TERASUN ENERGY

PROPOSED NEW POWERLINE FOR TERASUN ENERGY NEAR ARANDIS

ENVIRONMENTAL IMPACT ASSESSMENT SCOPING (INCLUDING IMPACT ASSESSMENT) REPORT

Prepared for: TeraSun Energy (Pty) Ltd

May 2022

DOCUMENT CONTROL

Report Title	SCOPING (INCLUDING IMPACT ASSESSMENT) REPORT FOR THE PROPOSED NEW POWERLINE FOR TERASUN ENERGY NEAR ARANDIS
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Review	Werner Petrick
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EXECUTIVE SUMMARY

1. GENERAL INTRODUCTION

TeraSun Energy (Pty) Ltd (TeraSun Energy) proposes to develop a PV Power Plant east of Arandis. To connect the proposed PV Power Plant with the national grid, a 132 kV interconnection overhead powerline between the plant and the Lithops Substation over a distance of ~20 km is planned (see Figure A). The proposed powerline will follow a route parallel (adjacent) to NamPower's existing / approved powerline corridor.

TeraSun Energy approached NamPower in 2021 regarding the construction of their powerline within NamPower's existing / approved powerline corridor. This option implies potential difficulties with the transfer of the ECC in future, however. Following discussions and communications with NamPower it was resolved that, in the interest of time and efficiency, TeraSun Energy should apply for their own ECC for an interconnection powerline, following the same route and parallel to the existing powerline. This option is also in line with the rationale to place linear infrastructure in the same development corridors.

This Environmental Impact Assessment (EIA) Scoping and Impact Assessment Report summarises the EIA process being followed for TeraSun Energy's proposed new powerline near Arandis. It includes an assessment of the environmental impacts that the proposed project is likely to have. The proposed management and mitigation measures relating to the proposed project are documented in an Environmental Management Plan (EMP).

2. ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

EIAs are regulated by the Ministry of Environment, Forestry and Tourism (MEFT) in terms of the Environmental Management Act, 7 of 2007. This Act was gazetted on 27 December 2007 (Government Gazette No. 3966) and its associated regulations were promulgated in January 2012 (Government Gazette No. 4878).

Prior to the commencement of the construction of the proposed powerline, an application for an environmental clearance was submitted in terms of this Act and its associated regulations to the Ministry of Mines and Energy (MME), as the competent authority. MME reviews the application and relevant reports and submits comments to the MEFT for their final review and decision.

The EIA process for the proposed project is explained diagrammatically in Figure B.

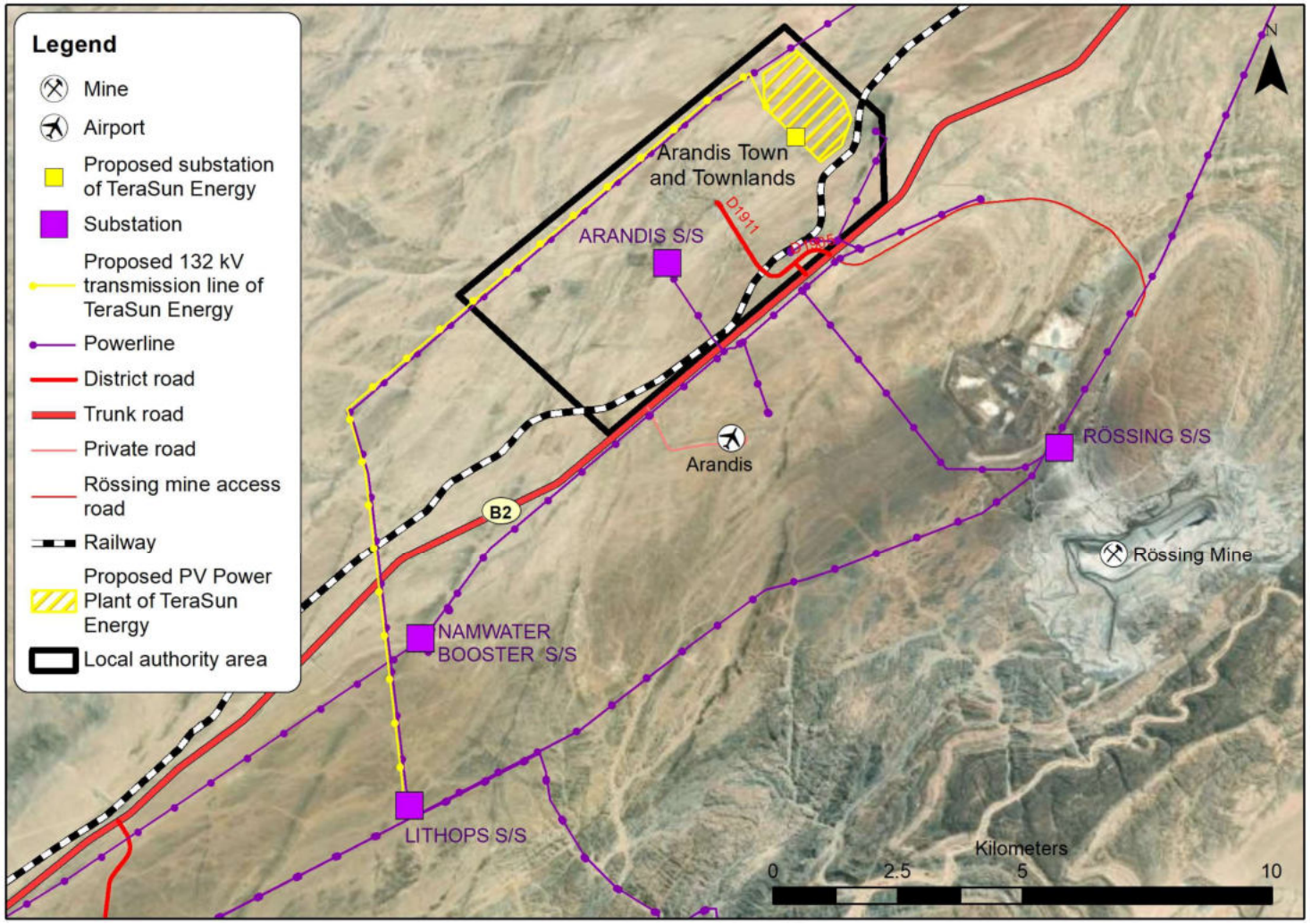

FIGURE A: LOCATION OF THE PROPOSED POWERLINE

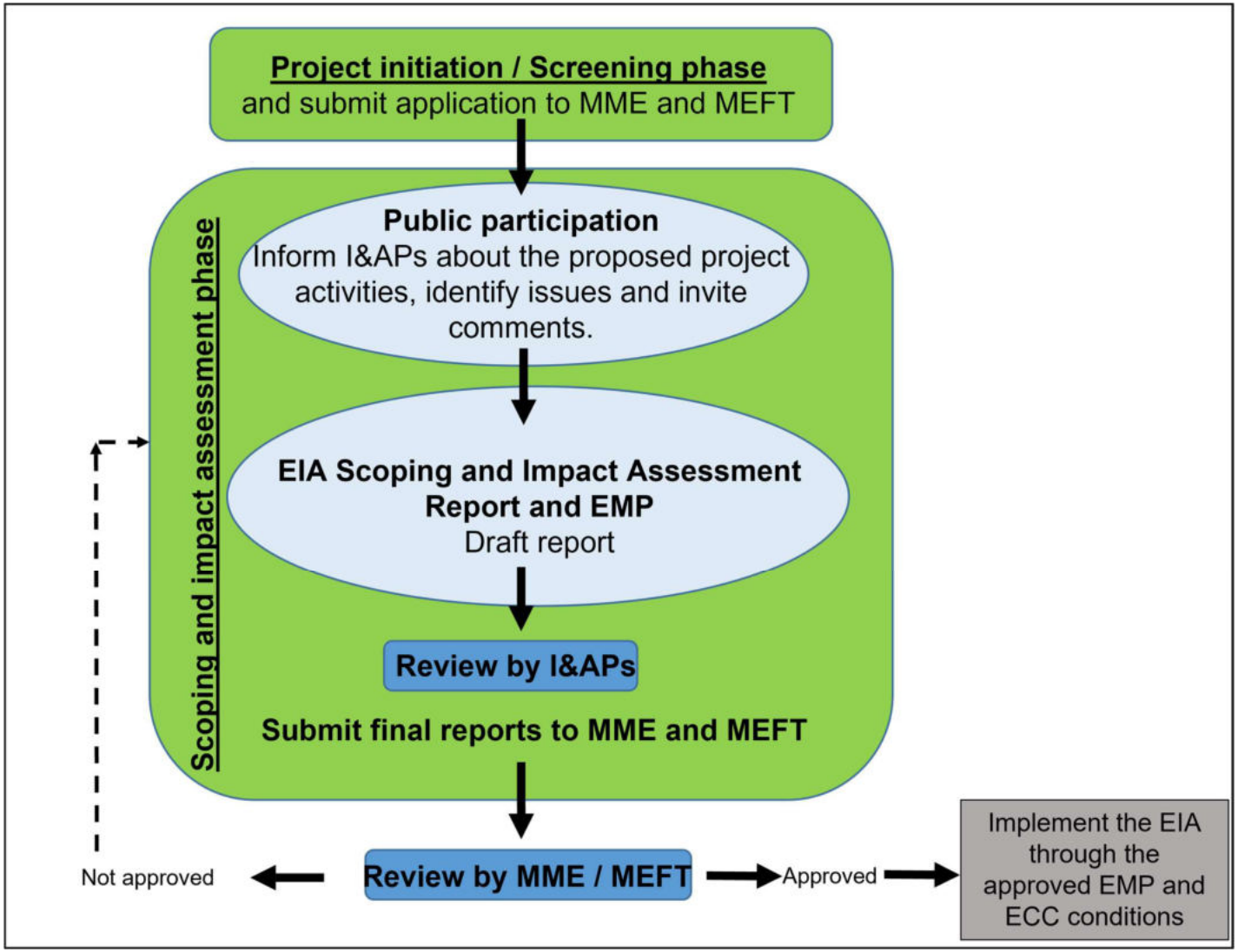

FIGURE B: THE EIA PROCESS

2.1 EIA Team

Namisun Environmental Projects and Development (Namisun) is an independent environmental consultancy firm appointed by TeraSun Energy to undertake the EIA.

Dr Pierré Smit, the project coordinator holds a PhD in Landscape Ecology and has twenty-seven years of experience in environmental management, managing environmental assessment and the implementation of EMPs and Environmental Management Systems in Namibia.

Werner Petrick, the EIA project manager, has twenty-three years of relevant experience in conducting / managing EIAs, compiling EMPs and implementing EMPs and Environmental Management Systems. Werner is certified as lead environmental assessment practitioner (EAP) and reviewer under the Environmental Assessment Professionals Association of Namibia (EAPAN). He holds a B.Eng. (Civil) degree and a master's degree in environmental management.

2.2 Steps in the public participation process

Registered Interested and Affected Parties (I&APs) were provided with the opportunity to comment on the EIA Scoping (including Impact Assessment) Report. The comment period ended on 14 May 2022 where after the report and EMP were updated to a final status with due consideration of the comments received, for submission to the MME as the competent authority and the MEFT for decision-making.

The steps that were followed as part of the consultation process are summarised below:

- Namisun notified MEFT and MME of the proposed project through a Background Information Document (BID).
- Namisun notified MEFT through the submission of the EIA Application Form (Form 1) and registration via the online portal of the MEFT (APP-003318).
- Submit the Application Form to the MME (Energy Directorate), who is the competent authority for the EIA process, on the 2nd of December 2021.
- Project initiation meetings and site visit with the TeraSun Energy team to discuss the proposed project.
- Namisun developed an EIA-specific stakeholder database for the project. This database (see Appendix D) was updated throughput the EIA process, as and when required.
- Namisun contacted (telephonically) various key stakeholders to confirm their e-mail addresses, to obtain further input and to share the relevant information.
- E-mails were sent to all I&APs on the database and site notices were placed in Arandis (i.e., near the proposed route of the powerline).

- BIDs were distributed via email to relevant authorities and I&APs on the stakeholder database and copies were made available on request during the period 29 November – 13 December 2021. The purpose of the BID was to inform I&APs about the proposed project activities, the EIA process being conducted, possible environmental impacts and ways in which I&APs could provide input to Namisun. Attached to the BID was a registration and response form, which provided I&APs with an opportunity to submit their names, contact details and comments on the project.
- Block advertisements were placed on the 29th of November and again the 6th of December 2021 in the Market Watch, which forms part of the following newspapers: *Die Republikein*; *Allgemeine Zeitung*; and *The Namibian Sun.*
- A Focus Group Meeting with officials of the Arandis Town Council was held in Arandis on 28 February 2022. Another Focus Group Meeting with personnel of NamPower was held on Zoom on 8 March 2022.
- A hard copy of the Draft Scoping and Impact Assessment Report and EMP (including all appendices) were made available for review at the offices of the Arandis Town Council for the period 14 April – 14 May 2022.
- Electronic copies of the executive summary of the Scoping (including Impact Assessment) Report and EMP (excluding the appendices) were distributed to all registered I&APs and relevant regulatory authorities via e-mail.
- Electronic copies of the full report (including appendices) were available on request.
- Authorities and I&APs had the opportunity to review the draft report and submit comments in writing to Namisun. The closing date for comments was 14 May 2022.
- Namisun incorporated the comments from I&APs and regulatory authorities received. Where relevant, the report was updated. A copy of the final report, including authority and I&AP review comments, will be delivered to the MME, who will forward it, with their recommendations, to MEFT for their review and final decision regarding the application for environmental clearance.

2.3 Opportunity to comment

I&APs were invited to comment on this EIA Scoping Report, which was available for a review and comment period from **14 April** to **14 May 2022**. Comments had to be sent to Namisun at the address, telephone number, or e-mail address shown below by no later than **14 May 2022**.

Namisun

Attention: Pierré Smit

E-mail address: oudoring@gmail.com

Cell number: +264 (0)81 752 7207

3. DESCRIPTION OF THE PROJECT

The new powerline runs from the proposed PV Power Plant, first in a northeast direction, and then parallel to the existing NamPower route to the west before it turns south towards the Lithops Substation where it connects, using an existing spare 132 kV bay.

The section between the PV Power Plant's private step-up substation and the NamPower route does not follow the NamPower corridor, but the rest of the new powerline is planned on the western side of the NamPower route. It is proposed that the NamPower service road within the corridor will be used as the road from where access points to the new poles will be made. The laydown activities will also take place within the corridor.

The project entails the installation of steel monopole powerline support structures, which will carry 132 kV electricity conductors and one optical fibre ground wire, 2.3 m above the conductors. The height of the poles varies between 18 and 21.6 m above ground. Spacing between the poles will between 350 and 450 m, depending on the terrain. An H-structure pole will be used for exiting / entering a substation. Aircraft warning spheres will be fitted on the powerline above major road crossings.

There is no need for any large-scale land clearance. Only the small areas where the digging of the monopole foundations will take place will be affected by localized and largely non-intrusive construction activities, including the preparation of each site. All components for the powerline (steel, conductors, and insulators, etc.) will be transported on the B2 main road to site by low-bed trailers and then transported along the line with the existing service road.

The poles are pre-assembled. Support structures (for the carrying of the conductors) will be slip-jointed to the poles onsite before the poles are hoisted. Mobile cranes will be used to place the poles in their foundation holes. All the intermediary poles are freestanding without any anchors. The three H-poles and bend poles will be anchored to the ground by steel cable stays.

Concrete will be mixed and poured onsite for the foundations of the monopoles, and for the foundation and platform of the substation and the plinths. Subsequently all concrete constituents (crushed stone, cement, water and sand) will have to be transported to site.

Transport vehicles (light and heavy trucks), mobile cranes, generator sets, cement mixing equipment, small tools and small equipment will be in use during the construction phase.

Electricity is only required during the construction activities and will be provided by portable and mobile generator sets. No electricity is needed for any other purpose and after the construction phase.

Drinking water and water for cement mixing will be transported from Arandis to the work areas daily during the construction phase.

Diesel is the main consumable and will be required for the vehicles and equipment. Fuel stations in Arandis will be used and no fuel will be stored onsite.

Some construction and non-hazardous waste (steel and wire offcuts, scrap metal, empty containers, electrical cable rolls, plastics and packaging and building rubble), hazardous waste (e.g. oil and fuel, contaminated materials and soil) as well as domestic waste (such as plastic bags, tins, bottles, paper, and packaging waste) will be generated. All waste will be contained and removed to a permitted municipal waste disposal site.

Drip trays will be placed under all stationery vehicles and equipment. Any oil spill will be scooped into bags and taken to a permitted hazardous waste disposal site.

Once a work area is established, a portable chemical toilet will be placed onsite to ensure that sewage is contained and disposed of appropriately.

Up to 20 people will be employed to construct the powerline. Nobody will stay onsite, and all workers will reside in Swakopmund or Arandis. Workers will be transported by bus to and from the workplaces.

Construction commencement is subject to regulatory agreement, i.e., approval of the EIA and issuing of an ECC by the DEA at MEFT. Construction of the powerline is also dependent on the implementation / program of the proposed PV Power Plant. Construction will take approximately nine to twelve months to complete.

