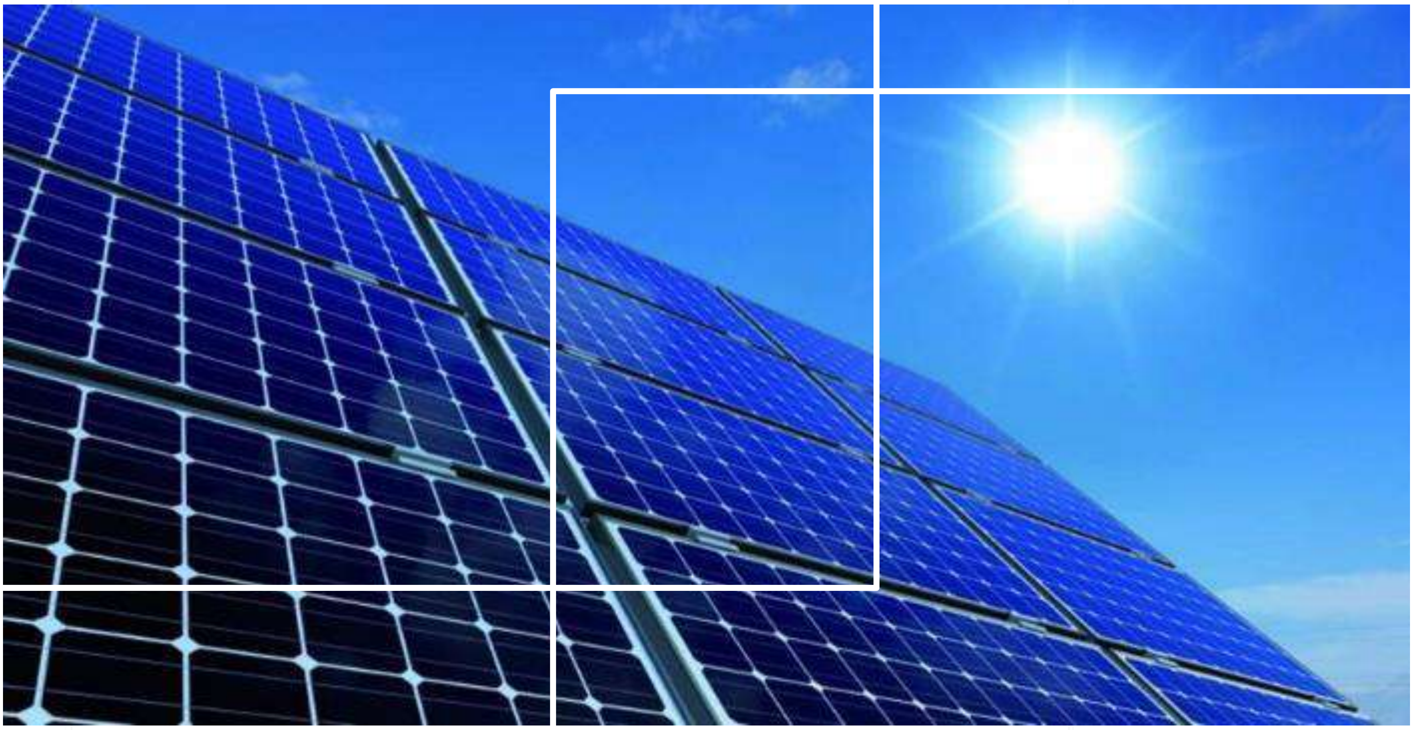

Submitted to: ISPS Solar Operations Namibia (Pty) Ltd
Attention: Mr. Garth Cloete & Ms. Lisbé le Roux

REPORT:

MAXWELL SOLAR PLANT PROJECT – SCOPING AND IMPACT ASSESSMENT REPORT

PROJECT NUMBER: ECC-130-375-REP-06-D

REPORT VERSION: REV 01

DATE: APRIL 2022

TITLE AND APPROVAL PAGE

Project Name:	MAXWELL SOLAR PLANT PROJECT – SCOPING AND IMPACT ASSESSMENT REPORT
Client Company Name:	ISPS Solar Operations Namibia (Pty) Ltd
Client Name:	Mr. Garth Cloete & Ms. Lisbé le Roux
Ministry Reference:	APP-003433
Authors:	Diaan Hoffman, Matthew Bliss, Lester Harker and Stephan Bezuidenhout
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DISCLAIMER

Environmental Compliance Consultancy (ECC) (Reg. No. CC 2013/11401) has prepared this scoping report plus impact assessment and the ESMP on behalf of the Proponent. This report has been authored by employees of ECC, who have no material interest in the outcome of this report, nor do any of the ECC team have any interest that could be reasonably regarded as being capable of affecting their independence in the preparation of this report. ECC is independent of the Proponent and has no vested or financial interest in the Project, except for fair remuneration for professional fees rendered which are based upon agreed commercial rates. Payment of these fees is in no way contingent on the results of this report or the assessment, or a record of decision issued by the Government. Any personal views or opinions expressed by the writer may not necessarily reflect the views or opinions of Environmental Compliance Consultancy or its client.

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Executive Summary

This scoping study has been undertaken by following the requirements of the Environmental Management Act (EMA), No.7 of 2007 and the Environmental Impact Assessment Regulation, No. 30 of 2012, gazetted under the Environmental Management Act, No. 7 of 2007.

The Proponent, ISPS Solar Operations Namibia (Pty) Ltd proposes the construction and the operation of a 13 megawatt (MW) solar photovoltaic (PV) power plant on farm Maxwell No. 82, which will be linked to the Eldorado substation and supply B2Gold's Otjikoto mine with electricity through the Namibian Modified Single Buyer (MSB) framework.

A ground-mounted single-axis tracking solar photovoltaic plant with a nominal capacity of approximately 13 000 kWp (DC) (13 MW) is planned to be constructed. The final size will depend on any limitations imposed by the Electricity Control Board of Namibia (ECB) and the final designs of the solar plant.

Through the scoping process and impact assessment, it was found that the significant impacts that may occur during the construction and operational phases of the Project are impacts relating to the potential removal of protected and vulnerable plant species, habitat destruction due to the clearing and preparation of about 22ha of land, avifauna collisions, potential removal or displacement of vulnerable or protected wildlife species and the potential soil disturbances due to construction and operational activities.

These impacts have been classified as minor to moderate and should thus be carefully monitored and managed according to the ESMP, to ensure that the significance level of the impact is minimized as far as reasonably possible.

With the implementation of best practice methods, national regulations and recommended mitigation measures, the significance of the impacts are expected to be low to minor.

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DEFINITIONS AND ABBREVIATIONS

TERM OR ABBREVIATION	DESCRIPTION
AIDS	Acquired Immune Deficiency Syndrome
COVID19	Corona Virus Disease 2019
dB	Decibel
DC	Direct current
DEA	Directorate of Environmental Affairs
CB	Electricity Control Board
ECC	Environmental Compliance Consultancy
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EMP	Environmental Management Plan
ESMP	Environmental and Social Management Plan
ESIA	Environmental and Social Impact Assessment
GIS	Geographic Information Systems
GDP	Gross Domestic Product
Ha	Hectares
HIV	Human Immunodeficiency Virus
I&AP	Interested & Affected Parties
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
kV	Kilovolts
kWh	Kilowatt per hour
kWp	Kilowatt peak
m^2	Square meters
MAWLR	Ministry of Agriculture, Water and Land Reform
masl	Meters above sea level
MEFT	Ministry of Environment, Forestry and Tourism
MW	Megawatts
MWh	Megawatts per hour
p.a.	Per annum
PV	Photovoltaic
PPE	Personal Protective Equipment
OSH	Occupational safety and health
SANS	South African National Standards
SPS	Sustainable Power Solutions
RH	Relative Humidity
TB	Tuberculosis
Wp	watt peak
WHO	World Health Organisation

1 INTRODUCTION

1.1 BACKGROUND INFORMATION

The purpose of the report is to provide the necessary environmental and social scoping and assessment for the proponent to apply for and obtain an environmental clearance certificate for the construction and operation of a 13 megawatts (MW) solar photovoltaic (PV) power plant on farm Maxwell No. 82, Otjozondjupa Region, Namibia (Figure 1).

Environmental Compliance Consultancy (ECC) has been engaged by the Proponent, ISPS Solar Operations Namibia (Pty) Ltd to undertake an environmental assessment process and develop a scoping report and an environmental (and social) management plan (ESMP) in terms of the Environmental Management Act, No. of 7 of 2007 and its regulations. An environmental clearance application will be submitted to the relevant competent authority: The Ministry of Mines and Energy (MME) and The Ministry of Environment, Forestry, and Tourism (MEFT).

Farm Maxwell No. 82 is located between Otjiwarongo and Otavi to the northwest of the B2Gold's Otjikoto mine. The farm can be accessed by driving along the B1 road for approximately 61 km from Otjiwarongo (en route to Otavi) and turning onto the D2886 road. The proposed site is situated to the northeastern side of the road approximately 13 km from the B1 highway. The location is shown in Figure 2.

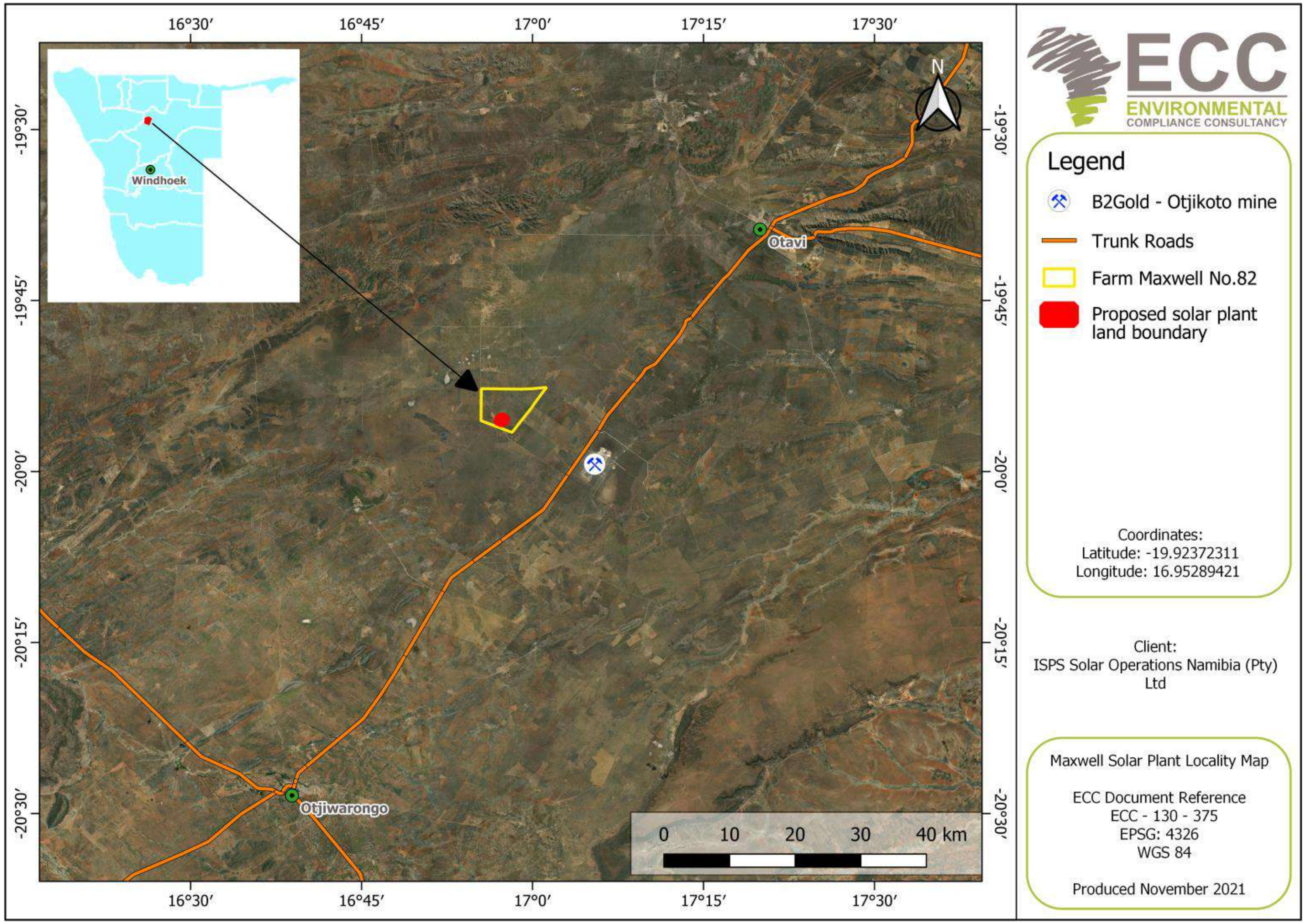

Figure 1 – Locality map of the proposed Project location

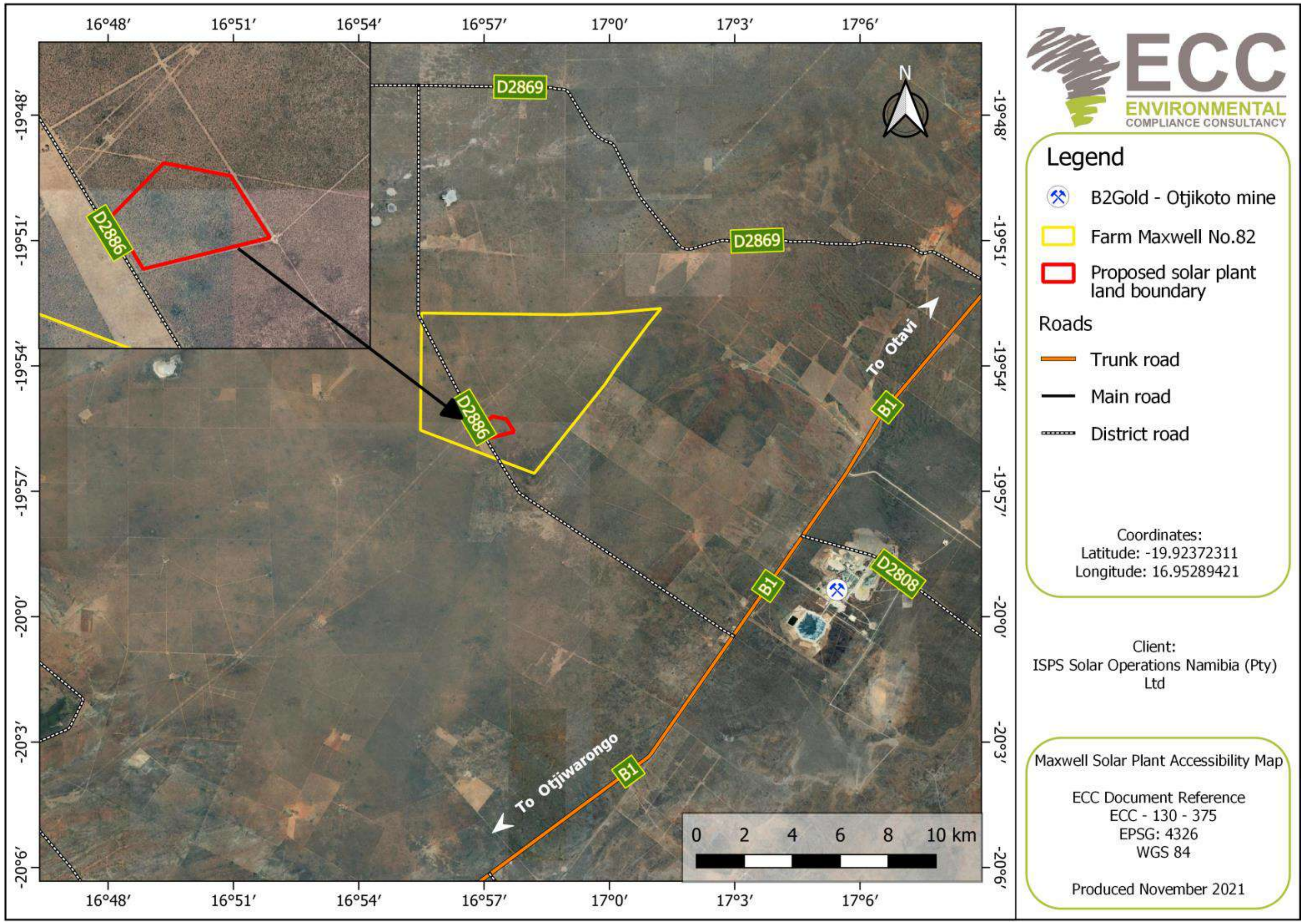

Figure 2 – Accessibility map of farm Maxwell No. 82 and the proposed Project site

1.2 PURPOSE OF THE SCOPING REPORT

An environmental and social impact assessment (ESIA) has been conducted in compliance with the Namibian Environmental Management Act, 2007 and its regulations. This report presents the findings of the ESIA process. In addition to describing the prescribed ESIA process, the report describes the baseline biophysical and socioeconomic environments, provides a project description, findings from the scoping and assessment phases, and presents an environmental and social management plan (ESMP). The scope of the assessment was determined through undertaking an assessment of the proposed Project against the receiving environment, obtained through a desktop review, available site-specific literature, and site reports.

ECC has prepared this report. ECC's terms of reference for the assessment is strictly to identify, assess and address potential effects, whether positive or negative, establish their relative significance, explore alternatives for technical recommendations and identify appropriate mitigation measures.

This report provides information to the public and stakeholders to aid in the decision-making process for the Project. The objectives are to:

- Describe the proposed activity and the site on which the activity is to be undertaken;
- Describe the baseline environment that may be affected by the proposed activity;
- Identify the laws and guidelines that have been considered in the assessment and preparation of this report;
- Provide details of the public consultation process;
- Describe the need and benefits of the proposed activity; and
- Provide a high-level analysis of feasible or unfeasible alternatives that were considered; and
- Provide an assessment of potential impacts identified.

The Ministry of Environment, Forestry and Tourism (MEFT) as the competent authority that deals with applications for environmental clearance has determined that an Environmental and Social Management Plan (ESMP) be developed to provide a management framework for the planning and implementation of the development. The ESMP provides development standards and arrangements to ensure that the potential environmental and social impacts are mitigated, prevented, minimised and/or enhanced as far as reasonably practicable and that statutory requirements and other legal obligations are fulfilled.

1.3 THE PROPONENT OF THE PROPOSED PROJECT

Table 1 – Proponent's details

Company Representative:	Contact Details:
Mr. Garth Cloete & Ms. Lisbé le Roux	ISPS Solar Operations Namibia (Pty) Ltd The Woodmill, Vredenburg Rd Stellenbosch 7600, RSA Lisbe@sps.africa +274 82 655 0761

1.4 ENVIRONMENTAL AND SOCIAL ASSESSMENT PRACTITIONER

Environmental Compliance Consultancy (ECC) (Reg. No. CC 2013/11401) has prepared this report and the ESMP on behalf of the Proponent.

This report has been authored by employees of ECC, who have no material interest in the outcome of this report, nor do any of the ECC team have any interest that could be reasonably regarded as being capable of affecting their independence in the preparation of this report. ECC is independent of the Proponent and has no vested or financial interest in the Project, except for fair remuneration for professional fees rendered which are based upon agreed commercial rates. Payment of these fees is in no way contingent on the results of this report or the assessment, or a record of decision issued by the Government.

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1.5 ENVIRONMENTAL REQUIREMENTS

The Environmental Management Act, 2007, and its regulations stipulate that an environmental clearance certificate is required before undertaking any of the listed activities that are identified in the Act and its regulations. Potential listed activities triggered by the Project are provided in Table 2.

Table 2 – Activities potentially triggered by the proposed Project.

Source: Environmental Management Act, 2007, and its regulations

Listed activity	As defined by the regulations of Act	Relevance to the project
Energy generation, transmission and storage activities	1. The construction of facilities for – (a) The generation of electricity (b) the transmission and supply of electricity	A solar PV power plant will be constructed and installed on-site and cater for a peak demand of 13 MW. A 22kV overhead powerline (single line with wood pylons - 500 meters in length) will be installed to a nearby substation.
Waste management, treatment, handling and disposal activities	2.2. Any activity entailing a scheduled process referred to in the Atmospheric Pollution Prevention Ordinance, 1976. 2.3 The import, processing, use and recycling, temporary storage, transit or export of waste.	A septic tank will be installed on-site (operational phase) and chemical toilets will be used during the construction phase as well as during the operational phase of the Project. Waste generated during the construction phase will be removed by a skip and will be disposed of at the nearest landfill site. The majority of the waste will be recycled.
Forestry activities	4. The clearance of forest areas, deforestation, afforestation, timber harvesting or any other related activity that requires authorisation in terms of the Forest Act, 2001 (Act No. 12 of 2001) or any other law.	Vegetation will be cleared for the construction and installation of the solar PV power plant and ablution facilities, which will include approximately 22 hectares.

Listed activity	As defined by the regulations of Act	Relevance to the project
Water resource development	8.1. The abstraction of ground or surface water for industrial or commercial purposes	Water will be abstracted for use on-site for the ablution facilities and maintenance during the operational phase.
Hazardous substance treatment, handling and storage	9.2 Any process or activity which requires a permit, licence or other form of authorisation, or the modification of or changes to existing facilities for any process or activity which requires an amendment of an existing permit, licence or authorisation or which requires a new permit, licence or authorisation in terms of a law governing the generation or release of emissions, pollution, effluent or waste.	A septic tank will be installed for the permanent ablutions that will be constructed.

2 APPROACH TO THE ASSESSMENT

2.1 THE ASSESSMENT PROCESS

The ESIA methodology applied for the Project has been developed using the International Finance Corporation (IFC) standards and models, in particular, Performance Standard 1; 'Assessment and management of environmental and social risks and impacts' (International Finance Corporation, 2017) (International Finance Corporation, 2012), which establishes the importance of:

- Integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects;
- Effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and
- The client's management of environmental and social performance throughout the life of the Project.

Furthermore, the Namibian Draft Procedures and Guidance for ESIA and EMP (Republic of Namibia, 2008) as well as the international and national best practice; and over 25 years of combined EIA experience, were also drawn upon in the assessment process.

This impact assessment is a formal process in which the potential effects of the Project on the biophysical, social and economic environments are identified, assessed and reported, so that the significance of potential impacts can be taken into account when considering whether to grant approval, consent or support for the Project.

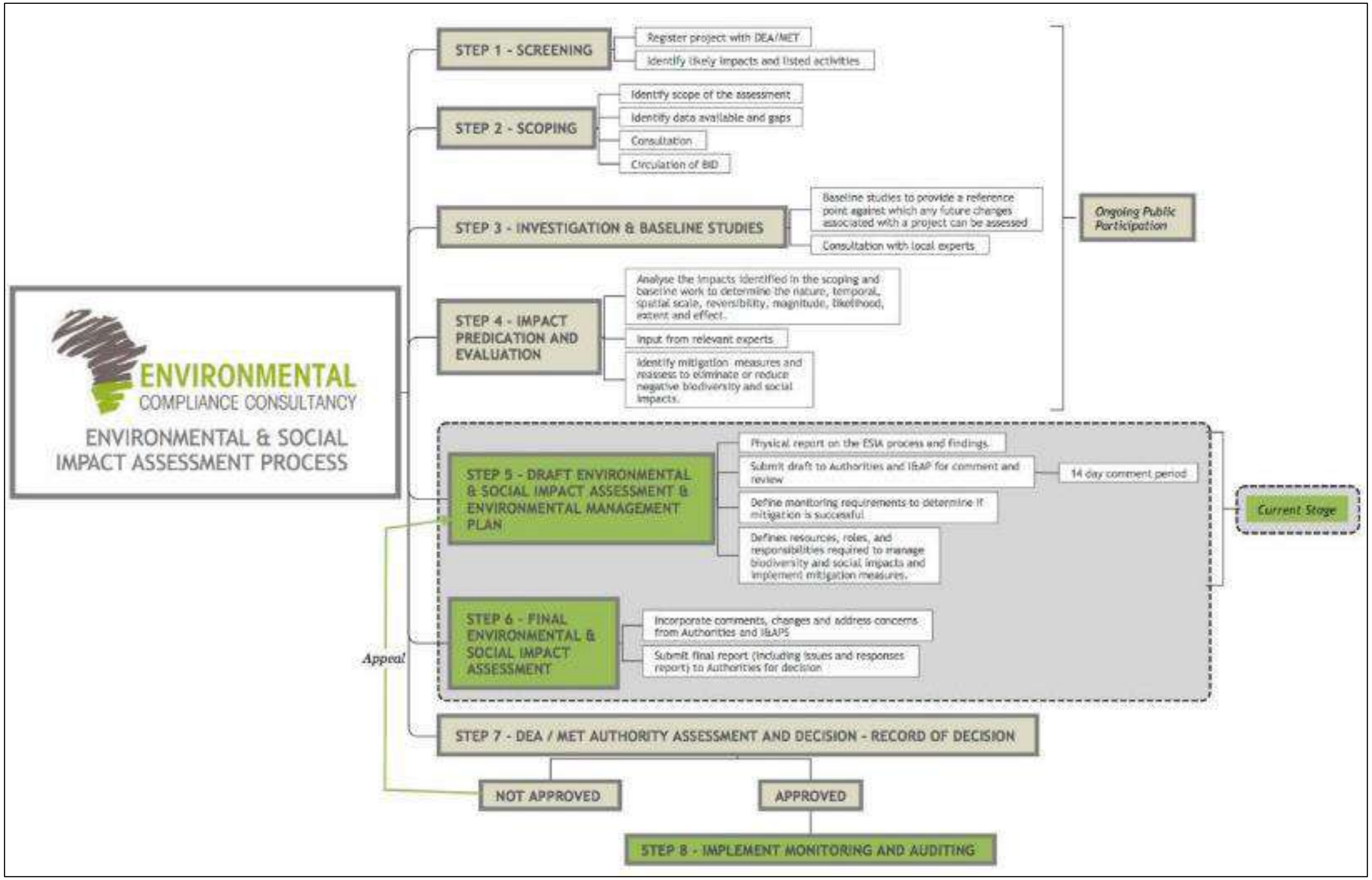

Figure 3 – ECC ESIA method

2.2 Screening of the Project

The first stages in the ESIA process are to register the Project with the DEA and undertake a screening exercise to determine whether it is considered as a listed activity under the Environmental Management Act, No. 7 of 2007 (and associated regulations) and if significant impacts may arise from the Project. The location, scale and duration of Project activities will be considered against the receiving environment.

It was concluded that an ESIA (i.e., scoping report and ESMP) is required, as the Project is considered as a listed activity and there may be potential for significant impacts to occur.

2.3 Scoping of the Environmental Assessment

Where an ESIA is required, the second stage is to scope the assessment. The main aim of this stage is to determine which impacts are likely to be significant (the main focus of the assessment), scope the available data and any gaps which need to be filled, determine the spatial and temporal scope and identify the assessment methodology.

The screening phase of the Project is a preliminary analysis to determine ways in which the Project may interact with the biophysical, social and economic environment. Impacts that are identified as potentially significant during the screening and scoping phases are taken forward for further assessment in the ESIA process. The details and outcomes of the screening process are discussed further in Sections 6 and 7.

Subsequently, scoping of the ESIA was undertaken by the EIA team. The scope of the assessment was determined through screening the Project against the receiving environment obtained through a high-level desktop review. Feedback from consultation with the client also informed this process.

2.4 Baseline Studies

Baseline studies are undertaken as part of the scoping stage, which involves collecting all pertinent information from the current status of the receiving environment. This provides a baseline against which changes that occur as a result of the Project can be measured.

The Project's baseline information was obtained through a desktop study, focusing on environmental receptors that could be affected by the proposed Project, verified through site-specific information. The baseline information is covered in Section 5.

A robust baseline is required to provide a reference point against which any future changes associated with a project can be assessed, and it allows for suitable mitigation and monitoring actions to be identified.

The existing environment and social baseline for the Project were collected through various methods:

- Desktop studies;
- Consultation with stakeholders;
- Specialists studies conducted in the general area between Otjiwarongo and Otavi; and
- Engagement with Interested and Affected Parties (I&APs) - See Appendix C.

2.5 IMPACT PREDICTION AND EVALUATION

Impact prediction and evaluation involve predicting the possible changes to the environment as a result of the development/Project. The recognized methodology was applied to determine the magnitude of impact and whether or not the impact was considered significant and thus warrant further investigation. The impact prediction and evaluation methodology used is presented in Section 6 of this report. The findings of the assessment are presented in Section 7.

2.6 ESIA CONSULTATION

Public participation and consultation are requirements stipulated in Section 21 of the Environmental Management Act, No. 7 of 2007 and associated regulations for a project that needs an environmental clearance certificate. Consultation is a compulsory and critical component in the ESIA process in achieving transparent decision-making and can provide many benefits.

The objectives of the stakeholder engagement process are to:

- Provide information on the Project to I&APs: introduce the overall concept and plan;
- Clarify responsibility and regulating authorities;
- Listen to and understand community issues, concerns and questions;
- Explain the process of the ESIA and timeframes involved; and
- Establish a platform for ongoing consultation.

2.7 INTERESTED AND AFFECTED PARTIES

Farm Maxwell is surrounded by privately owned farms (See Figure 4). The Project site can be accessed by driving along the B1 road for approximately 61 km from Otjiwarongo (en route to the Otavi) and turning onto the D2886 road. The proposed site is situated to the northeastern side of the road approximately 13 km from the B1 highway.

The owners of the farms that border the Project site were identified as I&APs, as well as the relevant local authority bodies. Other I&APs were identified through invitations such as newspaper advertisements and site notices.

2.8 SITE NOTICES

A site notice ensures neighbouring properties and stakeholders are made aware of the proposed Project. The notice was set up at the boundary of the proposed site as illustrated in Appendix C.

2.9 NEWSPAPER ADVERTISEMENTS

Notices regarding the Project and associated activities were circulated in three newspapers namely the 'Republikein', Allgemeine Zeitung' and the 'Sun' on the 24th of January and 31st of January 2022. The purpose of this was to commence the consultation process and enable I&APs to register an interest in the Project. The adverts can be found in Appendix C.

2.10 BACKGROUND INFORMATION DOCUMENT

The background information document presents a high-level description of the Project sets out the ESIA process and when and how consultation is undertaken and provides contact details for further Project-specific inquiries to all registered I&APs. The BID was distributed to all registered and identified I&APs for the Project.

2.11 SUMMARY OF ISSUES RAISED

The initial public participation phase involves the notifications of the Project through media such as; newspaper adverts, direct mail sent to identified I&APs and the display of site notices. No feedback has been received by I&APs.

The scoping report and EMP have been submitted for public review from the 28th of March 2022 to the 11th of April 2022 (14 days). No comments or concerns were raised by I&Aps during this period.

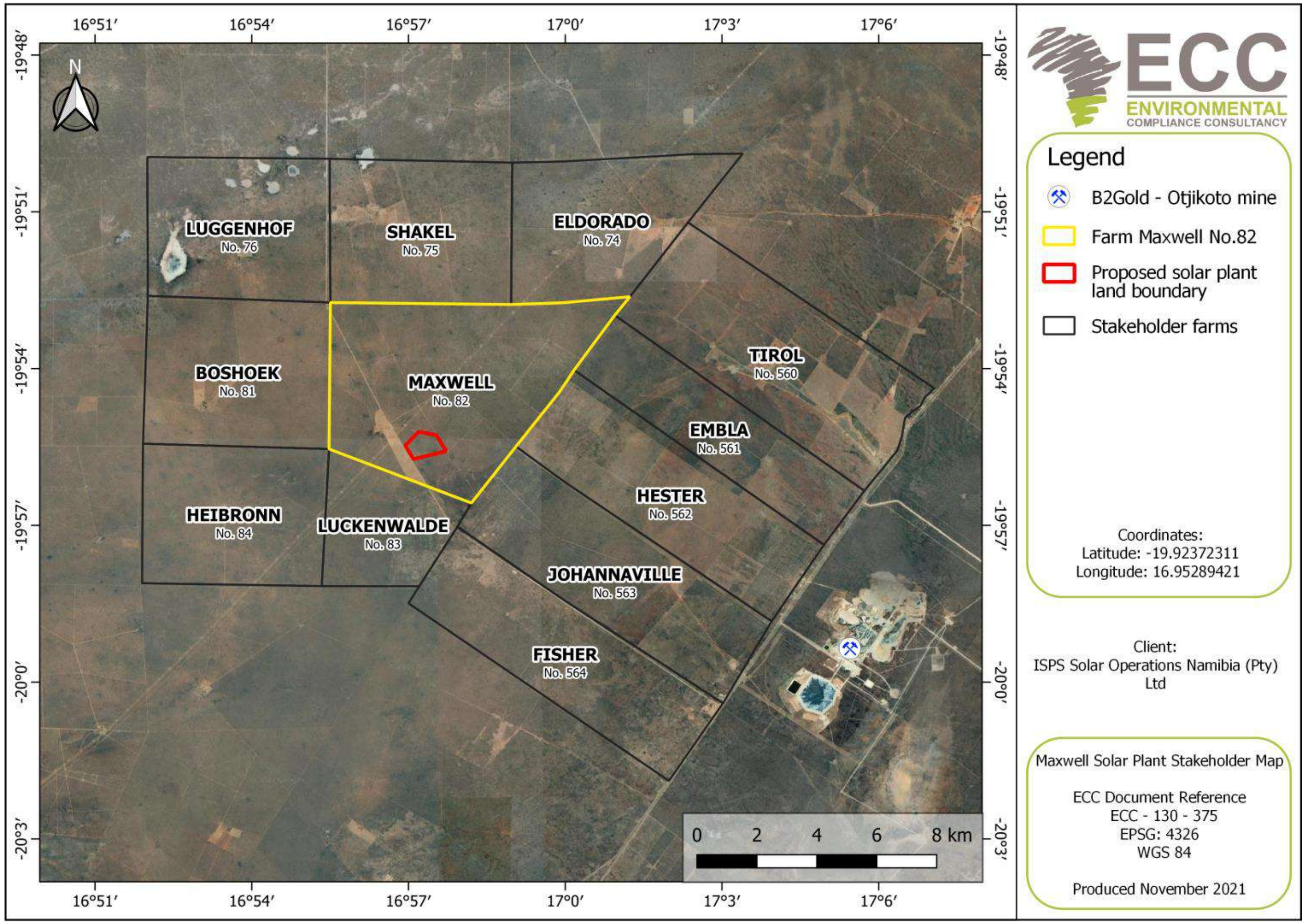

Figure 4 - Map showing farm Maxwells No. 82 neighbouring farms

2.12 Draft ESIA and EMP

This report and ESMP for the Project's environmental clearance includes an assessment of the biophysical and social environment, which satisfies the requirements of Step 5 (Figure 2).

This combined scoping and ESIA report documents the findings of both the scoping and assessment processes and provides stakeholders with the opportunity to comment and continue consultation and forms part of the environmental clearance application. The ESMP provides measures to manage the environmental and social impacts of the Project and outlines specific roles and responsibilities to fulfil the plan. This ESIA report focuses on the significant impacts that may arise from the Project as described in Step 4 (Figure 3). These impacts are discussed in Section 7.

This stage aims to ensure all stakeholders and I&APs have the opportunity to provide final comments on the assessment process, findings and register their concerns. Should any significant changes arise that were not captured in the scoping report an addendum report will be submitted to the directorate of environmental affairs (DEA) incorporating such comments.

2.13 Final ESIA and EMP

The final Scoping report and associated appendices will be available to all stakeholders on the ECC website www.eccenvironmental.com and will be published on the MEFT website for public access.

The ESIA report and appendices will be formally submitted to the Office of the Environmental Commissioner, DEA as part of the application for an environmental clearance certificate for the Project.

2.14 Authority Assessment and Decision Making

The Environmental Commissioner in consultation with other relevant authorities will assess if the findings of the ESIA presented in the amended ESIA report is acceptable. If deemed acceptable, the Environmental Commissioner will revert to the Proponent with a record of decision and any recommendations.

2.15 MONITORING AND AUDITING

In addition to the ESMP being implemented by the Proponent, a monitoring strategy and audit procedure will be determined by the Proponent and competent authority. This will ensure key environmental receptors are monitored over time to establish any significant changes from the baseline environmental conditions caused by project activities.

3 REVIEW OF THE LEGAL ENVIRONMENT

This chapter outlines the regulatory framework applicable to the proposed Project. As stated in Section 1, environmental clearance is required for any activity listed in the Government Notice No. 29 of 2012 of the EMA.

3.1 NATIONAL LEGISLATION AND RELEVANT INTERNATIONAL PERFORMANCE STANDARD(S)

Table 3 - Legal compliance

National regulatory regime	Summary	Applicability to the project
Constitution of the Republic of Namibia of 1990	The Constitution of the Republic of Namibia, 1990 clearly defines the country's position concerning sustainable development and environmental management. Article 95 of the constitution refers that the state shall actively promote and maintain the welfare of the people by adopting policies aimed at the following: *"Maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilization of living natural resources on a sustainable basis for the benefit of all Namibians, both present, and future; in particular, the government shall provide measures against the*	The proponent will conform by engaging the local community for the proposed Project by prioritizing local jobs through the different stages of the Project.

National regulatory regime	Summary	Applicability to the project
	dumping or recycling of foreign nuclear and toxic waste on Namibian territory."	
Environmental Management Act, (No. 7 of 2007) and its regulations, including the Environmental Impact Assessment Regulation, 2007 (No. 30 of 2012)	The Act aims to promote sustainable management of the environment and the use of natural resources by establishing principles for decision-making on matters affecting the environment. It sets the principles of environmental management as well as the functions and powers of the minister. The Act requires certain activities to obtain an environmental clearance certificate before project development. The Act states an EIA may be undertaken and submitted for as record of decision as part of the environmental clearance certificate application. The MEFT is responsible for the protection and management of Namibia's natural environment. The Department of Environmental Affairs under the MEFT is responsible for the administration of the EIA process.	The proposed Project triggers the need for environmental assessments before commencement, thus the Environmental scoping report (and ESMP) documents the findings of the environmental assessment undertaken for the proposed Project, which will form part of the environmental clearance application. The assessment and report have been undertaken in line with the requirements under the Act and associated regulations.

National regulatory regime	Summary	Applicability to the project
Electricity Act No. 4 of 2007 & its Regulations.	"To establish the Electricity Control Board and provide for its powers and functions; to provide for the requirements and conditions for obtaining licences for the provision of electricity; to provide for the powers and obligations of licensees, and to provide for incidental matters".	The project will be generating and supplying electricity to B2Gold's Otjikoto mine. The proponent considers and maintains the Act and its regulations together with the breakdown process to apply for the provision of electricity licences. The Proponent should ensure that all requirements from the Electricity Control Board is followed and adhered to.
National policy for Independent power Producers (PPs) of 2018	The policy outlines the key provisions of MME commitments to encourage private investment in Namibia's power sector and outlines the power market model, pricing regime, procurement approach, and the requirements for the IPPs to develop power generation projects and seek licenses for implementing the projects.	The proposed Project is classified as a medium-size independent power producer project (5 to 100 MW). The proponent takes into consideration, the procedures necessary towards obtaining an independent power producer licence.
Water Act, No. 54 of 1956	Although the Water Resources Management Act, No. 11 of 2013 has been promulgated, it cannot be enacted as the regulations have not been passed – so the Water Act 54 of 1956 is still in effect. This act provides for *"the control, conservation and use of water for domestic, agricultural, urban and industrial purposes; to make provision for the control, in a certain respect*	The Act stipulates obligations to prevent pollution of water. Should wastewater be discharged, a permit is required. The ESMP sets out measures to avoid polluting the water environment. Measures to minimise potential groundwater and surface water pollution are contained in the ESMP. Abstraction of water from boreholes requires an abstraction permit. Abstraction rates need to be measured and reported to the authorities by

National regulatory regime	Summary	Applicability to the project
	and for the control of certain activities on or in water in certain areas". The Department of Water Affairs within the Ministry of Agriculture Water and Land Reform (MAWLR) is responsible for the administration of the Act.	following the requirements of this legislation. In addition, annual reporting on the environmental impacts of water abstraction is recommendable. Should the Project require drilling and abstraction of water from underground sources, an application should be submitted to the authorities.
Soil Conservation Act, No. 76 of 1969) and the Soil Conservation Amendment Act, No. 38 of 1971)	Makes provision for the prevention and control of soil erosion and the protection, improvement and the conservation, improvement and manner of use of the soil and vegetation.	The land will be cleared for the construction/installation of the solar components (solar panels and inverters), which could constitute a risk for soil erosion and disturbances.
The Forestry Act, No. 12 of 2001 as amended by the Forest Amendment Act, No. 13 of 2005	Section 22 and 23 discusses the requirements and protection of vegetation in natural areas. A permit for the cutting, destruction or removal of vegetation that are classified under rare and or protected species; clearing the vegetation on more than 15 hectares on any piece of land or several pieces of land situated in the same locality which has predominantly woody vegetation, or cut or remove more than 500	The necessary permits should be obtained from the MEFT, where the application should satisfy that the cutting and removal of vegetation will not interfere with the conservation of soil, water or forest resources.

National regulatory regime	Summary	Applicability to the project
	cubic metres of forest produce from any piece of land in a period of one year.	
National Heritage Act, No. 27 of 2004.	The Act provides the provision of the protection and conservation of places and objects with heritage significance.	There might be potential for heritage objects to be found on-site, therefore the stipulations in the Act have been taken into consideration and are incorporated into the ESMP. The chance find procedure must be used in the event of identifying potential heritage sites
Nature Conservation Ordinance Act No. 4 of 1975 and its regulations.	"The Act makes provision for the conservation and management of wildlife and regulates fishing in inland waters. The text consists of 91 sections divided into 7 Chapters and completed by 9 Schedules. The Chapters are the following: Preliminary (I); Game Parks and Nature Reserves (II); Wild animals (III); problem animals (IV); Fish in inland waters (V); Indigenous plants (VI); general (VII). The Nature Conservation Board shall be continued under section 3. The Cabinet may appoint Nature Conservator".	The land will be cleared to accommodate the proposed development, potentially leading to habitat loss, destruction, and fragmentation. The proponent considers the impacts involved, thus impacts magnitude are discussed in this report in section 7 and mitigation measures and rehabilitation in the ESMP.
Labour Act, No. 11 of 2007: Regulations relating to the	The Act provides for the regulation of employees' health and safety in the workplace.	Noise and dust deposition during construction and maintenance are probable disturbances that potentially could impact workers, therefore consideration of operations that could compromise the safety and welfare of workers are accounted for in the ESMP. The Proponent will be

National regulatory regime	Summary	Applicability to the project
Health and Safety of Employees at Work (GN 156/1997).		responsible to develop and implement a health and safety management plan.
The Regional Councils Act (No. 22 of 1992)	The Act sets out conditions under which Regional Councils must be elected and administer each delineated region. From a land use and project planning point of view, their duties include, as described in section 28 "to undertake the planning of the development of the region for which it has been established with a view to physical, social, and economic characteristics, urbanisation patterns, natural resources, economic development potential, infrastructure, land utilisation pattern and sensitivity of the natural environment. The main objective of this Act is to initiate, supervise, manage, and evaluate development.	In conjunction with this Act, the proponent should recognise the power vested in the Otjozondjupa Regional Councils as an I&AP and will be consulted during the Environmental Impact Assessment (EA) process.

Table 4 – Specific permits and licence requirements for the proposed Project

Permit, licence or registration	Relevant authority	Project bearing
Water abstraction permits	Ministry of Agriculture, Water and Land Reform	An abstraction permit is required for the abstraction of water from a borehole for commercial purposes.
Sewage permits	Ministry of Agriculture, Water and Land Reform	Permits related to the sewage system (septic tank) should be obtained.
Permits for the removal of vegetation	Ministry of Environment, Forestry and Tourism	Permits will need to be obtained for the clearing of vegetation.
Electricity generation licence	Electricity Control Board	The proponent will need to complete form Form_DGx_PV to apply for an electricity generation licence.

3.2 International Best Practice Documents

The following documents apply to this development:

- **IUCN:** Mitigating biodiversity impacts associated with solar and wind energy development Guidelines for project developers;
- **BirdLife South Africa:** Best practice guidelines - Birds & Solar Energy Guidelines for assessing and monitoring the impact of solar power generating facilities on birds in southern Africa; and
- **IFC:** Utility-Scale Solar Photovoltaic Power Plants. A Project Developer's Guide.

4 PROJECT DESCRIPTION

4.1 COMPANY BACKGROUND

The Proponent is a subsidiary of Sustainable Power Solutions (SPS) which was founded in 2008 and is developing and funding commercial and industrial-scale solar PV systems in sub-Saharan Africa.

"SPS has to date successfully commissioned more than 150 solar and storage projects in the C&I space across Sub-Saharan Africa, including St Helena Island and Seychelles. Some of SPS's more iconic projects are the V&A Waterfront, Basson DC (Shoprite), Alphonse Island and the largest rooftop installation in Namibia at the Grove Mall". SPS forms part of the CDC Group, the United Kingdom's development finance institution.

4.2 NEED FOR THE PROJECT

Namibia is a country with very few overcast days throughout the year, thus being ideal for renewable energy sources like solar power. Renewable energy sources are needed to move away from fossil fuel use, especially in light of the current climate crisis. Namibia's revised energy and climate change strategy and plan, presented to the COP26 in Glasgow in mid-November 2021, calls for a significant effort to ramp up the nation's renewable energy, particularly solar energy.

B2Gold is an international senior gold producer headquartered in Vancouver, Canada and through its subsidiaries, it owns 90% of the Otjikoto mine. The mine currently uses a mix of energy, including heavy oil-fired generators and its own solar farm. The proposed Project will supply the Otjikoto mine with renewable energy; this is important to save energy for the mine and reduce the carbon footprint of one of Namibia's major gold producers.

4.3 ALTERNATIVES NEEDED

Best practice environmental assessment methodology calls for consideration and assessment of alternatives to the Project. In terms of the Environmental Management Act, No. 7 of 2007 and its regulations, alternatives considered should be analysed. This requirement ensures that during the design evolution and decision-making process, potential environmental impacts, costs, and technical feasibility have been considered, which leads to the best option(s) being identified.

There were no other readily available and feasible sites, and the current identified location is ideally located near B2Gold's Otjikoto mine, and the landowner has provided permission (Appendix D, show the agreement with the landowner) for the development of the proposed solar plant. The proposed Project is also planned next to the Eldorado substation, where the solar plant will be linked.

During the ESIA assessment, alternatives will take the form of consideration of optimisation and using eco-friendly solutions to reduce potential impacts.

4.4 BACKGROUND OF THE PROJECT

The Proponent proposes the development and installation of a 13 MW solar photovoltaic (PV) power plant on farm Maxwell No. 82, which will be linked to the Eldorado substation and supply B2Gold's Otjikoto mine with electricity through the Namibian Modified Single Buyer (MSB) framework. The Project involves the installation of solar components (solar panels and inverters) that will cover an area of approximately 22ha (Figure 6).

The Eldorado substation will be constructed by Nampower adjacent to the proposed solar PV power plant and a 22 kV overhead powerline (single line with wood pylons, 500 meters in length) will be constructed by the Proponent from the substation to the solar plant. Overhead powerlines (Figure 6 – 66kV line) are also being constructed from the Eldorado substation to the Otjikoto mine to supply the mine with electricity (falls under a Nampower project), EIA for these powerlines have been conducted by ECC for B2Gold (environmental clearance certificate was issued on the 5th of June 2020 – ECC - 00693). Furthermore, ablutions will also be constructed on-site for the construction and operational phase. Figure 7, shows the proposed layout of the plant.

4.5 PROPOSED INFRASTRUCTURE LAYOUT ON-SITE

A ground-mounted single-axis tracking solar photovoltaic plant with a nominal capacity of approximately 13 000 kWp (13 MW) direct current (DC) is planned to be constructed on farm Maxwell No. 82. The final size will depend on any limitations imposed by the Electricity Control Board of Namibia (ECB) and the final designs of the solar plant.

The site layout of the proposed solar PV power plant can be seen in Figure 7. The plant will consist of solar components and a small substation that will be linked to the Eldorado substation to the northwest of the site with a 22 kV overhead powerline (single line with wood pylons, 500 meters in length). Figure 7, Figure 8 and Figure 9 show a more detailed overview of the solar components, the substation, and the powerline leading to the Eldorado substation. Figure 10, shows the expected production (MWh) over the next twenty years and the system characteristics for the next five (5) years.

The main technical specifications are as follows (Figure 8 and Figure 9):

- 13 000 kWp (13 MW) nominal capacity;
- Specific yield will be 2 453 kWh/kWp/p.a;
- Annual solar plant output of approximately 31 940 782 kWh/p/a during the first year;
- Modules will include Bi-facial, 640-watt peak (Wp), tier 1 rated;
- Inverters (centralised, string) will include string inverters 250 Wp, tier 1 rated; and
- A single-axis (east to west) tracker.

The Proponent should also ensure that all Nampower safety requirements and recommendations with regards to the construction overhead powerline are followed and adhered to.

Figure 5 also gives a visual overview of the mechanisms of a solar PV plant.

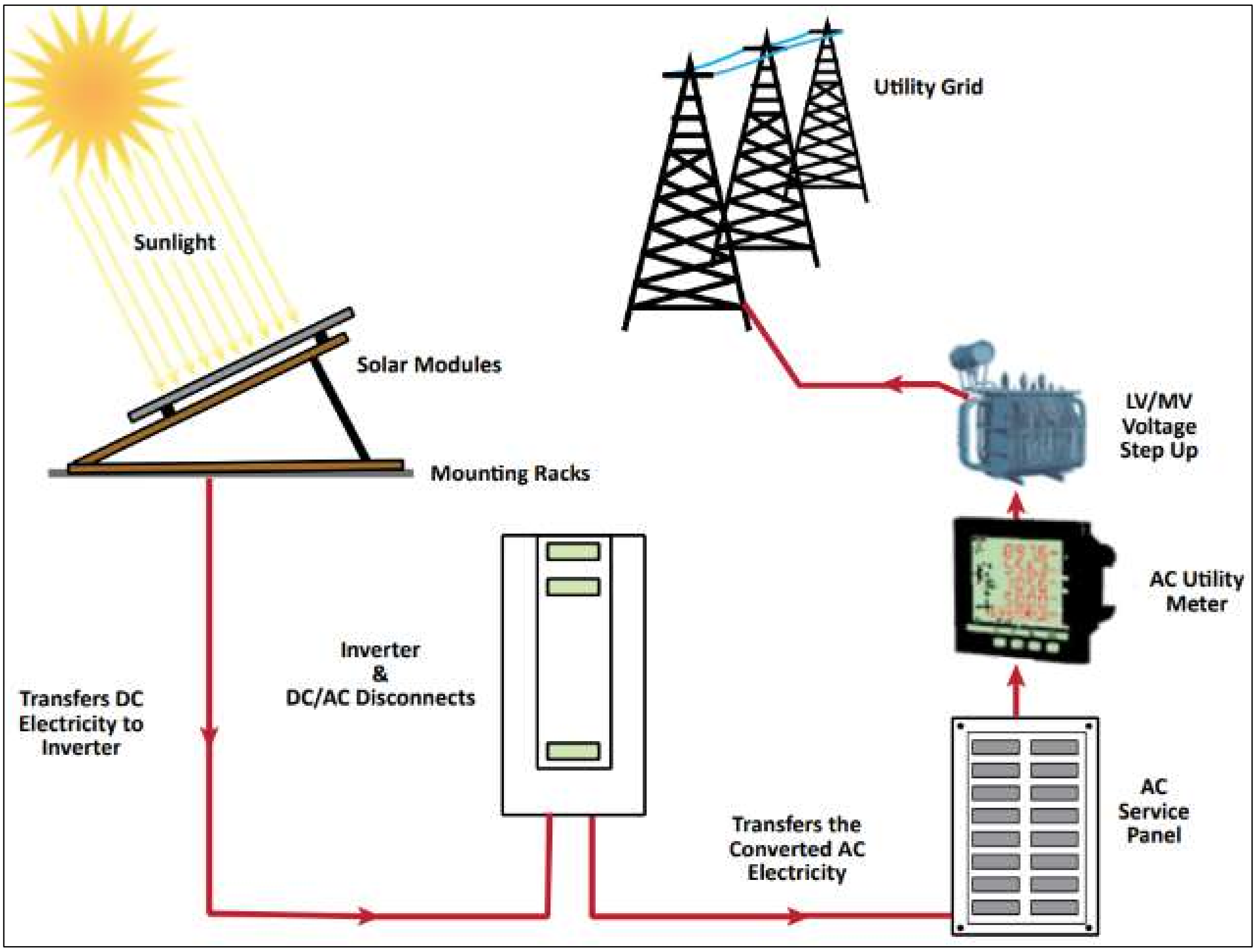

Figure 5 - Overview of a solar PV plant (IFC, 2015)

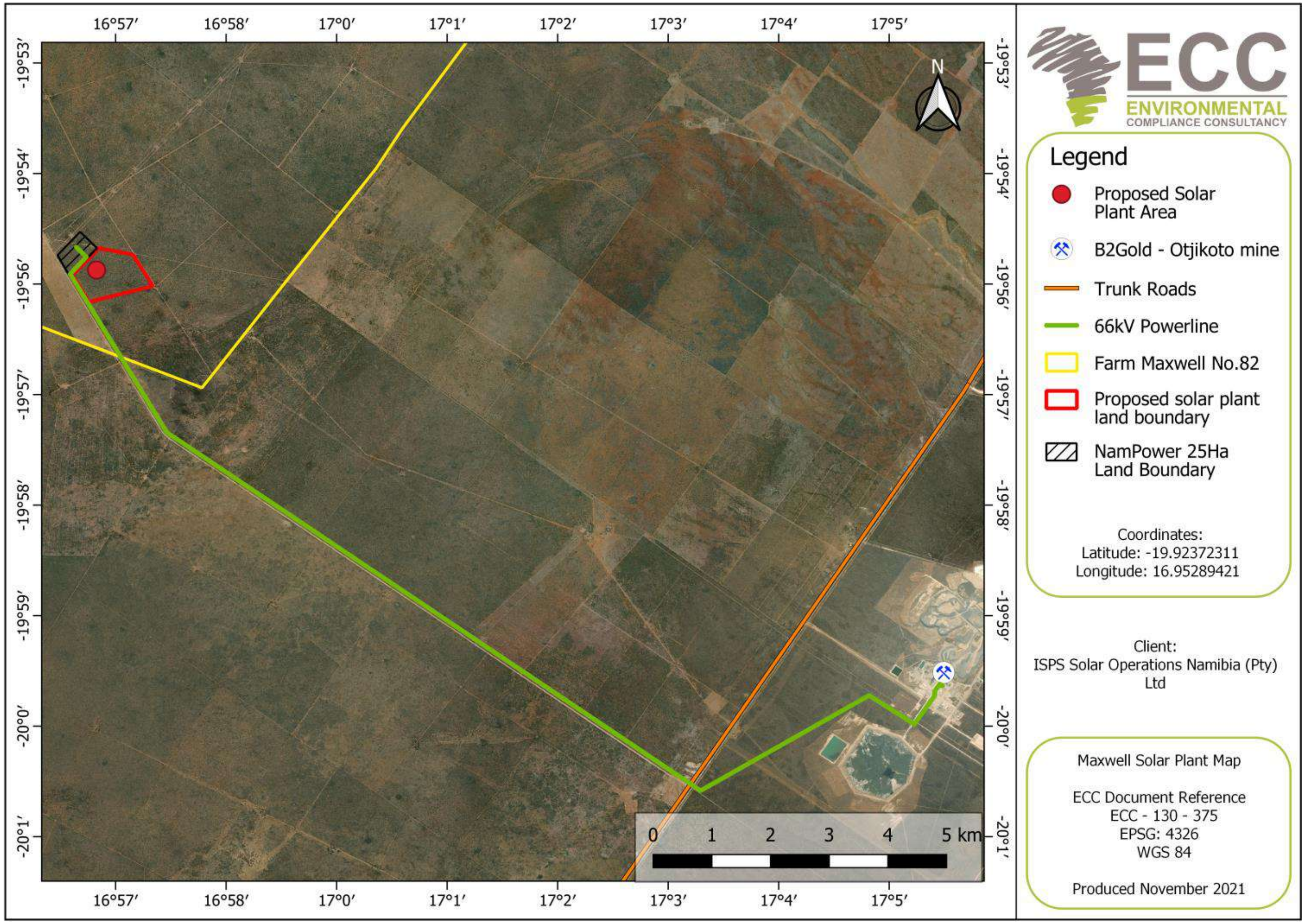

Figure 6 – Proposed solar PV power plant and powerline pathway to the Otjikoto mine

