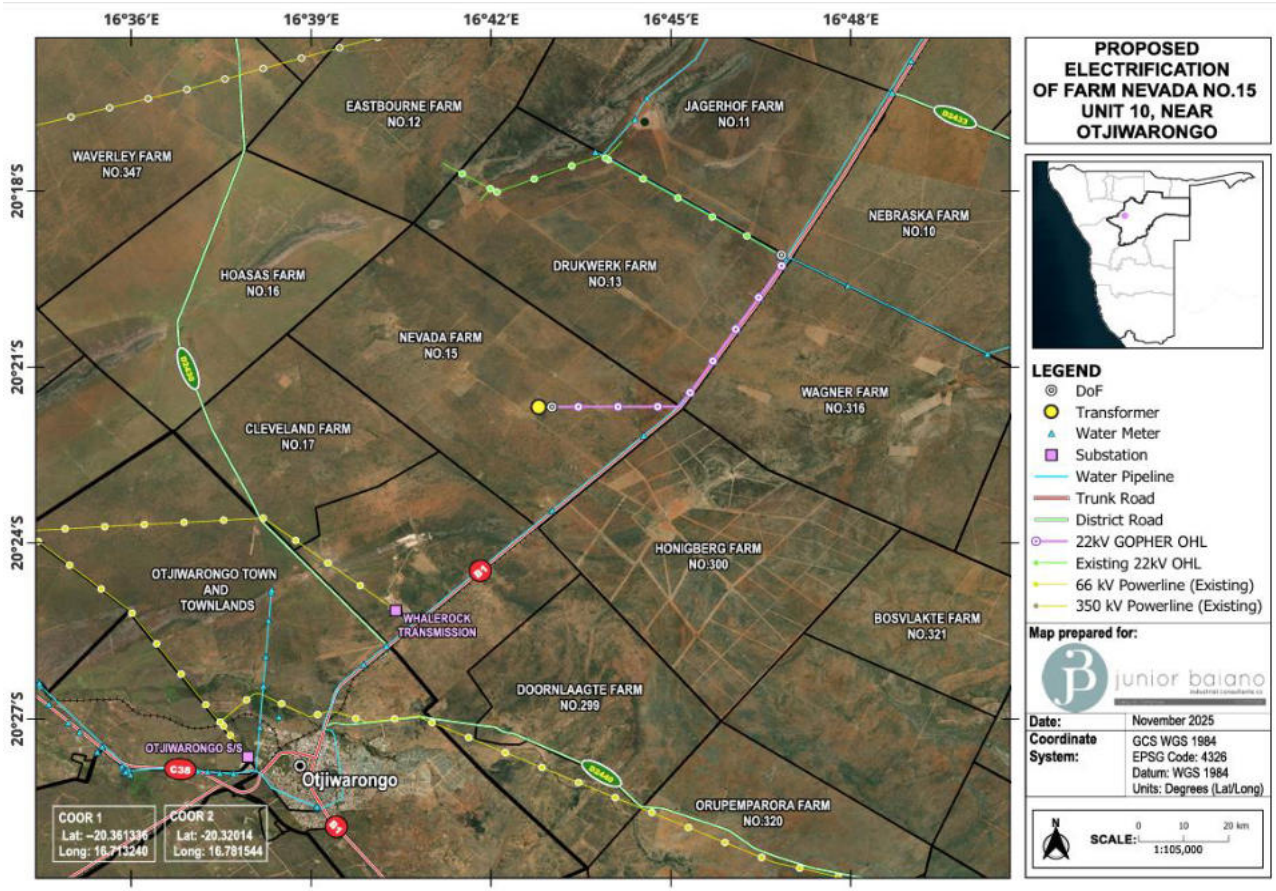
ENVIRONMENTAL IMPACT ASSESSMENT

ROPOSED DEVELOPMENT AND OPERATION OF A POWERLINE AND ELECTRIFICATION OF FARM NEVADA NO. 15, UNIT D, OTJIWARONGO DISTRICT, OTJOZONDJUPA REGION, NAMIBIA



ENVIRONMENTAL SCOPING REPORT
FINAL VERSION
ECC APPLICATION: 7053

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junior baiano
industrial consultants cc

Prepared by: Junior Baiano Industrial Consultants cc
Postal Address: PO Box 23537, Windhoek
Contact Person: Fredrich Nghiyolwa
Contact number: +264 (61) 219 773
Cell: +264 (0) 81 1472029
Email: JuniorB200581@gmail.com
Signature ……
Date ……..

Prepared for: Mr. Wilson N. Mavulu
Postal Address: Po Box 27136, Windhoek
Contact Person: Mr. Wilson N. Mavulu
Contact number: +264 81 3813043/0811491300
Email: mavulu@un.org
Signature ……
Date ……

EXECUTIVE SUMMARY

Junior Baiano Industrial Consultants (JBIC) cc has been appointed by Mr. Wilson and Mrs. Martha Mavulu (hereafter referred to as “the Proponent”) to undertake an Environmental Impact Assessment (EIA), prepare an Environmental Management Plan (EMP), and apply for an Environmental Clearance Certificate (ECC) for the proposed construction and operation of a 22 kV medium-voltage (MV) overhead powerline and associated electrification infrastructure to supply electricity to Farm Nevada No. 15 – Unit D, located in the Otjiwarongo District of the Otjozondjupa Region, Namibia.

The proposed development entails the construction of approximately 7 km of 22 kV overhead powerline extending from the existing distribution network near Otjiwarongo Substation to Farm Nevada. The project includes the installation of approximately 86 medium-voltage poles (approximately 11 m in height), the establishment of a T-off connection point from the existing line, installation of a 16 kVA 22/0.4 kV transformer at the farm premises, and internal electrification of key agricultural and residential facilities.

In terms of the Environmental Management Act, 2007 (Act No. 7 of 2007), and the Environmental Impact Assessment Regulations, 2012 (GN 30 of 2012), the construction of electricity transmission and supply infrastructure constitutes a listed activity under Energy Generation, Transmission and Storage Activities. As such, the project may not proceed without first obtaining an Environmental Clearance Certificate.

To ensure compliance with national environmental legislation and regulatory requirements, the Proponent appointed JBIC cc as an independent Environmental Assessment Practitioner (EAP) to conduct the Environmental Assessment process and submit the ECC application on their behalf.

The proposed development is linear in nature and involves limited, localised ground disturbance primarily associated with:

- Pole foundation excavation;

- Temporary use of existing farm access roads;
- Minor vegetation clearing within the servitude corridor;
- Installation of earthing systems and conductors;
- Transformer installation at a single farm location.

The anticipated construction period is approximately 30 days. No permanent construction camps, bulk earthworks, blasting, or large-scale land transformation are proposed.

Potential Environmental and Socio-Economic Impacts

In accordance with the EIA Regulations (2012), the proposed project has the potential to result in the following impacts:

- Localised soil disturbance and compaction at pole foundation sites;
- Temporary dust generation from construction vehicle movement;
- Minor noise impacts during pole installation and conductor stringing;
- Selective vegetation clearing within the servitude for safety clearance;
- Temporary disturbance to livestock and wildlife;
- Visual presence of overhead infrastructure within the rural landscape;
- Potential bird collision or electrocution risks associated with overhead conductors;
- Risk of accidental veld fires during dry windy conditions;
- Minor occupational health and safety risks during construction;
- Temporary disruption to farm access and infrastructure;
- Accidental disturbance of unknown archaeological or cultural heritage resources, if encountered;
- Generation of minor construction waste and potential hydrocarbon spill risks; and
- Positive socio-economic impacts associated with improved agricultural productivity and rural electrification.

Public Participation Process

A Public Participation Process (PPP) was undertaken in accordance with the Environmental Impact Assessment Regulations. Interested and Affected Parties (I&APs) were informed of the proposed development through newspaper advertisements, site notices, and direct stakeholder engagement.

All consultation activities, issues raised, and responses are documented in Chapter 4 of this report, with supporting documentation included in the Appendices. The consultation process ensured transparency, regulatory compliance, and provided affected landowners and stakeholders with the opportunity to comment on the proposed development.

Recommendation

Based on the findings of the Environmental Assessment, it is concluded that the majority of identified environmental and socio-economic impacts associated with the proposed 22 kV powerline are low to moderate in significance and can be effectively mitigated through the implementation of the recommended management and mitigation measures contained in this report and the accompanying Environmental Management Plan (EMP).

The project footprint is narrow and linear, construction is short-term, and operational impacts are limited primarily to visual presence and routine maintenance activities. The most notable long-term ecological consideration relates to potential avifauna interaction with overhead conductors; however, this risk can be managed through appropriate design and mitigation measures.

Importantly, the project delivers moderate to major positive socio-economic benefits through:

- Improved energy reliability for agricultural operations;
- Enhanced irrigation capacity;
- Reduced reliance on diesel generation;
- Improved worker welfare and rural living conditions;
- Long-term farm productivity and economic sustainability.

Provided that all mitigation measures and monitoring requirements described in the EMP are fully implemented, the residual impacts are expected to remain within acceptable limits.

The proposed 22 kV powerline and electrification of Farm Nevada No. 15 – Unit D is therefore considered environmentally acceptable, technically feasible, and aligned with Namibia's rural electrification and infrastructure development objectives.

Accordingly, it is recommended that the proposed development be authorised through the issuance of an Environmental Clearance Certificate (ECC), subject to adherence to the conditions and commitments contained in this report and the approved Environmental Management Plan.

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Acronyms

TERMS	DEFINITION
BID	Background Information Document
CA	Competent Authorities
EAP	Environmental Assessment Practitioners
ECC	Environmental Clearance Certificate
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
EMP	Environmental Management Plan
GDP	Gross Domestic Product
GHG	Greenhouse Gasses
ISO	International Organization for Standardization
I&Aps	Interested and Affected Parties
JBIC	Junior Baiano Industrial Consultants
MEFT: DEA	Ministry of Environment, Forestry and Tourism's Directorate of Environmental Affairs
PPE	Personal Protective Equipment

1 CHAPTER ONE: BACKGROUND

1.1 INTRODUCTION

Mr. Wilson and Mrs. Martha Mavulu (hereafter referred to as “the Proponent”) propose the development and operation of a new overhead medium-voltage (MV) powerline and associated electrification infrastructure to supply electricity to Farm Nevada No. 15 – Unit D, situated in the Otjiwarongo District of the Otjozondjupa Region, Namibia.

Farm Nevada currently operates on a limited 5 kW solar energy system, which is insufficient to meet the operational energy requirements of the farm. The lack of reliable electricity supply constrains irrigation capacity, agricultural processing, storage, mechanisation, worker housing services, and overall farm productivity. The proposed connection to the national grid has therefore been identified as a necessary and sustainable solution to enhance agricultural efficiency, support rural development, and improve quality of life on the farm.

The proposed development entails:

- Construction of an approximately 7 km long overhead medium-voltage powerline extending from the existing Otjiwarongo Substation to the project site;
- Installation of approximately 86 medium-voltage poles (approximately 11 m height) spaced at regular intervals;
- Installation of a 16 kVA, 22/0.4 kV transformer at the farm premises;
- Establishment of a switching and connection point at the T-off location;
- Internal electrification of key farm facilities, including the farmhouse, worker accommodation, irrigation pumps, and processing facilities.

Construction activities will include pole foundation excavation, pole erection, conductor stringing, installation of earthing systems and drop-out fuses, and minor civil works associated with transformer installation. The anticipated construction period is approximately 30 days.

In terms of the Environmental Management Act, 2007 (Act No. 7 of 2007) and the Environmental Impact Assessment Regulations (GN 30 of 2012), the proposed development constitutes a listed activity under: Section 1: Energy Generation, Transmission and Storage Activities, specifically *The construction of facilities for the transmission and supply of electricity*.

As such, the project may not proceed without first undergoing an Environmental Assessment process and obtaining an Environmental Clearance Certificate (ECC).

The purpose of this Environmental Impact Assessment (EIA) is to:

- Assess the potential environmental and socio-economic implications of the proposed powerline construction and operation;
- Identify environmental sensitivities within the project area;
- Evaluate potential impacts associated with construction and operation;
- Recommend appropriate mitigation and management measures; and
- Ensure compliance with Namibia's environmental legislation and responsible land-use planning principles.

To meet these requirements, the Proponent has appointed Junior Baiano Industrial Consultants cc (JBIC) as the independent Environmental Assessment Practitioner (EAP) to oversee the Environmental Assessment process and prepare the accompanying Environmental Management Plan (EMP). This Scoping Report forms part of the submission to the Ministry of Environment, Forestry and Tourism (MEFT) for consideration and issuance of the Environmental Clearance Certificate for the proposed development.

1.2 PROJECT LOCATION

The proposed development is located on Farm Nevada No. 15 – Unit D, within the Otjiwarongo District of the Otjozondjupa Region, central Namibia. The project area lies within a predominantly rural agricultural landscape characterised by commercial livestock farming and associated farm infrastructure.

The proposed powerline will originate near the existing Otjiwarongo Substation and extend approximately 7 km toward Farm Nevada, traversing portions of Farm Drukwerk No. 13 before terminating at the proposed transformer installation on Farm Nevada. The alignment follows existing access corridors and farm tracks wherever possible to minimise environmental disturbance.

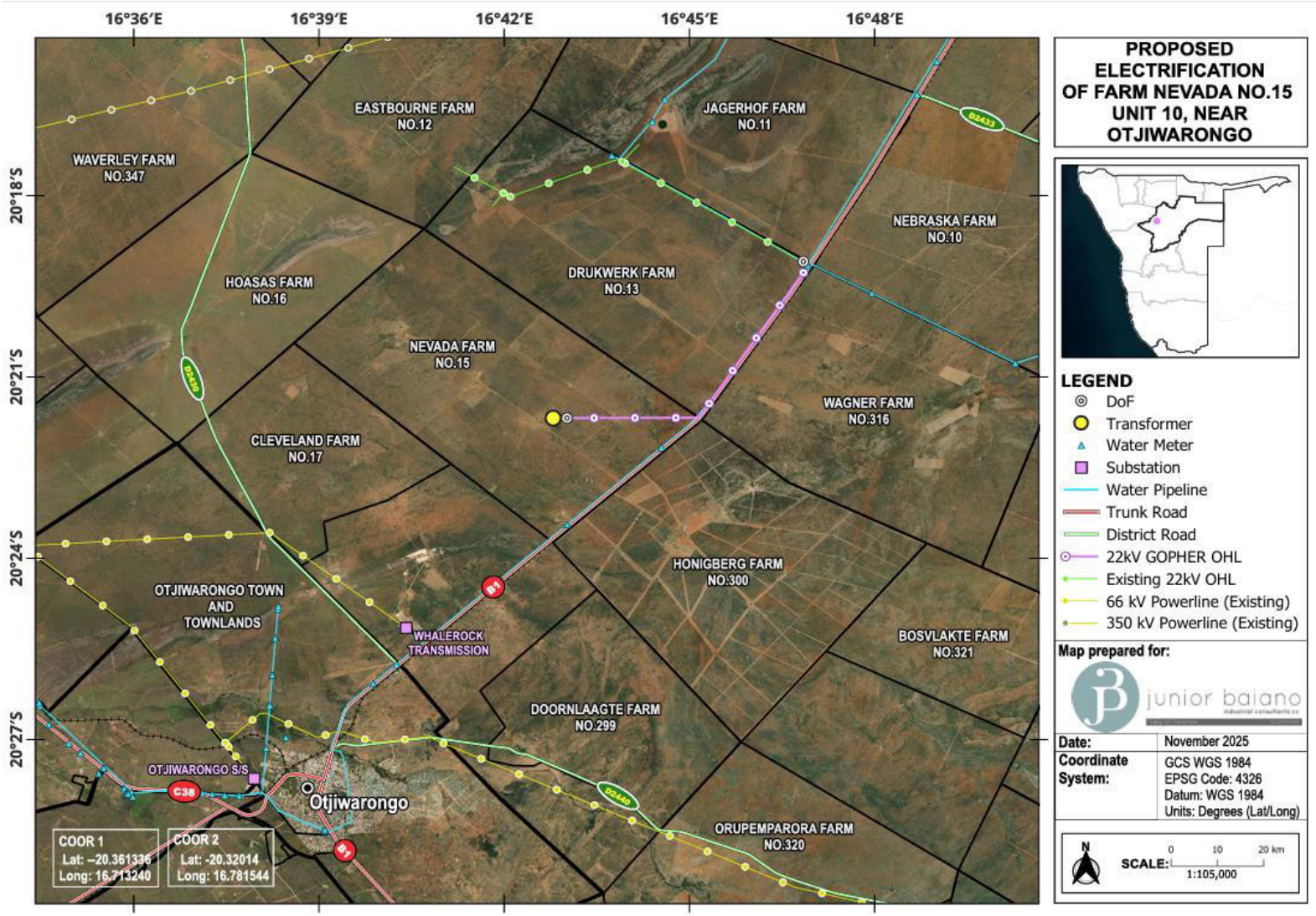

Figure 1-1: Locality Map

The spatial configuration of the proposed powerline route is illustrated in the locality map included in Figure 1-1. The map indicates:

- The proposed T-off point from the existing 22kV overhead line;
- The alignment of the new medium-voltage line;
- Pole spacing and positioning;
- The transformer location at the farm premises;
- Adjacent farm boundaries and infrastructure.

The project coordinates are referenced using the WGS 84 geographic coordinate system and are used for regulatory submission and servitude registration purposes.

1.3 PROJECT OVERVIEW

The proposed development entails the construction and operation of a medium-voltage (MV) overhead powerline to supply grid electricity to Farm Nevada No. 15 – Unit D, located within the Otjiwarongo District of the Otjozondjupa Region.

The project will establish a connection from the existing 22kV distribution network near Otjiwarongo Substation and extend approximately 7 km toward Farm Nevada, traversing portions of Farm Drukwerk No. 13 before terminating at a transformer installation on the farm.

The development forms part of a rural electrification initiative aimed at improving agricultural productivity, supporting irrigation expansion, enabling agro-processing, and enhancing rural living conditions.

1.3.1 Technical Description of the Proposed Development

The project consists of the following primary components:

- Construction of approximately 7 km of 22kV/33kV overhead medium-voltage line;
- Installation of approximately 86 medium-voltage poles (11 m height) spaced at 120 m intervals and 70 m at bends
- Establishment of a T-off connection point from the existing 22kV overhead line

- Installation of a 16kVA, 22/0.4kV transformer at Farm Nevada
- Installation of drop-out fuses and earthing systems (86 earthing points indicated);
- Internal electrification of farm facilities.

The MV Network Layout is illustrated in the Appendices which shows pole spacing, transformer location, and the connection point to the existing line.

1.3.2 Route Alignment and Spatial Context

The proposed powerline alignment follows existing access corridors and previously disturbed areas where feasible to minimise environmental disturbance. The route connects from the existing 22kV infrastructure near Otjiwarongo and proceeds northeast toward Farm Drukwerk before terminating at Farm Nevada.

The broader spatial context is illustrated in the Appendices, which presents the cadastral layout, surrounding farms, existing transmission infrastructure (66kV and 350kV lines), trunk and district roads, and the Otjiwarongo townlands.

1.3.3 Servitude and Wayleave Requirements

The proposed powerline will be constructed within a defined servitude corridor aligned with the route shown in the Appendices. Servitude agreements will be concluded with affected landowners prior to construction.

Where the alignment intersects:

- District roads,
- Existing utility corridors,
- Existing transmission lines,
- Water pipelines,

the necessary wayleave approvals will be obtained from the relevant authorities.

No expropriation of land is anticipated, and the route does not traverse communal land. The servitude width will comply with national electricity distribution standards.

1.3.4 Construction Methodology

Construction activities will be temporary, linear in nature, and localised along the defined servitude corridor. The overall construction period is anticipated to last approximately **30 days**, subject to weather conditions and material availability.

Works will be undertaken by qualified electrical contractors in accordance with national electrical safety standards and the approved Environmental Management Plan (EMP).

Construction will proceed in a sequential manner as outlined below.

1.3.4.1 Site Preparation and Surveying

Prior to commencement of physical works, the following activities will be undertaken:

- Detailed survey pegging of all pole positions along the approved alignment;
- Verification of servitude boundaries and access arrangements with landowners;
- Identification of environmentally sensitive features (e.g., drainage lines, mature trees, fencing);
- Demarcation of no-go areas where applicable;
- Establishment of temporary material laydown areas at strategic locations.

Access to the construction corridor will utilise existing farm roads and tracks wherever feasible in order to minimise additional vegetation clearing and soil disturbance. No new permanent access roads are proposed.

Temporary laydown areas will be small in footprint and used only for short-term storage of poles, conductors, hardware, and tools. All laydown areas will be rehabilitated upon completion of works.

1.3.4.2 Pole Foundation Excavation and Installation

Each pole location will require the excavation of a foundation pit using mechanical augers or manual excavation methods, depending on soil conditions.

Typical activities include:

- Excavation of pole foundation pits (generally limited in diameter and depth appropriate for 11 m poles);

- Temporary stockpiling of excavated soil adjacent to each pit;
- Placement and alignment of medium-voltage (MV) poles;
- Backfilling using excavated material;
- Compaction of soil to ensure structural stability;
- Installation of earthing systems at each pole location in accordance with electrical safety requirements.

Disturbance at each pole site will be localised and typically confined to a small area around the foundation. Excess spoil material will not be removed from site but will be reinstated and levelled.

Where poles are located near drainage lines or slopes, additional stabilisation measures may be implemented to prevent erosion.

1.3.4.3 Conductor Stringing and Line Installation

Once poles are installed and secured, conductor stringing will be undertaken.

This phase includes:

- Installation of insulators and hardware assemblies;
- Stringing of conductors between poles using tensioning equipment;
- Installation of drop-out fuses and switching equipment at designated locations;
- Establishment of the T-off connection point to the existing 22kV overhead line;
- Mechanical tensioning and alignment of conductors;
- Electrical safety testing and system verification prior to energisation.

Conductor stringing will be undertaken using controlled tension methods to prevent damage to vegetation and to ensure safety clearances are maintained.

All works will comply with national electrical distribution standards and safety protocols.

1.3.4.4 Transformer Installation and Low-Voltage Connection

At Farm Nevada No. 15 – Unit D, a 16kVA, 22/0.4kV transformer will be installed at a designated location.

Activities include:

- Preparation of a stable foundation base;
- Mounting of the transformer on a pole or appropriate structure;
- Installation of associated switching and protection equipment;
- Connection of low-voltage distribution lines to farm facilities;
- Electrical testing and commissioning.

Low-voltage distribution will extend to key infrastructure including residential units, irrigation pumps, and processing facilities.

1.3.4.5 Environmental and Safety Controls During Construction

Throughout construction, the following controls will be implemented:

- Dust suppression where necessary;
- Controlled waste collection and disposal;
- Safe fuel handling and storage;
- Prevention of hydrocarbon spills;
- Rehabilitation of disturbed areas after installation;
- Compliance with Occupational Health and Safety regulations.

Importantly:

- No blasting is required;
- No large-scale earthworks are anticipated;
- No permanent construction camps are proposed;
- No bulk material extraction will occur on site.

All works will be undertaken in accordance with the approved Environmental Management Plan (EMP).

1.3.5 Operational Phase

Upon completion and commissioning, the powerline will become part of the regional electricity distribution network supplying Farm Nevada.

1.3.5.1 Operational Characteristics

The operational phase will involve:

- Continuous transmission of electricity from the existing distribution network to the farm;
- Periodic inspection and maintenance of poles, conductors, and hardware;
- Vegetation management within the servitude corridor to maintain safety clearances;
- Occasional repair or replacement of components where required.

Routine maintenance activities may include:

- Visual inspections;
- Replacement of damaged insulators;
- Tightening of conductors;
- Clearing of encroaching vegetation;
- Transformer servicing.

Maintenance access will utilise existing farm tracks and previously established access points.

1.3.5.2 Operational Impacts

Operational impacts are expected to be minimal and largely confined to:

- Visual presence of poles and overhead conductors within the landscape;
- Occasional vehicle access for maintenance;
- Vegetation trimming within the servitude corridor;

- Low-level electromagnetic fields consistent with standard 22kV distribution infrastructure.

No significant noise, air emissions, water use, or ongoing ground disturbance are anticipated during normal operation.

The development is therefore considered to have **low operational environmental risk**, subject to compliance with maintenance and environmental management requirements.

1.3.6 Summary of Activity Impacts

Table 1-1 below provides a structured summary of the anticipated disturbance levels associated with each key phase of the proposed powerline development and electrification project.

