ESS8; NHCC Act	ZBCL	Before construction in each section
ESCP-8	Implement stakeholder engagement plan throughout project	ESS10	ZBCL / CLOs	Throughout project
ESCP-9	Prepare and implement Biodiversity Management Plan as part of CEMP	ESS6	Contractor; ZBCL oversight	Before vegetation clearance in any section
ESCP-10	Conduct quarterly independent environmental and social audits; report to Bank	ESS1	RDA (independent auditor)	Quarterly during construction; annually during operation
ESCP-11	Submit semi-annual monitoring reports to the Bank	ESS1	RDA / ZBCL	Semi-annually throughout project
ESCP-12	Conduct RAP completion audit within 24 months of project completion	ESS5	RDA (independent auditor)	No earlier than 12 months after final resettlement case closed
ESCP-13	Implement land cover change monitoring programme for 5 years post-road opening	ESS6	RDA	Annual; Years 1–5 post-completion
ESCP-14	Ensure all contractors and subcontractors comply with ESS requirements through contract provisions	ESS2	RDA; Contractor	Incorporated in all contract documents before tender
ESCP-15	Disclose ESIA, ESMP, RAP and other safeguard documents in accessible format	ESS10	RDA	Before appraisal and before construction; update as needed

8.49 Non-Technical Summary — English Version

This section presents the Non-Technical Summary (NTS) of the ESIA for the Rehabilitation of the Mutanda-Mwinilunga Road (214 km, Main Road T5), North Western Province, Zambia. The NTS provides a plain-language overview of the project, its environmental and social impacts, and the measures being taken to protect communities and the environment. The full NTS will also be translated into Luvale and Luchazi for distribution in communities along the project corridor.

8.49.1 What is this project?

The Road Development Agency (RDA) is proposing to rehabilitate approximately 214 km of the Mutanda to Mwinilunga Road in North Western Province. This road, known as Main Road T5, runs from Mutanda town in Solwezi District westward through Manyinga and Kabompo Districts to Mwinilunga Boma near the border with the Democratic Republic of Congo. The road has not been properly maintained for many years and is in very poor condition, making it difficult or impossible to

use during the rainy season. This project will rehabilitate the road with a new sealed surface, repair all drainage, replace damaged bridges and culverts, and install new road safety features, making the road usable in all seasons throughout the year.

8.49.2 Who is doing the study?

Zulu Burrow Consulting Limited (ZBCL) has been contracted by RDA to prepare this Environmental and Social Impact Assessment (ESIA), which examines the potential effects of the road rehabilitation on the environment and on communities along the corridor. The ESIA is required by Zambian law before construction can begin, and must be approved by the Zambia Environmental Management Agency (ZEMA). The findings of the ESIA are used to design measures to protect communities and the environment during and after construction.

8.49.3 What will happen if the road is not rehabilitated?

If this project does not proceed, the road will continue to deteriorate and is likely to become completely unusable within 5–10 years in some sections. Communities along the corridor will continue to face 3–5 months of isolation from markets, hospitals, and schools every rainy season. Farmers will continue to lose crops because they cannot reach markets. Sick people — particularly women in childbirth — will continue to face life-threatening delays in reaching hospital care. Young people will continue to face barriers to accessing secondary school in district towns. The No Action option is clearly the worst outcome for communities along the corridor.

8.49.4 What are the main benefits of the project?

The main positive outcomes expected from the road rehabilitation are: year-round access to markets for farmers, enabling better prices for produce and reduced post-harvest losses; faster and more reliable access to hospitals and health centres, expected to save lives particularly for pregnant women and seriously ill patients; improved access to secondary schools for children from rural villages; lower transport costs, making goods and services more affordable; short-term jobs for local people during construction (minimum 30% of construction workers recruited locally); and long-term economic development for North Western Province.

8.49.5 What are the main adverse impacts and how will they be managed?

The main adverse impacts that have been identified are: (1) Some households and businesses near the road will need to move to allow the road to be widened to its full legal width. All affected people will receive fair compensation at full market value before they are required to move, and will receive help to find new homes and restore their livelihoods. (2) Forest and woodland along the road corridor will be cleared to make room for road construction. All cleared areas will be replanted after construction. (3) Rivers and streams may be temporarily disturbed during construction of bridges and culverts. Careful management — including working in the dry season and using barriers to contain mud — will protect rivers and fish. (4) Communities near construction sites may be disturbed by dust, noise, and heavy truck traffic. Strict rules will be enforced to minimise these impacts. (5) There is a risk of increased HIV/AIDS and gender-based violence near worker camps. Mandatory awareness programmes, a Code of Conduct for all workers, and a confidential support service for any affected community members will be in place before any workers arrive.

8.49.6 How can communities have their say?

The ESIA has been prepared following consultations with communities along the full 214 km corridor in May and June 2026. Communities will have a further opportunity to comment on the draft ESIA during the 30-day public review period required by Zambian law. Copies of the full ESIA will be available at all four District Council offices (Mwinilunga, Kabompo, Manyinga, and Solwezi) and at the RDA offices. Nontechnical summaries in Luvala, Luchazi, and English will be available from Community Liaison Officers and through traditional authority offices along the corridor. Community radio announcements will inform communities about how to submit comments during the review period. Throughout the construction period, there will be a Grievance Redress Mechanism — a formal process for communities to raise any complaints or concerns — with Community Liaison Officers available in all communities to receive and follow up on concerns.

9.0 DECOMMISSIONING AND REHABILITATION PLAN

This section consolidates the environmental management commitments associated with the decommissioning, demobilisation and closure phase of the rehabilitation works. Because the rehabilitated road itself is a permanent public asset that will remain in operation, decommissioning obligations under this project relate to the temporary construction facilities and ancillary sites: contractor camps and satellite camps, workshops and batching plants, material stockpile areas, haul and access roads, borrow pits and quarry sites.

- **Site clearance and demobilisation:** On completion of the works all temporary structures, plant and equipment shall be removed; wastes shall be cleared and disposed of in accordance with the Detailed Waste Management Framework in Section 8; and fuel and chemical storage areas shall be decontaminated, with any hydrocarbon-affected soils excavated and disposed of at approved facilities.
- **Borrow pit and quarry rehabilitation:** All borrow pits and quarry sites shall be reshaped to safe, free-draining profiles, stockpiled topsoil shall be respread, and the sites revegetated in accordance with the Erosion Control and Revegetation Technical Specifications (Appendices). Where communities or landowners request retention of a pit as a water pond or other beneficial after-use, this shall be agreed in writing with the landowner, the local authority and the Engineer, and made safe accordingly.
- **Reinstatement of ancillary land:** Camp sites, stockpile areas and temporary access roads on customary land shall be ripped, topsoiled and revegetated, and formally handed back to the landowner or community with a signed reinstatement record.
- **Decommissioning audit:** A closure inspection shall be undertaken jointly by the Contractor, the Consultant and RDA prior to issue of the final demobilisation certificate, verifying that all reinstatement commitments in the ESMP have been discharged; the inspection record shall be available to ZEMA on request.

9.1 ESIA Conclusions

This Environmental and Social Impact Assessment concludes that the rehabilitation of approximately 214 km of the Mutanda to Mwinilunga Road (Main Road T5) in North Western Province, Zambia, is technically, economically, environmentally, and socially feasible, provided that the mitigation, management, and compensation measures set out in the Environmental and Social Management Plan (ZBCL/ESMP/001/2026) and the Resettlement Action Plan (ZBCL/RAP/001/2026) are fully and effectively implemented throughout all phases of the project.

The project will generate significant, long-lasting, and broadly distributed positive socioeconomic impacts for communities in North Western Province, including: permanent restoration of all-weather access along the 214 km corridor, eliminating the wet-season isolation currently experienced by communities for 3 to 5 months per year; dramatically improved access to district hospitals, health centres, and emergency medical services, with expected reductions in maternal and child mortality; significantly reduced vehicle operating costs across the corridor, improving the economics of agricultural marketing, commercial activity, and government service delivery; short-term construction employment and skills development for local communities; improved road safety on the rehabilitated sealed surface; and long-term contribution to North Western Province economic development and poverty reduction consistent with the Government of Zambia's Eighth National Development Plan objectives. The principal adverse impacts identified — physical and economic displacement of households, businesses, and assets within the right-of-way; biodiversity and habitat loss from vegetation clearance; water quality risks from earthworks runoff and spills; community health and safety risks from worker influx (particularly GBV, SEA, and HIV/AIDS); cultural heritage risks from construction activities near sacred sites and graves; occupational health and safety risks to workers; and cumulative deforestation in the operational phase — are all assessed as manageable through the mitigation measures set out in the ESMP and RAP. With full implementation of these measures, all pre-mitigation HIGH significance adverse impacts are assessed as reducible to LOW or LOW-MODERATE post-mitigation significance. The one impact remaining at MODERATE residual

significance in the operational phase — induced deforestation — reflects broader land governance challenges requiring coordinated government action. The ESIA has been conducted in full compliance with the Environmental Management Act No. 12 of 2011, ZEMA EIA Regulations (SI 28/1997), and applicable international standards. Meaningful and documented stakeholder consultation has been conducted throughout, and the principal community concerns — fair compensation, employment, GBV/SEA, cultural heritage, road safety, and environmental protection — have been directly and comprehensively addressed in the ESMP and RAP.

9.2 Conditions for Project Approval

9.2.1 Pre-Construction Conditions — Must Be Completed Before Any Works Commence

The ESIA Team identifies the following as mandatory pre-construction conditions:

- ZEMA Environmental Impact Assessment Certificate must be obtained and all conditions of approval satisfied before any site preparation or construction activities commence.
- The RAP must be finalised, including completion of the full PAP census, socioeconomic survey, and formal independent asset valuation along the full 214 km corridor, with all compensation schedules publicly disclosed.
- All compensation payments must be verified as fully received by each PAP, and all physically displaced households must be relocated to acceptable replacement accommodation, before civil works commence in the relevant road section.
- The pre-construction cultural heritage survey must be completed along the full 214 km corridor; all identified heritage sites must be marked as legally binding exclusion zones on construction drawings; and NHCC clearance must be obtained for all heritage-sensitive areas.
- Community Liaison Officers must be recruited, trained, and deployed; the Project Grievance Register must be operational; and the GRM must be communicated to all communities along the corridor before construction mobilisation.
- Forest Clearance Permits must be obtained from the Zambia Forestry Department for RoW clearance in all classified forest areas along the corridor.
- WARMA water abstraction licences must be obtained for all approved construction water sources before extraction commences.
- The Pre-Construction Environmental Baseline Survey must be completed and documented, establishing quantified baseline values for all ESMP monitoring parameters.

9.2.2 Construction Phase Conditions — Must Be Maintained Throughout Construction

- The Contractor's CEMP must be reviewed, approved by ZBCL and RDA, and operational before any site mobilisation or vegetation clearance activities. All workers must sign the Code of Conduct before commencing work on site.
- HIV/AIDS awareness training induction and GBV Code of Conduct induction must be completed by all workers within 5 days of employment commencing on site.
- The Chance Find Procedure must be in place and all workers trained before any ground-breaking or excavation activities commence.
- The GBV Service Provider must be contracted and operational with a functioning confidential reporting channel before any construction workers are deployed at any section of the corridor.
- Monthly E&S Monitoring Reports must be submitted to RDA and the financing institution by ZBCL within 10 working days of each month end throughout the construction period.
- The independent environmental and social monitoring contract must be in place and the first audit conducted within the first month of construction.