4. IDENTIFICATION AND DESCRIPTION OF POTENTIAL ENVIRONMENTAL IMPACTS AND ASSESSMENT FINDINGS

The following aspects and their potential impacts were identified in the process and have been considered by the Environmental Team:

During the site preparation and construction phase:

- Loss or disturbance of biodiversity composition
    - Removal and damage to vegetation, including plants of conservation concern
    - Illegal harvesting of wood and protected species for ornamental purposes
    - Illegal killing (poaching) and collecting of animals
    - Accidental harming or killing of animals (e.g.: road kills, falling into foundation pits, drowning in open water bodies)
- Loss, damage, or fragmentation of habitat

  - Loss or damage of sensitive habitats on rocky outcrops and drainage lines
  - Loss or damage to habitats related to the biological soil crust
- Loss or disturbance of biodiversity structure
  - Interference, disturbance, and displacement of species (individuals, populations and concentrations or groups)
  - Interruption or restriction of movement patterns
  - Introduction of invasive alien species
  - Disturbance of surface water flow patterns and impacts downstream
- Loss, damage, or disturbance of avifauna
  - Interference, disturbance, and displacement of birds
  - Interference or loss of bird habitats, flightpaths, corridors, or flyways
  - Harming and killing of birds because of collisions and or electrocution
- Soil
  - Loss of topsoil because of wind and water erosion
  - Potential contamination because of pollution from waste and accidental spills and leaks of hydrocarbons
  - Potential damage to biological soil crusts
- Surface water and groundwater
  - Potential contamination pollution of groundwater and surface water resulting from waste and accidental spills and leaks of hydrocarbons during construction
  - Disturbances and interference with flow patterns can enhance damming, diverting or water erosion
- Archaeology
  - Potential destruction or damage to archaeological / heritage sites
- Waste
  - Discharge of effluent or sewerage into soil and water
  - Pollution of soil and water
  - Impacts on biodiversity
  - General degradation and nuisance impacts
- Noise
  - Disturbance to third parties (sensitive receptors).
- Dust
  - Dust from construction activities causing impacts to third parties
- Visual
  - Intrusive impacts on views and sense of place
- Employment and income (positive)
  - Job creation and skills development
  - Impacts to the local, regional and national economy

- Third party health, safety and security

During the operational phase:

- Loss or fragmentation of habitat
  - Loss of landscape connectedness through habitat loss or fragmentation
- Loss or disturbance of avifauna
  - Interference, disturbance, and displacement of birds
  - Harming and killing of birds because of collisions and or electrocution
- Visual
  - Intrusive impacts on views and sense of place

The issues that were identified as requiring further assessment; and the assessment findings are summarised in Table A.

TABLE A: SUMMARY OF POTENTIAL IMPACTS ASSOCIATED WITH THE PROPOSED NEW POWERLINE

Potential Impact	Significance	
	Before mitigation	After mitigation
Potential loss or disturbance of biodiversity composition	**L**	**L**
Potential loss, damage, or fragmentation of habitats	**M**	**L**
Disturbance of birds during construction	**L**	**L**
Collision of birds with the interconnection overhead powerline	**M**	**L**
Electrocution of birds on the interconnection overhead powerline	**L**	**L**
Disturbance and damage to heritage sites	**L**	**L**

5. WAY FORWARD

The way forward is as follows:

- I&APs reviewed the report and send their comments to Namisun.
- Namisun finalized the report, incorporating I&APs' comments.
- Submission of the final report (including I&APs' comments) to MME and MEFT for their review and decision.

6. ENVIRONMENTAL IMPACT STATEMENT AND CONCLUSIONS

It is Namisun's opinion that the environmental aspects and potential impacts relating to the proposed interconnection overhead powerline has been successfully identified and assessed as part of this EIA process. Relevant management and mitigation measures have been provided to ensure significant environmental and social impacts are avoided / minimised and positive social impacts enhanced, where relevant. These measures are included in the EMP.

It is recommended that, if MEFT provides a positive decision on the application for the proposed project, they should include a condition to the clearances that Terasun Energy must implement all commitments in the EMP.

SCOPING (INCLUDING IMPACT ASSESSMENT) REPORT AND ENVIRONMENTAL MANAGEMENT PLAN FOR A PROPOSED NEW POWERLINE FOR TERASUN ENERGY

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ACRONYMS AND ABBREVIATIONS

Below a list of acronyms and abbreviations used in this report.

Acronyms / Abbreviations	Definition
ACS	African Conservation Services
ATC	Arandis Town Council
CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species
CV	Curriculum vitae
DEA	Department of Environmental Affairs
EAP	Environmental Assessment Practitioner
EAPAN	Environmental Assessment Professionals Association of Namibia
ECC	Environmental Clearance Certificate
ECPS	Erongo Coal Power Station
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPL	Exclusive prospecting license
ha	hectares
HFO	Heavy fuel oil
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
I&APs	Interested and/or affected parties
IHME	Institute for Health Metrics and Evaluation
km	kilometres
kV	Kilovolts
MET	Ministry of Environment and Tourism
MEFT	Ministry of Environment, Forestry and Tourism
MME	Ministry of Mines and Energy
MoHSS	Ministry of Health and Social Services
NPC	National Planning Commission
NSA	Namibia Statistics Agency
(Pty) Ltd	Proprietary Limited
PV	Photovoltaic
SEA	Strategic Environmental Assessment
TB	Tuberculosis
WHO	World Health Organization

SCOPING (INCLUDING IMPACT ASSESSMENT) REPORT AND ENVIRONMENTAL MANAGEMENT PLAN FOR A PROPOSED NEW POWERLINE FOR TERASUN ENERGY

1 INTRODUCTION

This chapter describes the report's purpose, the project's background and proposed powerline, summarises legislative requirements, explains the report structure, summarises assumptions and limitations of the study and explains how Interested and Affected Parties (I&APs) can provide input.

This Environmental Impact Assessment (EIA) Scoping (Including Impact Assessment) Report has been compiled as part of the EIA process for the proposed interconnection powerline between the Photovoltaic (PV) power plant of TeraSun Energy (Pty) Ltd (TeraSun Energy) and the Lithops Substation near Arandis.

The report therefore describes and assesses the following key activities:

- Construction of a new 132 kV interconnection overhead powerline from the proposed PV power plant east of Arandis to the Lithops Substation, located on the existing Walmund – Rössing powerline southwest of Arandis, over a distance of ~20 km.

Registered I&APs are being provided with the opportunity to comment on this EIA report (see Section 1.5). Once the comment period closes, the report will be updated to a final report with due consideration of the comments received and will be submitted to the Energy Directorate of the Ministry of Mines and Energy (MME) (i.e., the competent authority) and the Ministry of Environment, Forestry and Tourism (MEFT), Department of Environmental Affairs (DEA) for decision-making.

1.1 BACKGROUND

TeraSun Energy proposes to develop a PV Power Plant east of Arandis. Arandis is located in the Erongo Region, about 60 km east of Swakopmund, off the main B2 road that connects Windhoek with the central coastal towns of Namibia. To connect the proposed PV Power Plant with the national grid, a 132 kV interconnection overhead powerline between the PV Power Plant and the Lithops Substation is planned (see Figure 1 for the location of the proposed powerline route in relation to the proposed PV Power Plant and other reference points).

The development of the interconnection overhead powerline between the proposed PV Power Plant and the Lithops Substation originates from the original "Arandis Power Project" for which an EIA process has been completed. An Environmental Clearance Certificate (ECC) was issued to

Arandis Power (Pty) Ltd (Arandis Power) for the Arandis Power Project, including, amongst other the development of the proposed PV Power Plant, based on an approved EIA (amendment) Report and Environmental Management Plan (EMP) (SLR, 2014).

Arandis Power is applying to the MEFT (DEA) for a transferal of the ECC from Arandis Power to TeraSun Energy, in parallel to the application for the proposed new powerline by TeraSun Energy.

In 2012, the possibility of establishing a new transmission network in the Arandis area was investigated by NamPower. This was coupled to NamPower's plans to establish their Erongo Coal Power Station (ECPS) near Arandis. A corridor route (able to accommodate up to three double circuit lines) was identified between the ECPS and the existing Walmund – Rössing line. This route also made provision for a connection to the proposed Arandis Power Project. NamPower received an ECC for the development of the powerlines, based on an approved EIA conducted by Enviro Dynamics in 2012. NamPower has already constructed one powerline in this corridor.

Although planned and approved, neither the Arandis Power Project nor the ECPS have been implemented yet.

The powerline that TeraSun Energy is proposing, will follow a route parallel (adjacent) to NamPower's existing / approved powerline corridor.

This report focuses only on TeraSun Energy's proposed powerline.

Prior to the commencement of the construction of the proposed powerline, environmental clearance is required from the MEFT (DEA), based on an approved EIA process, in terms of the Environmental Management Act, No. 7 of 2007 and its associated EIA Regulations of 2012.

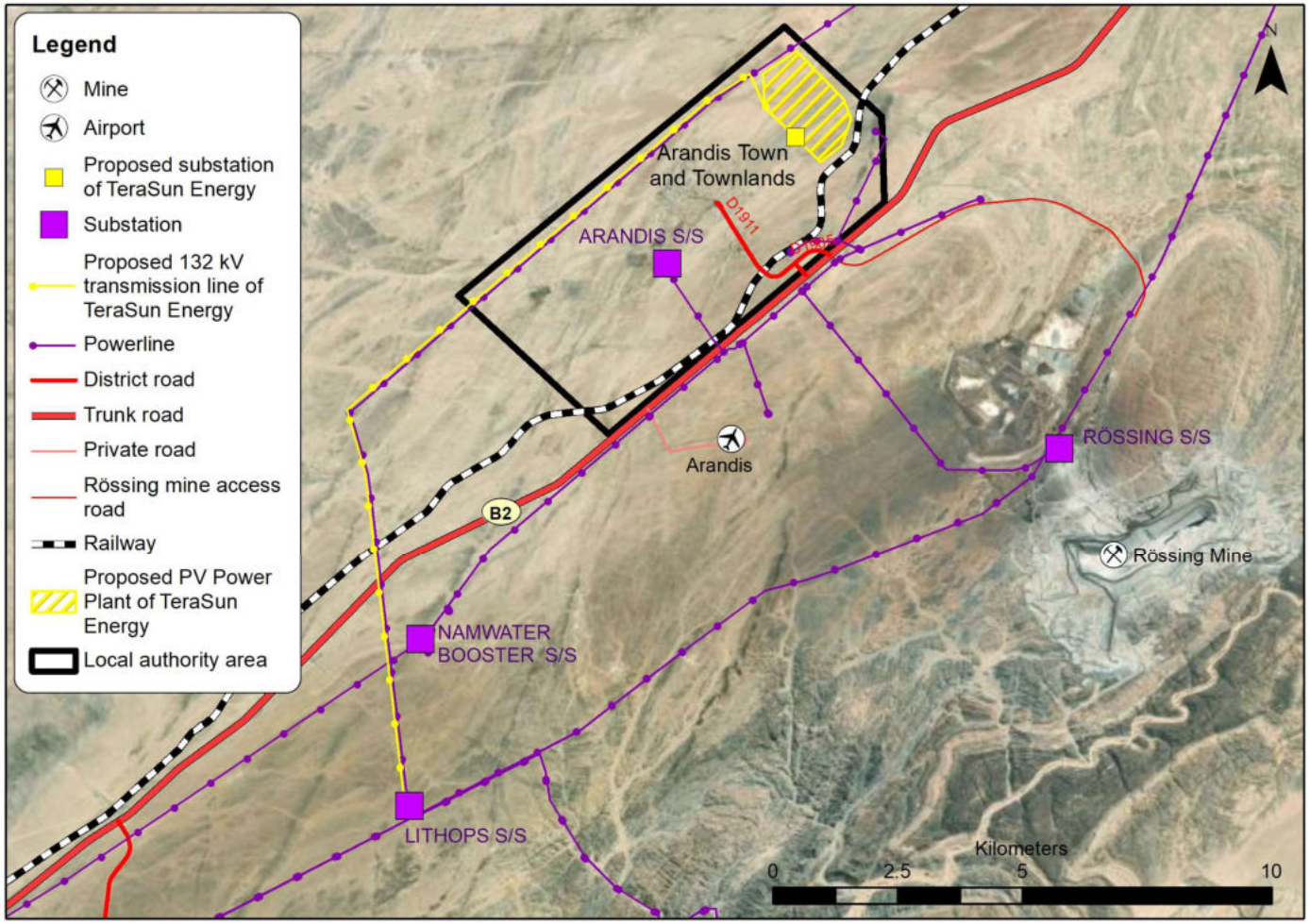

FIGURE 1: LOCATION OF THE PROPOSED NEW POWERLINE

1.2 MOTIVATION (NEED AND DESIRABILITY) FOR THE PROPOSED PROJECT

The motivation for the proposed PV Power Plant east of Arandis was provided in the approved EIA (SLR, 2014) and will not be repeated here. The need for the construction of the proposed powerline is to connect the proposed PV Power Plant with the national grid, i.e., to feed electricity that will be generated by the PV Power Plant into the national grid.

TeraSun Energy approached NamPower in 2021 regarding the construction of their powerline within NamPower's existing / approved powerline corridor. This option implies potential difficulties with the transfer of the ECC in future, however. Following discussions and communications with NamPower it was resolved that, in the interest of time and efficiency, TeraSun Energy should apply for their own ECC for an interconnection powerline, following the same route and parallel to the existing powerline. This option is also in line with the rationale to place linear infrastructure in the same development corridors (SAIEA, 2011).

1.3 INTRODUCTION TO THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

Namisun Environmental Projects and Development (Namisun) as an independent firm of environmental consultants based in Namibia, has been appointed by TeraSun Energy as the independent Environmental Assessment Practitioner to undertake and manage the EIA process for the proposed powerline.

EIAs are regulated by the MEFT in terms of the Environmental Management Act, No. 7 of 2007. This act was gazetted on 27 December 2007 (Government Gazette No. 3966) and its associated regulations were promulgated in January 2012 (Government Gazette No. 4878).

1.3.1 EIA PROCESS

Prior to the commencement of the proposed construction of the powerline, an environmental clearance is required from the DEA of the MEFT, based on an approved EIA process, report and EMP, in terms of the above-mentioned Act and its associated regulations.

This EIA process includes a screening phase and a scoping phase (including an impact assessment) and the development of an EMP (see Figure 2). The assessment methodology is discussed in Chapter 2, which describes the phases of the assessment process in detail.

This report is the Scoping Report, with impact assessments included and the EMP (Chapter 9).

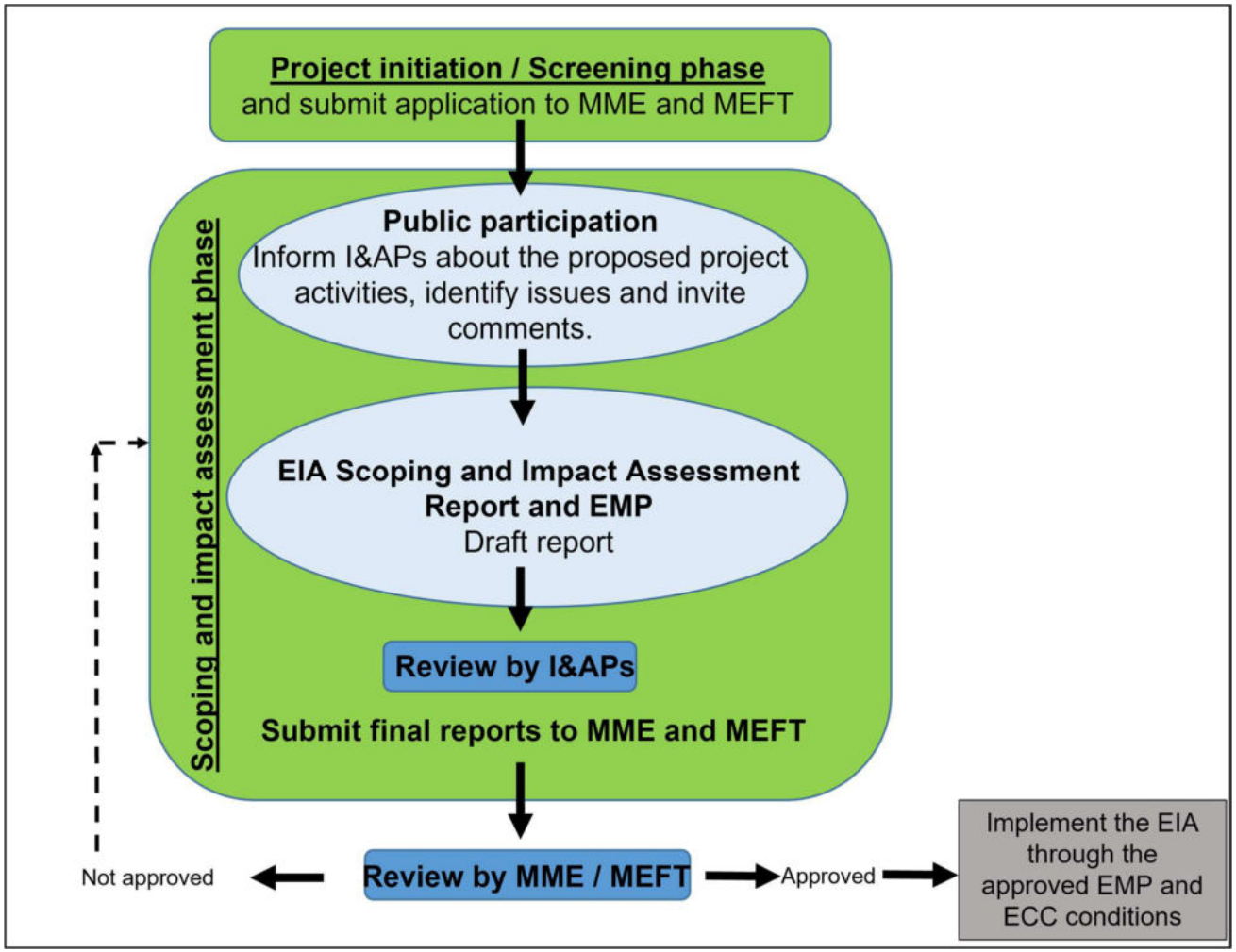

FIGURE 2: EIA PROCESS

The overall objectives of the assessment process are to:

- Provide information on the proposed activities, i.e., the construction and operational activities of the proposed 132 kV interconnection overhead powerline.
- Describe the current environment in which it will be situated.
- Identify, in consultation with I&APs, the potential negative and positive environmental (and social) aspects.
- Assess the associated potential impacts of the proposed activities and infrastructure associated with the proposed new powerline.
- Develop an EMP to avoid / minimise the potential impacts.

The EIA process has been registered on the EIA online portal of the MEFT. A final decision relating to the application will be made by the DEA of the MEFT.

Parallel application for an ECC was submitted to the competent authority, the MME, who will review the application and relevant reports and submit their comments to the MEFT.

Existing relevant information from the previous EIAs were used in this report and have been further augmented by site visits by the EIA team, updated and reconfirmed specialist input, and comments gathered as a result of stakeholder engagement. The potential impacts relating to the proposed activities and infrastructure associated with the proposed new powerline could therefore be assessed and the assessment findings are included in this report.