Unlike large-scale infrastructure developments, the proposed 22kV overhead line is linear in nature, involves limited ground disturbance, and does not require extensive earthworks or permanent construction camps. Disturbance is expected to be temporary and localised primarily during pole installation and conductor stringing.

Table 1-1: Summary of Activity Impacts – Proposed Powerline Development

Activity	Purpose	Disturbance Level
Route Surveying and Pegging	Confirm pole locations and servitude alignment	Very Low – limited to short-term pedestrian access and marking of pole positions
Servitude Demarcation	Define construction corridor and no-go areas	Very Low – administrative and marking activity; no vegetation removal required beyond minimal clearing
Temporary Material Laydown Areas	Store poles, conductors and equipment during construction	Low – small, temporary footprint; fully rehabilitated after use
Access Along Existing Farm Roads	Enable transport of materials and personnel	Very Low – utilises existing tracks; no new permanent roads required
Pole Foundation Excavation	Install approximately 86 medium-voltage poles	Localised Moderate – small excavation at each pole location; disturbance confined to foundation footprint; rehabilitated post-installation
Pole Installation and Backfilling	Secure structural stability of poles	Localised Low – soil reinstated and compacted after installation
Installation of Earthing Systems	Ensure electrical safety compliance	Very Low – minor excavation at each pole base
Conductor Stringing and Tensioning	Establish overhead electrical connection	Low – temporary access required; no continuous ground disturbance
T-Off Connection to Existing 22kV Line	Integrate new line into existing distribution network	Localised Moderate – short-term activity at connection point; no expansion of existing substation infrastructure

Activity	Purpose	Disturbance Level
Transformer Installation (16kVA)	Step-down voltage for farm distribution	Low to Moderate – limited foundation preparation at single location; permanent but small footprint
Low-Voltage Distribution to Farm Facilities	Electrify residential and agricultural infrastructure	Low – minor trenching or pole-mounted connections within farm premises
Vegetation Clearing within Servitude	Maintain statutory safety clearances beneath conductors	Low – selective clearing only; no large-scale vegetation removal anticipated
Construction Workforce Presence	Implement installation works	Low – short-term presence (~30 days); no permanent accommodation camps
Waste Generation During Construction	Packaging, minor scrap materials	Low – managed under EMP; no hazardous waste anticipated
Rehabilitation of Disturbed Areas	Restore surface stability and visual condition	Positive – reinstatement of soil and natural vegetation where feasible
Operational Phase – Routine Maintenance	Ensure long-term system reliability	Very Low – periodic inspections and vegetation trimming only

1.4 ACCESSIBILITY

The proposed powerline and electrification project is located within the Otjiwarongo District of the Otjozondjupa Region, an area that benefits from an established regional road network and well-developed farm access infrastructure.

Primary access to the project area is obtained via the B1 National Road, which connects Otjiwarongo to Windhoek and the northern regions of Namibia. From the B1, district and farm access roads provide direct connectivity to Farm Drukwerk No. 13 and Farm Nevada No. 15, Unit D.

The proposed powerline alignment largely follows:

- Existing farm access tracks;
- Existing utility corridors;
- Previously disturbed routes associated with agricultural activities.

As illustrated in the locality and routing maps in the Appendices, no new public roads are required for the development. Construction vehicles will utilise established farm roads and internal tracks, thereby avoiding the need for new permanent road construction.

Where minor deviations from existing tracks are required to reach specific pole locations, short temporary access paths may be created. These will:

- Follow previously disturbed or naturally clear areas where feasible;
- Avoid drainage lines, steep slopes, and mature trees;
- Be limited to the minimum width required for safe vehicle passage;
- Be rehabilitated immediately after construction in accordance with the Environmental Management Plan (EMP).

Given the linear nature of the project and the availability of existing access infrastructure, disturbance associated with vehicle movement is expected to be low, temporary, and fully reversible.

1.5 INFRASTRUCTURE AND SERVICES

Although the project is located within a rural agricultural setting, the Otjiwarongo District benefits from established infrastructure that adequately supports construction and operation of a medium-voltage distribution line.

The project does not require the establishment of major new supporting infrastructure beyond the powerline itself.

1.5.1 Road Network

- The site is accessible from the B1 National Road and regional district roads connecting to Otjiwarongo.
- A network of internal farm access roads provides suitable routes for construction vehicles.
- These roads are routinely used for agricultural operations and are capable of accommodating light and medium construction vehicles.
- No permanent new roads are proposed.
- Any temporary access created for pole installation will be rehabilitated after construction.

1.5.2 Water Supply

Construction of the powerline requires minimal water usage. Water may be required for:

- Limited dust suppression during dry conditions;
- Concrete mixing (if required for specific foundations);
- Domestic use by construction personnel.

Water will be sourced through:

- Existing farm boreholes, subject to landowner consent; or
- Water transported from Otjiwarongo via approved suppliers.

No permanent water abstraction infrastructure will be installed as part of the project.

1.5.3 Power Supply (Construction Phase)

During construction, power tools and equipment will operate using:

- Portable generators;
- Vehicle-mounted power systems; or
- Battery-operated equipment.

Upon completion, the new line will connect to the existing 22kV distribution network at the approved T-off point, supplying Farm Nevada via a 16kVA transformer as illustrated in the engineering layout (Appendices).

1.5.4 Sanitation and Waste Management

Construction workforce numbers are expected to be small and temporary. The following measures will be implemented:

- Provision of portable chemical toilets during construction;
- Daily collection of domestic waste;
- Storage of waste in secure containers;
- Removal of waste to the Otjiwarongo municipal landfill or other approved disposal facilities;
- Separate storage and removal of hydrocarbon-contaminated materials where applicable.

No waste will be buried or burned on site.

1.5.5 Communication Networks

The project area benefits from moderate mobile network coverage due to proximity to Otjiwarongo. Construction teams will utilise:

- Mobile phones;
- Two-way radios where required;
- GPS and digital mapping tools.

Emergency communication procedures will form part of the contractor's Safety Plan.

1.5.6 Accommodation

Construction is short-term (approximately 30 days). Personnel will be accommodated through:

- Daily commuting from Otjiwarongo; or
- Temporary arrangements at nearby farmsteads or lodges.

No permanent construction camp is proposed.

1.6 NEED AND DESIRABILITY

The proposed powerline and electrification project is justified on both national policy grounds and local socio-economic need.

1.6.1 Project Need

Farm Nevada No. 15 – Unit D currently operates using a 5 kW solar energy system, which is insufficient to meet agricultural and residential energy demands. The lack of reliable grid electricity constrains:

- Irrigation expansion;
- Agricultural mechanisation;
- Cold storage and processing capacity;
- Worker housing services;
- Operational efficiency.

Connection to the national grid is therefore necessary to:

- Improve agricultural productivity;
- Enhance value-added processing;
- Support rural economic activity;
- Improve quality of life on the farm.

1.6.2 Policy Alignment

The project aligns with:

- Namibia's Vision 2030 (rural infrastructure development);
- National Development Plans (NDP5 and NDP6);
- National energy access and rural electrification objectives;
- Sustainable agricultural development strategies.

Rural electrification is recognised as a catalyst for economic development, improved livelihoods, and reduced inequality between urban and rural areas.

1.6.3 Regional Socio-Economic Benefits

The project will generate:

- Short-term employment during construction;
- Local procurement of materials and services;
- Increased agricultural output;
- Improved worker welfare conditions;
- Long-term economic sustainability of the farming enterprise.

Reliable electricity enables irrigation expansion, agro-processing, and improved farm management practices, thereby strengthening rural resilience.

1.6.4 Environmental Suitability

The project:

- Follows existing access corridors;
- Requires limited ground disturbance;
- Avoids major ecological sensitivity areas;
- Has low operational environmental risk;
- Includes full rehabilitation of temporary disturbance areas.

The linear and contained footprint makes the project environmentally suitable for implementation under EMP controls.

1.7 PROJECT ALTERNATIVES

The consideration of alternatives is a statutory requirement under Regulation 8 of the Environmental Impact Assessment Regulations (GN 30 of 2012). The purpose of evaluating alternatives is to ensure that the proposed development represents the most environmentally responsible, technically feasible, and socio-economically justified option.

For the proposed electrification of Farm Nevada No. 15 – Unit D, alternatives assessed include:

- The No-Go Alternative;
- The Grid Connection (Go) Alternative;
- Routing and micro-alignment alternatives;
- Technical design alternatives;
- Operational alternatives relating to construction methods, access, and environmental management.

1.7.1 No-Go Alternative

Under the No-Go Alternative, the proposed powerline would not be constructed and Farm Nevada would continue operating under its current 5 kW solar energy system.

1.7.1.1 Environmental Implications

- No vegetation clearing or pole installation would occur.
- No short-term soil disturbance from excavation would take place.
- Existing land use (commercial farming) would remain unchanged.
- No visual change to the landscape would occur.

1.7.1.2 Socio-Economic Implications

- Farm Nevada would remain constrained by insufficient energy supply.
- Irrigation expansion and agricultural productivity improvements would remain limited.
- Opportunities for value-added processing and economic growth would be restricted.

- No short-term employment during construction would be generated.
- Long-term rural economic sustainability may be affected.

1.7.1.3 Policy Alignment

The No-Go Alternative does not align with Namibia's rural electrification and infrastructure expansion objectives. Access to reliable electricity is a recognised catalyst for rural development, economic productivity, and improved living standards.

While environmentally neutral in the short term, the No-Go Alternative limits long-term socio-economic development potential.

1.7.2 Grid Connection (Go) Alternative

The Go Alternative involves constructing the proposed 22kV overhead powerline and installing a 16kVA transformer as described in Section 1.3.

1.7.2.1 Economic and Strategic Advantages

- Provides reliable and stable grid electricity.
- Enables irrigation expansion and agricultural mechanisation.
- Improves worker living conditions.
- Supports value-added agricultural processing.
- Enhances long-term farm sustainability.
- Aligns with national rural electrification objectives.

1.7.2.2 Environmental Justification

- Linear infrastructure with a narrow servitude footprint.
- Localised and temporary construction disturbance.
- No blasting or large-scale earthworks.
- Fully rehabilitable pole foundation sites.
- Minimal operational environmental impact.

Given the relatively low environmental footprint and significant socio-economic benefits, the Go Alternative is the preferred option, subject to compliance with the Environmental Management Plan (EMP).

1.7.3 Routing and Micro-Siting Alternatives

Although the connection point to the existing 22kV infrastructure is geographically constrained, alternative routing options were considered during planning.

Routing considerations included:

- Following existing farm access tracks;
- Avoiding drainage lines and riparian areas;
- Avoiding mature trees and sensitive vegetation;
- Avoiding farm infrastructure such as boreholes and fencing;
- Minimising crossing of internal paddocks where feasible.

The selected alignment represents the shortest technically feasible route while minimising ecological disturbance and land-use conflict.

Micro-siting of pole positions will continue during detailed surveying to:

- Avoid rocky outcrops where possible;
- Avoid erosion-prone slopes;
- Maintain safe distances from existing infrastructure.

1.7.4 Technical Design Alternatives

Alternative technical configurations were considered, including:

a) Overhead Line vs Underground Cable

- Underground cabling would significantly increase excavation requirements, cost, and soil disturbance.
- Fault detection and maintenance would be more complex.
- Greater ground disturbance would occur during installation.

Preferred Option: Overhead line, due to lower ground disturbance, lower cost, and ease of maintenance.

b) Transformer Sizing Alternatives

Transformer sizing was determined based on projected energy demand.

- Oversized transformers would increase capital cost and unnecessary infrastructure.

- Undersized transformers would limit future expansion.

Preferred Option: 16kVA transformer aligned with projected load requirements.

c) Alternative Energy Supply (Solar Expansion)

Expansion of the existing solar system was considered.

However:

- Solar supply remains weather-dependent.
- Battery storage costs are high.
- Irrigation and processing loads exceed current solar capacity.

Preferred Option: Grid connection to ensure reliability and long-term sustainability.

1.7.5 Operational Alternatives

The table below gives a summary of the operational alternatives.

Table 1-2: Summary of Operational Alternatives Considered

Aspect	Alternatives Considered	Preferred Option & Justification
Energy Source	Solar-only; Diesel generators; Grid connection	Grid connection provides reliable long-term supply
Line Installation	Overhead vs Underground	Overhead line – lower disturbance and cost
Access	New access roads vs Existing farm tracks	Use of existing farm tracks
Water Use (Construction)	Borehole abstraction; Water carting	Minimal water use; source agreed with landowner
Sanitation	Temporary chemical toilets; Permanent facilities	Temporary mobile units – fully reversible
Waste Management	On-site disposal; Off-site disposal	Off-site disposal at approved facilities
Vegetation Clearing	Full corridor clearing; Selective trimming	Selective trimming to maintain safety clearance

1.7.6 Conclusion on Alternatives

The assessment demonstrates that:

- The No-Go Alternative preserves the status quo but limits agricultural and socio-economic development.
- The Grid Connection (Go) Alternative provides significant socio-economic benefits with low and manageable environmental impacts.
- Routing and design have been optimised to minimise disturbance.
- Operational alternatives have been selected to ensure environmental responsibility and cost-effectiveness.

Therefore, the **Implementation (Go) Alternative** is recommended as the most viable, sustainable, and environmentally responsible option for the electrification of Farm Nevada No. 15 – Unit D.

2 CHAPTER TWO: POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

2.1 INTRODUCTION

This Environmental Impact Assessment (EIA) Report for the proposed development and operation of a medium-voltage powerline and electrification of Farm Nevada No. 15 – Unit D, located in the Otjiwarongo District of the Otjozondjupa Region, has been prepared in accordance with Namibia's environmental, energy, land-use and infrastructure legislation.

The legal and policy framework governing electricity transmission and distribution projects establishes clear requirements for environmental protection, infrastructure development, land-use regulation, pollution prevention, biodiversity conservation, occupational health and safety, and responsible utilisation of natural resources.

Namibia's environmental and infrastructure legislation ensures that projects of this nature:

- Prevent pollution and manage construction-related waste responsibly, including hydrocarbons, packaging materials and solid waste;
- Protect soil, vegetation, wildlife and water resources from unnecessary disturbance during pole installation and line construction;
- Promote sustainable land-use planning within agricultural and rural landscapes;
- Safeguard the occupational health and safety of construction personnel, landowners and surrounding communities;
- Regulate servitude establishment and wayleave approvals for linear infrastructure;
- Ensure compliance with national electricity distribution standards and safety requirements; and
- Clarify the obligations of the Proponent, contractors, competent authorities and reviewing authorities with regard to environmental compliance and infrastructure management.

2.2 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

The pursuit of sustainable infrastructure development is guided by Namibia's constitutional principles and legislative framework. This section summarizes the key legal instruments applicable to the proposed construction and operation of the medium-voltage powerline supplying Farm Nevada No. 15 – Unit D.

The table below identifies relevant legislation, outlines key provisions, and explains how these provisions apply to the proposed electrification project.

Table 2-1 - Legal Compliance

Aspect	Legislation / Policy	Relevant Provisions	Relevance to Proposed Electrification Project
Constitutional Obligations	Namibian Constitution (1990)	• Article 95(l): State must safeguard ecosystems and biodiversity. • Article 16: Protects lawful property and economic activity.	• Construction must avoid unnecessary environmental harm. • Electrification constitutes lawful economic activity subject to environmental safeguards.
Environmental Management	Environmental Management Act (EMA) 7 of 2007	• Listed activities require EIA and ECC. • Promotes pollution prevention, waste management and public consultation.	• Construction of electricity transmission infrastructure triggers listed activities. • ECC required prior to commencement.

Aspect	Legislation / Policy	Relevant Provisions	Relevance to Proposed Electrification Project
	EIA Regulations (GN 30 of 2012)	Prescribes EIA process, consultation and reporting requirements.	Guides public notices, consultation process, BID distribution and preparation of this EIA and EMP.
Energy Regulation	Electricity Act 4 of 2007	• Regulates generation, transmission and distribution of electricity. • Licensing and operational compliance requirements.	Powerline must comply with national electricity distribution standards and safety requirements.
Land & Servitudes	Deeds Registries Act 47 of 1937	Regulates registration of servitudes.	Powerline servitude must be legally registered against affected properties.
	Regional Councils Act 22 of 1992	Regulates regional land administration and infrastructure coordination.	Project must align with regional planning objectives within Otjozondjupa Region.
Heritage Protection	National Heritage Act 27 of 2004	• Prohibits disturbance of heritage resources without approval. • Requires chance-find procedures.	If graves, artefacts or historical features are encountered during pole excavation, works must cease and authorities notified.

Aspect	Legislation / Policy	Relevant Provisions	Relevance to Proposed Electrification Project
Forestry & Vegetation	Forest Act 12 of 2001	• Permit required for removal of protected trees. • Controls clearing near watercourses.	Selective vegetation clearing within servitude may require Forestry permit if protected species are affected.
Water Resources	Water Resources Management Act 11 of 2013	• Prohibits pollution of water resources. • Regulates abstraction.	• Construction must prevent contamination of groundwater and drainage lines. • Minimal water use during construction.
Pollution & Waste	Draft Pollution and Waste Management Bill	Standards for waste handling and hazardous substances.	Construction waste and hydrocarbons must be stored and disposed of responsibly.
Air Quality	Atmospheric Pollution Prevention Ordinance 11 of 1976	Controls emissions and dust.	Dust control measures required during dry conditions.
Soil Protection	Soil Conservation Act 76 of 1969	Prevents erosion and land degradation.	Pole excavation and access must minimise erosion risk; rehabilitation required.
Occupational Health & Safety	Labour Act 11 of 2007	Requires safe working conditions and PPE.	Contractors must comply with OHS standards during construction and maintenance.

Aspect	Legislation / Policy	Relevant Provisions	Relevance to Proposed Electrification Project
Public Health	Public and Environmental Health Act 1 of 2015	Prevents creation of nuisances (dust, waste, sanitation).	Construction must not create health risks to workers or neighbouring landowners.
Fuel Storage & Handling	Petroleum Products and Energy Act 13 of 1990	Regulates storage and handling of fuel.	Any temporary on-site fuel storage must comply with bunding and safety requirements.
National Development Planning	Vision 2030; NDP5/NDP6	Promote infrastructure expansion, rural development, economic sustainability.	Electrification supports agricultural productivity and rural economic growth.
Climate Policy	National Climate Change Policy (2011)	Encourages low-carbon development and climate resilience.	Grid connection reduces reliance on inefficient diesel generators and supports sustainable energy use.

All legislation is legally binding on the Proponent and must be complied with throughout the construction and operational lifespan of the proposed powerline and electrification of Farm Nevada No. 15 – Unit D.

Compliance will be achieved through:

- Implementation of the Environmental Management Plan (EMP);
- Adherence to all conditions contained within the Environmental Clearance Certificate (ECC);
- Compliance with national electricity distribution standards;
- Observance of servitude registration and wayleave requirements;
- Alignment with applicable sectoral regulatory obligations.

Where specialist compliance is required—such as heritage protection, vegetation clearance, hazardous-material handling, fuel storage, or electrical safety—the Proponent will engage qualified and registered professionals or licensed service providers to ensure regulatory adherence.

Environmental compliance monitoring may include:

- Site inspections during construction;
- Contractor compliance checks;
- Incident reporting procedures;
- Corrective action implementation;
- Submission of compliance reports to the competent authority where required.

All relevant permits and authorisations must be obtained prior to commencement of construction activities.

2.2.1 Key Permits and Authorisations Required

The following permits and approvals may be required prior to implementation:

- Environmental Clearance Certificate (ECC)

Issued under the Environmental Management Act (7 of 2007) by the Ministry of Environment, Forestry and Tourism (MEFT).

This is the primary environmental authorisation required before construction of the powerline may commence.

2.2.1.1 Electricity Distribution and Technical Approval

The project must comply with the Electricity Act (4 of 2007) and relevant distribution standards applicable to medium-voltage infrastructure.

Technical approval and compliance certification will be required prior to energisation of the line.

- Servitude Registration and Wayleave Approvals
- Servitude agreements must be concluded with affected landowners.
- Servitudes must be registered against property title deeds where required.
- Wayleave permissions must be obtained where the alignment intersects:
    - Public roads;
    - Existing transmission infrastructure;
    - Utility corridors;
    - Water pipelines.
- Permit for Removal of Protected Tree Species (If Applicable)

Required under the Forest Act (12 of 2001) if removal of any protected tree species becomes unavoidable during servitude clearing.

Selective vegetation clearing will be undertaken to minimise removal.

2.2.1.2 Water Use Authorisation (If Applicable)

Under the Water Resources Management Act (11 of 2013), a permit may be required if significant water abstraction is undertaken during construction.

Given the limited water needs of this project, abstraction requirements are expected to be minimal.

2.2.1.3 Fuel Storage Compliance (If Applicable)

Under the Petroleum Products and Energy Act (13 of 1990), a licence may be required if on-site fuel storage exceeds regulatory thresholds.

All temporary fuel storage will:

- Be limited in volume;
- Be stored in bunded containers;
- Include spill-prevention measures.

2.2.1.4 Hazardous Waste Disposal

Where hazardous waste (e.g., waste oils, contaminated absorbents) is generated during construction, disposal must occur through licensed service providers in accordance with national waste management standards.

2.2.1.5 Land Access Agreements

Written consent and access agreements must be secured from affected landowners prior to construction.

2.2.2 Operational Compliance

During operation, compliance obligations include:

- Maintenance of electrical safety clearances;
- Vegetation management within the servitude corridor;
- Adherence to Occupational Health and Safety standards;
- Prevention of environmental contamination;
- Compliance with conditions of the ECC.

2.2.3 Summary

The proposed electrification project is subject to clear environmental, electrical, land-use and safety regulatory requirements.

All necessary approvals will be secured prior to construction, and the project will be implemented in accordance with the Environmental Management Plan (EMP) and all applicable national legislation.

3 CHAPTER THREE: RECEIVING ENVIRONMENT

3.1 SOCIO-ECONOMIC ENVIRONMENT

The proposed electrification project is located on Farm Nevada No. 15, Unit 10, situated approximately north-east of Otjiwarongo town within the Otjozondjupa Region of Namibia. The project involves the construction of a 22 kV medium-voltage (MV) overhead powerline branching from the existing regional electricity network to supply grid power to the farm.

The receiving environment is characterised by:

- Commercial livestock farming,
- Scattered farmsteads and agricultural infrastructure,
- Low population density,
- Existing regional road and powerline infrastructure,
- Proximity to Otjiwarongo as a regional economic centre.

Figure 3-1 (Regional Context Map) illustrates the position of the Otjozondjupa Region within Namibia and the relative location of the project site near Otjiwarongo.

Figure 3-1: Regional Map of Namibia

3.1.1 Regional Context

The Otjozondjupa Region forms part of central-northern Namibia and is one of the country's key agricultural regions, known primarily for:

- Commercial cattle farming,
- Game farming and tourism,
- Mixed crop production in certain areas,
- Growing service-sector activities linked to Otjiwarongo town.

According to the Namibia Statistics Agency (NSA), 2023 Population and Housing Census, Otjozondjupa has:

- A population of approximately 160,000–170,000 people,
- A predominantly working-age population,
- Economic activity largely centred on agriculture, retail trade, public services, and tourism.

The table below summarises key socio-economic indicators for Otjozondjupa Region based on NSA 2023 Census data.

Table 3-1: Selected Socio-Economic Indicators – Otjozondjupa Region

Indicator	**Namibia (2023)***	**Otjozondjupa (2023)***
Population size	~3.02 million	~160,000–170,000
Literacy rate (15+)	~91%	~90–93%
Labour force participation	~58%	~60–65%
Main household income	Wages & salaries	Wages + Farming
Households using wood/charcoal	~46%	Significant rural reliance
Access to safe water	~87%	High in towns; borehole-dependent in farms

Otjiwarongo serves as:

- The regional administrative centre,
- A transport node along the B1 national road,
- A supply and service hub for surrounding commercial farms.

The region reflects:

- Strong agricultural economic dependency,
- Moderate urbanisation around Otjiwarongo,
- Continued rural reliance on groundwater resources,
- A working-age labour force capable of supporting construction activities.

The regional economy is heavily dependent on sustainable land use, water availability, and agricultural productivity — factors that must be considered when implementing infrastructure projects.

3.1.2 Local Context – Farm Nevada and Surrounding Properties

At the local scale, the project area falls within a typical central Namibian commercial farming landscape characterised by:

- Large freehold farm portions,
- Cattle grazing camps,
- Borehole-based water supply systems,
- Farm access roads and internal tracks,
- Low settlement density.