9.2.3 Operational Phase Conditions — Must Be Sustained During Operation

- RDA must maintain an E&S Officer with ongoing responsibility for ESMP operational monitoring, RAP Completion Audit coordination, and reporting to ZEMA on post-construction compliance.

- Long-term land cover change monitoring using satellite imagery analysis must continue annually for a minimum of 5 years post-opening to track induced deforestation and land use change.
- Road safety features (speed calming, guardrails, pedestrian crossings, school zone signing) must be maintained in functional condition throughout the operational period.
- The RAP Completion Audit must be conducted not earlier than 12 months after the final resettlement case is closed, and the report publicly disclosed.

9.3 Overall Assessment and Recommendation

The ESIA Team — representing the multidisciplinary expertise of Zulu Burrow Consulting Limited in environmental science, social development, ecology, resettlement, cultural heritage, gender and GBV, hydrology, and community liaison — unanimously recommends that the Road Development Agency and the Government of the Republic of Zambia proceed with the rehabilitation of the Mutanda-Mwinilunga Road, subject to satisfaction of the pre-construction conditions and maintenance of the construction and operational conditions set out in this chapter.

The Mutanda-Mwinilunga Road Rehabilitation Project represents a high-value, transformative development investment for North Western Province and for Zambia as a whole. The project will unlock economic potential, improve social service access, and directly improve the quality of life for hundreds of thousands of Zambians along the 214 km corridor and throughout the wider province. The adverse environmental and social impacts associated with the project are real and significant, but they are manageable through the comprehensive mitigation framework developed in this ESIA, ESMP, and RAP. The ESIA Team is committed to providing the technical and supervisory expertise necessary to ensure that RDA, the Contractor, and all project partners implement this framework effectively throughout the project lifecycle.

Role	Name / Organisation	Signature and Date
Team Leader / Senior Environmental Specialist	Zulu Burrow Consulting Limited	
Social Development Specialist	Zulu Burrow Consulting Limited	
Ecologist / Biodiversity Specialist	Zulu Burrow Consulting Limited	
Cultural Heritage Specialist	Zulu Burrow Consulting Limited	
GBV and Gender Specialist	Zulu Burrow Consulting Limited	
ZBCL Quality Assurance Manager	Zulu Burrow Consulting Limited	
RDA Director — Planning and Design	Road Development Agency	

9.4 References

The following references were consulted in the preparation of this Environmental and Social Impact Assessment. All web resources were last accessed June 2026.

Author / Organisation	Full Reference
African Development Bank (2013)	Integrated Safeguards System — Policy Statement and Operational Safeguards. AfDB, Abidjan.
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Author / Organisation	Full Reference
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CITES (2023)	Appendices I, II and III. Convention on International Trade in Endangered Species of Wild Fauna and Flora. Available at: https://www.cites.org
Government of Zambia (2011)	Environmental Management Act No. 12 of 2011. Government Printer, Lusaka.
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ILO (2017)	ILO Core Conventions. International Labour Organization, Geneva.
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IUCN (2023)	The IUCN Red List of Threatened Species. Version 2023-1. Available at: https://www.iucnredlist.org
Ministry of Infrastructure, Housing and Urban Development Zambia (2023)	Road Design Manual — Updated Edition 2023. Government of Zambia, Lusaka.
Ramsar Convention (1971)	Convention on Wetlands of International Importance especially as Waterfowl Habitat. Ramsar, Iran.
Road Development Agency (2026)	Letter RDA/CS/ONS/00 dated 15 May 2026 from Eng. Ziko Banda, Director Planning and Design, directing preparation of full ESIA and RAP for Mutanda-Mwinilunga Road Rehabilitation Project. RDA, Lusaka.
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Author / Organisation	Full Reference
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World Bank (2018)	Environmental and Social Framework. World Bank Group, Washington DC.
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Zulu Burrow Consulting Limited (2026a)	Environmental and Social Project Brief (ESPB) — Mutanda-Mwinilunga Road Rehabilitation. ZBCL/ESPB/001/2026. ZBCL, Lusaka.
Zulu Burrow Consulting Limited (2026b)	Updated Draft Road Design Report — Rehabilitation of 214 km Mutanda-Mwinilunga Road. ZBCL, Lusaka.
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Zulu Burrow Consulting Limited (2026e)	Resettlement Action Plan (RAP) — Mutanda-Mwinilunga Road Rehabilitation. ZBCL/RAP/001/2026. ZBCL, Lusaka.
Zulu Burrow Consulting Limited (2026f)	Ecological and Biodiversity Baseline Survey Report — Mutanda-Mwinilunga Road. ZBCL/BIO/001/2026. ZBCL, Lusaka.
Zulu Burrow Consulting Limited (2026g)	Hydrological and Drainage Assessment Report — Mutanda-Mwinilunga Road. ZBCL/HYD/001/2026. ZBCL, Lusaka.
Zulu Burrow Consulting Limited (2026h)	Cultural Heritage Survey Report — Mutanda-Mwinilunga Road. ZBCL/CH/001/2026. ZBCL, Lusaka.
Zulu Burrow Consulting Limited (2026i)	Socioeconomic Baseline Survey Report — Mutanda-Mwinilunga Road. ZBCL/SEB/001/2026. ZBCL, Lusaka.
Zulu Burrow Consulting Limited (2026j)	GBV Risk Assessment Report — Mutanda-Mwinilunga Road. ZBCL/GBV/001/2026. ZBCL, Lusaka.

10.0 DECLARATION OF AUTHENTICITY OF REPORT CONTENTS

We, the undersigned, declare that the information contained in this Environmental Impact Statement for the Rehabilitation of the 214 km Mutanda–Mwinilunga Road (M8/T5), North Western Province, is to the best of our knowledge true, accurate and complete, and that no material information relevant to the decision of the Zambia Environmental Management Agency has been withheld.

For the Developer

Name: _____

Position: _____

Road Development Agency

Signature: _____ Date: _____

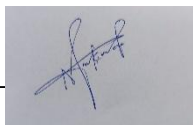
For the Consultant

Name: Mwemena Mukonde

Position: Environmental and Social Specialist

Zulu Burrow Consulting Limited

Signature: _____ Date: 31-08-2026



11.0 APPENDICES

The appendices and annexes to this Environmental Impact Statement comprise the approved Terms of Reference, maps and satellite imagery, proof of public consultation (scoping meeting minutes, attendance registers and comments), specialised study reports and supporting technical data. Annex extracts reproduced within this volume are presented below; full annexes are submitted as separate volumes where indicated in the Schedule of Annexes.

The approved Terms of Reference for this ESIA (prepared in the ZEMA format, with its own appendices) is submitted as a separate accompanying volume in fulfilment of the requirement for a copy of the approved Terms of Reference under this section.

The following annexes form an integral part of this ESIA. Where marked as "in progress" or "to be finalised", draft versions are available for review on request from ZBCL. All annexes will be incorporated in full in the Final ESIA to be submitted to ZEMA following the public disclosure and comment period.

Annex	Title	Reference	Status and Description
A	E&S Scoping Checklist	ZBCL/ESIA-SC/001/2026	Completed — Separate Document. The scoping checklist records the systematic screening of all potential environmental and social issues, the rationale for inclusion or exclusion from detailed assessment, and the agreed scope of specialist studies. Available for review on request.
B	Terms of Reference for the ESIA	ZBCL/ESIA-ToR/001/2026	Completed — Separate Document. The approved Terms of Reference, agreed between ZBCL and RDA/ZEMA, define the scope, methodology, and deliverable requirements for this ESIA. Prepared as the first deliverable following the RDA direction letter of 15 May 2026.
C	Ecological and Biodiversity Baseline Survey Report and Species Lists	ZBCL/BIO/001/2026	Field surveys completed June 2026. Full report and species checklists (flora, mammals, birds, reptiles, amphibians, invertebrates) to be included in Final ESIA. Report covers vegetation mapping, habitat condition assessment, IUCN Red List species review, and biodiversity sensitivity mapping for the full 214 km corridor.
D	Hydrological and Drainage Assessment Report	ZBCL/HYD/001/2026	Data collection completed; hydraulic analysis in progress. Report includes watercourse crossing survey, catchment analysis, dambo hydrological mapping, flood risk assessment, groundwater assessment, and drainage infrastructure condition survey results.
E	Cultural Heritage Survey Report	ZBCL/CH/001/2026	Field survey completed June 2026; report being finalised. Includes archaeological walkover survey results, community-led mapping of graves, sacred sites, and ceremonial areas, NHCC consultation records, and recommendations for exclusion

Annex	Title	Reference	Status and Description
			zones and heritage management.
F	Socioeconomic Baseline Survey Report and Data Appendices	ZBCL/SEB/001/2026	Surveys completed June 2026; analysis in progress. Report includes household survey data, focus group discussion summaries, livelihood
			system analysis, service access mapping, and vulnerability analysis across all corridor communities.
G	GBV Risk Assessment Report	ZBCL/GBV/001/2026	Report to be finalised August 2026. Covers GBV/SEA risk factor analysis, community vulnerability mapping, GBV service provider landscape in NWP, referral pathway design, and Code of Conduct framework for this project.
H	Stakeholder Engagement Plan (SEP) and Consultation Register	ZBCL/SEP/001/2026	Consultations ongoing; SEP and Consultation Register to be finalised with Final ESIA. Includes all meeting minutes, attendance lists, photographic records, issues raised and ESIA response matrix, and ongoing engagement schedule.
I	Project Location Maps and Environmental Sensitivity Maps (GIS)	ZBCL/GIS/001/2026	GIS mapping in progress. Maps to include: project location (national/provincial scale); corridor alignment with chainage; environmental sensitivity overlay (habitats, wetlands, dambos, GMA proximity, NHCC sites); PAP distribution; borrow pit locations; contractor camp sites.
J	Environmental and Social Management Plan (ESMP)	ZBCL/ESMP/001/2026	Completed — Separate Document (companion to this ESIA). Contains the full mitigation matrix, monitoring plan, CEMP framework, institutional arrangements, reporting schedule, and ESMP budget. To be incorporated as contractual requirement in civil works bid documents.
K	Resettlement Action Plan (RAP)	ZBCL/RAP/001/2026	Completed — Separate Document (companion to this ESIA). Contains the full PAP eligibility framework, entitlement matrix, valuation methodology, compensation schedules, livelihood restoration programme, implementation plan, and RAP monitoring framework.
L	Project Grievance Register and GRM Procedures	ZBCL/GR/001/2026	Completed — Separate Document. Contains the GRM framework, intake procedures, tracking register template, escalation protocol, and GBV-specific confidential reporting procedures.
M	Copies of Key National Legislation and	N/A	To be compiled as a reference document for the Final ESIA. Includes