It is thought that this Scoping Report (including an assessment of impacts), together with the EMP will provide sufficient information for the DEA to make an informed decision regarding the proposed activities, and whether an ECC can be issued or not. Table 1 outlines the report content.

TABLE 1: SCOPING REPORT CONTENT

Chapter	Objective
Chapter 1: Introduction	Describes the purpose of the report, briefly describes the project, summarises legislative requirements, explains the report structure, summarise limitations of the study and explains how the input of I&APs is included.
Chapter 2: Assessment methodology	Outlines the EIA process, including the I&AP consultation process.
Chapter 3: Legal framework	Provides an overview of relevant Namibian policies and applicable Namibian legislation
Chapter 4: Description of the proposed project	Describes the proposed powerline between the PV Power Plant and the Lithops Substation.
Chapter 5: Alternatives	This chapter summarises the project alternatives.

Chapter 6: Description of the current environment	Provides a general overview of the current baseline conditions associated with the proposed new powerline.
Chapter 7: Identification and description of potential impacts	Outlines the environmental aspects and potential impacts associated with the construction and operations of the proposed new powerline.
Chapter 8: Impact Assessment	Assesses the key potential impacts (as identified in Chapter 7).
Chapter 9: Conclusion and Recommendations	EIA conclusion and impact statement.
References	Reference list.
Appendices	Contains all supporting information

The EMP is a stand-alone document, based on the Scoping Report, and provides the necessary management and mitigation measures relating to the construction and operations of the proposed new powerline.

1.4 ASSUMPTIONS AND LIMITATIONS

Assumptions, uncertainties, and limitations are presented in the specialist studies (Appendices E to G), where relevant, and will not be repeated in this report. Some general assumptions are described below.

1.4.1 STUDY AREA

For the specialist studies the area under investigation is defined as the land within and adjacent to the powerline corridor that was given environmental clearance after an EIA was commissioned by NamPower in 2012.

1.4.2 SPECIALIST STUDIES

The 2012 EIA conducted for the transmission line route of NamPower includes specialist assessments on vegetation (Mannheimer), biodiversity (Irish), avifauna (Scott & Scott) and archaeology (Kinahan). It is presumed that the specialist assessments of 2012 would still suffice, but verification by means of desktop assessments with reference to vegetation, avifauna and archaeology was necessary and only these specialist assessments of the baseline and possible cumulative changes were made.

1.4.3 TECHNICAL INFORMATION SHARED BY TERASUN ENERGY

It is assumed that the technical (project) information provided by TeraSun Energy is accurate. Furthermore, it is assumed that the baseline descriptions and assessments conducted as part original EIAs are accurate.

1.4.4 ENVIRONMENTAL ASSESSMENT LIMIT

The following activities and associated potential impacts are excluded from this application / assessment (i.e., this report):

- Activities related to the existing NamPower overhead powerlines.
- The EIA focused on third parties only and did not assess health and safety impacts on workers because it is assumed that these aspects are separately regulated by health and safety legislation, policies and standards, and that TeraSun Energy will adhere to these.

1.4.5 CONSULTATION WITH I&APS

Officials from the Arandis Town Council (ATC) and personnel of NamPower were engaged during the assessment. A meeting with officials of ATC took place in Arandis on 28 February 2022 and a Zoom meeting was held with NamPower on 8 March 2022. Consultation with other I&APs was ensured through advertisement in newspapers, site notices, email notifications and the distribution of relevant EIA documents, i.e., a background information document (BID) and this EIA report and EMP (see Section 2.2 for further details).

1.5 OPPORTUNITY TO COMMENT

I&APs were invited to comment on this Scoping (including an assessment of impacts) Report and EMP, which were available for a review and comment period from **14 April** to **14 May 2022**. Comments should have been sent to Namisun at the telephone number, or e-mail address shown below by **no later than 14 May 2022.**

Namisun
Attention: Pierré Smit
E-mail address: oudoring@gmail.com
Cell number: +264 (0)81 752 7207

2 ASSESSMENT METHODOLOGY

This chapter outlines the EIA process and methodology applied, including the I&AP consultation process, in accordance with the requirements outlined in the EIA Regulations of 2012.

2.1 PROCESS AND METHODOLOGY

2.1.1 PROJECT INITIATION AND SCREENING PHASE

- Namisun notified MEFT and MME of the proposed project through a background information document (BID).
- Namisun notified MEFT through the submission of the EIA Application Form (Form 1) and registration via the online portal of the MEFT (APP-003318).
- Submit the Application Form to the MME (Energy Directorate), who is the competent authority for the EIA process, on the 2nd of December 2021.
- Project initiation meetings and site visit with the TeraSun Energy team to discuss the proposed project.
- Early identification of environmental aspects and potential impacts associated with the construction and operations of the proposed new powerline and determine additional legal requirements.
- Confirm specialists' terms of reference for reassessment of the baseline and possible cumulative impacts, considering findings from NamPower's EIA (Enviro Dynamics, 2012).
- Identify key stakeholders relating to the proposed new powerline. Namisun developed an EIA-specific stakeholder database for the project. This database (see Appendix D) was updated throughput the EIA process, as and when required. Namisun contacted (telephonically) various key stakeholders to confirm their e-mail addresses, to obtain further input and to share the relevant information.

2.1.2 SCOPING (INCLUDING ASSESSMENT) PHASE

- Namisun notified the I&APs of the proposed project via (newspaper advertisements, this document, emails, distribution of a BID, site notices and telephone calls).
- Obtain initial comments from I&APs.
- Carry out specialist (re)assessments.
- Assess the potential impacts of the proposed activities (and infrastructure) and compile an EIA Scoping (including impact assessment) Report and EMP (this report).
- Distribute the Scoping Report for review and comment by regulatory authorities and I&APs.
- Finalize the report with due consideration of comments received.
- Submit the final reports to the MME and MEFT for decision making.

2.1.3 SCOPING REPORT

The main purpose of the Scoping Report is to indicate which environmental aspects relating to the construction and operations of the proposed new powerline might have an impact on the environment. These potential impacts were assessed, and the findings are presented in this report (see Chapters 7 and 8).

Table 2 outlines the Scoping Report requirements as set out in Section 8 of the EIA Regulations that were promulgated in January 2012 in terms of the Environmental Management Act, 7 of 2007.

TABLE 2: SCOPING REPORT REQUIREMENTS STIPULATED IN THE EIA REGULATIONS

Requirements for a Scoping Report in terms of the February 2012 Regulations	Reference in Report
(a) The curriculum vitae of the EAPs who prepared the report.	Section 2.1.5 and Appendix A
(b) A description of the proposed activity.	Chapter 4
(c) A description of the site on which the activity is to be undertaken and the location of the activity on the site.	Chapter 4 & 6
(d) A description of the environment that may be affected by the proposed activity and the manner in which the geographical, physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed listed activity.	Chapter 6, 7 and 8
(e) An identification of laws and guidelines that have been considered in the preparation of the Scoping Report.	Chapter 3
(f) Details of the public consultation process conducted in terms of regulation 7(1) in connection with the application, including - (i) the steps that were taken to notify potentially interested and affected parties of the proposed application; (ii) proof that notice boards, advertisements and notices notifying potentially interested and affected parties of the proposed application have been displayed, placed or given; (iii) a list of all persons, organisations and organs of state that were registered in terms of Regulation 22 as interested and affected parties in relation to the application; and	Sections 2.2

Requirements for a Scoping Report in terms of the February 2012 Regulations	Reference in Report
(iv) a summary of the issues raised by interested and affected parties, the date of receipt of and the response of the EAP to those issues.	
(g) A description of the need and desirability of the proposed listed activity and any identified alternatives to the proposed activity that are feasible and reasonable, including the advantages and disadvantages that the proposed activity or alternatives have on the environment and on the community that may be affected by the activity.	Section 1.2 and Chapter 5
(h) A description and assessment of the significance of any significant effects, including cumulative effects, that may occur as a result of the undertaking of the activity or identified alternatives or as a result of any construction, erection or decommissioning associated with the undertaking of the proposed listed activity.	Chapter 7 and 8
(i) Terms of reference for the detailed assessment.	Chapter 7 and 8 (However, not applicable due to the fact that this is the final report, which includes an assessment and specialist input. No further assessment is required).
(j) A management plan, which includes - (i) information on any proposed management, mitigation, protection or remedial measures to be undertaken to address the effects on the environment that have been identified including objectives in respect of the rehabilitation of the environment and closure; (ii) as far as is reasonably practicable, measures to rehabilitate the environment affected by the undertaking of the activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and (iii) a description of the manner in which the applicant intends to modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation remedy the cause of pollution or degradation and migration of pollutants.	A stand-alone EMP

2.1.4 INFORMATION COLLECTION

Namisun obtained information from various sources to identify the environmental aspects associated with the construction and operations of the proposed powerline and to assist in the (re)assessment of potential impacts. Information was sourced from:

- The EIA Report for the proposed construction of the west coast transmission lines for NamPower, specifically for the section between the proposed ECPS and the existing Walmund – Rössing powerline (Enviro Dynamics, 2012).
- Technical information relating to the proposed new powerline and activities, provided by TeraSun Energy.
- Consultations with stakeholders.
- Specialist input to confirm the baseline information and to (re)assess potential cumulative impacts, including:
    - Vegetation by Coleen Mannheimer (botanist).
    - Heritage by John Kinahan (archaeologist).
    - Avifauna by African Conservation Services (Dr Ann and Mike Scott).
- Atlas of Namibia.
- The roadside geology of Namibia.
- Groundwater in Namibia – an explanation to the hydrogeological map.
- Climatic data retrieved from www.meteoblue.com.
- Namibia Statistics Agency (NSA) and National Planning Commission (NPC) reports
- Health information retrieved from www.mhss.gov.na and the Institute for Health Metrics and Evaluation (IHME)
- The Structure Plan for Swakopmund 2020 – 2040.
- Site visits by Namisun.
- Google Earth.

2.1.5 EIA TEAM

Namisun (a Namibia-based company) was appointed to undertake and manage the EIA process and environmental clearance applications.

Werner Petrick, the EIA project manager has twenty-three years of relevant experience in environmental management, conducting/managing EIAs, compiling EMPs and implementing EMPs and Environmental Management Systems. Werner has a B. Eng (Civil) degree and a

master's degree in environmental management and is certified as lead environmental assessment practitioner (EAP) and reviewer under the Environmental Assessment Professionals Association of Namibia (EAPAN). The relevant curriculum vitae documentation is attached in Appendix A.

Dr Pierré Smit, the project coordinator, holds a PhD in Landscape Ecology and has twenty-seven years of experience in environmental management, managing environmental assessment and the implementation of EMPs and Environmental Management Systems in Namibia.

The Environmental Project Team for the EIA process is outlined in

Table 3.

The relevant curriculum vitae documentation is attached in Appendix A.

TABLE 3: EIA PROJECT TEAM

Team	Name	Designation	Tasks and roles	Company
Project proponent	Mr Ezio Vernetti	Managing Director	Responsible for the interface between TeraSun Energy and the environmental team, and for ensuring implementation of the EIA outcomes.	TeraSun Energy
Project manager	Mr Werner Petrick	EAP	Management of the EIA process Compilation of EIA amendment report and EMP	Namisun
Project coordinator	Dr Pierré Smit	EAP		
Further specialist input incorporated into this report				
Vegetation	Coleen Mannheimer	Botanist	Vegetation baseline and re-assessment	Coleen Mannheimer
Archaeology	John Kinahan	Archaeologist	Archaeological baseline and re-assessment	J Kinahan Archaeologist
Avifauna	Mike and Ann Scott	Bird Specialists	Avifauna baseline and re-assessment	African Conservation Services CC

2.2 PUBLIC PARTICIPATION PROCESS

The public participation process for the proposed project was conducted to ensure that all persons and or organisations that may be affected by, or interested in, the proposed activities and infrastructure, were informed of the project and could register their views and concerns. By consulting with relevant authorities and I&APs, the range of environmental issues to be considered

in this Scoping Report (including the assessment of impacts) has been given specific context and focus.

Section 2.2.1 provides a summary of I&APs consulted, the process that was followed, and the issues that were identified.

2.1.6 Interested and Affected Parties

The broad list of persons, group of persons or organisations that were informed about the project and were requested to register as I&APs, should they be interested and or affected, include:

- MME
- MEFT
- Officials from ATC.
- Representatives of NamPower.
- I&APs that registered on the project, including representatives of Telecom Namibia, Paratus, Roads Authority, NamWater and TransNamib.

These stakeholders were informed about the need for the proposed project activities, the EIA process (including the public consultation), as well as the outcomes of the assessment.

The full stakeholder database for this project is included in Appendix D of this report.

2.1.7 Steps in the Public Consultation Process

Table 4 sets out the steps that were followed as part of the consultation process:

TABLE 4: CONSULTATION PROCESS WITH I&APS

TASK	DESCRIPTION	DATE
Notification - regulatory authorities and I&APs		
Notification to MME and MEFT	Namisun notified the DEA of the MEFT of the proposed project through registering the project on their online portal and uploading the BID. The ECC application form and BID were submitted to the competent authority (MME).	November 2021
I&AP identification	The stakeholder database was developed. This database is updated as and when required. A copy of the I&AP database is attached in Appendix D.	November 2021 – ongoing
Distribution of BID	Copies of the BID were distributed via email to relevant authorities and I&APs on the stakeholder database and hard copies were made available on request. The purpose of the BID was to inform I&APs and authorities about the proposed activities, the assessment process being followed, possible environmental impacts and ways	November - December 2021

TASK	DESCRIPTION	DATE
	in which I&APs could provide input to Namisun. Attached to the BID was a registration and response form, which provided I&APs with an opportunity to submit their names, contact details and comments on the project. A copy of the e-mail notification and BID are attached in Appendix B.	
Site notices	Site notices were placed in Arandis and on the site to notify I&APs of the proposed project, and the EIA process being following. Photos of the site notices that were displayed are attached in Appendix B.	November 2021
Newspaper Advertisements	Block advertisements were placed in the Market Watch as part of the following newspapers: • The Namibian Sun (29 November and 6 December 2021) • Die Republikein (29 November and 6 December 2021) • Allgemeine Zeitung (29 November and 6 December 2021) Copies of the advertisements are attached in Appendix B	November - December 2021
Key stakeholder and focus group meetings and submission of comments		
Focus group meetings	A Focus Group Meeting with officials of ATC was held in Arandis on 28 February 2022 and a Focus Group Meeting was held with personnel of NamPower via Zoom on 8 March 2022. Minutes of the meeting are attached in Appendix C.	February / March 2022
Comments and responses	A summary of questions / comments / issues raised (with responses) during the meetings and by email are provided in Section 2.2.3. See Appendix C.	February - March 2022
Review of draft Scoping Report and EMP by I&APs and authorities		
I&APs and authorities review of Scoping Report with EMP	Copies of the Scoping Report (including impact assessment) with the EMP were made available for review at the offices of ATC. Electronic copies of the report were available on request from Namisun. Summaries of the Scoping Report were distributed to all relevant authorities and I&APs on the I&AP database via e-mail (see Appendix D for the stakeholder database). Authorities and I&APs could review the draft report and submit comments in writing to Namisun. The comments period commenced on the **14 April 2022** and the closing date for comments was **14 May 2022.**	April - May 2022

TASK	DESCRIPTION	DATE
MME and MEFT review of Scoping Report and EMP	Namisun (and the appointed environmental specialists) considered all the comments from I&APs and regulatory authorities, even after the closing date for comments. Where relevant, the reports were updated. A copy of the final report, including comments from authorities and I&AP, will be submitted to the MME for their review and recommendation to MEFT who will do the final review for decision-making. The final report (including I&APs comments) will be uploaded onto the MEFT portal.	May 2022
Communicate decision to I&APs	MEFT's decision regarding the ECC application will be communicated to all register I&APs via email.	After MEFT's review period

2.1.8 SUMMARY OF COMMENTS AND ISSUES RAISED

All questions / comments / issues that have been raised throughout the process by authorities and I&APs, with relevant responses, are summarized as follows:

No comments were received during the BID review period.

3 LEGAL FRAMEWORK

This chapter provides an overview of relevant Namibian policies and applicable Namibian legislation and international conventions / treaties applicable to the proposed powerline project.

The Republic of Namibia has five tiers of law and a few guiding policies relevant to environmental assessment and protection, which include the Constitution of the Republic of Namibia, statutory law, common law, customary law and international law.

As the main source of legislation, the Constitution of the Republic of Namibia (1990) makes provision for the creation and enforcement of applicable legislation. Article 95 (1) of the Constitution says: *"The State is obliged to ensure maintenance of ecosystems, essential ecological processes and biological diversity and utilisation of living natural resources on a sustainable basis for the benefit of Namibians both present and future".* In this context and in accordance with the constitution, Namibia has passed numerous laws intended to protect the natural environment and mitigate against adverse environmental impacts.

Some international legislation, treaties, standards and guidelines – some to which Namibia is a signatory – are also of relevance, including the following:

- The Convention on Biological Diversity (CBD) of 1992 details the preservation of rare and endemic species and Article 14 of the convention requires that EIAs are carried out for projects that are likely to have an adverse effect on biodiversity.
- The Convention to Combat Desertification of 1992 advocates the prevention of excessive land degradation that may threaten livelihoods.
- The Convention on International Trade in Endangered Species (CITES) of 1973 regulates the trade in endangered species – specifically species threatened with global extinction and species that may become extinct unless trade in them is strictly regulated.

In 2011 the Strategic Environmental Assessment (SEA) for the Central Namib Uranium Rush was conducted (SAIEA, 2011). On the one hand the assessment advocates the identification of areas of high biodiversity; on the other hand, it emphasizes the protection of key habitats like ridges, inselbergs, valley flanks, large ephemeral rivers, coastal wetlands, springs and ephemeral pans, caves and isolated sand patches. The assessment stresses the importance of maintaining ecological process, and the careful placement of infrastructure corridors considering sensitive areas. It also recommends that development infrastructure should be placed within corridors as far as possible. Professional monitoring of key indicators and disclosure of monitoring results is also an important recommendation of the assessment.