Neighbouring properties include farms such as:

- Drukwerk Farm No. 13,
- Jagerhof Farm No. 11,
- Nebraska Farm No. 10,
- Wagner Farm No. 316,
- Honiberg Farm No. 300,
- Cleveland Farm No. 17,
- Hoasas Farm No. 16.

The land use is predominantly:

- Livestock production,

- Rangeland grazing,
- Borehole-supported farming operations.

There are no high-density settlements within the immediate project footprint.

3.1.3 Land Use Sensitivities

Although the area is rural and sparsely populated, it remains socio-economically sensitive because livelihoods depend directly on:

- Grazing land availability,
- Borehole water supply,
- Farm fencing and infrastructure integrity,
- Reliable road access.

Key socio-economic sensitivities relevant to the powerline construction include:

- Avoidance of damage to fences and gates,
- Protection of boreholes and pipelines,
- Prevention of livestock disturbance,
- Safe vehicle movement along shared farm tracks,
- Avoidance of interference with farm operations.

3.1.4 Access to Services

The project benefits from proximity to Otjiwarongo town, which provides:

- Health facilities and emergency services,
- Fuel stations,
- Hardware suppliers and electrical contractors,
- Accommodation facilities,
- Retail and food suppliers,
- Telecommunications coverage.

This reduces the need for establishing permanent camps or major service infrastructure at the project site.

3.1.5 Infrastructure Context

The broader landscape already contains:

- Existing 22 kV and higher-voltage powerlines,
- Regional trunk roads,
- District gravel roads,
- Farm access tracks.

The proposed electrification aligns with existing infrastructure corridors, thereby reducing the need for new access routes or major land transformation.

3.1.6 Socio-Economic Relevance to the Proposed Powerline Project

The proposed electrification of Farm Nevada No. 15, Unit 10 is expected to generate limited but meaningful socio-economic effects within the immediate farming area and the broader Otjiwarongo District. Unlike large infrastructure or mining projects, the construction of the 22 kV medium-voltage powerline is short-term, spatially confined, and technically straightforward. However, its long-term operational benefits are significant for rural productivity and sustainability.

The project's socio-economic relevance must therefore be assessed in terms of:

- Short-term construction impacts,
- Long-term agricultural productivity gains,
- Infrastructure upgrading within a commercial farming landscape,
- Compatibility with existing land use and livelihoods.

3.1.6.1 Potential Positive Contributions

Although construction activities are expected to last approximately 30 days, the project offers several positive contributions:

3.1.6.1.1 Short-Term Construction Phase Benefits

Short-term construction phase benefits include:

- Temporary employment opportunities for:
  - General labourers,
  - Pole installation teams,
  - Drivers and equipment operators,
  - Security or site assistants where required.
- Procurement of goods and services from Otjiwarongo, including:
  - Fuel and lubricants,
  - Electrical hardware and construction materials,
  - Accommodation and catering (if required),
  - Vehicle repairs and mechanical services.
- Engagement of local electrical contractors or sub-contractors where feasible. While the employment footprint is modest, these short-term economic injections are locally relevant, particularly in rural economies dependent on agriculture.

3.1.6.1.2 Long-Term Operational Benefits

The most significant socio-economic contribution arises during the operational phase:

- Improved energy reliability for farming operations;
- Reduced reliance on diesel generators;
- Lower long-term operating costs;
- Enhanced capacity for:
  - Irrigation pumping,
  - Water abstraction,
  - Cold storage,
  - Processing equipment,
  - Workshop operations;
- Reduced greenhouse gas emissions compared to diesel-based generation;
- Improved resilience during fuel shortages or price fluctuations.

Electrification strengthens farm viability and productivity, which in turn supports:

- Rural employment retention,
- Local economic stability,
- Agricultural competitiveness.

3.1.6.2 Key Socio-Economic Sensitivities

Because the project is located within a commercial farming landscape, the primary socio-economic sensitivities relate to land use and farm operations rather than residential displacement.

Key sensitivities include:

3.1.6.2.1 Protection of Farm Infrastructure

- Boreholes and water infrastructure;
- Internal farm roads and tracks;
- Livestock fencing and gates;
- Pipelines and reservoirs;
- Farm security arrangements.

3.1.6.2.2 Livestock and Grazing Management

- Avoiding unnecessary disturbance to grazing camps;
- Ensuring livestock are not stressed by construction noise or vehicle movement;
- Preventing open trenches or pits that could pose risks to animals.

3.1.6.2.3 Traffic and Dust Management

- Managing construction vehicle speeds;
- Minimising dust generation along farm roads;
- Coordinating movement through gates and controlled access points.

3.1.6.2.4 Safety Considerations

- Ensuring pole foundations are secured;
- Preventing unsafe conductor stringing across active grazing areas;
- Maintaining safe clearance distances from farm buildings and infrastructure.

Unlike urban electrification projects, there are no high-density settlements within the immediate project footprint. However, shared access roads may be used by neighbouring farms and must be managed responsibly.

3.1.6.3 Overall Socio-Economic Sensitivity Rating

The overall socio-economic sensitivity of the project area is assessed as **low to moderate**, based on:

- Very low residential density;
- Predominantly commercial agricultural land use;
- Limited duration of construction activities;
- Highly localised physical footprint (pole positions and alignment corridor);
- Reversible and manageable disturbance.

Potential impacts are considered manageable because:

- The alignment largely follows existing corridors;
- No permanent displacement of land use will occur;
- No loss of agricultural land of significance is expected;
- Impacts are confined to pole footprints and servitude clearance;
- Mitigation measures are straightforward and standardised.

With proper implementation of:

- Land access agreements,
- Construction-phase communication,
- Traffic management measures,
- EMP compliance,
- Vegetation management controls,

the project is not expected to result in:

- Long-term disruption to farming livelihoods;
- Permanent land-use conflict;
- Significant socio-economic displacement.

Instead, the electrification is expected to enhance rural productivity and long-term sustainability within the receiving agricultural environment.

3.2 Climate

3.2.1 Overview of Climatic Setting

The proposed 22 kV powerline project at Farm Nevada No. 15, Unit 10, near Otjiwarongo falls within Namibia's central plateau semi-arid climatic zone. This climatic region is characterised by:

- Low to moderate seasonal rainfall
- High summer temperatures
- Cool to cold winter nights
- High evaporation rates
- Low relative humidity during the dry season

The area forms part of the broader Otjozondjupa plateau system, where water scarcity, strong rainfall seasonality and high temperature variability influence land use, vegetation structure, and soil stability.

Climatic conditions are particularly relevant to the powerline project in relation to:

- Foundation excavation and soil stability
- Worker heat exposure during construction
- Dust generation along access routes
- Fire risk during vegetation clearing
- Storm and lightning exposure of overhead infrastructure

3.2.2 Rainfall Patterns

Rainfall in the Otjiwarongo area is seasonal and occurs predominantly during the summer months (December–March). Based on national climatic atlas data, the project area receives approximately 350–450 mm of rainfall per year, placing it within a moderate rainfall band relative to Namibia's western regions.

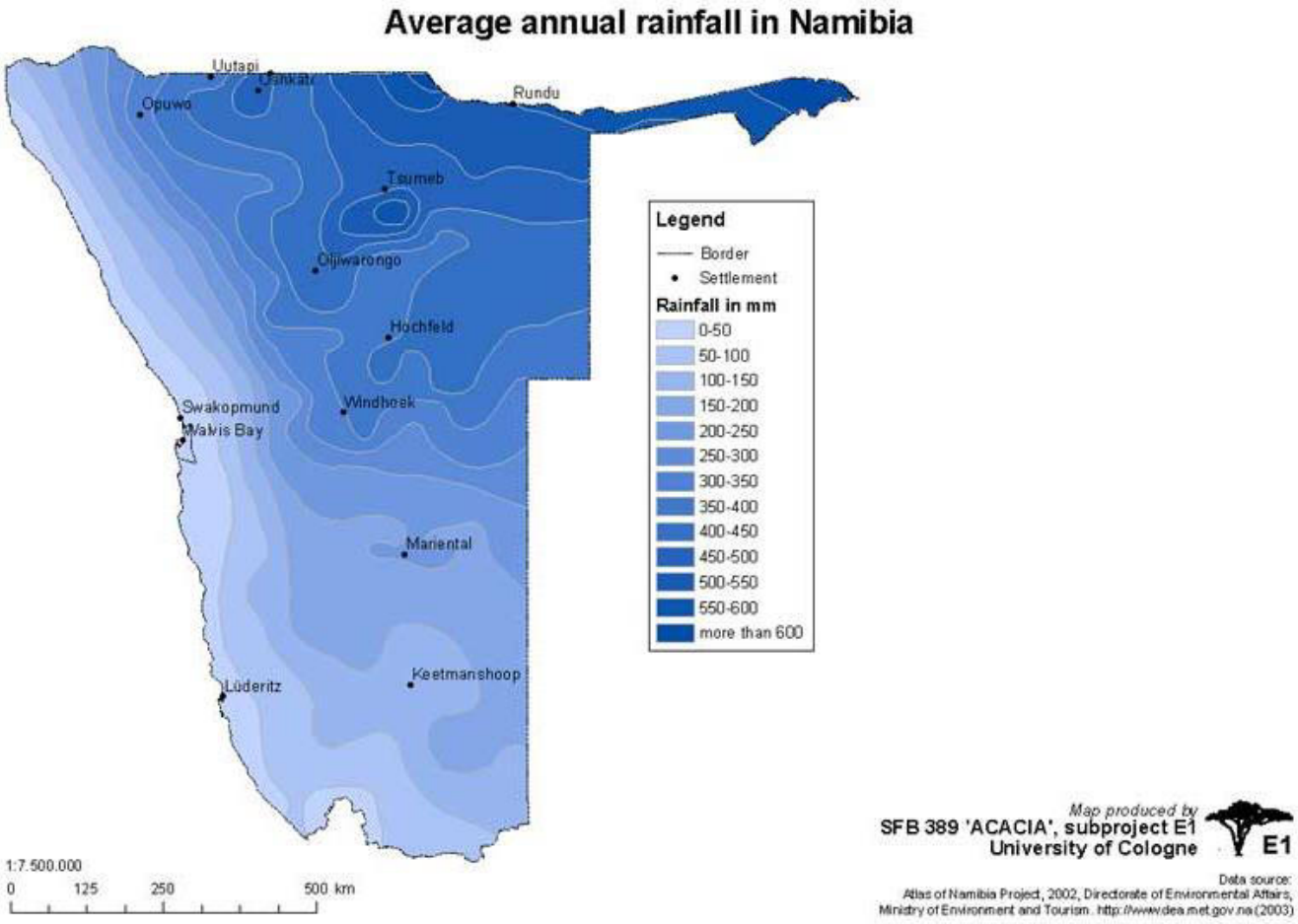

Figure 3-2: Average Annual Rainfall in Namibia

Figure 3.2 illustrates the east–west rainfall gradient across Namibia, with rainfall decreasing toward the coast. The Otjiwarongo area lies within the 350–450 mm isohyet band.

Rainfall is typically delivered through:

- Short-duration convective thunderstorms
- Localised heavy downpours
- Extended dry spells between events

Rainfall variability across central Namibia is significant.

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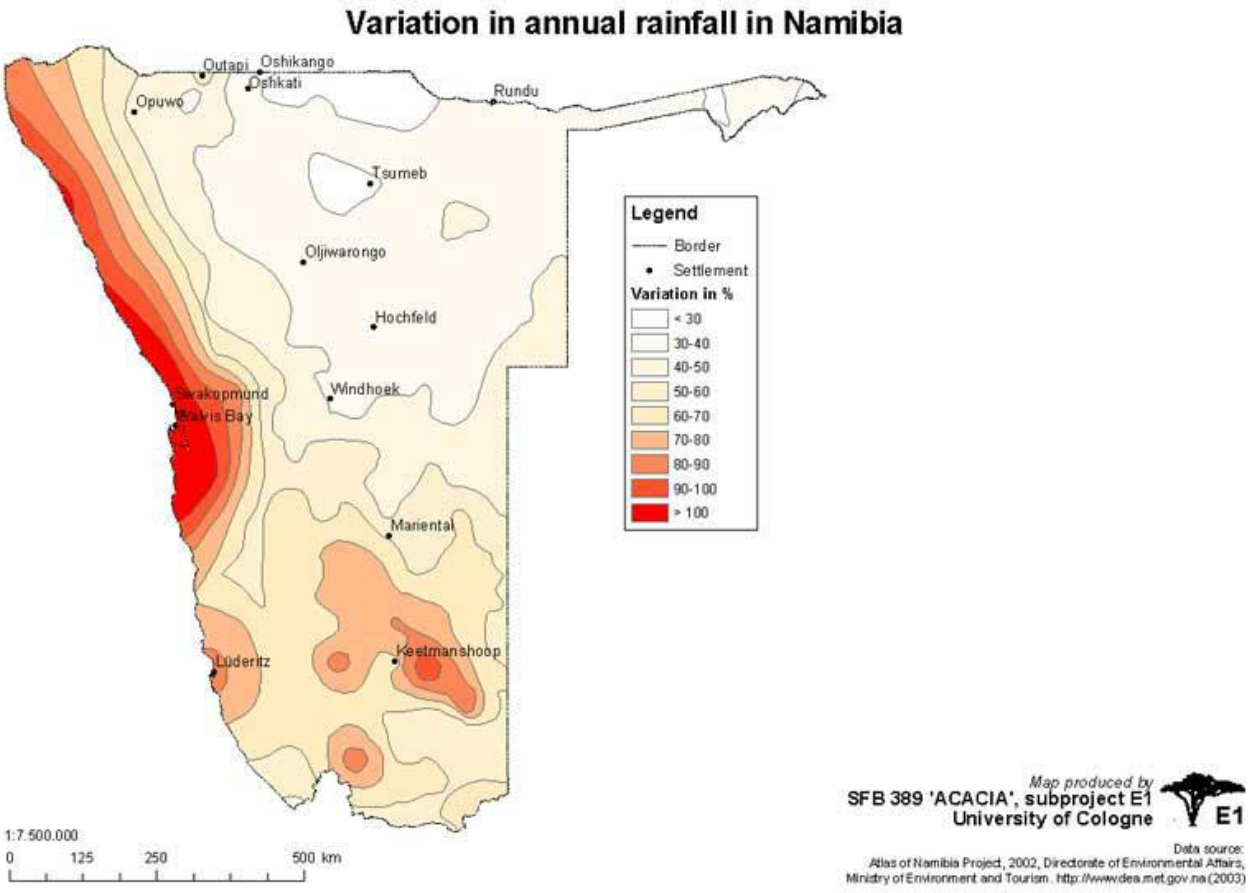

Figure 3-3: Variation in Annual Rainfall in Namibia

Figure 3.3 shows that inter-annual rainfall variability in the central plateau commonly ranges between 30–50%, indicating frequent drought cycles.

Rainfall influences:

- Timing of foundation excavation (wet soils may affect compaction)
- Temporary erosion around pole bases
- Access road conditions during construction
- Vegetation recovery within the servitude

The project does not require significant water abstraction; however, stormwater runoff around foundation areas must be appropriately managed.

3.2.3 Climate Variability and Extremes

The Otjiwarongo region experiences:

- Recurrent drought cycles (approximately every 3–5 years)
- Occasional high-intensity storm events
- Lightning activity during summer thunderstorms
- Multi-year dry periods

These extremes require:

- Lightning protection and earthing compliance for overhead lines
- Structural stability of poles under storm conditions
- Erosion control around disturbed areas

3.2.4 Temperature Regimes

The project area experiences warm to hot temperatures, with annual mean values ranging between 20–22°C.

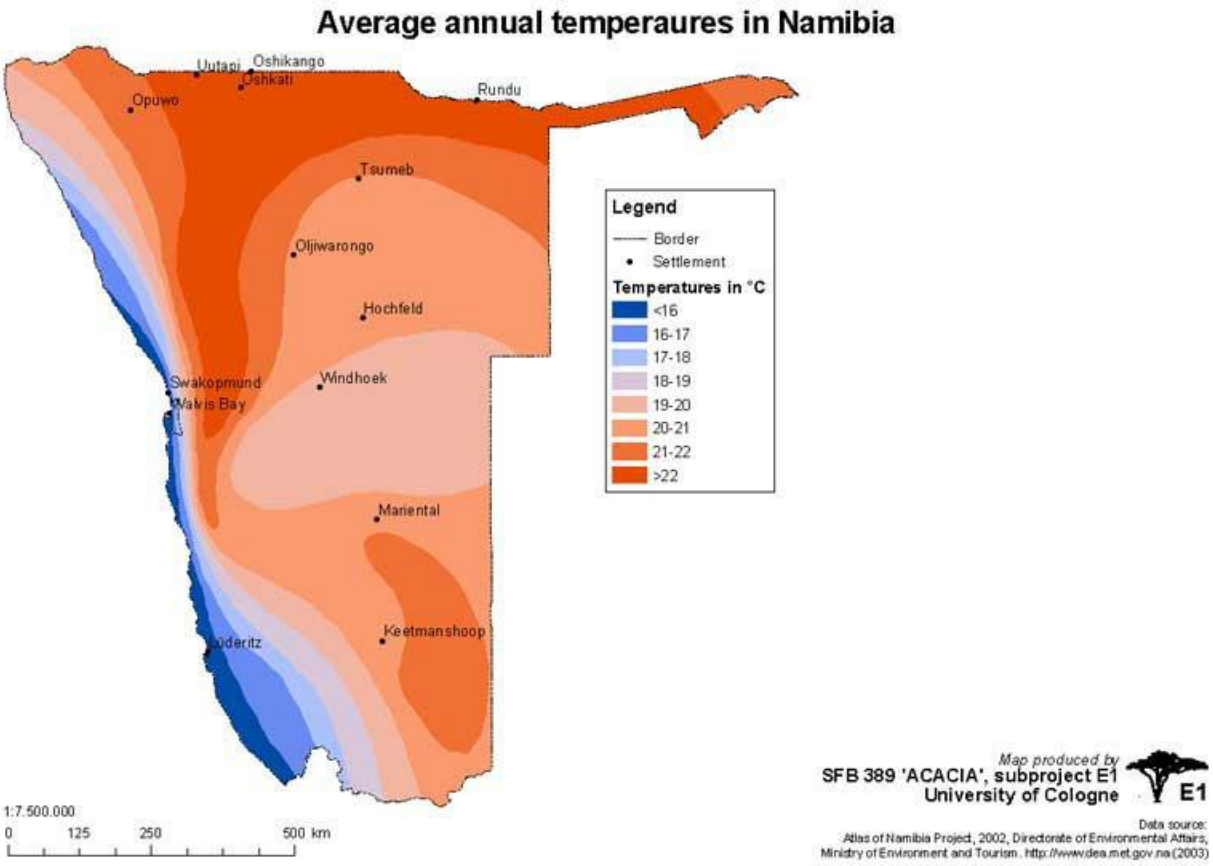

Figure 3-4: Average Annual Temperatures in Namibia

Seasonal patterns are typical of semi-arid central Namibia:

a. Summer (October–March)

- Daytime highs: 32–36°C
- Occasional peaks above 38°C
- Elevated heat-stress risk for construction workers

b. Winter (June–August)

- Daytime temperatures: 18–25°C
- Night-time lows: 0–6°C
- Occasional frost in sheltered areas

High temperatures may:

- Increase worker dehydration risk
- Influence concrete curing (if used in foundations)
- Harden soils during dry months

Cold winter mornings may affect worker productivity but do not pose significant structural risk to infrastructure.

3.2.5 Evaporation and Water Balance

Evaporation in the Otjiwarongo region significantly exceeds rainfall (Figure 3.5).

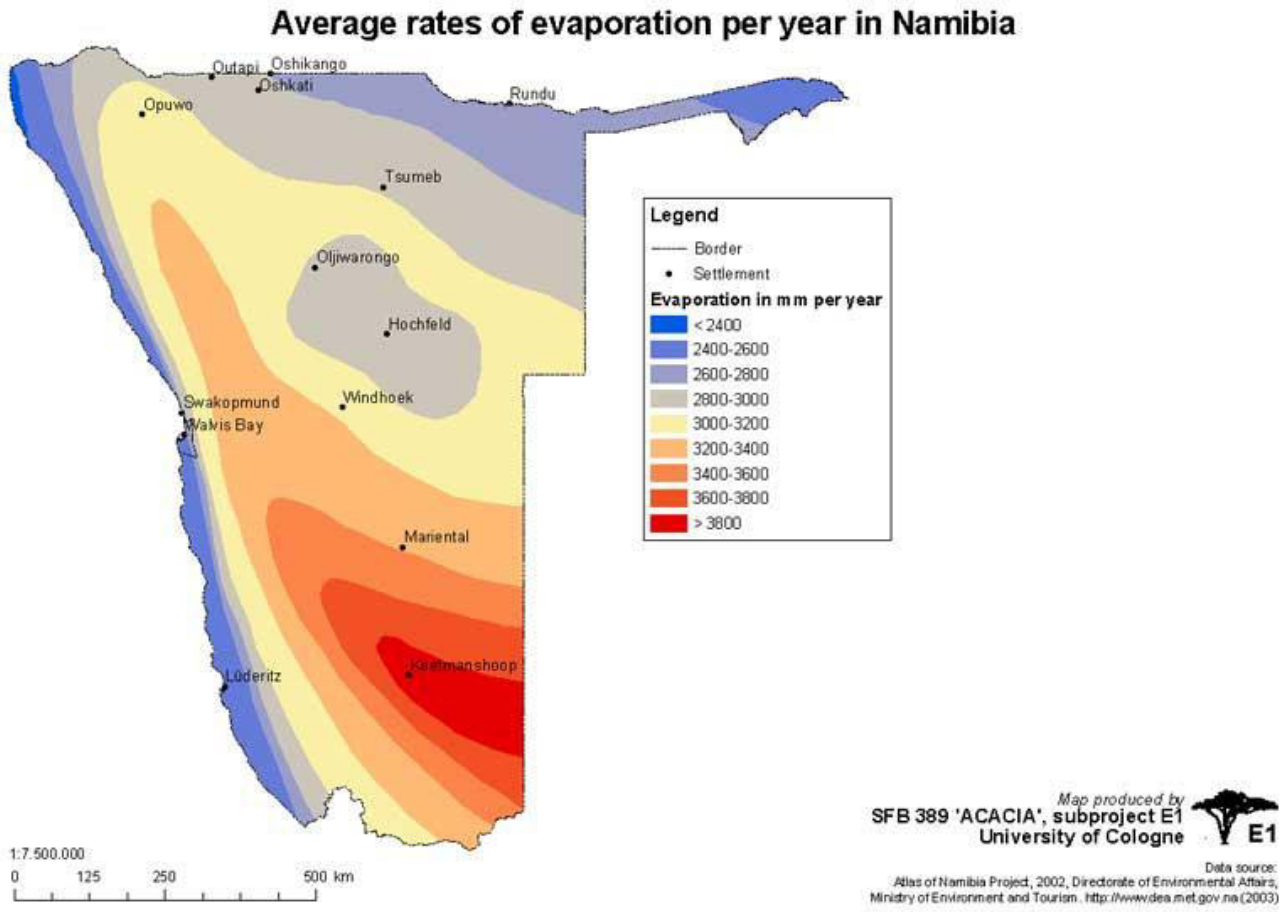

Figure 3-5: Average Evaporation Rates in Namibia

Average evaporation in the project area ranges between 2,600–3,000 mm per year, which far exceeds annual rainfall. This creates a strongly negative water balance.