Annex	Title	Reference	Status and Description
	Regulations		the full text of: EMA No. 12 of 2011; SI 28/1997; Lands Act Cap. 184; Land Acquisition Act Cap. 189; NHCC Act Cap. 173; Wildlife Act No. 14 of 2015; Forests Act No. 4 of 2015; OHS Act Cap. 44; Employment Act Cap. 268.
N	Field Survey Photographs	N/A	Photographic record from all field surveys, community consultations, and road condition assessment activities. Photos geotagged and annotated. To be compiled and included in Final ESIA.
O	ZEMA Correspondence and Scoping Decision	N/A	To be incorporated on receipt. Includes ZBCL's initial project brief submission to ZEMA, ZEMA's scoping decision letter, and all subsequent regulatory correspondence.
P	Borrow Pit Site Assessment Reports (per site)	N/A	One report per approved borrow pit site; to be completed during detailed design phase as borrow pit locations are confirmed. Each report covers site location, material quality assessment, environmental sensitivity screening, and draft BPMRP framework.
Q	Non-Technical Summary	ZBCL/NTS/001/2026	Three versions to be prepared: English; Luvale; Luchazi. Plain-language summary of the ESIA findings for community distribution. To accompany ESIA disclosure and public comment period.
R	NHCC Correspondence and Cultural Heritage Records	N/A	To be incorporated on receipt. Includes NHCC consultation records from scoping, NHCC response to cultural heritage survey findings, and NHCC clearance documentation for the project corridor.
S	DNPW, WARMA, and Forestry Department Consultation Records	N/A	To be incorporated on receipt. Includes correspondence and meeting records from all sector agency consultations; WARMA guidance on water abstraction licensing; DNPW guidance on wildlife corridor and GMA management; Forestry Department guidance on Forest Clearance Permit requirements.
T	RDA Direction Letter for Full ESIA (15 May 2026)	RDA/CS/ONS/00	Incorporated. Letter from Eng. Ziko Banda, RDA Director — Planning and Design, dated 15 May 2026, formally directing ZBCL to conduct a full ESIA and RAP in lieu of the ESPB. This
			letter is the formal initiation document for this ESIA.

11.1 Appendix: Biodiversity Management Plan Summary

11.2 Biodiversity Management Plan — Key Measures

The Biodiversity Management Plan (BMP) is a component of the overall ESMP and is implemented by the Contractor as part of the CEMP. The BMP is developed in detail by the ZBCL Ecologist and will be finalised based on the full pre-construction biodiversity baseline survey results. The table below summarises the ten principal biodiversity management measures and their implementation requirements.

Measure	Timing	Responsible	Method	Oversight	Completion Indicator
Pre-clearance wildlife survey	Before each vegetation clearance section	Ecologist (qualified, minimum BSc in ecology or related field)	Survey 50 m either side of proposed clearance line using standard transect methods; check for nesting birds (restrict clearance if active nest within 30 m); check for any protected species (stop work if found; notify DNPW); record all significant wildlife encounters	ZBCL ESMP Supervisor	Written clearance-to-proceed from Ecologist before any clearance equipment enters section
Vegetation clearance equipment — mulching preference	During clearance	Contractor	Prefer mulching head attachment on excavator over manual slash-and-burn; no burning of cleared material without Forestry Dept written permit; clear in one direction to allow wildlife escape route	ESMP Supervisor	No burning incidents; use of mulching equipment documented
Wildlife exclusion zone maintenance	Throughout construction	Contractor	All exclusion zones marked with high-visibility tape and posts; zone boundaries inspected bi-weekly; any breach or damage repaired within 24 hours; no temporary use of exclusion zones for materials storage, vehicle access, or dumping	ESMP Supervisor	Monthly exclusion zone inspection records; zero breaches tolerance
Wildlife crossing underpasses — design and construction	During construction at identified locations	Contractor / Design Engineer	Minimum 2 wildlife underpasses at identified wildlife corridor crossing points (locations confirmed by pre-	ZBCL	Underpasses constructed to approved design; approaches clear
			construction wildlife survey); dimensions minimum 3 m × 2 m clear opening; rough concrete floor with local soil substrate; drainage maintained; approaches kept free of barriers		

Measure	Timing	Responsible	Method	Oversight	Completion Indicator
Bushmeat prohibition enforcement	Throughout construction	Contractor / DNPW	Zero tolerance for possession or consumption of wild game meat at all sites and camps; Code of Conduct includes explicit prohibition; all workers sign declaration; monthly unannounced inspections; immediate dismissal for any confirmed violation	ZBCL / DNPW	Zero bushmeat incidents; inspection records on file
Invasive species monitoring and control	From Year 1; quarterly throughout and post-construction	ZBCL Ecologist (construction); RDA (operation)	Quarterly transect surveys for target invasive species (Lantana camara, Chromolaena odorata, Mimosa pigra, Senna spectabilis) along full corridor; removal within 30 days of detection (manual; no herbicide within 15 m of watercourse without ZEMA approval); monitoring records maintained	ZBCL (construction) / RDA (operation)	Invasive species map updated quarterly; no established infestations >0.5 ha at any survey
Pollinator and soil fauna protection	Throughout earthworks and revegetation	Contractor	Avoid application of insecticides within 50 m of any flowering vegetation or watercourse; use bee-friendly grass mixes in revegetation seed mixes; include flowering forb species (legumes) in revegetation planting at borrow pits and in woodland buffer planting	ESMP Supervisor	No insecticide applications within restricted zones; seed mix certificates on file
Riparian vegetation protection and restoration	Throughout construction and post-construction	Contractor / Ecologist	15 m riparian exclusion zone maintained; salvage transplant of riparian species from cleared areas wherever feasible; systematic replanting of riparian species after crossing works complete; species monitoring at 6 and 12 months post-planting; replace any failed plants	ZBCL Ecologist	Riparian exclusion zone maintenance records; planting records; survival rate minimum 70% at 12 months
Land cover change monitoring — operational phase	Annual; Years 1–5 post-road opening	RDA Environmental Officer	Annual Sentinel-2 satellite image analysis for 5 km corridor buffer; calculate deforestation rate and land cover change	RDA	Annual land cover change report; results shared with Forestry

Measure	Timing	Responsible	Method	Oversight	Completion Indicator
			statistics; compare to pre-construction baseline and Year 1 baseline; report to NWP Planning Authority; trigger consultation with Forestry Dept if deforestation rate >5% per year		Dept and NWP Planning Authority
Coordination with DNPW (wildlife management)	Before construction and ongoing	ZBCL / RDA	Formal MOU with DNPW signed before construction commences; quarterly joint meetings during construction; annual review of wildlife monitoring data during operational phase; DNPW anti-poaching patrol coordination; reporting of any wildlife mortalities or significant wildlife encounters within 24 hours	ZBCL / RDA	MOU signed; quarterly meeting records; wildlife monitoring data shared with DNPW annually

11.3 Appendix: Erosion Control And Revegetation Technical Specifications

11.4 A.1 Erosion Control Measures — Technical Specifications

The following table provides detailed technical specifications for all erosion control measures referenced in the ESMP and Construction Environmental Management Plan. These specifications form the minimum standard for all erosion control works on the project. Any variation from these specifications requires prior written approval from the ZBCL ESMP Supervisor.

Erosion Control Measure	Technical Specification	Application Locations
Silt fence	Geotextile fabric (minimum 100 g/m ² non-woven, minimum 70% UV stabilised) staked at 2 m intervals with timber stakes minimum 50 mm × 50 mm × 900 mm driven 300 mm into ground; fabric embedded 150 mm into ground at base; maximum height 900 mm above ground; inspected after every rainfall event and repaired within 24 hours of any damage or bypass; replaced when 50% capacity reached (silt accumulated to 50% of above-ground height)	At base of all slopes with active earthworks; along all drainage lines adjacent to cleared areas; minimum 10 m upslope of any watercourse
Sediment trap / check dam	Earth berm 300 mm high with geotextile overflow weir; minimum 2 m depth ponding zone upstream; 5 m wide inlet; inspected weekly; cleaned when 50% full; outflow to stable vegetated area or energy dissipator	At all natural drainage outfalls from active earthworks areas; at base of all borrow pit drainage lines
Turbidity barrier / silt curtain	Floating turbidity curtain (heavy-duty geotextile, minimum 2 m deep; buoyed; anchored to bed and	Downstream of all active watercourse crossing

Erosion Control Measure	Technical Specification	Application Locations
	bank); minimum 50% flow bypass capacity maintained at all times; inspected daily during in-stream works; removed only after all earthworks and concrete works are fully complete and runoff from the site is clear	works; around any in-stream works area
Topsoil windrow	Stripped topsoil stored in linear windrows maximum 2 m high; minimum 3 m base width; sides and tops protected by straw erosion blanket or jute netting held with wire pegs at 1 m grid; no topsoil windrow placed in drainage flow path; windrow storage maximum 6 months; reapplied to all stripped areas as soon as earthworks complete	All stripped areas along full corridor; borrow pit sites
Grass seeding / hydroseeding	Seed mix of local indigenous grass species (minimum 3 species including <i>Cynodon dactylon</i> , <i>Paspalum notatum</i> , and <i>Eragrostis curvula</i>); application rate minimum 30 kg/ha; mulch straw cover at 2 tonnes/ha to protect seed from rain splash; water as required until establishment; target 80% ground cover within 6 weeks on suitable soils (12 weeks in marginal conditions)	All disturbed slope surfaces and earthworks areas within 5 working days of earthworks completion in each area
Coconut-fibre erosion mat / jute mesh	Biodegradable 400 g/m ² coconut fibre or 200 g/m ² jute erosion control mat; pinned with metal staples at 1 m intervals on slopes and at edges; pre-seeded mats preferred to combine erosion control and revegetation in single operation	Cut slopes steeper than 1:2 gradient; embankment slopes in high-rainfall sections; dambo margin disturbed areas
Gabion toe protection	Double-twisted hexagonal wire mesh (galvanised or PVC coated); filled with approved hard, durable stone 100–200 mm size; minimum base width 1 m; minimum height 600 mm; laid on geotextile filter fabric; keyed into slope toe minimum 300 mm below ground; laced to adjacent units with binding wire	Embankment toes on permanent river and stream embankments; cut slope toes in high-seepage conditions; drainage channel lining in high-velocity sections
Riprap scour protection	Hard, durable angular stone 200–400 mm for standard protection; 400–600 mm at high-velocity culvert outlets and bridge abutments; laid on compacted granular filter layer or geotextile fabric; extend minimum 3 pipe diameters downstream of culvert outlet; anchor toe into streambed	All culvert outlet aprons; bridge abutment scour zones; energy dissipator basins at steep mitre drain outfalls
Concrete-lined channels	In-situ concrete 75 mm minimum thickness; reinforced where velocity >3 m/s; expansion joints at 5 m intervals; weep holes at 2 m spacing; designed for 1:25 year peak flow velocity	Side drains where gradient exceeds 3% and soil is non-cohesive; mitre drain outfalls; all drainage immediately adjacent to bridge structures
Energy dissipator / drop structure	Stepped or baffle-type energy dissipator at all mitre drain outfalls on grades >5%; drop structure where change in invert level exceeds 600 mm; concrete construction; minimum pool depth downstream equal to 1.5× incoming flow depth	At base of all steep mitre drains; at grade changes in roadside drains; at culvert outlets where approach velocity exceeds 2 m/s

11.5 A.2 Revegetation Technical Specifications

The following table provides detailed revegetation specifications for each category of disturbed area. All revegetation works are the responsibility of the Contractor and form part of the contracted works scope. Revegetation performance is monitored monthly by the ZBCL ESMP Supervisor and is a condition of the taking-over certificate for each road section.