Guidelines suggested by the SEA relevant to this assessment include:

- The protection of key habitats (specifically washes and rocky ridges).
- The prevention of extinctions.
- Maintenance of ecological processes such as surface hydrology, groundwater movement and moisture supply.
- Avoidance of impacts wherever possible, and rehabilitation / restoration after disturbance where avoidance is not possible or provide biological offset areas.
- Usage of existing and planned 'infrastructure corridors' to avoid important biodiversity areas, particularly 'no-go' areas, and consider alternatives and optimisation of service provision.
- Prevent secondary impacts and unnecessary collateral damage.
- Monitor key indicators and disclose the results.
- Minimize vehicle tracks to prevent disturbance of the biological soil crust.

Policies and plans currently in force and relevant to this assessment include:

- Namibia's Environmental Assessment Policy for Sustainable Development and Environmental Conservation (1994).
- Policy for the Conservation of Biotic Diversity and Habitat Protection (1994).
- The EIA Policy (1995).
- The National Climate Change Policy of Namibia (September 2010).
- White Paper on the Energy Policy, 1998.
- National Development Plan, 2017/2018 – 2021/2022, guided by Vision 2030.
- Namibia Vision 2030.
- National Biodiversity Strategy and Action Plan (NBSAP) 1 (2002) and 2 (2014).

Section 3.1 summarizes the various applicable Namibian laws of relevance to this project.

3.1 SUMMARY OF APPLICABLE ACTS AND POLICIES

In the context of the proposed new powerline, there are several laws currently applicable. They are reflected in Table 5.

TABLE 5: RELEVANT LEGISLATION FOR THE PROPOSED POWERLINE

YEAR	NAME	Natural Resource Use (energy & water)	Emissions to air (fumes & dust)	Emissions to land (non-hazardous & hazardous)	Emissions to water	Noise	Visual	Traffic	Impact on Land use	Impact on biodiversity	Impact on Archaeology	Socio-economic	3rd Party Safety & Health	Other
1956	Water Act, No. 54 of 1956, as amended	X			X							X		
1969	National Monuments Act, No. 28 of 1969										X			
1969	Soil Conservation Act, No. 76 of 1969 and the Soil Conservation Amendment Act, No. 38 of 1971	X		X	X				X	X				
1974	Hazardous Substance Ordinance, No. 14 of 1974													X
1975	Nature Conservation Ordinance, No. 14 of 1975	X			X					X	X			
1976	Atmospheric Pollution Prevention Ordinance, No. 11 of 1976		X											
1990	The Constitution of the Republic of Namibia of 1990	X	X	X	X	X	X	X	X	X	X	X	X	
1990	Petroleum Products and Energy Act, No. 13 of 1990		X	X	X					X			X	X
1990	Nature Conservation General Amendment Act of 1990,	X			X					X	X			

YEAR	NAME	Natural Resource Use (energy & water)	Emissions to air (fumes & dust)	Emissions to land (non-hazardous & hazardous)	Emissions to water	Noise	Visual	Traffic	Impact on Land use	Impact on biodiversity	Impact on Archaeology	Socio-economic	3rd Party Safety & Health	Other
1996	Nature Conservation Amendment Act, No.5 of 1996, and the Nature Conservation Amendment Act, No. 3 of 2017.	X			X					X	X			
1997	Namibian Water Corporation Act, No.12 of 1997	X												
1999	Road Traffic and Transport Act, No. 22 of 1999							X						
2001	The Forestry Act, No. 12 of 2001 as amended by the Forest Amendment Act, No.13 of 2005	X							X	X				
2003	Pollution Control and Waste Management Bill (3rd Draft September 2003)		X	X	X	X								
2004	National Heritage Act, No. 27 of 2004										X		X	
2007	Labour Act, 2007, No. 11 of 2007											X		
2007	Electricity Act, No. 4 of 2007								X					
2007	Environmental Management Act, No. 7 of 2007	X	X	X	X	X	X	X	X	X	X	X	X	

YEAR	NAME	Natural Resource Use (energy & water)	Emissions to air (fumes & dust)	Emissions to land (non-hazardous & hazardous)	Emissions to water	Noise	Visual	Traffic	Impact on Land use	Impact on biodiversity	Impact on Archaeology	Socio-economic	3rd Party Safety & Health	Other
2012	Regulations promulgated in terms of the Environmental Management Act, No. 7 of 2007	X	X	X	X	X	X	X	X	X	X	X	X	X
2013	Water Resources Management Act, No. 11 of 2013	X			X							X		
2015	Public and Environmental Health Act, No. 1 of 2015					X							X	
2017	Nature Conservation Amendment Act, No. 3 of 2017	X			X					X	X			

4 DESCRIPTION OF THE PROPOSED PROJECT

This chapter describes the project, i.e., the proposed 132 kV interconnection overhead powerline from the planned PV Power Plant east of Arandis to the Lithops Substation on the existing Walmund – Rössing powerline southwest of Arandis.

4.1 GENERAL PROJECT INFORMATION

4.1.1 DETAILS OF THE APPLICANT

Company name:	TeraSun Energy (Pty) Ltd
Contact (responsible) person:	Mr. Ezio Vernetti
Tel:	+264 61 435 824
E-mail:	ezio.vernetti@natura-energy.com

TeraSun Energy (Pty) Ltd is a 100% privately funded company. TeraSun Energy is a special purpose company exclusively dedicated to the ownership and operations of the solar power generation assets that are the object of this assessment. As of January 2022, TeraSun Energy is a fully owned subsidiary of Natura Energy, a Namibian registered proprietary limited company focused on the development in Namibia of renewable energy power generation projects. Natura Energy has executed in May 2021 an agreement with Globeleq Africa Limited, a United Kingdom registered private company, for the joint development of the TeraSun Energy project.

4.1.2 PROJECT OVERVIEW AND BACKGROUND

About a decade ago, NamPower identified the need to construct the ECPS near Arandis as part of the answer to an increased electricity demand associated with big projects in the Erongo Region at the time. In addition, NamPower decided to upgrade the west coast transmission network of the national power grid at the same time. Subsequently, NamPower commissioned three separate EIA studies for work on the powerline network in the Arandis area, namely:

- A section between the proposed ECPS and the existing Walmund – Rössing powerline.
- Connection between the proposed ECPS and the existing Khan Substation of NamPower.
- From the ECPS to the existing Rössing – Khan powerline.

Enviro Dynamics was appointed by NamPower to carry out the environmental assessment for the connection between the proposed ECPS and the existing Walmund – Rössing powerline (Enviro Dynamics, 2012). The connection made provision for three double circuit lines within this route, as well as a connection to the proposed Arandis Power Station.

To connect the proposed PV Power Plant east of Arandis with the Lithops Substation of NamPower on the existing Walmund – Rössing powerline (located southwest of Arandis), a 132 kV interconnection overhead powerline over a distance of ~20 km is planned. The proposed powerline is planned adjacent / parallel to an approved corridor of NamPower, within which a 220 kV NamPower powerline already exists. NamPower has approval to construct two more double circuit powerlines on this route, all running parallel (Enviro Dynamics, 2012).

The overall context of this project and the direction of the proposed powerline route is described in Chapter 1 of this report and will not be repeated here. Only the technical detail of the project is described here.

4.1.3 TECHNICAL DETAIL OF THE PROPOSED POWERLINE

The new powerline will run from the proposed PV Power Plant, first in a northeast direction, and then parallel to the existing NamPower route to the west before it turns south towards the substation. The offset distance between the lines, centre to centre, is 31 m. It will connect with the Lithops Substation, using an existing spare 132 kV bay.

FIGURE 3: PHOTO SHOWING AN EXAMPLE OF A STEEL MONOPOLE STRUCTURE FOR THE 132 KV POWERLINE

The project entails the installation of steel monopole powerline support structures as illustrated in Figure 3). The steel monopoles will carry 132 kV electricity conductors and one optical fibre ground wire, 2.3 m above the conductors. The length of the insulators is 1.234 m, and the height of the poles varies between 18 and 21.6 m above ground. Spacing between the poles will between 350 and 450 m, depending on the terrain. An H-structure pole will be used for exiting / entering a substation. Aircraft warning spheres will be fitted on the powerline above major road crossings.

4.1.4 SERVITUDE

The NamPower corridor makes provision for up to three double circuit lines – the existing 220 kV powerline and two more double circuit powerlines – all running parallel. A width of only 12 metres within this corridor was earmarked to be totally cleared of vegetation to create a rudimentary road, to provide access for construction teams and for maintenance of the line throughout its lifetime (Enviro Dynamics, 2012). The existing powerline corridor is without a registered servitude, as it was developed when the land – even the present Arandis Townlands – was still un-surveyed state land.

The section between the PV Power Plant's private step-up substation and the NamPower route does not follow the NamPower corridor, but the rest of the new powerline is planned on the western side of the NamPower route. The registration of a servitude for the proposed powerline of TeraSun Energy is implied. If a servitude needs to be registered on the un-surveyed state land outside of the Arandis Townlands, this servitude will be adjacent to the existing powerline corridor. The section between the PV Power Plant's private step-up substation and the NamPower route, as well as the section within the Arandis Townlands, will have a stand-alone servitude, if required.

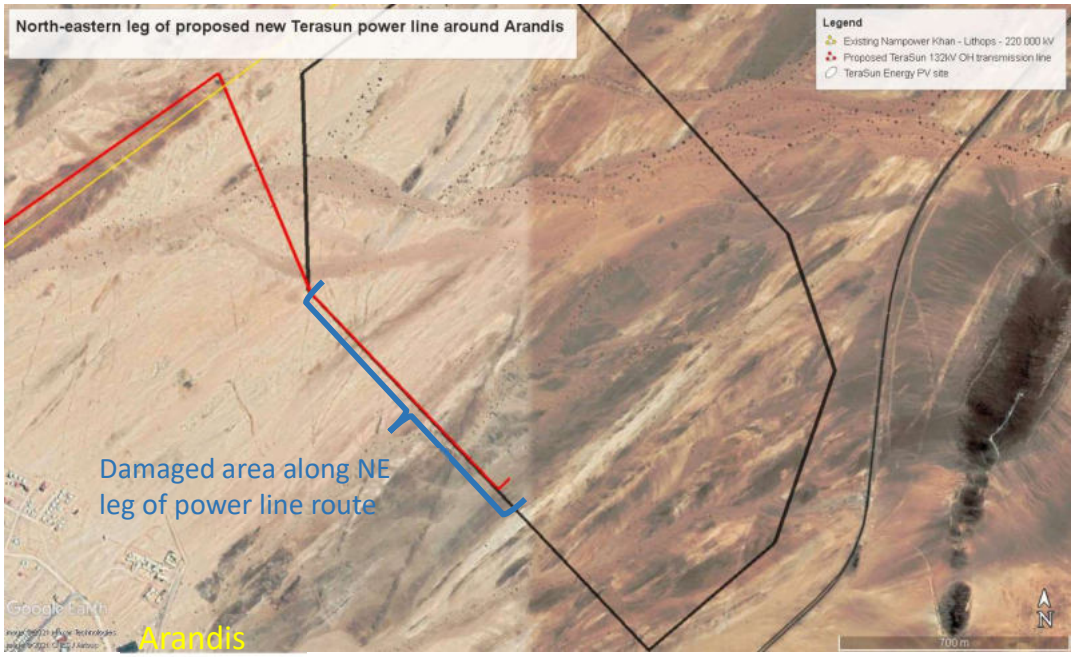

FIGURE 4: MAP SHOWING THE LEG OUTSIDE OF THE POWERLINE CORRIDOR
(Source: Mannheimer, 2021)

It is proposed that the NamPower service road within the existing NamPower corridor will be used as the road from where access points to the new poles will be made. The laydown activities will also take place within this existing corridor.

4.2 CONSTRUCTION PHASE

4.2.1 SITE PREPARATION

There is no need for any large-scale land clearance. Only the small areas where the digging of the monopole foundations will take place will be affected by localized and largely non-intrusive construction activities, including the preparation of each site. As can be seen in Figure 3, the construction activities associated with the erection of the poles leave very little visible marks of disturbance afterwards.

All components for the powerline (steel, conductors, and insulators, etc.) will be transported on the B2 main road to site by low-bed trailers and then transported along the line with the existing service road. No significant impacts associated with traffic interruption are expected on the B2 road due to the construction activities.

4.2.2 GENERAL CONSTRUCTION ACTIVITIES

The poles are pre-assembled. Support structures (for the carrying of the conductors) will be slip-jointed to the poles onsite before the poles are hoisted. Mobile cranes will be used to place the poles in their foundation holes. All the intermediary poles are freestanding without any anchors. The three H-poles and bend poles will be anchored to the ground by steel cable stays. Figure 5 illustrates how these cable stays are attached to the poles.

FIGURE 5: PHOTO SHOWING AN EXAMPLE OF THE STEEL CABLE STAYS

Concrete will be mixed and poured onsite for the foundations of the monopoles, and also for the foundation and platform of the substation and for the plinths. Subsequently all concrete constituents (crushed stone, cement, water and sand) will have to be transported to site.

4.2.3 VEHICLES AND EQUIPMENT

Transport vehicles (light and heavy trucks), mobile cranes, generator sets, cement mixing equipment, small tools and small equipment will be in use during the construction phase.

4.2.4 WATER SUPPLY

Drinking water and water for cement mixing will be transported from Arandis to the work areas daily during the construction phase.

4.2.5 POWER SUPPLY

Electricity is only required during the construction activities and will be provided by portable and mobile generator sets. No electricity is needed for any other purpose and after the construction phase.

4.2.6 FUEL SUPPLY AND STORAGE

Diesel is the main consumable and will be required for the vehicles and equipment. Fuel stations in Arandis will be used and no fuel will be stored onsite.

4.2.7 WASTE MANAGEMENT

Some construction and non-hazardous waste (steel and wire offcuts, scrap metal, empty containers, electrical cable rolls, plastics and packaging and building rubble), hazardous waste (e.g.: oil and fuel, contaminated materials and soil) as well as domestic waste (such as plastic bags, tins, bottles, paper, and packaging waste) will be generated. All waste will be contained and removed to a permitted municipal waste disposal site.

It must be pointed out that the existing powerline corridor is already littered with garbage (see Figure 6) to a large extend, especially within and adjacent to the Arandis Townlands. The construction team will have the unfortunate task to clean-up the entire corridor after the construction activities is completed to avoid potential accusations about inappropriate waste management.

FIGURE 6: PHOTO SHOWING EXISTING RUBBISH LITTERING ALONG THE POWERLINE

Drip trays will be placed under all stationery vehicles and equipment. Any oil spill will be scooped into bags and taken to a permitted hazardous waste disposal site.

Once a work area is established, a portable chemical toilet will be placed onsite to ensure that sewage is contained and disposed of appropriately.

4.2.8 ACCESS

As the powerline shall be constructed adjacent to the NamPower powerline, the existing service road of NamPower shall be used as the main access road and no new roads will be constructed. Only access points for the installation of the monopoles, from the service road, are required.

It must be emphasised that the service road is absent or hard to trace over long distances within the existing powerline corridor, especially in the southernmost parts. Several other roads also cross the powerline corridor, making it even more challenging to recognise (see Figure 7).

FIGURE 7: PHOTO SHOWING ROADS CROSSING THE POWERLINE CORRIDOR

4.2.9 STAFF, EMPLOYMENT AND ACCOMMODATION

Up to 20 people will be employed to construct the powerline.

Nobody will stay onsite, and all workers will reside in Swakopmund or Arandis. Workers will be transported by bus to and from the workplaces.

4.2.10 CONSTRUCTION SCHEDULE

Construction commencement is subject to regulatory agreement, i.e., approval of the EIA and issuing of an ECC by the DEA at MEFT. Construction of the powerline is also dependent on the implementation / program of the proposed PV Power Plant. Construction will take approximately nine to twelve months to complete.

5 ALTERNATIVES

This chapter summarises the alternatives relevant to this project.

5.1 HISTORICAL CONTEXT AND ALTERNATIVE ROUTE OPTIONS

In 2012 NamPower considered four route options for the connection of the proposed ECPS to the existing Walmund – Rössing line. Enviro Dynamics was appointed to evaluate the four options, select a preferred route and to conduct an EIA for the route (Enviro Dynamics, 2012). The main objective for the evaluation was to avoid as many impacts as possible, especially those that could otherwise not be easily mitigated.

The four routes are illustrated in Figure 8.

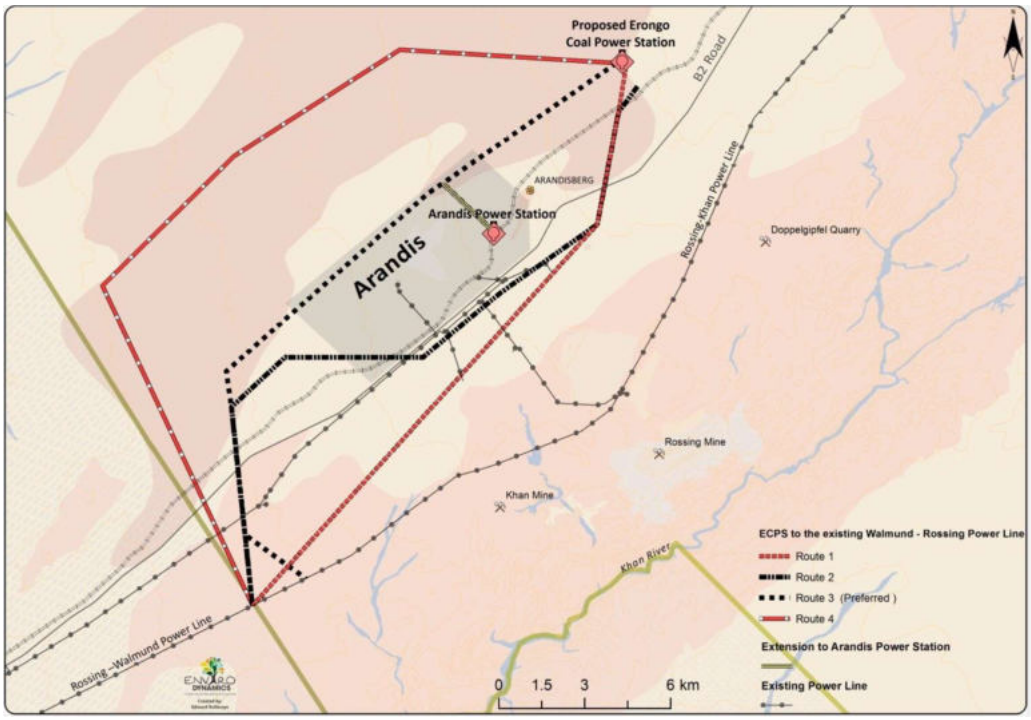

FIGURE 8: THE FOUR ALTERNATIVE ROUTES CONSIDERED IN 2012
(Source: Enviro Dynamics, 2012)

Following the recommendation of the Central Namib Uranium Rush SEA (SAIEA, 2011), the possibility to construct the new powerline within the same development corridor, i.e., along the existing Khan – Rössing and the Rössing – Walmund line to the south of the B2 main road, was investigated. Due to the rugged terrain, the available space next to the existing lines was found to be insufficient to accommodate the servitudes required for the new line. Subsequently, this alternative was dropped.