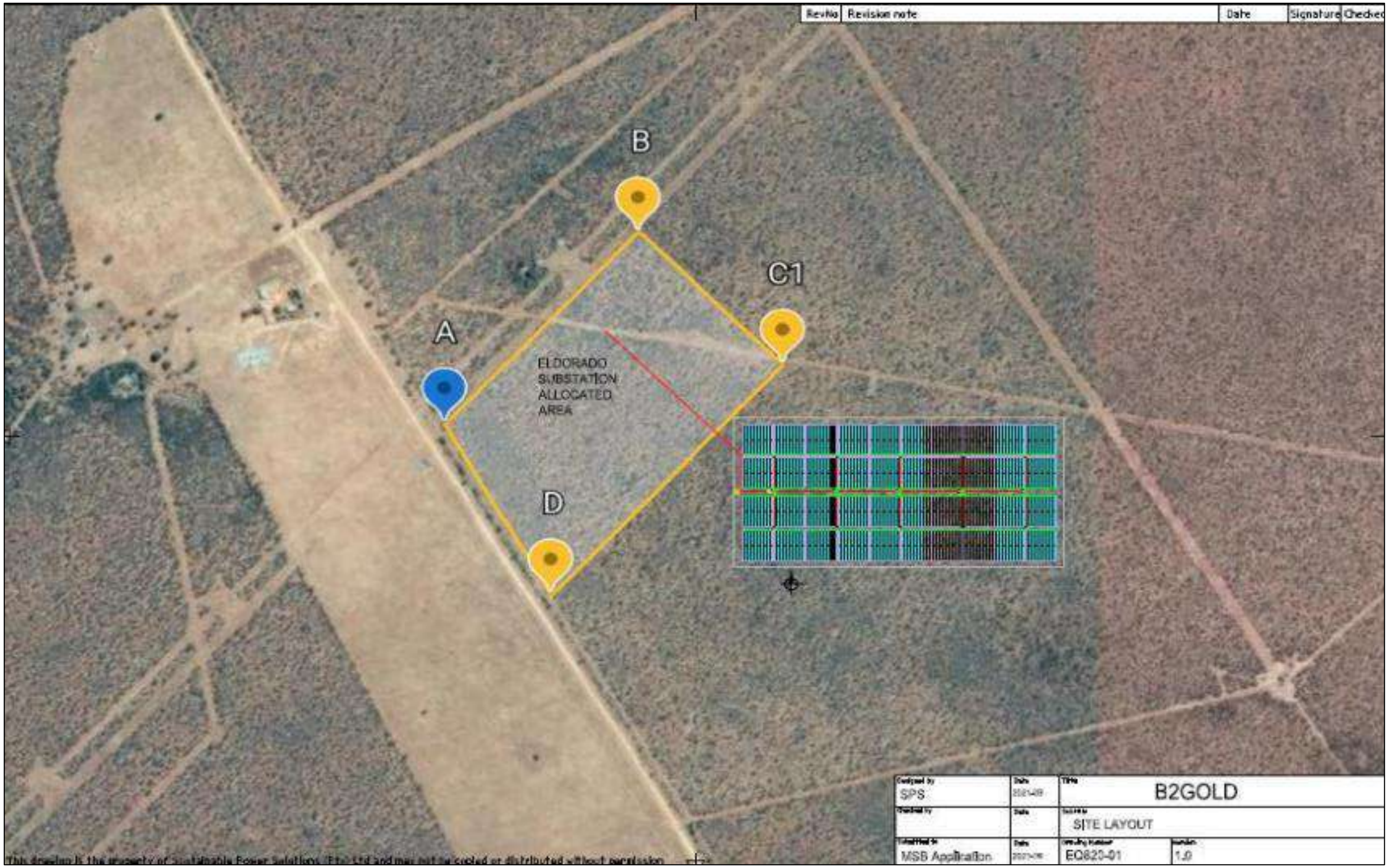

Figure 7 – Proposed site layout

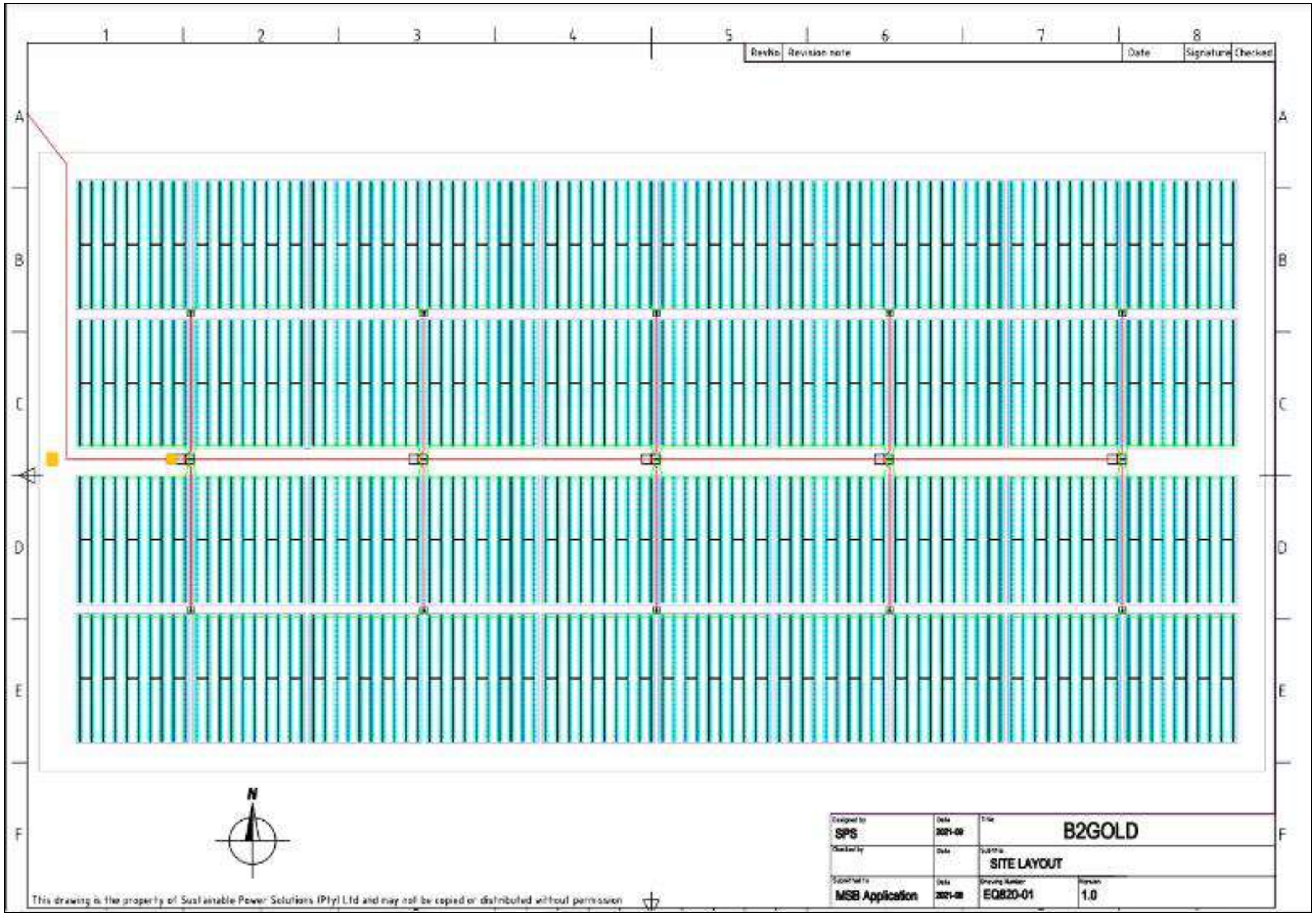

Figure 8 – Layout of the solar components

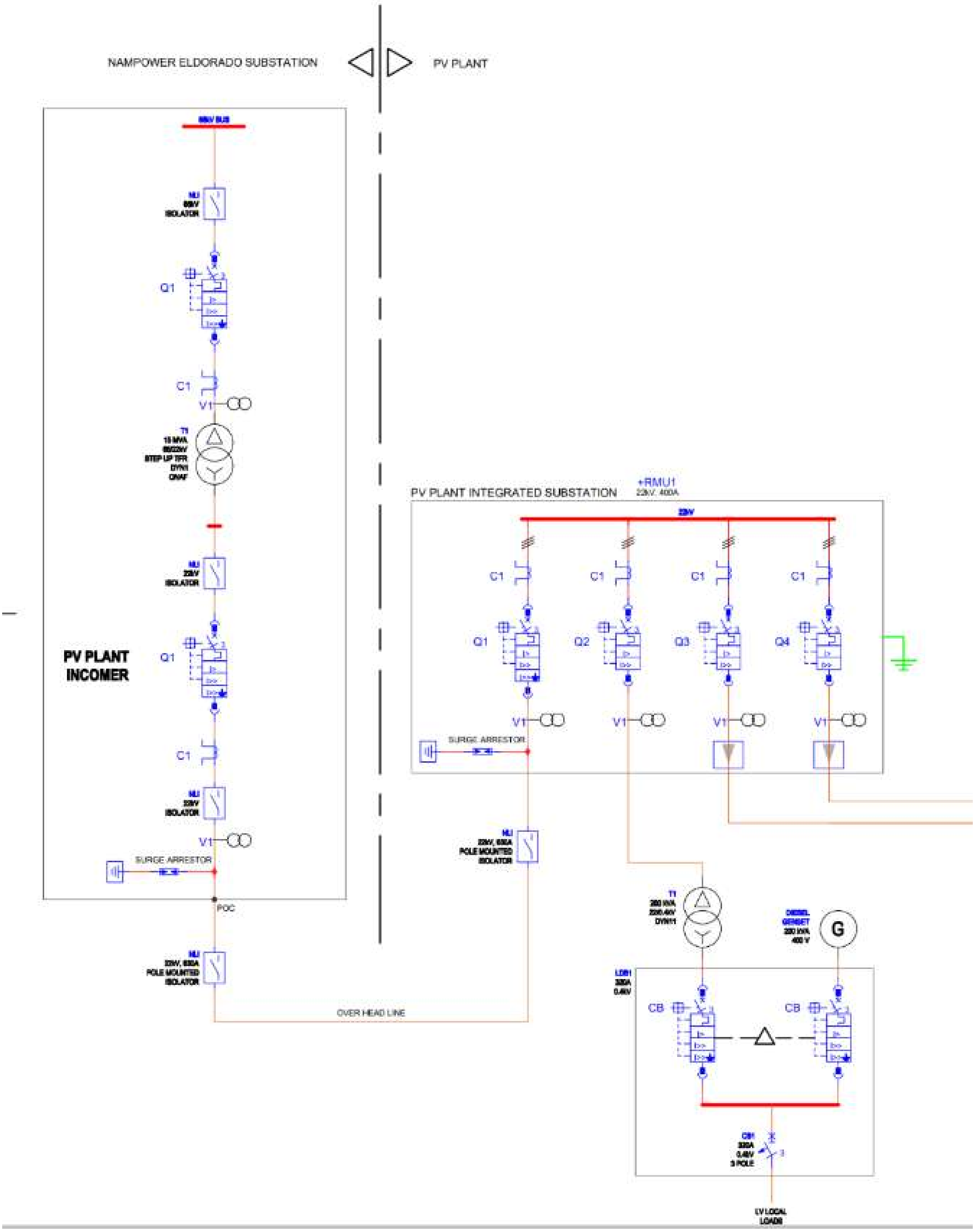

Figure 9 -PV plant substation 22/66kV and associated infrastructure

B2Gold Solar PV Park																				
Production (MWh)	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**	**Year 11**	**Year 12**	**Year 13**	**Year 14**	**Year 15**	**Year 16**	**Year 17**	**Year 18**	**Year 19**	**Year 20**
Jan	2,796	2,779	2,763	2,746	2,730	2,713	2,697	2,681	2,665	2,649	2,633	2,617	2,601	2,586	2,570	2,555	2,539	2,524	2,509	2,494
Feb	2,413	2,398	2,384	2,369	2,355	2,341	2,327	2,313	2,299	2,285	2,272	2,258	2,244	2,231	2,218	2,204	2,191	2,178	2,165	2,152
Mar	2,495	2,480	2,465	2,450	2,436	2,421	2,406	2,392	2,378	2,363	2,349	2,335	2,321	2,307	2,293	2,280	2,266	2,252	2,239	2,225
Apr	2,378	2,364	2,349	2,335	2,321	2,307	2,294	2,280	2,266	2,253	2,239	2,226	2,212	2,199	2,186	2,173	2,160	2,147	2,134	2,121
May	2,530	2,514	2,499	2,484	2,469	2,455	2,440	2,425	2,411	2,396	2,382	2,368	2,353	2,339	2,325	2,311	2,297	2,284	2,270	2,256
Jun	2,377	2,363	2,348	2,334	2,320	2,306	2,293	2,279	2,265	2,252	2,238	2,225	2,211	2,198	2,185	2,172	2,159	2,146	2,133	2,120
Jul	2,548	2,533	2,518	2,502	2,487	2,472	2,458	2,443	2,428	2,414	2,399	2,385	2,370	2,356	2,342	2,328	2,314	2,300	2,286	2,273
Aug	2,782	2,765	2,749	2,732	2,716	2,700	2,683	2,667	2,651	2,635	2,620	2,604	2,588	2,573	2,557	2,542	2,527	2,511	2,496	2,481
Sep	2,821	2,804	2,787	2,771	2,754	2,737	2,721	2,705	2,688	2,672	2,656	2,640	2,624	2,609	2,593	2,578	2,562	2,547	2,531	2,516
Oct	2,903	2,886	2,869	2,851	2,834	2,817	2,800	2,784	2,767	2,750	2,734	2,717	2,701	2,685	2,669	2,653	2,637	2,621	2,605	2,590
Nov	2,829	2,812	2,795	2,778	2,761	2,745	2,728	2,712	2,696	2,679	2,663	2,647	2,632	2,616	2,600	2,584	2,569	2,554	2,538	2,523
Dec	2,907	2,889	2,872	2,855	2,837	2,820	2,804	2,787	2,770	2,753	2,737	2,720	2,704	2,688	2,672	2,656	2,640	2,624	2,608	2,593
System characteristics for next 5 years																				
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**															
Max Demand - Generation: (MVA)	10	10	10	10	10															
Energy Entering Supply Point (MWh)	31,777	31,587	31,397	31,209	31,022															
Energy Leaving at Delivery point (MWh)	30,919	30,734	30,550	30,366	30,184															
Electrical losses (MWh)	858	853	848	843	838															
Breakdown of Losses																				
Line Losses (Est)	*1.0%*	*1.0%*	*1.0%*	*1.0%*	*1.0%*															
Transformer Losses (Est)	*1.7%*	*1.7%*	*1.7%*	*1.7%*	*1.7%*															

Figure 10 - Show the expected production (MWh) for the proposed solar plant

4.6 PROPOSED STAGE OF THE PROJECT

4.6.1 Development and planning stage

The proposed Project envisions the development, construction and operation of a PV power plant (solar panels mounted on steel frames, receiving mast and cabling) covering an area of approximately 22ha. Overhead powerlines will be constructed from the new Eldorado substation to the proposed PV power plant (as part of this project) and to B2Gold's Otjikoto mine to supply the mine with renewable energy (falls under a separate Nampower project). The final size will depend on any limitations imposed by the Electricity Control Board of Namibia (ECB) and the final designs of the solar plant.

4.6.2 Construction stage

Vegetation will be cleared for the construction and installation of the solar plant and ablution facilities, which will cover approximately 22 hectares. A 13 MW solar PV power plant will be constructed on-site and a 22 kV overhead powerline (single line with wood pylons, 500 meters in length) will be constructed as part of the Project from the new Eldorado substation to the proposed site to link the solar plant with the power grid to supply B2Gold's Otjikoto mine with renewable energy. A permanent ablution block is also planned to be constructed on-site for use during the operational phase.

4.6.3 Operational stage

During operation, the solar power plant will supply renewable energy to B2Gold's Otjikoto mine. Other operational activities will mainly involve the maintenance and cleaning of the solar components and associated infrastructure.

4.6.4 Decommissioning stage

The ESMP developed for the proposed Project sets out auditable management and rehabilitation actions for the Proponent to ensure careful and sustainable management measures are implemented for their activities in respect of the surrounding environment and community. The proponent will accord to and implement rehabilitation measures towards the Project decommissioning stage as outlined in the ESMP.

4.7 UTILITIES

4.7.1 Water supply

Water will be abstracted for use on-site for the ablution facilities and maintenance during the operational phase. The proponent needs to apply for the relevant permits through the MAWLR.

4.7.2 Workers accommodation

The proposed Project is expected to require about 60 workers during the construction phase, most of the workforce will be part of Sustainable Power Solutions (Pty) Ltd. During the operational phase, it is expected that three full-time jobs will be created and a further 20 part-time jobs when cleaning of the solar plant and associated infrastructure is required. People employed within the local community will stay at their homes and a small construction camp will be set up on-site for workers that do not reside in any of the nearby towns or villages.

4.7.3 Waste management (solid and Effluent Waste)

A septic tank will be installed on-site (operational phase) and chemical toilets will be used during the construction phase. Waste generated during the construction phase will be removed by a skip and will be disposed of at the nearest landfill site. The majority of the waste will be recycled.

5 ENVIRONMENTAL AND SOCIAL BASELINE

5.1 Introduction

The detailed environmental and socio-economic baseline assessment of the Project is provided in this report. Baseline studies aim to assess possible Project impacts (positive, negative and cumulative), thus ensuring input into the Project designs, which avoid, reduce or mitigate the potentially adverse environmental and social risks. This section provides an overview of the existing biophysical environment through the analysis of the available baseline data regarding the receiving environment. Desktop studies, followed by site verification on the national database are undertaken as part of the scoping process to get information about the current status of the receiving environment. This provides a baseline where changes that occur as a result of the proposed Project can be measured.

5.1 Socio-economic

The potential social impacts are anticipated to be of low to moderate significance, and those that may transpire shall be confined within the local area: these potential impacts may include the following:

- Jobs will be created as a result of the Project.
- Potential to unearth, damage or destroy undiscovered heritage remains;
- Occupational and community health and safety;
- Potential visual disturbances and impacts to nearby landowners and tourists; and
- Minor disruption to the residents of neighbouring farms, including some potential increase in noise levels during the construction phase.

5.2 Environmental

The potential environmental impacts are anticipated to be of minor to moderate significance for the proposed Project, and those that may arise shall be contained within the proposed site boundaries, these potential impacts may include the following:

- Disturbance of soil during the construction phase;
- Potential soil erosion within cleared areas;
- Vegetation clearing with regards to the proposed construction on the 22 ha area;
- Avifauna collision risk with the reflective surfaces of the solar panels;
- Potential impacts on biodiversity and ecology through habitat fragmentation or habitat loss; and
- Potential disturbance or displacement of protected or vulnerable species.

5.3 BASELINE ENVIRONMENT

5.3.1 Climate

The proposed site area is situated to the northwest of B2Gold's Otjikoto Mine in Otjozondjupa Region, Namibia. The area where farm Maxwell No. 82 is located has a climate that is characterised by mild summers and cool winters with mean maximum temperatures ranging between 23˚C and 33˚C and mean minimum temperatures ranging between 5˚C to 19˚C. The hottest months of the year is between October and December and the coolest months are in June and July (Bubenzer, 2002 & meteoblue, 2021).

February has the highest Relative Humidity (RH), averaging approximately 70% RH, and the driest month is June with approximately 10% RH. The average rainfall in this area during the year is between 450 to 500 mm and rainfall events are limited to the summer months, mainly between November and March. Potential evaporation is between 3000 and 3200 mm per year (Bubenzer, 2002).

Climate and weather data near B2Gold's Otjikoto mine (19.99°S 17.07°E) has been used to give the most accurate data for the proposed site. The site has wind speeds between 0 and 28 km/h, where the months of July to October are known to have the strongest winds. Wind can occur any time of the day and the most predominant wind directions for this area are ESE, E and ENE (Figure 12) (meteoblue, 2021).

Namibia in general has on average 300 days a year of clear skies. The average daily solar radiation is between 6.2-6.4 kWh/m^2 for this part of Namibia, which is very high and is thus the perfect location for a solar power plant (Bubenzer, 2002 & Mendelsohn et al., 2002) (Figure 13).

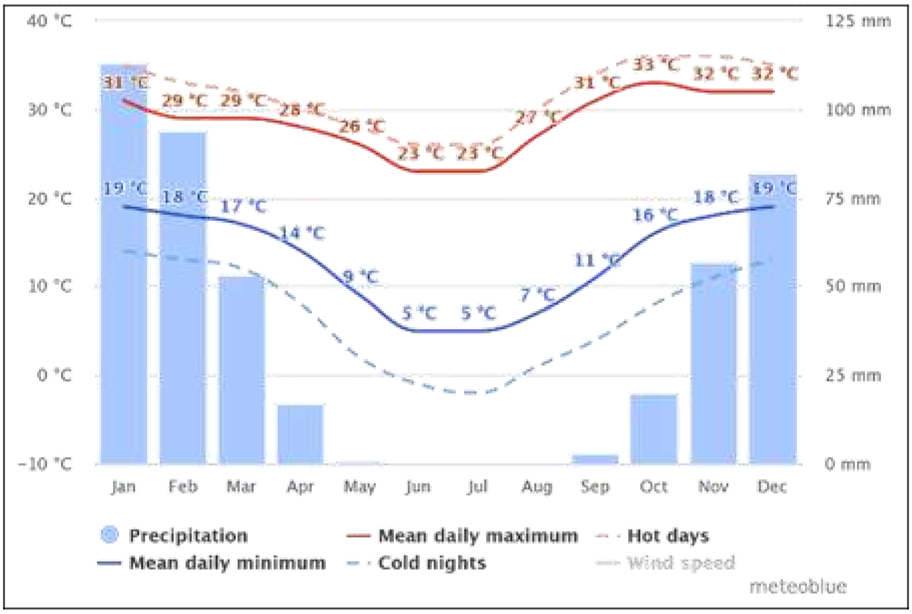

Figure 11 - Yearly climate overview for the area near and surrounding the Otjikoto mine (Meteoblue,2021)

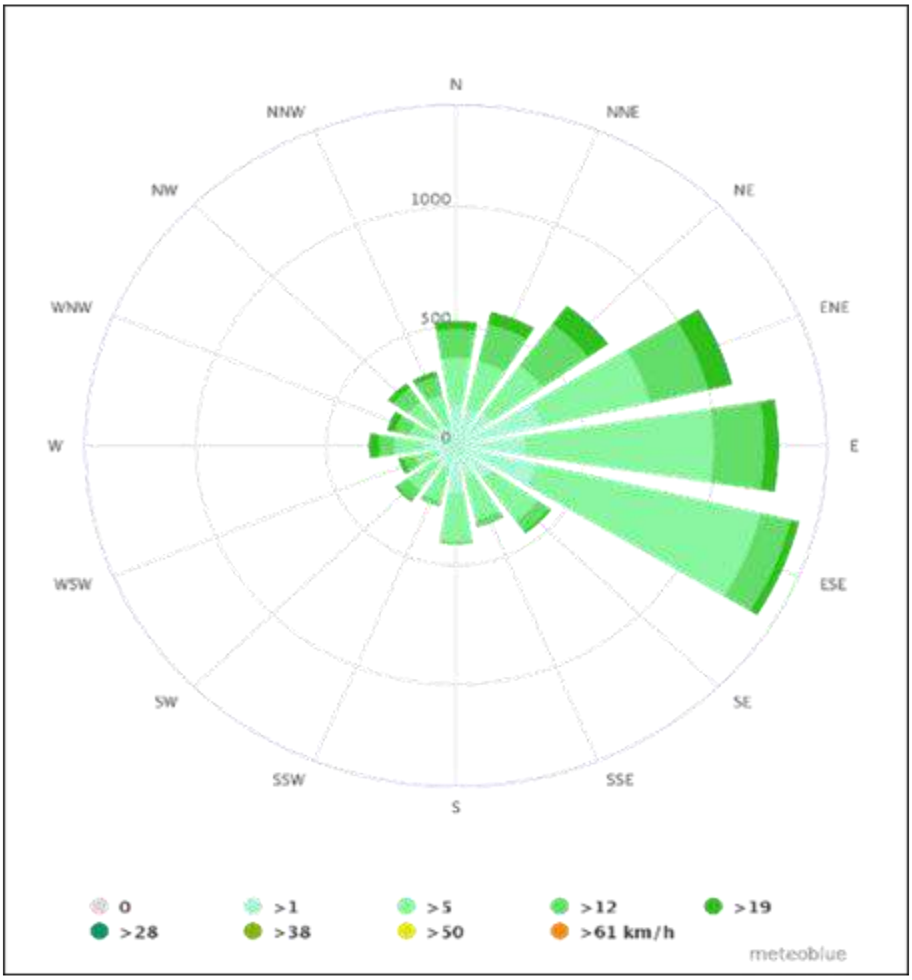

Figure 12 - Average wind speed and wind direction for the area near and surrounding the Otjikoto mine (Meteoblue,2021)

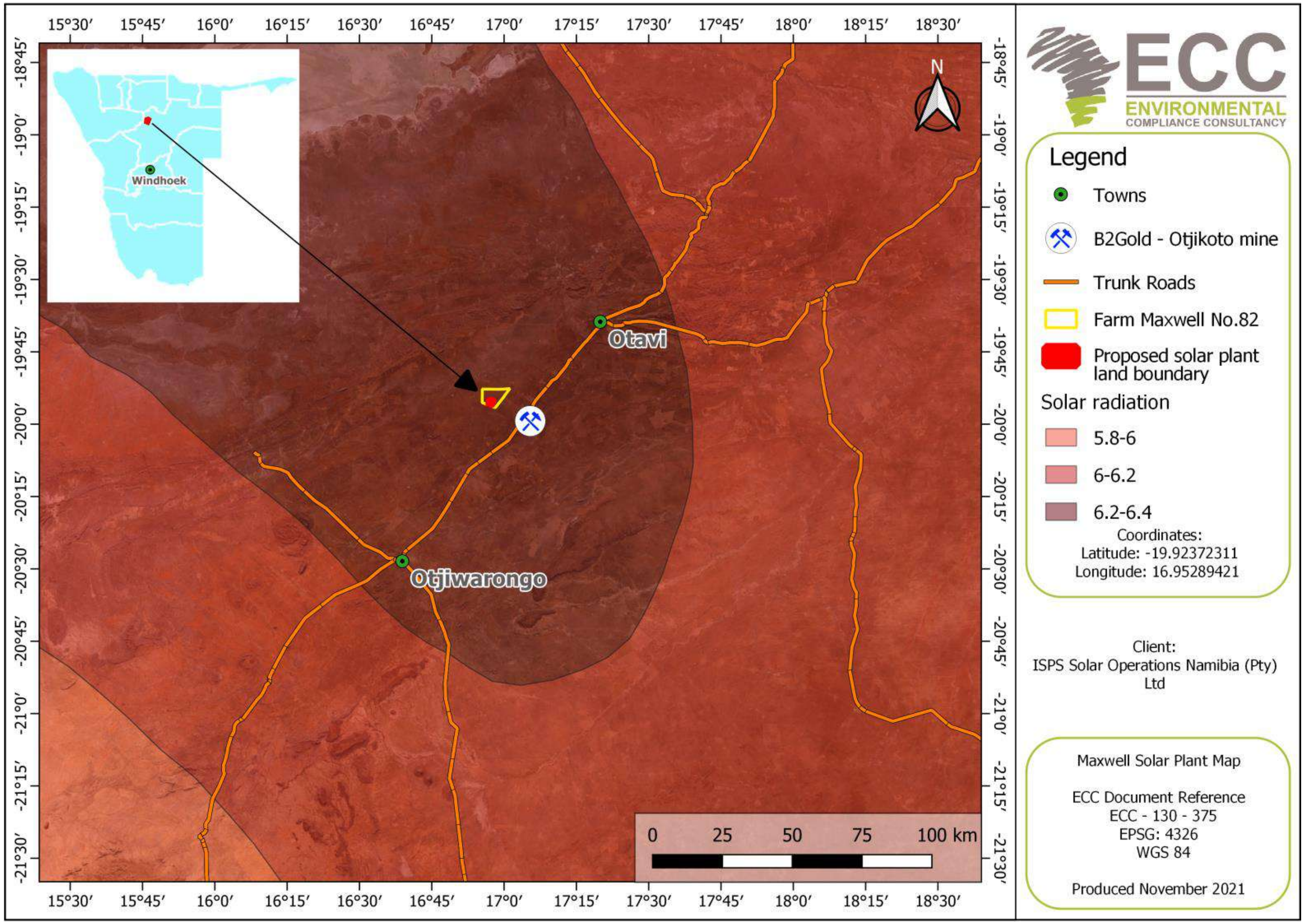

Figure 13 - Showing the average solar radiation in kWh/ m²/day

5.3.2 Vegetation

Vegetation in Namibia is strongly influenced by rainfall. The proposed Project site is situated within the thornbush shrubland vegetation cover. The plant diversity and tallest trees are most lush in the north-eastern parts of the country and contrast sparser and shorter to the west and south of the country. This gradient is not simple as factors such as soil types, landscape and human impacts may also influence the vegetation. The plant diversity (400 to more than 500 species) for this area is high and the dominant vegetation structure on farm Maxwell No. 82 is dense shrubland and falls within the Savanna biome (Mendelsohn et al. 2002).

In Namibia, there are 35 species of trees and/or shrubs that have legal or protected status, some of these trees/shrubs have more than one legal status and/or are classified as endemic or near-endemic. Of these species 10 are protected under forestry laws, 17 are protected under the Forestry Act No. 12 of 2001, three (3) are endemic, five (5) are near-endemic (Cunningham, 2017).

In this area, there are also 111 grass species of which four (4) species are endemic (*Eragrostis omahekensis*, *Eragrostis scopelophila*, *Pennisetum foermeranum* and *Setaria finite*) (Cunningham, 2017).

A list of plant species that have been found or sampled in the general area of Otjiwarongo and Otavi has been provided by the National Botanical Research Institute (NBRI) as well as a specialist study conducted by Dr. Cunningham for a B2Gold project and can be seen in Appendix E.

5.3.3 Fauna

The overall terrestrial diversity for the farm Maxwell is moderate compared to other parts of the country (Bubenzer, 2002, IUCN, 2021, Mendelsohn et al., 2002, Oberprieler and Cillié, 2008 & Stuart and Stuart, 2015).

Amphibians: This area has a frog diversity of between 12 and 15 species (Bubenzer, 2002 & Mendelsohn et al., 2002). According to Cunningham (2017) there are about “three (3) rubber frogs, two (2) puddle and two (2) sand frogs, and one (1) species each for rain, toad, kassina, ornate, caco, bullfrog and platanna” that could potentially occur in the area. One of these species are endemic (*Phrynomantis annectens*) and one species is classified as “near threatened” due to habitat loss and development (*Pyxicephalus adspersus*) (Cunningham 2017).

Reptiles: The reptile diversity of this area is high with between 71 and 80 species, with between five (5) to 12 endemic species; the number of observed lizard species for this area is between 28 to 31 different species of which three (3) to five (5) species are endemic. The snake diversity is also expected to be between 35 and 39 species (five (5) to six (6) endemic species). (Bubenzer, 2002 & Mendelsohn et al., 2002).

Furthermore, all tortoise species, rock monitors and pythons (dwarf and rock pythons) might potentially be encountered within the Project site boundaries and are protected under the Nature Conservation Ordinance No. 4 of 1975.

Mammals: The mammal diversity of the area is about 90 species with two (2) species are classified as endemic. This diversity figure is mainly represented by bats (26 species), rodents (25 species) and carnivores (19 species) (Cunningham, 2017). Various protected or threatened mammal species may occur on the Project site of which one is classified as near threatened (Brown Hyena) and four (4) are classified as vulnerable (Cheetah, Leopard, Pangolin, Black-footed cat) according to the IUCN red list of threatened species. Some of these species are also listed in the CITES appendices (i.e., pangolin).

Avifauna: The area within and surrounding farm Maxwell has an overall high bird diversity of up to approximately 230 species that could potentially be encountered, with low bird endemism (between one (1) to three (3) species) (Mendelsohn et al., 2002 & Oberprieler and Cillié, 2008).

Most bird species in Namibia fall under Schedule 4: Protected Game within the Namibian Conservation Ordinance No. 4 of 1975, except for the following excluded species: Weavers, Sparrows, Mousebirds, Redheaded Quela, Bulbul, and Pied crow as well as 19 huntable game bird species identified in Schedule 6 of the Nature Conservation Ordinance (Nature Conservation Ordinance No. 4 of 1975).

A large number of migratory bird species may only pass through Namibia, thus some of the species might be rare to encounter during the year, but could potentially be found within the farm boundaries. Surface water on or near the proposed site (rainy season) might attract various water birds (either resident or migratory).

5.3.4 Hydrology

The best-known fractured aquifer in Otjozondjupa Region is the Owambo Basin which supplies water to towns like Otavi, Outjo and Tsumeb. Farm Maxwell No. 82 is located almost at the catchment divide between to the northwest the Ugab catchment, to the north the Etosha catchment and to the east the Omatako catchment. The flat ground which is in the area also has some moderately productive fractured aquifers and areas where the drainage is indistinct and Kalahari aquifers are common in the northeastern Otjozondjupa (Mendelsohn, et al, 2002).

Several ephemeral pans, viewed as important habitats for vertebrate fauna and flora are also found within the general area surrounding farm Maxwell No. 82.

The main and most important ephemeral drainage lines in the general area are the Ugab River to the northwest and Omabonda, Ondaugaura and Waterberg Rivers (tributaries to the Omatako) to the south and southeast. Although not as important as perennial rivers, well-vegetated ephemeral drainage lines are still viewed as important habitats for a variety of vertebrate fauna in the general area.

There are no pans, dams or drainage lines within the proposed solar plant land boundary area (Figure 14).

According to the Namibian Monitoring Information System & Hydrological Map of Namibia (https://na-mis.com/), the site falls over a porous aquifer with moderate groundwater potential. The groundwater vulnerability in this area is considered to be high, and groundwater recharge within this area is considered to be moderate (>1 to 1.5 % of the total average rainfall). Groundwater in this area is generally of excellent quality (Group A) and the abstraction rate is moderate.

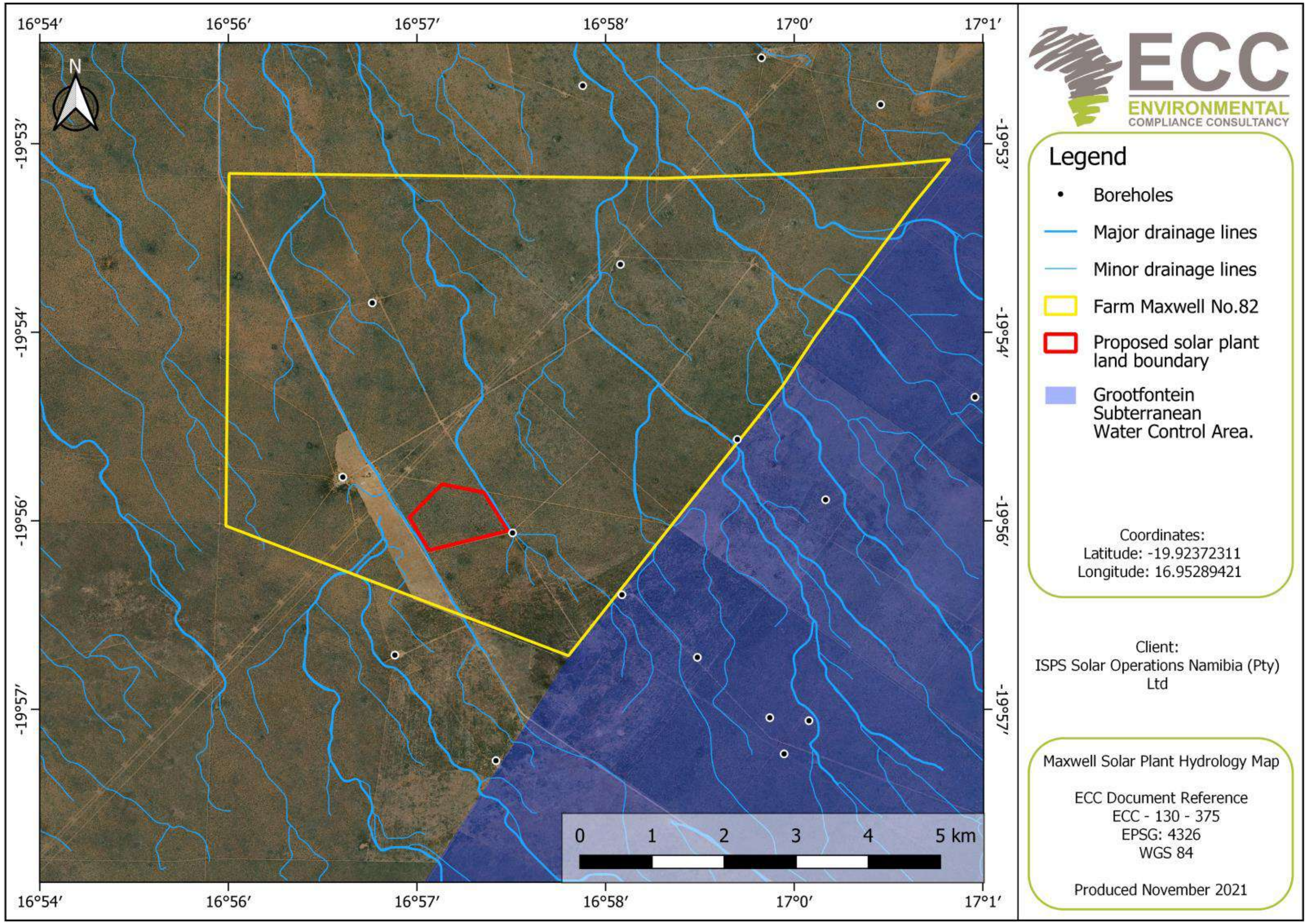

Figure 14 - Hydrology map for the proposed solar plant and surrounding areas

5.3.5 Soil, geology and topography

Namibia can be divided into two broad geological provinces, one covering the western parts and the other in the east. The western parts consist of a variety of geological formations of different ages and compositions and formed under very diverse environmental conditions – some were formed in the depths of primaeval oceans, others as a result of the movement of the earth's crust or because of collisions or volcanic eruptions. Most of these formations are exposed in the west as rugged landscapes of mountains, hills, valleys and plains with sparse vegetation, providing an interesting insight into Namibia's geological past.

In eastern Namibia, the formations are covered with deposits of a much more recent past (Mendelsohn et al., 2002). The deposits are loose, aeolian of origin, sandy and unconsolidated. On the surface the east of Namibia appears monotonous and uniform, covered with dense vegetation in the north and decreasing to the south. Most of the knowledge about these sediments has been derived from water abstraction boreholes, rare outcrops and underlying formations exposed along drainage lines and around isolated pans.

The topography of the proposed site is relatively flat and uniform, with a slight variation in elevation between 1430 and 1434 meters above sea level (masl) throughout the site. The elevation on-farm Maxwell differs a bit more from approximately 1490 meters above sea level to less than 1420 masl. The surface geology appears to be smooth and the entire landscape has a gentle gradient dipping from south to north (Figure 15).

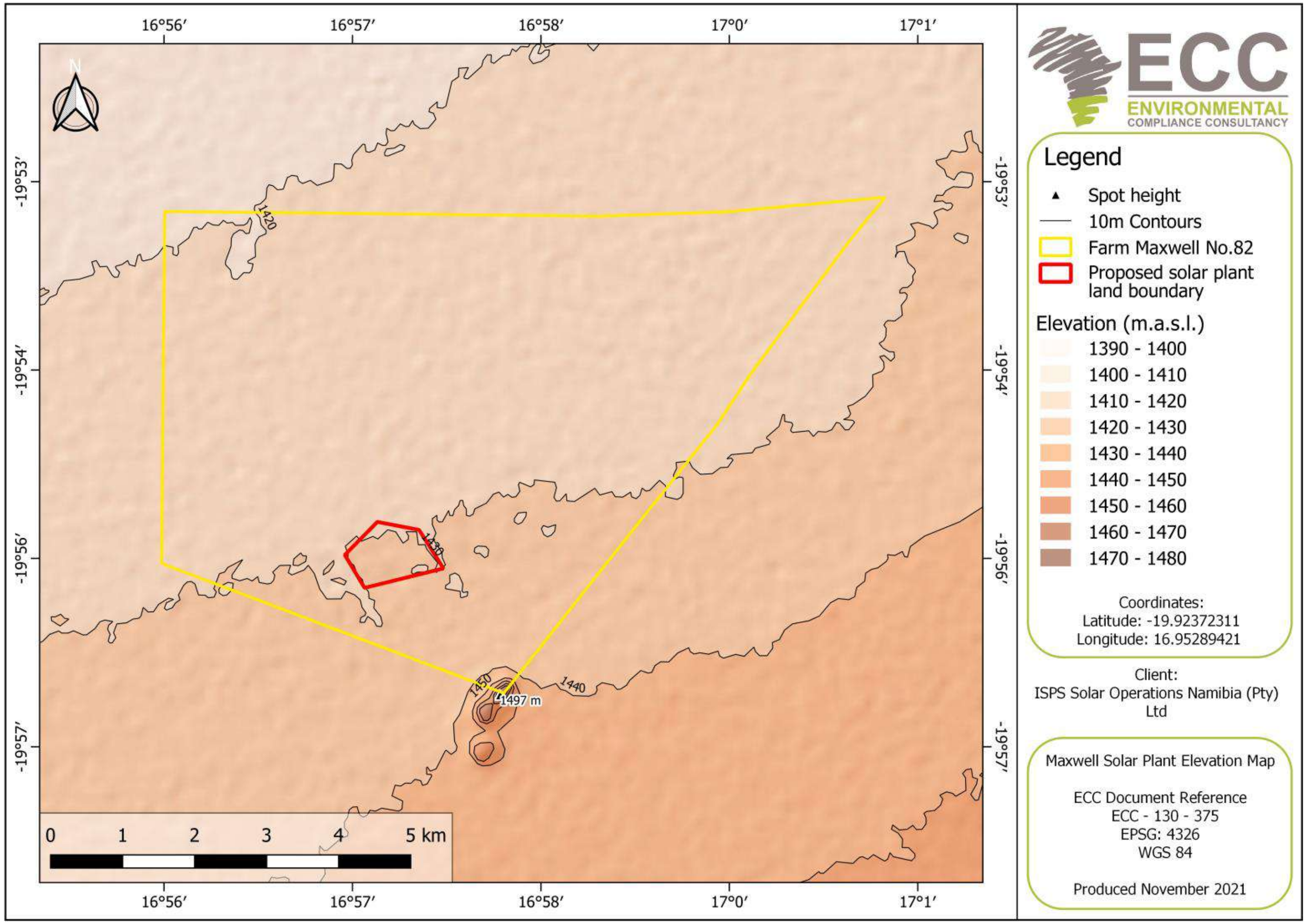

Figure 15 - Shows the elevation on and around the proposed solar plant area

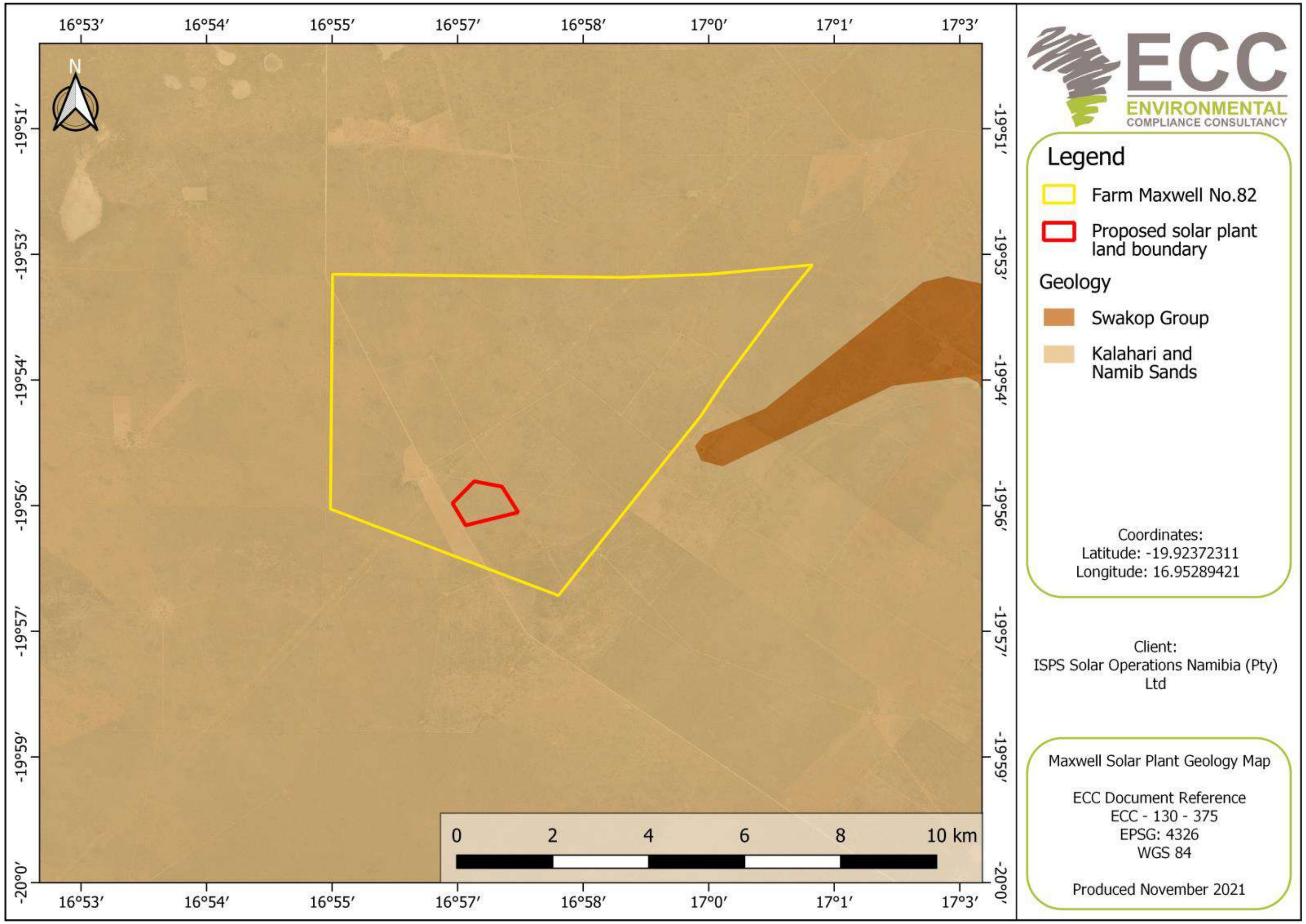

Figure 16 - Geology map of the area around the proposed site

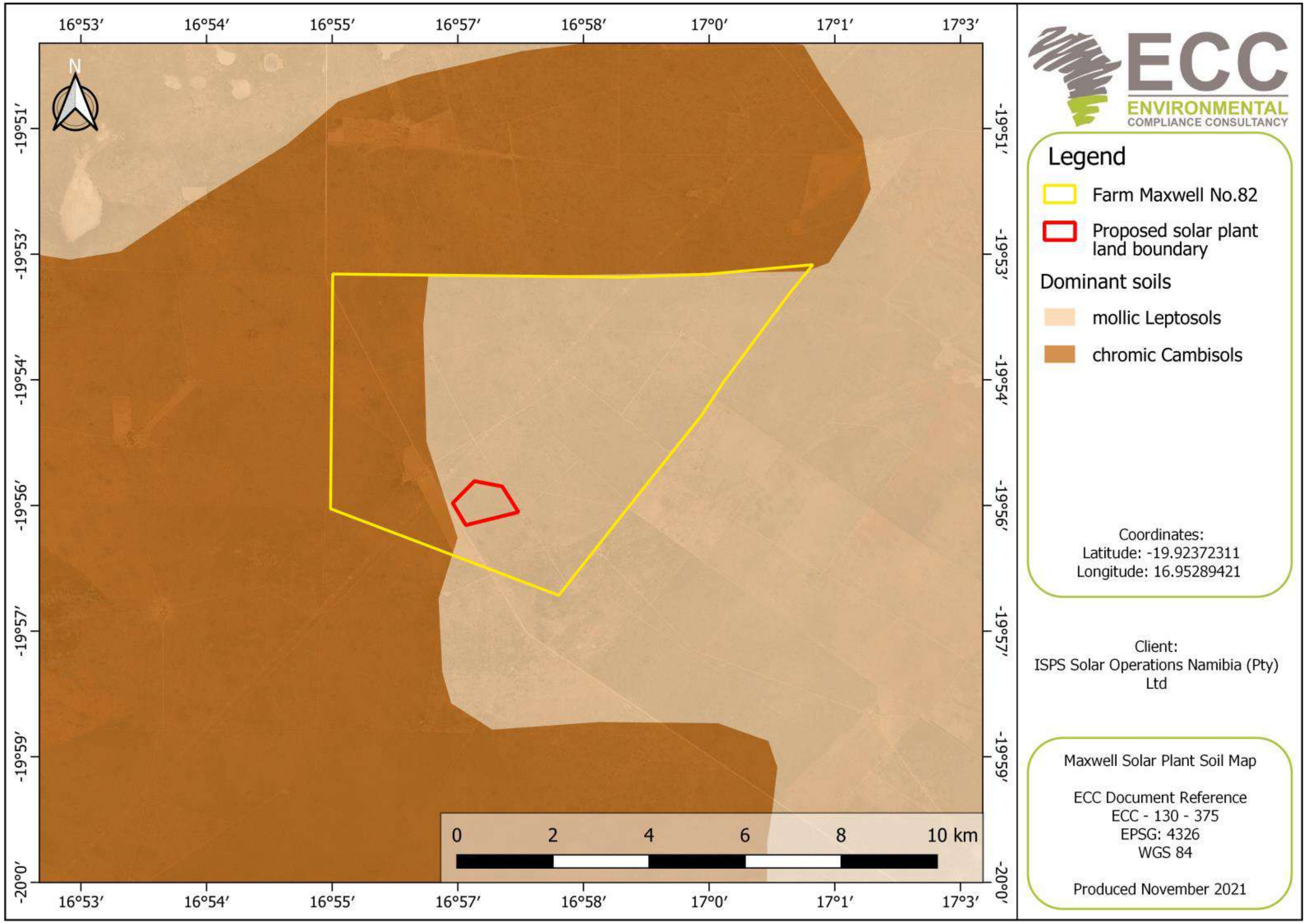

Figure 17 - Soil map of the area surrounding the proposed site

The geology within the farm boundaries consists of Kalahari and Namib Sands Group, which form part of the Kalahari Group Complex and the area is largely covered by Leptosols and Cambisols soils (Figure 16 and Figure 17) (Buzenher, 2002). The rock types of this area consist of sands and calcrete (Buzenher, 2002).

The dominant soils found within and surrounding the farm boundary include mollic Leptosols and chromic Cambisols (Figure 17). Namibian soils vary a great deal, variations occur on a broad scale but there is even a great deal of variability at a local level.

The first part of the soil name provides information on the properties of the soil, namely: mollic "soils with a good surface structure" and chromic is "soils with bright colours". The second name reflects the conditions and processes which have led to the formation of the soils (Mendelsohn et al., 2002).

Leptosols are typically formed in areas that are actively eroding, especially in hilly or undulating areas which cover a large part of the southern and north-western parts of Namibia. This type of soil is coarse-textured and offers limited depth due to the presence of hard-rock, highly calcareous or cemented layer within 30cm of the surface. Leptosols are the shallowest soils in Namibia and often contain gravel, this soil has a low water-holding capacity. Water run-off and water erosion can be very high in these areas if heavy rainfall occurs (Mendelsohn et al., 2002).

Cambisols are soils that usually have a medium to high fertility, but is also characterised by the absence of significant quantities of organic material, clay, and iron and aluminium. Considering geological time Cambisols were formed quite recently mainly from medium to fine-textured parent materials (Mendelsohn et al., 2002).

5.4 SOCIO-ECONOMIC ENVIRONMENT

Otjozondjupa Region is clustered into seven constituencies (Grootfotein, Okahandja, Omatako, Okakarara, Otavi, Otjiwarongo and Tsumkwe). The region's capital town is Otjiwarongo. Local authorities govern the towns in a form of municipalities. Otjozondjupa Region occupies 105 460 km^2 of Namibia's 824 292 km^2 total surface area and lies approximately 330 km northeast of the central Khomas Region. To the west and northwest, the region is boarded by Erongo and Kunene region and Kavango East and Kavango west are northeast and Omaheke region to the south-east. Otjozondjupa is amongst six regions that predominantly have a larger male population (51.5%) than females (NSA, 2014).

Namibia is one of the least densely populated countries in the world (2.8 people per km^2). Vast areas of Namibia are still without people, in contrast to some dense concentrations, such as the central-north and along the Kavango River.

The projected total population for Otjozondjupa Region was 158 237, making up 6.6 % of the country's population and an annual growth rate of 0.6 % in 2018 (NSA, 2018). In the Otjozondjupa region approximately 54% of all people live in an urban area and 46 % in rural areas in 2011. Otjiherero is the most spoken language (27 % of all households). The average household size is 3.9 people and the literacy rate is 83 % for people older than 15 (NSA, 2017). Living in an urban environment implies better living conditions – in the Otjozondjupa Region 95 % of all households have access to safe water, only 39 % have no proper ablution facilities, 56 % have electricity for lighting and 56 % of the population depend on open fires to prepare food (NSA, 2011).

The urban population pyramid for Namibia shows a very clear dominance of the age group 20 to 35 as well as for infants (0 to 4 years of age) (Figure 18). As the majority of people in the Otjozondjupa Region are living in an urban area. The majority of Namibia's population is young, as most of them are within the child-bearing age range (NSA 2014).

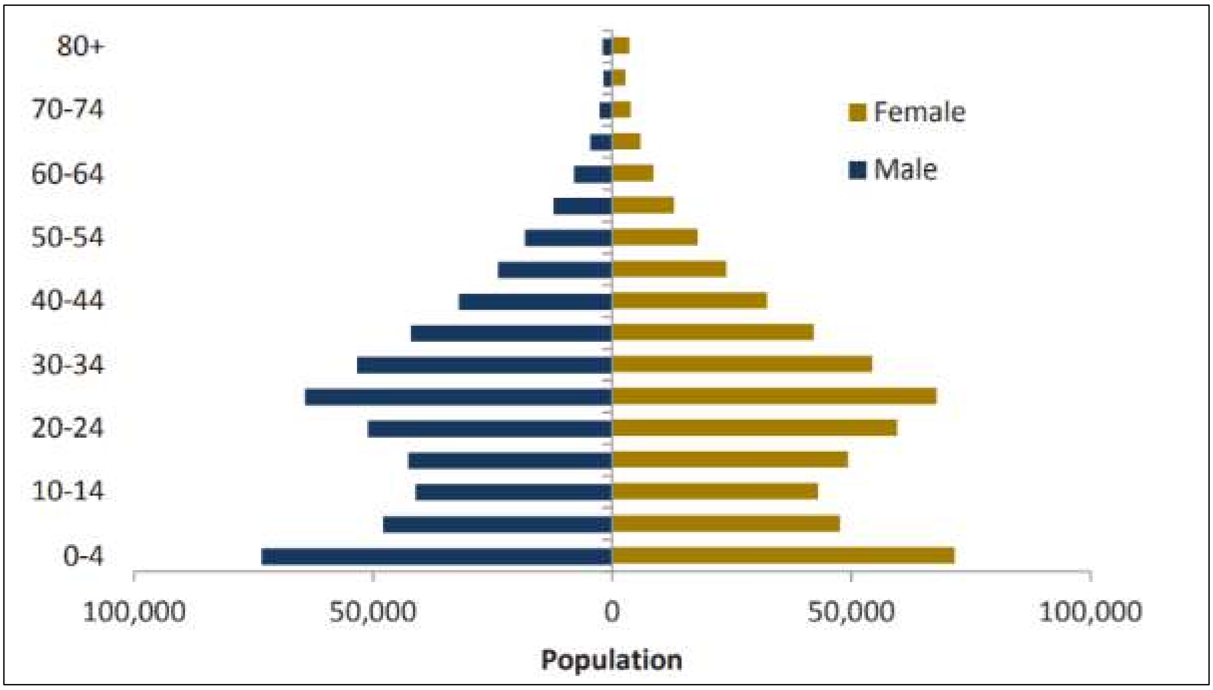

Figure 18 - 2015 urban population pyramid of Namibia (NSA 2014)

5.4.1 Governance

Since independence in 1990, Namibia is led by a democratically elected and stable government to date through three organs of government and functions(legislative, executive, and judiciary). The country was ranked 5th out of 54 African countries in the Ibrahim Index of African Governance in 2015 and subsequently ranked 4th out of 54 African countries in 2017 for indicators including the quality of governance and the government's ability to support human development; sustainable economic opportunity; rule of law and human rights; and development of smart information and communication technology to access information for socio-economic growth (National Planning Commission, 2017).

As a result of sound governance and stable macroeconomic management, Namibia has experienced rapid socio-economic development. Namibia has achieved the level of 'medium human development and ranks 125th on the Human Development Index out of 188 countries (NPC, 2020). Globally, Namibia was ranked 43rd out of 168 countries in 2018 on the Global Peace Index, as was therefore considered one of the most peaceful countries in the world (NPC, 2020).

5.4.2 Employment

In 2018, 53.4 % of all working Namibians were employed in the private sector and 21.5 % by the state. State-owned enterprises employ 7.6 % Namibians and private individuals 16.6 %. Wages and salaries represented the main income source of 47.4 % of households in Namibia. Agriculture (combined with forestry and fishing) as an economic sector has the most employees – 23 % of all employed persons in Namibia work in this sector. Agriculture is also the sector that employs the most informal workers in Namibia, calculated at 87.6 %. Wages of employees in the agriculture sector are lower than all other sectors except for workers in accommodation and food services and domestic work in private households (NSA, 2019).

Low education levels affect employability and prevent many households to earn a decent income. Of all people employed in Namibia, 63.5 % are not higher qualified than junior secondary level (Grade 10 and lower). In total 11.8 % of all people employed had no formal education. In total 29.1% of all people employed are within the category "elementary occupation" and 15.2 % in the category "skilled agriculture" (NSA, 2019).

Overall, the rate for unemployment is estimated at 33.4 % for Namibia, using the broad definition of unemployment. More than 60 % of the population is over 15 years of age and about one-third of the total population can be regarded as part of the labour force. The unemployment rate in rural and urban areas is almost the same – 33.4 % in urban areas and 33.5 % in rural areas (NSA, 2019). The youth group also ranks high in unemployment levels, even though many Namibia youth complete post-secondary education. In 2018 the unemployment level was at 59.6 % for those aged 15-19, 57 % for those aged 20-24, and 42.3 % for 25-29-year-olds (NSA, 2018).

According to the Socio-Economic impact Assessment of COVID-19 in Namibia by the United Nations Namibia (2020), there has been an estimated increase in unemployment from 33.4 % to 34.5 % and through a best-case scenario, it is also estimated that poverty will increase from 17.2 % to 19.5 % due to a drop in the domestic GDP (United Nations Namibia 2020).

5.4.3 Economy

In the Otjozondjupa Region, 61.7 % of all households depend on salaries and wages as their main income source, 2.6 % of households depend on subsistence farming as the main income whilst 9.9 % derive incomes from business activities, non-farming activities and pension (NSA, 2018).