Revegetation Type	Application Area	Species Mix and Method	Timing
Slope revegetation — standard	On all disturbed slopes and earthworks areas except those requiring structural erosion protection measures	Grass seed mix (Cynodon dactylon 30%; Paspalum notatum 30%; Eragrostis curvula 20%; Pennisetum clandestinum 20%) at 30 kg/ha; straw mulch 2 t/ha; watered to establishment (minimum weekly in first month); target 80% cover by 6 weeks	Within 5 working days of earthworks completion in each area
Riparian zone replanting	All riparian exclusion zones and cleared areas within 15 m of any watercourse	Indigenous riparian species: Syzygium cordatum (Waterberry) 30%; Diospyros mespiliformis (Jackalberry) 25%; Combretum spp. 25%; other site-specific species 20%; planted as 30 cm containerised seedlings at 3 m × 3 m spacing; supplementary grass seeding between tree seedlings; watering during establishment; replacement of failed plants within 6 months	Within first dry season following completion of watercourse crossing works in each section
Woodland buffer planting	All borrow pit sites, contractor camp sites, and staging areas after use	Mixed indigenous miombo species: Brachystegia spiciformis 25%; Julbernardia globiflora 25%; Uapaca kirkiana 25%; Parinari curatellifolia 25%; planted as 30 cm seedlings at 2 m × 2 m spacing on prepared pits; watered to establishment; grass seeded between trees; weed control in first year	Within first dry season following borrow pit closure or site demobilisation
Roadside verge — standard	Road verges (shoulder edge to RoW boundary) along all rural sections of corridor	Grass species mixture (stress-tolerant and drought-resistant local species); applied by hydroseeding or hand broadcast after final grading of verge; target continuous ground cover within 2 months of seeding; invasive species to be controlled by manual removal within 30 days of detection	Within 2 weeks of completion of grading and shaping of each verge section
Borrow pit — full rehabilitation	All borrow pit sites upon completion of extraction	Topsoil reapplied from stockpile (minimum 150 mm); final surface graded to positive drainage to prevent ponding; grass seeding as standard specification above; tree planting as woodland buffer above; site fenced to exclude livestock during establishment; performance monitoring monthly until 80% cover achieved	Revegetation in first dry season after extraction complete; monitoring for 24 months post-closure
Dambo margin revegetation	All disturbed dambo margins and wetland edge vegetation clearance areas	Wetland grass and sedge mix (Cyperus spp., Eleocharis spp., Miscanthus junceus) from on-site nursery where available, or transplanted salvaged material from cleared areas; planted at 0.5 m spacing; no exotic species in dambo planting; natural regeneration supplemented rather than replaced	Immediately on completion of dry-season dambo works; before first rains

11.6 Appendix: ESMP Implementation Schedule

11.7 Full ESMP and RAP Implementation Action Schedule

The following table provides the complete ESMP and RAP implementation action schedule, covering all pre-construction, construction, and post-construction obligations. This schedule is the primary management tool for tracking ESMP compliance and is updated in each quarterly E&S Monitoring Report to reflect completion status. Actions marked as incomplete at any quarterly review are subject to a formal corrective action notice.

Ref	Action	Responsible	Reports To	Timing	Completion Indicator
PC-01	Finalise and submit Draft ESIA to ZEMA	ZBCL	RDA	August 2026	Completed when ESIA submitted
PC-02	Conduct 30-day public disclosure and comment period	ZBCL / CLOs	RDA / ZEMA	Sept–Oct 2026	ZEMA public notice issued; 3 disclosure venues minimum
PC-03	Respond to public comments and prepare Final ESIA	ZBCL	RDA	Oct–Nov 2026	All material comments addressed in response matrix
PC-04	Obtain ZEMA EIA Certificate	RDA	ZEMA	Nov 2026	EIA Certificate received and conditions noted
PC-05	Complete full PAP census along entire 214 km corridor	ZBCL RAP Team	RDA	July–Sept 2026	Census completed; database populated; cut-off date declared
PC-06	Complete independent asset valuation (licensed ZIEA valuer)	Property Valuer	RDA	Sept–Nov 2026	Valuation report approved by RDA and Financing Institution
PC-07	Conduct community information sessions on RAP entitlements	CLOs	ZBCL	Oct–Nov 2026	All communities informed; compensation rates publicly disclosed
PC-08	Sign Compensation Agreements with all PAPs (section by section)	ZBCL RAP Team	RDA	Nov 2026–Feb 2027	100% of Compensation Agreements signed before mobilisation in each section
PC-09	Pay all compensation (verified) before civil works in each section	RDA Finance	RDA	Concurrent with construction mobilisation in each section	CLO payment verification forms completed for all PAPs
PC-10	Pre-construction cultural heritage survey — full 214 km	Cultural Heritage Specialist	ZBCL	June–Aug 2026	Survey report complete; NHCC clearances
					obtained for sensitive areas
PC-11	Obtain Forest Clearance Permits for classified forest areas in RoW	Contractor / RDA	Zambia Forestry Dept	Before mobilisation	Forest Clearance Permits issued and on file
PC-12	Obtain WARMA water abstraction licences for all construction water sources	Contractor	WARMA	Before first abstraction	Licences issued and on file for all approved sources

Ref	Action	Responsible	Reports To	Timing	Completion Indicator
PC-13	Recruit, train, and deploy Community Liaison Officers	ZBCL	ZBCL	Before mobilisation	CLOs deployed and operational; contact details communicated to communities
PC-14	Establish and communicate GRM to all communities	CLOs / ZBCL	ZBCL	Before mobilisation	Grievance Register operational; GRM publicised in all communities
PC-15	Tender, select, and contract GBV Service Provider	RDA / ZBCL	RDA	Before any workers deployed	GSP contracted; confidential reporting line operational
PC-16	Complete pre-construction environmental baseline survey	ZBCL Environmental Specialist	ZBCL	June–Aug 2026	Baseline monitoring data established for all ESMP parameters
PC-17	Prepare and approve Contractor CEMP (all sections)	Contractor	ZBCL / RDA	Within 30 days of contract award; before mobilisation	CEMP reviewed and approved in writing by ZBCL and RDA
PC-18	Conduct worker induction (all employees, subcontractors)	Contractor	ZBCL oversight	Before any worker starts work on site	100% of workers inducted; records on file
PC-19	Establish and commission main contractor camp	Contractor	ZBCL inspection	Before construction commences	Camp inspection by ZBCL confirms ILO compliance; treatment plant operational
PC-20	Prepare Livelihood Restoration Programme (LRP) framework	ZBCL Livelihoods Officer	RDA	Before first PAP displacement	LRP framework approved by RDA and Financing Institution
C-01	Implement dust suppression (water bowsing) programme	Contractor	ZBCL weekly check	Throughout earthworks phases	PM10 at sensitive receptors within standard; complaints log reviewed weekly
C-02	Install and maintain erosion control measures (silt fences, sediment traps)	Contractor	ZBCL bi-weekly	Before clearance; maintained throughout	Erosion controls installed and effective; post-rain inspection records on file
C-03	Progressive revegetation of all disturbed areas	Contractor	ZBCL monthly	Within 5 working days of earthworks completion in each area	80% ground cover target met within 6 weeks of seeding
C-04	Implement Traffic Management Plan in all active sections	Contractor	ZBCL / RTSA check	Before any works on or near carriageway	Flagmen in place; speed limits enforced; pedestrian bypasses maintained
C-05	Conduct monthly HIV/AIDS awareness sessions (all camps)	Contractor (health educator)	ZBCL monthly check	Monthly from first month of construction	Attendance records: 100% of workers attend minimum 1 session/month

Ref	Action	Responsible	Reports To	Timing	Completion Indicator
C-06	Maintain GBV reporting mechanism and Code of Conduct compliance	Contractor / GSP	ZBCL monthly audit	Ongoing from mobilisation	GBV complaints log reviewed monthly; Code of Conduct compliance audited
C-07	Implement OHS Plan — daily pre-start briefings, PPE, incident reporting	Contractor OHS Officer	ZBCL weekly	Daily and ongoing	LTIFR; PPE compliance rate; incident register reviewed weekly
C-08	Restrict in-stream works at major rivers to dry season (May–Oct) only	Contractor	ZBCL oversight	May–October each year	No in-stream works at major crossings Nov–April; turbidity monitoring at all crossings
C-09	Implement wildlife pre-clearance surveys and anti-poaching Code of Conduct	Ecologist / Contractor	ZBCL	Before each clearance section; ongoing	Pre-clearance survey completed; no poaching incidents; Code of Conduct signed
C-10	Submit monthly E&S Monitoring Reports to RDA and Financing Institution	ZBCL ESMP Supervisor	RDA	Monthly; within 10 working days of month end	Monthly reports submitted on time; all monitoring data included
C-11	Conduct quarterly independent E&S audits	Independent Monitor	RDA	Quarterly	Audit reports submitted to RDA and Financing Institution; non-compliances resolved
C-12	Maintain community grievance register and resolve grievances within 15 days	CLOs / ZBCL	ZBCL	Ongoing from mobilisation	GRM resolution rate; average days to resolve; escalation cases tracked
C-13	Monitor and enforce borrow pit management and rehabilitation	ZBCL ESMP Supervisor	RDA	Monthly per active pit	BPMRP implementation status per pit; vegetation cover at closed pits
C-14	Maintain PAP welfare monitoring (monthly during construction)	CLOs	ZBCL Social Specialist	Monthly from displacement of first PAP	CLO welfare visit records; escalation of at-risk cases
C-15	Submit quarterly RAP progress reports to RDA and Financing Institution	ZBCL RAP Team	RDA	Quarterly	Compensation payment status; LRP enrolment; welfare monitoring outcomes
C-16	Implement Chance Find Procedure for all excavation and earthworks	Contractor / ZBCL CH Specialist	NHCC / ZBCL	Active from first excavation	No excavation in any section without workers trained in CFP; CFP response log
C-17	Manage camp solid waste and hazardous waste in compliance with Waste Management Plan	Camp Manager	ZBCL monthly	Ongoing from camp establishment	Waste Register maintained; disposal manifests on file; no open burning
C-18	Conduct turbidity monitoring at all active watercourse crossings	ZBCL Environmental Specialist	ZBCL	Weekly at active crossings; immediately	Turbidity log; corrective action notices issued for exceedances