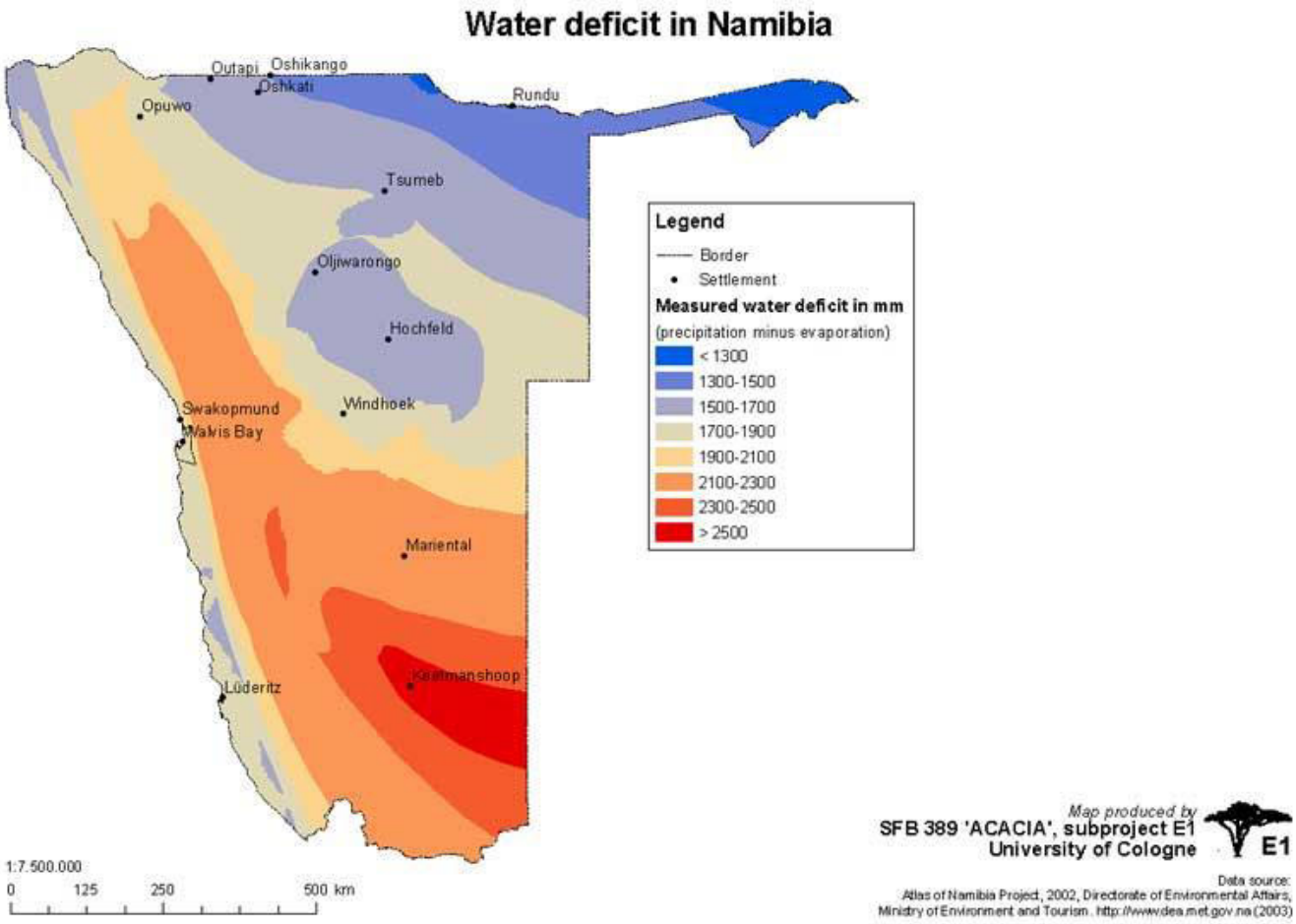

Figure 3-6: Water Deficit Map for Namibia

Figure 3.6 confirms that the project area falls within a 1,700–2,100 mm annual water deficit zone.

High evaporation contributes to:

- Rapid drying of disturbed soils
- High dust generation potential
- Elevated fire risk during dry seasons

Because the project is not water-intensive, climate-related water demand impacts are minimal. However, dust and fire management remain critical.

3.2.6 Humidity and Atmospheric Moisture

Relative humidity in the Otjiwarongo area is generally low, particularly during late winter (Figure 3.7)

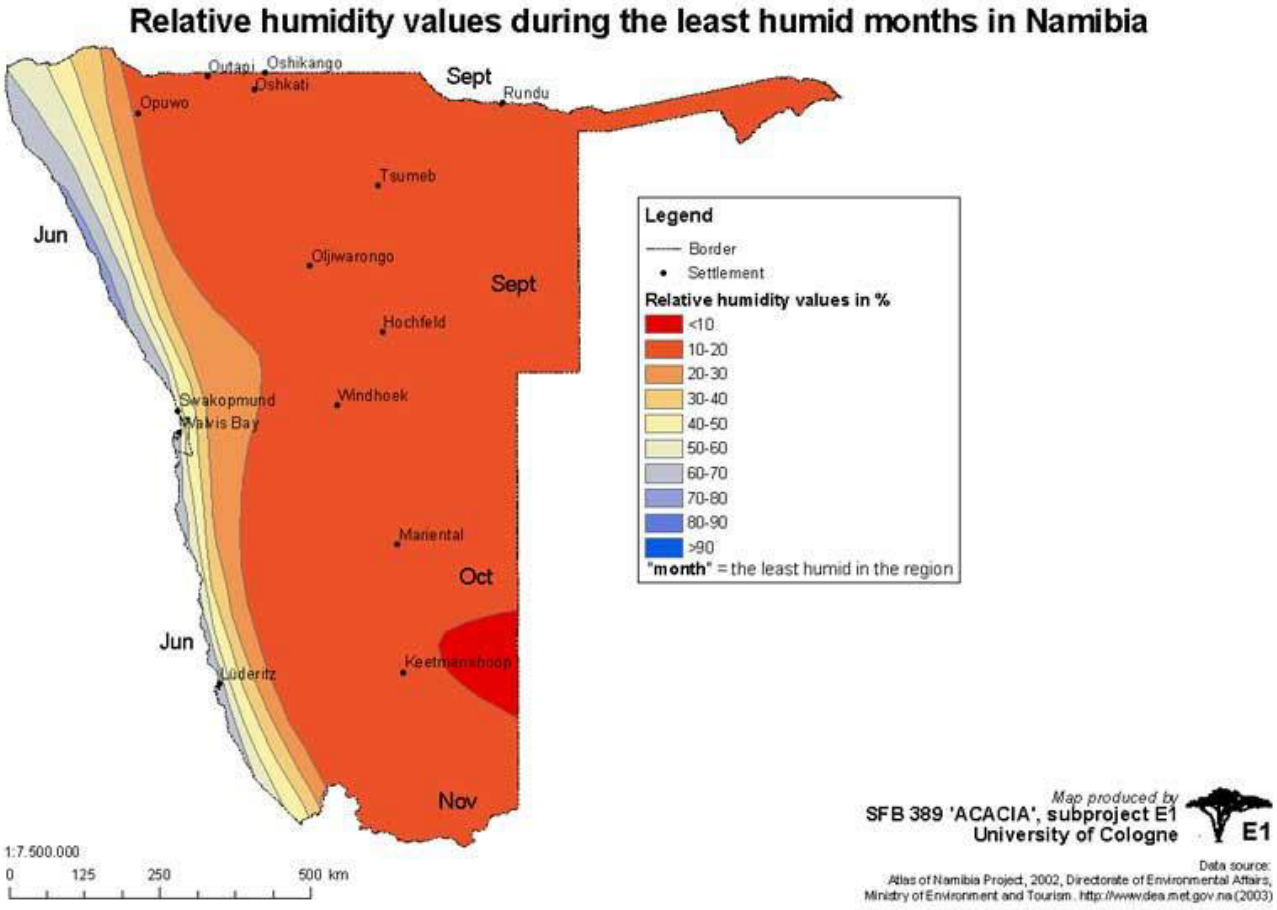

Figure 3-7: Relative Humidity Map for Namibia

Relative humidity typically ranges:

- 10–20% during August–September
- 30–50% during peak summer months

Low humidity contributes to:

- Increased dust generation during vehicle movement, drilling, and sampling,
- Dehydration risks for field staff,
- Elevated fire danger when combined with high winds and dry vegetation,
- Faster drying of soils and drilled spoils.
- Elevated veld fire danger

3.2.7 Wind Patterns

The Otjiwarongo area experiences:

- Predominantly easterly to south-easterly winds
- Strong seasonal gusts during late winter and early spring
- Thunderstorm-related wind events in summer

- Wind influences:
- Dust dispersion during construction
- Safe conductor stringing operations
- Fire spread potential

Construction scheduling must account for high-wind days, particularly during conductor installation.

3.2.8 Solar Radiation

The project area receives high levels of solar radiation.

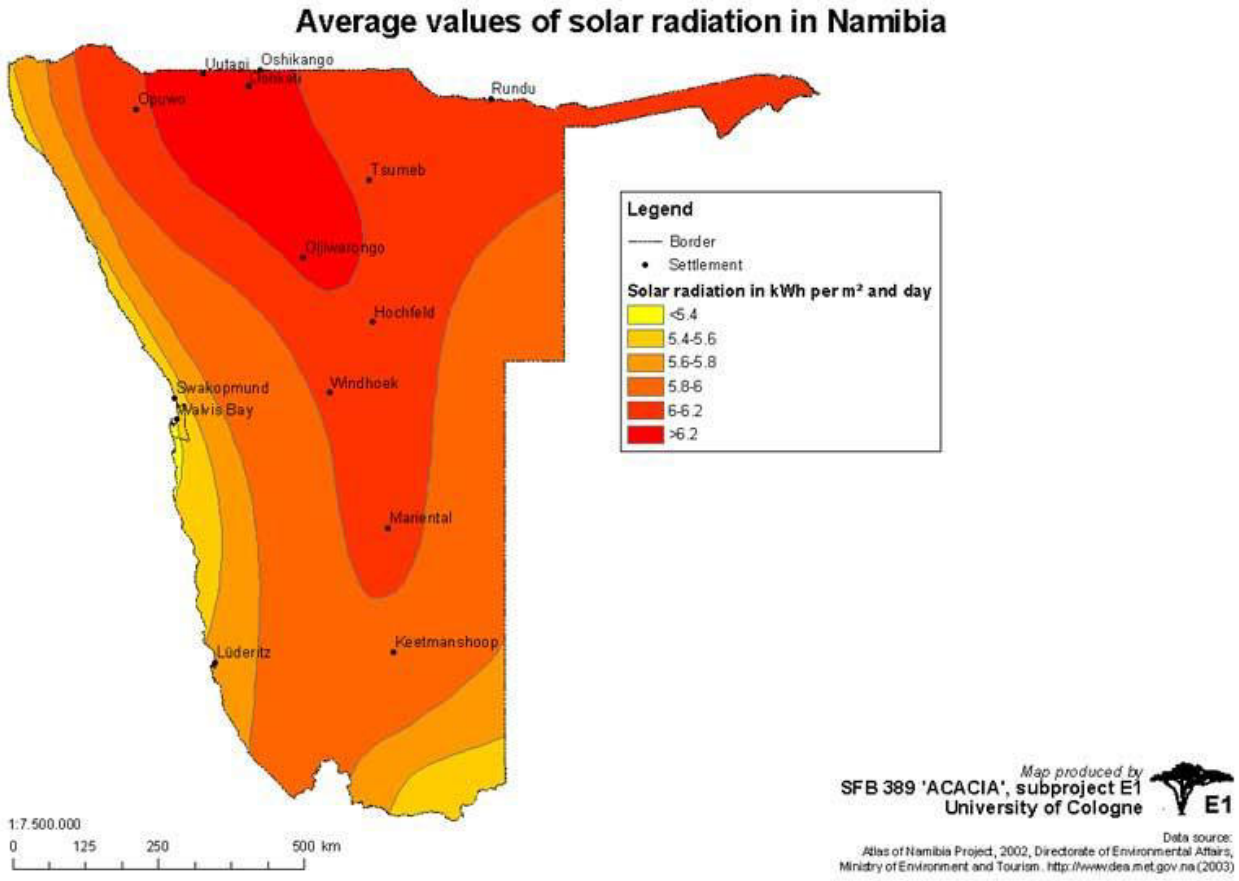

Figure 3-8: Solar Radiation Map

Solar radiation averages approximately 5.6–6.0 kWh/m²/day in the Otjiwarongo region.

High solar exposure:

- Increases worker heat load
- Enhances compatibility with solar-powered farm systems
- Supports Namibia's renewable energy objectives

3.2.9 Overall Climatic Sensitivity

Climatic sensitivity for the proposed powerline project is assessed as **Moderate**, primarily due to:

- High evaporation and dust potential
- Seasonal heat stress
- Lightning exposure
- Fire risk during dry windy periods

However:

- The project footprint is narrow and linear
- Construction duration is short
- No water-intensive processes are involved
- Long-term climate impacts are negligible

With implementation of appropriate:

- Dust suppression measures
- Fire management protocols
- Worker safety procedures
- Lightning and earthing standards

climate-related risks are considered manageable.

3.3 Topography, Relief and Landscapes

The proposed powerline project area at Farm Nevada No. 15, Unit 10 is located within Namibia's central interior plateau, characterised by the transition from the lower-lying western escarpment to the elevated inland plateau. The topography of the Otjiwarongo District ranges from approximately 1,300 m to over 1,600 m above sea level, consisting of gently undulating plains, isolated low hills, shallow valleys, and scattered rocky outcrops typical of the central Namibian plateau.

These landforms influence drainage patterns, erosion potential, vegetation structure, and the level of physical access for construction activities associated with the installation of the 22 kV overhead powerline.

The Elevations and Relief Map (Figure 3-9) shows that the project area lies within a moderate-elevation belt between approximately 1,200–1,600 m above sea level, forming part of the interior plateau.

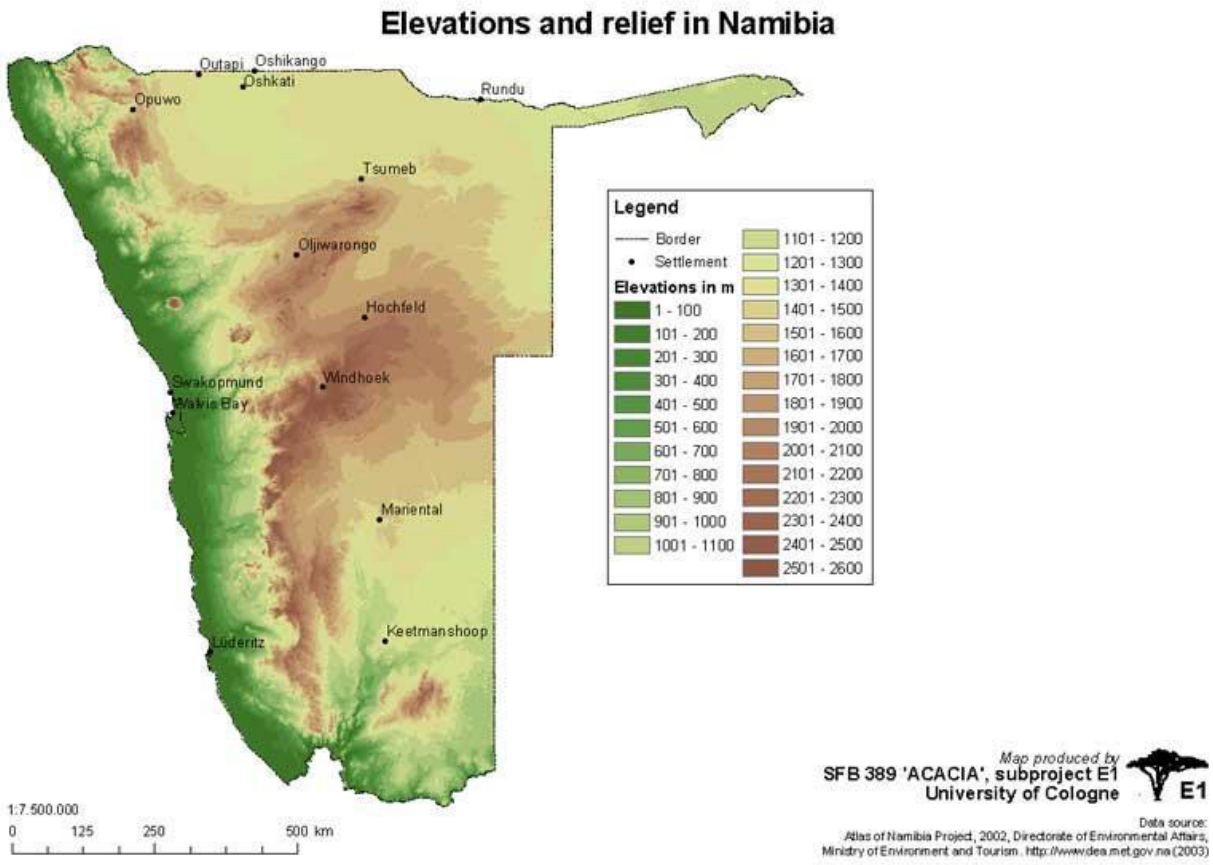

Figure 3-9: Elevations and Relief in Namibia

Although the escarpment zone further west contributes to more rugged terrain, the immediate project area around Otjiwarongo is characterised by relatively moderate slopes and open plateau conditions. Ephemeral drainage systems occur across the landscape and may convey runoff during heavy summer rainfall events. These geomorphological features result in shallow to moderately deep soils, occasional rocky patches, and intermittent slope changes that may affect vehicle movement, pole foundation excavation, and erosion sensitivity during construction.

The Altitudinal Profiles Map (Figure 3-10) illustrates the east–west rise in terrain from the coastal lowlands near Walvis Bay and Swakopmund toward the higher interior around Otjiwarongo. This gradient highlights the elevated plateau setting in which the project is located.

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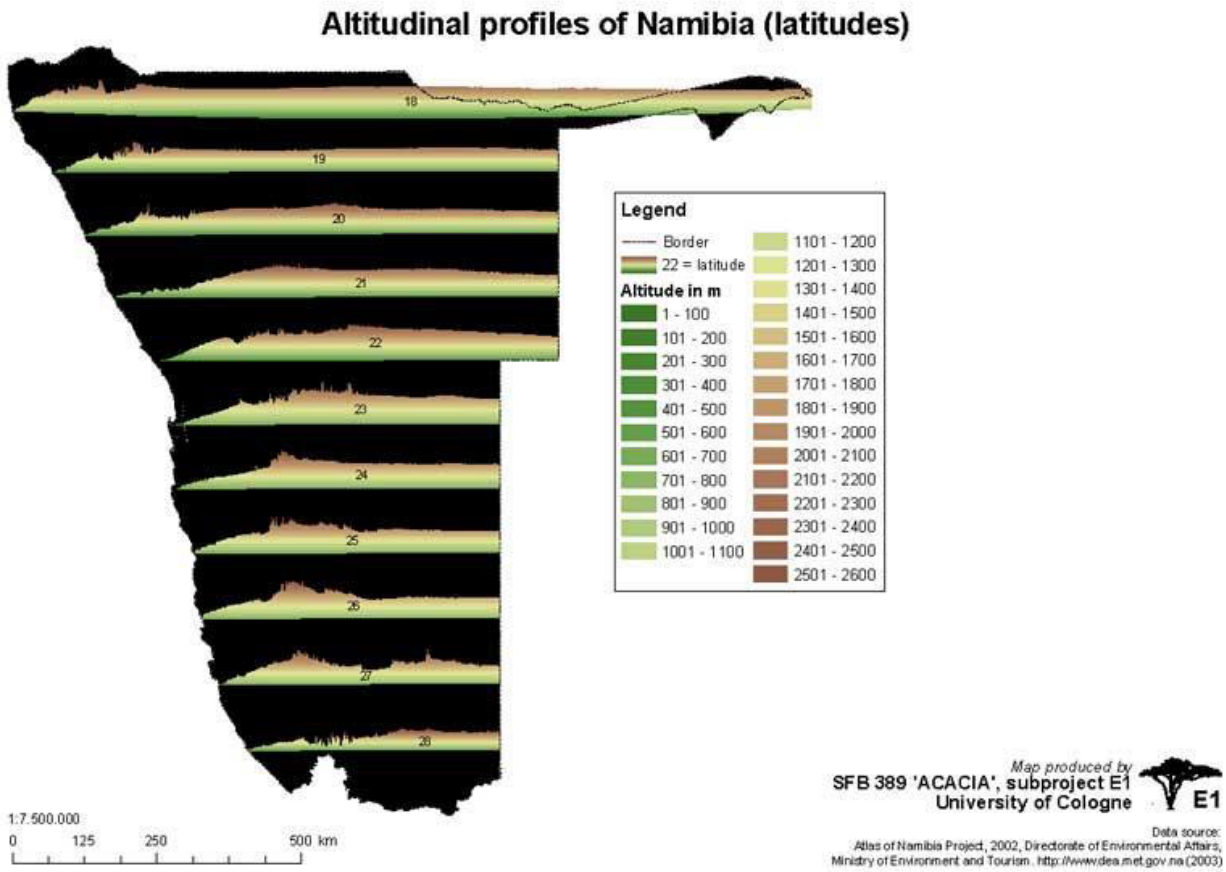

Figure 3-10: Altitudinal Profiles of Namibia

3.4 Soils

Soils across the proposed powerline project area at Farm Nevada No. 15, Unit 10 in the Otjiwarongo District are typical of Namibia's central plateau system. They consist predominantly of Arenosols, Regosols, shallow Calcisols and areas of exposed or near-surface bedrock.

As shown on the Dominant Soils Map of Namibia (Figure 3-11), the project area is characterised by a mosaic of:

- Rock outcrops in isolated ridges and shallow hills
- Eutric Regosols, typical of weakly developed plateau soils
- Haplic Calcisols, common in semi-arid rangelands with calcrete lenses
- Chromic and Cambic Arenosols, occurring in deeper sandy patches

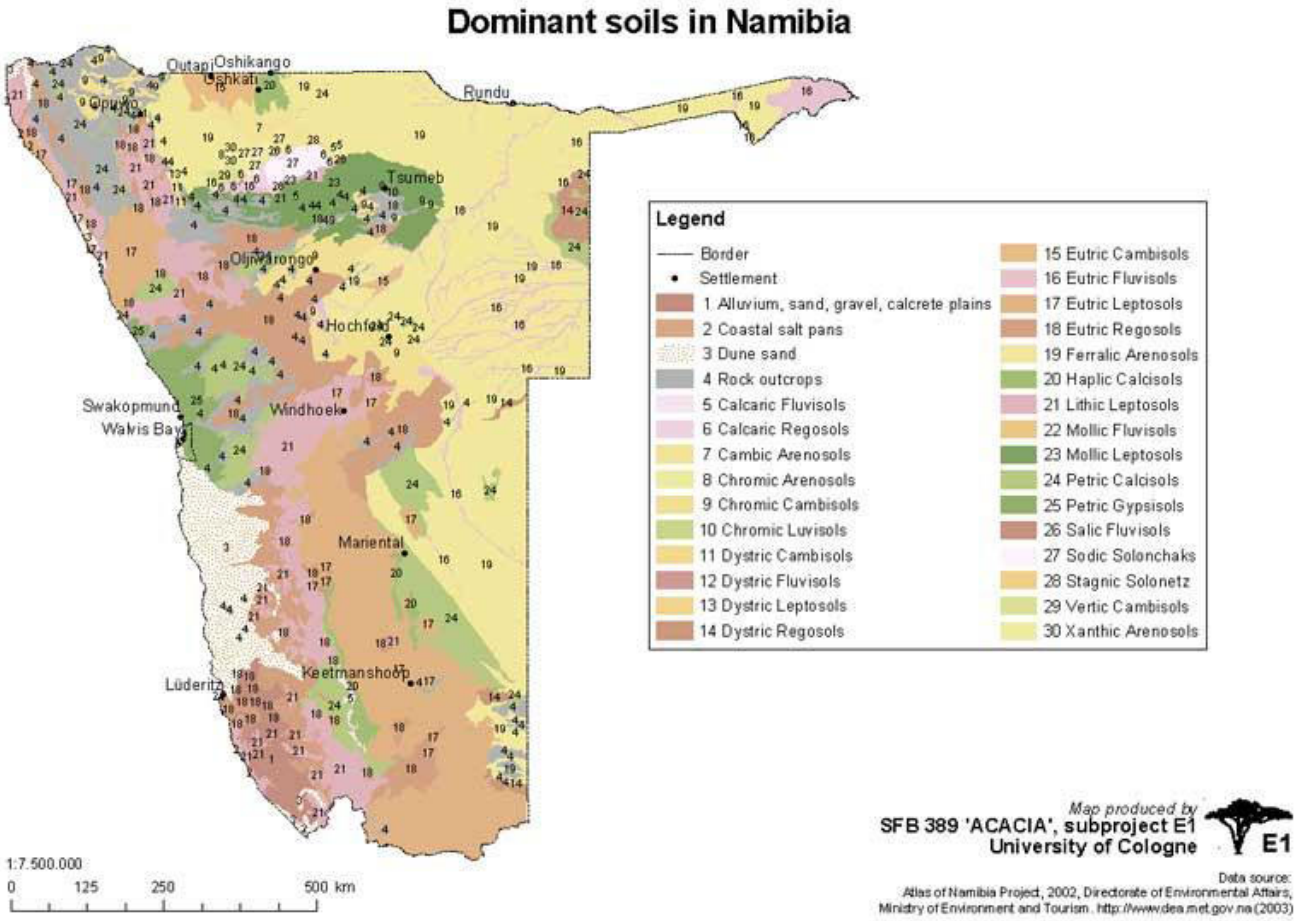

Figure 3-11: Dominant Soils in Namibia

These soils are generally:

- Moderately shallow to shallow (<60 cm in many areas)
- Sandy to sandy-loam in texture
- Well-drained
- Susceptible to compaction when disturbed
- Prone to erosion where vegetation cover is removed

For the powerline project, soil characteristics directly influence:

- Pole foundation stability
- Excavation depth and backfilling requirements
- Risk of erosion around pole bases
- Rehabilitation of disturbed areas
- Access track management during construction

Where deeper sandy and calcareous substrates occur, erosion potential increases once vegetation is disturbed. Therefore, strict adherence to soil conservation and rehabilitation measures outlined in the EMP is required.