The figure for informal-employed people is also lower (44.2 %) as people are employed in a wider range of secondary and tertiary economic sectors such as administration, security, services and accommodation and food service activities (NSA, 2018).

Guest farms, museums, craft shops, game parks/reserves and private game farms, the Waterberg Plateau park, the Hoba meteorite site and other tourism-related economic activities further drive economic activities in Otjozondjupa Region. Income and employment through tourism are growing, subsequently.

Since 2016, Namibia has 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 average growth of not more than 1 % annually since 2017.

During the second quarter of 2020 the domestic economy contracted by 11.1%, which is the largest contraction since 2013; but, the Bank of Namibia (BoN) predicts that the Gross Domestic Product (GDP) could grow by 1.9 % in 2021 and by 2.8 % in 2022. The impact assessment also showed that 96.5% of tourism businesses have been affected by COVID-19 in 2020, the manufacturing and construction sectors contracted by 9.2 % and 5.7 % respectively and there was also a 2 % to 3 % decline in net export (United Nations Namibia 2020).

5.4.4 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. Despite the progress, the World Health Organization (WHO) in 2015 recommended strategic priorities of the health system in Namibia which include 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).

HIV/AIDS remains a major reason for low life expectancy and is one of the leading causes of death in Namibia. There is a high HIV prevalence among the whole population, but since the peak in 2002 (15,000 new cases of HIV per year, and 10 000 yearly deaths due to AIDS) the epidemic started to stabilise (UNICEF, 2011). Although new infections, as well as fatalities, halved during the next decade, life expectancy for females returned to pre-independence levels but for males, it did not reach pre-independence levels yet. 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).

Tuberculosis (TB) is a leading killer of people infected by HIV/AIDS, and Namibia has a high burden – in 2018, 35 % of people diagnosed 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).

Over the period 2000 to 2013 significant rises were observed for stroke, ischemic heart diseases, diabetes, and depressive disorders, but HIV/AIDS remained the top cause of premature mortality. Over the same period, significant decreases were observed for diarrheal diseases, neonatal conditions, and malaria. Risk factors are key drivers of premature mortality, and social ills were identified as the leading factor for death – particularly unsafe sex and alcohol and drug abuse. TB and malaria are compounded by the AIDS epidemic, and the risk of contracting malaria and TB is 15 % greater if a person is also infected with HIV, with a risk of 50 % higher to die as a result (IHME, 2016).

As of the beginning of 2020 the coronavirus disease (COVID-19), a communicable respiratory disease, causes 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 is anticipated that this may have 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.

Furthermore, COVID-19 has also resulted in a loss of learning and socialising opportunities for children in Namibia and there was a lack of access to school feeding programs and parents had to provide or find alternative care for children. There has also been a 6 % increase in health workers across Namibia as a result of the pandemic (United Nations Namibia 2020). The Namibian economy remains confined, following the aftermath of COVID-19. Hence, development partners, public and private sectors need the commitment to explore new approaches in order to revive the fragile economy (NSA,2019). By mid-February 2022, Namibia has recorded 4 002 deaths due to COVID-19 most of these deaths occurred in 2021, as a result of the Delta and Omnicron variants.

5.4.5 Cultural heritage

From the Namibian GIS data and information from the Atlas of Namibia, there are no heritage sites within the proposed site with regards to the following periods: records from 1.8 million to 10000 years ago, 10000 to 2000 years ago or within the last 2000 years (Bubenzer, 2002 & Mendelsohn et al., 2002). Regardless, there is potential to unearth heritage sites.

6 IMPACT IDENTIFICATION & EVALUATION METHODOLOGY

6.1 INTRODUCTION

This section outlines ECCs method to identify and evaluate impacts arising from the Project. The findings of the assessment are presented in section 7.

The evaluation and identification of the environmental and social impacts require the assessment of the Project characteristics against the baseline characteristics, ensuring all potentially significant impacts are identified and assessed. The significance of an impact is determined by taking into consideration the combination of the sensitivity and importance/value of environmental and social receptors that may be affected by the Project, the nature and characteristics of the impact, and the magnitude of potential change. The magnitude of change (the impact) is the identifiable changes to the existing environment that may be negligible, low, minor, moderate, high, or very high; temporary/short term, long-term or permanent; and either beneficial or adverse.

This chapter provides the following:

- Details on the assessment guidance used to assess impacts;
- Lists the limitations, uncertainties and assumptions with regards to the assessment methodology;
- Details how impacts were identified and evaluated and how the level of significance was derived; and
- Details how mitigation was applied in the assessment and how additional mitigation was identified.

6.2 ASSESSMENT GUIDANCE

The following principal documents were used to inform the assessment method:

- International Finance Corporation standards and models, in particular, performance standard 1: 'Assessment and management of environmental and social risks and impacts' (International Finance Corporation, 2012 and 2017).
- Namibian Draft Procedures and Guidance for EIA and EMP (Republic of Namibia, 2008).

6.3 LIMITATIONS, UNCERTAINTIES AND ASSUMPTIONS

The following limitations and uncertainties associated with the assessment methodology were considered in the assessment phase:

Some of the limitations included a lack of information on avifauna collisions with regards to solar PV plants, especially with regards to protected species. It is also uncertain to what extent the ecosystem will be influenced by the clearing of land and associated disturbances.

Peer-reviewed studies and best practice documents have been used to make assumptions on the severity of some of the impacts associated with the Project as well as to determine what mitigation measures might be most efficient.

Where uncertainties exist, a cautious approach has been applied, allowing the worst-case scenario for potential impacts to be identified. Where limitations and uncertainties exist, assumptions have been made and applied during the assessment process.

6.4 ASSESSMENT METHODOLOGY

The ESIA methodology applied to this assessment has been developed by ECC using the International Finance Corporation (IFC) standards and models, in particular, performance standard 1: 'Assessment and management of environmental and social risks and impacts' (International Finance Corporation, 2017); Namibian Draft Procedures and Guidance for EIA and EMP (Republic of Namibia, 2008); international and national best practice; and over 25 years of combined ESIA experience. The methodology is set out in Figure 19 and Figure 20.

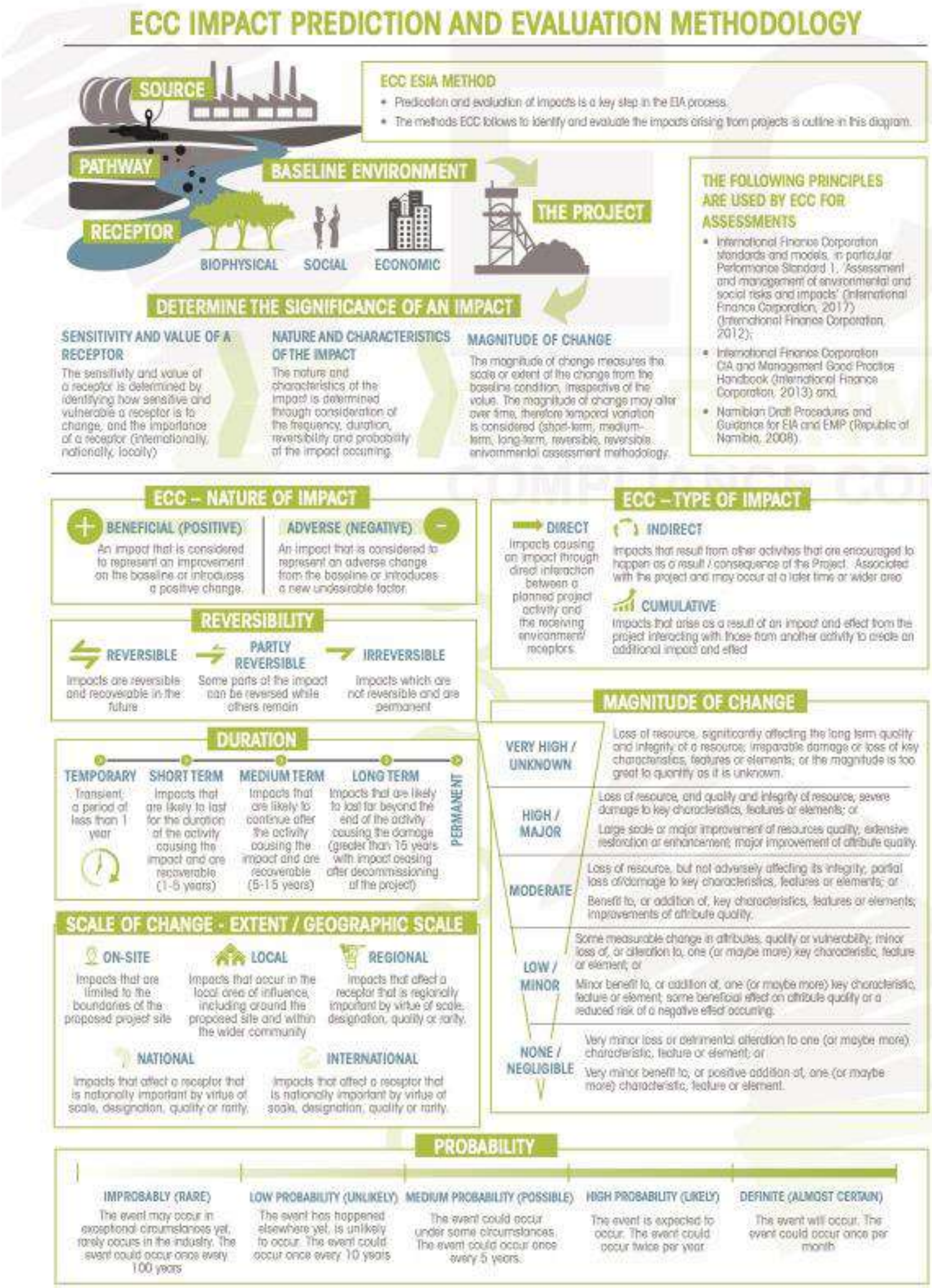

Figure 19 – ECC ESIA methodology based on IFC standards

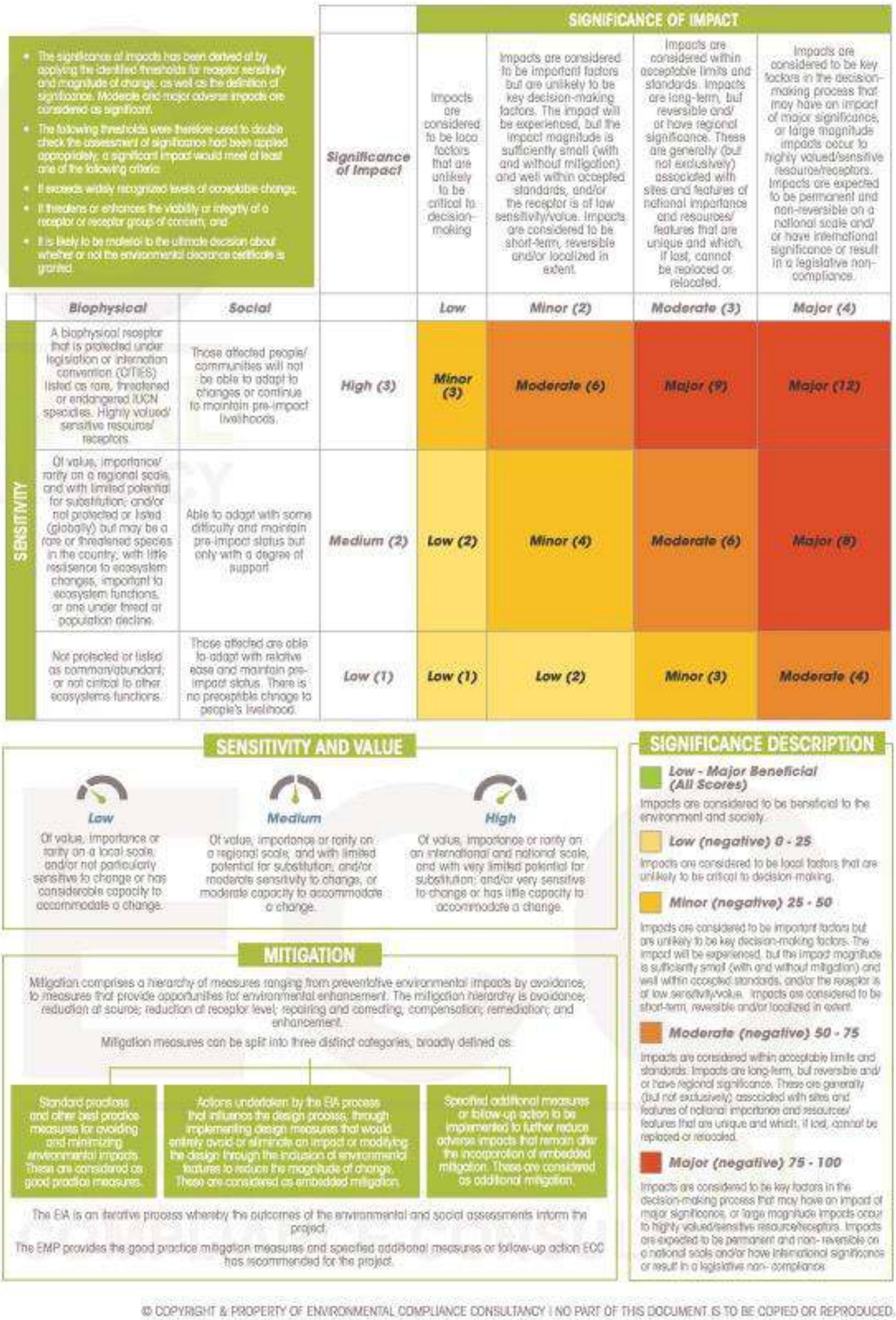

Figure 20 – ECC ESIA methodology based on IFC standards

6.5 MITIGATION

Mitigation comprises a hierarchy of measures ranging from preventative environmental impacts by avoidance, to measures that provide opportunities for environmental enhancement. The mitigation hierarchy is avoidance; reduction at source; reduction at receptor level; repairing and correcting; compensation; remediation; and enhancement.

Mitigation measures can be split into three distinct categories, broadly defined as:

1. Actions undertaken by the ESIA process that influence the design process, through implementing design measures that would entirely avoid or eliminate an impact, or modifying the design through the inclusion of environmental features to reduce the magnitude of change. These are considered as embedded mitigation.
2. Standard practices and other best practice measures for avoiding and minimising environmental impacts. These are considered as good practice measures.
3. Specified additional measures or follow-up action to be implemented, in order to further reduce adverse impacts that remain after the incorporation of embedded mitigation. These are considered as additional mitigation.

The ESIA is an iterative process whereby the outcomes of the environmental assessments inform the Project.

The ESMP (Appendix A) provides the good practice measures and specified additional measures or follow-up action.

Embedded mitigation and good practice mitigation was taken into account in the assessment. Additional mitigation measures will be identified when the significance of impact requires it and causes the impact to be further reduced. Where additional mitigation is identified, a final assessment of the significance of impacts (residual impacts) will be carried out, taking into consideration the additional mitigation.

7 IMPACT ASSESSMENT FINDINGS & MITIGATION

This Chapter presents the findings of the EIA for the Project as per the EIA process, scope and methodology set out in Section 2 and Section 6. A range of potential impacts has been identified that may arise as a result of the Project. This EIA report aims to focus on the significant impacts that may arise as a result of the Project. This section therefore only considers the significant impacts and or those that may have specific interest to the community and stakeholders and a summary of these significant impacts are discussed further in this section.

When undertaking the assessment exercise, the design of the Project and best practice measures were considered to ensure the likely significant effects and any required additional mitigation measures were identified. A summary of the potential impacts and mitigation or control measures are discussed below.

The following topics were considered during the scoping phase:

- Groundwater;
- Soils and topography;
- Landscape (visual impacts, sense of place);
- Socioeconomics (employment, health and safety, and land-use);
- Noise;
- Biodiversity and ecology;
- Avian collisions;
- Vegetation clearing;
- Air quality (dust emissions); and
- Cultural heritage.

For each potential significant impact, a summary is provided which includes the activity that would cause an impact; the potential impacts; embedded or best practice mitigation (stated where required or available); the sensitivity of receptor that would be impacted; the severity, duration and probability of impacts; the significance of impacts before mitigation and after mitigation measures are applied.

Figure 21 shows a visual overview of potential impacts associated with solar PV plants.

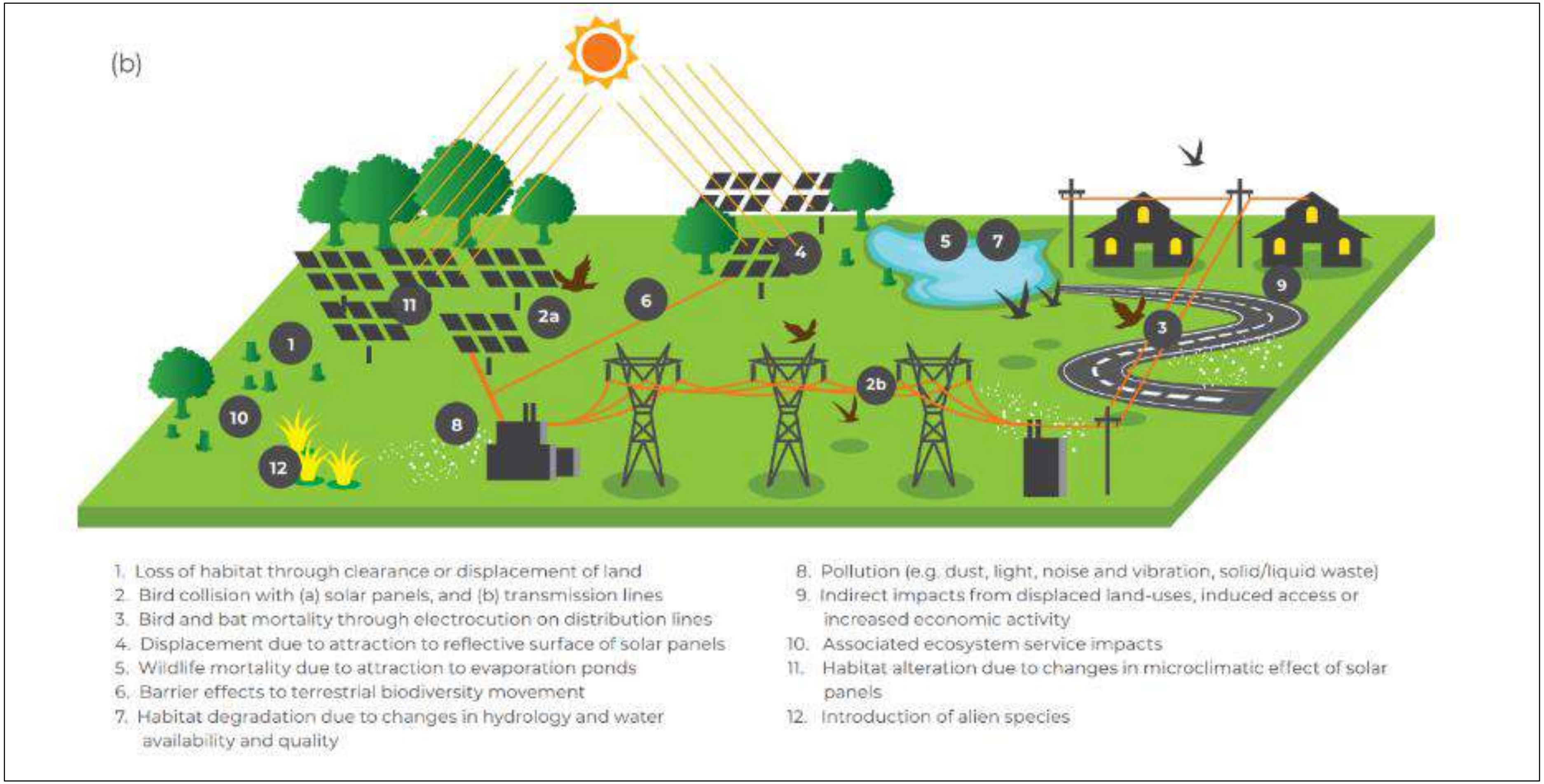

Figure 21 – Visual overview of potential impacts associated with solar PV plants (Bennun et al. 2021)

7.1 IMPACTS NOT CONSIDERED SIGNIFICANT

As a result of an iterative development process, mitigation has been incorporated and embedded into the Project, thereby designing out potential environmental and social impacts or reducing the potential impact so that it is not significant. Best practice has also played a role in avoiding or reducing potential impacts. The ESMP provides best practice measures, management and monitoring for all impacts.

Impacts that have been assessed as not being significant are summarised in Table 5 below and not discussed further.

The listed impacts below are non-significant and do not render any threat to the environment in a way that adversely challenges its resilience of it to continue in its modified form.

Table 5 – Non-significant impacts

Environment or social topic	Potential impact	Summary of preliminary assessment findings
Air Quality	Potential for dust generation during the construction phase of the project.	During the construction phase, vegetation will be cleared which will expose the bare ground and thus increase the potential for dust generation on-site. An increase in vehicles traffic to the Project site transporting building materials (i.e., solar components) will also potentially contribute to dust generation. Excavation activities might also discharge dust and marginally affect the ambient air quality of the vicinity. This impact is expected to occur only during the construction phase of the Project. Recommended mitigation measures in the ESMP will need to be followed and adhered to, to reduce this potential impact as far as reasonably possible. By following the mitigation measures the potential impact is expected to be non-significant.
Noise	Potential for noise generation during the construction phase of the project.	There is the potential for an increase in noise during the construction phase, due to construction activities, an increase in vehicles and an increase in people in the area. Increased noise levels are only expected during normal daytime working hours. Recommended mitigation measures in the ESMP will need to be followed and adhered to, to reduce this potential impact as far as reasonably possible. By following the mitigation measures the potential impact is expected to be non-significant.
Occupational health and safety	Potential accidents, incidents or death occurring during the construction and	Labour Act, No. 11 of 2007: Regulations relating to the Health and Safety of Employees at Work (GN 156/1997) should be adhered to. The Proponent will be responsible to develop an occupational health and safety management plan for the Project.

Environment or social topic	Potential impact	Summary of preliminary assessment findings
	maintenance of the solar plant	The majority of health and safety risks will be associated with the construction phase of the Project, thus the Proponent must adhere to all recommended mitigation measures and the health and safety management plan for the site (to be developed by the Proponent). All PPE recommendations should be followed, safety procedures adhered to and a health and safety officer/site foreman should be on-site to provide appropriate supervision of all work carried out.
Fire Risk - environment	Potential of fire starting due to construction activities and/construction camps. This might have an impact on the environment and biodiversity.	During the construction phase, there will be a risk of accidental fires, due to machinery and an increase in people in the vicinity (i.e., construction camps). This impact is unlikely if all recommended mitigation measures are followed and adhered to.
Fire Risk - community	Potential of fire starting due to construction activities and/construction camps. This might have an impact on the local community (i.e., burning of neighbouring farmers land).	During the construction phase, there will be a risk of accidental fires, due to machinery and an increase in people in the vicinity (i.e., construction camps). This impact is unlikely if all recommended mitigation measures are followed and adhered to.

Environment or social topic	Potential impact	Summary of preliminary assessment findings
Waste management - Visual (General solid and construction waste)	A potential increase in general solid and construction waste during the construction phase might be unsightly.	During the construction phase, there is the potential for an increase in waste generation due to all materials brought to the site (i.e, packaging), general building materials and the increase in people on-site. This might be a visual disturbance for nearby farm owners or people using the D2886. This impact is expected to be non-significant if the recommended mitigations are followed on-site. The Proponent will need to develop a waste management plan to counter the impact of waste dispersal on and surrounding the site.
Waste management - Biodiversity (General solid and construction waste)	Potential increase in general solid and construction waste during the construction phase. This might potentially kill or harm wildlife (entanglement or choking risk).	The potential increase in waste on-site (especially packaging and other smaller waste items) might be a potential choking or entanglement risk for local fauna and related ecosystems and ecosystem services. This impact is expected to be non-significant if the recommended mitigations are followed on-site. The proponent will need to develop a waste management plan to counter the impact of waste dispersal on and surrounding the site.
Heritage	Potential to unearth, damage or destroy undiscovered heritage remains.	Due to the clearing of the proposed 22ha of land, there is the potential to unearth on undiscovered heritage remains. The recommended mitigation measures should be followed and the chance finds procedure implemented.
Visual	The solar plant might be a potential visual disturbance to nearby landowners	The proposed Project is a potential visual disturbance (i.e., structures and reflection of light) for nearby farm owners or people using the D2886. But due to the elevation of the site (relatively flat area with a gentle drop in elevation from southeast to northwest), the solar plant is not expected to be a major visual disturbance.

Environment or social topic	Potential impact	Summary of preliminary assessment findings
Increased people/foot traffic in the immediate vicinity. (Construction phase)	Potential increased people/foot traffic in the immediate vicinity (Construction phase), might potentially cause conflict with neighbouring farm owners	The potential risk of negative social interactions to occur between the workforce and the public, due to the increase of people in the area (about 60 workers during the construction phase). An internal Health and Safety Management Plan will be developed by the client to address this topic and the mitigation measures provided.
Poaching	Potential poaching incidents due to increased people/foot traffic in the immediate vicinity (Construction phase).	Due to the increase of people in the area during the construction phase, there is the potential for poaching incidents (i.e., killing of animals for consumption/collection of veld food (tortoises, frogs), killing animals like pangolins for their scales or harvesting protected plant species). This impact is expected to be non-significant if the recommended mitigations are followed on-site.
Soil quality	Potential soil contamination from chemicals or hydrocarbons spilt during construction and maintenance	Due to the expected increase in vehicles and heavy vehicles on site, there is the potential for hydrocarbon leaks. The chemical toilets that will be used during the construction phase is also a potential spill hazard that might have an impact on soil quality (i.e., alter soil chemistry or kill microorganisms). This potential impact is expected to be non-significant, but the recommended mitigation measures should be followed.
Soil erosion	Potential soil erosion due to the clearing of 22ha of vegetation.	Due to the 22ha cleared area, there is the potential for soil erosion as a result of intense weather events (i.e., strong winds and thunderstorms resulting in surface runoff). Mitigation measures will be critical to implement to manage this potential risk, which reduces risk to low.

Environment or social topic	Potential impact	Summary of preliminary assessment findings
Groundwater	Potential groundwater contamination from chemicals or hydrocarbons spilt during construction and maintenance	Due to the expected increase in vehicles and heavy vehicles on site, there is the potential for hydrocarbon leaks. The chemical toilets that will be used during the construction phase is also a potential spill hazard that might have an impact on groundwater quality. This potential impact is expected to be non-significant, but the recommended mitigation measures should be followed.
Sewage Waste	Potential nutrient enrichment of groundwater due to sewage or chemical spills from the septic tank	On-site sewage disposal systems/septic tanks need to be effectively cleaned and maintained. There is the potential for nutrient enrichment of groundwater. Specifications in ESMP should be closely followed.
Habitat fragmentation	Potential habitat fragmentation and loss due to the removal of about 22 ha and change in the environment	The movement of wildlife might potentially be impacted by the clearing of 22ha of vegetation and the construction of the solar plant which will act as a barrier. The impact is expected to be minor because overall the land surrounding the proposed solar plant is a relatively untouched natural habitat (except for a large area cleared to the west of the proposed site), which suggests wildlife will still be able to move in the area.
Powerline Construction	The construction and excavation of holes (for pylons) could potentially impact reptiles, mammals, birds in the surrounding areas/habitat.	Due to the construction of the overhead powerlines, there will be vehicles in the field as well as the excavation of holes for the installation of wood pylons that might potentially have an impact on reptiles, mammals, birds in the surrounding areas/habitat. This impact is expected to be of low significance, but the recommended mitigation measures in the ESMP should still be followed.

7.2 SIGNIFICANT ISSUES TO BE ADDRESSED

Table 6 - List of potentially significant impacts scoped into the assessment

Environment or social topic	Potential impact	Summary of preliminary assessment findings
Job creation	Beneficial impact by the creation of potential direct and indirect job opportunities during the proposed project.	The Project is expected to create full time and part-time job opportunities during the construction phase and operational phase of the Project. Although the majority of the workforce will be provided by SPS, the impact is still seen as significant as job opportunities will be created for the local communities.
Vegetation	Potential damage or removal of protected plant species when the proposed 22 ha are cleared.	The proposed area that is planned to be clear is approximately 22 ha which equates to about 30 soccer fields (0.71 ha soccer fields). With this size of land area cleared there is the potential to disturb or damage protected plant species.
Wildlife/Vegetation	Potential habitat destruction when the proposed 22 ha are cleared.	The proposed area that is planned to be clear is approximately 22 ha which equates to about 30 soccer fields (0.71 ha soccer fields). Thus, 22 ha of natural habitat will be lost and altered.
Avifauna	Potential avifauna collision risk with the reflective surfaces of the solar panels, the powerline nearby (part of B2Gold and Nampower project) and the proposed 22kV overhead powerline	There is the potential for avifauna collision with solar components (reflective surface of solar panels and as a result of the potential "lake effect" of solar panels) and associated infrastructure (powerline to solar plant). This area has various species that might collide with solar panels or powerlines.

Environment or social topic	Potential impact	Summary of preliminary assessment findings
	(single line with wood pylons - 500 meters in length).	
Wildlife	Potential disturbance or displacement of protected or vulnerable species	The construction, clearing and excavation activities have the potential to disturb, harm or kill birds and mammals in the area, this might include some protected species.
Soil	Potential soil disturbances as a result of the ground preparation and construction of the solar plant.	The proposed 22 ha area that will be cleared for the solar plant is expected to result in soil disturbances. Excavation to construct a solar plant could potentially disturb soil profile and construction activities might cause soil compaction in the area. This is a long term/permanent soil disturbance.

7.3 SCOPING ASSESSMENT FINDINGS

When undertaking the scoping exercise, the design of the Project and best practice measures were considered to ensure the likely significant effects and any required additional mitigation measures were identified. A summary of the potential impacts and mitigation or control measures were discussed

Tables 7, 8, 9, 11, 12 and 13 set out the findings of the scoping assessment phase. Activities that could be the source of an impact have been listed, followed by receptors that could be affected. The pathway between the source and the receptor has been identified where both are present. Where an activity or receptor has not been identified, an impact is unlikely, thus no further assessment or justification is provided. Where the activity, receptor and pathway have been identified, a justification has been provided documenting if further assessment is required or not required.

Due to the nature and localised scale of the proposed construction activities and proposed operational activities, and the environmental context of the site, the potential environmental and social effects are expected to be minor to moderate. The only areas where uncertainty remained during the scoping phase was the potential effects on vegetation removal, avian collision with reflective surfaces of solar panels, potential disturbances or displacement and impacts on soil (soil disturbances and soil erosion). Further consideration of the potential impacts on biodiversity and the environment was therefore undertaken and results are presented in sections 7.5 and 7.6.

7.4 SOCIAL IMPACTS

7.4.1 Job creation

According to the Socio-Economic impact Assessment of COVID-19 in Namibia by the United Nations Namibia (2020), there has been an estimated increase in unemployment from 33.4% to 34.5% and through a best-case scenario, it is also estimated that poverty will increase from 17.2% to 19.5% due to a drop in the domestic GDP (United Nations Namibia 2020). The Otjozondjupa region has an estimated unemployment number of 17 585 people (NSA, 2017). The national value and sensitivity of employment are thus considered to be high as it is of importance to the country and the local economy.

DIRECT EMPLOYMENT: CONSTRUCTION

Approximately 60 workers will be required during the construction phase. The Proponent will employ local people mostly where it will be deemed feasible to do so. The majority of the workforce will be provided by SPS. The beneficial impact of creating temporary jobs is expected to result in a temporary impact with a low magnitude of change. A minor beneficial impact on the community and economy is therefore expected.

DIRECT EMPLOYMENT: OPERATION

Approximately 3 permanent jobs and about 20 part-time jobs (when cleaning of the power plant is required) will be created in the operational stage as a direct result of the Project, with the anticipated creation of downstream jobs such as goods services, and contractor works expected throughout the lifespan of the Project. The magnitude of change during operation is considered as low but has long term effects thereby resulting in a minor beneficial impact on the community and economy.

Table 7 - impacts related to beneficial socio-economic impacts

Activity	Receptor	Impact	Nature of impact	Value & Sensitivity	Magnitude of change	Significance of impact
Construction works - general	– Community – Job seekers – Local economy	Creation of jobs in the local community.	Beneficial Direct Partially Reversible Regional Short Term Reversible	High	Minor	Beneficial Minor (9)
Operations of the proposed project	– Community – Job seekers – Local economy	Creation of 3 permanent and 20 part-time/temporary jobs	Beneficial Direct Irreversible Regional Long Term Reversible	High	Minor	Beneficial Minor (9)

Impact management/control measures may include but are not limited to the following:

- Maximise local employment and local business opportunities;
- Enhance the use of local labour and local skills as far as reasonably possible; and
- Ensure that goods and services are sourced from the local and regional economy as far as reasonably possible.

7.5 IMPACTS ON BIODIVERSITY

7.5.1 Impacts related to vegetation clearing

The proposed Project will involve the clearing of 22 ha of vegetation to make way for the solar components and associated infrastructure. Construction activities at ground-mounted solar plant sites usually involve vegetation clearing, excavation of soil and roots, stripping of topsoils, soil compaction and grading of the land to create a level ground surface (Beatty et al. 2017). Vegetation in the area that plays an important part within the local habitat (i.e., Raptors and vultures nesting in larger trees) are often removed, pesticides are sometimes used to get rid of unwanted plants or weeds and the area is often covered with gravel. These practices are usually used to accommodate convenient construction, operations of the plant and even for easy access, but according to Beatty et. al. (2017) and Macknick et al. (2013), there are alternatives where vegetation could be incorporated into solar plant design.

According to Patton et al. (2013), solar plant developments have the potential to impact a variety of ecological resources in the areas where they occur. A direct impact includes habitat removal (22 ha of natural habitat removed) and indirect impacts on vegetation include the changes in temperature, soil moisture, hydrological conditions, ecosystem function, reduced diversity, habitat destruction, the spread of invasive species and changes in community structure. Impacts sustained during the construction phase of the project could potentially continue throughout the lifespan of the project (i.e., several decades) and these changes (direct and indirect) could then result in both short and long-term changes in plant species distribution, abundance and species composition (Patton et al. 2013).

The following ecosystem functions could also be impacted according to Beatty et al. (2017):

- Wildlife cover;
- Forage;
- Travel corridors;
- Trophic relationships;
- Mycorrhizal associations;
- Nutrient cycling;
- Soil retention; and
- Carbon sequestration.

The following habitat and ecological issues could arise due to the clearing of vegetation:

Habitat destruction: This refers to the process where the natural habitat is disturbed or changed to the point where it cannot support the native species of the area anymore. Biodiversity that usually formed part of the landscape could potentially be killed or displaced, which could result in a reduction in species abundances. Habitat loss and destruction are some of the leading drivers of biodiversity loss.

Ecosystem alteration: This refers to the process where the natural landscape is altered, for example, the natural vegetation cover is removed and a non-natural landscape (i.e., bare ground is not natural in this part of Namibia) is present after the impact or change. This, in turn, changes the ecosystem (i.e., loss or disturbance of ecosystem) of the area cleared, which could change the species composition and impact ecosystem functioning.

According to a specialist study conducted for the general area surrounding the B2Gold's Otjikoto mine for the area between Otjiwarongoo and Otavi, there are about 34 tree and shrubs species that have at least one type protected/legal status or is near-endemic/endemic. In this area it is expected that 17 species are protected under the forestry act, 10 species are protected by other forestry laws, five (5) species are near-endemic and three (3) species are endemic. Furthermore, about three (3) species in the area is protected by the Nature Conservation Ordinance No. 4 of 1975 and four (4) species are listed under Appendix 2 of CITES (Cunningham, 2017).

In the are between Otjiwarongo and Otavi the following protected tree/shrub species are expected to be the most sensitive (Cunningham, 2017):

- *Aloe litoralis;*
- *Cyphostemma juttae*;
- *Erythrina decora*;
- *Heteromorpha papillosa*; and
- *Moringa ovalifolia*.

In this part of Namibia about 111 grass species are expected to be present, of these species the following are endemic (Cunningham, 2017):

- *Eragrostis omahekensis*;
- *Eragrostis scopelophila*
- *Pennisetum foermeranum;* and
- *Setaria finite.*

However, the only species that might potentially be found on-site (once the solar plant is constructed) is *Eragrostis omahekensis,* because according to Cunninham (2017), this species is usually present in disturbed soils. *Setaria finite* is never very common but is the grass species in the area most likely to be impacted by new developments (this species is usually associated with drainage lines) (Cunningham, 2017).

None of the grass, tree or shrub species known/expected to occur in the area between Otjiwarong and Otavi is however exclusively associated with the proposed development areas.

The magnitude of change on vegetation (damage or removal of protected species) with regards to the clearing of vegetation is considered to be moderate because about 22 ha of vegetation will be cleared. The sensitivity of the receptor is rated as medium because although there are protected species in the area they are not solely associated with the proposed site. There are also no drainage lines, ephemeral pans or hills on the proposed site, these habitats are more sensitive and might have unique species. The significance of the impact has thus been classified as minor (Table 8) and with the implementation of recommended mitigation measures, the significance of the impact is expected to be low.

The magnitude of change on the local ecosystem (habitat destruction) with regards to the clearing of vegetation is considered to be moderate because about 22 ha of natural habitat will be removed. The sensitivity of the receptor is rated as medium because the ecosystem will be altered and natural habitat destroyed, and some species might be displaced due to this change; But, it is not expected to be severe and is not expected to have a significant impact on ecosystem functioning within the local area. The significance of the impact has thus been classified as moderate (Table 9) and with the implementation of recommended mitigation measures, the significance of the impact is expected to be minor.

Table 8 - Impacts related to clearing of vegetation

Description of activity	Receptor	Description of impact	Effect/ description of the magnitude	Value of sensitivity	Magnitude of change	Significance of impact	Residual impact after mitigation
Clearing of about 22 ha of vegetation to make way for the proposed solar plant.	**Vegetation**	Potential damage or removal of protected plant species when the proposed 22 ha are cleared	**Adverse** **Cumulative** (>100 ha area cleared to the west) **Irreversible** **Moderate** **Permanent** **On-site** **Likely**	Medium	Moderate	**Minor (4)**	**Low (2)**

Impact management/control measures may include but are not limited to the following:

- Do not use herbicides to manage plants on-site as far as reasonably possible;
- Plant native vegetation between solar components, " with acceptable characteristics within engineering constraints" (i.e., grass and small shrubs) (Beatty et al., 2017);
- Ensure that vegetation clearing permits are in place before clearing starts;
- A professional botanist or ecologist should be on-site to identify any protected or threatened species;
- Appropriate permits should be obtained for the removal of any protected species;
- Relocate protected/sensitive species to suitable habitat if recommended by the professional; and
- Control all alien/invasive species on-site.

Table 9 - Impacts related to habitat destruction

Description of activity	Receptor	Description of impact	Effect/ description of the magnitude	Value of sensitivity	Magnitude of change	Significance of impact	Residual impact after mitigation
Potential habitat destruction when the proposed 22 ha are cleared	**Biodiversity**	Potential habitat destruction and impacts on ecosystem functioning due to the clearing of 22ha of vegetation and ground preparations.	**Adverse** **Cumulative** (>100 ha area cleared to the west) **Irreversible** **Moderate** **Permanent** **On-site** **Almost Certain**	Medium	Moderate	**Moderate (6)**	**Minor (4)**

Impact management/control measures may include but are not limited to the following:

- Keep or plant native vegetation between solar components (if larger rows are planned between components);
- Try to limit the amount of vegetation that is cleared, to limit habitat loss (Hanneline, et al., n.d.);
- Use grazing animals/livestock, and not chemicals, to control vegetation on-site;
- Try to keep some natural habitat intact;
- Ensure efficient planning, in order to reduce disturbances in areas that do not form part of the planned construction area;
- Reseed native grasses between solar components; and
- Plant native vegetation on-site where possible.

7.5.2 Avifauna collisions

The development of solar PV plants usually involves the clearing of large areas of land, which usually has numerous solar panels stacked close to each other. These large arrays of panels might potentially confuse waterbirds in thinking it is a waterbody/wetland (known as the "lake effect", which might lead to potential collisions (Jenkins et al. 2017).

Bird collisions with solar PV plants are relatively understudied and very little information is available on bird mortality rates. But Jenkins et al. (2017) mentioned bird collisions ("lake effect") is "emerging as a significant impact factor" at a site where continuous mortality monitoring is taking place. A study conducted in the Northern Cape at one of South Africa's largest solar plants (96 MW), noted eight (8) fatalities over three months. The "extrapolated mortality" for this solar plant has been identified at 435 birds per year (about 4.5 birds per MW per year). This study recorded no collisions of threatened bird species (Visser et al. 2019). A study conducted in the United States estimated the collision rate at about 2.49 birds per MW per year (Kosciuch et al, 2020).

According to Hanneline et al. (n.d) PV panels are less reflective than Concentrated Solar Power (CSP) panels and is thus expected to not be a major risk for collisions (i.e., compared to that of large windows or other reflective surfaces).

Approximately 236 bird species ("breeding residents") occur or could occur in the general area between Otjiwarongo and Otavi (Cunningham, 2017). Of these species, 31 are endangered and/or threatened (Table 10) and the following endemic species might be found in the area (Cunningham, 2017):

- Monteiro's hornbill (*Tockus monteiri*);
- Damara hornbill (*Tockus damarensis*);
- Violet wood-hoopoe (*Phoeniculus damarensis*);
- Bare-cheeked babbler (*Turdoides gymnogenys*); and
- Rüppell's parrot (*Poicephalus rueppellii*)

Flamingos, raptors, vultures, bustards, korhans, waterbirds and some other birds are also prone to penitentially collide with powerlines in the area (African Conservation Services, 2020). Some of these species are endangered as seen in Table 10. There is only a short powerline that will form part of the proposed Project, and relevant mitigation measures will be included in the ESMP to ensure a reduction in bird mortalities on the proposed site.

Table 10 – Namibian and global endangered statuses (IUCN 2022 & Simmons et al 2015)

Common name	Scientific name	Global endangered status	Namibian endangered status	Sensitive to habitat destruction
Steppe Eagle	*Aquila nipalensis*	Endangered		
Tawny eagle	*Aquila rapax*	Vulnerable	Endangered	Yes
Verreaux's Eagle	*Aquila verreauxii*	Least concern	Near threatened	
Kori Bustard	*Ardeotis kori*	Near threatened	Near threatened	Yes
Rufous-bellied heron	*Ardeola rufiventris*	Least concern	Endangered	
Chestnut-banded plover	*Charadrius pallidus*	Least concern	Near threatened	
Pallid Harrier	*Circus macrourus*	Near threatened	Near threatened	
Black stork	*Ciconia nigra*	Least concern	Endangered	
Peregrine Falcon	*Falco peregrinus*	Least concern	Near threatened	
Red-footed Falcon	*Falco vespertinus*	Vulnerable	Near threatened	
Saddlebill	*Ephippiorhynchus senegalensis*	Least concern	Endangered	
Great Snipe	*Gallinago media*	Near threatened	Near threatened	
Black-winged pratincole	*Glareola nordmanni*	Near threatened	Near threatened	
White-backed vulture	*Gyps africanus*	Critically endangered	Endangered	Yes (high)
Cape vulture	*Gyps coprotheres*	Vulnerable	Critically endangered	
African fish-eagle	*Haliaeetus vocifer*	Least concern	Vulnerable	
Booted eagle	*Hieraaetus pennatus*	Least concern	Endangered	
Ludwig's bustard	*Neotis ludwigii*	Endangered	Endangered	
Eurasian Curlew	*Numenius arquata*	Near threatened	Near threatened	
Marabou	*Leptoptilos crumenifer*	Least concern	Near threatened	
Maccoa Duck	*Oxyura maccoa*	Endangered	Near threatened	
Great white pelican	*Pelecanus onocrotalus*	Least concern	Vulnerable	

Common name	Scientific name	Global endangered status	Namibian endangered status	Sensitive to habitat destruction
Lesser flamingo	*Phoeniconaias minor*	Near threatened	Vulnerable	
Violet woodhoopoe	*Phoeniculus damarensis*	Least concern	Endangered	
Black-necked grebe	*Podiceps nigricollis*	Least concern	Near threatened	
Rüppell's Parrot	*Poicephalus rueppelli*	Least concern	Near threatened	Yes
Martial eagle	*Polemaetus bellicosus*	Endangered	Endangered	Yes
Secretarybird	*Sagittarius serpentarius*	Endangered	Vulnerable	Yes
Bateleur	*Terathopius ecaudatus*	Endangered	Endangered	
White-headed vulture	*Trigonoceps occipitalis*	Critically endangered	Vulnerable	
Lappet-faced vulture	*Torgos tracheliotos*	Endangered	Vulnerable	Yes

Figure 22 outlines the potential flight paths of waterbirds in the area, due to the location of pans and dams in the area (African Conservation Services, 2020). This might thus increase potential collisions/mortalities associated with the proposed Project.

Figure 22 – Potential flight paths for waterbirds in the area of the solar plant (B2Gold powerline Avifauna specialist study – African Conservation Services, 2020).

The magnitude of change on the avifauna with regards to avifauna collision with solar panels and associated infrastructure is considered to be moderate because of the expected collision rates mentioned in Visser et al. (2018) and Kosciuch et al, (2020). Mortality rates for the proposed solar plant could potentially result in between 32.37 and 58.5 mortalities, but these are just estimated figures, actual mortalities could be more or less. The sensitivity of the receptor is rated as medium because waterbirds seem to be more at risk and as mentioned in Cunninham (2017) various popular breeding sites (Waterberg national park, Etosha national park and Omatako dam) are within a 120 km radius of the proposed site; there is thus the possibility that during migration/breeding/rainy seasons that collisions might increase. But, it is not expected to be severe and is not expected to have a significant impact on bird populations. None of the bird species known/expected to occur in the area between Otjiwarongo and Otavi is however exclusively associated with the proposed development areas (Cunningham 2017).

In general overhead powerlines are a major concern as various protected or endangered species are prone to collide with these overhead powerlines as seen in the Avifauna specialists study attached (conducted for the B2Gold powerlines). The specialist study has been conducted for the 66 kV overhead powerline from the Eldorado substation to

B2Gold's Otjikoto mine and gives a good overview of the species that might potentially be impacted in the general area as well as the significance of the impacts. The Proponent should follow and adhere to the recommendations and mitigations measures in the specialist's study and ESMP, to ensure that the significance of the impact is reduced as far as reasonably possible.

Table 11 - Impacts related to potential avifauna collision

Description of activity	Receptor	Description of impact	Effect/ description of the magnitude	Value of sensitivity	Magnitude of change	Significance of impact	Residual impact after mitigation
Solar PV plant operations	**Avifauna**	Potential avifauna collision risk as a result of the potential "lake effect" of solar panels, and potential collisions with associated infrastructure (proposed powerline).	**Adverse** **Cumulative** (B2Gold solar plant) **Irreversible** **Moderate** **Permanent** **Regional** **Likely**	Medium	Moderate	**Moderate (6)**	**Minor (4)**

Impact management/control measures may include but are not limited to the following:

- Keep a record of all avifauna collisions and name of species or photographic evidence with dates;
- Increase monitoring during the rainy season (when pans, dams and drainage lines hold water);
- If collisions increase or are higher than the estimated numbers additional bird deterrent measures should be implemented; and
- Bird Flight Diverters (i.e., coils, flappers, etc.) should be installed along the entire overhead powerline to minimise/prevent mortalities.

7.5.3 Disturbance and displacement of potentially vulnerable and protected species

The construction of solar PV facilities usually involve the clearing of large areas of land and for the proposed Project the proposed area is about 22 ha; this equates to the clearing of about 30 soccer fields next to each other. With such an aerial extent of the disturbance, there is the possibility to potentially impact protected, sensitive or vulnerable species. This clearing usually tends to "destroy, degrade, fragment or otherwise displace" species (avifauna habitat loss is especially a concern) (Jenkins et al. 2017).

According to Patton et al. (2013), all new proposed solar energy plants (construction and operation) have the potential to impact wildlife (Mammals, birds, reptiles and amphibians), and the extent of the impact will depend on the following factors:

- Size of area/habitat to be disturbed;
- The nature of the disturbance (i.e., long-term/permanent alteration due to construction of 22 ha solar plant);
- Wildlife occupying the area; and
- Timing of the construction phase and activities" relative to the crucial life stages of wildlife (i.e., breeding season)".

Potential disturbances on wildlife include (Patton et al. 2013):

- Behavioural disturbance;
- Harassment;
- Nest abandonment;
- Territory adjustments;
- Reduction in carrying capacity;
- Genetic isolation;
- Uptake of toxic materials (during construction or if maintenance/cleaning uses chemicals);
- Reproductive impairment; and
- Increased predation rates.

Amphibian Species: According to Cunningham (2017), the most important species in the area is *Phrynomantis annectens* (endemic species), but is widespread and not only associated with the area between Otjiwarongo and Otavi. There is no permanent surface water on the proposed site and thus the Project is unlikely to impact amphibian species.

Reptile Species: According to Cunningham (2017), approximately 80 reptile species are could occur in the general area of which 21 are endemic, four (4) species are threatened or protected (“*Stigmochelys pardalis*, *Psammobates oculiferus, Python natalensis* and *Varanus albigularis”*), one (1) species protected game (*Python anchietae),* but is not classified as vulnerable and 13 species have international conservation status. *“Python natalensis* classified as vulnerable and *Naya nigricincta* as rare although *N. nigricincta* is however more common in Namibia than South Africa”.

Avifauna Species: According to Cunningham (2017), this area has a high bird diversity, with up to five (5) endemic species. This area has not been classified as an Important Birding Area (IBA) in Namibia, but there are a few IBAs nearby (within 120 km radius), Etosha and Waterberg national parks and the Omatako dam.

The following avifauna species are sensitive to habitat changes/destruction according to African Conservation Services, (2020) (avifauna specialist study for the B2Gold powerline): Damara hornbill, Monteiro’s hornbill, Rüppell's parrot, Secretarybird, Carp’s tit and the species mentioned as sensitive in Table 10.

Mammal Species: According to Cunningham (2017), the most important mammal species in this area are species that are endangered, threatened or protected. The species that could be found here include Cheetah (vulnerable), Temminck's Pangolin (vulnerable), Black-footed Cat (vulnerable, rare), Leopard (vulnerable), Striped Leaf-nosed Bat (near threatened), Brown Hyaena (near threatened), Southern African Hedgehog (rare) and the protected species listed in the Nature Conservation Ordinance 4 of 1975 (IUCN, 2022).

The magnitude of change on protected, sensitive, endangered or threatened wildlife species with regards to potential disturbances or displacement (as a result of the proposed Project) is moderate, as there are a few protected species in the area and according to African Conservation Services, (2020), white-backed vulture nest have been encountered on farm Maxwell and nearby farms. Other sensitive, protected, endangered or threatened species or breeding/nesting birds might also be found/present on-site. The sensitivity has been rated high because various of the species mentioned in this section is listed under Appendix I and Appendix II of CITES, the Nature Conservation Ordinance 4 of 1975, listed as endangered or threatened by the IUCN and listed as sensitive to habitat destruction in the Avifauna specialists study for the B2Gold powerline in the area. None of the wildlife species known/expected to occur in the area between Otjiwarongo and Otavi is however exclusively associated with the proposed solar plant site.

The significance of the impact has thus been classified as moderate (Table 12) and with the implementation of recommended mitigation measures, the significance of the impact is expected to be minor.

Table 12 - Impacts related to the potential disturbance or displacement of vulnerable or protected species

Description of activity	Receptor	Description of impact	Effect/ description of the magnitude	Value of sensitivity	Magnitude of change	Significance of impact	Residual impact after mitigation
Vegetation clearing and construction activities	**Biodiversity**	Potential disturbance or displacement of protected or vulnerable species	Adverse Direct Irreversible Moderate Permanent On-site Likely	High	Moderate	**Moderate (6)**	**Minor (3)**

Impact management/control measures may include but are not limited to the following:

- Preconstruction monitoring is recommended to determine the presence of any threatened or protected species;
- Keep some of the natural habitat on-site intact;
- Professional ecologists should evaluate the site for any potential endangered or protected species (i.e., endangered vultures breeding in trees on-site);
- Plant native vegetation between solar components, that will not necessarily influence/impact the solar panels (i.e., native grasses);
- Do not use pesticides on-site as far as reasonably possible;
- Use livestock/wildlife to naturally control vegetation on-site;
- The breeding season of wildlife should be considered for construction activities (i.e., ground-nesting birds);
- Regular toolbox talks with construction workers and operational staff on the importance of biodiversity mitigation measures; and
- Strict rules should be implemented on-site to prevent any poaching, harming, collection or killing of wildlife.

7.6 Impacts on the Environment

7.6.1 Soil disturbances

A few factors can contribute to the overall effect(s) of soil disturbance in a specific project area and can include the degree of the disturbance, the amount of change in a certain soil property and the extent to which that change occurs, the pattern of disturbances (i.e., evenly, patches etc) and the location of proposed area relative to other "resource values" (i.e., streams, heritage sites, sensitive habitats and riparian zones) (Napper et al. 2009).

The proposed Project will include vegetation clearing, excavation, ground preparations and other construction activities that might potentially disturb the natural soil environment on the proposed site. Some of the common causes of soil disturbances from solar energy projects include (Patton et al. 2013):

- **Soil compaction:** This occurs when soil is compressed (i.e., heavy machinery or vehicles in the field), thus resulting in increased densities due to reduced pore spaces. During wet conditions (rainy season) soils are more vulnerable to compaction.
- **Soil horizon mixing:** This usually occurs during construction activities such as excavations and backfilling, this disturbs the soil profile and displaces topsoil. Due to these changes soils are more prone to erosion because stabilizing matrices are removed (i.e., desert pavement and biological crust). This also impacts vegetation in the area, by influencing optimum conditions for native plants and making way for invasive species.
- **Soil contamination:** This could occur due to machinery and vehicles (i.e., fuels and oils) used on site**.** Some solar plant sites use herbicides (weed control) and chemicals for dust control that could potentially contaminate soils. Soil contamination could then impact wildlife (ingestion and inhalation), water quality and vegetation. Other impacts include the reduction in carbon fixing qualities of soil (removal of "biological soil crust") and the potential release of soil-borne diseases/toxins.

The following impacts could occur as a result of disturbed soils (Patton et al. 2013):

- **Soil Erosion:** This occurs when substantial amounts of soil are lost due to natural dominant eroding agents like wind and surface water runoff. The clearing of vegetation, soil stockpiling, vehicles and machinery use and excavating on projects sites might significantly increase the vulnerability of soils.

- **Sedimentation:** Wind and water erosion are usually responsible for sediments making their way to streams, dams and other natural surface water sources. Sedimentation can have various negative impacts on natural or man-made waterways, for example increasing the potential severity of floods and blocking drainages or navigation channels and sediments that remain suspended in surface water can degrade water quality.

The magnitude of change in the soil environment is expected to be moderate because it is approximately 22 ha of soil that might be disturbed as a result of construction activities and this, in turn, could indirectly impact vegetation, water resources, wildlife and microorganisms. The sensitivity of the receptor is rated as medium because soil plays an important part in ecosystem functioning. The significance of the impact has thus been classified as moderate (Table 13) and with the implementation of recommended mitigation measures, the significance of the impact is expected to be low.

Table 13 - Impacts related to the potential soil disturbances

Description of activity	Receptor	Description of impact	Effect/ description of the magnitude	Value of sensitivity	Magnitude of change	Significance of impact	Residual impact after mitigation
Construction and operational activities	**Soil**	Potential soil disturbances during the construction phase of the Project.	Adverse Direct Partly reversible Moderate Permanent On-site Definite	Medium	Moderate	**Moderate (6)**	**Low (2)**

Impact management/control measures may include but are not limited to the following (Bennun et al. 2021):

- Try to keep soil disturbances to a minimum, for example only prepare the soil/ground as required for the construction of the solar plant (i.e., foundations);
- Prevent driving with heavy vehicles in the field and use existing access roads as far as reasonably possible;
- Prevent soil compaction;
- Do not leave the ground bare (i.e., replant natural grasses or smaller plant species);
- Recommended to store and retain topsoil and sub-soil removed from the construction areas for later use during reestablishment (i.e., when construction work is done);
- Use native and non-invasive species for "landscaping and rehabilitation works";
- For the rehabilitation of disturbed areas use "soil, mulch and vegetation debris (that contain natural seed stock)" to facilitate natural revegetation;
- Use "manual methods (e.g. hoeing or hand-pulling)" for the clearing of vegetation, where possible to limit soil disturbance; and
- Soil erosion and sedimentation control measures should be implemented.

8 CONCLUSION

Through the scoping process and impact assessment, it was found that the significant impacts that may occur during the proposed construction and operational phases of the Project are impacts relating to the potential removal of protected and vulnerable plant species, habitat destruction due to the clearing and preparation of about 22 ha of land, avifauna collisions, potential removal or displacement of vulnerable or protected wildlife species and the potential soil disturbances due to construction and operational activities.

These impacts have been classified as minor to moderate and should thus be carefully monitored and managed according to the ESMP, to ensure that the significance level of the impact is minimized as far as reasonably possible.

With the implementation of best practice methods, national regulations and recommended mitigation measures, the significance of the impacts are expected to be low to minor.

Furthermore, the potential impacts with regards to waste generation, increased traffic or people in the vicinity of the proposed site, occupational health and safety, heritage, visual impacts, noise, air quality, habitat fragmentation, fire risk, groundwater and soil contamination, soil erosion and sewerage waste are expected to be of low to minor significance. But, these areas should still be managed according to the ESMP to ensure that the Proponent complies with the relevant legislation, international standards and best practices.