Ref	Action	Responsible	Reports To	Timing	Completion Indicator
				on turbidity exceedance	
C-19	Enrol displaced PAPs in Livelihood Restoration Programme (LRP)	ZBCL Livelihoods Officer	RDA	Within 30 days of each PAP's relocation	LRP enrolment register; LRP component delivery records per beneficiary
C-20	Conduct 6-month PAP welfare review surveys	CLOs	ZBCL Social Specialist	6 months after each PAP's relocation	Survey completed for 100% of PAPs; at-risk cases escalated
PCC-01	Complete all borrow pit rehabilitation and obtain ZBCL sign-off	Contractor	ZBCL	Within 12 months of project completion	80% ground cover at all borrow pit sites confirmed by ZBCL
PCC-02	Conduct 12-month PAP welfare review surveys	CLOs / ZBCL Social Specialist	RDA	12 months after each	Survey completed; livelihood recovery rate assessed
				PAP's relocation	
PCC-03	Commission independent RAP Completion Audit	RDA (independent auditor)	RDA / Financing Institution	No earlier than 12 months after last resettlement case closed	Completion audit report completed and publicly disclosed
PCC-04	Establish operational land cover change monitoring programme	RDA Environmental Officer	RDA	Year 1 post-road opening	Annual satellite analysis completed; results reported to NWP Planning Authority
PCC-05	Annual wildlife monitoring at wildlife corridor crossing points	DNPW / RDA	DNPW / RDA	Annual; Years 1–5	Camera trap and transect data; species comparison vs pre-construction baseline
PCC-06	Community borehole water quality monitoring (annually)	RDA Environmental Officer	RDA	Annual	Samples from minimum 8 monitoring boreholes; WHO standard compliance
PCC-07	Road safety monitoring — annual accident data review	RDA / RTSA	RDA	Annual	Fatalities, injuries, pedestrian incidents on T5 corridor; comparison vs national baseline
PCC-08	Annual community satisfaction survey	CLOs / RDA	RDA	Annual; Years 1–5	Survey results; satisfaction rates by category; dissatisfaction triggers consultation
PCC-09	Submit annual E&S performance report to Financing Institution	RDA Environmental Officer	Financing Institution	Annual for 5 years post-opening	Annual report submitted; outcome indicators reported
PCC-	Invasive alien species	RDA	RDA	Quarterly;	Invasive species

Ref	Action	Responsible	Reports To	Timing	Completion Indicator
10	monitoring and control along road corridor	Maintenance Team		Years 1–3; annually thereafter	map update; control actions taken and effectiveness

11.8 Annex K (Extract): PAP Database — Field Register Specification

11.9 PAP Census and Register — Data Fields Specification

The following table defines all data fields in the PAP Register maintained by the ZBCL RAP team throughout the project lifetime. The register is implemented as a secure digital database (Excel or Kobo Toolbox for field data collection; migrated to password-protected database for management). Each row in the register represents one household (one PAP case). The register is updated at each project milestone — census, valuation, agreement, payment, relocation, LRP enrolment, and welfare monitoring — providing a complete lifecycle record for every PAP case. The PAP Register is the master record for all compensation and resettlement activities. It is reviewed in every monthly E&S Monitoring Report, audited quarterly by the Independent Monitor, and forms the primary evidence base for the RAP Completion Audit. Access to individual PAP records (containing personal data) is restricted to authorised ZBCL and RDA personnel. Aggregate data from the register (totals, statistics, completion percentages) is reported publicly in E&S Monitoring Reports.

Field Name	Description / Content	Data Source
PAP ID Number	Unique identifier assigned at census registration; format: DIST-CHNG-HHNO (e.g. MWN-045-003)	Census enumerator at point of registration
Full Name of Household Head	Legal name as per NRC; alternative local name recorded if different	Census enumerator
National Registration Card (NRC) Number	Verified against original NRC; photocopy retained on file	Census enumerator
Gender of Household Head	Male / Female / Other	Census enumerator (observed or self-reported)
Date of Birth / Age	Age in years if DOB unknown	Self-reported; NRC cross-reference
Contact Phone Number	If household head has mobile phone; otherwise nearest contact	Self-reported
Village/Settlement Name	Administrative village name; traditional authority sub-area	Census enumerator (local knowledge confirmed)
Chieftdom Name	Traditional authority chieftdom within which property is located	Census enumerator
District Name	Administrative district (Mwinilunga / Kabompo / Manyinga / Solwezi)	Census enumerator
Road Chainage (km)	Nearest chainage to affected property; measured from Mutanda town	ZBCL GIS Specialist (GPS survey)
GPS Coordinates of Main Affected Asset	WGS84 decimal degrees; accuracy minimum ±3 m	Census enumerator (hand-held GPS)
Category of Displacement (1/2/3)	Cat 1: Formal title; Cat 2: Customary rights; Cat 3: Non-titled occupant pre-cutoff	ZBCL RAP Team assessment

Field Name	Description / Content	Data Source
Type of Primary Affected Asset	Residential structure / Commercial structure / Agricultural land / Trees / Multiple (specify)	Census enumerator
Residential Structure — Construction Type	Earthen brick / Fired brick / Concrete block / Timber / Thatch only / Mixed	Census enumerator (observation)
Residential Structure — Roof Type	Iron sheet (CGI) / Thatch / Tiles / Concrete slab	Census enumerator (observation)
Residential Structure — Floor Type	Earth / Concrete / Tiles	Census enumerator (observation)
Residential Structure — Number of Rooms	Count of rooms excluding kitchen and bathroom	Census enumerator (observation)
Residential Structure — Estimated Floor Area (m ²)	Tape-measured external dimensions; area calculated	Census enumerator (tape measure)
Residential Structure — Condition	Good (no defects) / Fair (minor defects) / Poor (significant defects requiring major repair)	Valuer and census enumerator
Secondary Structures on Plot	Kitchen / Store / Toilet / Borehole / Other (describe)	Census enumerator (observation)
Agricultural Land — Area Affected (ha)	GPS-surveyed area of cultivated land within RoW	Census enumerator (GPS polygon)
Agricultural Land — Crop Types and Areas	Species; area per crop (m ² or ha)	Census enumerator (direct observation and farmer interview)
Trees — Species and Count	Count per species per tree category (fruit / timber / multipurpose)	Census enumerator with ZBCL botanist verification for specialist species
Monthly Household Income (self-reported)	Total estimated monthly household income in ZMW from all sources	Household head; confidential
Primary Income Sources	Up to 3 primary income sources ranked by importance	Self-reported
Household Size (total persons)	Total number of persons normally resident in household	Self-reported; cross-checked against observation
Number of Dependants	Persons under 18 or over 65 or disabled who are economically dependent	Self-reported
Vulnerability Assessment Score	Composite score based on 7 vulnerability criteria (see RAP Section 8.39); determines additional assistance eligibility	ZBCL RAP Social Specialist
Vulnerability Category (if applicable)	Female-headed / Elderly / Disabled / Child-headed / HIV/AIDS / Poverty / Remote / Multiple (specify)	ZBCL RAP Social Specialist
PAP Consultation Date	Date of household census interview	Census enumerator
PAP Consent Obtained (Y/N)	Signed consent form or thumbprint with witness	Census enumerator
Photo Reference Numbers	Reference to photographs of main structure, plot, and key assets	Census enumerator (digital camera)

Field Name	Description / Content	Data Source
Compensation Agreement Reference	Reference number of signed Compensation Agreement (populated after valuation and agreement)	ZBCL RAP Team
Compensation Payment Reference	Bank transfer or mobile money confirmation reference (populated after payment)	ZBCL Finance Team
Payment Verification Date	Date of CLO verification visit confirming receipt of payment	CLO
Physical Relocation Completion Date	Date PAP vacated and was confirmed relocated to alternative site	CLO
LRP Enrolment Status	Not required / Enrolled (programme): (specify) / Completed	ZBCL Livelihoods Officer
6-Month Welfare Review Date and Status	Date of 6-month post-relocation CLO welfare visit; outcome: Recovering / Stable / Concern — requires follow-up	CLO
12-Month Welfare Review Date and Status	Date of 12-month post-relocation welfare visit; outcome: Restored / Below baseline — additional support required	ZBCL Social Specialist
Case Notes	Any special circumstances, disputes, additional support actions, or case-specific notes	CLO / ZBCL RAP Team (ongoing)

11.10 Annex D (Extract): Geotechnical Investigation — Test Pit Data Summary

11.11 D.1 Test Pit Investigation Results Summary

The following table summarises the results of the 16 representative test pit investigations conducted along the 214 km project corridor during the geotechnical baseline investigation in May–June 2026. Test pits were excavated to a maximum depth of 3 m or to refusal on rock or groundwater. Laboratory testing of soil samples was conducted at the ZBCL accredited materials testing laboratory in Lusaka. Full geotechnical data is reported in the Hydrological and Drainage Assessment Report (Annex D of the Final ESIA). These results are used in the ESIA to characterise soil erosion risks, identify areas of problematic subgrade requiring special treatment, and locate potential borrow pit material sources. Note: Test pit locations were selected to represent the range of geomorphological and soil conditions along the corridor. Additional test pits at 1 km intervals are being conducted during the detailed design phase for pavement design purposes and for detailed borrow pit siting assessment. Results of these additional investigations will be reported in the Final Geotechnical Report.

Test Pit	Chainage	Landform	Soil Type	Water Table	Foundation	Compaction	Strength	Engineering Comment
TP-001	km 8.5	Plateau interfluvial	Ferralitic red laterite	1.8 m (no water)	Good	92% (MDD = 1.85 Mg/m ³)	18.5	CBR 45% at 98% AASHTO; suitable sub-base
TP-002	km 15.2	Roadside dambo margin	Hydromorphic clay (black cotton)	0.4 m (water table near surface)	Poor	Cannot compact adequately in wet condition	Liquid limit 65%; PI 38%	Remove to 1.2 m and replace with laterite; French drain required

Test Pit	Chainage	Landform	Soil Type	Water Table	Foundation	Compaction	Strength	Engineering Comment
TP-003	km 23.8	Valley floor crossing	Alluvial sandy loam	0.9 m	Moderate	89% achievable in dry condition	CBR 12% at 95% AASHTO	Marginal subgrade; lime stabilisation may improve; monitor closely
TP-004	km 31.4	Plateau road section	Sandy ferrallitic (light texture)	2.2 m	Moderate to poor	94% achievable	CBR 22% at 95% AASHTO; highly erodible when disturbed	Suitable subgrade but HIGH erosion risk; immediate stabilisation after exposure
TP-005	km 45.9	Gentle slope section	Ferrallitic gravelly laterite	>3 m (not encountered)	Good	97% achievable	CBR 68% at 95% AASHTO;	Excellent sub-base material;
							high quality gravel	potential borrow pit material; quality test OK
TP-006	km 58.1	Dambo crossing (wide)	Organic hydromorphic peat and clay	0.2 m (very shallow)	Very poor	Not compactable	Highly compressible; organic content >15%	Deep excavation and full replacement required; geotextile reinforcement; embankment design review
TP-007	km 67.5	Roadside cut (hill)	Weathered phyllite (Katangan)	Bedrock at 1.1 m	Very good	N/A — rock subgrade	Rock RQD 45% (moderately weathered)	Good subgrade; rock cutting required; blasting may be needed in places
TP-008	km 79.3	Manying a town approach	Mixed fill (old road embankment materials)	1.6 m	Variable (poor in places)	Variable — 85–95% in different layers	Inconsistent; some weak spots	Remove existing unstable fill; reconstruct embankment with properly compacted approved material
TP-009	km 92.4	Plateau interfluve	Dense red laterite with gravel	>3 m (not encountered)	Good	98% achievable	CBR 85% at 95% AASHTO	Excellent sub-base quality; recommended as potential borrow pit
TP-	km	River	Alluvial	1.8 m	Good	95%	CBR 55%;	Good sub-