Given the linear and localised footprint of the powerline, soil disturbance will be limited primarily to:

- Pole excavation sites
- Short-term access routes
- Temporary work areas

Impacts are expected to be minor and manageable with standard reinstatement practices.

3.5 Geology

The geology underlying the project area forms part of Namibia's central plateau geological framework. In the Otjiwarongo region, bedrock is generally dominated by:

- Metamorphic formations (including schists and gneisses)
- Granitic intrusions
- Localised calcrete accumulations in valley bottoms
- Fractured-rock aquifer systems

The Groundwater Basins and Rock Types Map (Figure 3-12) illustrates that the project area lies within a geologically complex terrain typical of central Namibia.

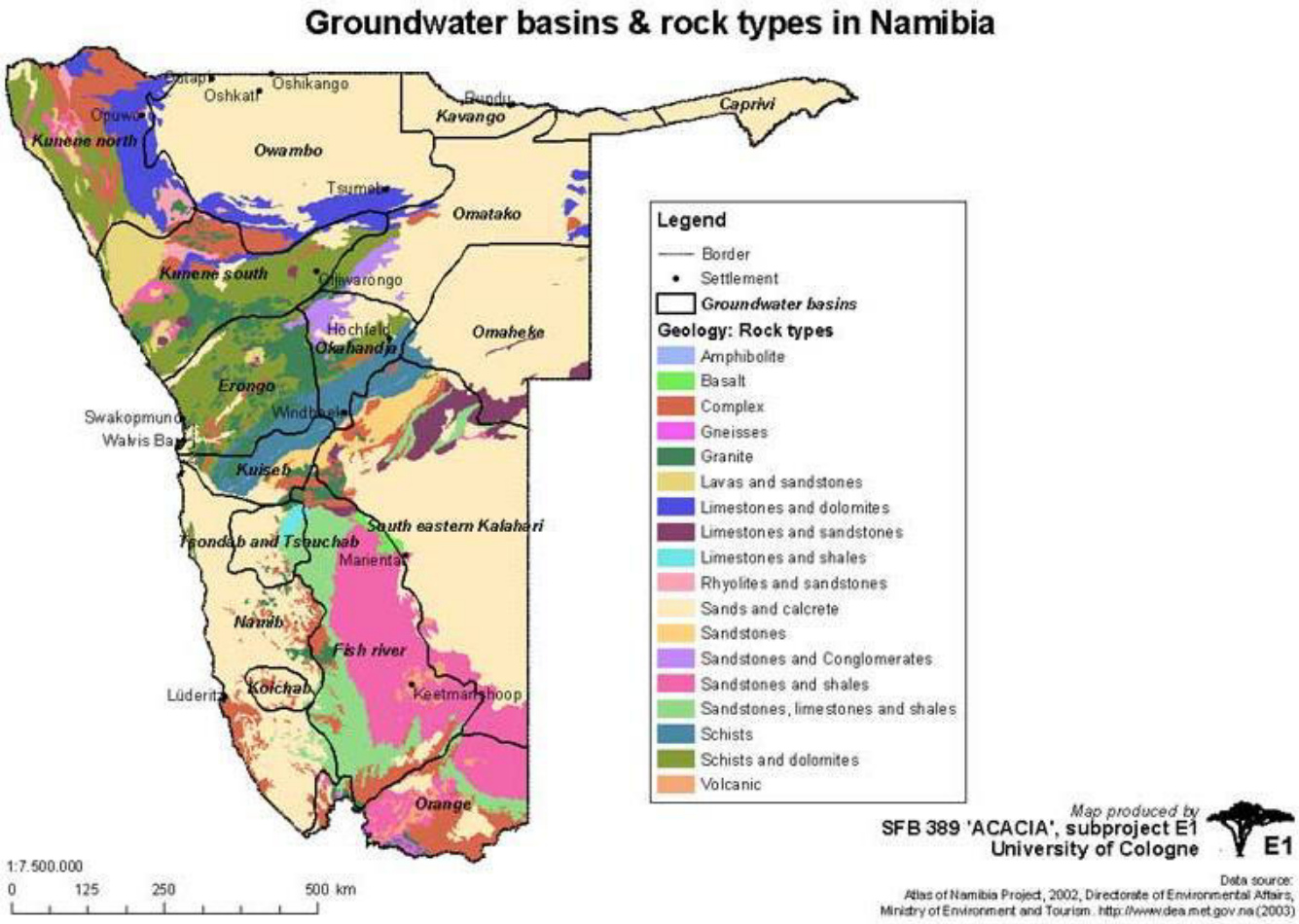

Figure 3-12: Groundwater Basins and Rock Types in Namibia

These lithologies influence:

- Foundation excavation difficulty in rocky sections
- Stability of pole foundations
- Groundwater occurrence within fractured-rock systems
- Drainage behaviour across the landscape

Unlike mineral exploration projects, the powerline installation does not involve subsurface drilling or geological extraction. However, geological conditions remain relevant for:

- Assessing excavation feasibility
- Determining whether mechanical or manual excavation is required
- Ensuring adequate compaction and stability of pole foundations
- Avoiding placement within unstable or highly fractured zones

Overall, geological conditions are considered suitable for standard pole installation methods, with only minor localised adjustments expected in rocky areas.

3.6 Hydrology

The project area lies within a semi-arid hydrological zone characterised primarily by ephemeral drainage systems. The Otjiwarongo region forms part of the broader inland drainage systems that flow episodically during high-intensity summer rainfall events.

The Hydrography Map of Namibia (Figure 3-13) confirms that:

- No perennial rivers occur within or near the immediate project area
- The landscape contains ephemeral drainage lines and shallow channels
- Surface water flow is highly seasonal

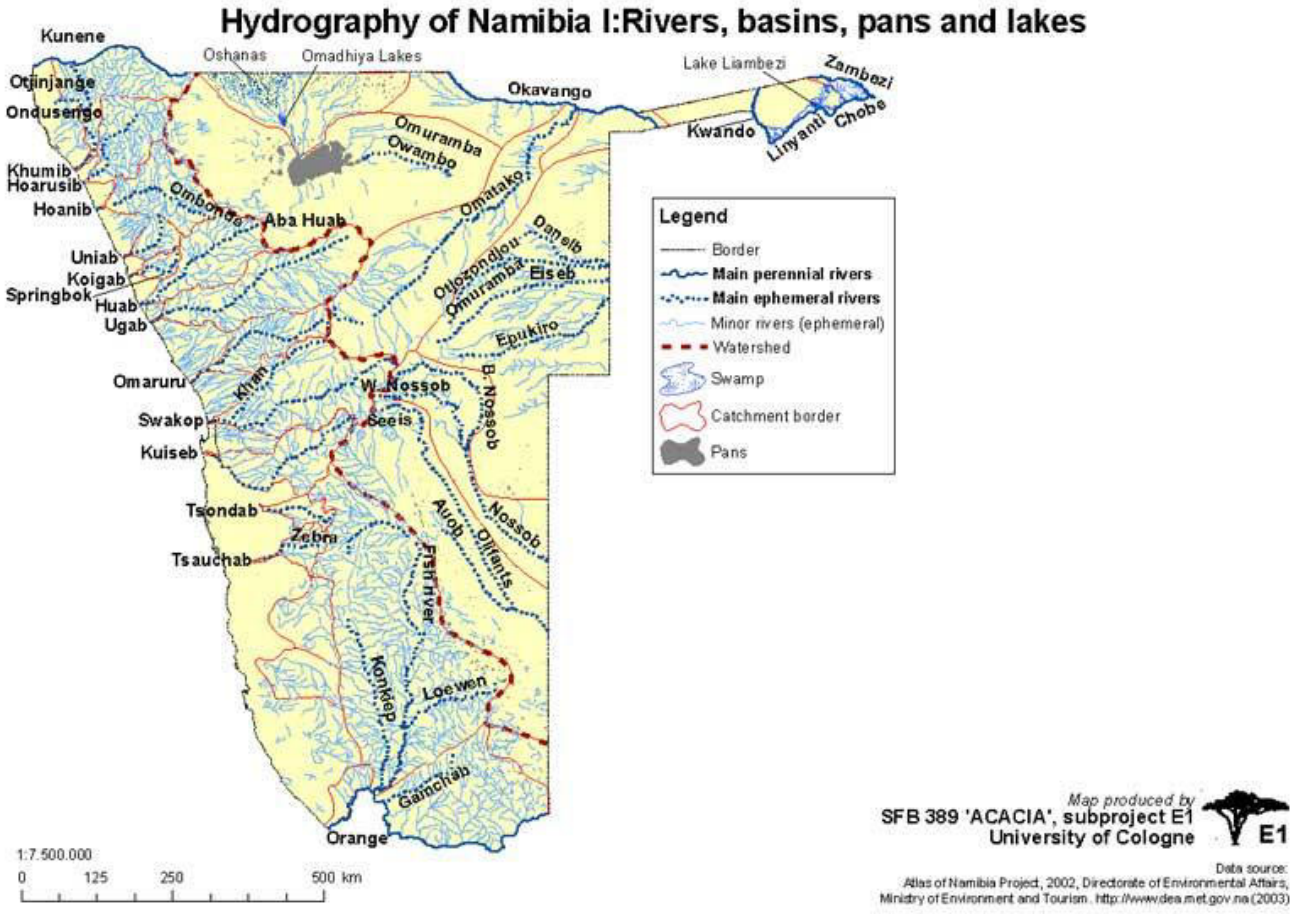

Figure 3-13: Hydrography of Namibia – Rivers, Basins, Pans and Lakes

Surface water availability is limited and confined to short-lived runoff events following heavy storms. Shallow drainage depressions may experience brief flash flows during intense rainfall.

For the powerline project, hydrological considerations include:

- Avoiding pole placement within active drainage lines
- Preventing obstruction of natural runoff pathways

- Ensuring that access routes do not alter drainage patterns
- Minimising soil compaction that could increase surface runoff

Because the project does not involve water abstraction or drilling fluids, hydrological contamination risks are minimal. However, standard precautions are required to prevent:

- Fuel or oil spills from construction equipment
- Sediment runoff into ephemeral channels
- Obstruction of natural drainage features

Given the limited footprint and absence of water-intensive activities, hydrological impacts are expected to be minor and localised.

3.7 Flora, Vegetation Structure and Biodiversity

The proposed 22 kV powerline project on Farm Nevada No. 15, Unit 10, in the Otjiwarongo District falls within Namibia's central Tree-and-Shrub Savanna Biome—one of the country's most extensive and ecologically important vegetation systems. Vegetation patterns in this region are shaped by semi-arid climatic conditions, variable summer rainfall, shallow plateau soils, and underlying metamorphic and granitic geology (Atlas of Namibia Project, 2002; Mendelsohn et al., 2003).

The landscape consists of a mosaic of shrub-dominated savanna, scattered woodland elements, and grass–shrub communities typical of central Namibia. These ecosystems support moderate biodiversity and provide essential grazing resources for livestock farming, which is the dominant land use in the Otjiwarongo area.

3.7.1 Vegetation Structure

Vegetation in and around the project area is primarily classified as Tree-and-Shrub Savanna, with localised transitions into Sparse Shrubland and Grass–Shrub Mosaic on shallower soils and rocky areas.

Dominant structural elements include:

- Vachellia and Senegalia shrub species
- Scattered savanna trees
- Perennial and annual grasses adapted to semi-arid conditions

Figure 3-14 illustrates that the Otjiwarongo region lies within Namibia's central savanna band characterised by shrub- and tree-dominated landscapes.

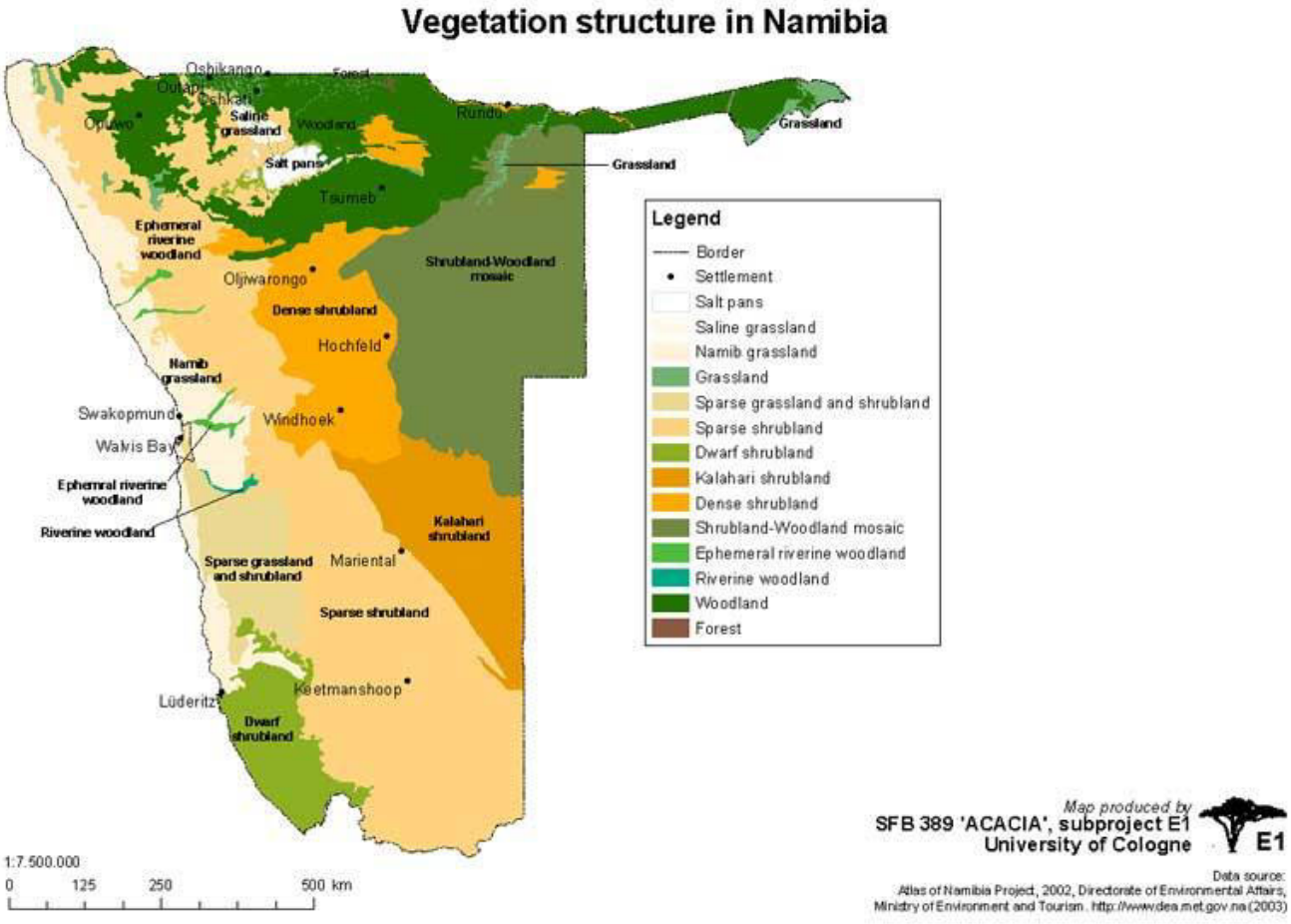

Figure 3-14: Vegetation Structure in Namibia

Vegetation density varies according to soil depth, slope and grazing pressure, with denser woody patches occurring along drainage lines and deeper soils.

For the powerline project, vegetation disturbance will be limited to:

- Pole foundation footprints
- Narrow working areas around poles
- Short temporary access routes where required

No large-scale vegetation clearing is anticipated.

3.7.2 Floral Diversity

The Otjiwarongo region supports approximately 150–300 plant species per grid unit, reflecting moderate biodiversity typical of semi-arid savannas. Species richness increases northwards with higher rainfall and declines toward drier western areas.

Figure 3-15 confirms that the project area lies within a medium-diversity band consistent with central plateau savanna vegetation.

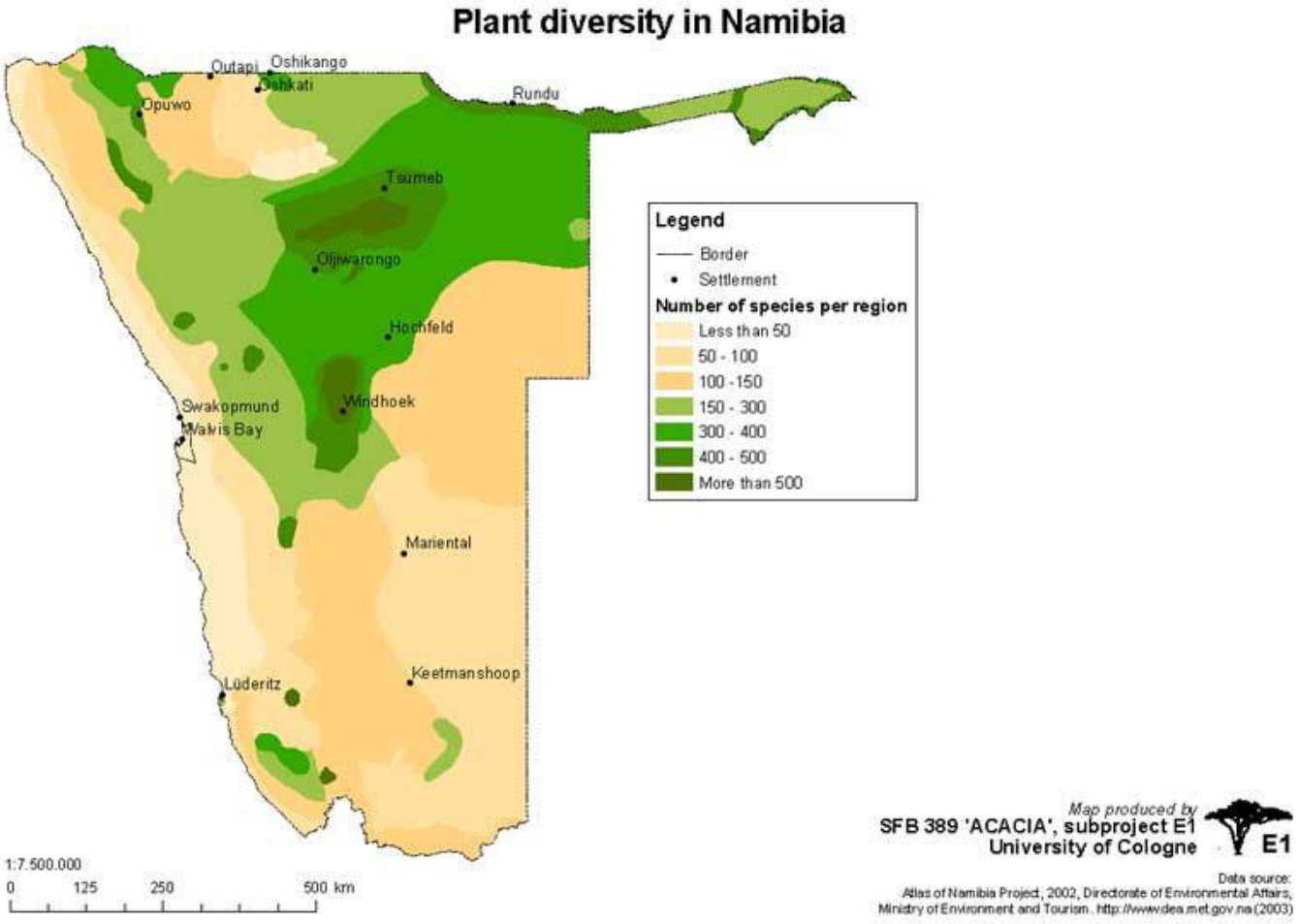

Figure 3-15: Plant Diversity in Namibia

Although biodiversity is moderate at national scale, localised microhabitats—such as drainage lines and rocky outcrops—can support higher species concentrations and must be considered during micro-siting of poles.

3.7.3 Important Plant Species

Several plant species of ecological, grazing, and regulatory importance are likely to occur within and around the project area. The broader national distribution patterns of selected species are shown in Figure 3-16.

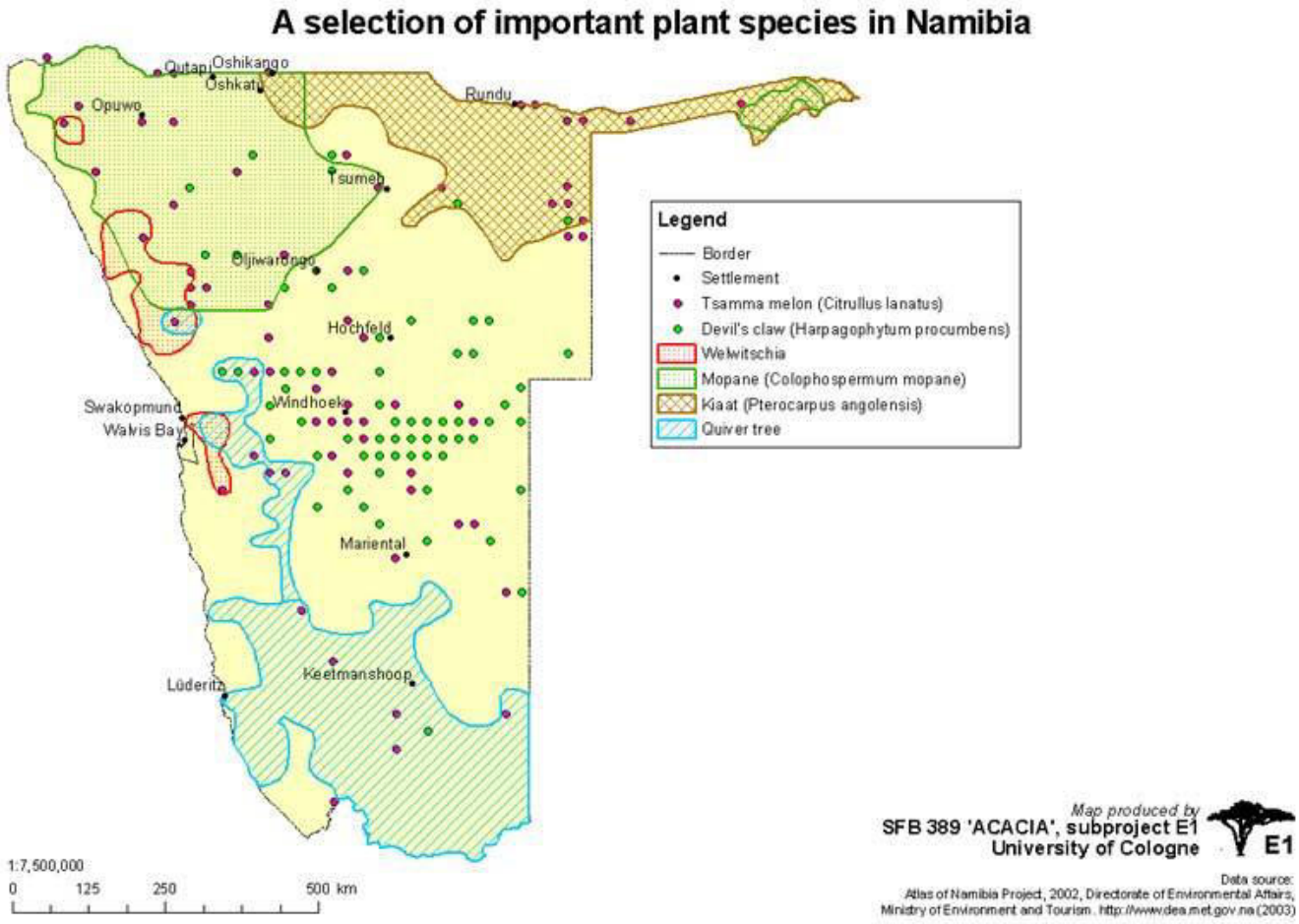

Figure 3-16: Important Plant Species in Namibia

3.7.3.1 Dominant and Co-Dominant Woody Species

These species define the structural character of the vegetation and are widely distributed across area. They shape habitat quality, bush density, and ecological sensitivity.