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APPENDIX A – ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

APPENDIX B – BACKGROUND INFORMATION DOCUMENT

APPENDIX C – PUBLIC CONSULTATION

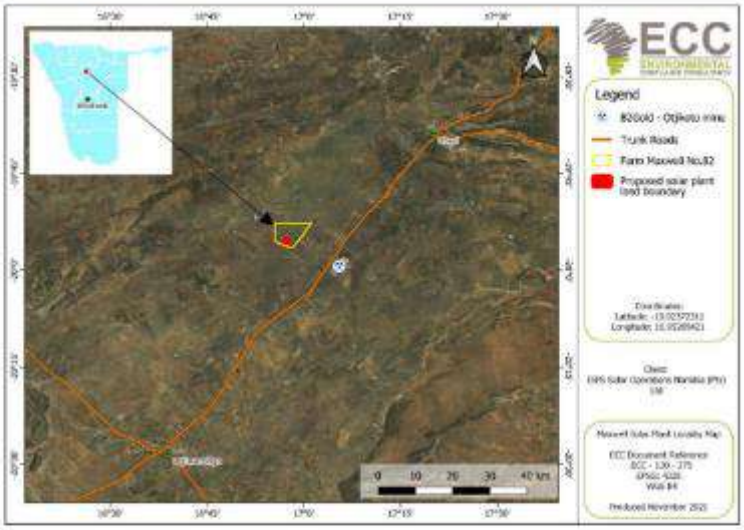
NOTICE OF AN ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED CONSTRUCTION AND OPERATION OF A 13 MW SOLAR PHOTOVOLTAIC POWER PLANT ON FARM MAXWELL NO.82, OTJOZONDJUPA REGION, NAMIBIA.

Environmental Compliance Consultancy CC (ECC) hereby gives notice to members of the public that an application for an environmental clearance certificate in accordance with the Environmental Management Act, No. 7 of 2007 will be made as per the following:

Applicant:	**ISPS Solar Operations Namibia (Pty) Ltd**
Environmental Assessment Practitioner (EAP):	**Environmental Compliance Consultancy**
Location:	**Otjozondjupa Region, Namibia**
Project ID:	**ECC-130-375**

Proposed Project Activity: The proponent, ISPS Solar Operations Namibia (Pty) Ltd (previously Mettle Solar Namibia Operations) proposes to construct and operate a 13-megawatt (MW) solar photovoltaic (PV) power plant on farm Maxwell No. 82, which will be linked to the Eldorado substation and supply B2Gold (Otjikoto mine) with electricity through the Namibian Modified Single Buyer (MSB) framework.

Proposed Project Area: Otjozondjupa Region, Namibia



I&APs Registration: The purpose of the registration period is to introduce the proposed project and to allow Interested and Affected Parties (I&APs) to register and comment on the Background Information Document (BID), to ensure that potential issues and concerns are brought forward, so that they can be considered and assessed during the impact assessment process.

I&APs and stakeholders are required to register for the project at: www.eccenvironmental.com/projects

The team at ECC will then maintain contact with all registered I&APs to engage and to keep them informed as the ESIA process develops. ECC will also provide registered I&APs input opportunities and review periods throughout the assessment process.

ECC
ENVIRONMENTAL
COMPLIANCE CONSULTANCY

Contact: Mr JS Bezuidenhout or Mrs J Mooney
Environmental Compliance Consultancy
Registration Number CC/2013/11404
PO Box 91193, Klein Windhoek
Tel: +264 81 669 7608
E-mail: info@eccenvironmental.com
Website: www.eccenvironmental.com/projects

	
Coordinates:	20° 0.455'S, 17° 2.953'E
	
Coordinates:	19° 55.639'S, 16° 56.991'E

8 Republikein Sun Allgemeine Zeitung **Market Watch** MONDAY 31 JANUARY 2022

VACANCIES

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Department:
Operations Support

Reporting to:
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Closing date: 14 February 2022

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ST. BONIFACE COLLEGE
SAMBYU
St Boniface College Sambyu

Urgently Needed 2022

TEACHERS FOR THE FOLLOWING SUBJECTS:

A)English
B)Biology
C)Entrepreneurship

Note: Should be qualified to teach the subject Grade 9 to Advanced Subsidiary Level new curriculum

Minimum Requirements :
A recognised teaching qualification on NQF Level 7 plus 5 years teaching experince in Higher Level.

- Comprehensive Curriculum Vitae
- Certified proof of qualifications
- Preference will be given to Namibian applicants.

NB: No fax or email applications will be considered.

Due date:08 February 2022
ACCOMMODATION AVAILABLE

Contact:
The Principal
St Boniface College
P.O.Box 1082, Rundu
Tel-(066)259 601

SPS SUSTAINABLE POWER SOLUTIONS

NOTICE OF THE PROPOSED CONSTRUCTION AND OPERATION OF A 13 MW SOLAR PHOTOVOLTAIC POWER PLANT ON FARM MAXWELL NO.82, OTJOZONDJUPA REGION, NAMIBIA.

Environmental Compliance Consultancy CC (ECC) hereby gives notice to the public that an application for an environmental clearance certificate in terms of the Environmental Management Act, No. 7 of 2007 will be made as per the following:

Applicant:	**ISPS Solar Operations Namibia (Pty) Ltd**
Environmental Assessment Practitioner (EAP):	**Environmental Compliance Consultancy**
Location:	**Otjozondjupa Region, Namibia**

Project: The proposed construction and operation of a 13 MW solar PV power plant on farm Maxwell No.82 within the Otjozondjupa Region, Namibia.

Proposed Activities: The proponent, ISPS Solar Operations Namibia (Pty) Ltd (previously Mettle Solar Namibia Operations), proposes to construct and operate a 13-megawatt (MW) solar photovoltaic (PV) power plant on farm Maxwell No. 82, which will be linked to the Eldorado substation and supply B2Gold (Otjikoto) mine with electricity through the Namibian Modified Single Buyer (MSB) framework.

Purpose of the review and registration period: The purpose of the review and registration period is to introduce the proposed project and to afford registered Interested and Affected Parties (I&APs) an opportunity to comment on the Background Information Document (BID) to ensure that all issues and concerns are brought forward, captured and considered further in the assessment.

The registration period is effective from **24 January 2022** to **7 February 2022.** I&APs and stakeholders are required to register for the project at: www.eccenvironmental.com/projects/

The team at ECC will then maintain contact with all registered I&APs to keep them informed and engaged as the ESIA process develops. ECC will also provide registered I&APs relevant documents to review during the assessment process.

Environmental Compliance Consultancy
Registration Number: CC/2013/11404
Members: Mr JS Bezuidenhout or Mrs J Mooney
PO Box 91193, Klein Windhoek
Tel: +264 81 669 7608
E-mail: info@eccenvironmental.com
Website: www.eccenvironmental.com/projects
Project ID: ECC-130-375-ADT-05-D

ECC ENVIRONMENTAL

CCFN

VACANCY

THE ORGANISATION

CCFN is a not-for-gain association aiming to promote and support sustainable financing of Namibia's Community Based Natural Resource Management Programme. The organization supports communal conservancies, community forests and related community-based natural resources management entities and their beneficiaries. Amongst these are 83 communal conservancies and 45 community forests that work to sustainably manage their wildlife and other natural resources to improve the livelihoods of their members. The organization aims to serve primarily as a conduit between donors and the CBNRM Programme.

Amongst other initiatives, the organisation is currently mandated by the KfW Development Bank and the Ministry of Environment, Forestry and Tourism to act as the Project Implementation organisation for a project entitled Poverty Oriented Support to Community Conservation in Namibia core funded by the German Ministry of Economic Development (BMZ). The organisation is seeking a Procurement Officer for a duration of 12 months duration under this project. The incumbent must be a dynamic, energetic, and open minded individual whose skills set, experience and knowledge will enable results delivery under minimal supervision. If you can clearly have experience in proven experience in procurement, working with international donor organizations, can communicate with others in a way that will inspire them and if you are keen to take on new and stimulating endeavor that will offer you an opportunity to participate in sustainable transformation, then this position will appeal to you.

PROCUREMENT OFFICER

THE POSITION

The Incumbent will work with the Project Management Team and various stakeholders and report to the Project Manager. He/she will be responsible for;

i. Adherence to the Projects and donors' procurement guidelines as stipulated
ii. Administration of the procurement process
iii. Tender/Expression of Interests administration
iv. Overseeing purchases and deliveries
v. Assist with procurement and other office logistics services

Key areas of focus will be:

The Procurement Officer is responsible for the timely activation of the requisite procurement process for all Project procurement requirements. He/she will also be responsible for the ensuring timely procurement of goods and services ensuring cost effectiveness and quality.

THE PERSON

Minimum academic and experience requirements

- Minimum Diploma in Purchasing /Procurement from a recognized institution or other related/equivalent qualification
- At least 3 years' cumulative experience in a procurement related position of a similar nature
- Experience in working with international/recognized donor procurement requirements (German Co-operation funded projects will be an added advantage)

COMPETENCY REQUIREMENTS:

- Familiarity with financial systems and budgeting techniques
- Time management skills
- Can set priorities
- Good planning and organizing skills
- Ability to gain cooperation from suppliers and assistance from user department
- Ability to liaise with counterparts in other organizations
- Professional negotiation skills
- Highly ethical
- Analytical skills
- Detail oriented
- Adherence to ethical conduct
- Excellent written and verbal communication skills
- A valid driver's license is an advantage

INTERESTED

We offer a market related salary scale for the project duration. The candidate will be stationed in Windhoek with possible travel in and around Namibia. The closing date is 10 February 2022. Suitably qualified Namibian citizens are encouraged to apply encouraged to apply. We request that you e-mail your Cover letter, CV and Certified copies of qualification documents in PDF format to info@ccf-namibia.org, with the subject heading "Application for Vacancy – Procurement Officer".

Please note that only electronic CV's will be accepted.

2 Republikein Sun Allgemeine Zeitung Market Watch MONDAY 24 JANUARY 2022

Under a landmark UN-backed deal

Poor nations to receive Merck Covid pill

Lengthy procedures for approvals may delay supplies in many poorer nations for months.

FRANCESCO GUARASCIO

Nearly 30 generic drugmakers in Asia, Africa and the Middle East will make cheap versions of Merck & Co's Covid-19 pill, under a landmark UN-backed deal to give poorer nations wider access to a drug seen as a weapon in fighting the pandemic.

Merck's early greenlight to production of its anti-viral pill molnupiravir by other companies during the pandemic is a rare example in the pharmaceutical sector, which usually protects its patented treatments for longer periods.

However, there are questions about molnupiravir which has shown low efficacy in trials and has raised concerns for side-effects, and lengthy procedures for approvals may delay supplies in many poorer nations for months.

Under the deal, negotiated by the UN-backed Medicines Patent Pool (MPP) with Merck, the US company will not receive royalties for the sale of the low-cost version of the pill while the pandemic continues.

The MPP said the deal stipulated the pill would be distributed to 105 less-developed nations.

A molnupiravir course of 40 pills for five days is expected to cost about US$20 in poorer nations, an MPP official involved in the talks with drugmakers told *Reuters*, citing initial estimates from drugmakers, which are subject to change.

That is far below the US$700 per course the United States agreed to pay for an initial delivery of 1.7 million courses, but twice as high as first estimated by the World Health Organization (WHO)-backed programme to procure Covid-19 drugs and vaccines for the world.

Merck & Co. headquarters in Kenilworth, New Jersey, US. PHOTO GETTY IMAGES

The new agreement allows 27 generic drugmakers from India, China and other countries in Africa, Asia and the Middle East to produce ingredients and the finished drug.

> *Deliveries from some firms covered by the deal could start as early as February.*
>
> **- MPP**

An MPP spokesperson said deliveries from some firms covered by the deal could start as early as February. However, that will be subject to regulatory approval.

An experimental Covid-19 treatment pill, called molnupiravi. PHOTO REUTERS

Approval

While molnupiravir is in use in the United States after approval in December, some other Western countries have cancelled or are reconsidering orders after the drug showed low efficacy in trials.

Molnupiravir has also not been approved by the World Health Organization, which makes its sale at the moment not possible in most developing countries with limited regulatory resources for national authorisations.

The drug can already be sold in India, after it received emergency approval by the national regulator, but it is not currently recommended for use because of safety risks.

The developers of molnupiravir, which alongside Merck are US firm Ridgeback Biotherapeutics and Emory University, will not receive royalties for the sale of the low-cost versions made by generic drugmakers while Covid-19 remains classified as a Public Health Emergency of International Concern by the WHO.

Bangladesh's Beximco Pharmaceuticals, India's Natco Pharma, South Africa's Aspen Pharmacare Holdings and China's Fosun Pharma are among generics firms that will produce the finished product.

Other companies, including India's Dr Reddy's Laboratories, had struck earlier deals with Merck for the production of molnupiravir read more. Dr Reddy's will sell molnupiravir at 1400 rupees (US$18.8) per course.

The MPP spokesperson said there was no firm estimate yet of the likely output from generics makers covered by the deal, but that poorer nations' demand was expected to be largely covered.

The MPP works to increase access to life-saving medicines for poorer countries. It also has an agreement with Pfizer for the sub-licensing of its Covid-19 pill paxlovid to generics drugmakers. **-Reuters**

+264 81 669 7608
info@eccenvironmental.com
www.eccenvironmental.com

ECC Ref: ECC-130-375-LET-03-D
10 January 2022

Identified Stakeholder and Potentially Interested Party for:
The proposed construction and operation of a 13 MW solar photovoltaic (PV) power plant on farm Maxwell No.82, Otjozondjupa Region, Namibia.

Dear Sir or Madam:

RE: NOTIFICATION OF ENVIRONMENTAL ASSESSMENT OF THE PROPOSED CONSTRUCTION AND OPERATION OF A 13 MW SOLAR PHOTOVOLTAIC (PV) POWER PLANT ON FARM MAXWELL NO.82, OTJOZONDJUPA REGION, NAMIBIA.

Environmental Compliance Consultancy (ECC) has been engaged by ISPS Solar Operations Namibia (Pty) Ltd (previously Mettle Solar Namibia Operations) (the Proponent) to act on their behalf for the environmental clearance certificate application process in terms of the Environmental Management Act, No. 7 of 2007 for the proposed construction and operation of the solar photovoltaic (PV) power plant.

This letter is intended to engage potentially Interested and Affected Parties (I&APs) for the project and provides a communication channel to ECC whilst the ESIA is ongoing. You have been identified as an interested or affected party and therefore ECC wishes to inform you of how you can interact with the ESIA.

The proponent proposes to construct and operate a 13 megawatt (MW) solar PV power plant on a portion of farm Maxwell No. 82, which will be linked to the Eldorado substation and supply B2Gold (Otjikoto mine) with electricity through the Namibian Modified Single Buyer (MSB) framework.

Public participation is an important part of the ESIA process, as it allows the I&APs to obtain information about the proposed project and provide feedback. Communication with the I&APs occurs at various stages throughout a project lifecycle including:

- Advertising in newspapers; public notice boards (already done);
- Distributing a Background Information Document (BID) to identified I&APs; available online at (https://eccenvironmental.com/projects/)
- Registered I&APs will also be informed of the available draft scoping report for a review period, during which period I&APs will have the opportunity to review the draft document and raise any issues or concerns, and
- I&APs who wish to register as such must do so on the ECC website as per the link provided below: https://eccenvironmental.com/projects/

If you are unable to complete the registration form online, please contact us via email for assistance. info@eccenvironmental.com

ECC values community input and participation in our projects and we look forward to working with you as the project develops.

ENVIRONMENTAL COMPLIANCE CONSULTANCY CC
PO BOX 91193 WINDHOEK, NAMIBIA
MEMBERS: J L MOONEY & JS BEZUIDENHOUT
REGISTRATION NUMBER: CC/2013/11404

Should you have any questions or require additional information please do not hesitate to contact either of us.

Yours sincerely,

Stephan Bezuidenhout
Environmental Compliance Consultancy
Office: +264 81 669 7608
Email: stephan@eccenvironmental.com

Jessica Bezuidenhout Mooney
Environmental Compliance Consultancy
Office: +264 81 669 7608
Email: jessica@eccenvironmental.com

APPENDIX D – LEASE AGREEMENT

TERM SHEET: B2GOLD SOLAR PROJECT
(OTJIKOTO MINE)

Parties	This **Term Sheet** is concluded between: (1) **SUSTAINABLE POWER SOLUTIONS INVESTMENTS (PROPRIETARY) LIMITED**, a private company registered in accordance with the laws of South Africa under registration number 2016/215610/07 ("**SPS**"); (2) **MAXWELL CC**, a close corporation registered in accordance with the laws of Namibia under registration number 94/00397 ("**Landlord**"); (3) **B2GOLD NAMIBIA (PROPRIETARY) LIMITED** a private company registered in accordance with the laws of Namibia under registration number 93/613 ("**B2Gold**"); each a "**Party**" and hereinafter collectively described as the "**Parties**".
Introduction	SPS's principal business is developing and funding commercial and industrial scale solar photovoltaic systems in sub-Sahara Africa. SPS is a subsidiary of the UK's development finance institution, CDC Group Plc. B2Gold Corp is an international senior gold producer headquartered in Vancouver, Canada. Through its subsidiaries, it owns 90% of the Otjikoto Mine located in the north-central part of Namibia. The Landlord owns the farmland surrounding the area on which a 40 MVA substation (the "**Substation**") is to be constructed in order to bring grid power to B2Gold at its Otjikoto Mine, which Premises is in the process B2Gold will cover the cost for the construction of the Substation but the ownership thereof will vest in Nampower. Should the Project set out in this Term Sheet proceed, B2Gold will recover approximately half the cost of

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	the Substation from Solar SPV or NamPower, depending on the final arrangement between the parties. This Term Sheet sets out the principal terms on which SPS and the Landlord will fund, construct, commission and operate a solar photovoltaic plant through a newly incorporated company ("**Solar SPV**") to deliver clean renewable energy to B2Gold for consumption at its Otjikoto Mine.
Project	Means the solar photovoltaic plant to be constructed, commissioned and operated on certain areas of the farm, the details of which are set out in Annexure B hereto, owned by the Landlord in the Otjozondjupa region, Grootfontein District of Namibia (the "**Premises**"), and connected to the Nampower Substation located on the same Premises, to deliver clean renewable energy to B2Gold for consumption at their Otjikoto mine in terms of the Modified Single Buyer (MSB) model in Namibia (the "**Project**").
Legal Status	**This Term Sheet shall be non-binding on the Parties and is intended to record the details of the proposed Project and to provide confirmation of the Parties' respective commitment to proceed with the next steps of the Project.** The signing of this project will allow SPS and the Landlord to incorporate Solar SPV and to start the application for the generation license and the various application processes under the MSB model.
Description of Solar Plant	A ground mounted single axis tracking solar photovoltaic plant with a nominal capacity of approximately **13,000 kWp** (DC), the specification of which are set in **Annexure A** hereto (the "**Solar Plant**"). The final size will depend on any limitations imposed by the the Electricity Control Board of Namibia (ECB) and final designs on the Solar Plant.
Location of Solar Plant	The Project will be installed on certain portions of the Premises as depicted in **Annexure B** hereto. A written

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	lease agreement will be concluded between the Landlord and Solar SPV in respect of the use of the Premises for the installation of the Solar Plant for the duration of the Project (the "**Land Lease Agreement**").
Power Purchase Agreement	B2Gold and Solar SPV shall enter into a power purchase agreement (the "**PPA**") in terms of which Solar SPV shall sell the energy generated by the Solar Plant to B2Gold over a period of 10 (ten) years (the "**Term**"). The terms of the PPA shall be negotiated between the Parties, and shall be based on the standard PPA approved by the ECB, taking into account any input from Solar SPV's financiers. It is envisaged that the material terms of the PPA will be: • The duration of the PPA shall be 10 (ten) years as from successful commissioning of the solar plant (the "**Term**"); • Based on a forward selling exchange rate of NAD14.00 to the US$, the base tariff shall be [**NAD 1.08** (one Namibian Dollar and eight cents)] per kWh of energy delivered into the Nampower grid (the "**Base Tariff**"). Note that the final Base Tariff will be set once the main components for the Solar Plant have been procured, as the costs thereof will depend on the exchange rate at the time. • The Base Tariff shall escalate on each anniversary of the commissioning date with 4% (four percent); • In addition to the Base Tariff, Solar SPV shall be entitled to recover any cost levied by Nampower and/or the ECB for connecting to the Nampower grid via the Substation and delivering energy to B2Gold in terms of the MSB model (the "**Additional Costs**"). • Solar SPV shall guarantee that the Solar Plant will provide at least 95% of the modelled production energy in the first year of operation, reducing with

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	0.7% per year thereafter ("**Production Guarantee Threshold**"); • Provided Solar SPV meets the Production Guarantee Threshold, B2Gold likewise commits to procure an amount of not less than the Production Guarantee Threshold from Solar SPV each year; • Solar SPV shall at its cost ensure that the solar plant is properly maintained, insured and operated for the duration of the Term; • Provision for payment of a termination fee shall be made in the event of the agreement being terminated early due to B2Gold's mining licence not being extended (it being recorded B2Gold's current mining licence is set to expire in 2026). A draft of the PPA shall be provided to Solar SPV's financiers to ensure that the PPA is "bankable". The Parties undertake to incorporate any reasonable commentary from such financiers into account.
Parties' Obligations	SPS shall: • refund to B2Gold an amount equal to 50% of the costs of the Substation to be installed on the Premises in return for its use of up to 20MW of capacity; • provide the necessary funding for the development of the Project as well as for the costs of the engineering design, procurement, installation and commissioning the Project; • arrange for the necessary long-term refinancing for the Project post-commissioning; • obtain all necessary licences and regulatory approvals at its own cost in respect of the Project; • arrange for the preparation of all legal agreements to be entered into between the Parties, at its' cost;

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	• generally, act as project manager in relation to all aspects of the Project; • manage the corporate affairs of Solar SPV and report to all stakeholders on an ongoing basis; • manage the ongoing asset management and O&M services in relation to the Project. <u>The Landlord shall:</u> • make the Premises available to Solar SPV on which the Solar Plant is to be installed, on terms agreed between it and Solar SPV as per the Land Lease Agreement; • provide certain civil and mechanical installation services to the Project as agreed between it and Solar SPV. <u>B2Gold shall:</u> • provide the capital for the construction of the Substation at the Premises, as agreed between it and Nampower; • provide SPS/Solar SPV with the information necessary to design an optimised solar plant; • work together in good faith with Solar SPV and the Landlord to conclude the PPA and all other agreements and necessary regulatory approvals in respect of the Project.
Next Steps	Once this Term Sheet is signed, the following next steps are expected to be: a) the incorporation of Solar SPV by SPS and the Landlord; b) Solar SPV and the Landlord agreeing on the terms of the Land Lease Agreement; c) Solar SPV submitting the necessary applications for the approval of the Project under the MSB model which shall include: (i) commissioning an Environmental Impact Assessment for the Project;

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	(ii) applying for a generation license; (iii) applying for the necessary approvals under the Modified Single Buyer (MSB) model in Namibia; d) B2Gold and Solar SPV agreeing on the terms of the PPA.
Good faith	This Term Sheet commits the Parties to act in good faith and use their best efforts to realise the Project.
Confidentiality	Each Party agrees to keep strictly confidential both the contents and existence of this Term Sheet and the fact that the Parties are in discussions in relation thereto and agrees not to disclose any such matters without the prior written approval of the other Party. No public announcements of any nature whatsoever will be made by or on behalf of either Party, without the prior written consent of the other Party.
General	SPS will provide the Parties with a first draft of the PPA which, once signed, shall replace this Term Sheet. This Term Sheet may be executed in counterparts, each of which shall be deemed to be an original and which together shall constitute the same agreement.

Signed by the Parties as acceptance of the terms and conditions detailed in this document.

Signed at Stellenbosch on 7 July 2021

for **SUSTAINABLE POWER SOLUTIONS INVESTMENTS (PROPRIETARY) LIMITED**

F V. T Lemaat

who warrants that he is duly authorised hereto

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Signed at on 2021

for **B2GOLD NAMIBIA (PROPRIETARY) LIMITED**

A.T. DAWE

who warrants that he is duly authorised A.D
hereto

Signed at on 2021

for **MAXWELL CC**

who warrants that he is duly authorised
hereto

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ANNEXURE A: TECHNICAL DETAILS OF THE SOLAR PLANT

The Solar Plant which consists of a 13,000 kWp (nominal DC capacity) ground-mounted single-axis tracking solar photovoltaic plant

The main technical specifications are:

Solar plant nominal capacity	13,000 kWp
Specific yield	2,452 kWh/kWp/p.a
Annual Solar Plant output (first year)	Approx 31,940,782 kWh/p.a
Modules	Bi-facial, 640Wp (likely Canadian Solar) Tier 1 rated
Inverters (centralised, string)	String inverters 250Wp (likely Sungrow) Tier 1 rated
Tracker	Single axis (East - West) tracker (likely Bi-STI-Norland)

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ANNEXURE B: LOCATION OF SOLAR PLANT

Description of the Premises

ID	FMB/00082
FARM_NAME	MAXWELL
OWNERSHIP	MAXWELL CC
POSTAL_ADD	P O BOX 81 Kalkfeld
DISTRICT	GROOTFONTEIN
REGION	Otjozondjupa
AREA (Ha)	4775.25
X_COORD	16.9727
Y_COORD	-19.91

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APPENDIX E – NBRI LIST, SPECIALISTS BIODIVERSITY STUDY OF THE GENERAL AREA BETWEEN OTJIWARONGO AND OTAVI & AVIFAUNA SPECIALISTS STUDY

APPENDIX F – ECC CVS

ECC ENVIRONMENTAL COMPLIANCE CONSULTANCY

CURRICULUM VITAE

STEPHAN BEZUIDENHOUT

Name of Consultant:	Stephan Bezuidenhout
Position / Profession:	Managing Member & Senior Environmental Practitioner
Date of Birth:	11 April 1989
Nationality:	Namibian
Professional Memberships:	EAPAN, FSC Environmental Chamber, NCE, NCA, N-BiG
Email:	stephan@eccenvironmental.com
Website:	www.eccenvironmental.com
Contact:	+264 81 262 7872

QUALIFICATIONS:

University of Pretoria:	**2011 – 2012**	Postgraduate Degree in Environmental Management and Analysis
University of Stellenbosch:	**2007 – 2010**	Bachelor of Applied Science

PROFILE:

ECC's proudly Namibian Principal leads the ECC team as the lead Environmental Practitioner with a strong and dedicated environmental background. Mr Bezuidenhout has leading practical experience in identifying and applying legislative requirements to proposed projects. Identifying impacts and mitigations for projects within different sectors, including mining, energy, agriculture and construction.

KEY AREAS OF EXPERTISE:

Agriculture and Ecology	-	Aftercare, rehabilitation & restoration methodology & implementation Forest Stewardship Counsil (FSC) implementation and compliance
Environmental (and social) Impact Assessments (EIAs) (ESIAs) & Environmental Management	-	Compiling EIA Reports and EMPs Coordinate and review specialist studies Review EIA reports Environmental Management Systems (EMS) Public Participation & Stakeholder Management
Project Management	-	Management of teams through Southern Africa for various projects

LANGUAGES:

	Read	Write	Speak
English	Excellent	Excellent	Excellent
Afrikaans	Excellent	Excellent	Excellent

Stephan Bezuidenhout
Curriculum Vitae
1
Environmental Compliance Consultancy
ECC

SUMMARY OF EXPERIENCE AND CAPABILITY:

Since 2010, Stephan has been working as an environmental assessment practitioner. Stephan has a strong ecological background and has gained more than ten years' experience in the environmental industry. As a lead practitioner, Stephan has successfully driven environmental impact assessments and compliance assessments within Southern Africa. His hands on and practical experience and knowledge of international standards, such as FSC, IFC and World Bank standards allows Stephan to advise his clients and teams constructively and effectively.

PROJECT EXPERIENCE

PROJECT	DATE	ROLE
Best Practice Guide: Environmental Principles for Mining in Namibia	2017 - 2019	Team member
The FSC National Forest Stewardship Standard of Namibia	(2018-2020)	Part of the working group who compiled the National Standard for Forest Stewardship Council (FSC) in Namibia allowing for a higher rate of certification and improved compliance.
Jumbo Charcoal FSC Group Scheme Management	2015 - 2020	Jumbo Charcoal FSC Group Scheme Management
Biophysical Rehabilitation Plan for ML 42, 43, 44 and 45 as well as an overarching 5-year Biophysical Rehabilitation Plan for Namdeb	2018 - 2019	Part of the ECC team who completed the reporting and aided in the implementation of the Biophysical Rehabilitation Plans for Namdeb.
ESIA amendment for B2Gold Namibia Mining Licence (ML 169) to developed underground working for the Otjikoto (gold mine)	2018 - 2019	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report review).
Kunene Regional Counsel sustainable water supply Pipeline and Ancillary works	2017 - 2018	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report review).
ESIA application for B2Gold Namibia 10.8 megawatt PV solar upgrade to the B2Gold Power Plant	2017 - 2018	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report review).
ESIA application for Otjiwarongo Wastewater Treatment and Bulk Water Supply	2019	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report review).
ESIA for the Wastewater Treatment facilities for Gondwanan Collection	2019	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report review).
MAWF permit application for Water Abstraction and Discharge for Gondwanan Collection	2019	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report review).
EIA application for various exploration activities for Votorantim Metals Namibia Pty Ltd	2018 - Present	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report review).

Abengoa Solar SA, Kaxu Solar One 100MW Concentrating Solar Plants (CSP) Trough	2015 - 2017	Environmental Control Officer during commissioning and rehabilitation phases
Konkoonsies II PV Solar Energy Facility, On-site substation and a 132kV power line Northern Cape, South Africa	2015 - 2017	Environmental Assessment Practitioner during EIA process
Abengoa Solar SA Paulputs CSP (Pty) Ltd. 150 MW CSP Trough Northern Cape, South Africa	2015 - 2017	Environmental Assessment Practitioner during EIA Process
Abengoa Solar SA, Xina Solar One 200 MW CSP Trough Northern Cape, South Africa	2015 - 2017	Environmental Control Officer during construction phase
Soil Remediation and Commissioning report of NGALA Camp for Isondlo Project Support (IPS) (Pty) Ltd Gauteng, South Africa	2015	Lead consultant and project manager.
375 km 26-inch natural gas installation for SASOL & ROMPCO Mozambique representing Worley Parsons (Pty) LTD. South Africa	2013 - 2015	Environmental Coordinator and Manager
Department of Water Engineering (working on a catchment management project for the Municipality of Stellenbosch)	2011 - 2012	Intern at Aurecon South Africa
Other projects	2011-2020	Stephan has successfully completed various other projects in the sectors of Agriculture, Mining, Energy and Tourism where he acted as the Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP, and report review).

PUBLICATIONS

N.S., et al., Some ecological side-effects of chemical and physical bush clearing in a southern African rangeland ecosystem, Southern African Journal of Botany (2015). http://dx.doi.org/10.1016/j.sajb.2015.07.012

The FSC National Forest Stewardship Standard of Namibia (Draft V 4). Co-authored by S Bezuidenhout, P Cunningham, A Ashby, F Detering, W Enslin & D Honsbein

CERTIFICATION:

I, the undersigned, certify that to the best of my knowledge and belief, these data correctly describe me, my qualifications, and experience.

DATE: 21 / 10 /____ 2020

FULL NAME OF CONSULTANT

Jacobus Stephanus Bezuidenhout

ECC ENVIRONMENTAL COMPLIANCE CONSULTANCY

CURRICULUM VITAE

Diaan Hoffman

Name of Consultant:	Diaan Hoffman
Position / Profession:	Junior Ecologist and emerging Environmental Practitioner
Date of Birth:	19 May 1996
Nationality:	Namibian
Professional Memberships:	EAPAN No. 213
Email:	diaan@eccenvironmental.com
Website:	www.eccenvironmental.com
Contact:	+264 81 467 4294

QUALIFICATIONS:

University of Stellenbosch:	**2015 – 2018**	BSc Conservation Ecology

PROFILE:

Highly accomplished professional with experience as an environmental consultant. An out-the-box thinker, passionate about high-quality service in fast-paced environments. Excellent planning and execution ability, able to lead and collaborate with teams to deliver beyond expectations.

KEY AREAS OF EXPERTISE:

Environmental (and social) Impact Assessments (EIAs) (ESIAs)	-	Compiling EIA Reports and EMPs Public Participation & Stakeholder Management
Conservation		Small mammal sampling and parasite analysis. In-depth knowledge of biodiversity and Ecology.

LANGUAGES:

	Read	Write	Speak
English	Excellent	Excellent	Excellent
Afrikaans	Excellent	Excellent	Excellent

SUMMARY OF EXPERIENCE AND CAPABILITY:

Since 2019, Diaan has been working as an environmental assessment practitioner. In 2021 he started working as a junior ecologist assisting with the rangeland management and the FSC standard in Namibia. Diaan has a good biodiversity and ecology background.

PROJECT EXPERIENCE

PROJECT	DATE	ROLE
ENAEX EIA: Assisting with application for Environmental Clearance Certificate (ECC)	2019 - 2020	Team member
Bulk Mining Explosives: Updating EMP and application for renewal of ECC.	2019-2020	Team member
Sand Miners Association: Assisting with the writing of the EIA, EMP and creating of Maps	2019 - 2020	Team member
Okapana (TOTAL) Service Station CC: Conducting and assisting with the whole EIA process.	2019 - 2020	Team member
Walvis Bay Salt Refiners: Measuring Environmental Noise and assisting with the report writing.	2019-2020	Team member
Jumbo Charcoal FSC Group Scheme management.	2021	Team member
Jumbo Charcoal: writing of EMP	2021	Team member
EMCON: Creating Maps and Baseline sections for ESIA	2021	Team member
Nexus Charcoal: Conducting and assisting with the whole ESIA process.	2021	Team member
Etosha Charcoal: writing of EMP	2021	Team member
FSC Mapping and rangeland management	2021	Team member
GIS Mapping: Using QGIS to produce maps for various projects.	2021	Team member
Uis Afrititn EPLs: Conducting and assisting with the whole ESIA process.	2021	Team member
Paratus ESIA: Conducting and assisting with the whole ESIA process.	2021	Team member
Gmundner ESIA: Conducting and assisting with the whole ESIA process.	2021 -Present	Team member
!Uris Amendment: Conducting and assisting with the Amendment	2021 -Present	Team member

CERTIFICATION:

I, the undersigned, certify that to the best of my knowledge and belief, these data correctly describe me, my qualifications, and experience.

DATE: 19/08/2021

Diaan Philip Hoffman

ECC ENVIRONMENTAL COMPLIANCE CONSULTANCY

CURRICULUM VITAE

MATTHEW BLISS

Name of Consultant:	Matthew Bliss
Position / Profession:	Senior Environmental Practitioner
Date of Birth:	26 February 1965
Nationality:	Canadian
Email:	matthew@eccenvironmental.com
Website:	www.eccenvironmental.com
Contact:	+264 81 4904322

TERTIARY EDUCATION:

University of Waterloo:	1984 – 1989	**B.Sc. Applied Co-op Geology**
Lakehead University:	1992 – 1995	**Certified Environmental Assessment**
McGill University:	2013	**Executive CSR Program Certificate**
Amsterdam Centre for Entrepreneurship	2014	**Social Entrepreneur Leader Certificate**

Professional Associations:

- International Water Association, Advisory Board 2015 – 2018
- EITI International Board, Board member 2014 – 2016
- Better Coal, Advisory Board member 2014 – 2016
- Business and Biodiversity Offset Program member 2010 – 2011
- Mining Association of Canada, Initiative Leader 2007 – 2011
- Children's Coalition, Superior Greenstone Region, Parent member 2005 – 2007
- Resource Steering Committee, Terrace Bay Area, Industry representative 1998 – 2006
- Geological Association of Canada 1989 - present

PROFILE:

Matthew Bliss leads various ECC team projects as a senior environmental practitioner with a strong and dedicated environmental background. Mr Bliss has over 25 years of experience in the mining industry and is an international mining and development executive focused on integrating sustainable development into natural resource extraction and governance for the benefit of diverse stakeholders. Twenty-five years of leadership and executive experience in all aspects and phases of resource development ready to leverage for business success.

KEY AREAS OF EXPERTISE:

Environmental Management	-	Compiling EIA Reports and EMPs Coordinate, and

& Environmental (and social) Impact Assessments (EIAs) (ESIAs)		review specialist studies Review EIA reports Environmental Management Systems (EMS) Public Participation & Stakeholder Management
Mine Closure and Rehabilitation		Prepare, negotiate, revise, review, audit closure plans and financial assurance (asset retirement obligation according to GAAP and IFRS). Due diligence reviews of corporate level closure obligations and related plans for acquisition valuation.
Geology	-	Base metal and gold exploration and deposit development and financing. Mine geology and related drilling and resource and reserve development. Geological modelling for groundwater and aquifer assessment.
Project Management	-	Exploration projects Mine development project ESIA projects Risk assessment, environmental, safety and related governance audit projects Tailings dam, and waste rock ARD projects Mine closure and rehabilitation projects Design criteria project

LANGUAGES:

	Read	Write	Speak
English	Good	Good	Good

SUMMARY OF EXPERIENCE AND CAPABILITY:

PROJECT EXPERIENCE

PROJECT	DATE	ROLE
Oil and gas rights negotiations with farmers	1985	Petroleum landman
Alliston aquifer complex geology modelling	1988	Lead, co-author
VMS base metal exploration geochemical index tool development	1988-89	Lead developer, exploration geologist
Flin Flon copper-zinc exploration, MB, Canada	1989-90	Project geologist
Pick Lake zinc deposit development, ON, Canada	1992-95	Project lead
Sturgeon Lake waste rock dump ARD assessment	1992-93	Lead
Sturgeon Lake waste rock dump remediation	1993	Lead
Winston Lake mine closure plan approval	1999-2001	Lead
Winston Lake mine closure, ON, Canada	1999-2007	Lead
Samatosum mine closure, B.C., Canada	2000-07	Lead
White Pine mine closure, Michigan, USA	2001-07	Lead
Lac Dufault mine closure, Quebec, Canada	2001-07	Lead
Towards Sustainable Mining Safety Framework and Protocol development	2009-10	Lead with DeBeers, Barrick
Çayeli mine closure plan revision/approval Turkey	2010	Lead
Çayeli mine closure cost review and revision	2010	Lead

Design criteria for Cobre Panama project EPCM – ESIA and corporate responsibility requirements	2010	Lead
Boroo mine closure plan and costing revision, Mongolia	2011	VP, Lead
Dornod deposit groundwater supply and impact assessment and ESIA	2011-12	VP, Lead
Kumtor mine closure cost revision	2011	VP, Lead
Amulsar gold mine ESG and safety due diligence for acquisition, Jermuk, Armenia	2011	VP, Lead
Masbate gold mine ESG and safety due diligence for acquisition, Masbate, Philippines	2012	VP, Lead
Martabe gold mine ESG and safety due diligence for acquisition, North Sumatra, Indonesia	2012	VP, Lead
Skouries gold mine ESG and safety due diligence for acquisition, Thessolonikki, Greece	2012	VP, Lead
Kumtor 43-101 report environmental and sustainability chapters	2012	VP, Lead – environment and social
Öksüt gold deposit ESIA scoping, Turkey	2012-13	VP, Lead
Extractives team development, den Haag, Netherlands	2013-15	Director
Revise EITI validation criteria and scoring	2014-15	Board, Committee member
Revise EITI standard	2014-15	Board, Committee member
Develop Better Coal standard	2014-16	Advisory Board member
Environmental and closure projects for 80 country governments of IGF	2016-21	Deputy Director, Lead
SE Asia and Asia lead for 19 governments of the IGF region	2016-21	Deputy Director, Lead
Headspring uranium deposit ESIA	2021-22	Lead
Uis tin mine ESIA	2021-22	Reviewer and impact assessor
Osino gold project ESIA	2021-22	Impact assessor
Otjikoto gold mine waste rock dump rehabilitation	2021-22	Inspector
Navachab tailings ESIA, closure plan, EMS	2021-22	Lead

PUBLICATIONS

Aravena, R., Barker, J.F., Bliss, M., Wassenaar, L.I., and Gillham, R.W., 1988. *The origin and distribution of methane in the Alliston aquifer complex.* In: Environment Ontario (Editor), Proc. Technology Transfer Conf. Toronto Environment Section, Section C. Liquid and Solid Waste, Toronto, Ont., 28 – 29 November. Pp. 139 – 151.

Poirier, P., Bliss, M., 2001. Calculations of lime required to neutralising sulphides in waste rock co-disposed with tailings at the Winston Lake Zinc Mine, Canada. International Conference on Mining and the Environment - Securing the Future, Skelleftea, Sweden, 25 June to 2 July 2001.

Bliss, M., 2014. Trade mission to Colombia – Cordaid recommendations to Dutch Government, November 2014. Cordaid factsheet publication

Bliss, M., 2015. *Address to Dutch Parliamentarians during the CSR roundtable*, in lead up to EU vote on conflict minerals, 30 March 2015. Cordaid publication de Zeeuw, J., Kuschminder, J., Kwaw, A., Bliss, M., *Oil exploration in Kenya: Success requires consultation – Assessment of community perceptions of oil exploration in Turkana County, Kenya*. Cordaid publication

IGF and IISD co-authored publications, 2016 to 2021:

- Suriname Mining Policy Framework Assessment
- Rwanda Mining Policy Framework Assessments
- Kyrgyzstan Mining Policy Framework Assessments
- APEC Mine Closure Checklist (Advisor, Editor)
- Papua New Guinea Mine Reclamation Guideline
- Namibia Mine Closure Framework (pending)
- Environmental Management Guidance for Governments

CERTIFICATION

I, the undersigned, certify that to the best of my knowledge and belief, these data correctly describe me, my qualifications, and experience.

DATE: 9 / 03 / 22

FULL NAME OF CONSULTANT
MATTHEW BLISS

CURRICULUM VITAE

LESTER HARKER

Name of Consultant:	Lester Harker
Position / Profession:	Environmental Assessment Practitioner
Date of Birth:	26 February 1988
Nationality:	Namibian
Email:	lester@eccenvironmental.com
Website:	www.eccenvironmental.com
Contact:	+264 81 602 2082

TERTIARY EDUCATION:

University of Stellenbosch: **2006 – 2010** Bachelor of Arts (Environment and Development - attended)

PROFILE:

Lester works as an Environmental Assessment Practitioner with a diverse environmental background. Mr Harker has leading practice experience in fields of construction, exploration, monitoring and audit compliance and consultancy obtained from leading professionals.

KEY AREAS OF EXPERTISE:

Environmental Management	-	Project Management
Environmental (and social) Impact Assessments (EIAs)	-	Conducting and managing various small to large scale EIAs Compiling EIA Reports and EMPs Coordinate and review specialist studies
Environmental & Social Compliance reporting	-	Environmental and Social compliance audits in the construction industry

LANGUAGES:

	Read	Write	Speak
English	Excellent	Excellent	Excellent
Afrikaans	Excellent	Excellent	Excellent

SUMMARY OF EXPERIENCE AND CAPABILITY:

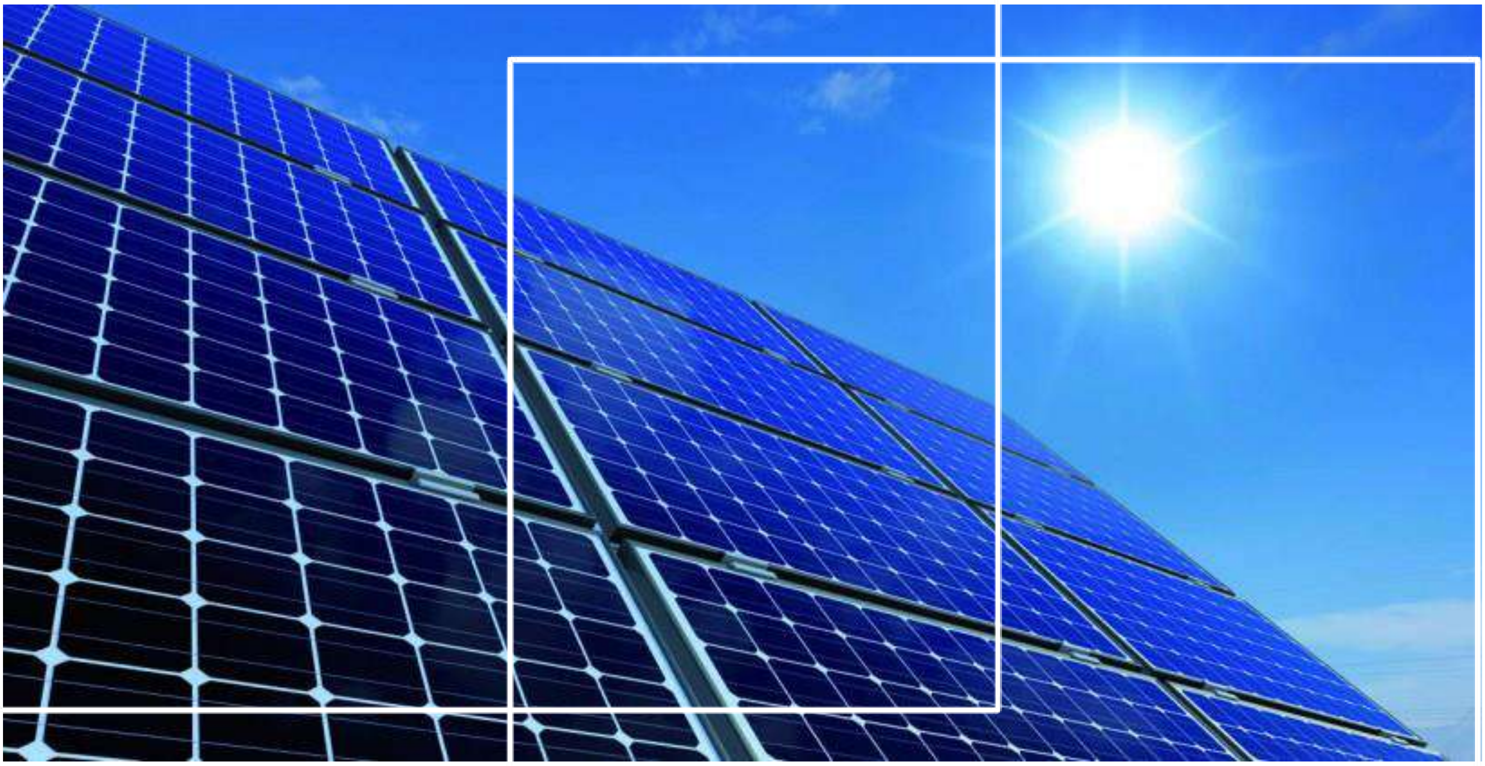
Has over 9 years of work experience. His first three years were as a junior environmental assessment practitioner, but already became involved with the holistic management of EIA projects. The following 5 years he has worked in the environmental management field with experience in Environmental Impact Assessments (EIAs), compliance monitoring and auditing in Namibia, the DRC and Equatorial Guinea. Has above average experience in successful client relations.

PROJECT EXPERIENCE

PROJECT	DATE	ROLE
Collaborated with the British CRIDF donor organisation to conduct a high level environmental investigation to determine the feasibility of treating and reusing the Rehoboth Wastewater facility for agricultural purposes	2015	Environmental Assessment Practitioner
Environmental scoping and impact assessment for exploration activities for Westrine Mining & Exploration Company (Pty) Ltd	2016	Environmental Assessment Practitioner.
Conducted an Environmental Scoping and Impact Assessment for the construction of a cement mining and processing facility in Equatorial Guinea, North Africa, for N.B.L.E Sa.	2016	Environmental Assessment Practitioner.
Conducted an environmental impact assessment for the Dauremas Mineral Development Company for exploration and proposed mining activities, Kunene Region.	2015-2017	Environmental Assessment Practitioner.
Conducted an Environmental Impact Assessment for a terrestrial diamond exploration project south of Aus, Karas Region for Hallie Investment Number 14.	2017	Environmental Assessment Practitioner.
Conducted an environmental performance audit in collaboration with a British firm for a copper and cobalt processing facility for the Somika Sarl Group of Companies operating in the DRC to fund the expansion of their processing facility.	2018	Environmental Assessment Practitioner
Projects Completed while at ECC		
Environmental impact assessment for a pilot sustainable water supply project by means of desalination, powered by solar to supplement water supply for Walvis Bay Erongo Region, Namibia	2020	Environmental Assessment Practitioner
Amendment application for the Palmwag Lodge, Gondwana Namibia.	2020	Environmental Assessment Practitioner
Environmental Assessment for the proposed development of residential, retail including tourism activities on Erf 4747, Swakopmund Namibia.	2020	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement and PPP.
Environmental scoping and impact assessment for the proposed exploration activities on 19 EPLs in the Omaheke and Khomas regions for Kuiseb Copper Company (Pty)Ld	2020	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement and PPP.
Environmental assessment for proposed exploration activities on EPL 7769 for Jin Peng	2020	Lead Environmental Assessment Practitioner managing the EIA process

Lester Harker
Curriculum Vitae
2
Environmental Compliance Consultancy
ECC

Investments (Pty) Ltd		(including stakeholder engagement and PPP.
Environmental assessment for the proposed exploration activities on EPL 7688	2020	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement and PPP.
Environmental and social compliance audit for 21 sites across Namibia under the Education, Training and Quality Improvement Project funded by the African Development Bank	2020	Site audits and development of an audit report and corrective action plan
Environmental Management Plant for an existing charcoal production and storage plant in Outjo, Namibia	2020	Environmental Assessment Practitioner
Environmental and social impact assessment for the proposed biomass processing (Retort System), storage and packaging plant on farm Gai//Khaisa no. 159, Otjozondjupa Region, Namibia.	2020	Environmental Assessment Practitioner
Environmental Management Plan for the proposed mechanised bush thinning operations on farm Gai//Khaisa no. 159, Otjozondjupa Region, Namibia	2020	Environmental Assessment Practitioner
Environmental and social impact assessment for the proposed quarrying activities for dimension stones on mining claims 72236, 72237, 72238, 72239 and 72240, Hardap Region, Namibia	2021	Environmental Assessment Practitioner
Environmental and social impact assessment for the proposed exploration activities on EPLs 7212, 7789, 7964, 7970, 7971, 7972 and 7994 in the Kunene, Otjozondjupa and Khomas regions	2021	Environmental Assessment Practitioner
Environmental and social impact assessment for the airborne electromagnetic surveys across portions within several EPLs in the Omaheke and Khomas regions for Kuiseb Copper Company (Pty) Ltd	2021	Environmental Assessment Practitioner



Submitted to: ISPS Solar Operations Namibia (Pty) Ltd
Attention: Ms Lisbé le Roux and Mr Garth Cloete
The Woodmill, Vredenburg Rd
Stellenbosch, 7600, RSA

REPORT ON:

13 MW SOLAR POWER PLANT – ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

PROJECT NUMBER: ECC-130-375-REP-07-D

REPORT VERSION: REV 01

DATE: APRIL 2022

TITLE AND APPROVAL PAGE

Project Name:	13 MW SOLAR POWER PLANT –Environmental and Social Management Plan
Client Company Name:	ISPS Solar Operations Namibia (Pty) Ltd
Client Name:	Ms Lisbé le Roux and Mr Garth Cloete
Ministry Reference:	APP - **003433**
Authors:	Diaan Hoffman, Lester Harker, Stephan Bezuidenhout, Samual
Status of Report:	Final Submitted to MME & MEFT
Project Number:	ECC-130-375-REP-07-D
Date of issue:	April 2022
Review Period	N/A

ENVIRONMENTAL COMPLIANCE CONSULTANCY CONTACT DETAILS:

We welcome any enquiries regarding this document and its content. Please contact:

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PO Box 91193, Klein Windhoek, Namibia
Tel: +264 81 669 7608
Email: info@eccenvironmental.com

DISCLAIMER

Environmental Compliance Consultancy (ECC) (Reg. No. CC 2013/11401) has prepared this scoping report and the preliminary ESMP on behalf of the Proponent. This report has been authored by employees of ECC, who have no material interest in the outcome of this report, nor do any of the ECC team have any interest that could be reasonably regarded as being capable of affecting their independence in the preparation of this report. ECC is independent of the Proponent and has no vested or financial interest in the Project, except for fair remuneration for professional fees rendered which are based upon agreed commercial rates. Payment of these fees is in no way contingent on the results of this report or the assessment, or a record of decision issued by the Government. Any personal views or opinions expressed by the writer may not necessarily reflect the views or opinions of Environmental Compliance Consultancy or its client.

Please note at ECC we care about lessening our footprint on the environment; therefore, we encourage that all documents are printed double-sided.

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DEFINITIONS AND ABBREVIATIONS

ABBREVIATIONS	DESCRIPTION
dB	Decibel
ECC	Environmental Compliance Consultancy
EIA	Environmental Impact Assessment
EMA	Environmental Management Act, No. 7 of 2007 and its regulations
ESMP	Environmental and Social Management Plan
IFC	International Finance Corporation
km	kilometre
MAWLR	Ministry of Agriculture, Water and Land Reform
MEFT	Ministry of Environment Forestry and Tourism
MME	Ministry of Mines and Energy
MSB	Modified Single Buyer
MSDS	Material Safety Data Sheet
MW	Megawatts
OSH	Occupational Safety and Health
PPE	Personal Protective Equipment
PV	Photovoltaic
SANS	South African National Standards
SHE	Safety Health Environmental

1 INTRODUCTION

1.1 BACKGROUND TO THE PROPOSED PROJECT

Environmental Compliance Consultancy (ECC) has been engaged by the Proponent ISPS Solar Operations Namibia (Pty) Ltd to undertake an environmental assessment process and develop a scoping report and an environmental and social management plan (ESMP) in terms of the Environmental Management Act, No. 7 of 2007 and its regulations. An environmental clearance application will be submitted to the relevant competent authority: The Ministry of Mines and Energy (MME) and the Ministry of Environment, Forestry, and Tourism (MEFT).

The Proponent, ISPS Solar Operations Namibia (Pty) Ltd proposes the construction and operation of a 13 megawatts (MW) solar photovoltaic (PV) power plant on farm Maxwell No. 82, which will linked to the Eldorado substation and supply B2Gold (Otjikoto mine) with electricity through the Namibian Modified Single Buyer (MSB) framework. Farm Maxwell No. 82 is located between Otjiwarongo and Otavi to the northwest of the Otjikoto mine (B2Gold). The farm can be accessed by driving along the B1 road for approximately 61 km from Otjiwarongo (en route to the Otavi) and turning onto the D2886 road. The proposed site is situated to the northeastern side of the road approximately 13 km from the B1 highway. The location is shown in Figure 1.

1.2 ENVIRONMENTAL REGULATORY REQUIREMENTS

This ESMP has been developed by following the requirements of the Environmental Management Act, No. 7 of 2007 and its regulations (EMA).

Legislation that should be adhered to include the following mentioned in table 1.

National regulatory regime	Relevance to the Project
Constitution of the Republic of Namibia of 1990	Social protection
Atmospheric Pollution Prevention Ordinance 11 of 1976	Social and Biophysical landscape protection
Environmental Management Act, No. 7 of 2007 and its regulations, including the Environmental Impact Assessment Regulations, No. 30 of 2012	Environmental Management
Electricity Act No. 4 of 2007 & its Regulations.	Project-related
National policy for Independent power Producers (PPs) of 2018	Project-related
Soil Conservation Act, No. 76 of 1969 and the Soil Conservation Amendment Act, No. 38 of 1971	Biophysical protection
Water Act, No. 54 of 1956	Water source protection
The Forestry Act, No. 12 of 2001 as amended by the Forest Amendment Act, No. 13 of 2005	Vegetation protection
Nature Conservation Ordinance Act No. 4 of 1975 and its regulations.	Biodiversity protection
Labour Act, No. 11 of 2007 and regulations relating to the Health and Safety of employees at Work (No. 156 of 1997)	Social protection
National Heritage Act, No. 27 of 2004.	Heritage protection
The Regional Councils Act (No. 22 of 1992)	Project-related
Draft Pollution Control; and Waste Management Bill (1999)	Biophysical landscape protection
Hazardous Substances Ordinance	Biophysical landscape protection

National regulatory regime	Relevance to the Project
Ordinance No. 14 of 1974	
IFC STANDARDS	**POSSIBLE RELEVANCE**
Performance Standard 1	Assessment and Management of Environmental and Social Risks and Impacts
Performance Standard 4	Community Health, Safety, and Security

1.3 Purpose of the ESMP

This ESMP provides a logical framework, proposed mitigation measures and management strategies for the activities associated with the proposed Project, in this way ensuring that the potential environmental and social impacts are mitigated and minimised as far as practically possible and that statutory and other legal obligations are adhered to and fulfilled. Outlined in the ESMP are the protocols, procedures and roles and responsibilities to ensure that management arrangements are effectively and appropriately implemented.

This ESMP forms an appendix to the environmental scoping report and impact assessment and has been based on the findings of the assessment; therefore, the environmental scoping report should be referred to for further information on the proposed Project, assessment methodology, applicable legislation, and assessment findings.

This ESMP is a live document and shall be reviewed at predetermined intervals, or updated when the scope of work alters, or when further data or information can be added. All personnel working on the Project will be legally required to comply with the standards set out in this ESMP.

The scope of this ESMP includes all activities carried out during the construction and operational stages of the Project.