To evaluate the remaining three options, six factors were identified to determine the preferred route:

- Existing development corridors.
- Presence of the Arandis Airport.
- Ecologically sensitive marble ridges and drainage lines.
- Future development possibilities of Arandis.
- The cumulative visual impact of powerlines in the area.
- Presence of active exclusive prospecting licenses (EPLs) in the area.

A comparative assessment of the various alternatives was undertaken (Enviro Dynamics, 2012), which is not repeated in this document. After considering all the factors, Route 3 was identified as the preferred alternative – even though this option was not located within the development corridors that existed in 2012.

The route chosen is away from the entrance of Arandis, meaning that the visual impacts are minimized. It is also further than 4 km away from the Arandis Airport, implying that it poses no risk to approaching and departing aircraft. The route does not clash with the land use zones proposed in the future planning of Arandis as well. The route can accommodate up to three double circuit lines and makes provision for a connection to the proposed Arandis Power Station as well.

5.2 ROUTE OPTIONS FOR THE PROPOSED NE POWERLINE

In compliance with the recommended decision of the 2012-assessment, TeraSun Energy did not consider alternative routes for the proposed new powerline other than the existing NamPower corridor. Therefore, TeraSun Energy approached NamPower in 2021 regarding the construction of their powerline within NamPower's existing / approved powerline corridor. However, it was decided that TeraSun Energy should apply for their own ECC (see also Section 1.2).

By following the same route, the location of the proposed TeraSun powerline minimizes visual impacts, is further than 4 km away from the Arandis Airport and does not clash with land uses proposed in the future planning of Arandis. The preference of this route is also in line with the rationale to place linear infrastructure in the same development corridors (SAIEA, 2011).

5.3 NO-GO PROJECT OPTION

With reference to Section 1.2, the motivation for the need for the construction of the proposed powerline is to connect the proposed PV Power Plant with the national grid. Without this powerline, electricity that will be generated by the PV Power Plant cannot feed into the national grid. If the project is not implemented, the baseline environment (see Section 6) will stay unchanged with no (potential) negative impacts on the environment, as further assessed in Sections 7 and 8.

6 DESCRIPTION OF THE CURRENT ENVIRONMENT

An understanding of the environmental and social context within which the proposed project is located is important to better understand any sensitivities and to help assess potential impacts. This chapter provides a general overview of the current baseline conditions associated with the proposed interconnecting overhead powerline.

This chapter was compiled utilizing the following key sources of information:

- The EIA Report for the proposed construction of the west coast transmission lines for NamPower, specifically for the section between the proposed ECPS and the existing Walmund – Rössing powerline (Enviro Dynamics, 2012).
- Technical information relating to the proposed new powerline and activities, provided by TeraSun Energy.
- Consultations with stakeholders.
- Specialist input to reassess and confirm the baseline information and to identify potential cumulative impacts, including:
    - Vegetation by Coleen Mannheimer (botanist) (Appendix E).
    - Avifauna by African Conservation Services (Dr Ann and Mike Scott) (Appendix F).
    - Heritage by John Kinahan (archaeologist) (Appendix G).
- Atlas of Namibia.
- The roadside geology of Namibia.
- Groundwater in Namibia – an explanation to the hydrogeological map.
- Climatic data retrieved from www.meteoblue.com.
- NSA and NPC reports
- Health information retrieved from www.mhss.gov.na and IHME
- The Structure Plan for Swakopmund 2020 – 2040.
- Site visits by Namisun.
- Google Earth.

The baseline environment with reference to the proposed powerline is described below.

6.1 REGIONAL CLIMATE

The climate of the central Namib Desert is strongly influenced by the quasi-stationary South Atlantic High off the southern Namibian coast. As a result of the sinking air over the cold Atlantic, temperatures close to the coast are moderate, the humidity is high, and overcast days and foggy nights are common. Sea temperatures along the central part of the Namibian coast are rarely

warmer than 20°C. The cold sea has a profound climatic influence over the land that borders it – climatically this part is referred to as Cool Desert.

Arandis is about 60 km from the coast. At this distance the climatic influence of the cold Atlantic becomes weaker and the influence from the warm interior stronger. Temperatures show wider diurnal and seasonal ranges, winter and summer is better defined, rain is the main source of precipitation, and insolation is higher (SPC, 2020).

6.1.1 PRECIPITATION, RELATIVE HUMIDITY AND EVAPORATION

Rainfall over the central Namib Desert can be described as extremely variable, patchy, unreliable and marked by a deviation coefficient of more than 100%. Rainfall events are rare and the total annual rainfall seldomly exceeds 50 mm. The long-term average rainfall for Swakopmund is less than 20 mm per annum. To the contrary, the relative humidity is high – with a long-term monthly average higher than 70% at the coast. Arandis is located within a zone where the average rainfall varies between 50 and 100 mm and the relative humidity is lower (Mendelsohn, et al., 2002).

The high relative humidity along the coast is closely coupled to the frequent occurrence of fog episodes. As the land elevates towards the interior, relative humidity reduces markedly, the annual average rainfall increases, and the frequency of precipitating fog episodes diminishes. Inland the aridity of the interior becomes increasingly noticeable and at an elevation of higher than 600 m above mean sea level (east of Arandis), fog episodes are a rarity. Whereas precipitating fog occurs on average 65 days per year at Swakopmund, producing a total precipitation of 35 mm per year, and with peaks between August and October (Viles, 2004), precipitation from fog at Arandis is closer to zero. As the relative humidity decreases towards the interior, the potential evaporation increases sharply. At Arandis it can exceed 2,100 mm per year, meaning an average water deficit of around 2,000 mm per year (Mendelsohn et al., 2002).

Rainfall events are limited to the summer months, potentially between November and April. Intense thunderstorms, often associated with heavy downpours over short periods, are characteristic. Flash floods may thus occur and can cause sheet erosion. In general rainfall is erratic and highly variable, both temporarily and spatially. Almost no rainfall is recorded between June and August.

6.1.2 TEMPERATURE

Temperatures measured at Arandis differ only slightly from along the coast. Along the coast the average minima are between 10°C and 11°C (at Arandis around 12°C), the average maxima are between 28°C and 29°C (at Arandis 30°C) and the average potential diurnal range is between 17°C and 18°C (at Arandis 19 - 20°C). Frost does not occur and minimum temperatures seldomly

drops below 6°C (Mendelsohn et al., 2002). Temperature wise, this zone is climatically described as cool desert. Towards the interior, however, average temperature differences show a steep gradient as the hot, dry climatic conditions of the interior become more apparent.

At Usakos, for example, maximum temperatures average around 30 - 32°C, mainly recorded during the afternoons between November and February, while minimum temperatures are around 4 - 6°C and are normally recorded during nights in June and July. Deviations from these averages are common, with the highest temperatures reaching 38 - 40°C and the lowest temperatures below 4°C. The number of frost days per year are 1 - 5 (Mendelsohn et al., 2002). Towards the interior temperature ranges fluctuate increasingly between maxima and minima, as well as daily and seasonally, creating harsh conditions for plants and animals to adapt to. In combination with the fluctuating rainfall and high potential evaporation, the demanding temperatures sustain climatic conditions sensitive to man-made interferences.

6.1.3 WIND

Due to the rhythm of prevalent air pressure systems, the wind patterns over Namibia's interior are fairly predictable.

Along the coast the southwest wind which originates from the South Atlantic High and blows over the cold ocean, dominates >20% of the time, and mostly during the day. Although the highest wind speed in all months exceeds 20 km/h, windspeed of between 10 and 20 km/h is more common – in 40% of all cases, when the wind direction is southwest. Windspeed above 20 km/h occurs in 25% of all cases when the southwest wind blows (retrieved from www.meteoblue.com). As the distance from the coast increases, wind speed decreases and the direction become more variable.

Occasional eastwinds (more accurately, from the northeast) blow during winter, because of cold sinking air over the interior that flows towards the coast. This air heats up as it blows towards the coast, and result in the recording of higher temperatures, often exceeding 30°C over the Namib Desert. Important, these hot, dry winds have a strong desiccation effect, and relative humidity figures drop noticeably during these events. Except the higher temperatures and drier conditions, eastwinds are loaded with dust from the interior.

Eastwinds occur 12.5% of the time and in 40% of the cases, have a speed of 5 - 10 km/h and in 30% of the cases have a speed of 10 - 20 km/h (retrieved from www.meteoblue.com).

In a recent study it was found that PM_{10} concentrations were the highest along the coast during eastwind conditions over the Namib Desert. Over the coastal towns the ambient dust conditions

are also prolonged because of the north-easterly / south-westerly wind conversion lines and cyclonic circulation associated with coastal troughs and coastal lows. $PM_{2.5}$ does not seem to be a pollutant of concern, though (Ministry of Mines and Energy, 2019).

In summary, the climatic factors described here signal precautionary measures against dust caused by construction activities. The aridity of the landscape is the reason for a well-adapted biodiversity, which is sensitive to man-made changes. The erratic occurrence of heavy downpours means that flash floods are possible, which can be exaggerated by man-made disturbances.

6.2 GEOMORPHOLOGY, TOPOGRAPHY AND SOILS

The proposed powerline is in an area which is geomorphologically described as the gravel plains of the central Namib Desert. This part of Namibia stretches between the ephemeral Ugab River in the north and the Kuiseb River in the south, and between the Atlantic Ocean in the west and the escarpment in the east. The underlying formations of the gravel plains cover a geological period from the Late Proterozoic to the Early Cretaceous (Schneider, 2004), consisting of schists, quartzites, meta-greywackes, marbles, and calc-silicates. These rocks form part of the central zone of the Damara Sequence, have been intensely folded and have an NNE/SSW strike. Part of the pre-Damaran basement, gneiss, and granite lithologies are quite common, and intrude the Damara metasediments as outcrops. As prominent ridges, Karoo-age dolerite dykes also intrude the Damara metasediments occasionally.

Although predominantly flat, the gravel plains of the central Namib Desert elevate from west to east and are markedly dissected by incised river valleys in some places, most prominently the Khan and Swakop River valleys, but also by several shallow, sandy drainage lines. Generally, the drainage is from east to west. Towards these river lines the landscape changes from open gravel plains to mountainous. The landscape is also interrupted by rocky outcrops and a few inselbergs and shows a gradual increase in elevation towards the escarpment.

The route of the proposed powerline crosses a landscape that is predominantly flat. It crosses a few ill-defined and low ridges and shallow, sandy drainage lines. Where the route crosses the B2 road to the south, the landscape becomes more undulating towards the incised valley of the Khan River. Marble and dolerite ridges become also more prominent towards the river.

Closer to the coast gypsum is a common surficial sediment on the gravel plains, forming because of the frequent sulphurous mists blowing off the sea and reacting with the calcareous sediments derived from Damaran marbles or calcrete to form gypsum as a replacement of calcite. These soils are distinctively darker and have in general a high concentration of salts and hydrogen sulphide,

which has an influence on the fog and in return intensifies chemical processes and soil genesis. Gypsum-content (petric gypsisols) dominate soils close to the coast, while gravel-covered and concrete surfaces characterize soils further inland (SPC, 2020). Petric gypsisols soils are absent within the proposed route of the powerline.

A distinctive feature of the gravel plains is its thin soils and the presence of a hard subsurface layer, often calcrete but sometimes a mix of schists, quartzites and marbles. The soils tend to be highly calcareous and can be best described as leptosols. Leptosols appear to be derived in situ but are often mixed with accumulated weathered material and are coarse-textured, containing gravel, pebbles, or unweathered pieces of rock from the local surroundings. Leptosols commonly accumulate in depressions, valleys, and flatter parts of the landscape, are poorly developed and thin, lack appreciable quantities of accumulated clay and organic material, and are susceptible to erosion (Mendelsohn et al., 2002). As the land elevates gently to above 600 m above mean sea level east of Arandis, more surficial material has accumulated within drainage lines, and in general the soil layer is deeper.

In many cases the soils of the gravel plains are capped by a biological soil crust overlying an evaporate layer. The biological soil crust is highly sensitive to disturbance and requires long recovery periods – tracks of vehicles can remain visible for many years, and the movement of vehicles and equipment could cause long-term, possible permanent damage to the substrate integrity. However, due to the higher lichen and biological soil crust incidence towards the west, substrates are more sensitive west of Arandis than east of it (Enviro Dynamics, 2012).

Due to the low rainfall over the central Namib Desert the vegetation is sparse and disturbances to the soil (and especially the vegetation and biological crust that retards soil erosion) can enhance water erosion because downpours are closely coupled to flash floods. In addition to the loss of topsoil, a loss of the biological crust result in environmental productivity while the habitat of some species is made unsuitable (Enviro Dynamics, 2012).

6.3 SURFACE WATER AND GROUNDWATER

Surface water over the largest part of Namibia is a rarity. This is ascribed to the little rain that falls, and when it falls it either evaporates, seeps into the ground or is rapidly drained by ephemeral rivers. Local run-off in the central Namib only occurs because of episodical heavy downpours. Run-off in the ephemeral rivers that cross the landscape from east to west is more frequent, due to the more regularly heavy downpours in their headwaters further inland. Surface drainage in the area around Arandis is generally from east to west, turning eventually south towards the Khan

River. The entire area where the proposed powerline is situated forms part of the drainage basin of the Khan River.

The Khan River is an important tributary of the Swakop River, one of Namibia's prominent west-flowing ephemeral drainage lines. The Swakop River originates to the east of Okahandja in central Namibia and receives run-off from several important tributaries, of which the Khan River is the largest, along its way to the coast. Both the Von Bach Dam and the Swakoppoort Dam are in the Swakop River, providing water to the central parts of Namibia, including Windhoek, Okahandja and Karibib. Below the Swakoppoort Dam the river functions ephemerally, reaching the coast only episodically. The Khan River joins the Swakop River at a point southwest of Arandis. Originating south of the Etjo and Omatako Mountains between Okahandja and Otjiwarongo, the Khan is one of only a few rivers in Namibia that is not dammed anywhere. As such the river is an important source of water for the lower segment of the Swakop River.

Despite the absence of surface water in both the Swakop and Khan River, the presence of subsurface water sustains elementary riverine vegetation, predominantly halophytes. Both rivers sustain porous aquifers, from which water is abstracted at some places. The water for Usakos, for example, is extracted from the Khan River. As recharge has diminished due to the impoundments upstream in the Swakop River, the water quality from this source deteriorates over time and is so saline that it is not extracted for human consumption near the coast anymore.

Despite the absence of surface water over the entire stretch of the proposed powerline, the shallow sandy drainage lines which the powerline crosses may turn into torrent streams during occasional heavy downpours. This signals a warning to keep activities and the placement of any infrastructure outside of these channels. Pollution from waste and accidental spills and leaks inside the drainage lines must be prevented as well. The drainage lines also form important linear oasis where food and water are more frequent, and the better shelter harbours some species.

Groundwater potential on the gravel plains is very low and limited. If present, the groundwater is saline and not suitable for human consumption in most cases (Christelis and Struckmeier, 2001).

6.4 BIODIVERSITY

6.4.1 VEGETATION

The area around Arandis where the powerline is planned form part of the (central) Namib Desert Biome. Vegetation structure is dominated by grassland and dwarf shrubland with a couple of dominant annual grass species. Cover is generally sparse and plant production low. Overall plant

diversity is estimated as < 100 species (Mendelsohn et al., 2002). Endemics include *Arthraerua leubnitziae* (Pencil bush), *Adenia pechuelii* (Elephant's foot*), Lithops ruschiorum*, *Hoodia officinalis, Aloe asperifolia* (Namib aloe), *Larryleachia marlothii*, *Polygala querichiana*, *Cotyledon orbiculate, Euphorbia giessii, Commiphora dinteri, C virgate* and *C. Saxicola* (Rock Corkwood), a pachycaul species characteristic of the central Namib. Since the 2012-assessment, *Commiphora saxicola* was added to the protected species list. Most of the sensitive species occur on the marble ridges and outcrops but *Aloe asperifolia* and *Commiphora saxicola* occur also on other terrains such as the open plains where they are typically concentrated in dense colonies (Mannheimer, 2021).

Plants grow slowly under the arid conditions, meaning that destroyed plants will not be replaced quickly. Any damage to the sensitive areas is likely to be long-term, the sensitive plants are under continuous threat and the cumulative damage to these species are a cause for concern. Species that occur in colonies such as *Aloe asperifolia* and *Lithops ruschiorum* are particularly sensitive to disturbance (Enviro Dynamics, 2012) because several individuals may be affected in a very small area of impact (Mannheimer, 2021).