- *Vachellia mellifera* (Black Thorn) – common in central Namibia
- *Senegalia erubescens* (Blue Thorn)
- *Vachellia reficiens* (Red Thorn)
- *Boscia albitrunca* (Shepherd's Tree)
- *Terminalia prunioides*
- *Grewia flava / G. flavescens*

These species form the vegetation matrix within which pole placement and access alignment must be carefully planned.

3.7.3.2 Less Dominant but Ecologically Significant Species

These species occur at lower densities but hold notable ecological, cultural or economic value:

- *Harpagophytum procumbens* (Devil's Claw) – regulated medicinal plant
- *Commiphora species* – common in rocky terrain
- *Aloe species* – present on rocky slopes

These species contribute significantly to ecosystem function, forage availability and microhabitat diversity.

3.7.3.3 High-Value and Protected Species (Patchy / Low Density)

Although not dominant in the immediate project area, the following species remain relevant for screening:

- *Pterocarpus angolensis* (Kiaat) – protected under the Forestry Act
- *Aloe dichotoma* (Quiver Tree) – protected species
- *Colophospermum mopane* (Mopane) – more common further north

If encountered, these species require avoidance and regulatory compliance.

3.7.3.4 Interpretation for the Powerline Project

Based on local conditions and vegetation structure:

- Dominant vegetation consists of thornbush and savanna tree species.
- Protected or high-value species may occur sporadically.
- Sensitive microhabitats include drainage lines and rocky outcrops.

Therefore, the project requires:

- Pre-construction vegetation walk-through inspection
- Micro-siting of poles to avoid protected species
- Minimal clearing footprint
- Compliance with the Forestry Act (2001)

3.7.3.5 Ecological Planning Implications

Key considerations for the powerline include:

- Micro-siting of poles to avoid large trees and protected species
- Avoidance of drainage-line woodland where possible
- Restricting clearing to the minimum area required for safety clearance
- Rehabilitation of disturbed areas after construction

- Retention of grass cover to prevent erosion

Because the project footprint is linear and limited, ecological disturbance is expected to be localised and reversible.

3.7.3.6 Overall Conclusion

The vegetation of the project area represents a typical central Namibian Tree-and-Shrub Savanna system. While not classified as highly sensitive at national scale, it supports grazing resources and scattered protected species that require responsible management. With appropriate micro-siting and adherence to the EMP, impacts on flora and biodiversity are expected to remain minor and localised.

3.7.4 Grass Cover and Ground Layer

Grass cover in the Otjiwarongo region is generally moderate (26–50%) in good rainfall years, declining during drought cycles. Common species include *Stipagrostis spp., Anthephora spp*., and *Eragrostis spp*. Figure 3-17 shows that central Namibia supports moderate grass cover compared to the arid western regions.

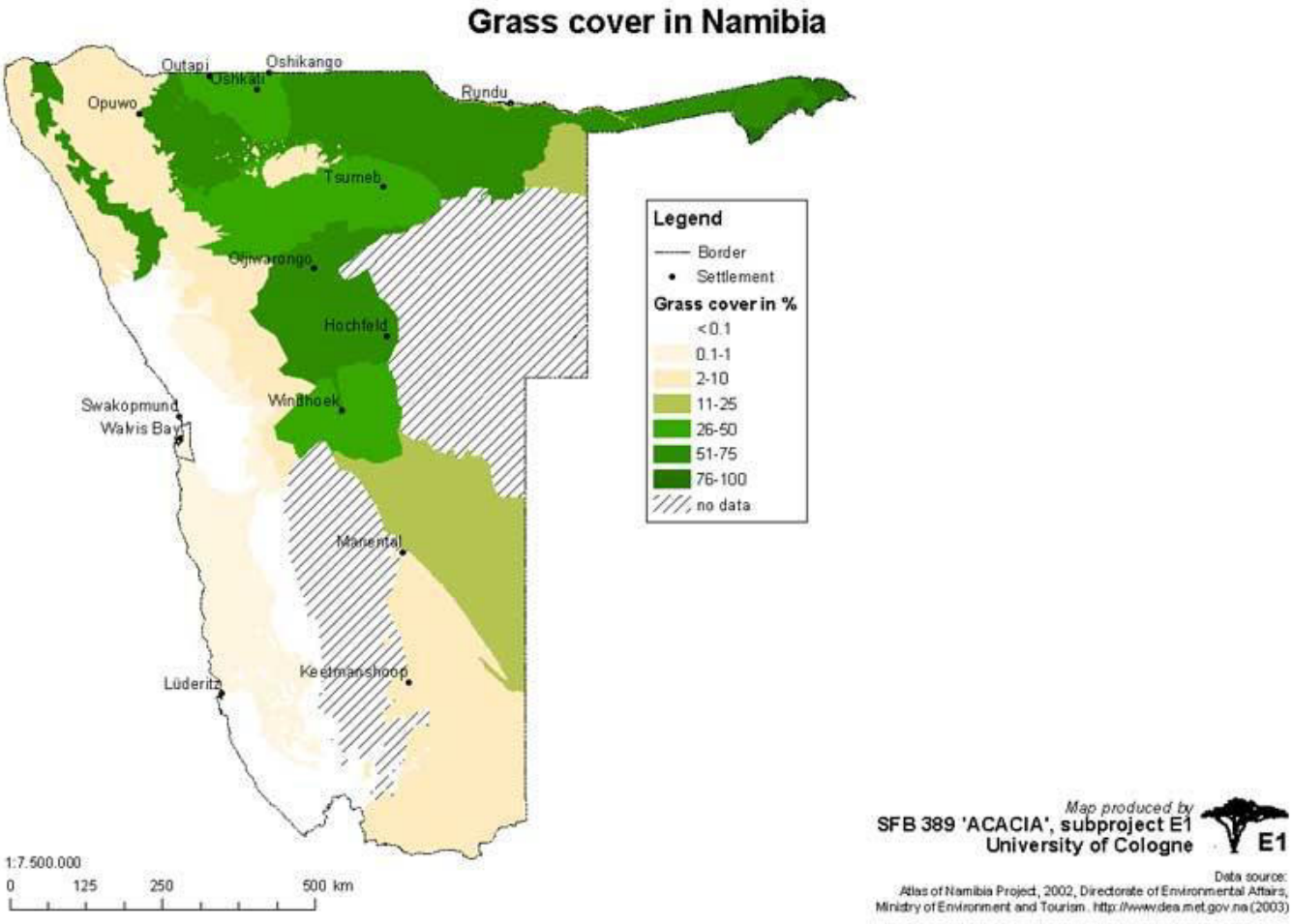

Figure 3-17: Grass Cover in Namibia

Grass cover is important for:

- Soil stabilisation
- Grazing productivity
- Erosion prevention

The project must therefore:

- Avoid unnecessary clearing
- Limit vehicle movement off existing tracks
- Restore compacted areas post-construction

3.7.5 Biome Context and Conservation Importance

The project area lies entirely within the Tree-and-Shrub Savanna Biome—the largest biome in Namibia and a key ecological system supporting livestock farming and wildlife movement. Figure 3-18 confirms the project's biome location.

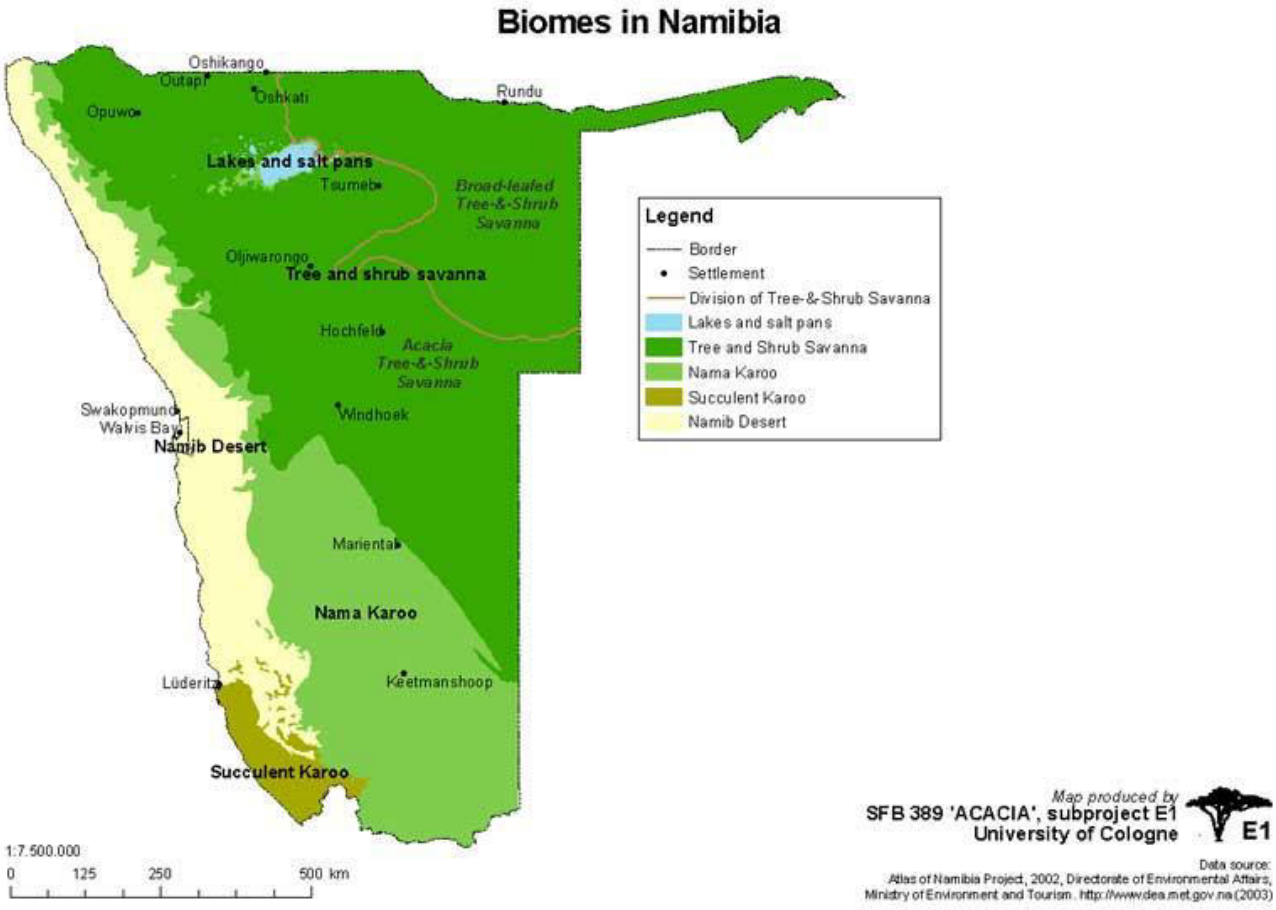

Figure 3-18: Biomes of Namibia

Bush encroachment by Vachellia mellifera and related species is a regional concern, affecting grazing capacity. However, the limited vegetation removal required for the

powerline will not materially contribute to encroachment trends. Vegetation clearing must remain confined to essential safety and servitude requirements.

3.7.6 Relevance to the EIA

Although the powerline project is small-scale and linear, vegetation may be directly affected through:

- Pole excavation
- Narrow vegetation clearance beneath conductors
- Temporary access routes
- Vehicle movement

Species of concern require:

- Micro-siting to avoid individual protected plants
- Compliance with applicable forestry regulations
- Pre-construction vegetation inspection

Given the economic importance of rangeland vegetation to farming livelihoods and the ecological value of the savanna biome, site-sensitive planning and strict adherence to the EMP will ensure impacts remain minor, localised and reversible.

3.8 Fauna

The project area falls within the Central Highlands and Tree-and-Shrub Savanna systems, which support moderate overall faunal diversity compared to Namibia's wetter northeastern regions. National gradients show that species richness generally increases from the arid southwest toward the more mesic northeast, placing the Karibib–Otjiwarongo–Omaruru zone within a transitional band (Mendelsohn et al., 2002). While not a national hotspot, the landscape supports a representative assemblage of mammals, birds, reptiles, amphibians and invertebrates typical of central Namibia, with local movements influenced by waterpoints, grazing patterns, and farm fencing.

3.8.1 Mammals

Central Namibia supports approximately 61–90 mammal species, aligning with the diversity expected around the corridor (Figure 3.19). Likely species include kudu, oryx, springbok, warthog, red hartebeest, and smaller carnivores such as jackal and caracal, as well as small mammals and bats.

For a powerline project, mammal sensitivities relate primarily to:

- disturbance during construction (noise, traffic),
- collision risk along access routes (especially night driving), and
- temporary barriers or habitat disruption where access intersects movement paths.

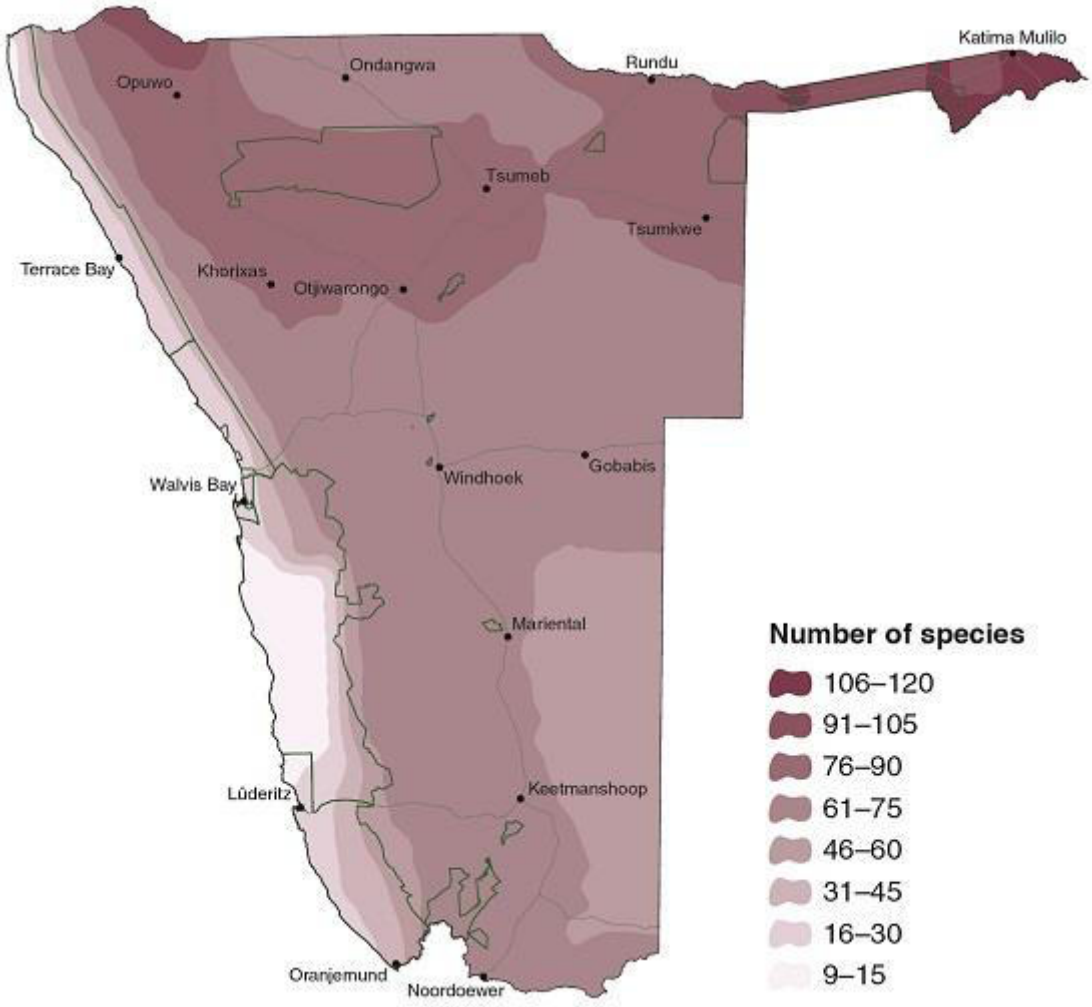

Figure 3-19: Mammal species richness mapS

3.8.2 Birds

The project area lies within a central Namibian savanna biodiversity band capable of supporting approximately 140–170 bird species (Figure 3.20). Avifaunal diversity in the region is influenced by:

- Tree-and-shrub savanna structure
- Ephemeral drainage lines and seasonal pans
- Mixed commercial grazing farmland
- Scattered water points and artificial reservoirs
- Proximity to wider wildlife movement corridors

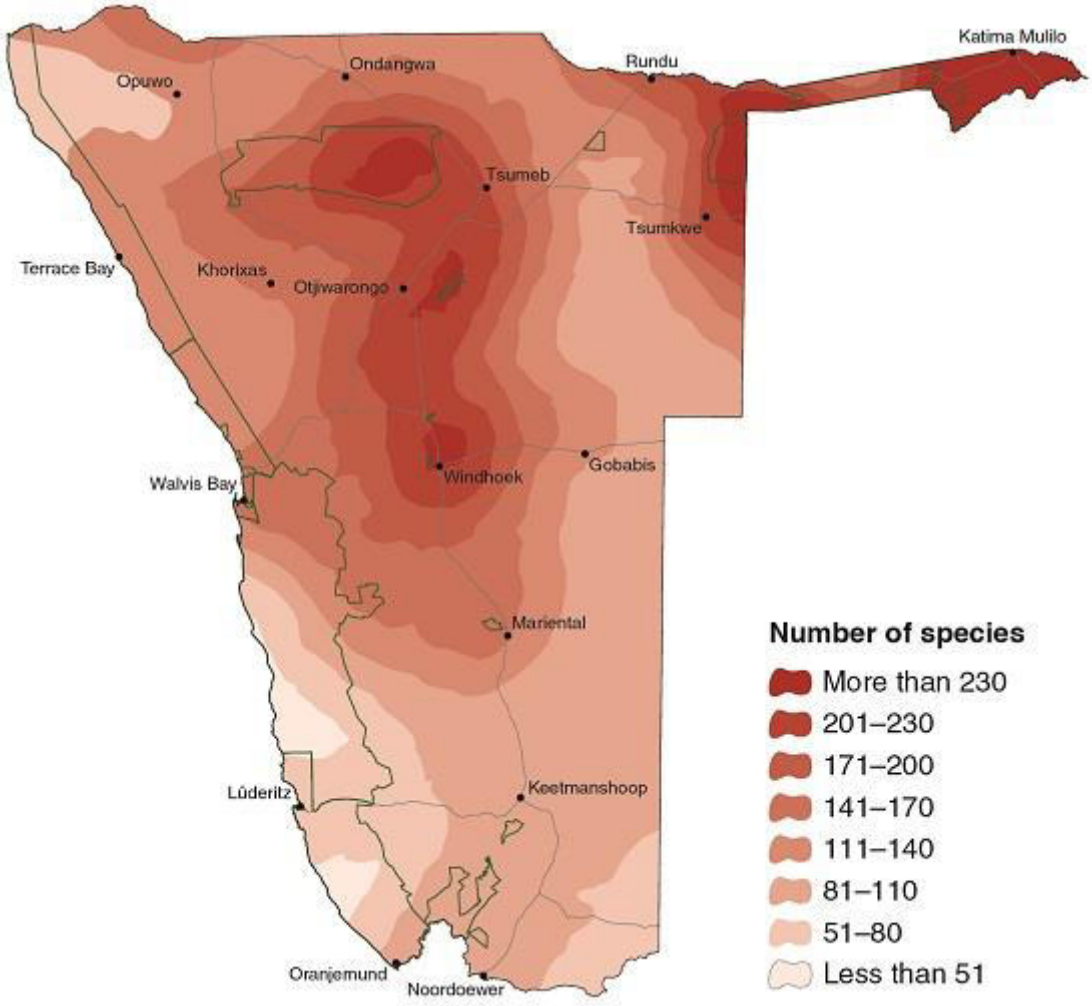

Figure 3-20: Bird species richness map

3.8.2.1 Bird communities

Bird communities in the Otjiwarongo–Karibib transition zone are typical of semi-arid savanna systems and include a mixture of resident, nomadic and seasonal species.

a) Large Raptors

Large-bodied raptors and vultures likely to occur include:

- Lappet-faced Vulture (*Torgos tracheliotos*) – IUCN Endangered
- White-backed Vulture (*Gyps africanus*) – IUCN Critically Endangered
- Hooded Vulture (*Necrosyrtes monachus*) – IUCN Critically Endangered
- White-headed Vulture (*Trigonoceps occipitalis*) – IUCN Critically Endangered
- Bateleur (*Terathopius ecaudatus*) – IUCN Endangered
- Martial Eagle (*Polemaetus bellicosus*) – IUCN Endangered
- Tawny Eagle (*Aquila rapax*) – IUCN Vulnerable
- Pale Chanting Goshawk (*Melierax canorus*) – Least Concern

These species are wide-ranging and utilise thermal updrafts for soaring. Large raptors are particularly sensitive to powerline infrastructure due to:

• Wide wingspan relative to conductor spacing
• Regular perching behaviour on elevated structures
• Long-distance commuting along open plains
• Attraction to livestock carcasses and water points

Given the conservation status of several vulture species in Namibia, even isolated mortality events may be ecologically significant.

b) Scavengers

Scavenger assemblages in the area may include:

• Hooded Vulture (*Necrosyrtes monachus*)
• White-headed Vulture (*Trigonoceps occipitalis*)
• Pied Crow (*Corvus albus*)
• Yellow-billed Kite (*Milvus migrans parasitus*)

Scavengers may be attracted to livestock carcasses on farmland, roadkill, or poorly managed waste. This can increase flight activity near infrastructure and elevate electrocution or collision exposure.

c) Savanna and Woodland Birds

Common savanna species include:

• Southern Yellow-billed Hornbill (*Tockus leucomelas*)
• Monteiro's Hornbill (*Tockus monteiri*)
• Lilac-breasted Roller (*Coracias caudatus*)
• Racket-tailed Roller (*Coracias spatulatus*)
• Burchell's Starling (*Lamprotornis australis*)
• Fiscal Shrike (*Lanius collaris*)
• Red-billed Spurfowl (*Pternistis adspersus*)
• Acacia Pied Barbet (*Tricholaema leucomelas*)

These species are generally less vulnerable to electrocution due to smaller body size, but may be susceptible to localised collision risk where lines intersect movement pathways.

d) Seasonal and Ground-Nesting Species

Open plains and lightly vegetated savanna areas may support:

• Sabota Lark (*Calendulauda sabota*)
• Spike-heeled Lark (*Chersomanes albofasciata*)
• African Pipit (*Anthus cinnamomeus*)
• Kori Bustard (*Ardeotis kori*) – Near Threatened
• Ludwig's Bustard (*Neotis ludwigii*) – Endangered
• Red-crested Korhaan (*Lophotis ruficrista*)
• Northern Black Korhaan (*Afrotis afraoides*)

Bustards and korhaans are of particular concern nationally due to documented susceptibility to powerline collision, especially in open landscapes where conductors are difficult to detect.

3.8.2.2 Avifaunal Sensitivity in Relation to Powerline Infrastructure

For rural 22 kV distribution lines, bird-related risks arise primarily from two mechanisms:

a) Electrocution Risk

Electrocution occurs when birds simultaneously contact:

• Two energised conductors, or
• An energised conductor and an earthed structure.

Risk is influenced by:

• Pole configuration and cross-arm design
• Conductor spacing
• Type of insulators
• Availability of perch points
• Behaviour of perch-hunting raptors

Although 22 kV lines generally pose lower electrocution risk than high-voltage transmission lines, wooden poles with narrow conductor spacing can still present hazards to large raptors and vultures if not bird-safe by design.