Test Pit	Chainage	Landform	Soil Type	Water Table	Foundation	Compaction	Strength	Engineering Comment
010	106.7	terrace (Kabompo approach)	sandy gravel		(gravel rich)	achievable	well-graded gravel	base and subgrade; potential aggregate source for concrete — subject to quality testing and
								WARMA licence
TP-011	km 118.3	Steep hill section	Quartzite and schist bedrock near surface	Rock at 0.5–0.8 m	Excellent (rock)	N/A	Hard, intact rock; RQD >75%	Good road foundation; significant rock cutting for gradient improvement; quartzite usable as crushed stone aggregate
TP-012	km 134.5	Dambo crossing (narrow)	Hydromorphic sandy clay	0.6 m	Poor in wet; moderate in dry	88% dry condition achievable	CBR 8% saturated; 28% dry	Seasonal bearing capacity variation; design for wet condition; geotextile; drainage essential
TP-013	km 147.2	Kabompo town outskirts	Urban fill (various materials)	1.4 m	Variable	Variable	Mixed and variable quality	Remove and replace; foundation investigation for bridge approach embankment required
TP-014	km 162.8	Remote plateau section	Red ferrallitic loam	2.5 m	Moderate to good	93% achievable	CBR 32% at 95% AASHTO	Adequate subgrade; moderate quality sub-base material nearby
TP-015	km 178.4	Valley bottom (Lunga approach)	Alluvial silty clay	0.9 m	Poor	Not reliably compactable	High plasticity; PI 29%	Remove and replace with selected granular fill; side drainage essential
TP-016	km 192.6	Mwinilunga approach road	Lateritic gravel (good quality)	>3 m	Good	97% achievable	CBR 78%	Excellent sub-base quality; nearest to urban area
								—

Test Pit	Chainage	Landform	Soil Type	Water Table	Foundation	Compaction	Strength	Engineering Comment
								community consultation on borrow pit siting essential

11.12 D.2 Geotechnical Investigation Implications for ESMP

The geotechnical investigation findings have the following specific implications for ESMP environmental management:

- High erosion risk soils (sandy ferralitic — TP-004 and similar): Approximately 25–30% of the corridor has highly erodible sandy ferralitic soils. These sections are mapped as HIGH EROSION RISK in the ESMP and require: increased silt fence density (minimum 1 fence per 25 m of slope length); immediate revegetation within 3 working days of earthworks completion (not 5); coconut fibre erosion matting on all slopes steeper than 1:3; and bi-weekly erosion inspection rather than the standard bi-weekly frequency.
- Black cotton soil sections (TP-002, TP-006, TP-012, TP-015): Four significant black cotton soil areas have been identified, totalling an estimated 8–12 km of the corridor. Excavation of these soils to the required depth generates volumes of unsuitable material (estimated 80,000–120,000 m³ total) that require off-site disposal. Disposal sites must be identified during detailed design and assessed for environmental and social acceptability. Black cotton soil is not suitable for use in any road construction layer or borrow pit rehabilitation fill — it must be disposed of at designated sites away from watercourses and agricultural land.
- Rock sections (TP-007, TP-011): Two sections with bedrock near surface have been identified, requiring rock cutting and potentially blasting. Blast management procedures, pre-blast condition surveys of nearby structures, and PPV monitoring requirements are triggered at these sections. Rock cutting spoil (quartzite and schist) may be suitable for crushed stone aggregate if quality testing confirms adequate strength and durability.
- Borrow pit candidates: Four test pit locations (TP-005, TP-009, TP-010, TP-016) have been identified as potential borrow pit material sources based on material quality. All four require: community and traditional authority consultation; environmental sensitivity screening (habitat, watercourse proximity, cultural heritage); and a site-specific Borrow Pit Management and Rehabilitation Plan before any extraction commences.

11.13 Annex C (Extract): Biodiversity Baseline — Field Survey Data

11.14 C.1 Camera Trap Survey Results

The following table presents the results of 15 camera trap stations deployed along the 214 km project corridor in May–June 2026 (21 trap-nights per station; total 315 trap-nights). Camera trap stations were positioned at wildlife movement corridors, water sources, and habitat transitions to maximise the likelihood of recording larger mammal species. Results are summarised by station; full photographic records and species identification details are in the specialist Biodiversity Report (Annex C, Final ESIA). Sensitivity rating reflects the relative wildlife biodiversity value of the habitat at each station, informing the ESMP management zoning.

Camera ID	Chainage	Habitat	Trap Nights	Period	Key Species Recorded	Sensitivity
CT-01	km 12	Miombo/dambo margin	21 nights	Jun 2026	Buffalo (3 events); Warthog (8); Mongoose (4); Porcupine (2); Guinea	Moderate

Camera ID	Chainage	Habitat	Trap Nights	Period	Key Species Recorded	Sensitivity
					Fowl (12); Francolin (6)	
CT-02	km 28	Dense miombo woodland	21 nights	Jun 2026	Leopard (1 event at night); Duiker (6); Warthog (3); Scrub Hare (11); Monitor lizard (2)	High
CT-03	km 44	Road corridor margin	21 nights	Jun 2026	Warthog (14); Vervet monkey (3 events); Scrub hare (9); Ground squirrel (5)	Low-moderate (road corridor effects visible)
CT-04	km 67	Riverine forest (Manyinga R.)	21 nights	Jun 2026	Hippo (2 events, entering from river); Sitatunga (1); Giant kingfisher (5 day events); Water mongoose (3); Crocodile track (1)	High — sensitive riparian habitat
CT-05	km 82	Degraded miombo / charcoal area	21 nights	Jun 2026	Vervet monkey (4); warthog (3); scrub hare (7); francolins (8)	Low (degraded habitat)
CT-06	km 99	Primary miombo woodland (intact)	21 nights	Jun 2026	Sable antelope (2 events); Roan antelope (1); Duiker (12); Warthog (6); African civet (2 night events); Honey badger (1)	High — intact habitat with larger mammals
CT-07	km 114	Kabompo River floodplain	21 nights	Jun 2026	Hippo (5 events); Elephant tracks (not on camera but GPS)	Very high — major wildlife zone
					tracks indicate recent crossing); Buffalo (4); Waterbuck (2); Crocodile (1 day event)	
CT-08	km 128	Miombo/agricultural mosaic	21 nights	Jun 2026	Warthog (11); Vervet monkey (6 events); Duiker (4); Scrub hare (15)	Low-moderate (agriculture fragmentation visible)
CT-09	km 143	Dense miombo (near GMA boundary)	21 nights	Jun 2026	Elephant (2 events — adult female and calf); Buffalo (4); Roan antelope (3); Duiker (8); Leopard (2 night events)	Very high — GMA adjacency and large mammal use
CT-10	km 157	Mwinilunga District woodland	21 nights	Jun 2026	Elephant (1 event — herd of 6); African wild dog tracks (not confirmed by camera — ID uncertain); Sable antelope (1); Roan (2); Porcupine (4); Civet (3)	Very high — elephant herd; possible wild dog
CT-11	km 169	Road corridor woodland margin	21 nights	Jun 2026	Warthog (7); Vervet (4); Guinea fowl (9); Scrub hare (12); Monitor (2)	Low-moderate (road corridor effects)

Camera ID	Chainage	Habitat	Trap Nights	Period	Key Species Recorded	Sensitivity
CT-12	km 183	West Lunga NP buffer area	21 nights	Jun 2026	Elephant (4 events — multiple individuals); Leopard (3 night events); Lion (1 night event — distant); Sable (2); Buffalo (6); Eland (1)	Critical — highest wildlife density on corridor; near NP
CT-13	km 196	Near Mwinilunga Boma (peri-urban)	21 nights	Jun 2026	Vervet monkey (dominant species — 18 events); Warthog (5); Mongoose (3); Domestic dogs (6)	Low (peri-urban)
CT-14	km 207	Forest margin / sacred grove area	21 nights	Jun 2026	Duiker (7); Scrub hare (14); Guinea fowl (11); Porcupine (2); Chimpanzee possible — contact calls heard but no camera confirmation	High — possible chimpanzee presence requires follow-up
CT-15	km 212	Mwinilunga Boma area	21 nights	Jun 2026	Vervet (8 events); domestic species dominant; limited wildlife	Very low (urban environment)

11.15 C.2 Bird Point Count Survey Results

The following table presents the results of bird point count surveys at 10 representative locations along the 214 km project corridor, conducted in May–June 2026 during the early morning survey window (05:30–09:00). Point counts used a 25 m radius, 5-minute count method standard for African woodland surveys. A total of 218 bird species were recorded across all 10 survey points; results below highlight key species and diversity indices by habitat type.

Point	Chainage	Habitat	Species Recorded	Key Species Notes
Point B-01	km 10	Miombo woodland edge	34	Miombo Robin (<i>Sheppardia griseoflava</i>); Black-cheeked Lovebird (<i>Agapornis nigrigenis</i>) — 3 individuals; Miombo Pied Barbet; White-bellied Sunbird; various weavers and seedeaters
Point B-02	km 25	Dambo margin	28	Wattled Crane (<i>Grus carunculata</i>) — 2 individuals at dambo edge; African Jacana; Malachite Kingfisher; Greater Swamp Warbler; Yellow-throated Longclaw
Point B-03	km 44	Open degraded woodland	19	Typical open-country species dominant; Helmeted Guineafowl; Swainson's Spurfowl; Open-bill stork (overhead); little diversity — degraded habitat
Point B-04	km 62	Dense miombo woodland	41	Miombo specialists dominant: Miombo Double-collared Sunbird; Miombo Rock Thrush; White-tailed Blue Monarch; Bar-winged Weaver; Grey-headed Batis; Pale-billed Hornbill
Point B-05	km 78	Manyinga River gallery forest	47	High diversity riparian zone: Pel's Fishing Owl (heard at dusk); African Fish Eagle (1 adult); Giant Kingfisher; Half-collared Kingfisher; African Broadbill; Narina Trogon; various sunbirds and warblers
Point B-06	km 95	Primary miombo (high	38	Verreaux's Eagle Owl (1, roosting); Miombo Rock Thrush; Miombo Pied Barbet; Racket-tailed Roller; African Hoopoe; Bronze Mannikin flocks

Point	Chainage	Habitat	Species Recorded	Key Species Notes
		canopy)		
Point B-07	km 113	Kabompo River edge	44	African Skimmer (2 on sandbar); Giant Kingfisher; Malachite Kingfisher; Whiteheaded Lapwing; African Fish Eagle; Goliath Heron; Little Egret; various waders on exposed sandbars
Point B-08	km 132	Agricultural mosaic	22	Common species: Red-billed Quelea flock (100+); Long-tailed Cormorant; Cattle Egret with livestock; limited miombo specialists in degraded fringe
Point B-09	km 148	Intact miombo near GMA	43	Racket-tailed Roller; Crowned Hornbill; African Broadbill; Black-cheeked Lovebird — 7 individuals (highest count on corridor); Miombo Double-collared Sunbird; Miombo Pied Barbet
Point B-10	km 165	West Lunga NP buffer	51	Highest diversity count: Western Nicator; Boehm's Bee-eater; Anchieta's Sunbird; Miombo Batis; Brown-headed Apalis; Bat Hawk (dusk); Southern Ground Hornbill (2 adults in distance)

The bird survey results confirm the high avifaunal diversity of the project corridor, with the western sections near the West Lunga National Park buffer recording the highest species richness (51 species at Point B-10). Black-cheeked Lovebird (*Agapornis nigrigenis*, VU) was confirmed at three sites along the corridor (Points B-01, B-04, B-09), with the highest count of 7 individuals at the intact miombo site near the Game Management Area (Point B-09). This confirms the importance of intact miombo woodland within and adjacent to the project corridor for this nationally significant threatened species, and supports the ESMP requirement for strict vegetation clearance limits and post-construction woodland revegetation.