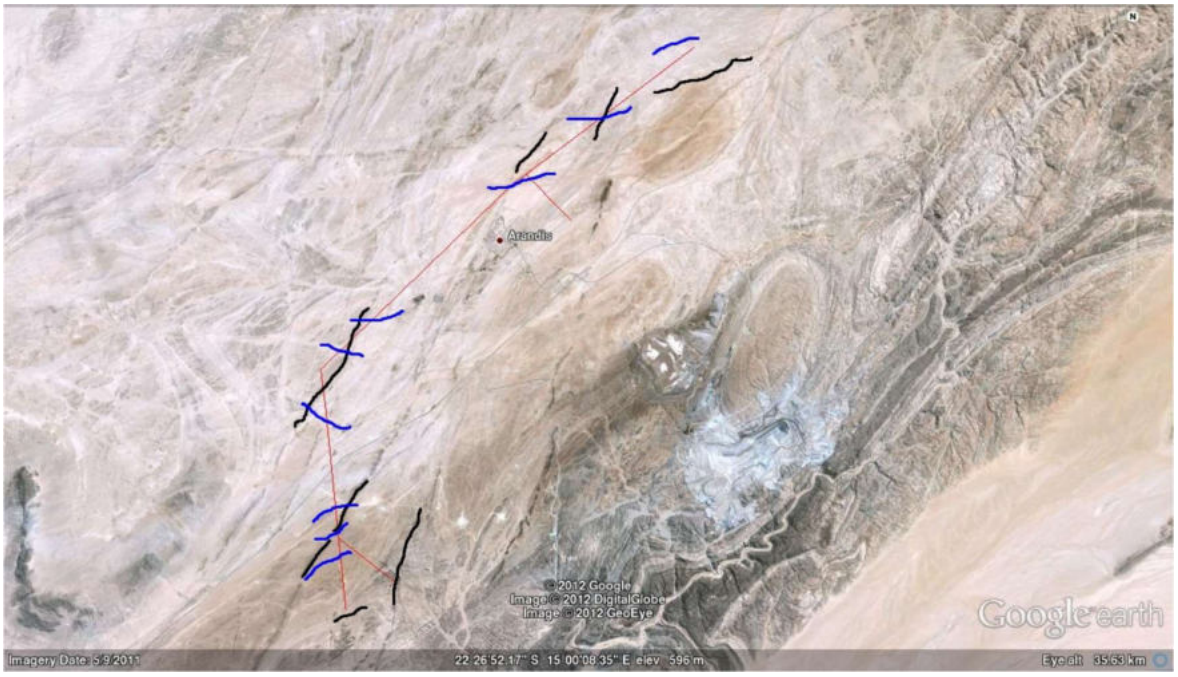

FIGURE 9: LOCATION OF SENSITIVE HABITATS
(Blue = drainage lines; black = rocky ridges. Source: Enviro Dynamics, 2012)

6.4.2 HABITATS

All three of the prevailing habitats identified (the gravel plains, rocky ridges, and drainage lines) are sensitive to disturbance (see also Figure 9). Most of the permanent plant life is associated with the drainage lines. These habitats are important sources of food and shelter for animals. Drainage lines also serve as movement routes for game to and from the Khan River. The presence of shelter and crevices in the rocky ridges result in higher biodiversity associated with these landforms. Moreover, damage to the sensitive habitats will inevitably affect the biodiversity of the wider landscape (Enviro Dynamics, 2012).

6.4.3 FAUNA

A total of 18 mammal species, 24 reptiles and 179 invertebrates are known or expected to occur in the area around Arandis. The occurrence of fauna is closely related to vegetation communities of the area, especially associated with the drainage lines and rocky ridges. Of the faunal species likely to occur, 78 species are of potential concern (i.e., endemic, threatened or of a legal status). None of the species of potential concern are restricted in distribution to the area, most are mobile and wide ranging. Resident species are mostly rodents, reptiles, and all invertebrates (Enviro Dynamics, 2012).

6.4.4 AVIFAUNA

A relative high number of bird species are expected to occur in the area – 193 species – a diversity that is classed as moderate–high. This figure represent 29% of the 676 species currently recorded in Namibia. Hereof 20 of the species recorded have conservation status, 14 (7%) were classed as Threatened in Namibia, while five (1%) were also Globally Threatened (ACS, 2021).

The sensitive habitats correlate also with the distribution of birds. With both ephemeral and permanent vegetation, drainage lines provide food, shelter and breeding habitat for birds and their prey species, especially bustards and korhaans. Drainage lines appear to serve as flightpaths for groups such as bustards, flamingos and raptors. In addition, man-made wetlands like the Arandis sewerage disposal facility attract birds as well. The gravel plains, on the other hand, are frequented by birds such as Ludwig's Bustard, while the habitats associated with higher elevations attract raptors (Enviro Dynamics, 2012).

The possibility of bird collisions increases significantly when a new powerline is constructed, especially when the powerline crosses drainage lines or ridges which are often important bird flightpaths. Bird species at risk include (Enviro Dynamics, 2012):

- Large terrestrial birds such as Ludwig's Bustard, Kori Bustard, Rüppell's Korhaan, Red-crested Korhaan, and the Northern Black Korhaan (collisions and disturbance).
- Raptors such as Martial Eagle, Booted Eagle, Lappet-faced Vulture, Verreauxs' Eagle, Cape Eagle-Owl, Black-chested Snake Eagle, peregrine Falcon, Lanner Falcon and Spotted Eagle-Owl (collisions and disturbance).
- Aquatic birds such as Great White Pelican, Greater Flamingo, Lesser Flamingo and Maccoa Duck (collisions).
- Namib sedentary endemics with a restricted distribution such as Gray's Lark and Rüppell's Korhaan (disturbance and habitat loss).

The main potential impacts to birds are collisions with powerlines and stay wires, electrocution, disturbance from construction activities, disturbance during nesting periods and habitat loss or fragmentation.

Powerline incidents are recorded since 2009, as an initiative of the NamPower / Namibia Nature Foundation Strategic Partnership and the central-western coast in the Erongo Region has been relatively well monitored. Collisions in the general area, are responsible for 90% of the incidents and electrocutions for the remaining 10%. Of significance are the large numbers of Ludwig's Bustard collisions, as well as flamingo and korhaan collisions (ACS, 2021).

6.4.5 DISTURBED AREAS

Over the longest part of the powerline corridor within and adjacent to the Arandis Townlands the land is highly disturbed, also within the powerline corridor. Wide-spread litter and garbage dumping (see Figure 6) and senseless landscape scars such as blading and permanent tracks (Figure 10) frequent this section and because of the disturbance, the service road of NamPower is absent or almost untraceable (Figure 7). Sand mining also occurs in the dry drainage lines, resulting in lang stretches of disturbed riverbeds. The leg of the route that runs from north to south, going towards the Lithops Substation, is less disturbed. The parts of this section in proximity of the crossings with the railway line, the B2 main road and the NamWater pipeline are also highly disturbed though.

FIGURE 10: PHOTO SHOWING THE DISTURBED PARTS OF THE POWERLINE CORRIDOR

6.5 ARCHAEOLOGY

With its small rocky outcrops that provide shelter, dense grass cover after good rainy seasons and temporary impoundments of water in natural rock hollows, the area around Arandis provided an important resource base for pre-colonial hunter-gatherer communities. Several sites of seed diggings are clustered around the outcrops. These sites are not occupation sites and therefore not considered particularly significant. Most of the area is of low archaeological significance (Enviro Dynamics, 2012).

The most important group of archaeological sites in the surroundings of Arandis lies to the immediate southeast of the proposed ECPS, i.e., outside of the route of the proposed powerline.

The known sites in proximity of the proposed powerline are documented in the specialist assessment of 2021 (see Figure 11). Accordingly, the route of the proposed powerline is largely confined to terrains which have been previously disturbed and is currently highly disturbed in some cases (see for example Figure 10).

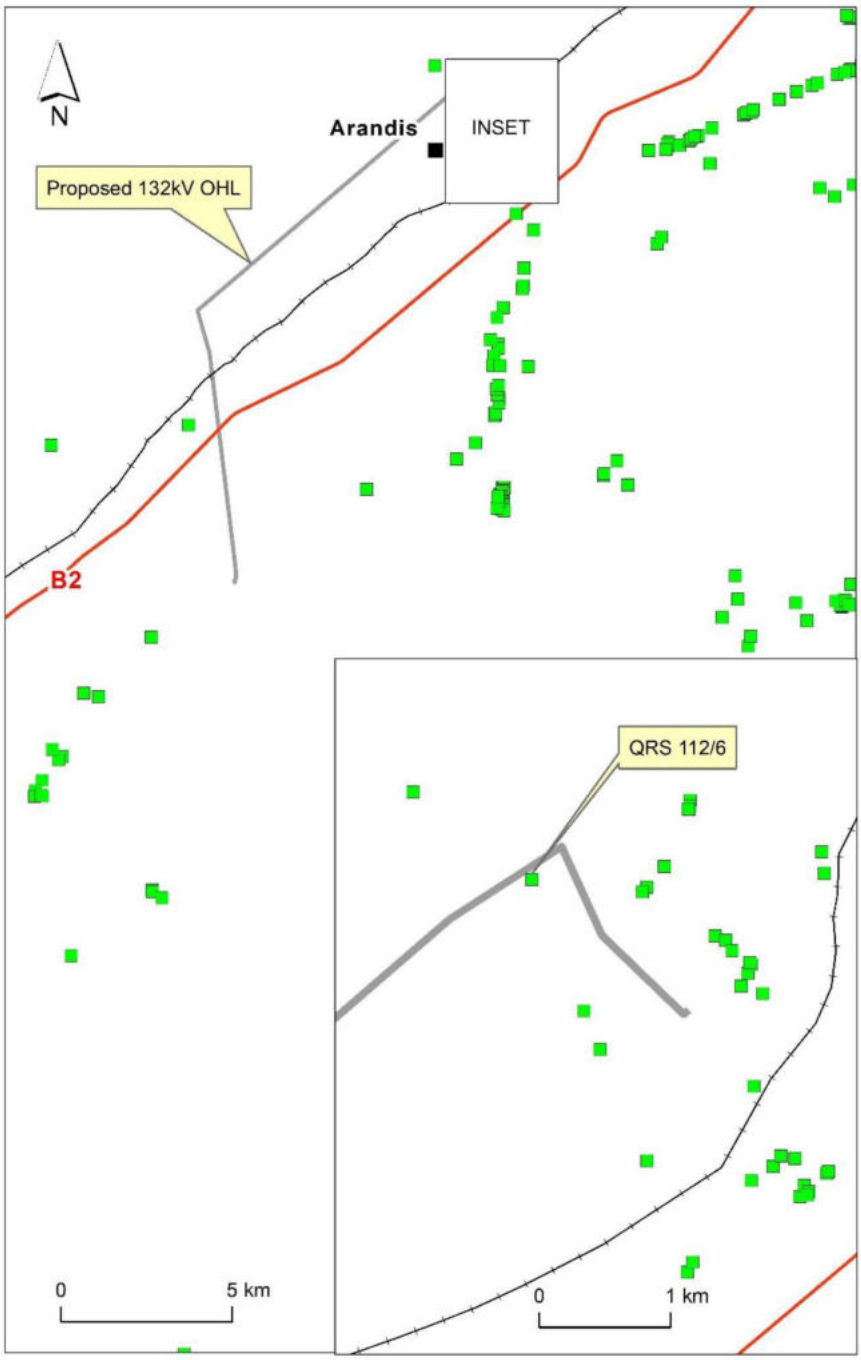

FIGURE 11: LOCATION OF KNOWN HERITAGE SITES IN PROXIMITY OF THE PROPOSED POWERLINE

(Source: Kinahan, 2021)

From the existing knowledge base available, it was found that the terrain in proximity of the proposed powerline route has a relatively low density of heritage sites. Of these, only one site (QRS 112/6) – an isolated seed digging site – is located between 30 and 50 m from both the existing and proposed route. Although still existing, this site is surrounded by a heavily disturbed area because of apparent uncontrolled earthworks and sand mining within the Arandis Townlands (see Figure 12). Clearly the site is prone to disturbance or destroying by activities not related to the powerline. All other sites are located between 300 and 600 m from the proposed powerline route (Kinahan, 2021).

From existing archaeological documentation and the results of the specialist (re-)assessment it is indicated that the proposed alignment of the powerline will have minimal archaeological impact. The proposed powerline route is not considered to pose a significant threat to the archaeology of the area concerned (Kinahan, 2021). The specialist study did not locate any further archaeological / heritage sites which would merit protection under the National Heritage Act, No. 27 of 2004.

FIGURE 12: LOCATION OF QRS 112/6 SURROUNDED BY A HEAVILY DISTURBED AREA

6.6 BRIEF SOCIO-ECONOMIC OVERVIEW

The project is located near Arandis in the Erongo Region, one of Namibia's regions that borders the Atlantic Ocean. The Erongo Region is also bordered by the Kunene and Otjozondjupa Regions in the north, the Khomas Region to the east and the Hardap Region to the south. The region is named after the Erongo Mountains which dominates the central section of Namibia's escarpment.

Each region in Namibia is governed by a regional council, elected during regional elections per constituency. The Erongo Region is subdivided into seven constituencies, of which Arandis forms one. Towns are governed through local authorities, in the case of Arandis by a town council.

Arandis was established by Rössing Uranium Limited in 1976 to provide housing for workers and their families. Up until 1990 the company managed the town, while building schools, houses, sport fields and a hospital. In 1994, Arandis was proclaimed as a town with the ATC taking of the administrative functions of the town (Enviro Dynamics, 2011).

6.6.1 DEMOGRAPHIC PROFILE

Namibia is one of the least densely populated countries in the world (2.8 persons per km^2). Vast areas of the country are without people, in contrast to some fairly dense concentrations, such as the central-north and along the Kavango River. The last national census was conducted in 2011 and counted 2.1 million Namibians (NPC, 2011). An inter-censal demographic survey was conducted in 2016 and estimated the total population of the country at 2.3 million and for the Erongo Region at 182,402, i.e., 7.8% of the national population total (NSA, 2017).

Windhoek, the capital, functions as a primate city – not only is it the urban area with the biggest population, but the concentration of private and public head offices attracts Namibians from all parts of the country in search for a better live. National population growth rate is estimated at less than 2%, lower than most African countries. Namibia's population is young - although 57% falls in the age group 15 – 59, 37% of the total population is younger than 15 (NSA, 2017). Since 2005 there is a steady improvement in life expectancy, currently estimated at 65 years.

In 2018 it was estimated that 50% of all Namibians are urbanized, in other words living in an urban settlement (retrieved from www.worldpopulationreview.com). The Erongo Region covers a great part of the central Namib Desert, the main reason why this region has a small rural population and is the region with the second highest percentage of people living in an urban area – 92%. Only the Khomas Region (95%) has a more urbanized population, but due to the bigger size of the Erongo Region the population density is low and only marginally higher (2.9) than the national figure in 2016. Living in an urban environment implies better living conditions – 98% of all households have

access to safe water, only 13% have no toilet facility, 76% have electricity for lighting and only 15% of all household make use of open fires to prepare food (NSA, 2017). Oshiwambo is the most spoken language (44% of all households) in the region, followed by Afrikaans (19%). Average household size is 3.1 and the literacy rate is 96% for people older than 15. Compared to other regions in Namibia, the Erongo Region has the second highest level of development and the second lowest rate of human poverty (Enviro Dynamics, 2012).

Although Walvis Bay is the biggest urban area in the Erongo Region, and the industrial hub of the region, the administrative capital of the region is Swakopmund and host most of the administrative and governmental headquarters of the region. Arandis is much smaller – even though the total population of Arandis was estimated at 6,500 people in 2011, the national census in the same year only counts 5,100 (NPC, 2011). At an estimated annual growth rate of 3.8% for the region, the expected total population of Arandis was 6,145 in 2016 (NSA, 2017).

6.6.2 ECONOMIC PROFILE

The economic activities of the Erongo Region revolve around the extraction of natural resources both renewable such as fish, as well as non-renewable such as minerals (Enviro Dynamics, 2012). Another important economic sector of Namibia and the Erongo Region is tourism, which is unfortunately still in limb-mode because of the global pandemic COVID-19.

Walvis Bay is the principal home of Namibia's fishing industry and the town boasts also the only deep sea port of the country, with world-class port facilities and linkages with the rest of Namibia and its neighbours via the Trans-Kalahari and Trans-Caprivi Highways as a well as a railway. An international airport located outside the town ensures a direct link to the rest of the world. Key economic activities of Walvis Bay include fishing, fish processing, manufacturing, logistics, marine engineering and storage.

Mining plays a pivotal role in the economy of Namibia. Since independence, it has consistently been the biggest contributor to Namibia's economy in terms of revenue and accounts for 25% of the country's income. Mining is a pronounced industry in the Erongo Region and the main commodities are uranium (extracted in the Erongo Region), gold, salt and dimension stones. Two of Namibia's large uranium mines – Rössing and Husab – are in proximity of Arandis. Two other uranium mines are currently under Care-and-Maintenance (Trekkopje and Langer Heinrich) while ongoing exploration and feasibility studies are done by Bannerman, Reptile and Marenica – all in the Erongo Region.

As a mining town, the local economy of Arandis was always closely coupled to the mining industry. Of lately many initiatives have been launched to diversify the town's economic base by marketing and attracting investments and as a result several new industries and businesses established in the town recently.

Since 2016 Namibia recorded slow economic growth, registering an estimated growth of only 1.1% in 2016. The primary and secondary industries contracted by 2.0 and 7.8% respectively. During 2017 the economy contracted by 1.7, 0.7 and 1.9% in the first, second and third quarters respectively (NSA, 2019). Despite the more positive expectations, the economy retracted to an average growth of not more than 1% annually since 2017.

6.6.3 EMPLOYMENT

The labour force participation rate is the proportion of the economically active population, given as a percentage of the working age portion of the population (i.e., older than 15 years of age). The rate of labour force participation for the Erongo Region was 80.9% compared to the average of 71.2% for Namibia in 2018 (NSA, 2019).

In 2018, 53.4% of all working Namibians were employed in the private sector and 21.5% by the state. State-owned enterprises employ a further 7.6% and private individuals 16.6%. Agriculture (combined with forestry and fishing) is the economic sector with the most employees – 23% of all employed persons in Namibia work in this sector. Wages and salaries represented the main income source of 47.4% of households in Namibia (NSA, 2019).

Low education levels affect employability and prevents many households to earn a decent income. Of all employed people in Namibia, 63.5% are not higher qualified than junior secondary level (Grade 10 and lower). In total 11.8% of all employed people had no formal education. In total 29.1% of all employed people fall in the category "elementary occupation" and 15.2% in the category "skilled agriculture. Overall, the rate for unemployment is estimated at 33.4% for Namibia, using the broad definition of unemployment. The highest unemployment rates are found amongst persons with education levels lower that junior secondary. The unemployment rate of persons with no formal education is 28.6%, with primary education 34.6% and with junior secondary education 32.7% (NSA, 2019).

Although declining over time, the primary sector (agriculture, mining and fishing) employs most Namibians (23%) and is also the sector with the most employers. It is also the sector that employs the most informal workers in Namibia, calculated at 87.6%. Wages of employees in this sector are

lower than all other sectors except for workers in accommodation and food services and domestic work in private households (NSA, 2019).