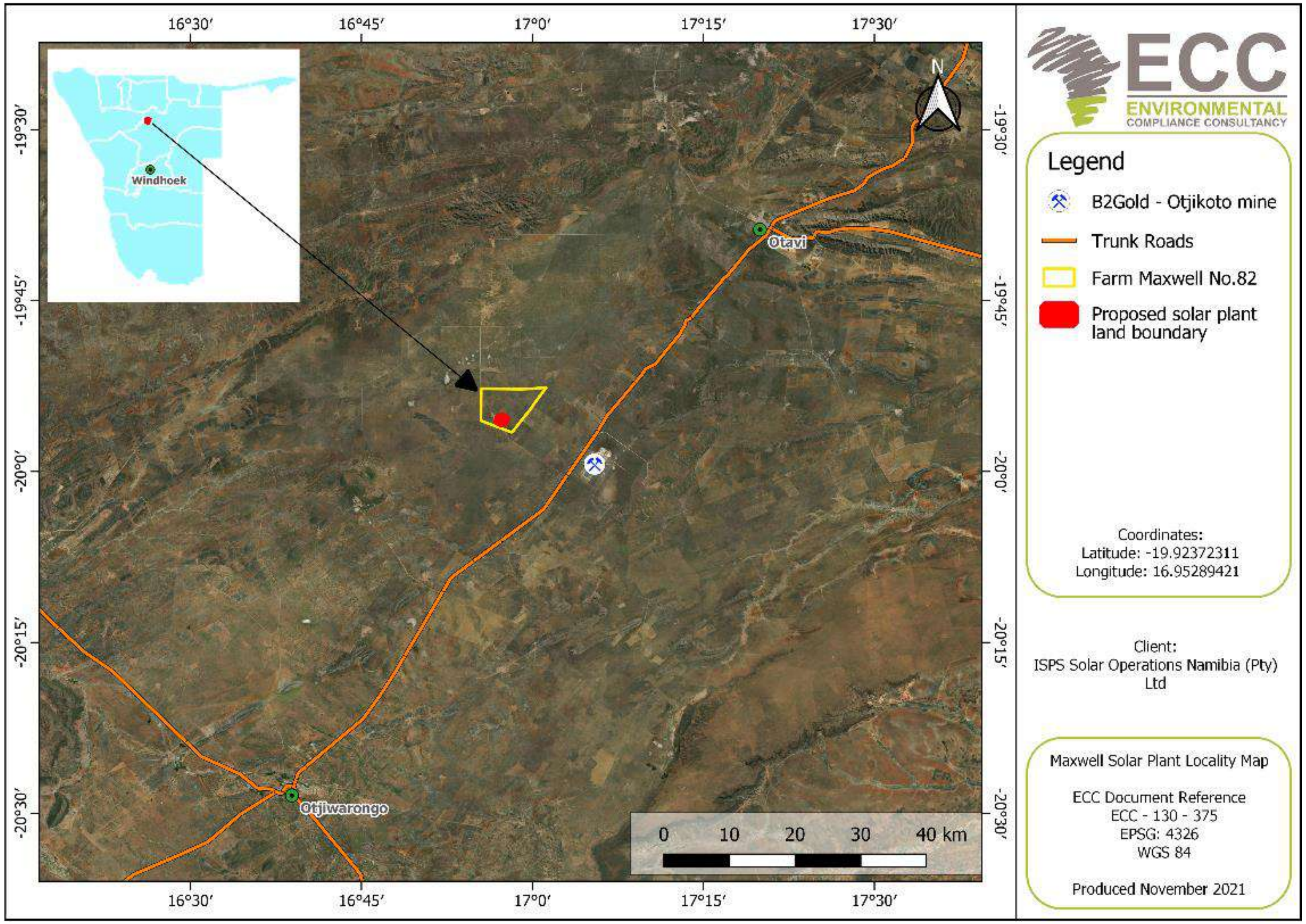

Figure 1 - Locality map showing the location of the proposed Maxwell solar PV power plant.

1.4 MANAGEMENT OF THIS ESMP

The Proponent will hold the environmental clearance certificate for the proposed Project and shall be responsible for the implementation and management of this ESMP. Before the commencement of the Project, this ESMP shall be reviewed, amended as required and approved for implementation. The implementation and management of this ESMP and thus the monitoring of compliance shall be undertaken through daily duties and activities as well as monthly inspections.

This report presents the ESMP and has been undertaken in terms of the requirements of the EMA of 2007 and its regulations.

1.5 LIMITATIONS, UNCERTAINTIES AND ASSUMPTIONS OF THIS ESMP

This ESMP does not include measures for compliance with statutory occupational health and safety requirements. This will be provided in the safety management plan to be developed by the Proponent. The Proponent should also ensure that all Nampower safety requirements and recommendations with regards to the overhead powerline are followed and adhered to.

Where there is any conflict between the provisions of this ESMP and any contractor's obligations under their respective contracts, including statutory requirements (such as licences, Project approval conditions, permits, standards, guidelines, and relevant laws), the contract and statutory requirements are to take precedence provided they are not in conflict with any environmental law or will in any way damage the environment beyond the limits set in the final approved ESMP.

The information contained in this ESMP has been based on the Project description as provided in the environmental scoping report.

1.6 ENVIRONMENTAL AND SOCIAL ASSESSMENT PRACTITIONER

Environmental Compliance Consultancy (ECC) (Reg. No. CC 2013/11401) has prepared this ESMP on behalf of the Proponent.

This report has been authored by Employees of ECC, who have no material interest in the outcome of this report, nor do any of the ECC team have any interest that could be reasonably regarded as being capable of affecting their independence in the preparation of this report. ECC is independent of the Proponent and has no vested or financial interest in the Project, except for fair remuneration for professional fees rendered which are based upon agreed commercial rates. Payment of these fees is in no way contingent on the results of this report or the assessment, or a record of decision issued by the

Government. No member or employee of ECC is or is intending to be, a director, officer, or any other direct Employee of ISPS Solar Operations Namibia (Pty) Ltd. No member or employee of ECC has or has had, any shareholding in ISPS Solar Operations Namibia (Pty) Ltd.

Environmental Compliance Consultancy
PO Box 91193, Klein Windhoek, Namibia
Tel: +264 81 669 7608
Email: info@eccenvironmental.com

2 PROJECT MANAGEMENT PERSONNEL

The Proponent shall provide a Project team to oversee the completion of current construction and proposed operational activities, which shall be composed of the Proponent's personnel and contractors. A nominated role shall be identified to ensure the management and implementation of this ESMP throughout the Project is carried out, which shall be supported by the Proponent.

2.1 ORGANISATIONAL STRUCTURE, ROLES AND RESPONSIBILITIES

The Proponent shall be responsible for:

- Ensuring all members of the Project team, including contractors, comply with the procedures set out in this ESMP
- Ensuring that all persons are provided with sufficient training, supervision, and instruction to fulfil this requirement
- Ensuring that any persons allocated specific environmental responsibilities are notified of their appointment and confirm that their responsibilities are clearly understood

Contractors shall be responsible for ensuring and demonstrating that all personnel employed by them are compliant with this ESMP, and meet the responsibilities listed above

The key personnel and environmental responsibilities of each role through the Project life are presented in Table 1.

Table 1 - Roles and responsibilities

Role	Responsibilities and duties
General Manager (Proponent)	– Responsible for ensuring compliance with this ESMP; – Ensuring employees understand and comply with the requirements of this ESMP; – Ensuring that all personnel are provided with enough training, supervision, and instruction to fulfil this requirement; – Ensuring compliance with this ESMP including overseeing the day-to-day activities during operations, and routine and non-routine maintenance works during operations; – Ensure the environmental policy is communicated to all personnel; – Responsible for providing the required resources (including financial and technical) to complete any required tasks; – Responsible for the management, maintenance and revisions of this ESMP;

Role	Responsibilities and duties
	– Maintain community issues and concerns register and keep records of complaints and responses provided; – Maintain an up-to-date register(s) of employees who have completed the site induction; – Ensuring that best environmental practice is undertaken throughout the operations of the solar PV plant; – Notifying relevant regulatory authorities as soon as possible if serious environmental incidents occur. – Being responsible for all management plans and environmental monitoring; and – Receiving and responding to environment-related complaints received from the public or other stakeholders.
Foreman (Appointed HSE responsible person)	– The site manager/foreman will be responsible for the implementation of the ESMP for the proposed solar PV plant. The foreman will be available, as required, throughout the operation of the solar plant and is responsible for the following roles: – Bearing authority and independence to demand reasonable steps as required to avoid or minimise unintended or adverse environmental impacts, and failing the effectiveness of such steps, to direct that relevant construction activities be ceased immediately should an adverse impact on the environment be likely to occur; – Weekly checklists must be completed by the foreman and findings submitted to the general manager; – Monthly ESMP checklists must be completed by the foreman. Findings are to be submitted to the general manager; – Provisioning of environmental awareness/management training and inductions; – Ensuring that best environmental practice is undertaken throughout the operations of the solar plant; – Timely distribution of any relevant environmental documentation, including revisions to this ESMP to all staff; – Responsible for being compliant with and adhering to this ESMP at all times; – Ensuring they have undertaken a site induction and are conversant with the requirements of this ESMP; and – Reporting of any operations and conditions that deviate from the ESMP or any non-compliant issues or accidents to the Proponent.
Employees/ Contractors as well as visitors	– Any contractors hired for operation or maintenance activities at the solar plant shall be compliant with this ESMP, and shall be responsible for the following:

Role	Responsibilities and duties
where applicable	– Undertaking activities by following this ESMP as well as relevant policies, procedures, management plans, statutory requirements, and contract requirements; – Implementing appropriate environmental and safety management measures; – Reporting environmental issues, including actual or potential environmental incidents and hazards, to the Proponent; and – Ensuring appropriate corrective or remedial action is taken to address all environmental hazards and incidents reported by employees and subcontractors.

2.2 EMPLOYMENT

The Proponent and all contractors shall comply with the requirements of the Republic of Namibia Regulations for Labour, Health and Safety, and any amendments to these regulations. The following shall be complied with:

- In liaison with local government and community authorities, the Proponent shall ensure that local people have access to information about job opportunities and are considered first for construction/maintenance contract employment positions;
- The number of job opportunities shall be made known together with the associated skills and qualifications;
- The maximum length of time the job is likely to last shall be indicated;
- Foreign workers with no proof of permanent legal residence shall not be hired;
- Every effort shall be made to recruit from the group of unemployed workers living in the surrounding area; and
- Every employee hired must be provided with a valid employment contract stating, the position hired for, the hourly remuneration offered.

3 COMMUNICATION AND TRAINING

It is important that regular communication is maintained with all the stakeholders and that stakeholders are made aware of potential impacts and how to minimise or avoid them. This section sets out the framework for communication and training in relation to the ESMP.

3.1 COMMUNICATIONS

The foreman/site manager shall communicate any environmental issues to the Project team through the following means (as and when required):

- Site induction;
- Internal and external audits and site inspections;
- Toolbox talks, including instruction on incident response procedures; and
- Briefings on key Project-specific environmental issues.

This ESMP shall be distributed to the Project team including any contractors and personnel working on the site to ensure that the environmental requirements are adequately communicated. Key activities and environmentally sensitive operations shall be briefed to workers and contractors.

During the construction and operational activities, communication amongst the management team shall include discussing any complaints received and actions to resolve them, any inspections, audits or non-conformance with this ESMP, and any objectives or target achievements.

3.2 ENVIRONMENTAL EMERGENCY AND RESPONSE

The general manager and the foreman are the primary contact persons in the event of an environmental emergency. The general manager has the authority and independence to request reasonable steps be taken to avoid or minimise unintended or adverse environmental impacts and failing the effectiveness of such steps, to direct that relevant actions be ceased immediately should an adverse environmental impact be anticipated. In the event of an incident that requires emergency services, the following services should be contacted.

Table 2 - Emergency contact details

Town	Ambulance	Police	Fire brigade
Otjiwarongo	+264 (67) 30-3734	+264 (67) 1-0111	+264 (67) 30-4444
Otavi	+264 (67) 23-4194	+264 (67) 23-4006	-

All employees need to be made aware of emergency procedures and what to do in the event of an emergency. This must be included in the training of employees. Regular documented drills also need to be carried out to ensure the competence of all employees in different emergencies.

3.3 COMPLAINTS HANDLING AND RECORDING

The Proponent shall maintain a complaint register that will detail the name and contact details of the complainant, the date and time of the complaint, the nature of the complaint, the appropriate action is taken to resolve issues, and the date of complaint handover. The Proponent shall be responsible for nominating the correct personnel to coordinate and resolve the issue.

Any complaints received verbally shall be recorded as per above and the information shall be given to the Proponent who is responsible for the management of complaints and will provide a written response to the complainant.

The workforce shall be informed about the complaints register, its location and the person responsible, to refer residents or the public who wish to lodge a complaint. The complainant shall be informed in writing of the results of the investigation and action to be taken to rectify or address the matter(s). Where no action is taken, the reasons why are to be recorded in the register.

The complaints register shall be kept for the facility and will be available for government or public review upon request.

3.4 SITE INDUCTION

All personnel involved in the Project shall be inducted to the site with a specific environment and social awareness training component. The environment and social awareness training shall ensure that personnel are familiar with the principles of this ESMP, the environment and social aspects and impacts associated with their activities, the procedures in place to control these impacts and the consequences of departure from these procedures. The Proponent shall ensure a register of completed training is maintained.

The site induction should include, but not be limited to the following:

- A general site-specific induction that outlines:
  - What is meant by “environment” and “social”;
  - What are the environmental risks and impacts of the solar plant;
  - What can be done to mitigate against such impacts; and
  - Why the environment needs to be protected and conserved
- The inductee's role and responsibilities concerning implementing the ESMP;
- The site environmental rules;
- Details of how to deal with, and who to contact if environmental problems do occur;
- Basic vegetation clearing principles and species ID sheets;
- Focal themes such as compliance, reporting of accidents and incidents, good housekeeping and standard procedures for waste management;
- The potential consequences of non-compliance with this ESMP and relevant statutory requirements; and
- The roles of responsible people for the Project.

4 REPORTING, COMPLIANCE AND ENFORCEMENT

4.1 ENVIRONMENTAL INSPECTIONS AND COMPLIANCE MONITORING

4.1.1 DAILY COMPLIANCE MONITORING

A copy of this ESMP shall be accessible, up-to-date, and on-site throughout the Project and shall be available upon request. It is the responsibility of the foreman/site manager to enforce the provisions of this ESMP and ensure this ESMP is complied with by all personnel daily throughout the facility. Daily, weekly and monthly inspections will be undertaken. Any environmental problems or risks identified shall be notified to the foreman and actioned as soon as is reasonably practicable.

4.1.2 MONTHLY COMPLIANCE MONITORING

Monthly inspections shall be undertaken by the general manager to check that the standards and procedures set out in this ESMP are being complied with. Any non-conformance shall be recorded, including the following details: a brief description of non-conformance, the reason for the non-conformance, the responsible party, the result (consequence), the corrective action taken and any necessary follow up measures required.

4.1.3 REPORTING

There shall be a requirement to ensure that any incident or non-compliance, including any environmental issue, failure of equipment or accident, is reported to the general manager.

4.2 RELEVANT PERMITS & BEST PRACTICE

Table 3 outlines some of the important permit applications with regards to the proposed Project and the following best practice documents apply to this development:

- **IUCN:** Mitigating biodiversity impacts associated with solar and wind energy development Guidelines for Project developers;
- **BirdLife South Africa:** Best practice guidelines - Birds & Solar Energy Guidelines for assessing and monitoring the impact of solar power generating facilities on birds in southern Africa; and
- **IFC:** Utility-Scale Solar Photovoltaic Power Plants. A Project Developer’s Guide.

Table 3 - Project-related permit/registration requirements

Permit, licences or registration	Relevant authority	Project bearing
Water abstraction permits	Ministry of Agriculture, Water and Land Reform	An abstraction permit is required for the abstraction of water from a borehole for commercial purposes.
Sewage permits	Ministry of Agriculture, Water and Land Reform	Permits related to the sewage system should be obtained.
Permits for the removal of vegetation	Ministry of Environment, Forestry and Tourism	Permits will need to be obtained for the clearing of vegetation.
Electricity generation licence	Electricity Control Board	The Proponent will need to complete form Form_DGx_PV to apply for an electricity generation licence.

4.3 NON-COMPLIANCE

Where it has been identified that works are not compliant with this ESMP, the Proponent shall employ corrective actions so that the works return to being compliant as soon as possible. In instances where the requirements of the ESMP are not upheld, a non-conformance and corrective action notice shall be produced. The notice shall be generated during the inspections and the general manager shall be responsible for ensuring a corrective action plan is established and implemented to address the identified shortcoming.

A non-compliance event or situation, for example, is considered if:

- There is evidence of a contravention of this ESMP and associated indicators or objectives;
- The foreman or the contractor has failed to comply with corrective or other instructions issued by the manager or qualified authority; or
- The foreman or contractor fails to respond to complaints from the public.

Activities shall be stopped in the event of a non-compliant event identified until corrective action(s) has been completed.

4.4 INCIDENT REPORTING

The general manager must ensure that an accident and incident (including minor or near-miss) reporting system is maintained by the foreman so that all applicable statutory requirements are covered. For any serious incident involving a fatality, or permanent disability, the incident scene must be left untouched until witnessed by a representative of the police. This requirement does not preclude immediate first aid being administered and the location being made safe.

The foreman must investigate the cause of all work accidents and significant incidents and must provide the results of the investigation and recommendations on how to prevent a recurrence of such incidents. A formal root-cause investigation process should be followed.

4.4.1 DISCIPLINARY ACTION

This ESMP is a legally binding document and non-compliance with it shall result in disciplinary action being taken against the perpetrator(s). Such action may take the form of (but is not limited to):

- Fines/penalties;
- Legal action;
- Monetary penalties imposed by the Proponent on the contractor;
- Withdrawal of licence(s); and
- Suspension of work.

The disciplinary action shall be determined according to the nature and extent of the transgression / non-compliance, and penalties are to be weighed against the severity of the incident.

5 ENVIRONMENTAL AND SOCIAL MANAGEMENT

5.1 ENVIRONMENTAL PERFORMANCE MEASUREMENT

Section 5 provides a register of environmental risks and issues, which identifies mitigation and monitoring measures, as well as roles responsible. This register will be subject to regular review by the manager and updated when necessary.

5.2 OBJECTIVES AND TARGETS

Environmental protection is the responsibility of management and if management is environmentally aware, it motivates all employees and their associated business partners, customers and suppliers to think and act in a more environmentally responsible manner. Environmental objectives and targets have been developed so that activities on the proposed site can minimise potential impacts on the environment, as far as reasonably practicable.
Environmental objectives for the Project are as follows:

- Zero pollution incidents;
- Sustainable resource use (water);
- Application of the waste management hierarchy;
- A safe working environment for employees; and
- Use natural resources effectively and efficiently.

5.3 REGISTER OF ENVIRONMENTAL RISKS AND ISSUES

An environmental review of the proposed Project has been completed to identify all the commitments and agreements made within the environmental scoping report. From this, a schedule of environmental commitments and risks has been produced (Table 4), which details deliverables including measures identified for the prevention of damage to the environment during the Project's lifetime.

Table 4 provides a register of environmental risks and issues, which identifies mitigation and monitoring measures, as well as the responsible person. This register will be subject to regular review by the manager and updated when necessary. The general manager will use this register to undertake monthly inspections to ensure the Project is compliant with this ESMP.

Table 4 - Environmental risks and issues, and mitigation and monitoring measures

Task activity/ equipment	Impact identified	Mitigation control measures	Monitoring requirements	Responsibility
Job creation, skills development and business opportunities	Beneficial socio-economic impacts on a local and regional scale	– Maximise local employment and local business opportunities; – Enhance the use of local labour and local skills as far as reasonably possible; and – Ensure that goods and services are sourced from the local and regional economy as far as reasonably possible.	Monthly, annually	Site foreman/ general manager
General construction completion and operational activities	Dust generation during the construction phase, future maintenance/construction and operational activities.	To minimise the potential for dust generation the following management measures should be implemented, as required: – Vehicles must adhere to speed limits to avoid producing excessive dust; – Vehicles and machinery should be maintained to limit exhaust fume emissions; – Use surfaces that minimise dust accumulation and facilitate effective cleaning; – Where an effect is profound, ensure dust suppression measures are in place; and – Employees to use and wear the appropriate PPE.	Daily	Site foreman/ general manager
	Noise generation	The Labour Act, No. 11 of 2007 and Regulations relating to the Health and Safety of Employees at Work (GN 156/1997) should be closely followed for occupational noise exposure, specifically focusing on chapter 6. Section 197 **(**(1) Subject to sub	Daily	Site foreman/ general manager

Task activity/ equipment	Impact identified	Mitigation control measures	Monitoring requirements	Responsibility
		regulations (2) and (3), no employer shall require or permit an employee to work in an environment in which he or she is exposed to an equivalent noise level equal to or exceeding 85 dB(A)**)** and Schedule 3(2) Noise Regulations (regulation 197). The SANS standard for environmental daytime noise is 45 dBA (outdoors) and 35 dBA (indoors) in a rural district. The ESMP should be closely followed to ensure that noise generated stays below these limits, as far as reasonably practicable. – Avoid noise-generating activities that could impact other users of the area by ensuring noisy activities are limited; avoid hammering on metal that generates intermittent noise, especially at night, and ensure appropriate measures are put in place to rectify noise complaints should they occur; – The Proponent should develop a health and safety management plan that takes into account noise generation; and – Ensure that procedures for receiving complaints from nearby land users or residents are in place and responded to timeously.		

Task activity/ equipment	Impact identified	Mitigation control measures	Monitoring requirements	Responsibility
	Employee health and safety.	– Health and Safety management plan should be developed and implemented on-site by the Proponent; – The Labour Act, No. 11 of 2007 and Regulations relating to the Health and Safety of Employees at Work (GN 156/1997) should be adhered to; – Appropriate PPE should be used for relevant tasks on-site; – Safety induction training sessions should be given to all technicians and field staff before commencement of their shifts (i.e., staff conducting electrical works or maintenance); – Risk identification and suitable prevention measures should be employed within the power plant area to eliminate potential impacts; – Frequent maintenance of all equipment and daily inspections done; – Occupational Incidents and accidents on-site should be reported to the division: Occupational Safety & Health (OSH) at the Ministry of Labour, Industrial Relation and Employment Creation, by using form F.5; – Emergency contact details should be readily accessible to contact relevant services during an emergency; – No unauthorized use of equipment should be allowed; – In the unlikely event of a death occurring within site boundaries from occupational negligence or otherwise from	Daily	Site foreman/ general manager

Task activity/ equipment	Impact identified	Mitigation control measures	Monitoring requirements	Responsibility
		a "freak accident event", the area should be secured and all personnel removed from the scene; – A root cause analysis into the event shall be undertaken as soon as practicably possible; – Counselling should be provided to the witnesses and other personnel members who may have been impacted by the event. – Appropriate safety signs should be added near dangerous areas or equipment; and – Employees should be made aware of all possible health and safety risks.		
	Fire management	– Development of a fire management system through the process of risk identification and assessment; – Developing site-specific work procedures as part of the fire management system; – Induction on fire prevention and toolbox talks; – Control and reduce the potential risk of fire by segregating and safe storage of flammable materials; – Avoid potential sources of ignition for example, by prohibiting smoking in and around areas where chemicals/fuel is stored; – Ensure suitable fire-extinguishing equipment is accessed immediately and conveniently whenever necessary. This can	Daily	All Staff members

Task activity/ equipment	Impact identified	Mitigation control measures	Monitoring requirements	Responsibility
		include pails of water, buckets of sand, or portable extinguishers; – For field fires, appropriate fire fighting equipment should be available on-site; – Emergency contact details should be readily available on-site; – Fires made for a "braai"/BBQ within the site area during construction should be monitored and put out to prevent the risks of causing a field fire; and – Ensure key personnel are trained to manage an emergency fire situation.		
	Potential visual disturbances	– Light disturbances should be minimised; – Lighting on-site is to be sufficient for safety and security purposes; – Maintain complaints register on-site to record any complaints; – Lighting should not be a nuisance for any residents/camps or lodges surrounding the site; – Neighbouring farmhouses and buildings should be considered during construction, to prevent reflective light disturbances; – Neighbours should be informed of construction activities and potential duration of activities;	Monthly/ annually	Site foreman/ general manager

Task activity/ equipment	Impact identified	Mitigation control measures	Monitoring requirements	Responsibility
		– The solar PV plant should blend in with the surrounding environment as far as reasonably practicable; and – Ensure that international best practice methods are considered for the construction of the solar PV plant.		
	Site safety and security	– The site should be well secured to prevent theft or vandalism and unauthorized entrance to the premises, which could be ensured by having a security guard on duty, security cameras and security fence/wall on-site; – Contractors and staff should be informed in writing of the consequences when breaking laws or rules; – Ensure that all Nampower safety requirements and recommendations with regards to the overhead powerline are followed and adhered to; – Contractors or staff should not trespass on private land; – Security systems should be well maintained; – All employees should be regularly updated about the safety procedures; and – Emergency contact details should be readily available on-site.	Daily, Monthly and annually	Site foreman/ general manager

Task activity/ equipment	Impact identified	Mitigation control measures	Monitoring requirements	Responsibility
Biodiversity	Potential habitat destruction and disturbance of wildlife.	– Keep or plant native vegetation between solar components (if larger rows are planned between components); – Try to limit the amount of vegetation that is cleared, to limit habitat loss; – Use grazing from animals/livestock, and not chemicals, to control vegetation on-site; – Try to keep some natural habitat intact; – Ensure efficient planning, in order to reduce disturbances in areas that do not form part of the planned construction area; – Reseeding native grasses between solar components; – Planting native vegetation on-site where possible; and – Holes excavated for pylons should be covered/fenced off during night or periods that no construction is taking place.	Daily, Monthly, yearly	General manager/ foreman/ site manager
	The possible encountering of biodiversity on-site	The Nature Conservation Ordinance Act No. 4 of 1975 and its regulations, Controlled Wildlife Products and Trade Act 9 of 2008 and the Animals Protection Act 71 of 1962 should be closely followed with regards to any encounters with wildlife within site boundaries. – No living organism should be removed from the site by anyone other than by a professional/registered animal handler, pest control company, SPCA, MEFT/MAWLR or relevant rehabilitation or wildlife organisations;	Daily, weekly	All staff members

Task activity/ equipment	Impact identified	Mitigation control measures	Monitoring requirements	Responsibility
		– No living organism shall be poached/consumed/harmed or killed for illegal purposes (i.e., illicit trade of pangolins for scales); – Prevent the killing of perceived dangerous species (e.g. snakes); collection of veld foods (e.g. giant bullfrog, tortoise, monitor lizard); any form of poaching (e.g. setting of snares for birds and ungulates, etc.). – Police and MEFT should be notified of any poaching incident involving sensitive or protected species or if such an animal is found on someone within or surrounding the Project site; – If snares or poaching equipment is found in the field it should be removed and destroyed; – Fences should be monitored for potential snares and traps; – Wildlife encountered on-site should be ethically treated; – Nests discovered on infrastructure within the Project site area should not be removed or destroyed if it is not clear that there are no eggs or chicks in the nests; – Nests/eggs/birds should be identified by a professional and action could be taken depending on advice or instruction given by the professional; – Pesticides and herbicides should not be used as far as reasonably possible;		

Task activity/ equipment	Impact identified	Mitigation control measures	Monitoring requirements	Responsibility
		– If there is no other possibility the relevant pesticides/herbicides/chemicals should be used by a professional/registered pest control company and the MSDS of the substance used should be closely followed; – Invasive plant species should be removed and their spread should be prevented; and – Waste on-site should be well managed and removed from the site to prevent animals (i.e. rodents, snakes, scorpions etc) from breeding/living on-site.		
	Potential displacement or harm of threatened or protected species	– Preconstruction monitoring is recommended to determine the presence of any threatened or protected species; – Keep some of the natural habitat on-site intact; – Professional ecologists should evaluate the site for any potential endangered or protected species (i.e., endangered vultures breeding in trees on-site); – Plant native vegetation between solar components, that will not necessarily influence/impact the solar panels (i.e., native grasses); – Do not use pesticides on-site as far as reasonably possible; – Use livestock/wildlife or manual labour to naturally control vegetation on-site; – The breeding season of wildlife should be considered for construction activities (i.e., ground-nesting birds);	Daily	Site forman/ general manager

Task activity/ equipment	Impact identified	Mitigation control measures	Monitoring requirements	Responsibility
		– Regular toolbox talks with construction workers and operational staff on the importance of biodiversity mitigation measures; and – Strict rules should be implemented on-site to prevent any poaching, harming, collection or killing of wildlife.		
	Potential Avifauna collisions	– Keep a record of all avifauna collisions and name of species or photographic evidence with dates; – Lighting on-site should preferably be a colour that does not attract insects, to prevent nocturnal birds from flying into the structures; – Increase monitoring during the rainy season (when pans, dams and drainage lines hold water); – If collisions increase or are higher than the estimated numbers additional bird deterrent measures should be implemented; and – Bird Flight Diverters (i.e., coils, flappers, etc.) should be installed along the entire overhead powerline to minimise/prevent mortalities.	Daily, Monthly	Site foreman/ general manager
	Potential removal of protected plant species	– Use existing roads for access to avoid new tracks; – Minimise clearance areas through proper planning of the construction/operational activities; – Protected plant species should not be removed, without the relevant permission or permits;	Daily, Monthly	Site foreman/ general manager

Task activity/ equipment	Impact identified	Mitigation control measures	Monitoring requirements	Responsibility
	The potential introduction of alien vegetation	– Construction vehicles should not drive in the field or create new tracks, without evaluating the plant species within that area; – Route new tracks around established and protected trees, and clumps of vegetation; – Large trees or shrubs should be evaluated for breeding birds (especially for protected species, for example, white back vultures) before being removed to make way for the power plant; – A professional botanist or ecologist should be on-site to identify any rare, endangered, threatened and protected species; – During toolbox talks and induction sessions, highlight to workers that the removal of significant plants should be avoided; – Where possible rescue and relocate plants of significance; – Plant native vegetation between solar components, “ with acceptable characteristics within engineering constraints” (i.e., grass and small shrubs); – Use grazing from animals/livestock or manual labour, and not chemicals, to control vegetation on-site; – Promote revegetation of cleared areas upon completion of construction activities;		

Task activity/ equipment	Impact identified	Mitigation control measures	Monitoring requirements	Responsibility
		– All Project equipment arriving on-site from an area outside of the Project or coming from an area of known weed infestations (not present on the Project site) should have an internal weed and seed inspection completed before such equipment is used; – Ensure contractors receive induction on preventing the spread of alien weed; – Ensure the potential introduction and spread of alien plants is prevented; – Ensure the correct removal of alien invasive vegetation and prevent the establishment and spread of alien invasive plants; – Eradicate weeds and alien species as soon as they appear; and – Ensure workers are aware of alien species and weeds.		
Heritage	Potential heritage discovery	In case of discovering or unearthing heritage sites, the following measures (chance-find procedure) shall be applied: – Works to cease and the area to be demarcated with appropriate tape by staff, and the general manager to be informed;	Daily	All staff/ general manager

Task activity/ equipment	Impact identified	Mitigation control measures	Monitoring requirements	Responsibility
		– Project manager to visit the site and determine whether work can proceed without damage to findings, mark exclusions boundary and mark the area with GPS; and – Contact the Namibian heritage council or a professional local archaeologist for any heritage finds.		
Emergency Incidents	Soil and water contamination due to inadequate control or accidental release of hazardous substances on site	During the construction and maintenance phases of the Project, the following should be taken into consideration. **Storage** – Separate hazardous and non-hazardous chemicals from each other; – Label chemicals appropriately; – Chemicals with different hazard symbols should not be stored together - clear guidance on the compatibility of different chemicals can be obtained from the Materials Safety Data Sheets (MSDS) which should be readily available; – Store chemicals in a dedicated, enclosed, and secure facility with a roof and a paved/concrete floor. – Consider the feasibility of substituting hazardous chemicals with less hazardous alternatives.	Daily	All staff members

Task activity/ equipment	Impact identified	Mitigation control measures	Monitoring requirements	Responsibility
		Spills The spill kits with the following items as a minimum should be made available on site (If any large fuel or chemical tanks are on-site during the construction or operational phases of the Project): – All up-to-date MSDS, readily available – Absorbent materials; – Shovels; – Heavy-duty plastic bags; – Protective clothing (e.g., gloves and overalls); – Major servicing of equipment shall be undertaken offsite or within appropriately equipped workshops; – For small repairs and required maintenance activities all reasonable precautions to avoid oil and fuel spills must be taken (e.g., spill trays, impervious sheets); – Provision of adequate and frequent training on spill management, spill response and refuelling must be provided to all onsite staff; – No refuelling is to take place within 50 meters of groundwater boreholes, surface water bodies or streams;		

Task activity/ equipment	Impact identified	Mitigation control measures	Monitoring requirements	Responsibility
		– Vehicles and machinery are to be regularly serviced to minimise oil and fuel leaks; and – All major petroleum product spills (spill of more than 200 litres per spill) should be reported to the Ministry of Mines and Energy (MME) on Form PP/11 titled “Reporting of major petroleum product spill’. **The following points, therefore, apply to all areas on the site:** – Assess the situation for potential hazards; – Do not come into contact with the spilt substance until it has been characterised and necessary personal protective equipment (PPE) is provided; and – Isolate the area as required. **The following measures are to be implemented in response to a spill:** – Spills are to be stopped at the source as soon as possible (e.g., close valve or upright drum);		

Task activity/ equipment	Impact identified	Mitigation control measures	Monitoring requirements	Responsibility
		– Spilt material is to be contained to the smallest area possible using a combination of absorbent material, earthen bunds or other containment methods; – Spilt material is to be recovered as soon as possible using appropriate equipment. In most cases, it will be necessary to excavate the underlying soils until clean soils are encountered; – All contaminated materials recovered after a spill, including soils, absorbent pads and sawdust, are to be disposed of at an appropriately licenced facility; and – A written incident report must be submitted to the general manager.		
Groundwater and surface water pollution	Possible nutrient enrichment of groundwater due to leakage of sewage into the groundwater	– The sewage system needs to be well maintained at all times; – Need to carefully investigate the sewage system regularly to look for leakages; – The sewage system and chemical toilets need to be cleaned/pumped regularly by the relevant authority or company with the appropriate permits in place; and – Groundwater needs to be monitored and tested to ensure that there is no contamination if a leak occurred.	Daily/weekly/ monthly	Site foreman/ general manager

Task activity/ equipment	Impact identified	Mitigation control measures	Monitoring requirements	Responsibility
	Water usage on-site	– Abstraction permits should be in place and abstraction monitored; – A water-wise mindset should be adopted on-site; – Water leakages or pipe bursts should be fixed as soon as possible; – Eco-friendly and low water use equipment should be used; and – Activities that require a lot of water (cleaning of solar components etc.) should be monitored to ensure that water is not wasted.	Daily/weekly/ monthly	Site foreman/ general manager
Soil	Potential soil erosion during heavy precipitation or strong winds on-site.	– Follow and adhere to the Soil Conservation Act, No. 76 of 1969 and the Soil Conservation Amendment Act, No. 38 of 1971; – Indigenous vegetation could be planted to prevent erosion; – Rock beds could also be used to prevent erosion on the gentle slopes around infrastructure (if there are any gentle slopes post-construction); and – An erosion control plan should be developed and implemented on-site due to the extent of land to be cleared.	Monthly, annually	Site foreman/ general manager
	Potential soil disturbances	– Follow and adhere to the Soil Conservation Act, No. 76 of 1969 and the Soil Conservation Amendment Act, No. 38 of 1971;	Daily, monthly	Site foreman/ general manager

Task activity/ equipment	Impact identified	Mitigation control measures	Monitoring requirements	Responsibility
		– Try to keep soil disturbances to a minimum, for example only prepare the soil/ground as required for the construction of the solar plant (i.e., foundations); – Prevent driving with heavy vehicles in the field and use existing access roads as far as reasonably possible; – Prevent soil compaction; – Do not leave the ground bare (i.e., replant natural grasses or smaller plant species); – Store and retain topsoil and sub-soil removed from the construction areas for later use during reestablishment (i.e., when construction work is done); – Use native and non-invasive species for "landscaping and rehabilitation works"; – For the rehabilitation of disturbed areas use "soil, mulch and vegetation debris (that contain natural seed stock)" to facilitate natural revegetation; – Use "manual methods (e.g. hoeing or hand-pulling)" for the clearing of vegetation, where possible to limit soil disturbance; and – Soil erosion and sedimentation control measures should be implemented.		

Task activity/ equipment	Impact identified	Mitigation control measures	Monitoring requirements	Responsibility
Waste management	Possible sewage discharge runs the risk of pathogen /diseases transmissions and odours.	– Ensure toilets are always clean and dry; – Provide adequate sanitary facilities, including clean water, soap, disposable paper towels; – Ensure suitable personal protective equipment that may include waterproof/abrasion-resistant gloves, footwear, eye, and respiratory protection; – Face visors are particularly effective against splashes when working with sewage; and – Install an impermeable hardstand in areas of high-risk contamination to prevent ground infiltration by pollutants.	Daily	All staff members
	Environmental pollution (littering and poor storage of solid waste)	– Waste management should be handled in accordance with the International Finance Corporation (IFC) standards as follows: – Implement a waste management plan (from “cradle to grave” methodology) covering all aspects of waste generated on-site; – Training and toolbox talk about the importance of waste management; – Ensure a high standard of housekeeping across within farm boundaries;	Daily/Weekly	All staff members

Task activity/ equipment	Impact identified	Mitigation control measures	Monitoring requirements	Responsibility
		– Solid waste shall be stored in an appointed area in covered, tip-proof metal drums/skips for collection and disposal to an approved waste management site; – The waste storage areas shall always be kept clean and tidy; – Storage of domestic waste on site may result in the attraction of unwanted scavengers and should be removed as soon as it is feasible; – Implement the waste management hierarchy across the site: avoid, reuse, recycle, then the disposal; – Return packaging of hazardous and non-hazardous materials (wherever possible), such as empty bags for reuse; – Solid wastes should be deposited/emptied regularly. – See the material safety data sheets available from suppliers for disposal of contaminated products and empty containers; – Liaise with the governing body (municipality/council) regarding the waste and handling of hazardous waste (if any); – Hydrocarbon and chemical contaminated solids have the potential to cause contamination to the soil, ground and or surface water, thus correct storage and disposal methods are required.		

6 DECOMMISSIONING

In the event that the solar plant is closed (and if ownership is not transferred), the Proponent and the new owner should mutually agree on the way ahead for the site and the infrastructure on-site. If the new owner has no use or plan for the site or buildings on-site the Proponent will be responsible to remove all equipment or any other materials from the site. If infrastructure is removed during decommissioning it is recommended that the Proponent implement a rehabilitation plan for the site, to ensure that the site is safe and that no further degradation to the site can occur.

7 IMPLEMENTATION OF THE ESMP

The proposed solar PV plants construction and operation work will be carried out in compliance with the relevant regulations. Minor to moderately significant impacts are anticipated and management and mitigation measures are in place to eliminate or reduce the severity of potential impacts.

This ESMP:

A. Has been prepared according to a contract with the proponent;
B. Has been prepared based on information provided to ECC up to January 2022;
C. Is for the sole use of the proponent, for the sole purpose of an ESMP;
D. Must not be used (1) by any person other than the Proponent or (2) for a purpose other than an ESMP; and
E. Must not be copied without the prior written permission of ECC.

ECC has prepared the ESMP based on information provided by the Proponent, and the environmental scoping report conducted for ISPS Solar Operations Namibia and the proposed solar PV plant on farm Maxwell No. 82.

ECC-130-375-BID-04-D

BACKGROUND INFORMATION DOCUMENT

THE PROPOSED CONSTRUCTION AND OPERATION OF A 13 MW SOLAR PHOTOVOLTAIC POWER PLANT ON FARM MAXWELL NO.82, OTJOZONDJUPA REGION, NAMIBIA.

PREPARED FOR

ISPS SOLAR OPERATIONS NAMIBIA (PTY) LTD

JANUARY 2022

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BACKGROUND INFORMATION DOCUMENT

THE PROPOSED CONSTRUCTION AND OPERATION OF A 13 MW SOLAR PHOTOVOLTAIC POWER PLANT ON FARM MAXWELL NO.82, OTJOZONDJUPA REGION, NAMIBIA.

1 PURPOSE OF THIS DOCUMENT

The purpose of this Background Information Document (BID) is to provide Interested and Affected Parties (I&APs) a background to the proposed project and to invite I&APs to register as part of the Environmental and Social Impact Assessment (ESIA) process.

The proponent, ISPS Solar Operations Namibia (Pty) Ltd (previously Mettle Solar Namibia Operations), a subsidiary of the Sustainable Power Solutions Investments (Pty) Ltd group intends to construct and operate a 13 MW solar photovoltaic (PV) power plant on farm Maxwell No. 82, which will be linked to the Eldorado substation and supply B2Gold (Otjikoto mine) with electricity through the Namibian Modified Single Buyer (MSB) framework.

Through registering for the project, all I&APs will be kept informed throughout the ESIA process, and a platform for participation will be provided to submit comments/ recommendations pertaining to the project.

This BID includes the following information:

- The proposed project and location;
- The necessity of the project, potential benefits or adverse impacts anticipated;
- The alternatives to the project that have been considered and assessed;
- How the ESIA process works;
- The public participation process and how to become involved; and
- The way forward.

2 DESCRIPTION OF PROPOSED PROJECT

2.1 Brief Introduction

Environmental Compliance Consultancy (ECC) has been engaged by the proponent to undertake an ESIA and develop an Environmental Management Plan (EMP) in terms of the Environmental Management Act, 2007 and its regulations. An environmental clearance application will be submitted to the Ministry of Environment, Forestry and Tourism (MEFT) for the project, which is the relevant authority to issue a Record of Decision (RoD) with regards to the proposed project.

2.2 Location

Farm Maxwell No. 82 is located between Otjiwarongo and Otavi to the northwest of the B2Gold (Otjikoto) mine. The farm can be accessed by road via the B1 highway for approximately 61 km west towards Otavi turning left onto the D2886 district road for another approximate 13 km distance. The location is shown in Figure 1.

2.3 What is Proposed

The proponent proposes to construct and operate a 13MW solar PV power plant on a portion of farm Maxwell No. 82 in the Otjozondjupa Region, Namibia.

2.4 Why is the Project Needed

Namibia is a country with very few overcast days throughout the year, thus being ideal for renewable energy sources like solar power. The proposed solar PV plant will supply the Otjikoto mine with renewable energy; this is an important factor to reduce the carbon footprint of one of Namibia's major gold producers.

2.5 Construction and Operational Phases

The following are envisioned during the proposed project:

- The development involves the construction and operation of a PV farm (solar panels mounted on steel frames, receiving mast and cabling) and will cover an area of approximately 22ha.
- Overhead powerlines will be constructed by Nampower from the new Eldorado substation to the Otjikoto mine to supply the mine with electricity (falls under a separate Nampower project and scoped out of this assessment).
- Furthermore, a permanent ablution block will also be constructed on-site for use during the operational phase.

2.6 Potential Impacts of the Project

2.6.1 Socio-economic

The potential social impacts are anticipated to be of low significance, and those that may transpire shall be confined within the allocated boundary on farm Maxwell No. 82, these potential impacts may include the following:

- Jobs will be created as a result of the project.
- Potential to unearth, damage or destroy undiscovered heritage remains;
- Occupational health and safety;
- Potential visual disturbances to nearby landowners; and
- Minor disruption to the residents of neighbouring farms, including some potential increase in dust and noise levels during the construction phase.

2.6.2 Environmental

Some of the potential environmental impacts are anticipated to be of minor significance, and those that may occur shall be contained within the farm boundaries, these potential minor impacts may include the following:

- Disturbance of soil during the construction phase;
- Potential soil erosion within cleared areas;
- Potential groundwater and soil contamination from chemicals or hydrocarbons spilt during construction and maintenance; and
- Potential sewage or chemical spills from the septic tank and portable chemical toilets.

There may also be impacts of a more significant nature that may require further investigation during the ESIA process. The impacts proposed at this stage include, but are not limited to:

- Vegetation clearing with regards to the proposed construction on a 22 ha area;
- Potential avifauna collision risk with the reflective surfaces;
- Potential impacts on biodiversity and ecology through habitat fragmentation or habitat loss; and
- Potential disturbance or displacement of protected or vulnerable species.

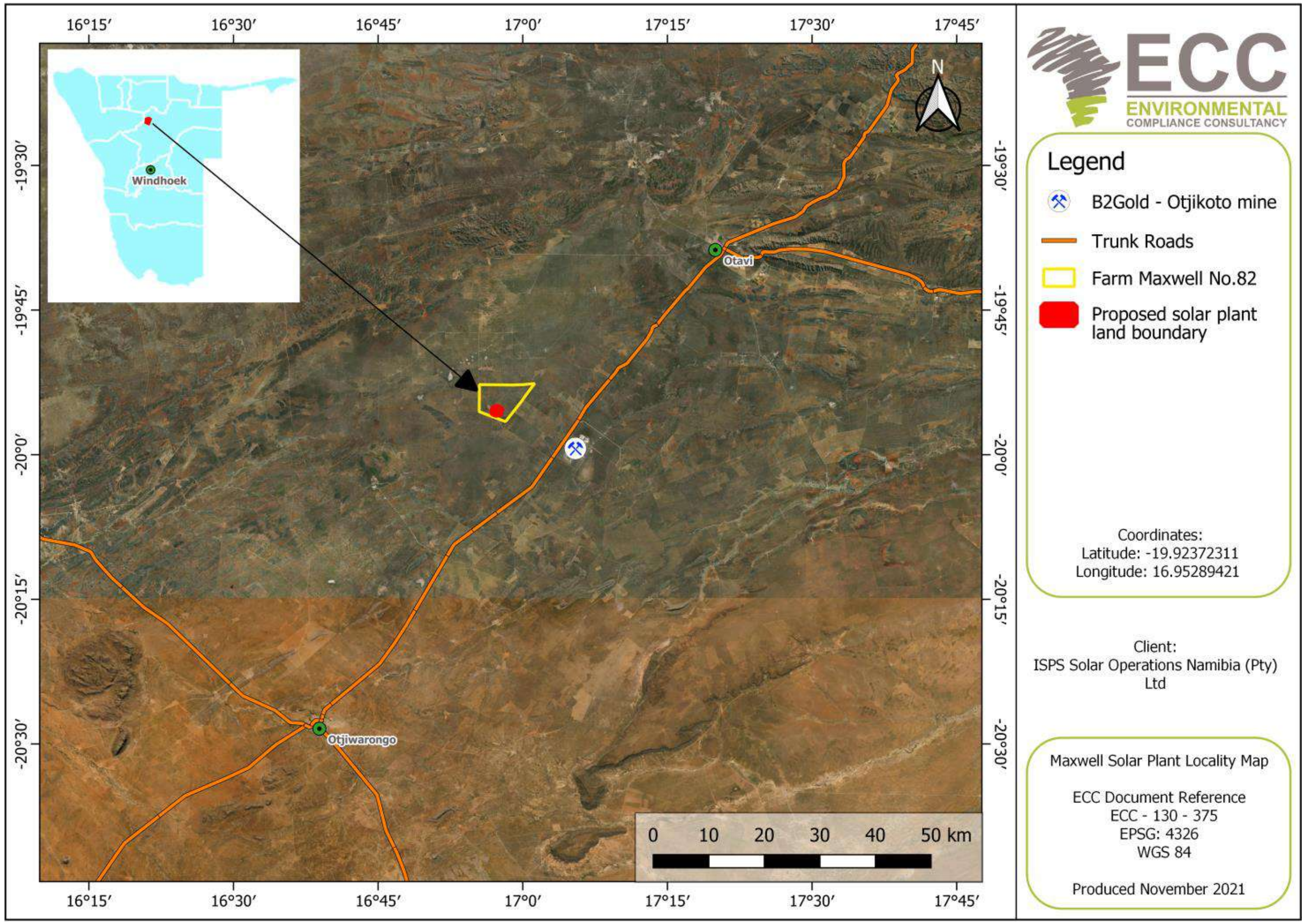

FIGURE 1 – LOCATION MAP OF THE PROPOSED PROJECT

3 CONSIDERATION OF ALTERNATIVES

Best practice environmental assessment methodology calls for consideration and assessment of alternatives to a proposed project.

There were no other readily available and feasible sites, and the current identified location is ideally located near the Otjikoto mine. The landowner has provided permission to the proponent for the development of the proposed solar PV plant.

During the assessment, alternatives will consider optimisation and using eco-friendly solutions to reduce potential impacts.

4 THE ENVIRONMENTAL ASSESSMENT PROCESS

This ESIA, conducted by ECC, is undertaken in terms of the Environmental Management Act, 2007 and its regulations. The process followed in this ESIA is set out in the flowchart in Figure 2.

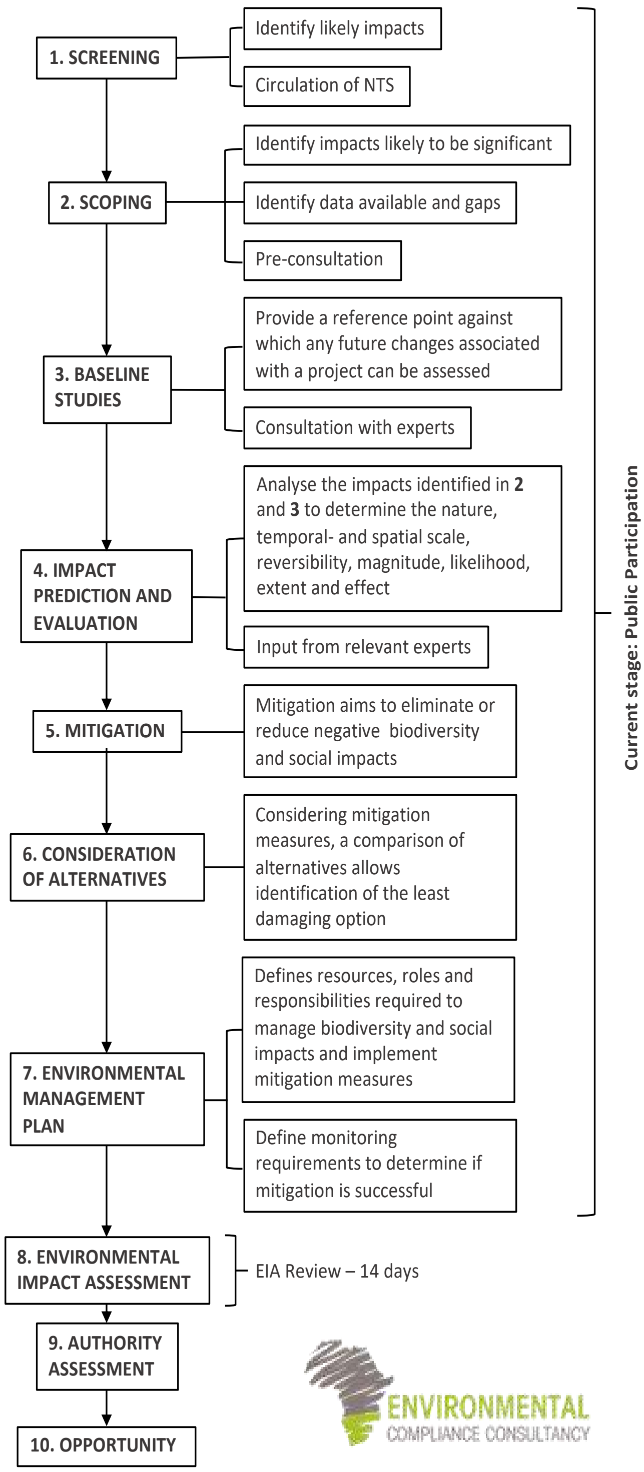

FIGURE 2 - FLOWCHART OF THE ENVIRONMENTAL ASSESSMENT PROCESS

4.1 Screening

A review of the proposed project's screening findings against the listed activities was conducted; the findings of which are summarised below.

ENERGY GENERATION, TRANSMISSION AND STORAGE ACTIVITIES

(1.a) The construction of facilities for the generation of electricity;

(1.b) The construction of facilities for the transmission and supply of electricity;

- A 13 MW solar PV power plant will be constructed and operated on-site.

WASTE MANAGEMENT, TREATMENT, HANDLING AND DISPOSAL ACTIVITIES

(2.1) The construction of facilities for waste sites, treatment of waste and disposal of waste.

(2.3) The import, processing, use and recycling, temporary storage, transit or export of waste.

- Chemical toilets will be used during the construction phase and a septic tank will be installed on-site (operational phase).
- Waste generated during the construction phase will be collected in a skip and will be disposed of at the nearest landfill site.
- The majority of domestic waste will be recycled.

FORESTRY ACTIVITIES

(4.) The clearance of forest areas, deforestation, aforestation, timber harvesting or any other related activity that requires authorisation in term of the Forest Act, 2001 (Act No. 12 of 2001) or any other law.

- Vegetation will be cleared for the construction and installation of the solar PV power plant and ablution facilities, which will cover approximately 22 hectares.

WATER RESOURCE DEVELOPMENTS

(8.1) The abstraction of ground or surface water for industrial or commercial purposes.

- Water will be abstracted for use on-site for the ablution facilities and maintenance cleaning during the operational phase.

HAZARDOUS SUBSTANCE TREATMENT, HANDLING AND STORAGE

(9.2) Any process or activity which requires a permit, licence or other forms of authorisation, or the modification of or changes to existing facilities for any process or activity which requires an amendment of an existing permit, licence or authorisation or which requires a new permit, licence or authorisation in terms of a law governing the generation or release of emissions, pollution, effluent or waste.

- A septic tank will be installed to collect and treat sewage waste.

4.2 Scoping

Due to the nature of the proposed project, and the implementation of industry best practice mitigation measures during the development, construction and operational phases, the effects on the environment and society are expected to be minor to moderate and will be limited to within the farm boundaries.

4.3 Baseline Studies

For the proposed project, baseline information was obtained through a desk-based study by focusing on the environmental receptors that could be affected by the proposed project. ECC will also engage with stakeholders, I&APs and the proponents to seek input into the assessment, and should it be required specialist studies will be initiated.

4.4 Impact Assessment

Impacts will be assessed using the ECC ESIA methodology. The ESIA will be conducted in terms of the Environmental Management Act, 2007 and its regulations. ECC's methodology for impact assessments was developed using IFC standards in particular Performance Standard 1 'Assessment and management of environmental and social risks and impacts' (IFC 2012, 2017) and Namibian Draft Procedures and Guidance for ESIA and EMP (GRN, 2008) including international and national best practice with over 25 years of combined ESIA experience.

4.5 Environmental Management Plan

An EMP shall be developed for the proposed project setting out auditable management actions for ISPS Solar Operations Namibia (Pty) Ltd to ensure careful and sustainable management measures are implemented for their activities in respect of the surrounding environment and community.

4.6 Public Participation and Advertising

Public participation is an important part of the ESIA process; it allows the public and other stakeholders to raise concerns or provide valuable local environmental knowledge that can benefit the assessment, in addition, it can aid the design process. This project is currently at the scoping phase and public participation phase.

At this phase ECC will perform the following:

- Identify key stakeholders, authorities, municipalities, environmental groups and interested or affected members of the public, hereafter referred to as I&APs.
- Distribute the BID for the proposed project (this document).
- Advertise the environmental application in two national newspapers
- Place notices on-site at or near the boundary.
- If required host a public meeting to encourage stakeholder participation and engagement, and provide details of issues identified by the environmental practitioner, stakeholders and I&APs.
- Record all comments of I&APs and present such comments, as well as responses provided by ECC, in the comments and responses report, which will be included in the scoping report that shall be submitted with the application, and
- Circulate I&AP comments to the project team for consideration of project design.

Comments must be submitted in writing and can be emailed using the details in the "contact us" section below.

CONTACT US

We welcome any enquiries regarding this document and its content. Please contact:

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At ECC we make sure all information is easily accessible to the public.

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VERTEBRATE FAUNA AND FLORA ASSOCIATED WITH THE PROPOSED B2GOLD OTJIKOTO GOLD MINE POWER PLANT UPGRADE
[Desktop Study – Baseline/Scoping]

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CONTENTS

Vertebrate fauna and flora associated with the B2Gold Otjikoto Power Plant Upgrade

1. Introduction

A desktop study (i.e. literature review) was conducted between 30 March and 2 April 2017 on the vertebrate fauna (i.e. reptiles, amphibians, mammals and birds) and flora (i.e. trees/shrubs larger >1m in height and grass) expected to occur in the general B2Gold Otjikoto Mine (Otjiwarongo/Otavi) area – i.e. for the proposed Photovoltaic (PV) Power Plant upgrade (22ha) located within the B2Gold Otjikoto ML area.

This literature review was to determine the actual as well as potential vertebrate fauna and flora associated with the general area commonly – albeit broadly – referred to as the Thornbush Savannah (Tree and Shrub Savannah) (Giess 1971) or Thornbush Shrubland (Mendelsohn *et al.* 2002). The vegetation structure is classified as Acacia shrublands (Mendelsohn *et al.* 2002). The main ephemeral rivers draining the general area are the Ugab River to the northwest and Omabonda, Ondaugaura and Waterberg Rivers – tributaries to the Omatako – to the south and southeast.

The Savannah Biome – of which the B2Gold (Otjikoto Mine) area forms part of – is underrepresented in the protected area network in Namibia covering 37% of the land area, but only 7.5% of the biome (Barnard 1998). Although the Thornbush Savannah is not classified as an area of special ecological importance, certain features such as mountains, inselbergs and ephemeral drainage lines throughout this vegetation type are important (Curtis and Barnard 1998).

The general B2Gold (Otjikoto Mine) area is regarded as "moderate to high" in overall (all terrestrial species) diversity and endemism (Mendelsohn *et al.* 2002). According to Simmons (1998b) central Namibia has between 161-200 endemic vertebrates (all vertebrates included). The overall diversity and abundance of large herbivorous mammals (big game) is viewed as "high" with 7-8 species while the overall diversity of large carnivorous mammals (large predators) is determined at 4 species with leopard and cheetah being the most important with "medium" densities followed by brown hyena with "low" densities (Mendelsohn *et al.* 2002).

According to Maggs (1998) there are approximately 4344 higher plant species with the most species being within the grasses (422), composites (Asteraceae) (385), legumes (Fabaceae) (377) and fygies (Mesembryanthemaceae) (177), recorded from Namibia. Total species richness depends on further collecting and taxonomic revisions. High species richness is found in the Okavango, Otavi/Karsveld, Kaokoveld, southern Namib and Central Highland (Windhoek Mountains) areas. Endemic species – approximately 687 species in total – are manly associated with the Kaokoveld (northwestern) and the succulent Karoo (southwestern) Namibia. The major threats to the floral diversity in Namibia are:
1). Conversion of the land to agriculture (with associated problems) and,
2). poorly considered development (Maggs 1998, Mendelsohn *et al.* 2002).