Given the presence of globally threatened vulture species in central Namibia, electrocution risk is considered a **moderate ecological sensitivity factor**, particularly if carcass attraction increases raptor density.

b) Collision Risk

Collision occurs when birds fail to detect conductors in flight, particularly:

• During dawn/dusk low light
• During strong crosswinds
• Along habitual commuting routes
• Where lines traverse open plains or drainage lines

Species most vulnerable to collision include:

• Ludwig's Bustard (*Neotis ludwigii*)
• Kori Bustard (*Ardeotis kori*)
• Large vultures
• Soaring eagles

Collision risk increases where:

• Lines cross ephemeral drainage lines that function as movement corridors
• Infrastructure intersects open grazing plains
• Carcass disposal increases local flight density

Given the relatively lower height of a 22 kV distribution line, collision risk is generally lower than that associated with high-voltage transmission lines; however, open plains conditions typical of the Karibib–Otjiwarongo corridor can still create localised exposure risk.

3.8.2.3 Site-Specific Risk Considerations

In the context of the proposed powerline:

• The area does not fall within a designated Important Bird Area (IBA).
• However, wide-ranging raptors and vultures are known from central Namibian farmlands.
• Livestock farming practices may influence scavenger density.
• Ephemeral drainage lines may function as linear movement corridors.
• Large open plains increase visibility challenges for certain ground-dwelling species.

Overall, avifaunal sensitivity is assessed as **moderate**, primarily due to the presence of threatened raptor and bustard species rather than species richness alone.

3.8.2.4 Construction Phase Considerations

During construction, potential impacts include:

- Temporary disturbance from machinery and noise
- Disturbance of nesting sites (if present in tall trees or rocky outcrops)
- Attraction of scavengers to improperly managed waste
- Increased vehicle activity

Mitigation during construction should include:

- Pre-construction inspection for active nests within the footprint
- Avoidance buffers around confirmed active raptor nests (if detected)
- No clearing of trees containing active nests
- Strict waste management
- Immediate removal of livestock carcasses within the servitude

Given the largely desktop nature of this study, a final pre-construction walkdown is recommended to confirm the absence of active nests in high-risk sections.

3.8.2.5 Operational Phase Considerations

Operational impacts are longer-term but generally low in magnitude.

Key concerns:

- Electrocution of large raptors
- Collision risk for bustards and vultures
- Perching behaviour increasing contact risk

Impact magnitude is expected to remain **low to moderate**, provided bird-safe design principles are implemented.

3.8.2.6 Mitigation Hierarchy for Avifauna

In line with EIA best practice and the mitigation hierarchy principle embedded within Namibia's environmental management framework, avifaunal impacts associated with the proposed 22 kV powerline should be addressed through a structured approach prioritising avoidance first, followed by minimisation, and finally operational management and adaptive monitoring. This hierarchy ensures that risks to sensitive species—particularly large raptors, vultures, and bustards—are reduced to the lowest reasonably practicable level.

a. Avoidance

Avoidance represents the most effective form of mitigation and focuses on preventing exposure of birds to electrocution and collision risk through careful planning and infrastructure placement during the design phase.

• Micro-alignment to minimise crossing of drainage corridors
• Avoid placement of poles adjacent to large nesting trees
• Avoid clustering near permanent water points

By incorporating avifaunal considerations at the routing and micro-siting stage, the project reduces the likelihood of interactions in areas where bird movement or nesting activity is naturally concentrated.

b. Minimisation

Where complete avoidance is not feasible, design-based and structural measures must be implemented to reduce the probability and consequence of bird interactions with the infrastructure. These measures focus on engineering design and visibility enhancement.

- Use bird-friendly pole configurations with adequate conductor spacing
- Ensure conductor-to-conductor and conductor-to-earth clearances meet bird-safe standards
- Install bird flight diverters in identified higher-risk segments (if required)
- Maintain vegetation beneath lines to improve visual contrast

Minimisation measures are particularly important for distribution lines where conductor spacing and pole design can significantly influence electrocution risk. Visibility-enhancement devices, where justified, can reduce collision probability for large-bodied species.

c. Operational Management

Despite avoidance and minimisation efforts, some residual risk may remain. Operational management therefore provides a monitoring and adaptive management framework to detect and respond to any unforeseen impacts during the operational phase.

• Quarterly inspection during first year of operation
• Recording of any bird mortality
• Adaptive mitigation if repeated incidents occur

Operational monitoring ensures that actual impact levels are verified against predicted risk, allowing for timely corrective action—such as targeted installation of diverters or perch management—if required.

3.8.2.7 Cumulative Considerations

Cumulative avifaunal impacts may arise where:

- Multiple distribution lines occur in proximity
- Infrastructure density increases within the farming landscape
- Carcass disposal practices attract scavenging raptors
- Existing transmission lines intersect with new distribution infrastructure
- Repeated small-scale mortality events occur across a wider landscape

Although the proposed 22 kV powerline represents a relatively small addition to the regional infrastructure network, cumulative effects must be considered at a landscape scale. Central Namibian farmlands already contain a mixture of transmission lines, distribution lines, farm fencing and other linear infrastructure. Even low individual mortality rates can become ecologically significant when combined across multiple projects, particularly for long-lived, slow-breeding species.

Vultures such as White-backed Vulture (*Gyps africanus*), Lappet-faced Vulture (*Torgos tracheliotos*), and Hooded Vulture (*Necrosyrtes monachus*) have low reproductive rates and high adult survival dependence. Consequently, even isolated electrocution or collision events can contribute disproportionately to regional population declines.

Bustards such as Ludwig's Bustard (*Neotis ludwigii*) are similarly vulnerable to cumulative collision mortality across extensive open landscapes.

Given the threatened status of several raptor and scavenger species occurring in central Namibia, cumulative mortality must be avoided even where individual project risk is assessed as low. The implementation of bird-safe design principles and post-construction monitoring therefore contributes not only to project-level compliance but also to broader regional biodiversity conservation objectives.

3.8.2.8 Conclusion

Although the project area does not represent a national avifaunal hotspot, it supports a diverse semi-arid savanna bird community including several globally threatened raptor and bustard species.

Electrocution and collision risks are inherent to overhead distribution lines; however, given:

• The 22 kV configuration,
• The absence of designated IBAs,
• The moderate species richness, and
• The application of bird-safe design and monitoring measures,

the overall avifaunal impact of the proposed powerline is expected to remain **low to moderate, localised, and manageable within the EMP framework**.

3.8.3 Reptiles

The region supports moderate reptile diversity (Figure 3.21), enhanced by rocky terrain. Powerline risks are mostly indirect:

- crushing/road mortality from construction traffic,
- disturbance of rocky refugia at tower sites, and
- increased exposure if ground cover is removed..

Likely species groups include:

- Lizards: agamas, plated lizards, geckos, skinks
- Snakes: puff adder, horned adder, mole snake, various harmless colubrids
- Tortoises: leopard tortoise (widespread but protected)

No range-restricted or highly sensitive reptile species are expected, but the area forms part of a broader escarpment-to-highveld diversity gradient.

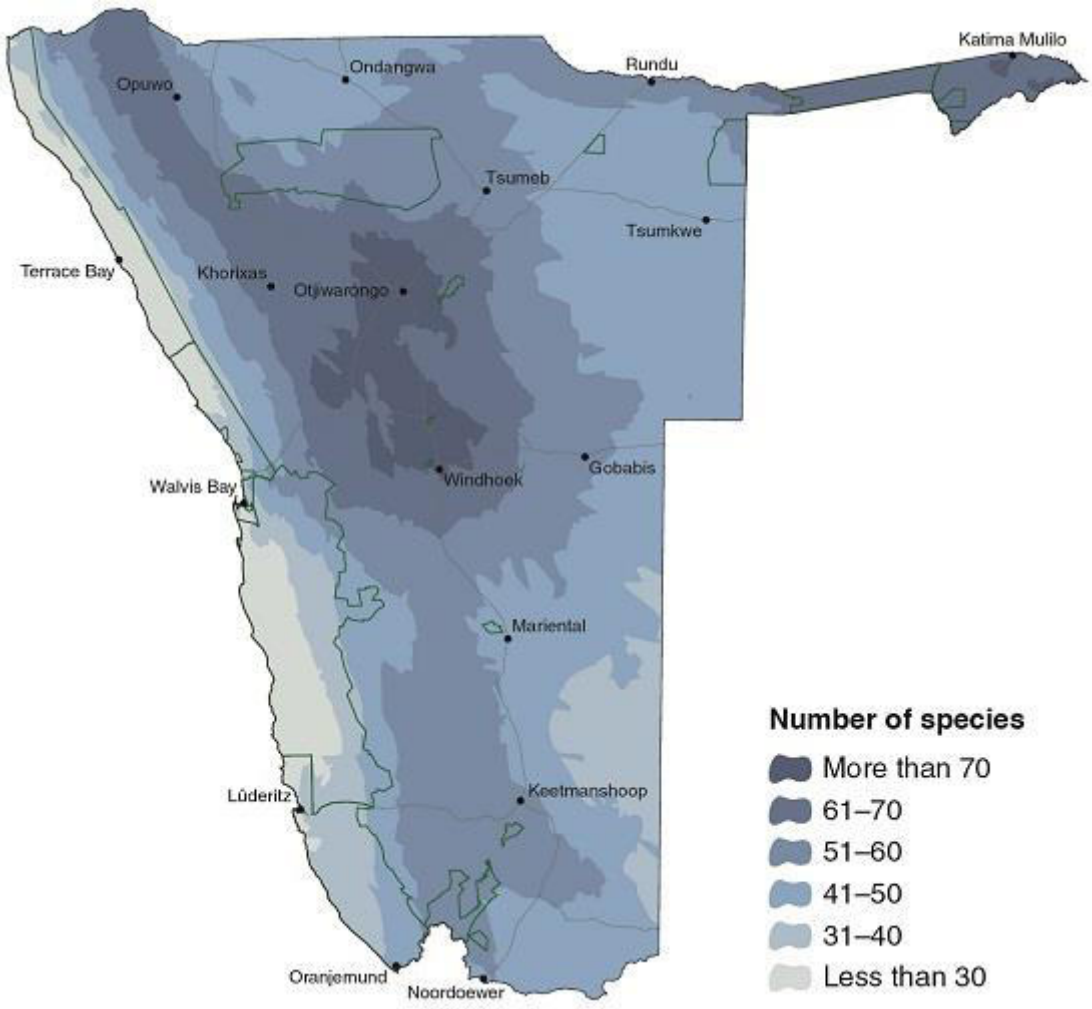

Figure 3-21: Reptile species richness map

3.8.4 Amphibians

Amphibian richness is low to moderate and highly seasonal (Figure 3.22). For powerlines, amphibian risk is generally low, but can increase where construction coincides with temporary pools after rainfall, especially near drainage lines and borrow/laydown areas that may collect water.

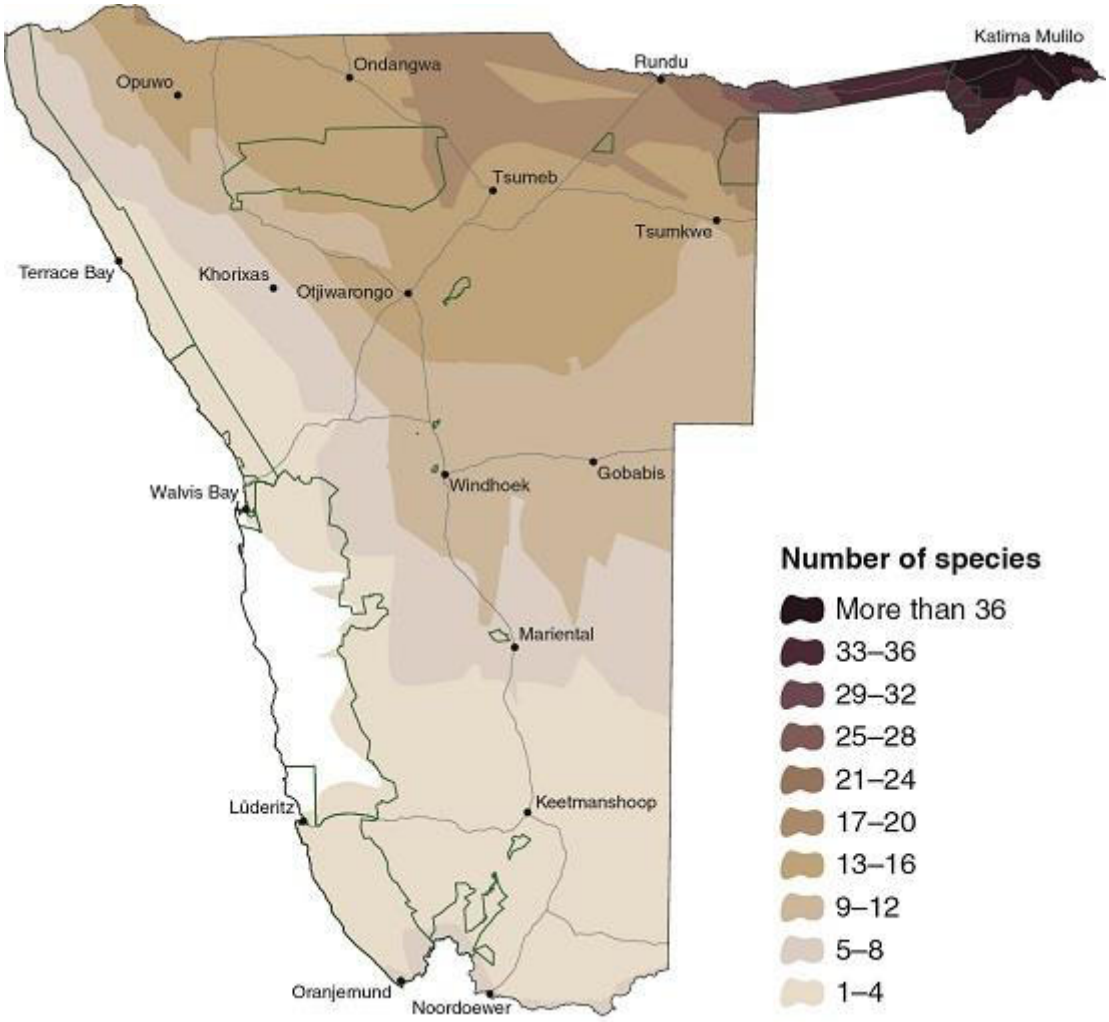

Figure 3-22: Amphibian species richness map

3.8.5 Freshwater Fish

Given the absence of perennial watercourses in the project area, no resident fish populations are expected. Fish presence is typically limited to episodic flood events in larger systems (Figure 3.23). Powerline relevance is therefore limited to avoiding contamination and sedimentation at drainage crossings.

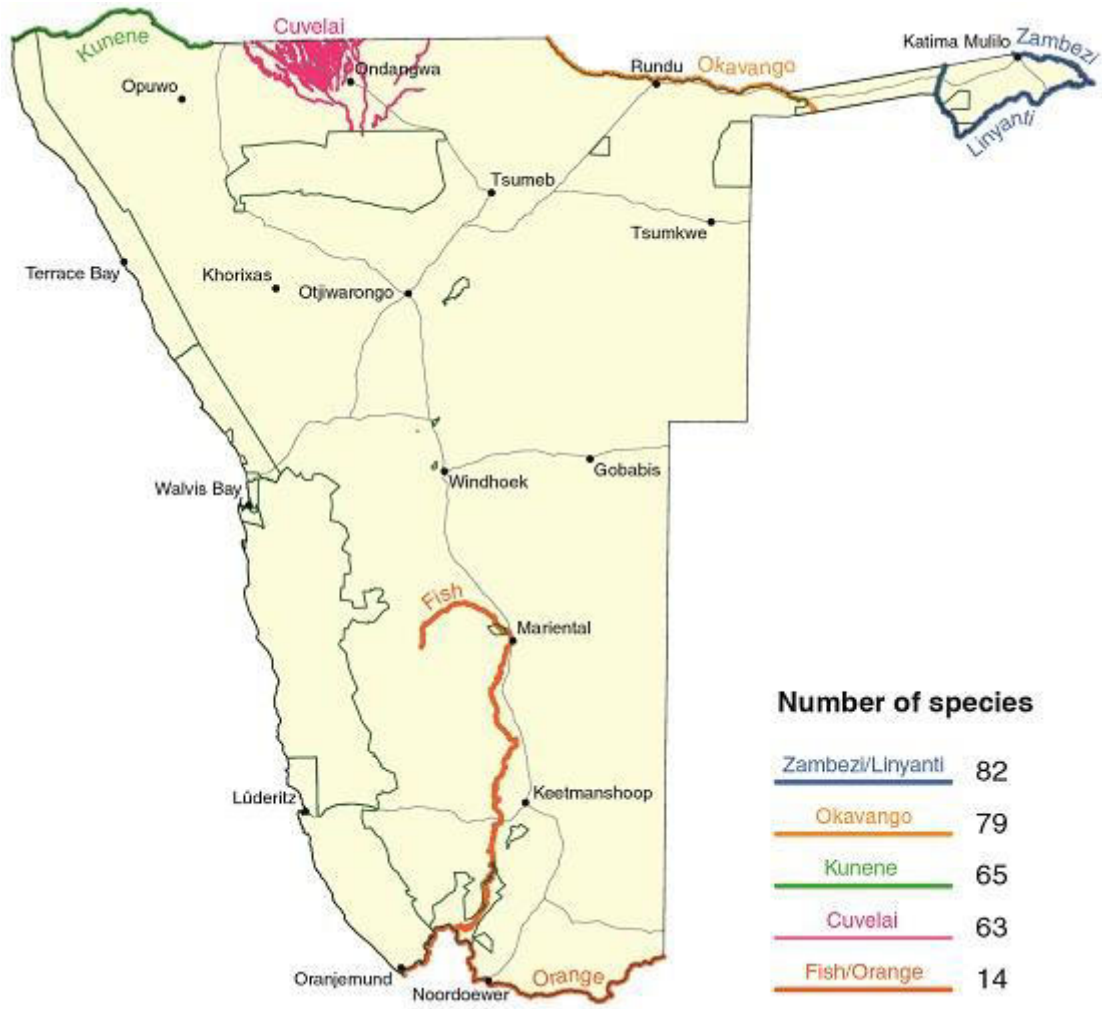

Figure 3-23: Fish species occurrence by catchment

3.8.6 Invertebrates

Invertebrate diversity is generally moderate to high across central Namibia (Figure 3-24) and underpins ecosystem functioning (soil turnover, nutrient cycling, pollination). Powerline impacts typically arise through:

- soil disturbance at tower footprints,
- habitat alteration from clearing, and
- dust deposition affecting pollinators and ground-dwelling taxa near access routes.

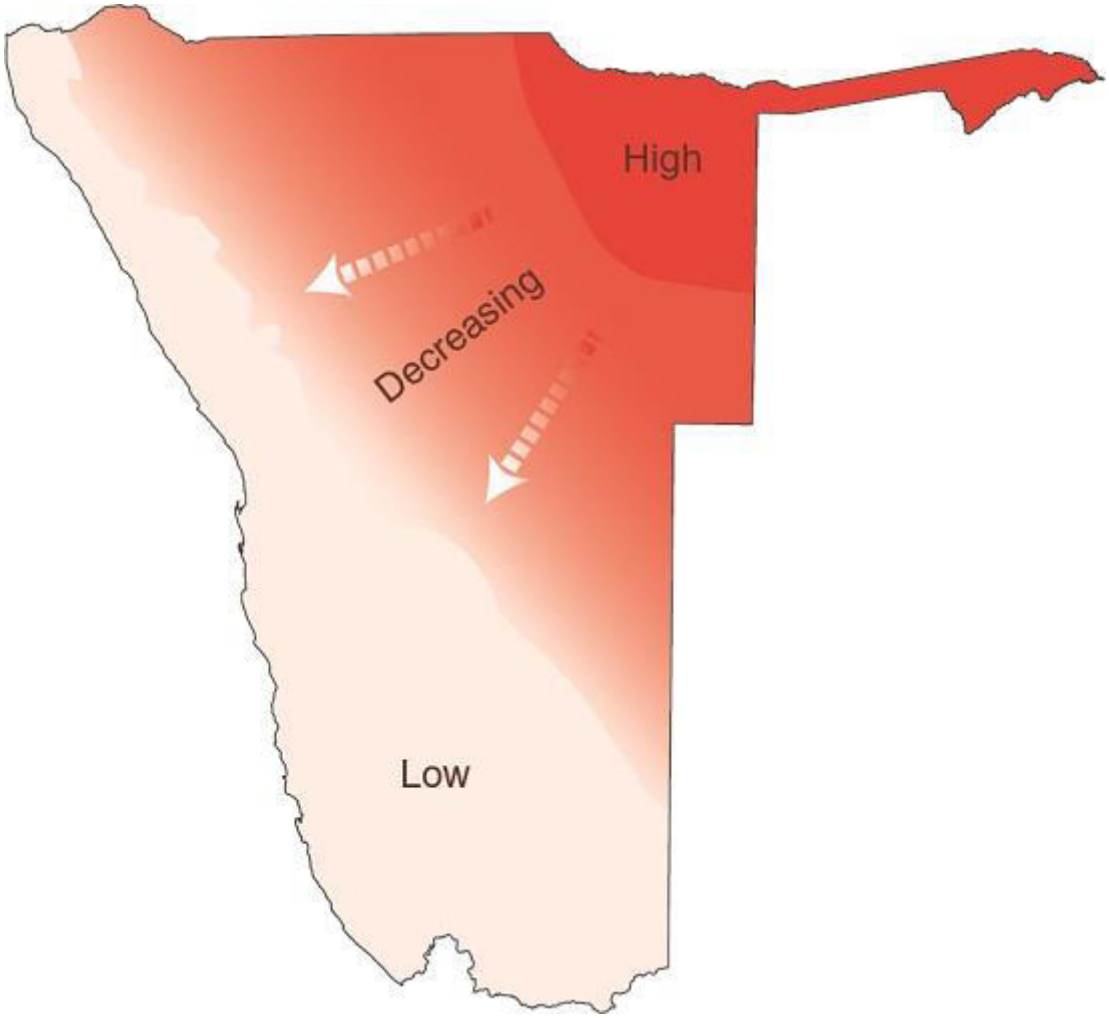

Figure 3-24: Invertebrate richness gradient map

3.8.7 Faunal Sensitivity Summary

Overall, faunal communities are representative of central Namibian savannas, with moderate richness and few highly range-restricted species expected. For a powerline project, sensitivity arises primarily from:

- Habitat disturbance at tower sites and along access routes,
- Noise and activity during construction,
- Vehicle movement and collision risk, and
- Bird interaction risks (collision/electrocution) associated with overhead lines.

From an ecological-planning perspective:

- Micro-siting of towers should avoid drainage lines, rocky refugia, and key movement paths where identified.
- Night driving should be minimised to reduce wildlife collisions.
- Speed controls are critical on shared farm roads.
- Dust suppression reduces indirect impacts.

- Where bird risk is confirmed, targeted mitigation measures should be applied in high-sensitivity sections.

With proper implementation of mitigation measures, faunal impacts associated with the powerline project are expected to remain low to moderate, localised, and manageable.

3.9 Heritage and Archaeological Resources

A separate specialist assessment of heritage and archaeological resources has been undertaken for the powerline project within the project area in accordance with the National Heritage Act (2004) and recognised heritage management good practice. This assessment identifies potential heritage and archaeological features that may occur along the proposed powerline alignment and associated construction footprint, evaluates their significance, and provides route- and site-specific management and mitigation measures applicable to powerline construction and maintenance activities.

The full Heritage and Archaeological Resources Report is included in the Appendices of this EIA and should be read together with the Environmental Management Plan (EMP) to ensure full compliance during project implementation, particularly during activities that involve ground disturbance such as:

- tower foundation excavations,
- access track upgrading or creation,
- laydown and batching areas (where applicable), and
- construction camp establishment.

Where heritage materials are encountered unexpectedly during construction, the project must implement the chance-finds procedure set out in the EMP and comply with any instructions issued by the relevant heritage authority before work continues in the affected area.

3.10 Environmental Sensitivity Assessment

This environmental sensitivity assessment identifies receptors and “no-go / caution” areas along the proposed ±7 km 22 kV overhead powerline alignment to Farm Nevada No. 15 (Unit D/Unit 10) near Otjiwarongo. The purpose is to guide micro-siting of poles (±86 sites), servitude clearance, access routing, and construction controls so that impacts predicted in the impact assessment (Chapter 5) remain localised, low to moderate, and manageable.