11.16 Annex: Solwezi Met Station Rainfall Records (2016–2026)

Monthly rainfall totals (mm) derived from daily precipitation records for Solwezi Meteorological Station covering 1 January 2016 to 30 April 2026 (3,731 daily observations; 20 daily values missing and treated as no data). Values marked with an asterisk (*) are derived from incomplete months or years: October 2025 is partial, and the 2026 record extends to 30 April only. A dash (—) indicates no data for that month.

Table: Monthly Rainfall Totals (mm), Solwezi Met Station

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2016	213.5	331.4	265.8	47.0	0.0	0.0	0.0	0.0	0.0	9.4	0.0	165.3	1,032.4
2017	359.6	388.1	182.0	122.4	0.0	0.0	0.0	0.0	0.0	24.4	128.2	298.3	1,503.0
2018	370.2	305.1	143.4	145.3	8.8	0.0	0.0	0.0	3.5	30.1	33.1	225.5	1,265.0
2019	205.8	282.1	131.4	58.5	0.2	0.0	0.0	0.0	0.0	3.4	212.4	204.0	1,097.8
2020	213.8	440.1	294.9	57.3	0.2	0.0	0.0	0.0	0.0	76.7	205.1	313.6	1,601.7
2021	370.3	1184.4	201.4	34.5	0.0	0.0	0.0	0.0	0.0	5.4	190.2	113.4	2,099.6
2022	233.9	83.4	225.1	138.7	0.0	0.0	0.0	0.0	0.0	3.0	106.2	232.1	1,022.4
2023	259.1	182.1	223.0	105.9	0.0	0.0	0.0	0.0	3.9	94.0	157.0	234.6	1,259.6
2024	194.1	53.2	92.0	33.1	0.0	0.0	0.0	0.0	0.0	23.0	152.9	379.3	927.6
2025	199.2	299.8	213.7	149.7	13.8	0.0	0.0	0.0	0.0	0.0*	245.9	438.3	1,560.4*
2026	—	244.8	311.8	51.7	—	—	—	—	—	—	—	—	608.3*

11.17 Appendix: Minutes of ESIA Scoping Meeting SM-01 — Mwinilunga, 10 July 2026

Meeting: ESIA Scoping Meeting SM-01. Date: 10 July 2026. Venue: Mwinilunga Council Chambers. Time: 14:00–16:30 hrs. These minutes are reproduced from the signed record of the meeting.

List of Attendees (head table and key participants):

Name	Organization / Company	Position	Online / Physical	From
Mwemena Mukonde	Supervising Engineer	Environmental and Social Specialist/Chairperson	Physical	14:00
Ben Lukwesa	Supervising Engineer	Social Development Specialist	Physical	14:00
Thelma Musumbulwa	Supervising Engineer	Resettlement Specialist	Physical	14:00
Jane Kanasha	Supervising Engineer	Community Liaison Officer	Physical	14:00
				14:00
				14:00
				14:00
				14:00
				14:00

Minutes and Proceedings:

#	Subject	Further action required by:	Target Date
1	Introduction Registration, Opening and Welcome		
1.1	Registration and attendance records signed by all members and participants present Participants registered and attendance records were signed.	---	---
1.2	Meeting was called to order at 14:50hrs		
1.2	The meeting commenced with an opening prayer led by Mr. Ben Lukwesa. Eng. Bonaventure Hakoma, Director Engineering dept with Muchinga Municipal Council also standing in for the Council Secretary, welcomed participants and emphasized the importance of the consultation in identifying environmental and social issues associated with the proposed road project. Introductions were conducted by all attendees		
1.3	The Environmental and Social Specialist, Mr Mwemena Mukonde introduced himself and welcomed all participants and Stakeholders present.		
2	PROJECT OVERVIEW Purpose of the Meeting Mr. Mwemena Mukonde explained that the meeting formed part of the ESIA process and was intended to obtain stakeholder views on potential environmental and social impacts, identify concerns, and gather recommendations to improve project implementation.	---	---
2.1	He further stated that going forward regular meetings will be ongoing to ensure continuous stakeholder engagement throughout the project		

#	Subject	Further action required by:	Target Date
	cycle. An emphasis was made stating the discussions of the engagement meeting was not limited to the agenda		
2.2	The chairperson shed more light on the project stating the stretch it will cover a total of it's a 214km stretch, and the demarcations of the each lot and contractors handling each lot namely 2, (Unik, Arabs and) The team presented the proposed 214 km Mutanda–Mwinilunga Road Project, explaining that the road has been divided into three construction lots. The expected right-of-way is approximately 30–50 metres where applicable. The proposed works include excavation, pavement construction and asphalt surfacing designed to support agricultural and mining activities. Construction is expected to last approximately three years followed by a defects liability period.		
3	Preliminary Environmental and Social Issues Identified		
3.1	- Dust, noise, vibration and pollution during construction. - Borrow pit management and rehabilitation. - Traffic safety, deviations and protection of pedestrians, livestock and children. - Impacts on properties and businesses within the road reserve. - Compensation and Resettlement Action Plan (RAP). - Employment opportunities and local contractor participation. - HIV/AIDS, GBV and community awareness. - Community health and social infrastructure.		
4.	Open Discussion, Stakeholder Concerns and Responses		
4.1	Short notice: Stakeholders noted limited attendance due to short notice; future engagements should provide adequate notice.		
4.2	Project commencement: Consultants confirmed the project is active and preparatory activities have commenced.		
4.3	Dust: Watering of roads and other dust suppression measures will form part of the contractor's Environmental Management Plan.		
4.4	Compensation: Government will undertake RAP, valuation and compensation before construction affects Project Affected Persons.		
4.5	Employment: Preference for local labour and local subcontractors was encouraged; approximately 30% of subcontract opportunities are intended for local participation where feasible.		
4.6	Road design: Road will be a single carriageway; durability designed for long-term service.		
4.7	Health facilities: Concern recorded for consideration although not within current scope.		
4.8	Borrow pits: Borrow pits will be managed and rehabilitated to minimize safety and environmental risks.		
4.9	Bridges: RDA is assessing bridges and crossings for inclusion where required.		
4.10	Camp sites: Traditional leaders and the Council will assist in identifying suitable camp locations.		
4.11	Town improvements: Requests for street lights, roundabouts and bypasses were recorded for consideration.		
5	Summary of Key Issues Raised The principal issues raised were: timely compensation of PAPs; dust suppression; road safety; local employment; participation of local contractors; rehabilitation of borrow pits; durability of the road;		

#	Subject	Further action required by:	Target Date
	community health programmes; provision of supporting infrastructure; and continued stakeholder engagement.		
6	Any Other Business		
6.1	Upcoming Stakeholders requested that access roads to borrow pits be restored after use, HIV/AIDS awareness programmes be strengthened, permanent camp infrastructure be considered where practical, and communities remain actively involved throughout the project.		--
5	Closure		
5.1	The Chairperson thanked all participants for their contributions and encouraged continued participation throughout the ESIA and project implementation process. The meeting closed with a closing prayer.		
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11.18 Appendix: Minutes of ESIA Scoping Meeting SM-02 — Shilenga Community Hall, Manyama, 15 July 2026

Meeting: ESIA Scoping Meeting SM-02. Date: 15 July 2026. Venue: Shilenga Community Hall, Manyama. Time: 11:30–15:00 hrs. These minutes are reproduced from the signed record of the meeting.

List of Attendees (head table and key participants):

Name	Organization / Company	Position	Online Physical	/	From
Mwemena Mukonde	Supervising Engineer	Environmental and Social Specialist/Chairperson	Physical		11:30
Ben Lukwesa	Supervising Engineer	Social Development Specialist	Physical		11:30
Thelma Musumbulwa	Supervising Engineer	Resettlement Specialist	Physical		11:30
Jane Kanasha	Supervising Engineer	Community Liaison Officer	Physical		11:30
Lloyd Makungu	Supervising Engineer	Environmental Expert			11:30
					11:30
					11:30
					11:30
					11:30

Minutes and Proceedings:

#	Subject	Further action required by:	Target Date
1	Introduction National Anthem, Registration, Opening and Welcome		
1.1	Registration and attendance records signed by all members and participants present Participants registered and attendance records were signed.	---	---
1.2	Meeting was called to order at 11:27 hrs		
1.2	The meeting commenced with the national anthem and opening prayer from the pastors fellowship member Ms Kanasha did the Opening remarks Protocols Observed The District Commissioner The UPND District Leadership All Heads of Govt Departments REPs- Their Royal Highnesses/ Sub Chiefs/ Group Leaders Ward Development Committees Pastors Fellowship The Chairperson FODEP OIC- CARITAS (Officer in Charge) DPO, Environmental Planner/ Valuation Officer District Provincial Officer Invited guests, Ladies and Gentlemen She thanked the guests for coming and introduced her and the institution she is coming from, she further stated there will be a register going round and to sign, the purpose of the meeting being the Mutanda- Mwinilunga Road, she further called upon Mr Lukwesa for some more welcoming remarks and a brief impacts, therefore, encouraged maximum participation of all the members present. He later called upon Mr Mukonde to give an overview of the project		
1.3	The Environmental and Social Specialist, Mr Mwemena Mukonde introduced himself and welcomed all participants and Stakeholders present.		
2	PROJECT OVERVIEW Purpose of the Meeting Mr. Mwemena Mukonde explained that the meeting formed part of the ESIA process and was intended to obtain stakeholder views on potential environmental and social impacts, identify concerns, and gather recommendations to improve project implementation.	---	---
2.1	He gave details on the project it being a 214km stretch from Mutanda-Mwinilunga road, he gave insights on the project design, the drainages, the speed bumps and traffic lights were possible. Exaction works will be the first part of the work, 150mm then we will back fill with various layers, a layer of asphalt will then follow, the road guarantee is 15-20years, the need to rehabilitate the road has come into play as an economic booster of the part of that part of country to support agriculture and mining sectors. The road project is 3years, the 3years may seem like a stretch but various activities need to be put into consideration i.e. the RAP, different seasons for example the rain season which might cause stoppages during the course of the project.		