In the Erongo Region 67.5% of all households depend on salaries and wages as the main income (NSA, 2019). Exact figures do not exist, but this high percentage can be ascribed to the dominance of the mining, fishing and manufacturing and processing sectors together with the prominence of state departments and the administrative sectors in the Erongo Region. A total of 12.6% of households receive their income from business activities (NSA, 2019).

No official figure exists, but there is good reason to believe that most of the workforce in Arandis is employed by the mines and the contractors working at the mines.

6.6.4 HEALTH

Since independence in 1990, the health status of Namibia has increased steadily with a remarkable improvement in access to primary health facilities and medical infrastructure. In 2015 the World Health Organization (WHO) recommended strategic priorities of the health system in Namibia which entail improved governance, an improved health information system, emergency preparedness, risk reduction and response, preventative health care and the combating of HIV/AIDS and TB (WHO, 2016).

According to the website of the Ministry of Health and Social Services (MoHSS) the Erongo Region has a total of 18 primary health care facilities, two health centres, and four district hospitals – in Swakopmund, Walvis Bay, Omaruru and Usakos (retrieved from www.mhss.gov.na). There are also private hospitals in Swakopmund and Walvis Bay and a private medical centre in Arandis

Like elsewhere in Namibia, HIV/AIDS remains a major reason for low life expectancy and is one of the leading causes of death in the Erongo Region. HIV/AIDS remains the leading cause of death and premature mortality for all ages, killing up to half of all males and females aged 40 - 44 years in 2013 (IHME, 2016). HIV/AIDS does not only affect the quality of life of those infected, but also that of those having to care for them. Tuberculosis (TB) is a leading killer of people infected by HIV/AIDS, and Namibia had a high burden in 2018, 35% of people notified with TB were infected with HIV. The country is included among the top 30 high-burden TB countries in the world, with an estimated incidence rate of 423 per 100,000 people and 60 fatalities per 100,000 people in 2018 (retrieved from www.mhss.gov.na).

In 2016 it was estimated that 12.6% of all people in the Erongo Region is younger than five years of age and 15.7% between five and fourteen years of age. Only 37.7% of children younger than

five years of age in the region attended programs of early childhood development in 2016 (NSA, 2017), implying that access to these facilities and access to infant health care facilities is limited.

The largest percentage of people in the Erongo Region utilize hospitals for medical care (42.8%) and only 22.9% have to rely on a clinic. 15.6% of the total population of the region receive their medical treatment from a doctor (NSA, 2017). The death rate of 9.9 deaths per 1000 people for the region was lower than the national average of 10.8% in 2016 (NSA, 2017).

As of the beginning of 2020 COVID-19 caused illness in humans at a pandemic scale and has resulted in an increasing number of deaths worldwide. The viral outbreak is adversely affecting various socio-economic activities globally, and with reports of the increasing number of people testing positive, it has significant impacts on the operations of various economic sectors in Namibia too. The disease caused many countries to enter a state of emergency and lockdown mode, with dire economic consequences. In addition, these measures have a detrimental effect on tourism – and Namibia is in both cases no exception.

7 IDENTIFICATION AND DESCRIPTION OF POTENTIAL ENVIRONMENTAL IMPACTS

This chapter outlines the environmental aspects and potential impacts associated with the construction and operations of the proposed powerline. Key aspects identified, are further assessed in Chapter 8.

7.1 ASPECT AND IMPACT IDENTIFICATION

Table 6 provides a summary of the activities associated with the proposed powerline as well as the associated environmental aspects and potential impacts on the environment.

The potential impacts were identified during the scoping process, in consultation with authorities, I&APs and the project team. For context, the description of the potential impacts should be read with the corresponding descriptions of the current environment in Chapter 6 of this report.

The relevance of the potential impacts ("screening") is also presented in the tables below to determine which aspects need to be assessed in further detail (Chapter 8 of this report).

TABLE 6: ENVIRONMENTAL ASPECTS AND POTENTIAL IMPACTS ASSOCIATED WITH THE PROPOSED POWERLINE

ACTIVITY	ASPECT	POTENTIAL IMPACT	RELEVANCE (SCREENING) – SIGNIFICANCE DISCUSSION
SITE PREPARATION AND CONSTRUCTION PHASE			
Use of the existing service road by vehicles and equipment. Laydown of equipment and construction materials. Creating new access points to new poles. Digging of foundations for the monopoles and the substation. Concrete mixing and pouring for foundations of the monopoles and substation, the platform of the	Biodiversity: Loss or disturbance of biodiversity composition - loss of species, loss of abundance, loss of key engineering species and rare, threatened and endangered species	• Removal and damage to vegetation, including plants of conservation concern • Illegal harvesting of wood and protected species for ornamental purposes • Illegal killing (poaching) and collecting of animals • Accidental harming or killing of animals (e.g.: road kills, falling into foundation pits, drowning in open water bodies)	It is possible that some plants and animals may be disturbed, damaged, or killed, accidentally or intentionally, during construction activities. See Chapter 8 for further assessment in detail.
	Biodiversity: Loss, damage, or fragmentation of habitat	• Loss or damage of sensitive habitats on rocky outcrops and drainage lines • Loss or damage to habitats related to the biological soil crust	Loss and damage, or fragmentation of habitat is possible. See Chapter 8 for further assessment in detail.

ACTIVITY	ASPECT	POTENTIAL IMPACT	RELEVANCE (SCREENING) – SIGNIFICANCE DISCUSSION
substation and the plinths. Erecting of the poles.	Biodiversity: Loss or disturbance of biodiversity structure (spatial distribution of organisms, interruption of flow and nutrient links, disturbance to movement patterns)	• Interference, disturbance, and displacement of species (individuals, populations and concentrations or groups) • Interruption or restriction of movement patterns • Introduction of invasive alien plants • Disturbance of surface water flow patterns and impacts downstream	None of the animal species of potential concern are restricted in distribution to the area, most are mobile and wide ranging. Resident species are mostly rodents, reptiles, and all invertebrates. Animals will most likely return after the construction phase. Potential damming, diverting of water flow, and erosion is possible in disturbed areas, resulting into flow alteration, a loss of topsoil and creating unsuitable habitats of some species. This potential impact seems to be localized, temporary and of a small extent though, also taking the scale of the proposed construction activities into consideration. Although invasive alien plants can establish on areas of disturbance, it is unlikely, due to the arid conditions. No further assessment required.
	Biodiversity: Loss, damage or disturbance of avifauna	• Interference, disturbance, and displacement of birds • Interference or loss of bird habitats, flightpaths, corridors, or flyways • Harming and killing of birds because of collisions and or electrocution	Birds may be disturbed while going about their daily activities such as feeding, roosting and, in particular, breeding. Although the collision and electrocution of birds with overhead powerlines may take place during the construction phase, it occurs predominantly during the operational phase. With reference to Section 4.2.1, a 220 kV NamPower powerline already exists along the route of the proposed powerline, meaning these possible impacts on birds must be considered cumulatively. Collisions and electrocutions happen more likely in known flightpaths or corridors of flyways, such as drainage lines. See Chapter 8 for further assessment in detail.
	Soil	• Loss of topsoil because of wind and water erosion • Potential contamination because of pollution from waste and accidental spills and leaks of hydrocarbons	Biological crusts are highly sensitive to disturbance (such as vehicle tracks) and require long recovery periods. However, biological crusts are absent along drainage lines, on the sandy flats and to the east of Arandis. The powerline route crosses only single, small areas where the crust is present, and these sensitive spots can be greatly avoided. Due to the aridity, the sparse vegetation and the sensitivity of the biological crust, disturbances to soil can enhance wind and water erosion, temporary and limited to small areas.

ACTIVITY	ASPECT	POTENTIAL IMPACT	RELEVANCE (SCREENING) – SIGNIFICANCE DISCUSSION
		• Potential damage to biological soil crusts	Soil can be contaminated because of improper waste management and accidental spills and leaks, in small, localized areas, which can be prevented or cleaned-up without much effort. Relevant Management and mitigation measures to address potential impacts are provided in the EMP. No further assessment required.
	Surface and groundwater	• Potential contamination pollution of groundwater and surface water resulting from waste and accidental spills and leaks of hydrocarbons during construction • Disturbances and interference with flow patterns can enhance damming, diverting or water erosion	Small areas can be contaminated because of improper waste management and accidental spills and leaks. By implementing the management and mitigation measures presented in the EMP, this potential impact can be greatly reduced / avoided. No disturbance or interference with flow patterns is foreseen as activities within the drainage lines can be avoided. No further assessment required.
	Archaeology	• Potential destruction or damage to archaeological / heritage sites	Based on existing data one small, single site of very low archaeological significance, surrounded by a heavily disturbed area, is likely to be affected by the construction of the powerline, but can be avoided with timeous-arranged measures. Although damage or destruction to unknown heritage sites may happen, it is unlikely. See Chapter 8 for further assessment.
	Waste	• Discharge of effluent or sewerage into soil and water • Pollution of soil and water • Impacts on biodiversity • General degradation and nuisance impacts	Potential impacts resulting from improper waste management, the handling, storage and disposal of effluent or sewerage is possible and have the potential to cause an impact on soil, water and air. By implementing the management and mitigation measures presented in the EMP this potential impact can be greatly reduced / avoided. As a result, waste is screened out as a potential issue. No further assessment required.

ACTIVITY	ASPECT	POTENTIAL IMPACT	RELEVANCE (SCREENING) – SIGNIFICANCE DISCUSSION
	Noise	• Disturbance to third parties (sensitive receptors).	Construction activities will be localised and of a short duration and will not result in significant noise generation. As a result, noise is screened out as a potential issue. No further assessment required.
	Dust	• Dust from construction activities causing impacts to air quality and causing disturbance to sensitive receptors (third parties).	Exposure of soil during construction will be restricted to small, localized areas around the poles only. The existing service road will be used from where access to the single poles will be made. It is therefore not likely to result in large-scale windblown dust emissions and a significant increase of dust is not expected. As a result, dust is screened out as a potential issue. No further assessment required.
	Visual	• Intrusive impacts on views and sense of place	Since the route chosen is parallel to the existing 220 kV powerline, visual impacts are minimized. These impacts are also of short duration and, as a result, potential visual impacts because of the construction phase are screened out as a potential issue. No further assessment required.
	Socio-economic conditions: Employment, investment and income	• Job creation and skills development • Investment benefits to the local, regional and national economy	Socio-economic impacts related to the construction phase are short-term and localized, as it will be done by a small work team (less than 20 employees) over a specific period. The creating of jobs and the economic benefits of the provision of power are positive impacts and will be optimized. No further assessment is required.
OPERATIONAL PHASE			
Use of the existing service road for routine inspection, monitoring and maintenance.	Biodiversity: Loss or fragmentation of habitat	• Loss of landscape connectedness through habitat loss or fragmentation	The single area of impact is confined to the existing service road which is continuous – as a result the overall impact on one single habitat is low because the powerline is linear and narrow, reducing the extent of the impact on one single habitat greatly. No further assessment is required.

ACTIVITY	ASPECT	POTENTIAL IMPACT	RELEVANCE (SCREENING) – SIGNIFICANCE DISCUSSION
Use of vehicles and equipment to conduct maintenance activities.	Biodiversity: Loss or disturbance of avifauna	• Interference, disturbance, and displacement of birds • Harming and killing of birds because of collisions and or electrocution	During maintenance activities birds may be disturbed while going about their daily activities such as feeding, roosting and, in particular, breeding. Collisions and electrocutions of birds occur predominantly during the operational phase and will be monitored. Collisions and electrocutions happen more likely in known flightpaths or corridors of flyways, such as drainage lines. See Chapter 8 for further assessment in detail.
	Visual	• Intrusive impacts on views and sense of place	The placement of the powerline within an approved infrastructure corridor, which was duly assessed for its visual impacts and selected because of its low visual impacts (Enviro Dynamics, 2012), and adjacent to an existing 220 kV powerline, mitigates the possible visual impacts as well as the overall cumulative visual impacts significantly. The potential visual impacts of the proposed new powerline cannot be avoided but are already optimally minimized as a result of the placement of the new powerline adjacent to an existing powerline corridor, therefore this impact is screened out as a potential issue. No further assessment required.

8 ENVIRONMENTAL IMPACT ASSESSMENT

This chapter assesses the key potential impacts (as identified in Chapter 7), relating to the proposed powerline.

The environmental issues that require further assessment, as identified in Chapter 7, relate to:

- Impacts on biodiversity in general.
- Impacts on avifauna.
- Impacts on heritage resources.

The activities that are summarised in this chapter, link to the description of the proposed project Chapter 4). This chapter must further be read in the context of the baseline conditions described in Chapter 6.

Management and mitigation measures to address the identified (potential) impacts are presented in the accompanying EMP (Chapter 9).

Both the criteria used to assess the impacts and the method of determining the significance of the impacts are outlined in Table 7, Table 8, and Table 9.

This method complies with the Environmental Management Act, No. 7 of 2007 and its regulations. Table 7 provides the impact assessment criteria and the approach for determining impact consequence (combining nature and intensity, extent and duration) and impact significance (the overall rating of the impact). Impact consequence and significance are determined from Table 8 and Table 9 respectively. The interpretation of the impact significance is given in Table 10. Both mitigated and unmitigated scenarios are considered for each impact.

The potential impacts are cumulatively assessed, where relevant, taking the existing environment into consideration.

The information in this section was sourced from the Vegetation Specialist Study (Mannheimer, 2021) included in Appendix E, the Avifauna Specialist Study (African Conservation Services, 2021) included in Appendix F, the Archaeology Specialist Study (Kinahan, 2021) included in Appendix G and Enviro Dynamics, 2012.

TABLE 7: IMPACT ASSESSMENT CRITERIA

IMPACT ASSESSMENT CRITERIA		
SIGNIFICANCE determination	**Significance = consequence x probability**	
CONSEQUENCE	**Consequence is a function of:** • **Nature and Intensity of the potential impact** • **Geographical extent should the impact occur** • **Duration of the impact**	
Ranking the NATURE and INTENSITY of the potential impact		
Negative impacts		
Low (L)	The impact has no / minor effect/deterioration on natural, cultural and social functions and processes. No measurable change. Recommended standard / level will not be violated. (Limited nuisance related complaints).	
Moderate (M)	Natural, cultural and social functions and processes can continue, but in a modified way. Moderate discomfort that can be measured. Recommended standard / level will occasionally be violated. Various third party complaints expected.	
High (H)	Natural, cultural or social functions and processes are altered in such a way that they temporarily or permanently cease. Substantial deterioration of the impacted environment. Widespread third party complaints expected.	
Very high (VH)	Substantial deterioration (death, illness or injury). Recommended standard / level will often be violated. Vigorous action expected by third parties.	
Positive impacts		
Low (L) +	Slight positive effect on natural, cultural and social functions and processes Minor improvement. No measurable change.	
Moderate (M) +	Natural, cultural and social functions and processes continue but in a noticeably enhanced way. Moderate improvement. Little positive reaction from third parties.	
High (H) +	Natural, cultural or social functions and processes are altered in such a way that the impacted environment is considerably enhanced /improved. Widespread, noticeable positive reaction from third parties.	
Very high (VH) +	Substantial improvement. Will be within or better than the recommended level. Favourable publicity from third parties.	
Ranking the EXTENT		
Low (L)	Local (confined to within the project concession area and its nearby surroundings).	
Moderate (M)	Regional (confined to the region, e.g.: coast, basin, catchment, municipal region, district, etc.).	
High (H)	National (extends beyond district or regional boundaries with national implications).	
Very high (VH)	International (Impact extends beyond the national scale or may be transboundary).	
Ranking the DURATION		
Low (L)	Temporary/short term. Quickly reversible. (Less than the life of the project).	
Moderate (M)	Medium Term. Impact can be reversed over time. (Life of the project).	
High (H)	Long Term. Impact will only cease after the life of the project..	
Very high (VH)	Permanent	
Ranking the PROBABILITY		
Low (L)	Unlikely	
Moderate (M)	Possibly	
High (H)	Most likely	
Very high (VH)	Definitely	
SIGNIFICANCE Description		
	Positive	**Negative**
Low (L)	Supports the implementation of the project	No influence on the decision.
Moderate (M)	Supports the implementation of the project	It should have an influence on the decision and the impact will not be avoided unless it is mitigated.
High (H)	Supports the implementation of the project	It should influence the decision to not proceed with the project or require significant modification(s) of the project design/location, etc. (where relevant).
Very high (VH)	Supports the implementation of the project	It would influence the decision to not proceed with the project.

TABLE 8: DETERMINING THE CONSEQUENCE

DETERMINING THE CONSEQUENCE					
INTENSITY OF IMPACT = LOW					
DURATION	VH	Moderate	Moderate	High	High
	H	Moderate	Moderate	Moderate	Moderate
	M	Low	Low	Low	Moderate
	L	Low	Low	Low	Moderate
INTENSITY OF IMPACT = MODERATE					
DURATION	VH	Moderate	High	High	High
	H	Moderate	Moderate	High	High
	M	Moderate	Moderate	Moderate	Moderate
	L	Low	Moderate	Moderate	Moderate
INTENSITY OF IMPACT = HIGH					
DURATION	VH	High	High	Very High	Very high
	H	High	High	High	Very High
	M	Moderate	Moderate	High	High
	L	Moderate	Moderate	High	High
INTENSITY OF IMPACT = VERY HIGH					
DURATION	VH	Very high	Very High	Very High	Very high
	H	High	High	Very High	Very high
	M	High	High	High	Very High
	L	Moderate	High	High	Very High
		L	M	H	VH
		EXTENT			

TABLE 9: DETERMINING THE SIGNIFICANCE

DETERMINING THE SIGNIFICANCE					
PROBABILITY	VH	Moderate	High	High	Very high
	H	Moderate	Moderate	High	Very high
	M	Low	Moderate	High	High
	L	Low	Low	Moderate	High
		L	M	H	VH
		CONSEQUENCE			

8.1 BIODIVERSITY

The biodiversity and, more particularly, the sensitive habitats and avifauna, have been discussed in Section 6.4. The physical footprint of the powerline is relatively restricted to a narrow, linear strip along the existing powerline corridor of NamPower and the sites where poles will be erected are small, localized and widely spaced. During the construction activities temporary impacts by the workforce, vehicles, machinery, and equipment are possible. In the operational phase, the activities will be reduced to limited vehicle and people movements because of continuous inspections and maintenance.