Sensitivity was evaluated using the receiving-environment description in Chapter 3 (land use, climate, drainage, soils, vegetation and fauna), the project’s linear footprint

characteristics (pole-by-pole ground disturbance), and the key impact pathways already identified for the powerline (dust, erosion, vegetation disturbance, avifauna interaction, fire risk, and farm infrastructure interactions).

3.10.1 Key Sensitivity Receptors and Constraints

3.10.1.1 Sensitive Habitats

For a linear 22 kV distribution line, sensitivity is driven less by “habitat loss” (very small pole footprints) and more by where poles and conductors intersect sensitive micro-habitats or movement corridors. The following are the most relevant sensitive habitats in the Farm Nevada receiving environment:

- Ephemeral drainage lines, shallow channels and seasonal pans
  These features are ecologically important as runoff concentration zones, seasonal greening areas, and wildlife/bird movement corridors. They are also physically sensitive to erosion and gullying if disturbed. Pole placement within active drainage lines should be avoided; where crossings are unavoidable, poles should be set back from channel edges and access routes should use existing stable crossings.
- Drainage-line vegetation / denser woodland patches
  Woody cover is often higher along drainage depressions, supporting greater bird activity, nesting opportunities, and shade-dependent microfauna. These zones are more sensitive to clearing and disturbance, and they can be higher-risk segments for bird interactions if lines cut across concentrated flight paths.
- Rocky outcrops, shallow bedrock ridges and stony rises
  These areas can host specialist plants, provide refugia for reptiles and small mammals, and are often associated with shallow soils prone to erosion once disturbed. They can also complicate excavation for pole foundations. In rocky patches, the preferred approach is micro-siting to avoid blasting, minimise disturbance, and keep access strictly on existing tracks.

Overall, the most sensitive habitats for this project are therefore (i) drainage corridors and associated vegetation, and (ii) rocky outcrops/rises, because these increase the likelihood of erosion, local biodiversity concentration, and bird movement interactions.

3.10.1.2 Protected Areas and Conservation Priorities

The project area occurs within a commercial farming landscape and does not fall inside proclaimed protected areas such as national parks. While formal conservation zoning

constraints are limited in this specific setting, the landscape still functions as part of a broader central Namibian savanna system where wildlife movement and raptor ranging behaviour can occur across farms.

For the purposes of this EIA, the most relevant “conservation priority” consideration is avifauna sensitivity (collision/electrocution exposure) rather than proximity to statutory protected areas. Accordingly, the alignment should preferentially follow existing linear infrastructure and disturbed corridors to avoid creating new “barriers” or attracting birds into higher-risk segments.

3.10.1.3 Vulnerable Flora and Fauna

Vulnerable flora and fauna sensitivity for this powerline is primarily receptor-based (i.e., the presence of particular species or behaviours), rather than large-scale habitat transformation.

- Avifauna (highest ecological sensitivity receptor for the project)
  The key vulnerability relates to large raptors/vultures (perching and soaring behaviour) and large-bodied ground/low-flying species such as bustards (collision susceptibility in open landscapes). Sensitivity is elevated near:
  - drainage corridors (movement pathways),
  - open plains (low visibility of conductors),
  - large nesting/perching trees, and
  - areas where carcasses/waste may attract scavengers.
- Large trees and protected plant specimens
  Individual mature trees (including large savanna trees used for shade, nesting, or perching) are sensitive because they may require clearance for conductor safety envelopes. Where protected tree species occur, sensitivity increases due to permitting requirements and slower recovery if removed.
- Fauna movement pathways and water points
  While the powerline does not create a solid barrier, construction activity and access can disturb wildlife and livestock. Sensitivity increases around water points, as they concentrate both livestock and wildlife activity.

A chance-find approach remains appropriate: if active nests, dens, burrows, sensitive plant specimens, or unusual wildlife concentrations are observed during pre-construction walkdown, micro-siting must be adjusted and buffers applied.

3.10.1.4 Hydrological and Soil Sensitivities

Soils and drainage in the Otjiwarongo farming landscape create practical sensitivity constraints for pole placement and access:

- *Erosion susceptibility* - Sandy to sandy-loam soils and disturbed calcrete/regosol surfaces can erode rapidly when vegetation cover is removed. Erosion sensitivity is highest on gentle slopes draining into channels, at track approaches to drainage lines, and around poorly compacted backfill at pole bases.
- *Flood-prone depressions and runoff concentration zones* - Shallow drainage depressions may carry episodic flows during intense storms. Pole excavation in these areas risks undermining, sediment mobilisation, and access failure.
- *Groundwater protection (low but relevant sensitivity)* - The project does not involve drilling, but spill risks from construction equipment still require controls. Sensitivity is elevated around boreholes, reservoirs, pipelines and trough areas, because even small spills or poor waste handling can affect farm water security.

Overall, hydrological/soil sensitivity is **low to moderate**, with **localised hotspots** at drainage features, sandy patches, and slopes.

3.10.1.5 Cumulative Environmental Constraints

When integrating ecological, hydrological, avifauna, heritage and land-use sensitivities, the following zones are identified as **moderate to high sensitivity** for this powerline project:

- Ephemeral drainage lines and associated denser vegetation (erosion + biodiversity concentration + bird movement)
- Open plains / wide sightlines (collision exposure for bustards and large birds)
- Rocky outcrops / shallow bedrock rises (specialist habitat + excavation constraints)
- Areas near water points and borehole infrastructure (farm livelihood sensitivity + attraction of fauna/birds)
- Areas near homesteads/farmsteads and known activity nodes (safety, nuisance, potential heritage sensitivity)

Areas of lower sensitivity include previously disturbed corridors and existing linear infrastructure routes, established farm tracks, and uniform grazing areas where vegetation is already modified and access is stable.

3.10.2 Sensitivity Zoning for Micro-Siting

For practical implementation, sensitivity along the alignment can be treated as three classes:

- *High sensitivity (avoid where feasible)* - active drainage channels, narrow drainage "bottlenecks", dense drainage-line woodland, rocky outcrops requiring heavy disturbance, and any confirmed nest/heritage finds.
- *Moderate sensitivity (use with strict controls)* - drainage margins, slopes draining into channels, open plains where bustards may occur, and areas near water points.
- *Low sensitivity (preferred)* - existing disturbed corridors, existing track edges, uniform grazing areas away from drainage lines and major trees.

3.10.3 Implications for the Project

To ensure the powerline remains within acceptable impact limits (as reflected in the impact assessment tables), the following spatial constraints should guide final alignment and pole-by-pole placement:

- Prioritise micro-siting in low-sensitivity areas and follow existing corridors where practicable to minimise new disturbance.
- Avoid pole placement within drainage lines; at crossings, keep poles outside channel edges and use stable access points to prevent sediment mobilisation.
- Avoid large nesting/perching trees where feasible, and do not remove trees with active nests; apply buffers if nests are confirmed.
- Minimise vegetation clearing to statutory safety requirements only, and retain grass cover wherever possible to reduce erosion and dust.
- Keep construction access on existing tracks, and avoid off-track movement in sandy soils and on slopes.
- Apply strict spill prevention and waste controls, especially near boreholes, reservoirs and water infrastructure.
- Implement avifauna risk controls in higher-sensitivity segments, including bird-safe pole configurations and targeted marking/management where justified by site conditions and monitoring outcomes.
- Maintain chance-find procedures for ecological and heritage resources throughout construction (stop work, notify, and only proceed once cleared).

With these constraints and the EMP measures, the proposed 22 kV powerline is expected to avoid high-sensitivity receptors where possible and limit unavoidable disturbance to small, localised, and reversible footprints.

4 CHAPER FOUR: PUBLIC CONSULTATION

4.1 Overview

Public consultation is a statutory requirement under the Environmental Management Act (EMA) No. 7 of 2007 and the Environmental Impact Assessment Regulations (GN 30 of 2012). Regulation 21 outlines specific steps to ensure that Interested and Affected Parties (I&APs) are given a fair opportunity to receive information, register concerns, and contribute to the assessment process.

For the proposed development and operation of a 22 kV powerline and electrification of Farm Nevada No. 15, Unit D, in the Otjiwarongo District, Otjozondjupa Region, all consultation activities were carried out in line with:

- The Environmental Management Act (EMA), 2007
- The EIA Regulations (GN 30 of 2012)
- Regulation 7(1) on public notification
- The project Terms of Reference
- International good practice principles on stakeholder participation

The statutory Notice of Environmental Assessment and Public Participation Process was issued, formally notifying stakeholders of the intended powerline development and electrification works.

The key objectives of the consultation process were to:

- Ensure transparency regarding the proposed rural powerline alignment and associated infrastructure;
- Provide clear and accessible information regarding the electrification of Farm Nevada No. 15, Unit D;
- Obtain local knowledge of environmental and socio-economic conditions along the proposed servitude;
- Identify potential concerns related to land access, farming operations, biodiversity, and safety;
- Facilitate meaningful, inclusive, and accountable participation in the EIA process.

A range of communication tools—including public notices, Background Information Documents (BIDs), direct stakeholder letters, and a public meeting—were used to inform and engage stakeholders. All supporting documentation (notices, letters, proof of distribution, attendance registers, and photographs) is included in the Appendices.

4.2 Identification of Interested and Affected Parties (I&APs)

The EIA team identified and invited the following stakeholder categories:

a. Institutional Stakeholders

- Otjozondjupa Regional Council
- Otjiwarongo Municipality
- CENORED
- Relevant line ministries and environmental offices

b. Landowners and Adjacent Farms

- Farm Nevada No. 15, Unit D (proponent property)
- Adjacent and neighbouring commercial farms (as listed in Section 4.2.3)

c. Local Community and General Public

- Residents within the Otjiwarongo District
- Any interested member of the public responding to the notice

Open invitation through statutory notice and direct communication allowed any interested person to register as an I&AP. Registration remained open for a minimum of 14 days, and all I&APs were added to the project stakeholder database for continued communication throughout the EIA process.

4.3 Methods Used for Public Consultation

The following methods were used to notify and engage Interested and Affected Parties (I&APs) in relation to the proposed powerline project.

4.3.1 Background Information Document (BID)

A Background Information Document (BID) was prepared to provide stakeholders with a concise overview of:

- The proposed development and operation of a 22 kV powerline;
- The electrification of Farm Nevada No. 15, Unit D;
- The location of the proposed infrastructure within the Otjiwarongo District;
- The EIA process and applicable legal framework;
- Potential environmental and socio-economic considerations (including biodiversity, avifauna, land use, and construction disturbance);
- Contact details for registration as an I&AP.

The BID was distributed via email and direct communication to neighboring farms and institutional stakeholders. Hard copies were made available upon request.

4.3.2 Newspaper and Notices

Notices of the Environmental Assessment and Public Participation Process was issued in compliance with the Environmental Management Act and EIA Regulations. The notices placed are presented in the table below.

Table 4-1: Newspaper Notices

Method	Area of Distribution	Language	Dates Placed
The Confidante Newspaper advert	Nationwide	English	28 Nov and 04 December 05 and 11 December 2025
The Brief Newspaper Advert	Nationwide	English	28 Nov and 04 December 05 and 11 December
Public Meeting	Farm Nevada No.15 Unit D	English Oshiwambo Afrikaans Damara/Nama	18 December 2025
Site/Public Notices	In around the project site	English	5 - 11 December 2025

The notices clearly outlined:

- The project description (proposed development and operation of a powerline and electrification of Farm Nevada No. 15, Unit D);
- The project location within the Otjiwarongo District;
- The name of the proponent (Mr. Wilson Mavulu);
- The appointed Environmental Assessment Practitioner;
- Public meeting details;
- Instructions for registration and submission of comments

Public/site notices were placed at strategic, high-visibility locations in around the project site.

Image 4-1: Site Notices

Image 4-2: Site Notices

Image 4-3: Public Meeting

4.3.3 Direct Stakeholder Notification

In addition to public notice, direct written invitations were issued to adjacent and nearby farms to ensure that potentially affected landowners were specifically informed.

A formal invitation letter was sent to Farm Drukwerk No. 13, requesting attendance at the public meeting and further requesting that invitations be extended to nearby farms.

The following neighbouring farms were specifically identified for notification:

- Waverley Farm No. 347
- Eastbourne Farm No. 12
- Hoasas Farm No. 16
- Jagerhof Farm No. 11
- Honingberg Farm No. 300
- Nebraska Farm No. 10
- Cleveland Farm No. 17
- Wagner Farm No. 316

This direct engagement ensured that landowners potentially affected by the proposed powerline alignment were adequately consulted.

4.4 Key Stakeholder Public Meeting

A public meeting was organised in accordance with the EMA requirements to allow stakeholders to receive information and provide comments.

Meeting details included:

- Venue: Farm Nevada No. 15, Unit D
- Settlement: Otjiwarongo District, Otjozondjupa Region
- Date: 18 December 2025
- Time: 14h00

The meeting details were communicated through the statutory notice and through direct stakeholder invitations

The agenda included:

- Overview of the proposed 22 kV powerline and electrification works;
- Description of the proposed alignment and infrastructure components;
- Construction activities and expected timeframe;

- Environmental and socio-economic considerations;
- Applicable legislation and I&AP rights;
- Open floor discussion for questions and comments.

4.4.1 Meeting Outcome

The public meeting was conducted to provide stakeholders with an opportunity to raise concerns and seek clarification regarding:

- Servitude width and access arrangements;
- Potential impacts on farming operations;
- Safety considerations;
- Environmental impacts, including vegetation clearance and avifauna interactions;
- Construction-related disturbance.

All comments received were recorded by the EIA team. Participant names and signatures are captured in the attendance register provided in the Appendices.

No objections of a nature preventing the continuation of the EIA process were recorded at the time of consultation.

4.5 Issues Raised During Public Consultation

Issues and concerns raised during the public consultation process were obtained through direct engagement with neighboring farm owners, institutional stakeholders, and feedback received during the statutory notification period. Although attendance at the formal public meeting was limited, the issues identified are consistent with those commonly raised in rural farming settings within the Otjiwarongo District and surrounding commercial agricultural areas. Given the nature of the proposed project, a rural 22 kV powerline and associated electrification works, the concerns focused primarily on land use compatibility, environmental protection, safety, and communication.

Table 4-2: Summary of Issues Raised

Theme	Key Issues Raised
Economic	• Preference for the use of local labour during construction where feasible. • Expectation that local suppliers in Otjiwarongo should be prioritised for goods and services. • Interest in potential longer-term benefits associated with improved electrification infrastructure.

Theme	Key Issues Raised
Health & Safety	• Safety concerns related to overhead powerlines on farming land. • Risk of accidental contact with powerline infrastructure by livestock, farm workers, or machinery. • Construction-phase safety management, including vehicle movement on farm roads. • Proper handling and disposal of construction waste.
Ecological and Environmental	• Vegetation clearing within the servitude and potential impact on grazing land. • Protection of livestock grazing areas and soil stability.• Avifauna interaction with powerline infrastructure (collision and electrocution risks). • Prevention of hydrocarbon spills from construction vehicles. • Avoidance of disturbance to drainage lines.
Land Use & Access	• Clarification of servitude width and long-term access rights. • Ensuring minimal disruption to normal farming operations. • Restoration of disturbed areas after construction.
Communication	• Need for clear communication regarding construction timelines. • Advance notification prior to access onto private land. • Ongoing point of contact for concerns during construction.

All issues raised were considered during the impact assessment process and have informed the identification of mitigation measures included in the Environmental Management Plan (EMP).

4.6 Conclusion

The public consultation process undertaken for the proposed development and operation of a 22 kV powerline and electrification of Farm Nevada No. 15, Unit D was conducted in compliance with the requirements of the Environmental Management Act (EMA), No. 7 of 2007, and the Environmental Impact Assessment Regulations (GN 30 of 2012).

Stakeholders were notified through multiple communication channels, including:

- Statutory public notice;
- Direct written invitations to neighbouring farms;
- Distribution of Background Information Documents (BIDs);
- A formally convened public meeting;
- Direct engagement with adjacent landowners.

Although attendance at the formal public meeting was limited, reasonable and genuine opportunities for participation were provided in accordance with the legislative requirements. Additional direct engagement efforts ensured that neighbouring farms and relevant stakeholders were informed and afforded an opportunity to raise concerns.

The issues raised were typical of rural electrification projects and focused primarily on:

- Construction-related disturbance;
- Environmental protection (including vegetation and avifauna);
- Occupational and public safety;
- Land access and farming compatibility;
- Ongoing communication during implementation.

Importantly, no objections were raised that would preclude continuation of the Environmental Assessment process.

All relevant concerns have been incorporated into the impact assessment and addressed through appropriate mitigation measures in the Environmental Management Plan (EMP). On this basis, the public consultation process is considered adequate, procedurally compliant, and sufficient for decision-making purposes.

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5 CHAPTER FIVE: ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS

5.1 OVERVIEW

The proponent is committed to implementing the proposed 22 kV overhead powerline and electrification of Farm Nevada No. 15, Unit D in a manner that is environmentally responsible, socially acceptable, and compliant with Namibia's Environmental Management Act (2007) and EIA Regulations (2012).

An Environmental Management Plan (EMP) has been prepared to guide the construction, operation, and maintenance of the powerline infrastructure. The EMP identifies potential environmental and socio-economic impacts, assesses their significance, and sets out appropriate mitigation and management measures.

Key focus areas include:

• Vegetation clearing within the servitude;
• Soil disturbance and erosion during pole installation;
• Dust and noise during construction;
• Waste management;
• Occupational and public safety;
• Avifauna interaction risks (collision and electrocution);
• Compatibility with ongoing farming activities.

Given the small-scale and linear nature of the 22 kV distribution line, impacts are expected to be localised and largely confined to the construction phase. The EMP therefore emphasises minimisation of disturbance, responsible construction practices, rehabilitation of affected areas, and ongoing monitoring.

The EMP will be implemented throughout the project lifecycle and reviewed where necessary to ensure continued compliance and effective environmental management.

5.2 ASSESSMENT OF IMPACTS

This section outlines how the overall methodology to assessing the project is possible environmental and social impacts. Each potential impact must be assessed in order to properly evaluate its significance. The definitions and explanations for each criterion are set out below in Table 5-1.

Table 5-1: Assessment Criteria

Duration – What is the length of the negative impact?	
None	No Effect
Short	Less than one year
Moderate	One to ten years
Permanent	Irreversible
Magnitude – What is the effect on the resource within the study area?	
None	No Effect
Small	Affecting less than 1% of the resource
Moderate	Affecting 1-10% of the resource
Great	Affecting greater than 10% of the resource
Spatial Extent – what is the scale of the impact in terms of area, considering cumulative impacts and international importance?	
Local	In the immediate area of the impact
Regional / National	Having large scale impacts
International	Having international importance
Type – What is the impact	
Direct	Caused by the project and occur simultaneously with project activities
Indirect	Associated with the project and may occur at a later time or wider area
Cumulative	Combined effects of the project with other existing / planned activities
Probability	
Low	<25%
Medium	25-75%
High	>75%

(***Adopted from ECC-Namibia, 2017)***

Table 5-2: Impact Significance

Class	Significance	Descriptions
1	Major Impact	Impacts are expected to be permanent and non-reversible on a national scale and/or have international significance or result in a legislative non- compliance.
2	Moderate Impact	Impacts are long term, but reversible and/or have regional significance.
3	Minor	Impacts are considered short term, reversible and/or localized in extent.
4	Insignificant	No impact is expected.
5	Unknown	There are insufficient data on which to assess significance.
6	Positive	Impacts are beneficial

(Adopted from ECC-Namibia, 2017)

Table 5-3: Environmental Impacts and Aspects Assessment

ENVIRONMENTAL IMPACT	ELEMENT	IMPACT	PHASE	DURATION	MAGNITUDE	EXTENT	TYPE	PROBABILITY	SIGNIFICANCE
TOPOGRAPHY	Topography & Landscape	Localised alteration of micro-topography at pole foundation sites	Construction	Short term	Small	Local	Direct	Highly Probable	Minor
TOPOGRAPHY	Topography & Landscape	Temporary visual disturbance from construction vehicles and equipment	Construction	Short term	Small	Local	Direct	Highly Probable	Minor
SOILS	Soil	Localised soil disturbance and compaction at pole sites and temporary access tracks	Construction	Short term	Small	Local	Direct	Highly Probable	Minor
SOILS	Soil	Risk of hydrocarbon contamination from equipment refuelling	Construction	Short term	Moderate	Local	Direct	Improbable	Low
SOILS	Soil	Localised erosion if disturbed	Construction	Moderate	Small	Local	Direct	Probable	Moderate

ENVIRONMENTAL IMPACT	ELEMENT	IMPACT	PHASE	DURATION	MAGNITUDE	EXTENT	TYPE	PROBABILITY	SIGNIFICANCE
		areas are not rehabilitated							
WATER	Surface Water	Sediment mobilisation into ephemeral drainage lines during rainfall	Construction	Short term	Small	Local	Direct	Improbable	Low
WATER	Groundwater	Potential contamination from accidental fuel or oil spills	Construction	Short term	Moderate	Local	Direct	Improbable	Low
WATER	Drainage Patterns	Minor alteration of natural runoff patterns at pole sites	Construction	Short term	Small	Local	Direct	Improbable	Low
AIR QUALITY	Air Quality	Dust generation from vehicle movement along farm roads during dry season	Construction	Short term	Moderate	Local	Direct	Highly Probable	Moderate
AIR QUALITY	Air Quality	Minor emissions from construction	Construction	Short term	Small	Local	Direct	Highly Probable	Minor

ENVIRONMENTAL IMPACT	ELEMENT	IMPACT	PHASE	DURATION	MAGNITUDE	EXTENT	TYPE	PROBABILITY	SIGNIFICANCE
		vehicles and generators							
NOISE	Noise Pollution	Temporary noise from augering, pole erection and conductor stringing	Construction	Short term	Small	Local	Direct	Highly Probable	Minor
NOISE	Noise Pollution	Disturbance to livestock due to intermittent construction noise	Construction	Short term	Small	Local	Direct	Probable	Minor
VISUAL	Landscape Character	Permanent visual presence of 11 m poles and overhead conductors in open agricultural landscape	Operational	Permanent	Moderate	Local	Direct	Highly Probable	Moderate
FLORA	Terrestrial Vegetation	Selective clearing within servitude for statutory safety clearance	Construction / Operation	Permanent (selective trimming)	Small	Local	Direct	Highly Probable	Minor

ENVIRONMENTAL IMPACT	ELEMENT	IMPACT	PHASE	DURATION	MAGNITUDE	EXTENT	TYPE	PROBABILITY	SIGNIFICANCE
FLORA	Terrestrial Vegetation	Accidental removal of protected tree species	Construction	Permanent	Moderate	Local	Direct	Improbable	Low
FLORA	Terrestrial Vegetation	Establishment of invasive species in disturbed areas	Construction	Long term	Small	Local	Indirect	Probable	Moderate
FAUNA	Terrestrial Fauna	Temporary disturbance from vehicle movement and human presence	Construction	Short term	Moderate	Local	Direct	Highly Probable	Moderate
FAUNA	Avifauna	Electrocution risk to large raptors on 22 kV structures	Operational	Long term	Moderate	Regional	Direct	Improbable	Moderate
FAUNA	Avifauna	Collision risk for bustards and large birds in open savanna landscape	Operational	Long term	Moderate	Regional	Direct	Improbable	Moderate
FIRE	Rangeland Vegetation	Risk of accidental veld fire during dry windy conditions	Construction	Short term	Great	Local	Direct	Improbable	Moderate

ENVIRONMENTAL IMPACT	ELEMENT	IMPACT	PHASE	DURATION	MAGNITUDE	EXTENT	TYPE	PROBABILITY	SIGNIFICANCE
SOCIO-ECONOMIC	Agricultural Activities	Temporary disruption to farm operations during construction	Construction	Short term	Moderate	Local	Direct	Probable	Moderate
SOCIO-ECONOMIC	Infrastructure Integrity	Potential damage to fences, gates or boreholes	Construction	Short term	Moderate	Local	Direct	Improbable	Low
SOCIO-ECONOMIC	Local Economy	Short-term employment and local procurement benefits	Construction	Short term	Moderate	Local	Direct	Highly Probable	Moderate Positive
SOCIO-ECONOMIC	Farm Productivity	Improved agricultural productivity due to reliable electricity supply	Operational	Long term	Great	Local	Direct	Highly Probable	Major Positive
HERITAGE	Archaeological / Cultural Resources	Accidental disturbance of unknown heritage resources during excavation	Construction	Permanent	Moderate	Local	Direct	Improbable	Low