#	Subject	Further action required by:	Target Date
2.2	The need for safety was emphasized at the centre of the project, for the community. 30percent local contractors are to be given priority for the project, with community members including women and youths to be given priority for employment opportunities during the course of the project.		
3	Preliminary Environmental and Social Issues Identified		
3.1	- Dust, noise, vibration and pollution during construction. - Road safety of the children in the community as construction will begin - Borrow pit management and rehabilitation. - Traffic safety, deviations and protection of pedestrians, livestock and children. - Impacts on properties and businesses within the road reserve. - Compensation and Resettlement Action Plan (RAP). - Employment opportunities and local contractor participation. - HIV/AIDS, STIs and other communicable diseases during the course of the project, GBV and community awareness. - Community health and social infrastructure.		
4.	Open Discussion, Stakeholder Concerns and Responses		
4.1	The floor was opened to hear and have the stakeholder engagement.		
4.2	Concern : 1. the People that are along the project corridor, are there any plans of compensation for those that will be affected, be it shops, or houses? 2. Road deviations, that are going to pass through people's farms or houses, are they going to be compensated? Responses. All the affected persons will be compensated, the team is going to come back to do a RAP within 2weeks. For deviations that are going to pass through private properties, consideration compensation as per protocol, compensation value will vary as it will be between, ourselves, the owner of the property and the government evaluator. And compensation varies, some prefer some prefer in kind, some prefer cash. The same applies for road operators, they will also be considered for compensation, over loss of business. Concern: 1. Time delays causes a lot of expenses, when is the construction of the road going to be done, what is RAP cut of date. Response. After RAP and compensations, cut of date will be announced. Concern: 1. When is the Rap? Response: In the next two weeks the team will be back to do the Rap. Concern: 1. Dust and noise concern what are measures that have been put in place to address these environmental concerns during construction What is the environmental management plan? Responses. We have an environmental management plan which each contractor will be availed (water bower trucks will be given to each contractor to		

#	Subject	Further action required by:	Target Date
	allow them to suppress the dust as construction will be on going, same thing with the deviations that will be created). Land degradation, reforestation programs have all been included in this environmental management plan.		
4.3	Meeting Paused as the DC joined the meeting.		
4.4	The National Anthem was sung.		
4.5	A Prayer as offered by the Pastors fellowship once again.		
4.6	Introductions by all members in the House.		
4.7	Recap on what was discussed from the top by Mr Lukwesa and Mr Mukonde.		
4.8	Continuation of open discussion, concerns and engagements Concern: 1.What are the meters and width of the road from end to end? what structures will be considered for RAP Response team: 1. The width, the total meters is 11 meters, shoulder of 2meters from each side, each lane 3.5mm and the other is the same. 2. The right of way is 30-50m from the right and 30-50m from the left, meaning all the structures within that proximity have to be considered for demolition. Addition: 1. About 50m in total will have to be considered from each side of the road as the right of way corridor, a total of 100m combined, depending on the scenario of structures that are very close to the road, the consideration of the structures built within the bracket may be reduced to 16-18m, however our job is to capture which structures are within the standard 30-50m then it will be up to RDA to consider these structures built so close to the road. Concern: 1. What will be the consideration for compensation. Response: Members of the house were asked to help disseminate information not to build anything along the right of way corridor between now and the 2weeks the team will come back for the RAP inventory and compensation consideration. Concern: 1. What is the compensation period for the project? Seeing we are approaching the rain season. 2. Clarification of the Lots given to the contractors, who is the supervisor. Response team: 1. The team will submit a RAP to RDA, later the team come with a government evaluator, for consideration evaluation purpose of all affected persons, the govt will then engage a resettlement consultant who will work hand in hand with the team, a compensation agreement will then be signed upon which the affected PAPs be paid. 2. Zulu barrow consulting limited is doing the Supervisory works for the entire 214ks, including the census for all the project affected persons. Concern: 1. The short notice of the meeting, given the importance of the meeting, it was not well planned, the affected persons are not part of this meeting. The correspondence of the meeting was too short. The worry is in the RAP will be difficult to do because the timeframe is short, the affected persons are absent from observation. Direction from the Council Secretary on the raised concern		

#	Subject	Further action required by:	Target Date
	Observations were observed and noted, the letter was on short notice, however it was important to note despite the short notice the council extended invitation to all the key leaders to sit on behalf of the members, further guidance was given that the meeting was an introductory meeting to introduce the project, the next meeting will be called for engagement with the community after the PAPs have been identified for feedback and how to forge ahead. Concern: Health issues concern, apart from spreading of condoms what others measures will be put in place to reduce birthrate due to the project. Response: Acknowledgement of vulnerability of women and youths in the community hence during the project, there will be a deliberate policy is to empower the women in the local communities to help reduce the vulnerability of women. Clarification Condom distribution is to/ for the workers and not to the general public in the community during the project. Concern: 1. Is there a consideration for a dual carriageway and a bypass road in the project. Response: No the design does not consider the road for a dual carriageway nor a bypass. Addition Dc. All the roads that are being done, an example of Kasempa road, the extra Ks, of the road were shared equally in the districts they would like the 10ks extra to be shared among Mwinilunga and Kalumbila, being a new district and therefore consideration should be given as they are just developing their CBD as currently the CBD is over stretched and because it is one of the fastest growing districts in the province, they sincerely need consideration in the 10ks extra from the 214ks. Member addition: Emphasis on taking developments equal between Manyama and Kisansa districts The need to consider a dual carriageway of its own for Manyama or a bypass as these are also growing districts to help decongest the cities. Response team: We have taken note of the suggestions for both a bypass and consideration for a dual carriageway, all minuted for presentation to RDA, and if the budget allows and if they can find resources, it will be considered as it is a budget issue. Concern: 1. A strong consideration emphasis on the 10ks consideration of the road for Manyama and Kisansa. Response. Well noted with many thanks we will act as swiftly to get the project running ASAP. Concern: 1. The strength of the road and quality given the 3 contractors in the different Lots. Response: Zulu Burrow will ensure quality and standard delivery across the entire stretch and ensure uniformity. DC's Concerns Township roads should be a must, the people of Manyama and Kisansa also deserve that, involvement of the local people throughout		

#	Subject	Further action required by:	Target Date
	the entire stretch, including unskilled labor considerations among the locals, only skills that are not available in the community should be considered from outside. Extinction of indigenous trees and creatures should be considered, work hand in hand with Forestry Dept to preserve the trees. Need to caution the workforce that will be working on the project on social issues that might bring about spread of diseases and increase birthrates. Compensation should consider all the offices in the district before actual compensation i.e. council forestry etc., in instances where it was a small building, they will not accept building an infrastructure of similar nature, decent buildings are needed hence these govt offices should be considered so that the people get buildings that stand the taste of time. They understand the road has been divided into 3 lots, emphasis on the need to speed up the process, need to see the works start by the end of this month end. Machines should be on the road by the 30th of the month of July.		
4.9	Chief Thanks the team, all protocols observed, people have really cried for many years, thanked the team and the government for the project cautioned the team not to take too long to begin the project, need for full settlement of PAPs before the project commences, indigenous trees should be conserved, abstinence should be encouraged by the frontliners of the project.		
5	Summary of Key Issues Raised Stakeholders raised concerns on compensation for affected properties and businesses, deviations, RAP timing, cut-off dates, dust suppression, environmental management, road reserve width, compensation process, short notice of meetings, employment, township roads, bypass proposals, project quality and construction timelines. The project team confirmed that all eligible PAPs would be identified through the RAP, compensation would follow Government procedures, environmental mitigation measures would be implemented, local labour would be prioritised and all recommendations would be submitted to RDA for consideration.		
6	Any Other Business		
6.1	Closing remarks by the DC. Thanked all the participants, protocols were observed, and emphasized the meeting is for the benefit of the people in the districts.		--
7	Closure		
7.1	The District Commissioner thanked participants and emphasised timely implementation, transparency and continued stakeholder engagement. The Chairperson thanked everyone for their participation and the meeting closed with a prayer.		
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11.19 Appendix: Attendance Register and Photographic Record — Scoping Meetings

ESIA supervision team attendance record for Scoping Meeting SM-02, Shilenga Community Hall, Manyama, 15 July 2026 (soft copy of the register; the full community attendance register bearing participants' signatures is held as a scanned record and shown in the photographic record below and in the ESIA Scoping Report, July 2026):

#	Name	Organization / Company	Position	Contact Details
1.	Mwemena Mukonde	Supervising Engineer	Environmental and Social Specialist	0978862546
2.	Ben Lukwesa	Supervising Engineer	Social Development Specialist	
3.	Thelma Musumbulwa	Supervising Engineer	Resettlement Specialist	
4.	Jane Kanasha	Supervising Engineer	Community Liaison Officer	
5.	Lloyd Makungu	Supervising Engineer	Environmental Expert	

Photographic record of the scoping meetings:



Photo 1: Presentation of the project and proposed ESIA Terms of Reference, Scoping Meeting SM-01, Mwinilunga Council Chambers, 10 July 2026.



Photo 2: Head table and facilitation team responding to stakeholder questions, Scoping Meeting SM-01, Mwinilunga.



Photo 3: Stakeholders in attendance during open discussion, Scoping Meeting SM-01, Mwinilunga.



Photo 4: Community members and stakeholders in attendance, Scoping Meeting SM-02, Shilenga Community Hall, Manyama, 15 July 2026.

MWINILUNGA TOWN COUNCIL
ATTENDANCE REGISTER

PURPOSE OF THE MEETING: Scoping Meeting SM-02, Manyama
DATE: 10/07/2026

Participants signing the attendance register

S/NO.	NAME	NRC	POSITION	DEPARTMENT/ WARD	CONTACT	SIGNATURE
01	Jane Kanasha	100771211	Chairperson	ZBCL	0979187474	[Signature]
02	Mwambura Thoms	100771211	Chairperson	ZBCL	0979187474	[Signature]
03	Mwambura Thoms	100771211	Chairperson	ZBCL	0979187474	[Signature]
04	Henry C. KAKSA	100771211	Chairperson	ZBCL	0979187474	[Signature]
05	Dennis Kanasha	100771211	Chairperson	ZBCL	0979187474	[Signature]
06	Dennis Kanasha	100771211	Chairperson	ZBCL	0979187474	[Signature]
07	Kashuwa Hendo	100771211	Chairperson	ZBCL	0979187474	[Signature]
08	Kashuwa Hendo	100771211	Chairperson	ZBCL	0979187474	[Signature]
09	Kashuwa Hendo	100771211	Chairperson	ZBCL	0979187474	[Signature]
10	Kashuwa Hendo	100771211	Chairperson	ZBCL	0979187474	[Signature]
11	Kashuwa Hendo	100771211	Chairperson	ZBCL	0979187474	[Signature]
12	Kashuwa Hendo	100771211	Chairperson	ZBCL	0979187474	[Signature]
13	Kashuwa Hendo	100771211	Chairperson	ZBCL	0979187474	[Signature]
14	Kashuwa Hendo	100771211	Chairperson	ZBCL	0979187474	[Signature]
15	Kashuwa Hendo	100771211	Chairperson	ZBCL	0979187474	[Signature]
16	Kashuwa Hendo	100771211	Chairperson	ZBCL	0979187474	[Signature]
17	Kashuwa Hendo	100771211	Chairperson	ZBCL	0979187474	[Signature]

Photo 5: Participants signing the attendance register, Scoping Meeting SM-02, Manyama.