The **Thornbush Savannah** is the dominant vegetation type in central Namibia. Although the vegetation in the Thornbush Savannah/Thornbush Shruband varies considerably with large areas dominated by *Acacia* species, characteristic species include *Acacia mellifera* subsp. *detinens*, *A. reficiens*, *A. hebeclada* subsp. *hebeclada*, *A. erubescens*, *A. fleckii* and in some places *A. tortilis* subsp. *heteracantha*. Another tree species usually present is *Boscia albitrunca* with *Philenoptera nelsii* and *Ziziphus mucronata* also occurring in this vegetation type (Giess 1971).

Grass cover varies depending on soil type with climax grasses such as *Anthephora pubescens, Brachiaria nigropedata* and *Digitaria* species and *Urochloa bolbodes* representative. *Stipagrostis uniplumis* and *Schmidtia pappophoroides* also occur in this vegetation type in the course of succession (Giess 1971).

The average plant production is "very high" with the variation in green vegetation biomass viewed as "low" estimated at 5-10% (Mendelsohn *et al.* 2002). Simmons (1998b) puts the plant endemism in the general area at between 1 and 10 species depending on the locality. The overall plant diversity (all species - "higher" plants) in the general area is "high" and estimated at 400-499 species (Mendelsohn *et al.* 2002). Plant endemism is "low" with 2-5 species expected from the general area.

Bush thickening or encroachment is viewed as an economic problem in the general area with an estimated 4,000 to 12,000 plants/ha – mainly *Acacia mellifera* and *Dichrostachys cinerea* being the dominant problematic species (Bester 2001, Cunningham 1998, Mendelsohn *et al.* 2002).

The B2Gold (Otjikoto Mine) area is not part of the communal conservancy system in Namibia with the closest such conservancy being the Ozonahi Conservancy and Otjituuo Conservancy to the east (Mendelsohn *et al.* 2002, NACSO 2010). The closest Freehold Conservancies are the Ombotozu (farms to the northeast of the mine) and Waterberg (farms to the southeast of the mine) Conservancies (Mendelsohn *et al.* 2002, See: www.canam.iway.na). The closest formally protected area is the Waterberg Plateau Park and the Etosha National Park located approximately 60km southeast and 70km northwest of the mine, respectively.

It is estimated that at least 80 reptile, 14 amphibian, 90 mammal, 236 bird species (breeding residents), at least 91-128 larger trees and shrubs and up to 111 grasses are known to or expected to occur in the general B2Gold (Otjikoto Mine) area of which a high proportion (e.g. 26.3% endemic reptiles) are endemics.

2 Methods

2.1 Literature review

A comprehensive and intensive literature review (i.e. desktop study) regarding the vertebrate fauna – e.g. reptiles, amphibians, mammals and birds – and flora (e.g. trees/shrubs >1m in height, grasses and herbs, etc.) that could potentially occur in the general B2Gold (Otjikoto Mine) area was conducted using as many references as manageable. A list of the references consulted can be viewed in the Reference section (Page 29).

3. Results

3.1 Reptile Diversity

The reptile diversity known, and/or expected to occur in the general B2Gold (Otjikoto Mine) area is indicated in Table 1:

Table 1. Reptile diversity known and/or expected to occur in the general B2Gold (Otjikoto Mine) area – i.e. north-central Namibia.

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International Status		
			SARDB (2004)	IUCN (2016)	CITES
TURTLES AND TERRAPINS					
Stigmochelys pardalis	Leopard Tortoise	Vulnerable; Peripheral; Protected Game			C2
Psammobates oculiferus	Kalahari Tent Tortoise	Vulnerable; Protected Game			C2

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International Status		
			SARDB (2004)	IUCN (2016)	CITES
Pelomedusa subrufa	Marsh/Helmeted Terrapin	Secure			C3
SNAKES					
Blind Snakes					
Rhinotyphlops boylei	Boyle's Beaked Blind Snake	Endemic; Secure			
Rhinotyphlops schinzi	Schinz's Beaked Blind Snake	Endemic; Secure	P		
Rhinotyphlops schlegelii	Schlegel's Beaked Blind Snake	Secure			
Thread Snakes					
Leptotyphlops scutifrons	Peters' Thread Snake	Secure			
Pythons					
Python anchietae	Dwarf Python	Endemic; Insufficiently known; Protected game		LC	C2
Python natalensis	Southern African Python	Vulnerable; Peripheral; Protected Game	V		C2
Burrowing Asps					
Atractraspis bibronii	Bibron's Burrowing Asp	Secure			
Atractraspis duerdeni	Duerden's Burrowing Asp	Endemic; Insufficiently known; Rare?			
Purple-glossed Snakes					
Amblyyodipsas ventrimaculata	Kalahari Purple-glossed Snake	Secure			
Quill Snouted Snakes					
Xenocalamus bicolour bicolor	Bicoloured Quill-snouted Snake	Secure			
Xenocalamus mechowii	Elongate Quill-snouted Snake	Secure			
Typical Snakes					
Lamprophis fuliginosus	Brown House Snake	Secure			
Lycophidion capense	Cape Wolf Snake	Secure			
Mehelya capensis	Cape File Snake	Secure			
Mehelya vernayi	Angola File Snake	Insufficiently known; Rare?			
Pseudaspis cana	Mole Snake	Secure			
Prosymna bivittata	Two-striped Shovel-snout	Secure			
Prosymna frontalis	South-western Shovel-snout	Endemic; Secure	P		
Psammophylax tritaeniatus	Striped Skaapsteker	Secure			
Psammophis trigrammus	Western Sand Snake	Endemic; Secure			
Psammophis leightoni trinasalis	Namib Sand Snake	Secure			
Psammophis jallae	Jalla's Sand Snake	Insufficiently known; Rare?	P		
Psammophis subtaeniatus	Stripe-bellied Sand Snake	Secure			
Psammophis brevirostris leopardinus	Leopard/Short-snouted Grass Snake	Secure			
Psammophis mossambicus	Olive Grass Snake	Secure			
Philothamnus semivariegatus	Spotted Bush Snake	Secure			
Dasypeltis scabra	Common/Rhombic Egg Eater	Secure			
Telescopus semiannulatus	Eastern Tiger Snake	Secure			
Dispholidus typus	Boomslang	Secure			
Aspidelaps lubricus infuscatus	Coral Snake	Secure			
Aspidelaps scutatus	Shield-nose Snake	Secure			
Elapsoidea semiannulata	Angolan Garter Snake	Secure			
Elapsoidea sunderwallii	Sundevall's Garter Snake	Endemic; Secure			
Naja anchietae	Snouted Cobra	Secure			
Naja mossambica	Mozambique Spitting Cobra	Secure			
Naya nigricincta	Black-necked Spitting Cobra	Endemic; Secure	R		
Dendroaspis polylepis	Black Mamba	Secure			
Bitis arietans	Puff Adder	Secure			
Bitis caudalis	Horned Adder	Secure			
Worm Lizard					

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International Status		
			SARDB (2004)	IUCN (2016)	CITES
Zygaspis quadrifrons	Kalahari Round-headed Worm Lizard	Secure			
Monopeltis anchietate	Anchieta's Spade-snouted Worm Lizard	Secure			
Monopeltis infuscata	Dusky Spade-snouted Worm Lizard	Secure			
Monopeltis mauricei	Slender Spade-snouted Worm Lizard	Secure			
LIZARDS					
Skinks					
Acontias occidentalis	Percival's Legless Skink	Secure			
Lygosoma sundevallii	Sundevall's Writhing Skink	Secure			
Trachylepis capensis	Cape Skink	Secure			
Trachylepis occidentalis	Western Three-striped Skink	Secure			
Trachylepis spilogaster	Kalahari Tree Skink	Endemic; Secure			
Trachylepis striata wahlbergi	Striped Skink	Secure			
Trachylepis varia	Variable Skink	Secure			
Trachylepis variegata punctulata	Variegated Skink	Secure			
Panaspis wahlbergii	Wahlberg's Snake-eyed Skink	Endemic; Secure			
Old World Lizards					
Heliobolus lugubris	Bushveld Lizard	Secure			
Ichnotropis capensis	Cape Rough-scaled Lizard	Secure			
Ichnotropis squamulosa	Common Rough-scaled Lizard	Secure			
Nucras intertexta	Spotted Sandveld Lizard	Endemic; Secure			
Nucras holubi	Holub's Sandveld Lizard	Secure			
Pedioplanis lineoocellata lineoocellata	Spotted Sand Lizard	Endemic; Secure			
Pedioplanis namaquensis	Namaqua Sand Lizard	Secure			
Plated Lizards					
Gerrhosaurus multilineatus	Kalahari Plated Lizard	Secure			
Gerrhosaurus nigrolineatus	Black-lined Plated Lizard	Secure			
Gerrhosaurus validus maltzahni	Giant Plated Lizard	Secure			
Girdled Lizards					
Cordylus jordani	Jordan's Girdled Lizard	Endemic; Secure			C2
Monitors					
Varanus albigularis	Rock or White-throated Monitor	Vulnerable; Peripheral; Protected Game	Safe to Vulnerable		C2
Agama					
Agama aculeata	Ground Agama	Secure			
Agama anchietae	Anchietae's Agama	Secure			
Agama planiceps	Namibian Rock Agama	Endemic; Secure			
Chameleons					
Chamaeleo dilepis	Flap-neck Chameleon	Secure		LC	C2
Geckos					
Lygodactylus bradfieldi	Bradfield's Dwarf Gecko	Endemic; Secure			
Narudasia festiva	Festive Gecko	Endemic; Secure			
Pachydactylus bicolor	Velvety Thick-toed Gecko	Endemic; Secure			
Pachydactylus capensis	Cape Thick-toed Gecko	Endemic; Secure			
Pachydactylus turneri	Turner's Thick-toed Gecko	Secure			
Pachydactylus punctatus	Speckled Thick-toed Gecko	Secure			
Pachydactylus rugosus rugosus	Rough Thick-toed Gecko	Endemic; Secure			
Pachydactylus weberi	Weber's Thick-toed gecko	Endemic			
Ptenopus garrulus garrulus	Common Barking Gecko	Endemic; Secure			

Namibian conservation and legal status according to the Nature Conservation Ordinance No 4 of 1975 (Griffin 2003)

Endemic – includes Southern African Status (Branch 1998)
SARDB (2004): R = Rare; V = Vulnerable; P = Peripheral (South African Red Data Book)
IUCN (2016): LC = Least Concern (most other reptiles have not yet been assessed by the IUCN Red List)
CITES: Appendix 2 or 3 species
Source for literature review: Alexander and Marais (2007), Branch (1998), Branch (2008), Boycott and Bourquin 2000, Broadley (1983), Buys and Buys (1983), Cunningham (2006), Griffin (2003), Griffin (2007), Hebbard (n.d.), Marais (1992), Tolley and Burger (2007)

Approximately 261 species of reptiles are known or expected to occur in Namibia thus supporting approximately 30% of the continents species diversity (Griffin 1998a). At least 22% or 55 species of Namibian lizards are classified as endemic. The occurrence of reptiles of "conservation concern" includes about 67% of Namibian reptiles (Griffin 1998a). Emergency grazing and large scale mineral extraction in critical habitats are some of the biggest problems facing reptiles in Namibia (Griffin 1998a).

The overall reptile diversity and endemism in the general B2Gold (Otjikoto Mine) area is estimated at between 71-80 species and 5-8 species, respectively (Mendelsohn *et al.* 2002). Griffin (1998a) presents figures of between 1-10 and 3-4 for endemic lizards and snakes, respectively, from the general area. The closest protected areas – Waterberg Plateau Park and Etosha National Park – have an estimated 83 and 109 species of reptiles, respectively (Griffin 1998a). A study conducted during the initial EIA indicates 78 species of reptiles from the area (Griffin 2007).

According to the literature, at least 80 species of reptiles are expected to occur in the general B2Gold (Otjikoto Mine) area with 21 species being endemic – i.e. 26.3% endemic. Four species expected to occur in the area of which 2 are tortoises (*Stigmochelys pardalis*, *Psammobates oculiferus, Python natalensis* and *Varanus albigularis*) are classified as vulnerable and protected game. One species – *Python anchietae* – is classified as protected game, but not as vulnerable. Thirteen species have an international conservation status (8 CITES Appendix 2 and 3 species and 6 SARDB species; *Python natalensis* has both a CITES and SARDB status) with *Python natalensis* classified as vulnerable and *Naya nigricincta* as rare although *N. nigricincta* is however more common in Namibia than South Africa. However, the IUCN (2016) has not yet assessed most reptiles for the IUCN Red List.

The 80 species expected to occur in the general area consist of at least 38 snakes (3 blind snakes, 1 thread snake, 2 python, 2 burrowing asps, 2 quill snouted and 28 typical snakes) of which 8 species (21.1%) are endemic, 4 species insufficiently known and 3 species as rare (?); 2 tortoises (both classified as vulnerable and protected game), 1 terrapin, 4 worm lizard, 16 lizards of which 4 species classified as endemic (25% endemic), 3 plated lizards, 1 girdled lizard (endemic), 1 monitor (vulnerable/protected game), 3 agamas (1 endemic), 1 chameleon and 10 geckos of which 7 species classified as endemic (i.e. 70% endemic).

Snakes (38 species with 8 species being endemic) and lizards (16 species with 4 species being endemic) are the most important groups of reptiles expected from the general area followed by geckos (10 species with 7 species being endemic). Namibia with approximately 129 species of lizards (Lacertilia) has one of the continents richest lizard fauna (Griffin 1998a). Geckos expected and/or known to occur in the general area have the highest occurrence of endemics (70%) of all the reptiles in this area. Griffin (1998a) confirms the importance of the gecko fauna in Namibia. Tortoises are viewed as the group of reptiles most under threat in Namibia (Griffin 1998a) making *Stigmochelys pardalis* and *Psammobates oculiferus* probably the most important reptiles expected in the area followed by the pythons – *P. anchietae* and *P. natalensis* – and *Varanus albigularis*. All the above mentioned species are either consumed as food or indiscriminately killed when encountered – e.g. *Python natalensis*. The species classified as insufficiently known (rare?) – Duerden's

Burrowing Asp, Angola File Snake and Jalla's Sand Snake – are also viewed as potentially important species expected to occur in the general area.

Due to the fact that reptiles are an understudied group of animals, especially in Namibia, it is expected that more species may be located in the B2Gold (Otjikoto Mine) area than presented in Table 1 above. However, as the proposed development site is located in the ML and associated anthropomorphic influences, it is expected that most of the larger reptiles have been extirpated over time – e.g. most of the larger species such as tortoises and rock monitor lizard are often collected as veld food around settled areas while snakes are instinctively killed.

None of the reptile species known/expected to occur in the general B2Gold (Otjikoto Mine) area are however exclusively associated with the proposed development area.

3.2 Amphibian Diversity

The amphibian diversity known, and/or expected to occur in the general B2Gold (Otjikoto Mine) area is indicated in Table 2:

Table 2. Amphibian diversity known and/or expected to occur in the general B2Gold (Otjikoto Mine) area – i.e. north-central Namibia.

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International Status: IUCN (2016)
Rain Frog			
Breviceps adspersus	Bushveld Rain Frog		LC
Toads			
Amietophrynus poweri	Western Olive Toad		LC
Kassinas			
Kassina senegalensis	Bubbling Kassina		LC
Rubber Frog			
Phrynomantis affinis	Spotted Rubber Frog		LC
Phrynomantis annectens	Marbled Rubber Frog	Endemic	LC
Phrynomantis bifasciatus	Banded Rubber Frog		LC
Puddle Frog			
Phrynobatrachus mababiensis	Dwarf Puddle Frog		LC
Phrynobatrachus natalensis	Snoring Puddle Frog		LC
Ornate Frogs			
Hildebrandtia ornata	Ornate Frog		LC
Cacos			
Cacosternum boettgeri	Boettger's Caco		LC
Bullfrogs			
Pyxicephalus adspersus	Giant Bullfrog*		LC
Sand Frogs			
Tomopterna krugerensis	Knocking Sand Frog		LC
Tomopterna tandyi	Tandy's Sand Frog		LC
Platannas			
Xenopus laevis	Common Platanna		LC

Namibian conservation and legal status according to the Nature Conservation Ordinance No 4 of 1975 (Griffin 2003)
IUCN (2016): LC = Least Concern
*The giant bullfrog is classified as "near threatened" by Du Preez and Carruthers (2009)
Source for literature review: Carruthers (2001), Channing (2001), Channing and Griffin (1993), Du Preez and Carruthers (2009), Griffin (2007), Passmore and Carruthers (1995)

Amphibians are declining throughout the world due to various factors of which much has been ascribed to habitat destruction. Basic species lists for various habitats are not always available with Namibia being no exception in this regard while the basic ecology of most species is also unknown. Approximately 4 000 species of amphibians are known worldwide with just over 200 species known from southern Africa and at least 57 species expected to occur in Namibia. Griffin (1998b) puts this figure at 50 recorded species and a final species richness of approximately 65 species, 6 of which are endemic to Namibia. This "low" number of amphibians from Namibia is not only as a result of the generally marginal desert habitat, but also due to Namibia being under studied and under collected. Most amphibians require water to breed and are therefore associated with the permanent water bodies, mainly in northeast Namibia.

According to Mendelsohn *et al.* (2002), the overall frog diversity in the general B2Gold (Otjikoto Mine) area is estimated at between 12-15 species. Griffin (1998b) puts the species richness in the general area at between 14-15 species. The closest protected areas – Waterberg Plateau Park and Etosha National Park – have an estimated 13 and 18 species of amphibians, respectively (Griffin 1998b). A study conducted during the initial EIA indicates 14 species of amphibians from the area (Griffin 2007).

According to the literature, at least 14 species of amphibians can occur in suitable habitat in the general B2Gold (Otjikoto Mine) area. The area is under represented, with 3 rubber frogs, 2 puddle and 2 sand frogs, and 1 species each for rain, toad, kassina, ornate, caco, bullfrog and platanna known and/or expected (i.e. potentially could be found in the area) to occur in the area. Of these, 1 species is endemic (*Phrynomantis annectens*) (Griffin 1998b) and 1 species classified as "near threatened" due to habitat loss and development (*Pyxicephalus adspersus*) (Du Preez and Carruthers 2009) – i.e. 14.3% of amphibians of conservation value from the general area. *Pyxicephalus adspersus* is more common in northern Namibia where their numbers are also declining due to overutilization as food by humans (Griffin pers. com.). The IUCN (2016) lists all the species as "least concern".

The most important species are the endemic *Phrynomantis annectens* although they are widespread in Namibia and not exclusively associated with the B2Gold (Otjikoto Mine) area in particular. Except for permanent water bodies associated with the mining activities, there is no permanent surface water in the immediate area. Other potential amphibian habitats in the area include ephemeral pans, ephemeral drainage lines, farm reservoirs and earth dams although the latter are also dependant on localised showers and temporary of nature (See Figure 1).

Due to the fact that amphibians are an understudied group of animals, especially in Namibia, it is expected that more species may be located in the B2Gold (Otjikoto Mine) area than presented in Table 2 above. However, except for ephemeral pans, the overall lack of suitable habitat in the immediate area is expected to negatively affect the presence of most amphibians.

None of the amphibian species known/expected to occur in the general B2Gold (Otjikoto Mine) area are however exclusively associated with the proposed development area.

3.3 Mammal Diversity

The mammal diversity known, and/or expected to occur in the general B2Gold (Otjikoto Mine) area is indicated in Table 3:

Table 3. Mammal diversity known and/or expected to occur in the general B2Gold (Otjikoto Mine) area – i.e. north-central Namibia.

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International Status		
			IUCN (2016)	SARDB (2004)	CITES
Elephant Shrews					
Elephantulus intufi	Bushveld Elephant-shrew	Secure		DD	
Aardvark					
Orycteropus afer	Aardvark	Secure; Protected Game			
Shrews					
Crocidura fuscomurina	Tiny Musk Shrew	Secure		DD	
Crocidura cyanea	Reddish-grey Musk Shrew	Secure		DD	
Crocidura hirta	Lesser Red Musk Shrew	Secure		DD	
Hyrax					
Procavia capensis	Rock Hyrax	Secure; Problem animal			
Bats					
Cloeotis percivali	Percival's Short-eared Trident Bat	Not listed	[1]V		
Eidolon helvum	African Straw-coloured Bat	Secure; Migrant	NT		
Hipposideros caffer	Sundevall's Leaf-nosed Bat	Secure		DD	
Hipposideros gigas	Giant Leaf-nosed Bat	Not listed	[1]NT		
Hipposideros vittatus	Striped Leaf-nosed Bat	Not listed	NT		
Rhinolophus blasii	Blasius's Horseshoe Bat	Not listed	NT		
Rhinolophus clivosus	Geoffroy's Horseshoe Bat	Secure		NT	
Rhinolophus darlingi	Darling's Horseshoe Bat	Secure; Peripheral		NT	
Rhinolophus denti	Dent's Horseshoe Bat	Secure		NT	
Rhinolophus fumigatus	Rüppell's Horseshoe Bat	Secure		NT	
Rhinolophus hildebrandtii	Hildebrandt's Horseshoe Bat	Not listed			
Taphozous mauritianus	Mauritian Tomb Bat	Secure			
Nycteris thebaica	Egyptian Slit-faced Bat	Secure			
Chaerephon nigeriae	Nigerian Free-tailed Bat	Secure			
Mops midas	Midas Free-tailed Bat	Secure			
Tadarida aegyptiaca	Egyptian Free-tailed Bat	Secure			
Miniopterus natalensis	Natal Long-fingered Bat	Secure		NT	
Eptesicus hottentotus	Long-tailed Serotine Bat	Secure			
Glauconycteris variegata	Variegated Butterfly Bat	Secure		NT	
Laephotis botswanae	Botswana Long-eared Bat	Secure		V	
Mimetillus thomasi	Thomas Flat-headed Bat	Not listed			
Neoromicia capensis	Cape Serotine Bat	Secure			
Neoromicia zuluensis	Zulu Serotine Bat	Secure			
Pipistrellus rueppellii	Rüppell's Pipistrelle	Insufficiently known; Peripheral			
Pipistrellus rusticus	Rusty Pipistrelle	Secure		NT	
Scotophilus dinganii	Yellow-bellied House Bat	Secure			
Hares and Rabbits					
Lepus saxatilis	Scrub Hare	Secure			
Pronolagus randensis	Jameson's Red Rock Rabbit	Secure			
Rodents					
Molerat					
Cryptomys damarensis	Damaraland Mole-Rat	Secure			
Porcupine					
Hystrix africaeaustralis	Cape Porcupine	Secure			
Rats and Mice					
Petromys typicus	Dassie Rat	Endemic; Secure		NT	
Pedetes capensis	Springhare	Secure			
Xerus inaurus	South African Ground Squirrel	Secure			
Graphiurus murinus	Woodland Dormouse	Secure			
Rhabdomys pumilio	Four-striped Grass Mouse	Secure			
Mus indutus	Desert Pygmy Mouse	Secure			
Mastomys natalensis	Natal Multimammate Mouse	Secure			
Mastomys coucha	Southern Multimammate Mouse	Secure			
Thallomys paedulcus	Acacia Rat	Secure			

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International Status		
			IUCN (2016)	SARDB (2004)	CITES
Thallomys nigricauda	Black-tailed Tree Rat	Secure			
Aethomys chrysophilus	Red Veld Rat	Secure			
Aethomys namaquensis	Namaqua Rock Mouse	Secure			
Desmodillus auricularis	Cape Short-tailed Gerbil	Secure			
Gerbillurus paeba	Hairy-footed Gerbil	Secure			
Tatera leucogaster	Bushveld Gerbil	Secure		DD	
Tatera brantsii	Highveld Gerbil	Secure			
Saccostomus campestris	Pouched Mouse	Secure			
Malacothrix typica	Gerbil Mouse	Secure			
Steatomys pratensis	Fat Mouse	Secure			
Petromyscus collinus	Pygmy Rock Mouse	Endemic; Secure			
Mus musculus	House Mouse	Invasive alien			
Primates					
Galago moholi	South African Galago	Vulnerable; Protected Game			C2
Papio ursinus	Chacma Baboon	Secure; Problem animal			C2
Hedgehog					
Atelerix frontalis angolae	Southern African Hedgehog	Insufficiently Known; Rare; Protected Game		R; NT	
Pangolin					
Manis temminckii	Ground Pangolin	Vulnerable; Peripheral; Protected Game		V	C2
Carnivores					
Proteles cristatus	Aardwolf	Insufficiently known; (Vulnerable?) Peripheral			
Hyaena brunnea	Brown Hyena	Insufficiently known; (Vulnerable?) Peripheral	NT	NT	
Crocuta crocuta	Spotted Hyena	Secure?; Peripheral		NT	
Acinonyx jubatus	Cheetah	Vulnerable; Protected Game	V	V	C1
Panthera pardus	Leopard	Secure?; Peripheral; Protected Game	NT		C1
Caracal caracal	Caracal	Secure; Problem Animal			C2
Felis silvestris	African Wild Cat	Vulnerable			C2
Felis nigripes	Black-footed Cat	Indeterminate; Rare	V		C1
Genetta genetta	Small Spotted Genet	Secure			
Suricata suricatta	Suricate	Secure			
Cynictis penicillata	Yellow Mongoose	Secure			
Galerella sanguinea	Slender Mongoose	Secure			
Mungos mungo	Banded Mongoose	Secure			
Helogale parvula	Dwarf Mongoose	Secure			
Otocyon megalotis	Bat-eared Fox	Vulnerable?; Peripheral			
Vulpes chama	Cape Fox	Vulnerable?			
Canis mesomelas	Black-backed Jackal	Secure; Problem animal			
Mellivora capensis	Honey Badger/Ratel	Secure; Protected Game		NT	
Ictonyx striatus	Striped Polecat	Secure			
Pigs					
Phacochoerus africanus	Common Warthog	Secure; Huntable Game			
Antelopes					
Tragelaphus strepsiceros	Greater Kudu	Secure; Huntable Game			
Tragelaphus oryx	Eland	Insufficiently known; Vulnerable (?); Protected Game			
Alcelaphus buselaphus	Red Hartebeest	Secure; Protected Game			
Oryx gazella	Gemsbok	Secure; Huntable game			
Sylvicapra grimmia	Common Duiker	Secure			

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International Status		
			IUCN (2016)	SARDB (2004)	CITES
Antidorcas marsupialis	Springbok	Secure; Huntable game			
Madoqua damarensis	Damara Dik-Dik	Insufficiently known; Protected Game			
Raphicerus campestris	Steenbok	Secure; Protected Game			
Oreotragus oreotragus	Klipspringer	Secure; Specially Protected Game			

SARDB (2004): R = Rare; E = Endangered; NT = Near Threatened; DD = Data Deficient
IUCN (2016): V = Vulnerable; NT = Near Threatened
[1]Monadjem *et al.* (2010)
CITES: Appendix 1 or 2 species
Other species not listed are viewed as "Least Concern" by IUCN (2016)
Source for literature review: De Graaff (1981), Griffin and Coetzee (2005), Estes (1995), Griffin (2007), Joubert and Mostert (1975), Monadjem *et al.* (2010), Skinner and Smithers (1990), Skinner and Chimimba (2005), Stander and Hanssen (2003) and Taylor (2000)

Namibia is well endowed with mammal diversity with at least 250 species occurring in the country. These include the well known big and hairy as well as a legion of smaller and lesser-known species. Currently 14 mammal species are considered endemic to Namibia of which 11 species are rodents and small carnivores of which very little is known. Most endemic mammals are associated with the Namib and escarpment with 60% of these rock-dwelling (Griffin 1998c). According to Griffin (1998c) the endemic mammal fauna is best characterized by the endemic rodent family *Petromuridae* (dassie rat) and the rodent genera *Gerbillurus* and *Petromyscus*.

Overall terrestrial diversity and endemism – all species – is classified as "moderate to high" in the central part of Namibia (Mendelsohn *et al.* 2002). The overall diversity (7-8 species) and abundance of large herbivorous mammals is "high" in the general area with kudu, red hartebeest and oryx having the highest density of the larger species (Mendelsohn *et al.* 2002). The overall abundance and diversity of large carnivorous mammals is "average" (4 species) in the general area with cheetah and leopard having the highest density of the larger species (Mendelsohn *et al.* 2002). The overall mammal diversity in the general B2Gold (Otjikoto Mine) area is estimated at between 61-75 species with 1-4 species being endemic to the area (Mendelsohn *et al.* 2002). Griffin (1998c) puts the species richness distribution of endemics also between 7-8 species. The closest protected areas – Waterberg Plateau Park and Etosha National Park – have an estimated 82 and 102 species of mammals, respectively (Griffin 1998c). A study conducted during the initial EIA indicates 78 species of amphibians from the area (Griffin 2007).

According to the literature, at least 90 species of mammals are known and/or expected to occur in the general B2Gold (Otjikoto Mine) area of which 2 species (2.2%) are classified as endemic. The Namibian legislation classifies 8 species as vulnerable, 2 species as rare, 1 species as specially protected game, 10 species as protected game, 5 species as insufficiently known, 1 species as peripheral, 1 species as migrant, 4 species as huntable game, 3 species as problem animals and 6 species not listed. At least 28.9% (26 species) of the mammalian fauna that occur or are expected to occur in general area are represented by bats, none of which are endemic. This is followed by rodents – 27.8% (25 species) – of which 2 species (8%) are endemic and carnivores with 21.1% (19 species) of which 1 species (5.3%) is classified as rare (black footed cat) and none endemic.

Thirty two species (35.6%) have some form of international conservation status (some species have more than one status) of which the IUCN (2016) classifies 3 species as vulnerable and 4 species as near threatened; SARDB (2004) classifies 1 species as rare, 4 as vulnerable, 13 as near threatened and 6 as data deficient while CITES classifies 3 species as Appendix 1 species and 5 species as Appendix 2 species. Furthermore Monadjem *et al.* (2010) classifies 1 species as vulnerable and 1 species as near threatened although this is probably using old IUCN status revised in IUCN (2016). The House Mouse (*Mus musculus*) is viewed as an invasive alien species to the area. *Mus musculus* are generally known as casual pests and not viewed as problematic although they are known carriers of “plague” and can cause economic losses (Picker and Griffiths 2011).

The most important species from the general area are probably all those classified as vulnerable (*Acinonyx jubatus* and *Felis nigripes*) and near threatened (*Eidolon helvum*, *Hipposideros vittatus*, *Rhinolophus blasii*, *Hyaena brunnea* and *Panthera pardus*) by the IUCN (2016) and rare (*Atelerix frontalis angolae* and *Felis nigripes*) under Namibian legislation. Species classified as insufficiently known (See Table 3) should also be viewed as important as too little is currently known to effectively assess these species.

Habitat alteration and overutilization are the two primary processes threatening most mammals (Griffin 1998c) with species probably underrepresented in the above mentioned table for the general area being the bats and rodents, as these groups have not been well documented from Namibia. However, as the proposed development sites are located within the ML and associated anthropomorphic influences, it is expected that most of the larger mammals do not occur permanently in the area and/or only occasionally pass through (e.g. cheetah, eland, etc.). Other mammal related problems associated with urban areas include genetic pollution (i.e. interbreeding between domestic/feral cats and African wild cat), poaching (snares are habitually set around settlements), disease spread (e.g. distemper from domestic dogs affect jackal and fox), etc.

None of the mammal species known/expected to occur in the general B2Gold (Otjikoto Mine) area are however exclusively associated with the proposed development areas.

3.4 Avian Diversity

The bird diversity known, and/or expected to occur in the general B2Gold (Otjikoto Mine) area is indicated in Table 4:

Table 4. Bird diversity known and/or expected to occur in the general B2Gold (Otjikoto Mine) area – i.e. north-central Namibia. [This table excludes migratory birds (e.g. Petrel, Albatross, Skua, etc.); species breeding extralimital (e.g. stints, sandpipers, etc.) and aquatic birds (e.g. ducks, herons, etc.) and rather focuses on birds that are breeding residents or can be found in the area during any time of the year. This would imply that many more birds (e.g. Palaearctic migrants and aquatic species) could occur in the area depending on “favourable” environmental conditions]

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International Status	
			Southern Africa	IUCN (2016)
Struthio camelus	Common Ostrich			
Scleroptila levaillantoides	Orange River Francolin		Near endemic	
Pternistis hartlaubi	Hartlaub’s Spurfowl	Endemic	Near endemic	
Peliperdix coqui	Coqui Francolin			
Pternistis adspersus	Red-billed Spurfowl		Near endemic	
Dendroperdix sephaena	Crested Francolin			
Pternistis swainsonii	Swainson’s Spurfowl			
Coturnix coturnix	Common Quail			
Coturnix delegorguei	Harlequin Quail			
Numida meleagris	Helmeted Guineafowl			

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International Status	
			Southern Africa	IUCN (2016)
Turnix sylvaticus	Kurrichane Buttonquail			
Indicator minor	Lesser Honeyguide			
Campethera bennettii	Bennett's Woodpecker			
Campethera abingoni	Golden-tailed Woodpecker			
Dendropicos fuscescens	Cardinal Woodpecker			
Dendropicos namaquus	Bearded Woodpecker			
Tricholaema leucomelas	Acacia Pied Barbet		Near endemic	
Tockus monteiri	Monteiro's Hornbill	Endemic		
Tockus damarensis	Damara Hornbill	Endemic	Near endemic	
Tockus erythrorhynchus	Red-billed Hornbill			
Tockus leucomelas	Southern Yellow-billed Hornbill		Near endemic	
Tockus bradfieldi	Bradfield's Hornbill		Near endemic	
Tockus nasutus	African Grey Hornbill			
Upupa africana	African Hoopoe			
Phoeniculus purpureus	Green Wood-Hoopoe			
Phoeniculus damarensis	Violet Wood-Hoopoe	E; Endemic		
Rhinopomastus cyanomelas	Common Scimitarbill			
Coracias garrulus	European Roller	NT		
Coracias caudatus	Lilac-breasted Roller			
Coracias naevius	Purple Roller			
Merops hirundineus	Swallow-tailed Bee-eater			
Merops persicus	Blue-cheeked Bee-eater			
Merops apiaster	European Bee-eater			
Colius colius	White-backed Mousebird		Endemic	
Urocolius indicus	Red-faced Mousebird			
Poicephalus meyeri	Meyer's Parrot			
Poicephalus rueppellii	Rüppell's Parrot	NT; Endemic	Near endemic	
Agapornis roseicollis	Rosy-faced Lovebird	Endemic	Near endemic	
Cypsiurus parvus	African Palm Swift			
Apus apus	Common Swift			
Tachymarptis melba	Alpine Swift			
Apus bradfieldi	Bradfield's Swift		Near endemic	
Apus affinis	Little Swift			
Corythaixoides concolor	Grey Go-away Bird			
Tyto alba	Barn Owl			
Otus senegalensis	African Scops-Owl			
Ptilopsis granti	Southern White-faced Scops-Owl			
Asio capensis	Marsh Owl			
Bubo africanus	Spotted Eagle Owl			
Bubo lacteus	Verreaux's Eagle-Owl			
Glaucidium perlatum	Pearl-spotted Owlet			
Glaucidium capense	African Barred Owlet			
Caprimulgus pectoralis	Fiery-necked Nightjar			
Caprimulgus tristigma	Freckled Nightjar			
Caprimulgus rufigena	Rufous-cheeked Nightjar			
Columba livia	Rock Dove			
Columba guinea	Speckled Pigeon			
Streptopelia capicola	Cape Turtle Dove			
Streptopelia senegalensis	Laughing Dove			
Turtur chalcospilos	Emerald-spotted Wood-dove			
Oena capensis	Namaqua Dove			
Neotis ludwigii	Ludwig's Bustard	E	Near endemic	E
Ardeotis kori	Kori Bustard	NT		NT
Lophotis ruficrista	Red-crested Korhaan		Near endemic	

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International Status	
			Southern Africa	IUCN (2016)
Afrotis afraoides	Northern Black Korhaan		Endemic	
Pterocles namaqua	Namaqua Sandgrouse		Near endemic	
Pterocles bicinctus	Double-banded Sandgrouse		Near endemic	
Pterocles burchelli	Burchell's Sandgrouse		Near endemic	
Gallinago nigripennis	African Snipe			
Rostratula benghalensis	Greater Painted Snipe			
Burhinus capensis	Spotted Thick-knee			
Vanellus armatus	Blacksmith Lapwing			
Vanellus coronatus	Crowned Lapwing			
Rhinoptilus africanus	Double-banded Courser			
Rhinoptilus chalcopterus	Bronze-winged Courser			
Cursorius rufus	Burchell's Courser		Near endemic	
Cursorius temminckii	Temminck's Courser			
Macheiramphus alcinus	Bat Hawk			
Elanus caeruleus	Black-shouldered Kite			
Milvus aegyptius	Yellow-billed Kite			
Gyps africanus	White-backed Vulture	E		E
Gyps coprotheres	Cape Vulture	CE		E
Aegypius tracheliotos	Lappet-faced Vulture	V		
Trigonoceps occipitalis	White-headed Vulture	V		
Terathopius ecaudatus	Bateleur	E		
Haliaeetus vocifer	African Fish-Eagle	V		
Circaetus pectoralis	Black-chested Snake-Eagle			
Circaetus cinereus	Brown Snake-Eagle			
Circus maurus	Black Harrier	E		
Circus macrourus	Pallid Harrier	NT		
Polyboroides typus	African Harrier-Hawk			
Kaupifalco monogrammicus	Lizard Buzzard			
Melierax canorus	Southern Pale Chanting Goshawk		Near endemic	
Melierax gabar	Gabar Goshawk			
Accipiter badius	Shikra			
Accipiter minullus	Little Sparrowhawk			
Accipiter avampensis	Ovambo Sparrowhawk			
Buteo augur	Augur Buzzard			
Aquila rapax	Tawny Eagle	E		
Aquila verreauxii	Verreaux's Eagle	NT		
Aquila spilogaster	African Hawk-Eagle			
Aquila pennatus	Booted Eagle	E		
Aquila wahlbergi	Wahlberg's Eagle			
Polemaetus bellicosus	Martial Eagle	E		V
Sagittarius serpentarius	Secretarybird	V		V
Polihierax semitorquatus	Pygmy Falcon			
Falco rupicolus	Rock Kestrel			
Falco rupicoloides	Greater Kestrel			
Falco chicquera	Red-necked Falcon			
Falco biarmicus	Lanner Falcon			
Falco peregrinus	Peregrine Falcon	NT		
Egretta garzetta	Little Egret			
Ardea cinerea	Grey Heron			
Ardea melanocephala	Black-headed Heron			
Bubulcus ibis	Cattle Egret			
Scopus umbretta	Hamerkop			
Threskiornis aethiopicus	African Sacred Ibis			
Anastomus lamelligerus	African Openbill			

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International Status	
			Southern Africa	IUCN (2016)
Ciconia nigra	Black Stork	E		
Ciconia episcopus	Woolly-necked Stork			
Ephippiorhynchus senegalensis	Saddle-billed Stork	E		
Leptoptilos crumeniferus	Marabou Stork	NT		
Oriolus auratus	African Golden Oriole			
Dicrurus adsimilis	Fork-tailed Drongo			
Terpsiphone viridis	African Paradise-Flycatcher			
Nilaus afer	Brubru			
Dryoscopus cubla	Black-backed Puffback			
Tcharga senegalus	Black-crowned Tcharga			
Tchagra australis	Brown-crowned Tchagra			
Laniarius atrococcineus	Crimson-breasted Shrike		Near endemic	
Prionops plumatus	White-crested Helmet-shirke			
Lanioturdus torquatus	White-tailed Shrike	Endemic	Near endemic	
Batis molitor	Chinspot Batis			
Batis pririt	Pririt Batis		Near endemic	
Corvus capensis	Cape Crow			
Corvus albus	Pied Crow			
Corvinella melanoleuca	Magpie Shrike			
Lanius collaris	Common Fiscal			
Eurocephalus anguitimens	Southern White-crowned Shrike		Near endemic	
Anthoscopus minutes	Cape Penduline Tit		Near endemic	
Parus niger	Southern Black Tit			
Parus carpi	Carp's Tit	Endemic	Near endemic	
Parus cinerascens	Ashy Tit		Endemic	
Riparia paludicola	Brown-throated Martin			
Riparia cincta	Banded Martin			
Hirundu albigularis	White-throated Swallow			
Hirundo dimidiata	Pearl-breasted Swallow			
Hirundo cucullata	Greater Striped Swallow			
Hirundo abyssinica	Lesser Striped Swallow			
Hirundo semirufa	Red-breasted Swallow			
Hirundo fuligula	Rock Martin			
Pycnonotus nigricans	African Red-eyed Bulbul		Near endemic	
Achaetps pycnopygius	Rockrunner	Endemic	Near endemic	
Sylvietta rufescens	Long-billed Crombec			
Eremomela icteropygialis	Yellow-bellied Eremomela			
Eremomela usticollis	Burnt-necked Eremomela			
Turdoides bicolor	Southern Pied Babbler		Endemic	
Turdoides gymnogenys	Bare-cheeked Babbler	Endemic	Near endemic	
Parisoma subcaeruleum	Chestnut-vented Tit-Babbler		Near endemic	
Zosterops senegalensis	African Yellow White-eye			
Zosterops pallidus	Orange River White-eye		Endemic	
Cisticola chiniana	Rattling Cisticola			
Cisticola rufilatus	Tinkling Cisticola			
Cisticola subruficapilla	Grey-backed Cisticola		Near endemic	
Cisticola juncidis	Zitting Cisticola			
Cisticola jaridulus	Desert Cisticola			
Prinia flavicans	Black-chested Prinia			
Malcorus pectoralis	Rufous-eared Warbler		Endemic	
Camaroptera brevicaudata	Grey-backed Camaroptera			
Calamonastes fasciolatus	Barren Wren-Warbler		Near endemic	
Mirafra passerina	Monotonous Lark			
Mirafra africana	Rufous-naped Lark			

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International Status	
			Southern Africa	IUCN (2016)
Mirafra fasciolata	Eastern Clapper Lark		Near endemic	
Mirafra sabota	Sabota Lark			
Calendulauda africanoides	Fawn-coloured Lark		Near endemic	
Chersomanes albofasciata	Spike-heeled Lark		Near endemic	
Eremopterix leucotis	Chestnut-backed Sparrowlark			
Eremopterix verticalis	Grey-backed Sparrowlark		Near endemic	
Calandrella cinerea	Red-capped Lark			
Spizocorys conirostris	Pink-billed Lark		Near endemic	
Monticola brevipes	Short-toed Rock Thrush			
Psophocichla litsitsirupa	Groundscraper Thrush			
Bradornis infuscatus	Chat Flycatcher		Near endemic	
Melaenornis mariquensis	Marico Flycatcher		Near endemic	
Cercotrichas leucophrys	White-browed Scrub-Robin			
Cercotrichas paena	Kalahari Scrub-Robin			
Oenanthe monticola	Mountain Wheatear		Near endemic	
Oenanthe pileata	Capped Wheatear			
Cercomela familiaris	Familiar Chat			
Myrmecocichla formicivora	Ant-eating Chat		Endemic	
Onychognathus nabouroup	Pale-winged Starling		Near endemic	
Lamprotornis nitens	Cape Glossy Starling			
Lamprotornis australis	Burchell's Starling			
Cinnyricinclus leucogaster	Violet-backed Starling			
Creatophora cinerea	Wattled Starling			
Chalcomitra amethystina	Amathyst Sunbird			
Chalcomitra senegalensis	Scarlet-chested Sunbird			
Cinnyris talatala	White-bellied Sunbird			
Nectarinia fusca	Dusky Sunbird		Near endemic	
Cinnyris mariquensis	Marico Sunbird			
Bualornis niger	Red-billed Buffalo-Weaver			
Sporopipes squamifrons	Scaly-feathered Finch		Near endemic	
Plocepasser mahali	White-browed Sparrow-Weaver			
Philetairus socius	Sociable Weaver		Endemic	
Ploceus intermedius	Lesser Masked-Weaver			
Ploceus velatus	Southern Masked-Weaver			
Ploceus rubiginosus	Chestnut Weaver			
Quelea quelea	Red-billed Quelea			
Euplectes afer	Yellow-crowned Bishop			
Euplectes orix	Southern Red Bishop			
Ortygospiza atricollis	African Quailfinch			
Amadina erythrocephala	Red-headed Finch		Near endemic	
Amadina fasciata	Cut-throat Finch			
Estrilda erythronotos	Black-faced Waxbill			
Estrilda astrild	Common Waxbill			
Granatina granatina	Violet-eared Waxbill			
Uraeginthus angolensis	Blue Waxbill			
Pytilia melba	Green-winged Pytilia			
Vidua macroura	Pin-tailed Whydah			
Vidua paradisaea	Long-tailed Paradise-Whydah			
Vidua regia	Shaft-tailed Whydah			
Passer domesticus	House Sparrow			
Passer motitensis	Great Sparrow		Near endemic	
Passer melanurus	Cape Sparrow		Near endemic	
Passer griseus	Southern Grey-headed Sparrow			
Motacilla aguimp	African Pied Wagtail			

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International Status	
			Southern Africa	IUCN (2016)
Motacilla capensis	Cape Wagtail			
Anthus cinnamomeus	African Pipit			
Anthus vaalensis	Buffy Pipit			
Crithagra atrogulariis	Black-throated Canary			
Serinus flaviventris	Yellow Canary		Near endemic	
Serinus albogularis	White-throated Canary		Near endemic	
Emberiza impetuani	Lark-like Bunting		Near endemic	
Emberiza tahapisi	Cinnamon-breasted Bunting			
Emberiza capensis	Cape Bunting		Near endemic	
Emberiza flaviventris	Golden-breasted Bunting			

Simmons et al. (2015): CE = Critically Endangered; E = Endangered; NT = Near threatened; V = Vulnerable
Endemic – Namibian status (Brown *et al.* 1998, Simmons *et al.* 2015)
Endemic and near endemic – southern African status (Hockey *et al.* 2006)
IUCN (2016): CE = Critically Endangered; E = Endangered; V = Vulnerable; NT = Near Threatened
Source for literature review: Brown (2008), Brown *et al.* (1998), Brown *et al.* (2006), Hockey *et al.* (2006), Komen (n.d.), Maclean (1985), Simmons *et al.* (2015), and Tarboton (2001)

Although Namibia's avifauna is comparatively sparse compared to the high rainfall equatorial areas elsewhere in Africa, approximately 658 species have already been recorded with a diverse and unique group of arid endemics (Brown *et al.* 1998, Maclean 1985). Fourteen species of birds are endemic or near endemic to Namibia with the majority of Namibian endemics occurring in the savannas (30%) of which ten species occur in a north-south belt of dry savannah in central Namibia (Brown *et al.* 1998).

Bird diversity is viewed as "high" in the general B2Gold (Otjikoto Mine) area with 201-230 species estimated and 1-5 species being endemic (Mendelsohn *et al.* 2000). Simmons (1998a) suggests 4-6 endemic species and "average" rankings for southern African endemics and red data birds expected from the general area. Although the general area is not classified as an Important Birding Area (IBA) in Namibia (Simmons 1998a) the closest such sites are located at the Waterberg and Etosha (ENP pan – Ramsar site). The Omatako Dam area located approximately 90km southeast of Otjiwarongo is viewed as important breeding, feeding and roosting sites for a variety of aquatic birds (Brown *et al.* 2006). Brown (2008) recorded 141 birds (127 expected and 66 confirmed of which 14 confirmed were not expected according to the literature) for the B2Gold area.

At least 236 species of terrestrial ["breeding residents"] birds occur and/or could occur in the general B2Gold (Otjikoto Mine) area at any time (Hockey *et al.* 2006, Maclean 1985, Tarboton 2001). All the migrant and aquatic species have been excluded here. Eight of the 14 Namibian endemics are expected to occur in the general area (57.1% of all Namibian endemic species or 3.4% of all the species expected to occur in the area). One species (Cape vulture) is viewed as critically endangered, 10 species as endangered, 4 species as vulnerable and 7 species as near threatened (Simmons *et al.* 2015). Other species of conservation concern that could possibly pass through the area and/or be attracted to water bodies, although not listed in Table 4 above as they are aquatic species, are maccoa duck (NT), black-necked grebe (NT), rufous-bellied heron (E) and great white pelican (V). The IUCN (2016) classifies 3 species as endangered (Ludwig's bustard, Cape vulture and white-backed vulture), 1 species as near threatened (kori bustard) and 2 species as vulnerable (martial eagle and secretarybird).

Sixty five (27.5% of all the birds expected) species have a southern African conservation rating with 8 species classified as endemic (12.3% of southern African endemics or 3.4% of all the birds expected) and 47 species classified as near endemic (72.3% of southern African endemics or 19.9% of all the birds expected) (Hockey *et al.* 2006).

The most important endemic species known/expected to occur in the general area are viewed as Monteiro's hornbill (*Tockus monteiri*), Damara hornbill (*Tockus damarensis*), violet wood-hoopoe (*Phoeniculus damarensis*), bare-cheeked babbler (*Turdoides gymnogenys*) and Rüppell's parrot (*Poicephalus rueppellii*). The species listed as critically endangered (Cape vulture), endangered (violet wood-hoopoe, Ludwig's bustard, white-backed vulture, bateleur, black harrier, tawny eagle, booted eagle, martial eagle, black stork, saddle-billed stork), vulnerable (lappet-faced vulture, white-headed vulture, African fish eagle, secretarybird) and near threatened (European roller; Rűppel's parrot, kori bustard, pallid harrier, Verreaux's eagle, peregrine falcon, marabou stork) by Simmons *et al.* (2015) as well as those listed by the IUCN (2016) are viewed as the most important. The Cape vulture is a cliff breeder and although the last remnants are known to occur in the Waterberg Area (i.e. greater Otjiwarongo area) they are not specifically associated with the B2Gold environment although are lured to the area by carcasses (and vulture restaurants). The larger raptors (e.g. vultures, eagles, etc.) are often persecuted due to actual and perceived livestock mortalities or succumb when feeding on poisoned carcasses set for problem predators while the bustards are viewed as pylon sensitive birds and prone to pylon strikes. However, as the proposed development site is located within the ML with associated anthropomorphic influences, it is expected that most of the raptors and other larger species (e.g. bustards) are not permanently associated with the area and/or only pass through.

None of the bird species known/expected to occur in the general B2Gold (Otjikoto Mine) area are however exclusively associated with the proposed development areas.

3.5 Tree and Shrub Diversity

It is estimated that at least 79-109 species of larger trees and shrubs (>1m) – Coats Palgrave 1983 [81 sp.], Curtis and Mannheimer 2005 [91 sp.], Mannheimer and Curtis 2009 [128 sp], Van Wyk and Van Wyk 1997 [60 sp.]) – occur in the general B2Gold (Otjikoto Mine) area.

The trees and shrubs known, and/or expected to occur in the general B2Gold (Otjikoto Mine) area (derived from Curtis and Mannheimer 2005 and Mannheimer and Curtis 2009) is presented in Table 5 below. Species indicated are know from the quarter-degree square distribution principle used and don't necessarily occur throughout the entire area. Some species indicated to possibly occur in the area according to Coats Palgrave (1983) and Van Wyk and Van Wyk (1997) is excluded here.

Table 5. Tree and shrub diversity known and/or expected to occur in the general B2Gold (Otjikoto Mine) area – i.e. north-central Namibia.

Species: Scientific name	**Expected:** Curtis and Mannheimer (2005)	**Expected:** Mannheimer and Curtis (2009)	**Status**
Acacia ataxacantha	√	√	
Acacia erioloba	√	√	Protected (F#)
Acacia erubescens	√	√	
Acacia fleckii	√	√	
Acacia hebeclada	√	√	
Acacia hereroensis	√	√	
Acacia karroo	√	√	
Acacia kirki	√	√	

Species: Scientific name	Expected: Curtis and Mannheimer (2005)	Expected: Mannheimer and Curtis (2009)	Status
Acacia luederitzii		√	
Acacia mellifera	√	√	
Acacia nebrownii		√	
Acacia nilotica	√	√	
Acacia reficiens	√	√	
Acacia senegal	√	√	
Acacia tortilis	√	√	
Adenium boehmianum		√	Protected (F#)
Albizia anthelmintica	√	√	Protected (F#)
Aloe litoralis	√	√	NC; C2; Protected (F#)
Bauhinia petersiana	√	√	
Berchemia discolor	√	√	Protected (F#)
Boscia albitrunca	√	√	Protected (F#)
Boscia foetida		√	
Burkea africana	√	√	Protected (F#)
Cadaba aphylla		√	
Caesalpinia rubra	√	√	
Carissa bispinosa		√	
Carissa edulis		√	
Catophractes alexandri	√	√	
Combretum apiculatum	√	√	
Combretum collinum	√	√	
Combretum engleri		√	
Combretum hereroense		√	
Combretum imberbe	√	√	Protected (F#)
Combretum psidioides		√	
Combretum zeyheri	√	√	
Commiphora africana		√	
Commiphora angolensis	√	√	
Commiphora glandulosa	√	√	
Commiphora glaucescens		√	Near-endemic
Commiphora mollis	√	√	
Commiphora pyracanthoides	√	√	
Commiphora tenuipetiolata		√	
Cordia sinensis		√	
Croton gratissimus	√	√	
Cyphostemma juttae		√	Endemic; NC; Protected (F#)
Dichrostachys cinerea	√	√	
Diospyros lycioides	√	√	
Dombeya rotundifolia	√	√	
Ehretia alba	√	√	
Elaeodendron transvaalense		√	Protected (F*)
Elephantorrhiza elephantina	√	√	
Elephantorrhiza suffruticosa	√	√	
Erythrina decora	√	√	Protected (F#); Endemic
Euclea divinorum	√	√	
Euclea undulata	√	√	
Euphorbia avasmontana	√	√	C2
Euphorbia guerichiana		√	C2
Euphorbia virosa		√	C2
Faidherbia albida	√	√	Protected (F#)
Ficus burkei	√	√	Protected (F#)
Ficus cordata	√	√	Protected (F#)
Ficus ilicina	√	√	

Species: Scientific name	**Expected:** Curtis and Mannheimer (2005)	**Expected:** Mannheimer and Curtis (2009)	**Status**
Ficus sycomorus	√	√	Protected (F#)
Flueggea virosa	√		
Fockea multiflora	√	√	
Grewia avellana			
Grewia bicolor	√	√	
Grewia falcistipula		√	
Grewia flava	√	√	
Grewia flavescens	√	√	
Grewia olukondae	√	√	
Grewia retinervis	√	√	
Grewia schinzii		√	
Grewia subspathulata		√	
Grewia tenax	√	√	
Grewia villosa	√	√	
Gossypium triphyllum		√	
Gymnosporia buxifolia		√	
Gymnosporia senegalensis	√	√	
Gyrocarpus americanus		√	Protected (F*)
Heteromorpha papillosa		√	Endemic
Ipomoea adenioides		√	
Kirkia acuminata	√	√	
Lannea discolor		√	
Lycium bosciifolium	√	√	
Lycium cinereum	√	√	
Lycium eenii	√	√	
Maerua juncea	√	√	
Maerua parvifolia		√	
Maerua schinzii	√	√	Protected (F*)
Melianthus comosus	√	√	
Montinia caryophyllacea	√	√	
Moringa ovalifolia	√	√	Protected (F*); NC; Near-endemic
Mundulea sericea	√	√	
Obetia carruthersiana	√	√	Near-endemic
Ochna pulchra	√	√	Protected (F*)
Olea europaea	√	√	Protected (F*)
Opilia campestris		√	
Osyris lanceolata	√	√	
Ozoroa crassinervia	√	√	Near-endemic; Protected (F*)
Ozoroa insignis		√	
Ozoroa paniculosa	√	√	
Pavetta zeyheri		√	
Peltophorum africanum	√	√	Protected (F*)
Phaeoptilum spinosum	√	√	
Philenoptera nelsii	√	√	Protected (F*)
Pouzolzia mixta		√	
Rhigozum brevispinosum	√	√	
Rhigozum trichotomum		√	
Rotheca myricoides		√	
Searsia ciliata	√	√	
Searsia lancea	√	√	Protected (F#)
Searsia marlothii	√	√	
Searsia pyroides	√	√	
Searsia tenuinervis	√	√	
Securidata longepedunculata	√	√	Protected (F*)

Species: Scientific name	**Expected:** Curtis and Mannheimer (2005)	**Expected:** Mannheimer and Curtis (2009)	**Status**
Spirostachys africana	√	√	Protected (F#)
Steganotaenia araliacea	√	√	
Strophanthus amboensis		√	Near-endemic
Tarchonanthus camphoratus	√	√	
Terminalia brachystemma	√	√	
Terminalia prunioides	√	√	
Terminalia sericea	√	√	
Tinnea rhodesiana		√	
Vangueria cyanescens	√	√	
Vangueria infausta		√	
Ximenia americana		√	
Ximenia caffra var. *caffra*	√	√	
Ziziphus mucronata	√	√	Protected (F#)

Endemic and Near-endemic – (Craven 1999, Curtis and Mannheimer 2005, Mannheimer and Curtis 2009)
F# – Forestry Act No. 12 of 2001
F* – Curtis and Mannheimer (2005) + Mannheimer and Curtis (2009)
NC – Nature Conservation Ordinance No. 4 of 1975
C2 – CITES Appendix 2 species (Curtis and Mannheimer 2005)

According to Curtis and Mannheimer (2005) and Mannheimer and Curtis (2009) between 91 and 128 species of trees and shrubs are known and/or expected to occur in the general B2Gold (Otjikoto Mine) area, respectively.

Thirty four (26.6%) species of larger trees and shrubs have some kind of protected status in the general area (some species have more than one status and this includes endemic/near endemic species). Three species (2.3%) are endemic, 5 species (3.9%) near-endemic, 17 species (13.3%) protected by the Forestry Act No. 12 of 2001, 10 species (7.8%) protected by various Forestry laws according to Curtis and Mannheimer (2005) and Mannheimer and Curtis (2009), 3 species (2.3%) protected by Nature Conservation Ordinance No. 4 of 1975 with 4 species (3.1%) classified as CITES Appendix 2 species.