8.1.1 ISSUE: POTENTIAL LOSS OR DISTURBANCE OF BIODIVERSITY COMPOSITION

This issue relates to the loss of species, loss of abundance, loss of key engineering species and loss of rare, threatened and endangered species.

Although in low numbers in the section of the powerline route, *Aloe asperifolia*, *Hoodia officinalis*, *Larryleachia marlothii*, *Commpihora saxicola, Euphorbia giessii* and *Lithops ruschiorum* are concentrated on the rocky ridges. As such, the impact can only be minimized by avoiding the spots where these plants occur in concentrated clumps.

No clearance for a new service road is needed. In the area where the service road is absent, the service road can be planned in such a way that potential impacts are minimized optimally. To prevent potential collateral impacts, the service road needs to be clearly demarcated in its entirety.

The only areas that may require some forms of clearance are the small sites where the poles are erected and the access tracks to these spots. These sites are small and widely spaced; and a service road already exists. If sufficient care is taken to prevent unnecessary collateral damage, the likelihood of the potential impact is greatly reduced (Mannheimer, 2021).

The loss of larger plants reduces habitat availability and food sources of many species, either directly or through the effect on prey species. Damaged plants will most probably regrow, although slowly.

None of the animal species of potential concern are restricted in distribution to the area, most are mobile and wide ranging. Resident species are mostly rodents, reptiles, and all invertebrates. Species will most probably return after the construction phase.

Construction activities may interfere with animals or disturb, harm or kill them, in particular residential and slow-moving animals, or interrupt their movement patterns. In the case of birds, the disturbances can have an impact on feeding, roosting and breeding patterns (see also Section 8.1.3). Open water bodies can cause a drowning hazard for animals.

Accidental harming or killing of animals (e.g.: road kills, falling into foundation pits, drowning in open water bodies) as well as illegal killing (poaching) and collecting of animals illegal and the harvesting of firewood or the collecting of plants such as aloes is possible. Poaching for food, selling of meat, killing of ‘nuisance’ species such as snakes and rodents, or the capturing of pets is possible. However, this possible impact is of short duration and avoidable through adequate management measures.

Assessment of Impact

Nature and intensity, duration of impact and geographical extent

The impact intensity is rated as low because it is controllable and the biodiversity of the area is already compromised by wide-scale disturbance, especially on land within and adjacent to the

Arandis Townlands. The duration of the impact is expected only during the construction and is thus low (short term) and it is expected that maintenance staff will be few. Although influences might be beyond the footprint area, the extent of the impact remains local, and the extent is thus low.

Consequence

The consequence of the impact is therefore low, for the unmitigated scenario and low for the mitigated scenario.

Probability

The probability is moderate – because it is possible that people will take the opportunity when it occurs if not controlled but may be reduced to low in the mitigated scenario.

Significance

The significance of the impact is rated as **low** for the unmitigated as well as the mitigated scenario.

Tabulated summary of the assessed impact – loss or disturbance of biodiversity composition

Mitigation	Intensity	Duration	Extent	Consequence	Probability of Occurrence	Significance
Unmitigated	**L**	**L**	**L**	**L**	**M**	**L**
Mitigated	**L**	**L**	**L**	**L**	**L**	**L**

Management and mitigation measures

- Protected and endemic species such as *Aloe asperifolia, Lithops ruschiorum, Hoodia spp*. and *Commiphora saxicola* that cannot be avoided should be considered for rescue prior to construction. This would have to be done under a permit from MEFT.
- Collection of plants, or parts of plants (including seed and/or fuelwood) should be forbidden. Strict rules and penalties need to be imposed on construction workers regarding illegal collecting of plants and firewood and killing of animals.
- Provide adequate competency training and awareness and reinforce acceptable behaviour through adequate information sharing.
- Apply strict supervision and control and strictly enforce all environmental rules, with special emphasis placed on preventing transgression and punishment of transgressors.
- Without infringing on the rights of workers, manage their movements and set rules for behaviour accordingly.

8.1.2 ISSUE: POTENTIAL LOSS, DAMAGE, OR FRAGMENTATION OF HABITAT

All three habitats present in the section of the powerline route are regarded as sensitive. Fauna and flora are directly dependent on these habitats; therefore, habitat destruction will inevitably have secondary impacts.

Loss and damage of habitats can be greatly avoided and mitigated if sufficient care is taken against collateral damage, e.g.: poles should not be sited in sensitive areas such as drainage lines and on rocky ridges.

The single areas of impact are confined to the sites where the poles are erected and the access tracks to these spots. Only the service road is continuous and can cause habitat fragmentation or slightly impact the connectedness of the landscape.

The overall impact of the project on one single habitat is however low because the powerline as well as the service road is linear and narrow, reducing the extent of the impact on one single habitat greatly; and because the sites where poles will be erected are small, localized and widely spaced (Mannheimer, 2021).

It would be hard to reduce the significance rating of this impact, as it cannot be avoided but only minimized by limiting the areas to be disturbed.

Assessment of Impact

Nature and intensity, duration of impact and geographical extent

The impact intensity is rated as moderate for the unmitigated scenario because modifications can occur. The duration of the impact is moderate (unmitigated), considering the detrimental effects when a habitat is destructed. Although influences might be beyond the footprint area, the extent of the impact remains local, and the extent is thus low. With mitigation, potential impacts can be minimized or largely avoided and the intensity, duration and extent of the impacts reduced to low.

Consequence

The consequence of the impact is considered as moderate for the unmitigated scenario and low for the mitigated scenario.

Probability

The impact will definitely occur (high) due to construction activities that will be undertaken. However, with mitigation the potential for impacts occurring is reduced

Significance

The significance of the impact is rated as **moderate** for the unmitigated scenario (where construction work may damage an area larger than the absolute minimum needed), albeit very localised and will not affect the overall population of any of the affected species, all of which are common and widespread. None of the habitats is unique, and all may also be found elsewhere. Management and mitigation measures are possible, and the impact can be minimized when interventions and alternative arrangements are implemented, reducing the significance to **Low**.

Tabulated summary of the assessed impact – loss, damage or fragmentation of habitat

Mitigation	Intensity	Duration	Extent	Consequence	Probability of Occurrence	Significance
Unmitigated	**M**	**M**	**L**	**M**	**H**	**M**
Mitigated	**L**	**L**	**L**	**L**	**M**	**L**

Management and mitigation measures

- Only the existing service road should be utilised for both construction and maintenance. This route should be clearly demarcated, together with designated turning points and construction laydown areas. The area used should be constrained as far as possible. Even in areas where tracks seem obvious, and are many, specific tracks should be selected and used.
- Limit the distances of access roads to points where the poles need to be erected.
- Wherever possible marble and other ridges and drainage lines should be avoided by not placing poles on the ridges or within the drainage lines.
- Strict control and supervision during construction is required to protect undisturbed areas outside the construction zone.

8.1.3 ISSUE: DISTURBANCE OF BIRDS DURING CONSTRUCTION

The impacts of disturbance on plants and residential animals are assessed in Section 8.1.1. In this section the specific impacts of disturbance on avifauna are assessed.

During construction, vehicle movements and human activity are at a peak and the possibility of disturbance and habitat destruction the highest, albeit short-term, site-specific and of a general lower significance. Disturbance during the operational phase is expected to decrease usually in the operational phase. In the case of birds, the results from disturbance are mainly indirect – temporary displacement of birds and a reduction in breeding success.

Assessment of Impact

Nature and intensity, duration of impact and geographical extent

No measurable change to natural functions and processes are foreseen, despite the possible displacement of birds. The intensity is low, thus. The impacts are local and site-specific, which means that the extent of the impacts is low. The impacts are temporary or short term, which means that the duration of the impact is low.

Consequence

The consequence of the impact is considered as low for the unmitigated scenario and low for the mitigated scenario.

Probability

The probability that birds will be disturbed is low. It is expected that mitigation measures can reduce the impacts.

Significance

The significance of the impact is rated as **low** for the unmitigated scenario. In the mitigated scenario the significance of the impact is rated as **low**.

Tabulated summary of the assessed impact – Disturbance of birds during construction

Mitigation	Intensity	Duration	Extent	Consequence	Probability of Occurrence	Significance
Unmitigated	**L**	**L**	**L**	**L**	**L**	**L**
Mitigated	**L**	**L**	**L**	**L**	**L**	**L**

Management and mitigation measures

In addition to the measures described in Sections 8.1.1 and 8.1.2, the following arrangements are specifically relevant to the disturbance of avifauna:

- Before construction, inspect the proposed power line route for any signs of nesting activity, and try to avoid the disturbance of breeding birds and chicks (especially ground-nesting birds such as Gray's Lark and Rüppell's Korhaan in sensitive ephemeral drainage lines / washes).
- Avoid the unnecessary destruction of habitat, especially in wash areas.
- Strictly enforce speed limits and anti-poaching measures.
- Promote ongoing awareness about the value of biodiversity and the negative impacts of disturbance, especially to breeding birds, and of poaching.

8.1.4 ISSUE: COLLISION OF BIRDS WITH THE INTERCONNECTION OVERHEAD POWERLINE

Overall, the impacts of powerline structures on avifauna and recommended mitigation measures are well documented, both globally and for the southern African subregion (ACS, 2021). Accordingly, the sections where powerlines cross drainage lines (and ridges) are considered potentially sensitive for birds.

Assessment of Impact

Nature and intensity, duration of impact and geographical extent

The intensity of this impact is moderate for the unmitigated scenario, since the natural ecological functions and processes can continue, but in a modified way. Discomfort is possible, particularly for the identified species at risk.

The extent of the impact is local (site-specific), since it is confined to the powerline, i.e., within the project corridor and thus low. Collisions will occur as long as the powerline exists, therefore the duration of the impact is very high.

With mitigation, these impacts would reduce.

Consequence

The consequence of the impact is considered as moderate for the unmitigated scenario and low for the mitigated scenario.

Probability

The probability that birds will collide with the proposed powerline and related structures is likely, i.e., high. With mitigation measures this can be reduced to moderate.

Significance

The significance of collisions is rated as **moderate** for the unmitigated scenario. In the mitigated scenario the significance of the impact is rated as **low**.

Tabulated summary of the assessed impact – Disturbance of birds during construction

Mitigation	Intensity	Duration	Extent	Consequence	Probability of Occurrence	Significance
Unmitigated	**M**	**VH**	**L**	**M**	**H**	**M**
Mitigated	**L**	**M**	**L**	**L**	**M**	**L**

Management and mitigation measures

- The powerline will likely cause a visual barrier, and this barrier will likely act as mitigation to reduce bird mortalities in itself.
- Bird flight diverters will be attached to the conductors in the identified zones – where the powerline crosses identified habitats and flightpaths such as drainage lines (8 km from the Lithops Substation northwards). In addition, the stay wires will be marked to increase visibility. Aircraft warning spheres will be fitted on the powerline above major road crossings as well.
- Monitoring is recommended to track bird mortalities and the effectiveness of the mitigation measures. See also the specific aspects to be monitored as suggested in the Specialist Report (Appendix F).

8.1.5 ISSUE: ELECTROCUTION OF BIRDS ON THE INTERCONNECTION OVERHEAD POWERLINE

Assessment of Impact

Nature and intensity, duration of impact and geographical extent

The intensity of this impact is low. The extent of the impact is site-specific and local, since it is confined to the powerline, and thus low. Electrocutions can occur as long as the powerline exists, therefore the duration of the impact is very high.

Consequence

The consequence of the impact is considered as moderate for the unmitigated scenario and low for the mitigated scenario.

Probability

The probability that birds can be electrocuted is improbable, i.e., low. With mitigation measures this can be further reduced.

Significance

The significance of the impact is rated as **low** for the unmitigated scenario as well as the mitigated scenario.

Tabulated summary of the assessed impact – Collision of birds with overhead powerline

Mitigation	Intensity	Duration	Extent	Consequence	Probability of Occurrence	Significance
Unmitigated	**L**	**VH**	**L**	**M**	**L**	**L**
Mitigated	**L**	**M**	**L**	**L**	**L**	**L**

Management and mitigation measures

- The powerline will likely cause a visual barrier, and this barrier will likely act as mitigation to reduce bird mortalities in itself.
- Should any of the other powerline structures present a risk of electrocution, standard mitigation measures should apply where relevant (e.g.: insulation of live sections, including "jumpers"; "gapping" of the earth wire on wooden poles).
- If technically possible, the insulator design for the 132 kV structure should preferably be such that it discourages perching by larger birds, such as raptors.
- Monitoring is recommended to track bird mortalities and the effectiveness of the mitigation measures. See also the specific aspects to be monitored as suggested in the Specialist Report (Appendix F).

8.2 ARCHAEOLOGY

Archaeology has been discussed in Section 6.5.

Only one, small site (QRS 112/6) – an isolated seed digging site – is located between 30 and 50 m from the proposed route. Although still existing, this site is surrounded by a heavily disturbed area because of apparently uncontrolled earthworks and sand mining within the Arandis Townlands (see Figure 11). The significance ranking of this site is 2 – indicating *"an isolated minor find in undisturbed primary context, with diagnostic material",* while its vulnerability ranking is 3, which indicates *"a probable threat from inadvertent disturbance due to proximity of development"*. On the basis on the field survey data reported by the specialist, the proposed powerline route poses a slight threat to an archaeological site (QRS 112/6) of very low significance (Kinahan, 2021).

However, from fieldwork evidence (see Figure 11) it is more likely that the site could be disturbed or destroyed by activities not related to the powerline, and even before any construction activity commences. In fact, the site can be avoided entirely by construction activities related to the powerline.

Moreover, the construction of the powerline is not considered to pose a significant threat to the archaeology of the area concerned (Kinahan, 2021). The route of the proposed powerline is therefore not considered to be archaeologically sensitive.

Archaeological assessment relies on the indicative value of surface finds recorded during field surveys. The results of previous field surveys in the same area may be used as a reliable basis for assessment. However, since the assessment is limited to surface observations and existing

survey data, it is necessary to caution the proponent that hidden, or buried archaeological or palaeontological remains might be exposed as the project proceeds. Although there is a generally low likelihood that unknown heritage sites are discovered, it is possible to uncover an unknown site during earthworks. For this reason, it is recommended that a Chance Finds Procedure is adopted (Kinahan, 2021), as indicated in the Heritage Specialist Report (See Appendix G) and the mitigation measures contained in the EMP. Important, the precautionary principle must be applied throughout – team members should be given training to know what heritage resources they may encounter and what to do in case a discovery is made.

8.2.1 ISSUE: DISTURBANCE AND DAMAGE TO HERITAGE SITES

It is possible that activities related to the proposed powerline may encroach hitherto unknown archaeological sites and this assessment is based on this uncertain scenario.

Assessment of Impact

Nature and intensity, duration of impact and geographical extent

The impact intensity is low because no measurable change is foreseen, but the duration of the impact is very high, because it is permanent. The extent of the impact is low because it is confined to a locality only.

Consequence

The consequence of the impact is considered as moderate for the unmitigated scenario and low for the mitigated scenario.

Probability

The probability is low and it is unlikely to occur.

Significance

The significance of the impact is rated as **low** for the unmitigated scenario. In the mitigated scenario the significance of the impact is rated as **low**.

Tabulated summary of the assessed impact – Disturbance and damage to heritage sites

Mitigation	Intensity	Duration	Extent	Consequence	Probability of Occurrence	Significance
Unmitigated	**L**	**VH**	**L**	**M**	**L**	**L**
Mitigated	**L**	**L**	**L**	**L**	**L**	**L**

Management and mitigation measures

- It is recommended that a Chance Finds Procedure is adopted.
- With timeous measures in place, the identified site can be avoided completely.
- The precautionary principle must be applied throughout – team members should be given training to know what heritage resources they may encounter and what to do in case a discovery is made.

8.3 CUMULATIVE IMPACTS

- In addition to the proposed new powerline, several overhead powerlines already exist in the larger landscape of the project area. Collisions of birds with these powerlines is therefore a major concern, with possible regional consequences. However, powerline incidents are recorded since 2009 and the central-western coast in the Erongo Region has been relatively well monitored (ACS, 2021). This knowledge base provides good input to identify and implement the necessary mitigation and management measures applied in this document.
- The presence of several existing powerlines in the wider landscape around Arandis compromises the visual characteristics of the area already. One additional powerline, adjacent to an existing powerline and alongside a determined powerline corridor does not compromise the visual quality significantly more.
- Impact on vegetation along the powerline route, particularly in the sensitive sections, will be greatly influenced by mitigation measures taken to control collateral damage, such as that caused by construction vehicles and crews. The cumulative damage to species of concern will be very low though, and will not affect their conservation status, providing that suitable care is taken, and mitigation measures are followed.

Education of construction crews and monitoring of compliance will be one of the biggest challenges for this project. The fact that vegetation is sparse often encourages the idea that an area is unimportant from a vegetation aspect. If collateral damage is controlled and infrastructure is sited in previously damaged areas or along existing roads, new damage should be relatively slight.

9 CONCLUSIONS AND RECOMMENDATIONS

The environmental aspects and potential impacts relating to the proposed construction of the powerline have been successfully identified and assessed as part of this EIA process. Relevant management and mitigation measures have been provided to ensure significant environmental and social impacts are avoided / minimised and positive social impacts enhanced, where relevant. These measures are included in the EMP.

Namisun believes that a thorough assessment / reassessment of the potential impacts associated with the proposed construction of the powerline has been achieved and will ensure MEFT to make an informed decision regarding the issuing of an ECC.

It is recommended that, if MEFT provides a positive decision on the application for the proposed project, they should include a condition to the clearance that TeraSun Energy must implement all commitments in the EMP.

The way forward is as follows:

- I&APs review the report and send their comments to Namisun.
- Namisun finalises the report, incorporating I&APs' comments.
- Submission of the final report (including I&APs' comments) to MME and MEFT for their review and decision.

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APPENDIX A: CV

APPENDIX B: INFORMATION SHARING RECORD

APPENDIX C: MINUTES OF MEETINGS

APPENDIX D: STAKEHOLDER DATABASE

APPENDIX E: SPECIALIST INPUT - VEGETATION

APPENDIX F: SPECIALIST INPUT – AVIFAUNA

APPENDIX G: SPECIALIST INPUT - HERITAGE