According to their protective status *Aloe litoralis* (NC, C2, Forestry#), *Cyphostemma juttae* (endemic, NC, Forestry#), *Erythrina decora* (endemic, Forestry#), *Heteromorpha papillosa* (endemic) and *Moringa ovalifolia* (NC, Near-endemic, Protected (F*) are probably the trees/shrubs most sensitive that are expected to occur in the general area.

None of the larger tree and shrub species known/expected to occur in the general B2Gold (Otjikoto Mine) area are however exclusively associated with the proposed development areas.

3.6 Grass Diversity

It is estimated that up to 111 grasses – 73 to 88 species – (Müller 2007 [88 sp.], Müller 1984 [73 sp.], Van Oudshoorn 1999 [73 sp.]) occur in the general B2Gold (Otjikoto Mine) area.

The grasses known and/or expected to occur in the general B2Gold (Otjikoto Mine) area ([1]Müller 1984, [2]Van Oudtshoorn 1999, and [3]Müller 2007) is presented in Table 6 below.

Table 6. Grass diversity known and/or expected to occur in the general B2Gold (Otjikoto Mine) area – i.e. north-central Namibia.

Species: Scientific name	Status	Ecological Status	Grazing Value
[2,3]*Andropogon chinensis*		Decreaser	High
[1]*Andropogon schinzii*		Decreaser	High
[1,2,3]*Anthephora pubescens*		Decreaser	High
[1,3]*Anthephora schinzii*		?	Low
[1,2,3]*Aristida adscensionis*		Increaser 2	Low
[1,2,3]*Aristida congesta*		Increaser 2	Low
[2,3]*Aristida stipitata*		Increaser 2	Low
[1,3]*Aristida effusa*		?	Low
[1,2,3]*Aristida meridionalis*		Increaser 3	Low
[1,2,3]*Aristida rhiniochloa*		Increaser 2	Low
[1,3]*Aristida stipitata*		Increaser 2	Low
[3]*Aristida stipoides*		?	Low
[1,2,3]*Brachiaria deflexa*		Increaser 2	Average
[2]*Brachiaria eruciformis*		Increaser 2	Average
[1,2]*Bothriochloa radicans*		Increaser 2	Low
[3]*Brachiaria malacodes*		Increaser 2	Low
[1,2]*Brachiaria marlothii*		Increaser 2	Low
[1,2,3]*Brachiaria nigropedata*		Decreaser	High
[1]*Brachiaria poaeoides*		?	Average
[1,2,3]*Cenchrus ciliaris*		Decreaser	High
[2]*Centropodia glauca*		Decreaser	High
[1,2,3]*Chloris virgata*		Increaser 2	Average
[1,2,3]*Cymbopogon caesius*		Increaser 1	Low
[2]*Cymbopogon plurinodis*		Increaser 1	Low
[1,3]*Cymbopogon pospischilii*		Increaser 1	Low
[1,2,3]*Cynodon dactylon*		Increaser 2	High
[1,2,3]*Dactyloctenium aegyptium*		Increaser 2	Average
[1,3]*Danthoniopsis ramosa*		?	Average
[2,3]*Dichanthium annulatum*		Decreaser	High
[1]*Dichanthium papillosum*		Decreaser	High
[1,2,3]*Digitaria eriantha*		Decreaser	High
[2,3]*Digitaria velutina*		Increaser 2	Low
[2]*Diplachne fusca*		Decreaser	High
[1,2,3]*Echinochloa holubii*		Increaser 2	Average
[2]*Eleusine coracana*		Increaser 2	Low
[1,2,3]*Elionurus muticus*		Increaser 3	Low
[1,2,3]*Enneapogon cenchroides*		Increaser 2	Average
[1,2,3]*Enneapogon desvauxii*		Intermediate	Average
[3]*Enneapogon scaber*		?	Low
[1,2,3]*Enneapogon scoparius*		Increaser 3	Low
[1,3]*Entoplocamia aristulata*		?	Average
[1,3]*Eragrostis annulata*		?	Low
[2,3]*Eragrostis bicolor*		?	Low
[1,2,3]*Eragrostis biflora*		Increaser 2	Low
[2]*Eragrostis cilianensis*		Increaser 2	Low
[2]*Eragrostis curvula*		Increaser 2	High
[1,3]*Eragrostis cylindriflora*		Increaser 2	Low
[3]*Eragrostis dinteri*		Increaser 2	Average
[1,2,3]*Eragrostis echinochloidea*		Increaser 2	Average
[2]*Eragrostis gummiflua*		Increaser 2	Low
[1,2,3]*Eragrostis lehmanniana*		Increaser 2	Average
[1,2,3]*Eragrostis nindensis*		Increaser 2	Average
[1,3]*Eragrostis omahekensis*	Endemic	Increaser 2	Low
[1,3]*Eragrostis porosa*		Increaser 2	Low
[1,2,3]*Eragrostis rigidior*		Increaser 2	Average
[1,2,3]*Eragrostis rotifer*		?	Average

Species: Scientific name	Status	Ecological Status	Grazing Value
[1,3]*Eragrostis scopelophila*	Endemic	Decreaser	Average
[1,2,3]*Eragrostis superba*		Increaser 2	Average
[1,2,3]*Eragrostis trichophora*		Increaser 2	Average
[1]*Eragrostis truncata*		?	Average
[2,3]*Eragrostis viscosa*		Increaser 2	Low
[1,2,3]*Fingerhuthia africana*		Decreaser	Average
[1,2,3]*Heteropogon contortus*		Increaser 2	Average
[1,2,3]*Hyparrhenia hirta*		Increaser 1	Average
[2]*Imperata cylindrica*		Increaser 1	Low
[3]*Leptochloa fusca*		?	Average
[1,2,3]*Melinis repens*		Increaser 2	Low
[1,2,3]*Microchloa caffra*		Increaser 2	Low
[1,3]*Monelytrum leuderitzianum*		?	Low
[3]*Odyssea paucinervis*		?	Low
[2,3]*Oropetium capense*		Increaser 2	Low
[1,2,3]*Panicum coloratum*		Decreaser	High
[1,3]*Panicum lanipes*		?	High
[1,2,3]*Panicum maximum*		Decreaser	High
[3]*Panicum novemnerve*		?	Low
[3]*Panicum repens*		Decreaser	High
[1,3]*Panicum stapfianum*		Decreaser	High
[1,3]*Pennisetum foermeranum*	Endemic	?	Low
[1,3]*Pogonarthria fleckii*		Increaser 2	Low
[1,2,3]*Pogonarthria squarrosa*		Increaser 2	Low
[2,3]*Schizachyrium sanguineum*		Increaser 1	Low
[1,2,3]*Schmidtia kalahariensis*		Increaser 2	Low
[1,2,3]*Schmidtia pappophoroides*		Decreaser	High
[1,3]*Setaria finita*	Endemic	?	Low
[2]*Setaria incrassata*		Decreaser	High
[2]*Setaria pallide-fusca*		Increaser 2	Average
[1,2,3]*Setaria verticillata*		Increaser 2	Average
[3]*Sorghum bicolor*		?	High
[2,3]*Sporobolus festivus*		Increaser 2	Low
[1,2,3]*Sporobolus fimbriatus*		Decreaser	High
[1,2,3]*Sporobolus ioclados*		Increaser 2	Average
[2]*Sporobolus pyramidalis*		Increaser 2	Low
[1,2]*Stipagrostis ciliata*		Decreaser	High
[1,2,3]*Stipagrostis hirtigluma*		Increaser 2	Low
[1,3]*Stipagrostis hochstetteriana*		Decreaser	High
[1,2,3]*Stipagrostis namaquensis*		?	Average
[1,2,3]*Stipagrostis obtusa*		Decreaser	High
[1,2,3]*Stipagrostis uniplumis*		Increaser 2	Average
[1,2]*Themeda triandra*		Decreaser	High
[2,3]*Tragus berteronianus*		Increaser 2	Low
[3]*Tragus racemosus*		Increaser 2	Low
[1,2,3]*Tricholaena monachne*		Increaser 2	Average
[2]*Trichoneura grandiglumis*		Increaser 2	Low
[1]*Triraphis purpurea*		Increaser 1	Low
[1,3]*Triraphis ramosissima*		?	High
[1]*Urochloa bolbodes*		Decreaser	High
[3]*Urochloa brachyura*		?	Average
[2,3]*Urochloa oligotricha*		Decreaser	High
[2,3]*Urochloa panicoides*		Increaser 2	High
[3]*Urochloa trichopus*		?	Low
[3]*Willkommia sarmentosa*		?	High

Endemic – Müller (2007)

? – not classified in literature, but often similar to other species within the genus

Up to 111 grasses are expected in the general B2Gold (Otjikoto Mine) area of which 4 species are viewed as endemic (*Eragrostis omahekensis*, *Eragrostis scopelophila*, *Pennisetum foermeranum* and *Setaria finite*). *Pennisetum foermeranum* is associated with rocky mountainous terrain and consequently only expected is such suitable habitat. *Eragrostis omahekensis* is virtually only found on disturbed soils – e.g. close to watering points – while *Eragrostis scopelophila* is associated with mountainous areas under trees and shrubs. The endemic *Setaria finite* is associated with drainage lines in the general area; never very common and probably the grass species most likely to be affected most by development in the area.

None of the grass species known/expected to occur in the general B2Gold (Otjikoto Mine) area are however exclusively associated with the proposed development areas.

3.7 Other Species

Aloes
Aloes are protected throughout Namibia (See Nature Conservation Ordinance No. 4 of 1975) with 3 other aloe species not included in Table 5, but which potentially occur in the general B2Gold (Otjikoto Mine) area, and also viewed as important are *Aloe dinteri*, *A. hereroensis* and *A. zebrina* (Rothmann 2004).

Commiphoras
Many endemic Commiphora species are found throughout Namibia with Steyn (2003) indicating that *Commiphora crenato-serrata* (not included in the Table 5) potentially also occurring in the general B2Gold (Otjikoto Mine) area.

Ferns
At least 64 species of ferns, of which 13 species being endemic, occur throughout Namibia. Ferns in the general B2Gold (Otjikoto Mine) area include at least 23 indigenous species (*Actiniopteris radiata*, *Adiantum capillus-veneris*, *A. poiretii*, *Asplenium cordatum*, *Blechnum australe*, *Cheilanthes dinteri*, *Cheilanthes involuta*, *C. marlothii*, *C. viridis*, *Christella chaseana*, *Marsilea aegyptiaca*, *M. ephippiocarpa*, *M. farinosa*, *M. marcocarpa*, *M. nubica*, *M. unicornis*, *M. vera*, *Microlepia speluncae*, *Ophioglossum polyphyllum, Pellaea calomelanos*, *P. pectiniformis*, *Thelypteris confluens*) with no endemics known/expected (Crouch *et al.* 2011). Although ferns require specific habitat – often rocky substrate – the general B2Gold (Otjikoto Mine) area is undercollected with more species probably occurring than presented above.

Lichens
The overall diversity of lichens is poorly known from Namibia, especially the coastal areas and statistics on endemicity is even sparser (Craven 1998). More than 100 species are expected to occur in the Namib Desert with the majority being uniquely related to the coastal fog belt. Lichen diversity is related to air humidity and generally decreases inland form the Namibian coast (Schultz and Rambold 2007). Off road driving is the biggest threat to these lichens which are often rare and unique to Namibia. To indicate how poorly known lichens are from Namibia, the recent publication by Schultz *et al.* (2009) indicating that 37 of the 39 lichen species collected during BIOTA surveys in the early/mid 2000's were new to science (i.e. new species), is a case in point.

Lithops
Lithops species – all protected (See Nature Conservation Ordinance No. 4 of 1975) – although not common in the B2Gold (Otjikoto Mine) area are known to occur towards the southeast and often difficult to observe, especially during the dry season when their

aboveground structures wither. The species expected to occur to the southeast of the B2Gold (Otjikoto Mine) is *Lithops pseudotruncatella* var. *elisabethiae* (Cole and Cole 2005). However, this species probably does not occur in the B2Gold (Otjikoto Mine) area.

Other
Other species with commercial potential that could occur in the general B2Gold (Otjikoto Mine) area include *Harpagophytum procumbens* (Devil's claw) – harvested for medicinal purposes and often over-exploited – and *Citrullus lanatus* (Tsamma melon) which potentially has a huge economic benefit (Mendelsohn *et al.* 2002).

A study conducted during the initial EIA indicates 107 plant species (no red data spp.; 8 endemic, 7 near endemic and 13 protected spp.) from the area (Mannheimer 2008).

Although the focus during this literature study was on the more visible (and larger) trees, shrubs, grasses and more important other species potentially occurring in the general area, many more species – e.g. herbs – occur throughout the area and are viewed as important.

None of the "other" plant species known/expected to occur in the general B2Gold (Otjikoto Mine) area are however exclusively associated with the proposed development area.

3.8 Important Species

Reptiles
Of the 80 species known/expected to occur in the general B2Gold (Otjikoto Mine) area, 21 species (26.3%) are endemic. Reptiles of greatest concern are probably the tortoises – *Stigmochelys pardalis* and *Psammobates oculiferus* which are often consumed by humans; *Python anchietae* and *P. natalensis* which are indiscriminately killed throughout their range and *Varanus albigularis* as well as the various *Pachydactylus* species geckos of which 70% are viewed as endemic. The species classified as insufficiently known (rare?) – Duerden's Burrowing Asp, Angola File Snake and Jalla's Sand Snake – are also viewed as potentially important species expected to occur in the general area.

Amphibians
Of the 14 species known/expected to occur in the general B2Gold (Otjikoto Mine) area, 14.3% (2 species) are of conservation value with 1 species being endemic (*Phrynomantis annectens*) and 1 species (*Pyxicephalus adspersus*) viewed as near threatened. However, except for ephemeral pans, the overall lack of suitable habitat in the immediate area is expected to negatively affect the presence of most amphibians.

Mammals
Of the 90 species known/expected to occur in the general B2Gold (Otjikoto Mine) area, 2.2% are endemic and 35.6% are classified under international conservation legislation. The most important groups are bats (28.9% - 0% endemic), rodents (27.8% - 8% endemic) and carnivores (21.9% - 5.3% endemic). The most important species from the general area are probably all those classified as vulnerable (*Acinonyx jubatus* and *Felis nigripes*) and near threatened (*Eidolon helvum*, *Hipposideros vittatus*, *Rhinolophus blasii*, *Hyaena brunnea* and *Panthera pardus*) by the IUCN (2016) and rare (*Atelerix frontalis angolae* and *Felis nigripes*) under Namibian legislation. Species classified as insufficiently known (See Table 3) should also be viewed as important as too little is currently known to effectively assess these species.

Birds
Of the 236 species known/expected to occur in the general B2Gold (Otjikoto Mine) area, 8 of the 14 endemics (i.e. 57.1% of all endemics) are expected. Furthermore 65 species are classified as southern African endemics and 47 species are classified as southern African

near-endemics. The most important endemic species known/expected to occur in the general area are viewed as Monteiro's hornbill (*Tockus monteiri*), Damara hornbill (*Tockus damarensis*), violet wood-hoopoe (*Phoeniculus damarensis*), bare-cheeked babbler (*Turdoides gymnogenys*) and Rüppell's parrot (*Poicephalus rueppellii*). The species listed as critically endangered (Cape vulture), endangered (violet wood-hoopoe, Ludwig's bustard, white-backed vulture, bateleur, black harrier, tawny eagle, booted eagle, martial eagle, black stork, saddle-billed stork), vulnerable (lappet-faced vulture, white-headed vulture, African fish eagle, secretarybird) and near threatened (European roller; Rűppel's parrot, kori bustard, pallid harrier, Verreaux's eagle, peregrine falcon, marabou stork) by Simmons *et al.* (2015) as well as those listed by the IUCN (2016) are viewed as the most important.

Trees/shrubs, Grass and Other
According to their protective status *Aloe litoralis* (NC, C2, Forestry#), *Cyphostemma juttae* (endemic, NC, Forestry#), *Erythrina decora* (endemic, Forestry#), *Heteromorpha papillosa* (endemic) and *Moringa ovalifolia* (NC, Near-endemic, Protected (F*) are probably the trees/shrubs most sensitive that are expected to occur in the general area. The most important grass expected in the area is the endemic *Setaria finite* associated with ephemeral drainage lines. Various aloe species – e.g. *Aloe litoralis* are known to occur in numbers along the B1 highway between Otjiwarongo and Otavi (Pers. obs.) – are viewed as other species of concern.

3.9 Important Areas

Important areas in the vicinity of the proposed B2Gold PV Solar site are:

Vertebrate fauna
a) Ephemeral pans
Ephemeral pans are important for a variety of fauna – e.g. amphibians (suitable habitat and breeding site), reptiles (terrapin habitat; foraging site – monitor lizard and pythons, etc.), mammals (drinking water; shade – larger trees usually associated with such sites (including habitat for cavity species – e.g. galago; foraging – browsers; mud bathing – warthog, etc.) and birds (drinking water; shade; roosting, nesting and perching site, etc.). Although most of the pans around the proposed PV Solar site are generally small, they are nevertheless important and it is recommended that development attempt to avoid these areas as far as possible.

b) Drainage lines
Drainage lines, albeit ephemeral, are the lifelines in the drier parts of Namibia with a variety of vertebrate fauna attracted and/or associated with such features. The main and most important ephemeral drainage lines in the general area are the Ugab River to the northwest and Omabonda, Ondaugaura and Waterberg Rivers – tributaries to the Omatako – to the south and southeast. Although not as important as perennial rivers, well vegetated ephemeral drainage lines are still viewed as important habitat for a variety of vertebrate fauna in the general area. Although not a true ephemeral river/drainage line, the area to the south of the proposed PV Solar site – See Figure 1 – is a drainage area – i.e. drains the area to the north southwards towards a pan system. It is recommended that development attempt to avoid this drainage area as far as possible.

Flora
a) Protected species
Protected tree species are viewed as the most important in the proposed development areas and the unnecessary removal of these should be avoided. See Table 5 for a list of these species.

b) Ephemeral pans

Ephemeral pans are viewed as important for flora as most of the larger specimens – protected and otherwise – are often associated with such areas and serve as habitat for various vertebrate fauna.

c) Drainage lines

Ephemeral drainage lines are viewed as important for flora as most of the larger specimens – protected and otherwise – are often associated with such areas and serve as habitat for various vertebrate fauna.

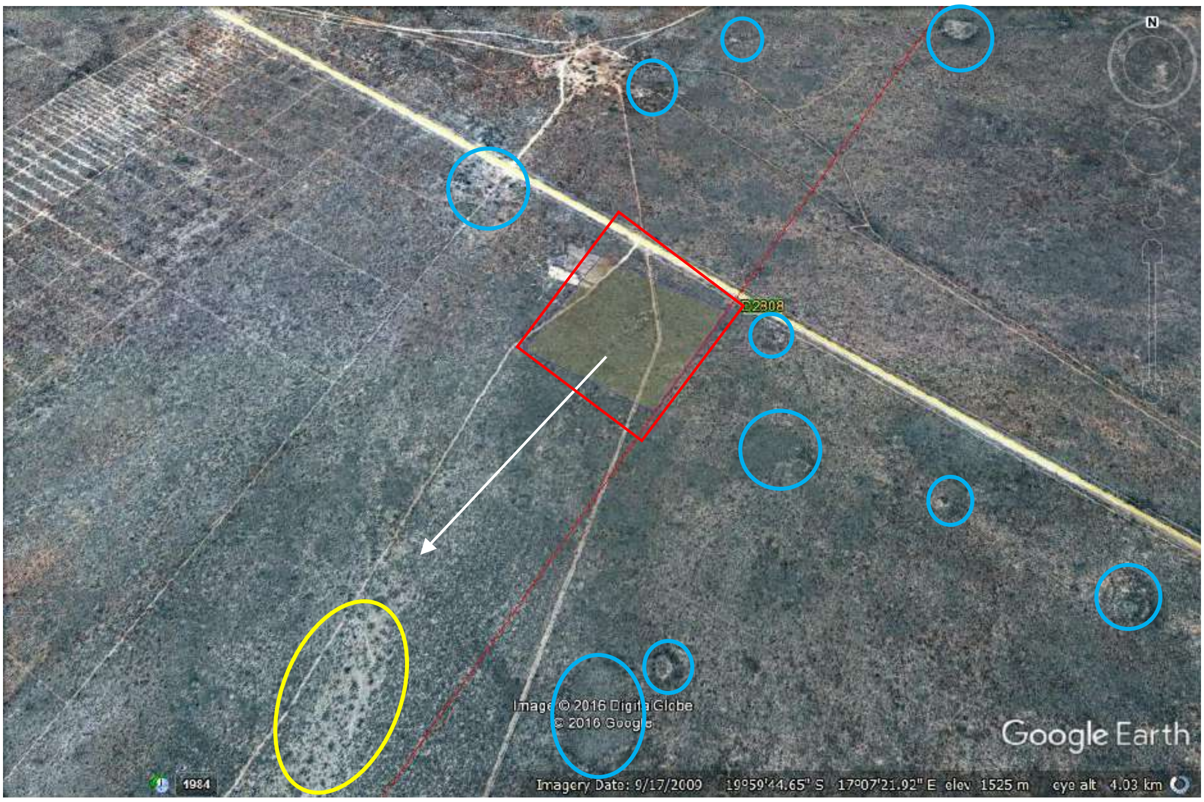

Figure 1. Proposed B2Gold PV Solar development – Red square. Blue circles = ephemeral pans; Yellow oblong = drainage area; White arrow = indicates drainage route/flow towards drainage area and pan system south of ML.

4. Conclusion

The proposed PV Solar development site is not located in a pristine area or in pristine condition with various anthropomorphic influences – e.g. Otjikoto Mine infrastructures; D2808 and B1 highway and other tarmac and gravel roads; fences; farming infrastructures, etc. – affecting the general area.

Although the proposed PV Solar site is close to a number of ephemeral pans, viewed as important habitat for vertebrate fauna and flora, it is not expected to detrimentally affect these pans. The drainage area and larger pan system to the south of the proposed development site is also important habitat in the general area.

However, none of vertebrate fauna (i.e. unique reptiles, amphibians, mammals and birds) and flora (i.e. larger trees/shrubs and grass) are expected to be exclusively associated with the proposed PV Solar development site.

5 Recommendations

All human induced activities change or are destructive to the local fauna and flora to some or other degree. Assessing potential impacts is occasionally obvious, but more often difficult to predict accurately. Such predictions may change depending on the scope of the activity – i.e. once initiated, may have a different effect on the fauna and flora as originally predicted. Thus continued monitoring of such impacts during the operational phase(s) is imperative.

General
The following general recommendations are suggested to show environmental sensitivity and commitment regarding the vertebrate fauna and flora should the PV Solar developments at the B2Gold (Otjikoto Mine) realise in future:

Vehicles and Tracks:
1. Avoid unnecessary affecting areas viewed as important habitat – i.e. ephemeral pans, ephemeral drainage lines; clumps of protected tree species;
2. Make use of existing tracks/roads as much as possible throughout the area;
3. Do not drive randomly throughout the area (could cause mortalities to vertebrate fauna and unique flora; accidental fires; erosion related problems, etc.);
4. Avoid offroad driving at night as this increases mortalities of nocturnal species;
5. Implement and maintain offroad track discipline with maximum speed limits (e.g. 30km/h) as this would result in fewer faunal mortalities and limit dust pollution;
6. Where new tracks have to be made off the main routes, the routes should be selected causing minimal damage to the environment – e.g. use the same tracks; cross drainage lines at right angles; avoid placing tracks within drainage lines; avoid collateral damage (i.e. select routes that do not require the unnecessary removal of trees/shrubs, especially protected species);
7. Rehabilitate all new tracks created;
8. Implement erosion control measures where applicable – e.g. cross drains on slopes, etc.;

Development Area:
9. Limit camp sites to the actual development sites and/or bus contractors in;
10. Use portable toilets to avoid faecal pollution around camp sites;
11. Initiate a suitable and appropriate refuse removal policy as littering could result in certain animals becoming accustomed to humans and associated activity and result in typical problem animal scenarios – e.g. baboon, black-backed jackal, etc.;
12. Avoid and/or limit the use of lights during nocturnal exploration activities as this could influence and/or affect various nocturnal species – e.g. bats and owls, etc. Use focused lighting for least effect;
13. Prevent the killing of species viewed as dangerous – e.g. various snakes – when on site;
14. Prevent the setting of snares for ungulates (i.e. poaching) or collection of veld foods (e.g. tortoises, monitor lizard) and unique plants (e.g. various *Aloe* and *Lithop*) or any form of illegal hunting activities;
15. Avoid introducing dogs and cats as pets to camp sites as these can cause significant mortalities to local fauna (cats) and even stock losses (dogs);
16. Remove and relocate slow moving vertebrate fauna (e.g. tortoises, chameleon, snakes, etc.) to suitable habitat;
17. Do not use electric fencing, reaching ground level, around the PV Solar site as these fences result in the mortality of numerous species – e.g. monitor lizard, chameleon, tortoises, various snakes, etc. Should electric fencing be used then the first 50cm from ground level should not be electrified to prevent accidental mortalities;
18. Investigate the idea of introducing domestic stock (e.g. sheep) during/after the growing season to keep vegetation manageable within the PV Solar site – i.e.

biological control rather than using herbicides and/or grading, etc. Proper veld management should be encouraged – e.g. rest, rotational grazing, appropriate stocking rates, etc. It is advised that the area be rested for at least 2 seasons to get the perennial grasses established before grazing commences;

19. Avoid the use of herbicides during terrain preparation due to potential pollution issues of the ephemeral pan systems and drainage lines;
20. Inform contractors/workers regarding the above mentioned issues prior to construction activities and monitor for compliance thereof throughout;
21. Rehabilitate all areas disturbed by the construction activities – i.e. camp sites, etc.;
22. Ensure that adequate fire fighting equipment (e.g. fire beaters; extinguishers, etc.) is available at camp sites and clear kitchen areas to avoid accidental fires;
23. Maintain a firebreak around the perimeter to prevent fire for entering/exiting the area. Domestic stock could also be used to maintain such a firebreak;
24. Liaise with MET staff throughout the project;
25. Employ an environmental officer to ensure compliance, especially of the rehabilitation of all the affected areas;

Avifauna:

26. Future power lines associated with the PV Solar site should include bird avoidance measures (flappers/coils/anti perching devices, etc.) typically used on pylon infrastructures, especially when in close proximity to any of the ephemeral pans in the vicinity;

Flora

27. Incorporate protected tree species (e.g. *Acacia erioloba*, *Searsia lancea*, etc.), especially larger specimens, into the overall design/layout of the PV Solar developments.Such natural landscaping would ensure a "natural" ambiance with existing shade trees requiring less water and maintenance than planting and introducing young trees and/or exotic species;
28. Identify important tree species to avoid – i.e. protected species – beforehand and mark (e.g. red/white tape) adequately so that bulldozer operators can easily see and avoid these specimens during land preparation activities;
29. Introduce a policy of re-establishing (i.e. planting) 2 indigenous tree/shrub species for each protected species removed. Indigenous species could be acquired at the Forestry nurseries in Okahandja and Grootfontein, NBRI (National Botanical Research Institute) in Windhoek, including local nurseries in Windhoek;
30. Avoid introducing ornamental plants, especially potential invasive alien species, as part of the landscaping (including camp sites), etc., but rather use localised indigenous species, which would also require less maintenance (e.g. water);
31. Remove all invasive alien species encountered at the sites – e.g. *Prosopis* spp.; *Opuntia* spp., etc. This would not only indicate environmental commitment, but actively contribute to a better landscape;

Landscaping

32. Avoid clear felling – i.e. removal of all the indigenous trees/shrubs and grasses – of the area prior to development; and
33. Show overall environmental commitment by adapting a minimalistic damage and indigenous planting approach to future development – e.g. retain local flora and avoid sensitive habitats such as pans/drainage lines.

It is not expected that the proposed PV Solar development's will adversely affect any unique vertebrate fauna and flora, especially if developments are limited to the development area only and the proposed recommendations (mitigation measures) are incorporated.

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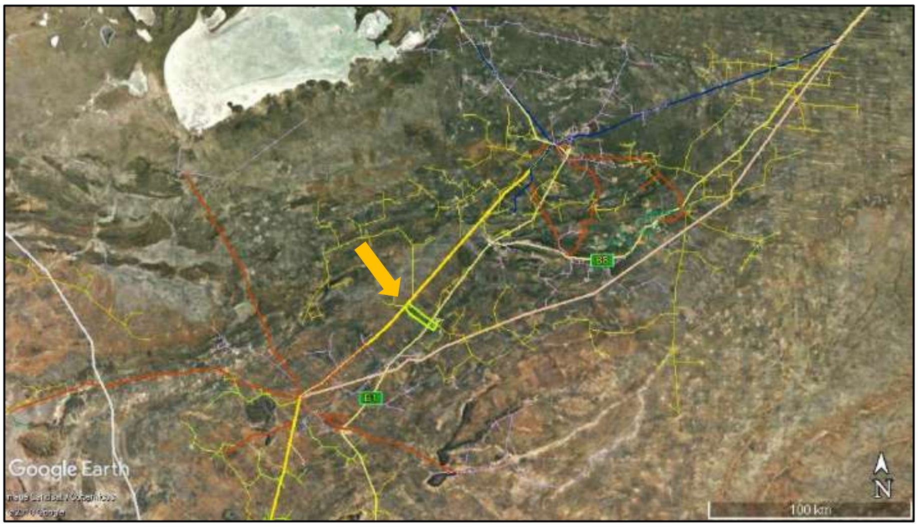
Environmental Impact Assessment for the B2Gold transmission power line, Otjiwarongo

Avifauna baseline/scoping and assessment



Prepared by:

African Conservation Services cc

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Prepared for:

Environmental Compliance Consultancy

ECC ENVIRONMENTAL COMPLIANCE CONSULTANCY

February 2020

Name of project	**Environmental Impact Assessment for the B2Gold transmission power line, Otjiwarongo** **Avifauna baseline/scoping and assessment**
Principal client	B2Gold Namibia (Pty) Ltd on behalf of NamPower (Pty) Ltd Namibia
Implementing agent	Environmental Compliance Consultancy (ECC) PO Box 91193, Klein Windhoek, Namibia Email: jessica@eccenvironmental.com Tel. +264 81 669 7608 / +264 81 653 1214 Representatives: Jessica Bezuidenhout (Mooney) and Titus Shuuya
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Report date	Draft 1: 21 October 2019 Draft 2: 23 October 2019 Draft 3: 2 December 2019 Draft 4: 12 February 2020 Draft 5: 13 February 2020

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Executive summary

B2Gold Namibia (Pty) Ltd, on behalf of NamPower (Pty) Ltd, is conducting an Environmental Impact Assessment for a proposed new overhead transmission power line for the B2Gold Mine, some 70 km north-east of Otjiwarongo in northern Namibia. Environmental Compliance Consultancy has been appointed to undertake the EIA process for the proposed project. The present avifauna baseline/scoping and assessment forms part of this EIA.

Two alternative structures were assessed in this report, namely a 220 kV steel lattice, with pylons around 31 m high and average span lengths of 450 m; and a 66 kV steel monopole, with pylons around 24 m high and average span length of 300 m. The design for both structures would include a combination of guyed and self-support structures, both with three conductors and one additional optical ground wire (OPGW) running at the top of the configuration.

It is proposed to link the new line into the existing NamPower 220 kV Gerus-Otjikoto line via a new Eldorado Substation. Two alternative routes have been proposed for the new line. Route Option 1 (23 km long) would run along the D2886 district road between Farm Lardner and Farm Fisher, whereas Route Option 2 (19 km long) would run between the boundaries of Farm Hester and Farm Lardner. The existing 33 kV (Cenored) distribution power lines in the area will remain.

According to the avifauna baseline and scoping of sites and species, the study area is potentially sensitive in terms of birds and their habitats.

The study area lies 55 km north-west of the Waterberg Plateau Park, with the Etosha National Park 135 km further to the north-west. Both national parks are also classed as Important Bird Areas, or places of international significance for the conservation of birds at the Global, Regional or Sub-regional level.

The study area falls within the Tree-and-shrub Savanna biome, with heavily bush-encroached Thornbush Shrubland, dominated by *Acacia* tree and bush species. Three main avifauna habitats in the area include farmland on the plains; rocky hills/koppies; and (mainly ephemeral) aquatic habitats. On farmland, larger trees (mainly *Acacia luederitzii*) provide nesting habitats for large raptors, including at least eight known active nests for White-backed Vultures; the more open habitats are used by Kori Bustard; and accessible watering points are used by many kinds of birds. Vulture nests have been recorded between 110 m and 1-3 km from Route Option 1 for the power line. A fairly restricted rocky hills/koppie habitat in the north-western parts of Farm Lardner and neighbouring properties (close to Route Option 1) supports large trees (including *Kirkia acuminata*), and may potentially be home to several Namibian near-endemic bird species with specific habitat requirements. The group of aquatic habitats includes a system of shallow ephemeral pans, and earth dams, that are reported to hold water regularly during the rainy season, when many waterbirds may move into the area. Several such pans and dams were indicated on Farm Fisher (many of them close to Route Option 1, with one large dam being 125 m away from the proposed servitude); several pan habitats are also apparent on Farm Lardner and Farm Luckenwalde. On the adjacent B2Gold Mine property, a large ephemeral pan on the nature reserve section is also reported to hold water during the rainy season, while a large (perennial) sewage pond (450 m from Route Option 2) and tailings dam are situated on or near the main entrance road to the mine; these habitats attract a variety of waterbirds.

A relatively high diversity of bird species has been recorded in the study area and surrounds, with a total of 217 species, or 32% of the 676 species currently recorded in Namibia; however, the area is not well documented in parts. The field trip for the present study also took place under drought conditions, when the bird diversity observed was fairly low. To address these limitations, data from several sources were combined for an overall checklist.

The checklist includes 18 species (9% of the total) that are threatened in Namibia (and comprising 25% of the 71 species on the Namibian Red Data List); eleven of the 18 species are also Globally Threatened. In particular, the adjacent Waterberg area is well known for its populations of several species of threatened vultures and other raptors. Satellite tracking data indicate that Cape Vultures have regularly visited the study area in the past, and perched/roosted on the existing 220 kV Gerus-Otjikoto power line in the past, a behaviour that could increase the risk of collisions on the line.

Risk assessment and mitigation efforts are directed towards priority species, namely those that have a high biological significance, i.e. primarily Red Data species (including those with migrant status) and/or endemic or near-endemic species. Twenty-one species are considered to have the potential to be impacted by power line structures (including 18 Red Data species, four Namibian near-endemic species and four with migrant status), namely:

- *Raptors (8)*

  White-backed Vulture (Critically Endangered, also Globally Critically Endangered)

  Cape Vulture (Critically Endangered, also Globally Endangered; now rare in Namibia)

  Lappet-faced Vulture (Endangered, also Globally Endangered)

  Martial Eagle (Endangered, also Globally Vulnerable)

  Bateleur (Endangered, also Globally Near Threatened)

  Tawny Eagle (Endangered)

  Secretarybird (Vulnerable, also Globally Vulnerable)

  Red-footed Falcon (Near Threatened, also Globally Near Threatened; Palearctic-breeding migrant)

- *Large terrestrial (cursorial) species (2)*

  Blue Crane (Critically Endangered, also Globally Vulnerable; now rare in Namibia)

  Kori Bustard (Near Threatened, also Globally Near Threatened)

- *Aquatic species (7)*

  Saddle-billed Stork (Endangered)

  Lesser Flamingo (Vulnerable, also Globally Near Threatened; intra-African migrant)

  Greater Flamingo (Vulnerable) (intra-African migrant)

  Great White Pelican (Vulnerable)

  Bar-tailed Godwit (Near Threatened, also Globally Near Threatened; Palearctic-breeding migrant)

  Black-necked Grebe (Near Threatened)

  Marabou Stork (Near Threatened)

- *Other smaller birds/Namibian near-endemic species (4)*

  Rüppell's Parrot (Near Threatened)

  Damara (Red-billed) Hornbill

  Monteiro's Hornbill

  Carp's Tit

The impacts of power line structures on avifauna and recommended mitigation measures are well documented, both globally and for the southern African subregion. Three main potential impacts have been identified for the project.

- *Collision of birds on power line structures*

The species most susceptible to collision mortality on power lines are large, long-lived and slow-reproducing birds, often habitat specialists with hazardous behavioural traits (especially flight height and flocking flight), with high spatial exposure to collision risk with power lines and unfavourable conservation status. The collision risk is believed to be increased by factors such as a large wingspan and low manoeuvrability, nomadic/migrant habits, flying in low light (e.g. flamingos and other waterbirds), courtship behaviour, juvenile inexperience, and predation; and flying under adverse weather conditions. Collisions may take place on overhead cables as well as on stay wires and other associated structures.

All the above 21 priority bird species are potentially at risk to collisions on power line structures. Areas of particular concern include flight paths around areas with large trees, used for nesting by White-backed Vulture and other raptors (particularly on Route Option 2); open areas along fence-lines/roadways/power line servitudes, used by Kori Bustard; and areas around water points accessible to birds, and other (ephemeral) aquatic habitats, when they hold water.

This impact is assessed as follows: sensitivity and value high; magnitude of change moderate; significance rating major (Route Option 2) reduced to moderate by mitigation; and significance rating moderate (Route Option 1), reduced to minor by mitigation.

- *Physical disturbance of birds and habitat destruction/modification during the construction of power lines*

During the construction phase of a project, physical disturbance to birds, as well as habitat destruction and/or modification, will take place. Birds may be disturbed while going about their daily activities such as feeding, roosting and, in particular, breeding.

Groups/habitats at particular risk to these impacts include nesting White-backed Vulture (especially on Route Option 2) and other raptors nesting in large trees; the ground-nesting Kori Bustard; nesting near-endemic species, including possible species on the rocky hills/koppie habitat (adjacent to Route Option 1).

This impact is assessed as follows: sensitivity and value high; magnitude of change minor; significance rating moderate, reduced to minor by mitigation (Route Option 1 & 2).

- *Electrocution of birds by streamers on power line structures*

The risk of electrocution on the proposed 220 kV steel lattice tower structure is considered to be non-existent, due to the large clearances involved. However, an electrocution could be caused should a large bird perch on top of the tower and send down a "streamer" of excrement that could hit a conductor, thereby bridging the gap between an earthed and a live component.

Electrocutions of large raptors, mainly vultures are, however, possible on the 66 kV steel monopole structure, should the birds perch or attempt to perch on the insulators and simultaneously touch a conductor and the (earthed) steel pole. The risk is increased by the large wingspans of such bird species, and by the gregarious nature of the vultures, where one or more birds may attempt to perch on the same spot; or if the bird is wet. Electrocutions by means of streamers of excrement (see above) are also possible on this structure.

Priority bird species in the study area that may potentially be impacted by electrocution in the above way include at least six large raptors, namely White-backed Vulture, Lappet-faced Vulture, Cape Vulture, Martial Eagle, Tawny Eagle and Bateleur. Tower structures adjacent to areas used regularly by vultures/raptors, including breeding sites on large trees, and water points would be more sensitive to such risks.

Electrocution of birds on power line structures (66 kV structure) are assessed as follows: sensitivity and value high; magnitude of change moderate; significance rating moderate (Route Option 2), reduced to minor by mitigation; significance rating minor (Route Option 1); general mitigation (bird perches on pylons) recommended.

Electrocution of birds by streamers on power line structures (220 kV and 66 kV structures): sensitivity and value high; magnitude of change negligible; significance rating minor (Route Option 1 & 2), no mitigation recommended.

Route Option 1 carries an overall lower risk than Route Option 2; and the 220 kV steel lattice pylon structure a lower (electrocution) risk than the 66 kV steel monopole structure. However, it is believed that these risks can be addressed by means of mitigation.

Although recorded mortalities may be in low numbers, the cumulative impacts of any negative interactions over the entire lifespan of the power line are an important consideration, viewed in association with the increase in power lines and other linear infrastructure in the study area, and the increasing effects of other human activities. Sensitive species that are already under threat, including Red Data and (near-)endemic species, as well as nomads/migrants are at particular risk to such cumulative effects. In particular, the mounting threats to vulture populations throughout the region are well documented; these include poisoning (both indirect and targetted); disturbance and loss of habitat; bush encroachment and its negative effect on the ability of vultures to find food; and trade in vulture parts for traditional medicine.

Mitigation measures are aimed at avoiding, minimising or rehabilitating negative impacts or enhancing potential benefits. The primary mitigation is the choice of route options and alternatives for a power line; if possible, areas where impacts on birds are likely to take place should be avoided.

As the main potential impact identified is bird collisions (and electrocutions) on power line structures, it is believed that these risks can be reduced by choosing Route Option 1. Marking of more sensitive sections of power line to increase visibility is also recommended, at identified sites and according to specified design. Recommendations are also made to reduce the impacts of physical disturbance to birds and habitat destruction/modification during the construction of the power line. Mitigations to reduce the impacts of electrocutions on the 66 kV structure are included; however, no mitigation is recommended for electrocution of birds by streamers on power line structures at this stage.

Detailed monitoring initiatives are recommended that should be conducted by NamPower and B2Gold, with the support of other partners.

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Abbreviations, acronyms and glossary of terms

AEWA	African-Eurasian Migratory Waterbird Agreement
BFD	Bird Flight Diverter
CBD	Convention on Biological Diversity
CMS	Convention on Migratory Species
DEA	Department of Environment Affairs
ECC	Environmental Compliance Consultancy
EIA	Environmental Impact Assessment
EIS	Environmental Information Service
EMA	Environmental Management Act
EMP	Environmental Management Plan
Endemic	Occurring within a restricted range
Endemic status categories	
	E = endemic, NE = near-endemic, sA = southern Africa, Nam = Namibia
IBA	Important Bird Area
IUCN	International Union for Conservation of Nature
IUCN Red List Categories	
	LC Least Concern
	NT Near Threatened
	VU Vulnerable
	EN Endangered
	CE Critically Endangered
	EW Extinct in the Wild
	EX Extinct
	G Global status
kV	kilovolt
MET	Ministry of Environment and Tourism
NAD	Namibian Avifaunal Database
NNF	Namibia Nature Foundation
OPGW	Optical ground wire (earth wire): a type of cable used in overhead power lines, combining the functions of grounding/earthing and communications
Pentad	A 5-minute x 5-minute coordinate grid super-imposed over the continent for spatial reference; nine pentads make up one Quarter Degree Square
Power line interaction categories	
	C = collision, D = disturbance/habitat destruction, E = electrocution, N = potential to disrupt the power supply through nesting activities
QDS	quarter degree square
RED	Regional Electricity Distributor
Residency	R = resident, N = nomadic, M = migrant, V = vagrant, Ra = rare
SABAP	Southern African Bird Atlas Project (SABAP1 & SABAP2)
S/S	Substation

1 Background

1.1 Introduction

B2Gold Namibia (Pty) Ltd (B2Gold), on behalf of NamPower (Pty) Ltd (NamPower), is conducting an Environmental Impact Assessment (EIA) for a proposed new overhead transmission power line approximately 19-23 km long for the B2Gold Mine, some 70 km north-east of Otjiwarongo in northern Namibia (Figure 1 and 2).

Environmental Compliance Consultancy (ECC) has been appointed by B2Gold to undertake the EIA process for the proposed project.

The present avifauna baseline/scoping and assessment forms part of this EIA.

1.2 Technical details of the proposed power line

Technical details of the proposed new transmission line have been supplied by GS Fainsinger and Associates Consulting Engineers (F de Wet pers. comm.) and their team.

Two alternative structures were assessed for the study, namely a 220 kV steel lattice pylon, and a 66 kV steel monopole option.

220 kV steel lattice pylon

The 220 kV structure would be lattice steel pylons, in a combination of guyed and self-support structures (Figure 3 and 4). The structure would be single circuit, with three conductors and one additional optical ground wire (OPGW) running at the top of the configuration. The typical height of the structure is 30.8 m for guyed and 31.8 m for strain towers, with average span lengths of 450 m.

The servitude width for a 220 kV line is 50 m (25 m on either side of the centre of the power line). Of this, typically, only 7-10 m will be bulldozed to create an access road along the route for construction and maintenance. Each tower site will be opened up to allow for the footprint of the stay anchors. Should there be any major trees that could affect the clearance under the power line along the 50 m servitude, these will be removed. Typically, however, vegetation will be preserved, but cleared and continued to be cleared and maintained under the power line (10 m and around the guyed towers / stay anchors).

66 kV steel monopole

The 66 kV structure comprises a steel type monopole with the following components (Figure 5):

- The height of the structures will be approximately 24 m, with average span lengths of 300 m (spacing between poles).
- Intermediate poles will be used on the straight sections of the line that are self-supporting, with no stay wires; however, a guyed design (with four guys per intermediate pole) is also an option. The pole length is 20 m, planted into the ground (approx. – 2.6 m).
- Bend poles with seven backstays will be used at points where the line changes direction (a 20 m pole length planted 2 m into the ground).
- A terminal H-Pole will be used at the start and at the end of the line with the last pole at substations. The pole length is 20 m, planted 2.6 m into the ground with two backstays.

Power line route

It is proposed to link the new line into the existing NamPower Gerus-Otjikoto 220 kV line via a new Eldorado Substation (Figure 2). The two existing Gerus-Otjikoto 220 kV lines (No. 1 and 2; Figure 6) run north-east from Gerus Substation, near Otjiwarongo to Otjikoto Substation, near Tsumeb (Figure 1 and 2). The Gerus-Platveld 66 kV line runs in parallel north-eastwards from Gerus Substation, to the Platveld Substation, on Farm Maxwell to the north-west of the B2Gold Mine site. The new link will be a dedicated connection to the mine due to the mine's power requirements. The existing 33 kV (Cenored) distribution power lines in the area (Figure 7) will remain.

Two alternative routes have been proposed for the new line (Option 1 and 2), with two associated proposed sites for the new Eldorado Substation (No. 1a and 2a; Figure 2):

Option 1: along the D2886 district road (between Farm Lardner and Farm Fisher)

The power line would run 45 m from centre line of road, followed by the 25 m from the farm boundary (i.e. the 50 m servitude will be centred 70 m from road centre line); this route would be 22.6 km long, with ±7 bend points; and

Option 2: between the farm boundaries (between Farm Hester and Farm Lardner)

The power line route centre line would be 25 m from the farm boundary / fence line (i.e. the route required would be 50 m from the boundary / fence line, with the power line installed in the centre of the 50 m servitude); this route would be 18.5 km long, with ±5 bend points.

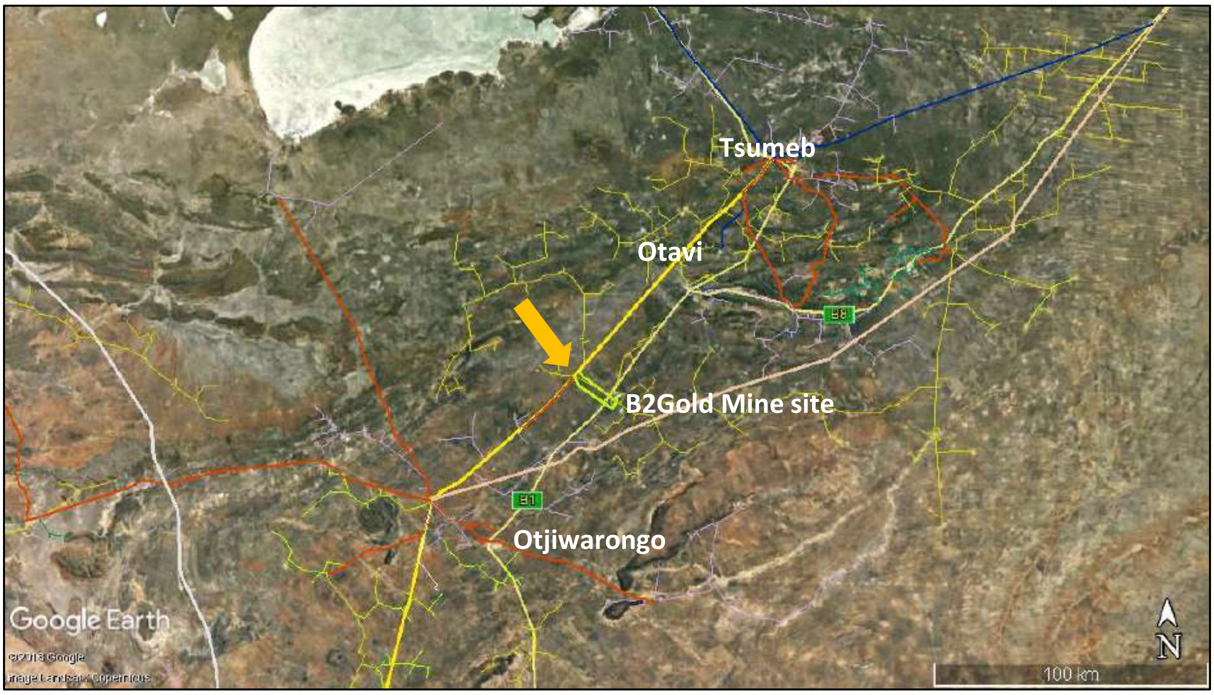


Figure 1. The study area north-east of Otjiwarongo in northern Namibia, indicating the two proposed alternative power line routes (arrow) from Eldorado Substation to the B2Gold Mine site; closest towns and existing power lines in the greater area (EIS 2019, based on a Google Earth map).

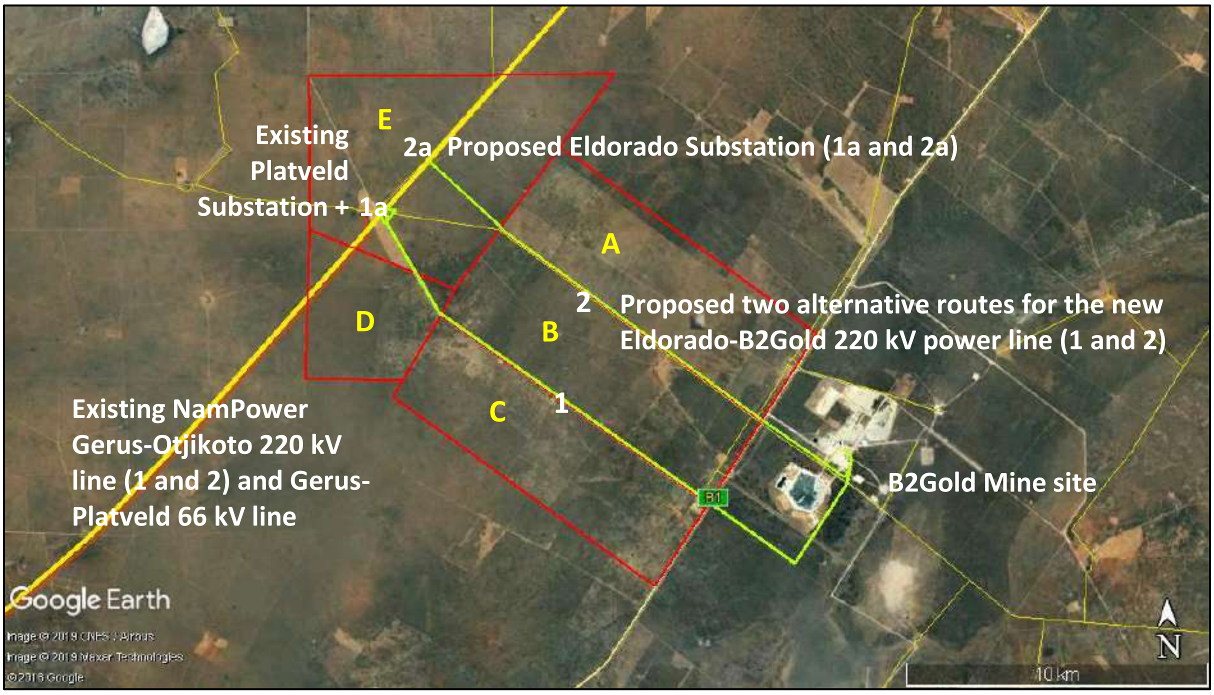


Figure 2. The study site to the north-west of the B2Gold Mine site, indicating the two proposed alternative power line routes (1 and 2) from the proposed Eldorado Substation (two sites, 1a and 2a) to B2Gold Mine site, as well as relevant existing power lines in the area (dark yellow, brown, together with smaller 33 kV distribution lines (Cenored; pale yellow) (EIS 2019, based on a Google Earth map).
Relevant farms (red outlines) are indicated as follows: A = Hester; B = Lardner; C = Fisher; D = Luckenwalde; E = Maxwell.

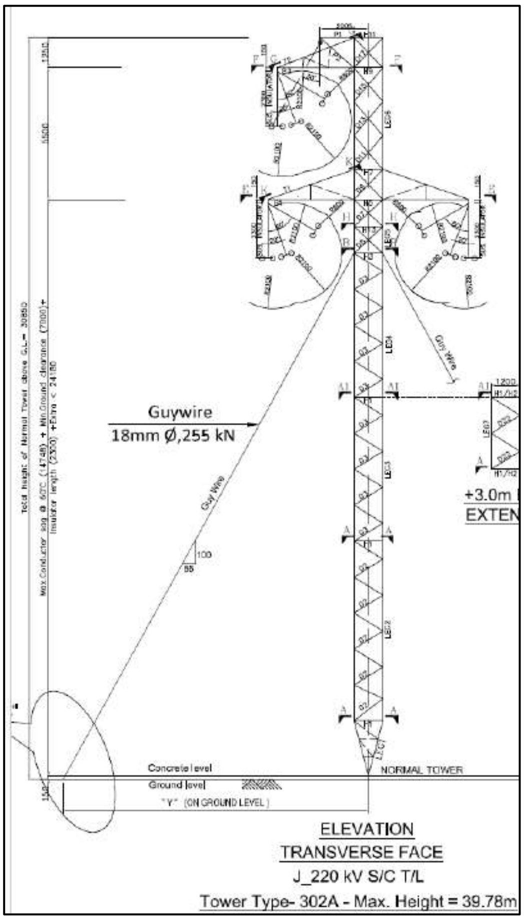


Figure 3 a, b, c. Examples of the guyed lattice steel pylon structure that will be used for the proposed 220 kV B2Gold power line; the design is single circuit, with three conductors and one additional optical ground wire (OPGW or earth wire) running at the top of the configuration (F de Wet pers. comm.).

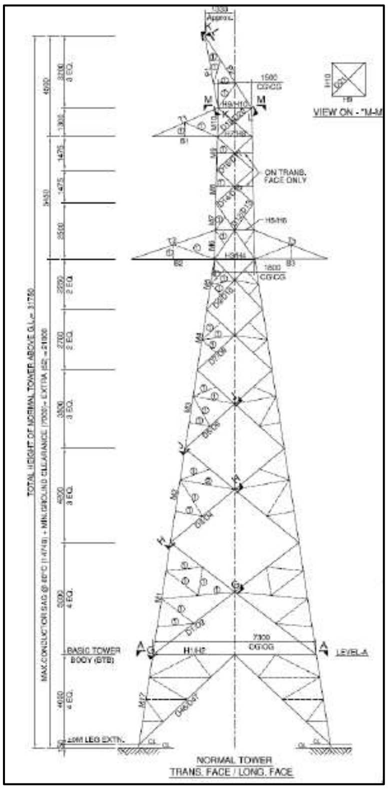


Figure 4 a, b. Examples of the self-support lattice steel pylon structure that will be used as a strain tower / bend point for the proposed 220 kV B2Gold power line; the design is single circuit, with three conductors and one additional optical ground wire (OPGW or earth wire) running at the top of the configuration (see Figure 3) (F de Wet pers. comm.).

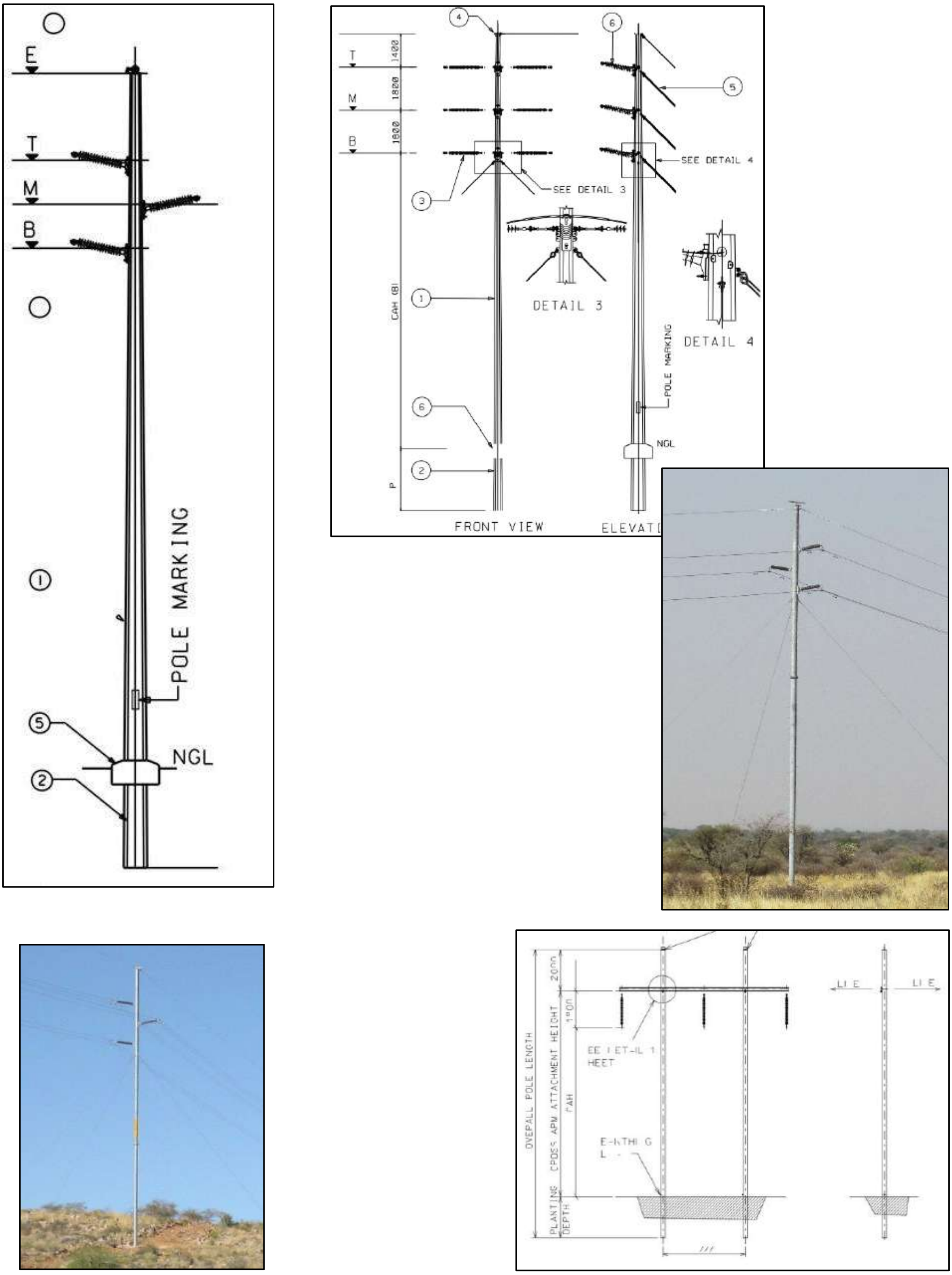


Figure 5 a, b, c. Examples of the steel monopole pylon (left), and bend poles (right top; also see Figure 37) and terminal H-pole structures (right bottom)that will be used for the proposed 66 kV B2Gold power line (F de Wet pers. comm.); the design is single circuit, with three conductors and one additional optical ground wire (OPGW or earth wire) running at the top of the configuration (photo bottom left of a similar, but guyed, structure: NamPower).

Figure 6. The existing NamPower 220 kV Gerus-Otjikoto line (No. 1 and 2) on Farm Maxwell (looking south-westwards), consisting of a self-support steel lattice structure (left) and a guyed-V structure (right). Note the large Sociable Weaver nest on the left-hand tower.

Figure 7. An existing Cenored 33 kV distribution line on Farm Lardner.

2 Approach and methodology

2.1 General approach

Avifaunal input to the EIA was requested in the form of a baseline/scoping and impact assessment study to provide an understanding of the potential risks to birds with the proposed development and to serve as a basis for the recommendations of mitigation for such risks and the monitoring programme for the Environmental Management Plan (EMP).

The study includes a baseline scoping of the project area some 70 km north of Otjiwarongo, in the north of Namibia (Figure 1 and 2). A desk-top study was supported by a field visit on 30 September – 2 October 2019.

Two sources of bird distribution data were used. The primary data, for the first Southern African Bird Atlas Project (SABAP1; Harrison, Allan, Underhill, Herremans, Tree, Parker, Brown 1997), were gathered during 1987-1992. This information is available on the Environmental Information Service (EIS; www.the-eis.com; EIS 2019) as well as on the comprehensive Namibian Avifaunal Database (NAD; www.biodiversity.org.na; NAD 2019), which includes all available information on birds in Namibia including SABAP1 data, nest record cards, wetland bird counts, Raptor Road Counts for Namibia and museum specimens. SABAP1 data are recorded on a quarter degree square (QDS) basis and are extremely comprehensive, although the information dates back to 1992.

A follow-up Southern African Bird Atlas Project (SABAP2) was initiated in South Africa in 2007 and in Namibia in 2012 (http://sabap2.adu.org.za). This information comprises more recent distribution data on a finer scale (in units termed pentads, or 5-minute x 5-minute coordinates; nine pentads make up one quarter degree square [QDS]). Although the distribution data are at a finer scale, the data collected to date for Namibia are still patchy and not yet as extensive as those for SABAP1; in particular, the study area is poorly atlassed in parts, and the results should be interpreted with caution. It is therefore advisable to use a combination of SABAP1 and SABAP2 data.

The bird checklist for the present study (Appendix 1) is based on both SABAP1 data for QDSs 1916DD, 1917CC, 2016BB and 2017AA (Figure 8), and available SABAP2 data for pentads 1955_1700, 1955_1705, 2000_1700 and 2000_1705 (Figure 9) which fall within QDS 1917CC and 2017AA. For the above SABAP1 and SABAP2 sources, as well as for observations made in the field (September-October 2019), presence/absence of species is indicated (Appendix 1).

Other sources of information include the Environmental Information Service (see above), the Red Data Book for Birds in Namibia (Simmons, Brown, Kemper 2015), other published sources (e.g. Hockey, Dean, Ryan 2005; Chittenden, Davies, Weiersbye 2016), the global International Union for the Conservation of Nature (IUCN) Red Data list for birds (www.iucnredlist.org; IUCN 2019); discussions with B2Gold environmental staff, farmers and other local birders; and both the authors' 35+ years of experience of working together on and observing birds in southern Africa, including in Namibia. The above sources were used to compile one combined checklist for the study area.

Potential sensitivities of the avifaunal environment were assessed according to standard criteria, i.e. in the context of protected area status; major topographical features and vegetation habitats; and wetland habitats including ephemeral rivers and associated wetlands, including pans and dams (EIS 2019). Avifaunal habitats that are limited in the present context were identified, in particular aquatic habitats.

Potential sensitivities of the bird species were assessed in terms of criteria identified for "priority species" that include bird species diversity (according to recorded distribution data, see above); the most recent Red Data status, both on a national scale (Simmons et al. 2015; and an update by Brown, Mendelsohn, Thomson, Boorman 2017) and global scale (IUCN 2019; see above); uniqueness or endemism/near-endemism to Namibia (i.e. having ≥90% of their global population in this country) (Simmons et al. 2015; Brown et al. 2017); residency/migrant status (for Red Data species); an indication of abundance, based on presence/absence for the above sources; any recorded breeding in the area (focusing on Red Data and endemic species); known sensitivity to collisions with overhead structures; and other ecological aspects. The NamPower/Namibia Nature Foundation (NNF) Strategic Partnership database (EIS 2019) was also consulted for relevant power line incidents on record in the vicinity of the study area.

During the field trip for the present study, the two proposed alternative servitudes for the new power line were surveyed, together with any existing power line servitudes where possible, to check for signs of recent bird interactions.

The criteria for the assessment of impacts are outlined below.

Gaps in baseline data were identified where applicable, and an indication of the confidence levels is provided. Recommendations were made for future work in terms of the EIA process.

Figure 8. The four quarter degree squares (QDSs; 1916DD, 1917CC, 2016BB and 2017AA; white blocks) and four pentads (red block, see Figure 8) on which available bird atlas data for the checklist for the study area is based (SABAP1 & SABAP2 data).

Figure 9. The four representative pentads for the study area (1955_1700, 1955_1705, 2000_1700, 2000_1705; indicated by the red block) for which supplementary bird atlas data from SABAP2 were obtained, which fall within the two QDSs indicated in Figure 8 (SABAP2 data).

2.2 Impact assessment methodology

The EIA methodology applied to this EIA has been developed using the International Finance Cooperation (IFC) standards and models, in particular Performance Standard 1, 'Assessment and management of environmental and social risks and impacts' (International Finance Corporation, 2017) (International Finance Corporation, 2012); Namibian draft procedures and guidance for EIA and EMP (Republic of Namibia, 2008); international and national best practice; and over 25 years of combined EIA experience (Environmental Compliance Consultancy 2019).

EIA determination of significance

The significance of an impact was determined by taking into consideration the combination of the sensitivity and importance/value of environmental and social receptors that may be affected by the proposed project, the nature and characteristics of the impact, and the magnitude of potential change. The magnitude of change (the impact) is the identifiable changes to the existing environment which may be direct or indirect; temporary/short term, long-term or permanent; and either beneficial or adverse. These are described as follows and thresholds are provided in Table 1, 2 and 3.

- The **sensitivity and value of a receptor** are determined by identifying how sensitive and vulnerable a receptor is to change, and the importance of the receptor (internationally, nationally, regionally and locally).
- The **nature and characteristics of the impact** are determined through consideration of the frequency, duration, reversibility and probability and the impact occurring.
- The **magnitude of change** measures the scale or extent of the change from the baseline condition, irrespective of the value. The magnitude of change may alter over time, therefore temporal variation is considered (short-term, medium-term; long-term, reversible, irreversible or permanent).

TABLE 1 - SENSITIVITY AND VALUE OF RECEPTOR

SENSITIVITY AND VALUE	DESCRIPTION
High	Of value, importance or rarity on an international and national scale, and with very limited potential for substitution; and/or very sensitive to change or has little capacity to accommodate a change.
Medium	Of value, importance or rarity on a regional scale, and with limited potential for substitution; and/or moderate sensitivity to change, or moderate capacity to accommodate a change.
Low	Of value, importance or rarity on a local scale; and/or not particularly sensitive to change or has considerable capacity to accommodate a change.

TABLE 2 - NATURE OF IMPACT

NATURE	DESCRIPTION
Positive	An impact that is considered to represent an improvement on the baseline or introduces a positive change.
Negative	An impact that is considered to represent an adverse change from the baseline or introduces a new undesirable factor.
Direct	Impacts causing an impact through direct interaction between a planned project activity and the receiving environment/receptors.
Indirect	Impacts that result from other activities that are encouraged to happen as a result / consequence of the Project. Associated with the project and may occur at a later time or wider area
Extent / Geographic Scale	
On-site	Impacts that are limited to the boundaries of the proposed project site

Local	Impacts that occur in the local area of influence, including around the proposed site and within the wider community
Regional	Impacts that affect a receptor that is regionally important by virtue of scale, designation, quality or rarity.
National	Impacts that affect a receptor that is nationally important by virtue of scale, designation, quality or rarity.
International	Impacts that affect a receptor that is internationally important by virtue of scale, designation, quality or rarity.
Duration	
Short-term	Impacts that are likely to last for the duration of the activity causing the impact and are recoverable
Medium-term	Impacts that are likely to continue after the activity causing the impact and are recoverable
Long-term	Impacts that are likely to last far beyond the end of the activity causing the damage but are recoverable over time
Reversibility	
Permanent /Irreversible	Impacts which are not reversible and are permanent
Temporary / Reversible	Impacts are reversible and recoverable in the future
Likelihood	
Certain	The impact is likely to occur
Likely	The impact is likely to occur under most circumstances
Unlikely	The impact is unlikely to occur

TABLE 3- MAGNITUDE OF CHANGE

MAGNITUDE OF CHANGE	DESCRIPTION
Major	Loss of resource, and quality and integrity of resource; severe damage to key characteristics, features or elements; or Large-scale or major improvement of resources quality; extensive restoration or enhancement; major improvement of attribute quality.
Moderate	Loss of resource, but not adversely affecting its integrity; partial loss of/damage to key characteristics, features or elements; or Benefit to, or addition of, key characteristics, features or elements; improvements of attribute quality.
Minor	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (or maybe more) key characteristic, feature or element; or Minor benefit to, or addition of, one (or maybe more) key characteristic, feature or element; some beneficial effect on attribute quality or a reduced risk of a negative effect occurring.
Negligible	Very minor loss or detrimental alteration to one (or maybe more) characteristic, feature or element; or Very minor benefit to, or positive addition of, one (or maybe more) characteristic, feature or element.

A level of certainty has also been applied to the assessment to demonstrate how certain the assessment to demonstrate how certain the assessment conclusions are and where there is potential for misinterpretation or a requirement to identify further mitigation measures, thereby adopting a precautionary approach. Where there is a low degree of certainty, monitoring and management measures can be implemented to determine if the impacts are worse than predicted and support the identification of additional mitigation measures through the lifetime of the proposed project. Table 4 provides the levels of certainty applied to the assessment, as well as a description.

TABLE 4 – LEVEL OF CERTAINTY

LEVEL OF CERTAINTY	DESCRIPTION
High	– Likely changes are well understood – Design/information/data used to determine impacts is very comprehensive – Interactions are well understood and documented – Predictions are modelled, and maps based on interpretations are supported by a large volume of data, and – Design/information/data has very comprehensive spatial coverage or resolution.
Medium	– Likely changes are understood – Design/information/data used to determine impacts include a moderate level of detail – Interactions are understood with some documented evidence – Predictions are modelled but not yet validated and/or calibrated, and – Mapped outputs are supported by a moderate spatial coverage or resolution.
Low	– Interactions are currently poorly understood and not documented. – Predictions are not modelled, and the assessment is based on expert interpretation using little or no quantitative data. – Design is not fully developed, or information has poor spatial coverage or resolution.

The significance of impacts has been derived using professional judgment and applying the identified thresholds for receptor sensitivity and magnitude of change (as discussed above) and guided by the matrix presented in Table 5. The matrix is applicable for impacts that are either positive or negative. The distinction and description of significance and whether the impact is positive, or negative is provided in Table 6.

TABLE 5 - GUIDE TO SIGNIFICANCE RATINGS

Magnitude of Change

Negligible	Minor	Moderate	Major	**Sensitivity**
Minor (3)	Moderate (6)	Major (9)	Major (12)	High
Low (2)	Minor (4)	Moderate (6)	Major (8)	Medium
Low (1)	Low (2)	Minor (3)	Moderate (4)	Low

Significance is not defined in the Namibian EIA Regulations, however the Draft Procedure and Guidance for EIA and EMP states that the significance of a predicted impact depends upon its context and intensity. Accordingly, definitions for each level of significance have been provided in Table 6. These definitions were used to check the conclusions of the assessment of receptor sensitivity, nature of impact and magnitude of impact was appropriate.

TABLE 6– SIGNIFICANCE DESCRIPTION

SIGNIFICANCE OF IMPACT	DESCRIPTION
Major (negative)	Impacts are considered to be key factors in the decision-making process that may have an impact of major significance, or large magnitude impacts occur to highly valued/sensitive resource/receptors. Impacts are expected to be permanent and non-reversible on a national scale and/or have international significance or result in a legislative non- compliance.
Moderate (negative)	Impacts are considered within acceptable limits and standards. Impacts are long-term, but reversible and/or have regional significance. These are generally (but not exclusively) associated with sites and features of national importance and resources/features that are unique and which, if lost, cannot be replaced or relocated.
Minor (negative)	Impacts are considered to be important factors but are unlikely to be key decision-making factors. The impact will be experienced, but the impact magnitude is sufficiently small (with and without mitigation) and well within accepted standards, and/or the receptor is of low sensitivity/value. Impacts are considered to be short-term, reversible and/or localized in extent.
Low (negative)	Impacts are considered to be local factors that are unlikely to be critical to decision-making.
Low – Major (Beneficial)	Impacts are considered to be beneficial to the environment and society:

The colour green has been applied to highlight positive impacts over negative impacts shown in shades of yellow, orange and red. The description for each level of significance presented in Table 6 was also followed when determining the level of significance for a beneficial impact.

The level of significance of impacts has been derived using professional judgment and applying the identified thresholds for receptor sensitivity and magnitude of change, as well as the definition for significance. It most instances, moderate and major adverse impacts are considered as significant, and however, there may be some instances where impacts are lower than this but are still considered to be significant. The following thresholds were therefore used to double check the assessment of significance had been applied appropriately; a significant impact would meet at least one of the following criteria:

- It exceeds widely recognized levels of acceptable change
- It threatens or enhances the viability or integrity of a receptor or receptor group of concern, and
- It is likely to be material to the ultimate decision about whether or not the environmental clearance certificate is granted.

2.3 Limitations and assumptions

Limitations

- A major limitation to the assessment and mitigation of potential impacts from power line structures is the difficulty in obtaining confirmed records of bird flight paths. The present investigation was limited in particular by the dry season field visit, under drought conditions, when potential pan habitats did not hold water or associated waterbirds. The avifaunal diversity in general is likely to increase under wetter conditions, including in the limited rocky hills/koppie habitats in the north-western part of Lardner. These limitations were addressed, in part, by incorporating long term bird atlas data in the assessment; however, further investigations of this aspect would be useful.
- A further limitation is the lack of representative long-term data on power line incidents in Namibia. Available data from the NamPower/NNF Strategic Partnership (EIS 2019) were consulted in this respect; however, dedicated surveys on power lines in the northern parts of the country are limited, due to the difficulty of access on bush-encroached servitudes.

Assumptions

- Combined SABAP1 and SABAP2 and other data used in this report provide a representative indication of the bird species likely to occur in the study area throughout the seasonal and inter-annual cycles.

In all the above respects, the precautionary principle should therefore apply.

3 Legislation and international conservation agreements

The Environmental Impact Assessment (EIA) process in Namibia is governed and controlled by the Environmental Management Act (EMA), 2007 (Anon. 2012) and the EIA Regulations 30 of 2012, which are administered by the office of the Environmental Commissioner through the Department of Environment Affairs (DEA) of the Ministry of Environment and Tourism (MET).

The above Environmental Management Act requires the full consideration of biodiversity (including birds), habitat and landscape parameters, values and criteria as part of the environmental assessment processes.

The conservation of terrestrial birds in Namibia is governed by the Nature Conservation Ordinance of 1975. The above Ordinance will eventually be replaced by the (draft) Parks and Wildlife Bill. The list of Specially Protected Birds according to this Bill is based on the Namibian Red Data Book (Simmons, Brown, Kemper 2015), and the Namibian Red Data categories in the latter document are used in the present report, together with a recent update (Brown et al. 2017). The study area does not fall within an officially protected area proclaimed under the above Nature Conservation Ordinance of 1975.

Namibia is a signatory to the international Convention on Biological Diversity (CBD; Rio de Janeiro, 1992), a legally binding instrument for the global conservation and sustainable use of biological diversity.

The Convention on Migratory Species (CMS 2011) has developed an inter-governmental treaty known as the African-Eurasian Migratory Waterbird Agreement (AEWA). Namibia is classed as a range state but, although guided by the principles of AEWA, is not yet a contracting party to this international agreement. The CMS provides guidelines on the management of the conflict between migratory birds and electricity power grids in the African-Eurasian Region.

The study area lies relatively close to an Important Bird Area (IBA; Simmons, Boix-Hinzen, Barnes, Jarvis, Robertson 1998; see below). IBAs are sites of international significance for the conservation of birds at the Global, Regional (Continental) or Sub-regional (southern African) level, selected according to stringent criteria (Barnes 1998). However, not all IBAs have official protection.

The study area does not fall within a proclaimed Ramsar site (Kolberg 2002; see below).

4 Potential sensitivities

4.1 Avifaunal environment

The study area lies between the towns of Otjiwarongo and Otavi in the north of Namibia (Figure 1 and 2).

4.1.1 Protected area status

The area lies some 55 km north-west of the nearest formally protected area and national park, the Waterberg Plateau Park (Figure 10). The Etosha National Park lies about 135 km further to the north-west. The area includes many freehold/commercial conservancies, with communal conservancies to the south-east, and the conservation status is regarded as relatively high.

Both the above national parks are also classed as Important Bird Areas (IBAs), namely Waterberg Plateau Park (N008) and Etosha National Park (N005) (Figure 9). IBAs are places of international significance for the conservation of birds at the Global, Regional (Continental) or Sub-regional (southern African) level, selected according to stringent criteria (Barnes 1998; Simmons et al. 1998).

The Waterberg Plateau Park IBA is characterised by high bird diversity (over 200 species recorded) and provides extensive mountain and cliff breeding habitat for raptors, including the only surviving colony of Cape Vultures in Namibia; and nesting and other habitats for other vulture species and a diversity of other birds. The woodlands and kloofs with perennial springs hold at least 12 near endemic/restricted range species.

The Etosha National Park IBA supports 340 bird species including Greater and Lesser Flamingo (occasional breeding site) and other waterbirds; a rich raptor fauna; and many other species. The Etosha Pan is also a proclaimed Ramsar site, or Wetland of International Importance (Kolberg 2002).

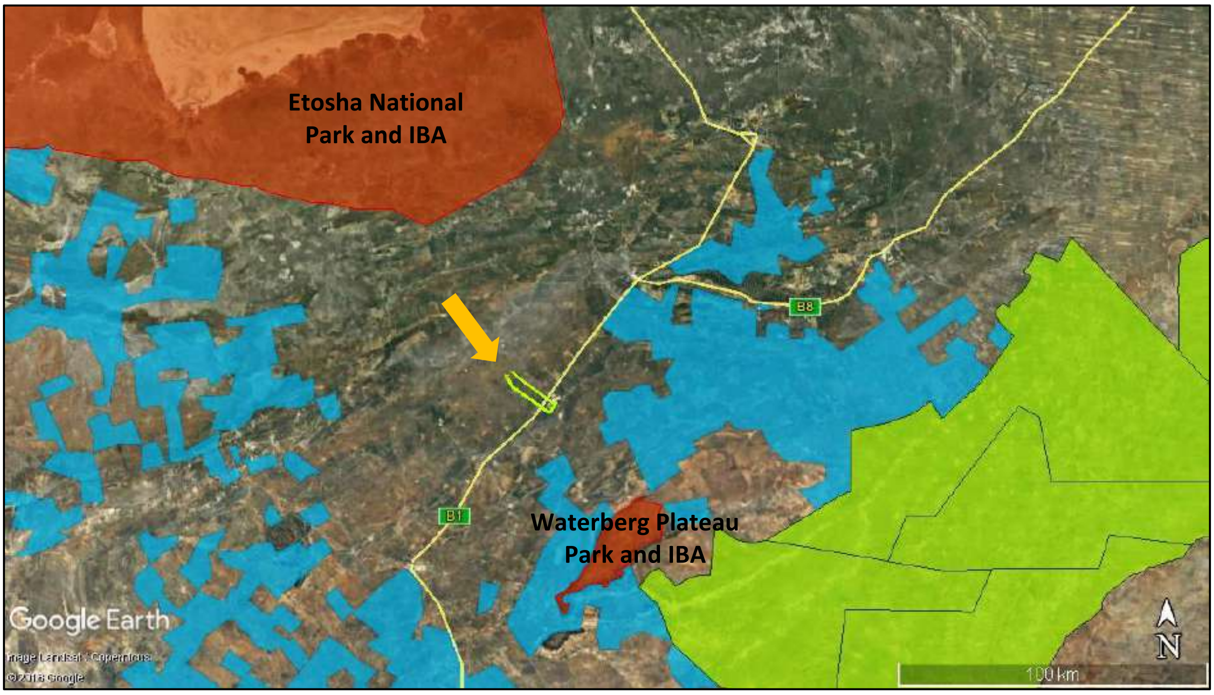


Figure 10. Protected areas and Important Bird Areas (IBAs) in relation to the study area (red = formally protected areas; green = communal conservancies; blue = freehold/commercial conservancies; based on a Google Earth map, EIS 2019).

4.1.2 Climate

The average annual rainfall for the greater study area is relatively high, namely 450-500 mm, falling mainly during December - February (Mendelsohn, Jarvis, Roberts, Robertson 2002).

Average annual temperatures are 20-22°C, and the dominant wind direction is from the east, with average wind speeds of around 15 km per hour.

4.1.3 Major topographical features and vegetation habitats

The study area lies within the Central-western Plains Landscape (Mendelsohn et al. 2002) and is generally flat. The Waterberg is a prominent inselberg to the south-east (Figure 1). The Otavi Mountains lie to the north.

The large ephemeral Etosha Pan lies to the north-west (Figure 11). The ephemeral Ugab River system rises just north-west of the study area, with smaller pan habitats occurring in the upper reaches of its catchment and running south-eastwards.

Farm dams and other irrigation facilities are relatively scarce in the area.

The study area falls within the Tree-and-shrub Savanna biome (Mendelsohn et al. 2002). The vegetation type is classed as Thornbush Shrubland, dominated by *Acacia* tree and bush species. The habitat is heavily bush-encroached, and this state is being addressed to varying degrees and by varying methods by the landowners.

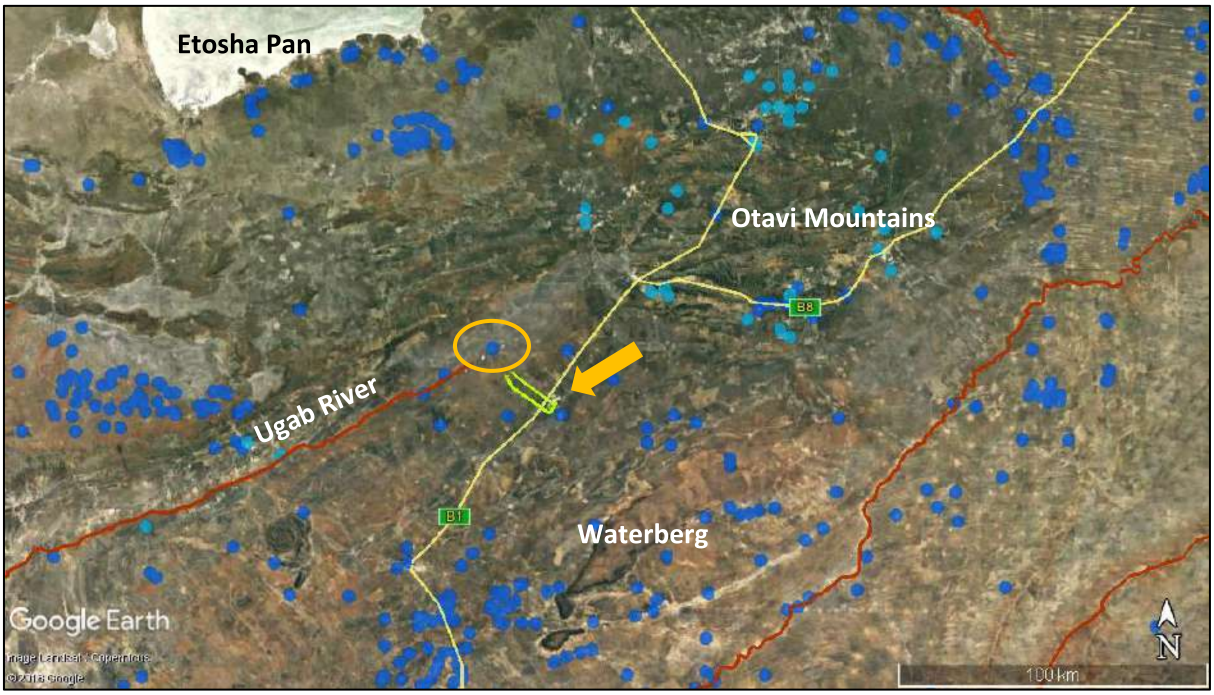


Figure 11. Ephemeral rivers (brown), irrigation facilities and other water bodies (blue) in relation to the study area; the ephemeral pans in the upper Ugab catchment are circled (based on a Google Earth map, EIS 2019).

4.1.4 Habitats in the study area and surrounds, in relation to birds

The predominant land uses in the greater study area are agriculture, conservation and nature-based tourism and mining. As mentioned above, the Thornbush Shrubland habitats are heavily bush-encroached, and this has an effect on bird distribution and activities.

Three main habitats in the study area and surrounds that are important to birds include farmland on the plains; rocky hills/koppies; and (mainly ephemeral) aquatic habitats. Specific localities of some of the vulture nesting sites, koppies and shallow pans/farm dams situated in the vicinity of the two proposed alternative power line routes are mapped below (Figure 12).

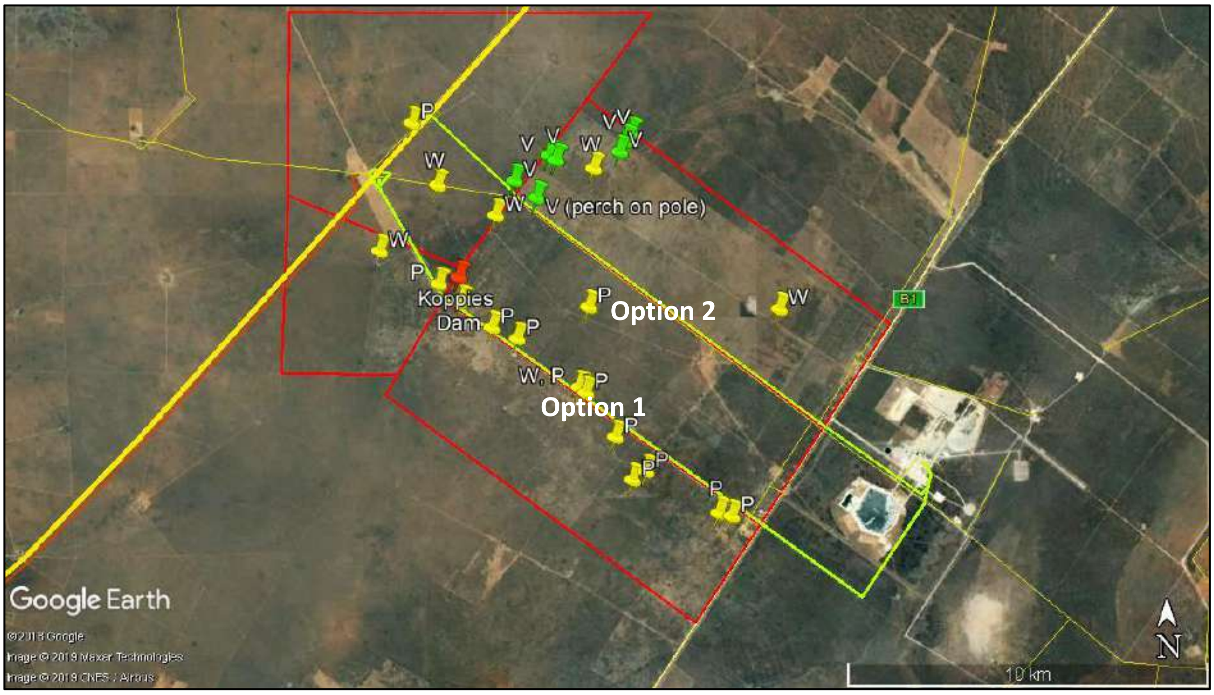


Figure 12. Specific localities of some of the vulture nesting (and perching) sites (V; green markers), koppie habitat (orange marker) and ephemeral pans/farm dams (P/W; yellow markers) situated in the vicinity of the two proposed power line route alternatives (Option 1 and 2; based on a Google Earth map, EIS 2019).

4.1.4.1 Farmland on the plains

Examples of habitats on farmlands in the study area that are potentially sensitive in terms of avifauna are illustrated below (Figure 13 to 16).

The main habitats available to birds in these areas include dense shrubland (bush-encroached to varying degrees), with larger trees (mainly *Acacia luederitzii* Kalahari acacia, Lüderitz acacia) providing nesting habitats for large raptors, including vultures; more open habitats (dry pans and areas that have been cleared, including along roads and fence lines), used by Kori Bustard; and watering points used by many kinds of birds, with easily accessible drinking sites favoured by vultures for drinking and bathing.

At least six or seven pairs of White-backed Vulture nest regularly in large trees on Farm Hester (Figure 13 and 16). One more nest was indicated on Farm Maxwell, where the vultures use a nearby 33 kV power line pole for perching (Figure 16c). An additional vulture nest was reported on Farm Lardner, with signs of frequent perching on a 33 kV power line pole (Figure 16 e and f). No vulture nesting activity was reported on Farm Fisher, and could not be ascertained on Farm Luckenwalde.

Although bush encroachment has been shown to impact negatively on the foraging success of the Cape Vulture (Schultz 2009; Simmons et al. 2015) and by implication other vulture species, and make it difficult for the birds to take off again, the taller trees in this habitat are able to support nesting.

The closest vulture nests to the proposed power line Option 1 are about 110 m (Farm Maxwell), and 1-3 km (Farm Hester), while the existing 33 kV poles are used for perching (Figure 16c, e and f). (Note that there is little electrocution risk from streamers on this structure [Figure 16 e and f] as the wooden pole is earthed, but the earth wire running upwards from the ground stops below the conductors, so it would be difficult for the bird to make contact with the earthed component while sitting on the pole [see Section 5.1.4 below]).

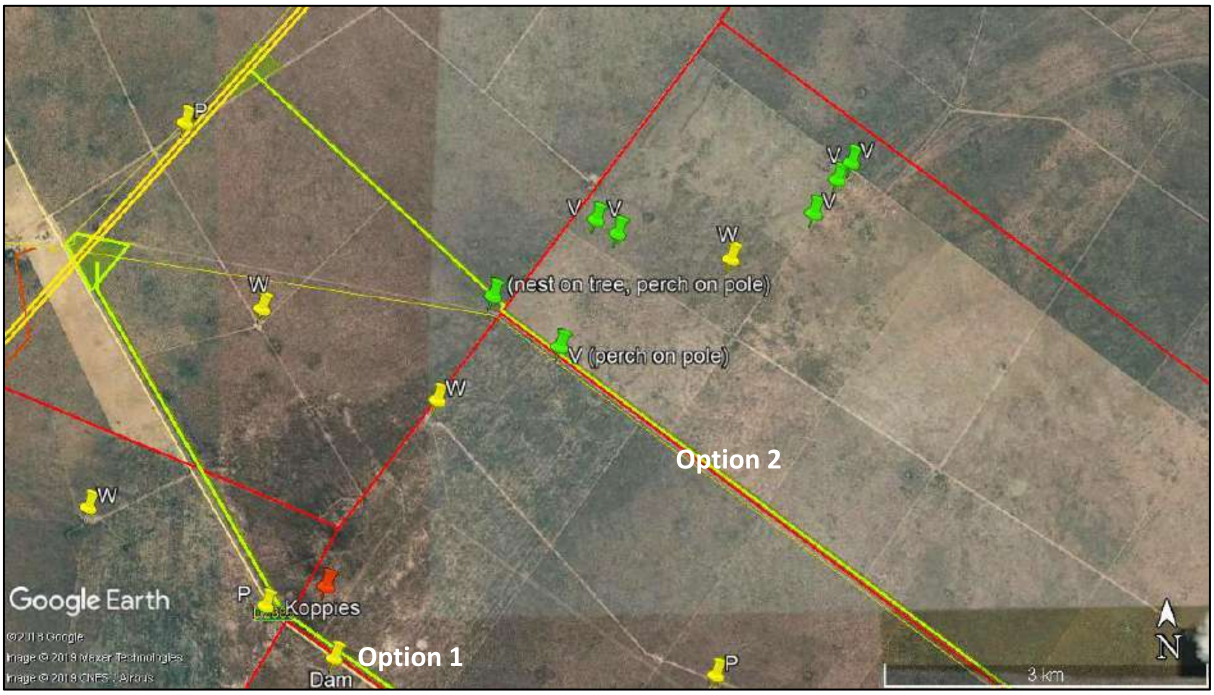


Figure 13. Specific localities of some of the White-backed Vulture nesting (and perching) sites (V; green markers) situated in the vicinity of the two proposed power line route alternatives (Option 1 and 2; based on a Google Earth map, EIS 2019).

Figure 14 a & b. Examples of bushy habitats and open areas on the farms in the study area.

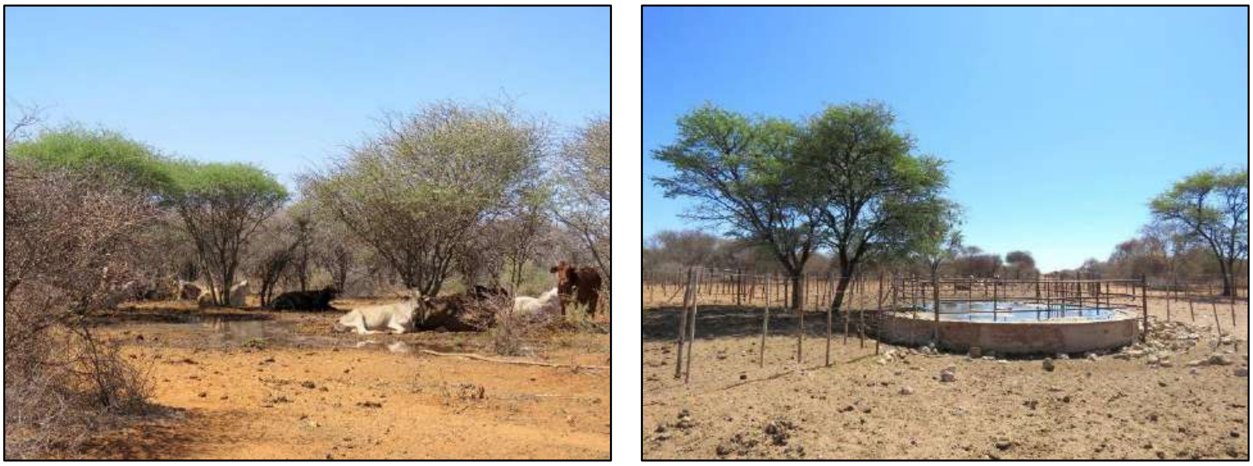


Figure 15 a & b. Examples of watering points on the farms.

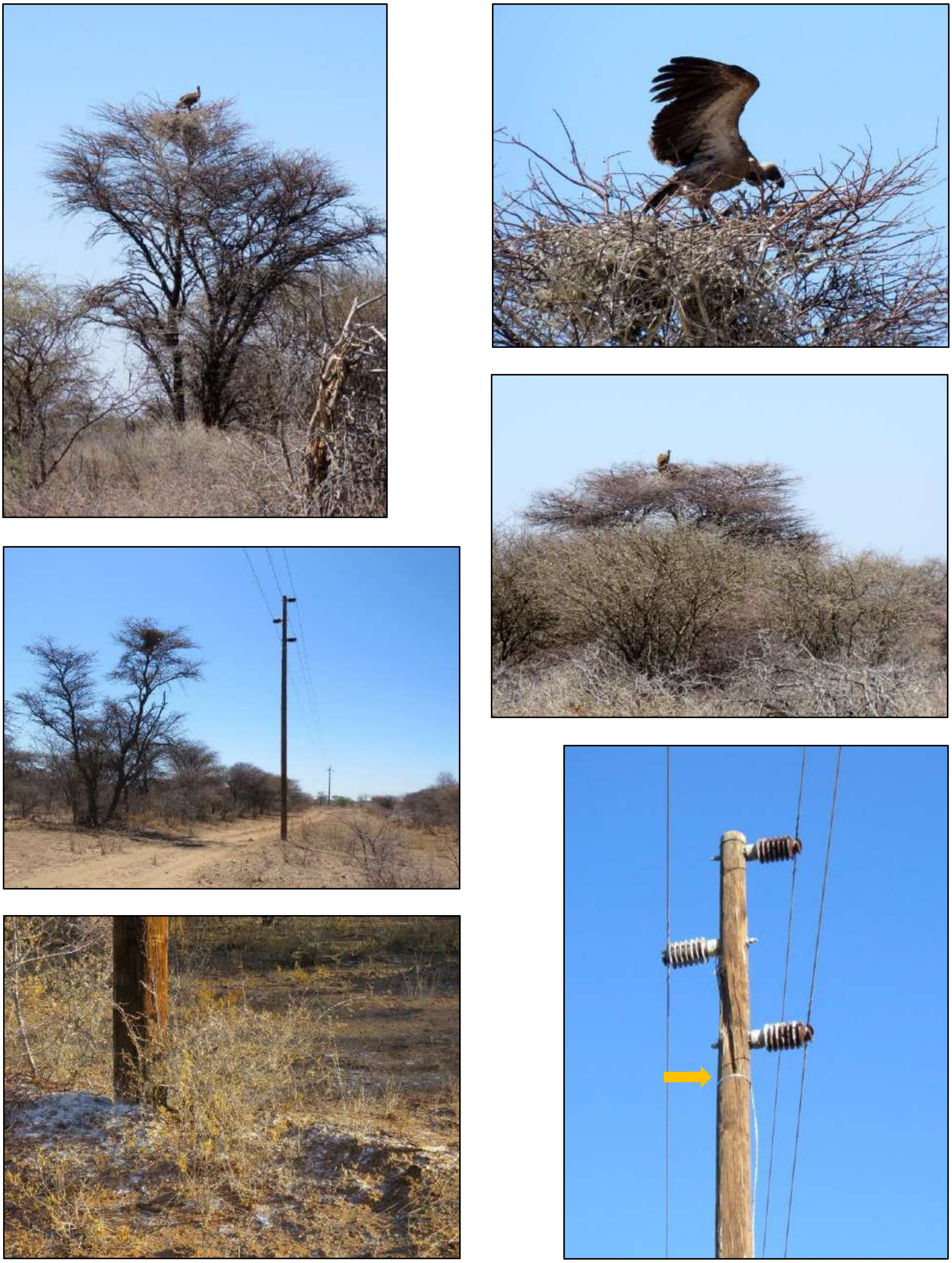


Figure 16 a – f. Examples of White-backed Vulture nests in *Acacia* trees (above), and of signs of perching by vultures on 33 kV power line poles on farms in the study area (two photographs below [e and f]; arrow indicates upper limit of the earth wire).

4.1.4.2 Rocky hills habitat

In the north-western parts of Farm Lardner and on the adjoining properties (Farm Luckenwalde and Farm Maxwell), a fairly restricted rocky hills/koppie habitat supports large trees including the deciduous *Kirkia acuminata* (common or mountain kirkia, bergsering, witsering) (Figure 17 and 18). The D2886 gravel road and Route Option 1 run close to these hills, on their western side.

Not many birds were seen in this habitat during the limited time of the field visit, but it is possible that Namibian near-endemic species with specific habitat requirements could be present, especially under wetter conditions (see 4.2.3 below).

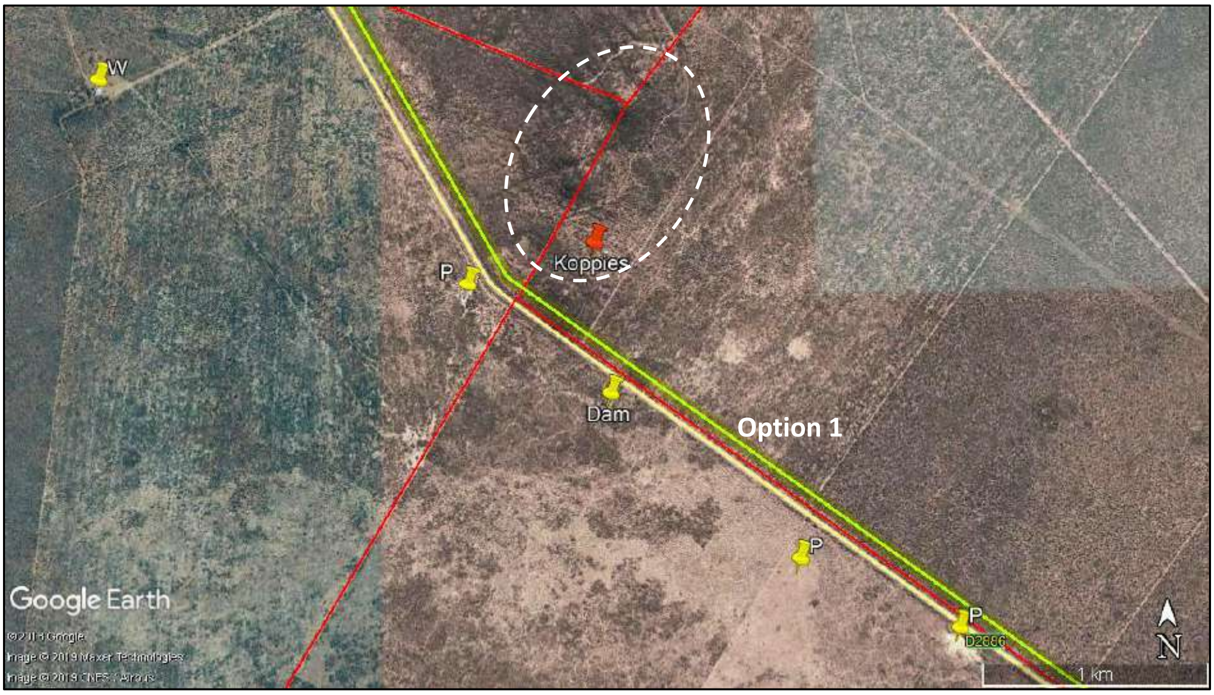


Figure 17. Specific locality of the rocky hills/koppie habitat (white circle) and some of the ephemeral pans/farm dams (P/W; yellow markers) situated in the vicinity of Option 1 of the two proposed power line route alternatives (based on a Google Earth map, EIS 2019).

Figure 18 a – d. Examples of the rocky hills/koppie habitat with large trees in the north-western parts of Farm Lardner and on the adjoining properties.

4.1.4.3 Ephemeral pans, earth dams and other aquatic habitats

A third main group of habitats is aquatic, including a system of shallow ephemeral pans that were dry at the time of the field visit, but are reported to hold water regularly during the rainy season. At such times these habitats are transformed, and cause many waterbirds to move into the area, by way of varying flight paths.

Several of these pans were indicated on Farm Fisher during the field trip, and some similar habitats are also apparent on Farm Lardner and Farm Luckenwalde (Figure 19 to 21). On Farm Fisher, several gravel pits and earth dams were also pointed out, in particular one relatively large earth dam at the north-eastern edge of the property, adjoining the D2886 road (Figure 19 and 20a). This dam is 125 m south-west of the road and the Option 1 power line route.

On the adjacent B2Gold Mine property, a large ephemeral pan on the nature reserve section (Figure 21a) is also reported to hold water during the rainy season, with many waterbirds, including up to 60 Great White Pelican observed at one time (D Rudman pers. comm.). Several pairs of Lappet-faced Vulture also breed in large trees near this pan area (Figure 21b). Other similar habitats in the greater study area include the ephemeral pan system in the upper catchment of the Ugab River (see 4.1.3 above), and pans to the east of the mine area (Figure 22). A sewage pond of about 140 m^2, lying on the main entrance road to the mine, provides an attractive habitat to a variety of waterbirds, including Greater Flamingo and Lesser Flamingo (Figure 19 and 23). Other species recorded regularly at this site (2016-2019) include Black-winged Stilt, Cape Shoveler, Red-billed Teal, Cape Teal, Blacksmith Lapwing, Little Stint, Little Egret, Egyptian Goose, Kittlitz's Plover, Grey Heron and Pied Avocet, as well as Marabou Stork elsewhere in the mine area (A Kanandjembo pers. comm.). The pond is 425 m north of the Option 2 power line route. A large tailings dam is situated nearby.

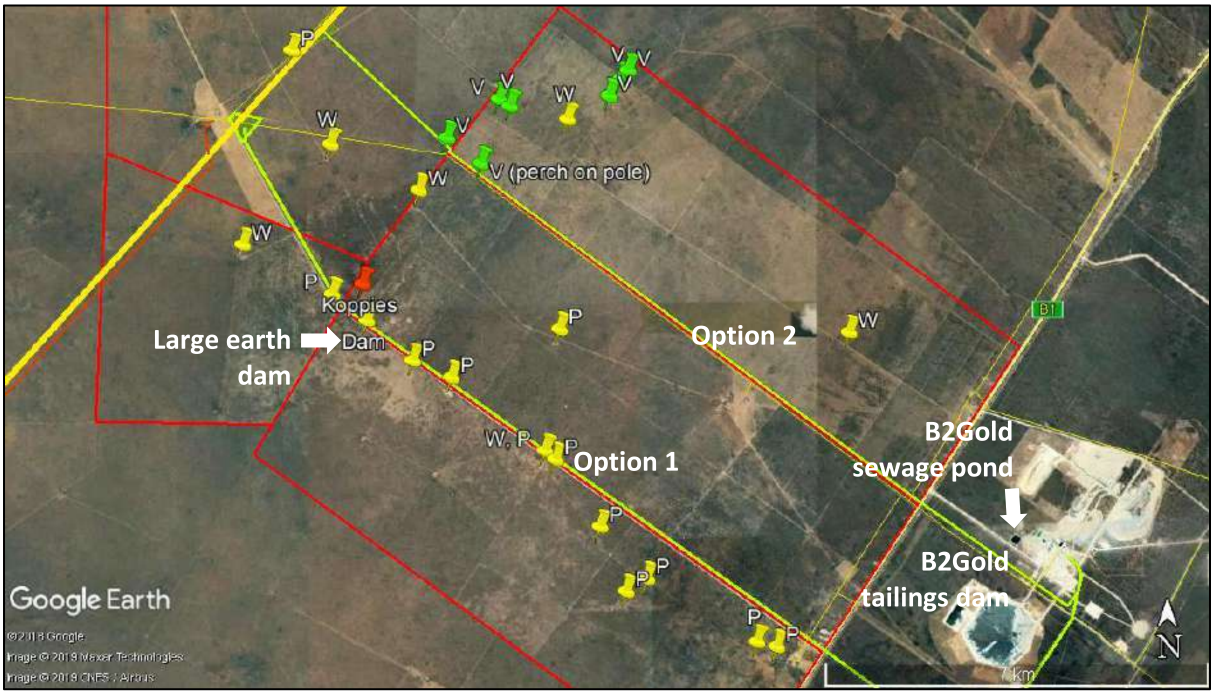


Figure 19. Specific localities of the ephemeral pans/farm and other dams (P/W; yellow markers) situated in the vicinity of the two proposed power line route alternatives (Option 1 and 2; based on a Google Earth map, EIS 2019).

Figure 20 a & b. Examples of (dry) ephemeral earth dams/pans on Farm Fisher (left) and Farm Maxwell (right).

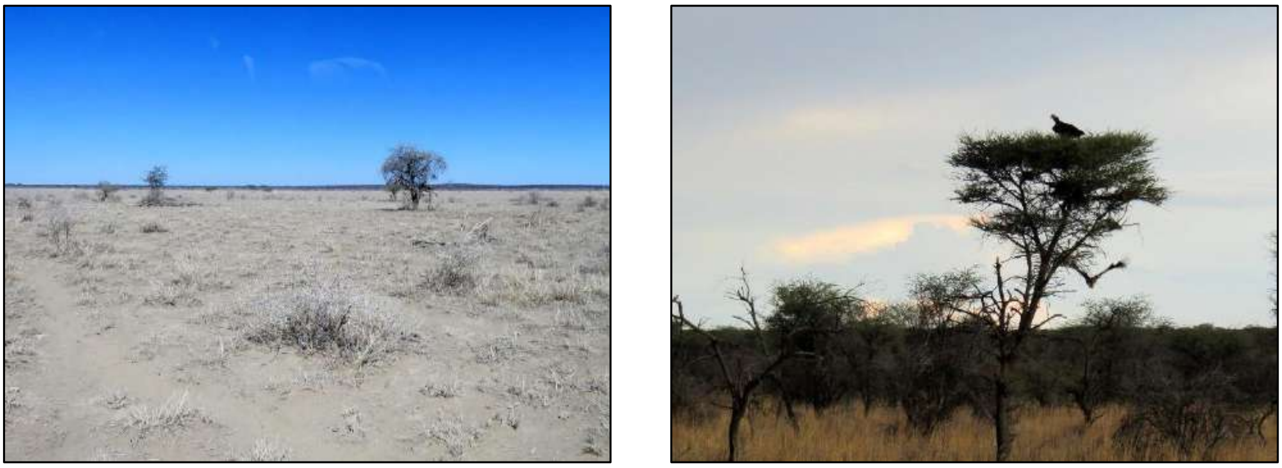


Figure 21 a & b. Large ephemeral pan in the B2Gold nature reserve area, with Lappet-faced Vulture on nest (right; photographed in November, 2016).

Figure 22. An ephemeral pan some 15 km to the east of the B2Gold Mine, holding water during the rainy season in March 2012 and attracting a flock of Marabou Stork (photograph posted on Google Earth by Aleksei N.iRudoy).

Figure 23 a to c. A large sewage pond on the main entrance road to the B2Gold Mine provides an attractive habitat to a variety of waterbirds, including a juvenile Greater Flamingo (right; photographed in October 2019).

4.2 Sensitivities in terms of bird species

Sensitivities of the bird species in the area are discussed below, according to relevant criteria.

Note that risk assessment and mitigation efforts are directed towards priority species, namely those species that have a high biological significance, i.e. primarily Red Data species (including those with migrant status) and/or endemic or near-endemic species.

4.2.1 Bird species diversity

A total of 217 bird species has been recorded for the study area (SABAP1 and SABAP2 data for QDSs 1916DD, 1917CC, 2016BB and 2017AA and pentads 1955_1700, 1955_1705, 2000_1700 and 2000_1705, and other sources: see above; Appendix 1). However, the area is under-atlassed (i.e. not well documented) in parts, and the results should be interpreted accordingly.

The above total represents 32% of the 676 species currently recorded in Namibia (Brown et al. 2017), a diversity that is classed as relatively high (Figure 24; Mendelsohn et al. 2002; EIS 2019).

The field trip for the present study took place during the dry season (September-October 2019), and under drought condirions, and the bird diversity then observed was fairly low. The combined data in Appendix 1 are thus considered the best reflection of bird diversity over the longer term.

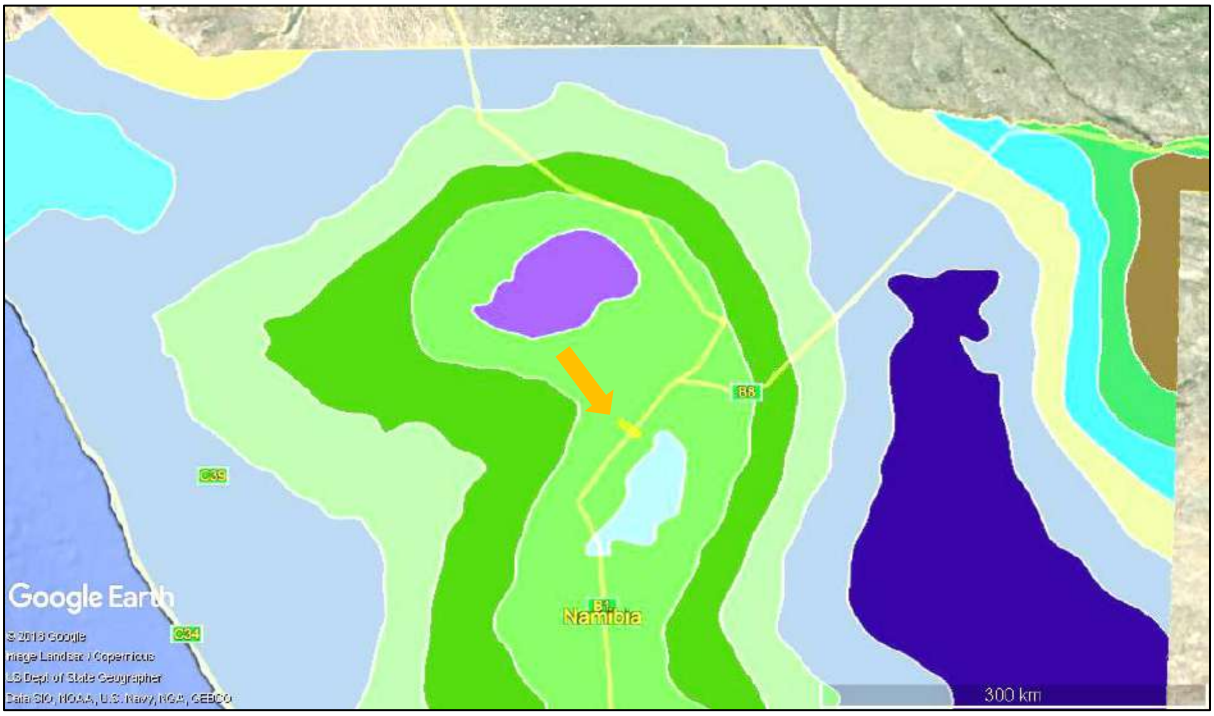


Figure 24. Bird diversity in the study area is regarded as relatively high (7 on a scale of 8) (Mendelsohn et al. 2002; based on a Google Earth map, EIS 2019).

4.2.2 Red Data status

The overall checklist for the study area (Appendix 1) includes 18 species (9%) that are threatened in Namibia (Brown et al. 2017). This represents 25% of the 71 species that are on the Namibian Red Data List. Eleven of these species are also Globally Threatened (IUCN 2019).

For the study area, these 18 Red-listed species are as follows:

- White-backed Vulture (Critically Endangered, also Globally Critically Endangered)
- Cape Vulture (Critically Endangered, also Globally Endangered; now rare in Namibia)
- Blue Crane (Critically Endangered, also Globally Vulnerable; now rare in Namibia outside the Etosha National Park and Omadhiya Lakes areas)

- Lappet-faced Vulture (Endangered, also Globally Endangered)
- Martial Eagle (Endangered, also Globally Vulnerable)
- Bateleur (Endangered, also Globally Near Threatened)
- Tawny Eagle (Endangered)
- Saddle-billed Stork (Endangered)

- Lesser Flamingo (Vulnerable, also Globally Near Threatened)
- Secretarybird (Vulnerable, also Globally Vulnerable)
- Greater Flamingo (Vulnerable)
- Great White Pelican (Vulnerable)

- Kori Bustard (Near Threatened, also Globally Near Threatened)
- Red-footed Falcon (Near Threatened, also Globally Near Threatened)
- Bar-tailed Godwit (Near Threatened, also Globally Near Threatened)
- Black-necked Grebe (Near Threatened)
- Rüppell's Parrot (Near Threatened)
- Marabou Stork (Near Threatened)

It should be noted that large birds that collide with power lines, such as vultures and other raptors, bustards and flamingos, have been identified as one of four major groups of threatened birds in Namibia (Simmons et al. 2015).

The Waterberg area is well known for its populations of several species of threatened vultures, and is an epi-centre for the remaining small population of Cape Vultures in Namibia (Simmons et al. 2015).

4.2.3 Endemism

The checklist for the study area includes at least four species that are near-endemic to Namibia (Appendix 1), with at least 90% of the populations occurring within the country. The above checklist also includes a number of species that are endemic or near-endemic to southern Africa; however, the focus in this study will be on those species that are near-endemic to Namibia, which the country has a special responsibility to conserve.

Endemism or having a limited distribution renders populations more vulnerable to threats.

The four recorded Namibian near-endemic species are as follows:

- Rüppell's Parrot
- Damara (Red-billed) Hornbill
- Monteiro's Hornbill
- Carp's Tit

The recorded level of endemism in the study area is considered relatively moderate (Figure 25); however, this group of birds is likely to be under-atlassed (poorly documented), and several other near-endemic species may potentially be found in the area, on closer investigation, e.g. Bare-cheeked Babbler, White-tailed Shrike, Hartlaub's Spurfowl, Rockrunner, Violet Woodhoopoe.

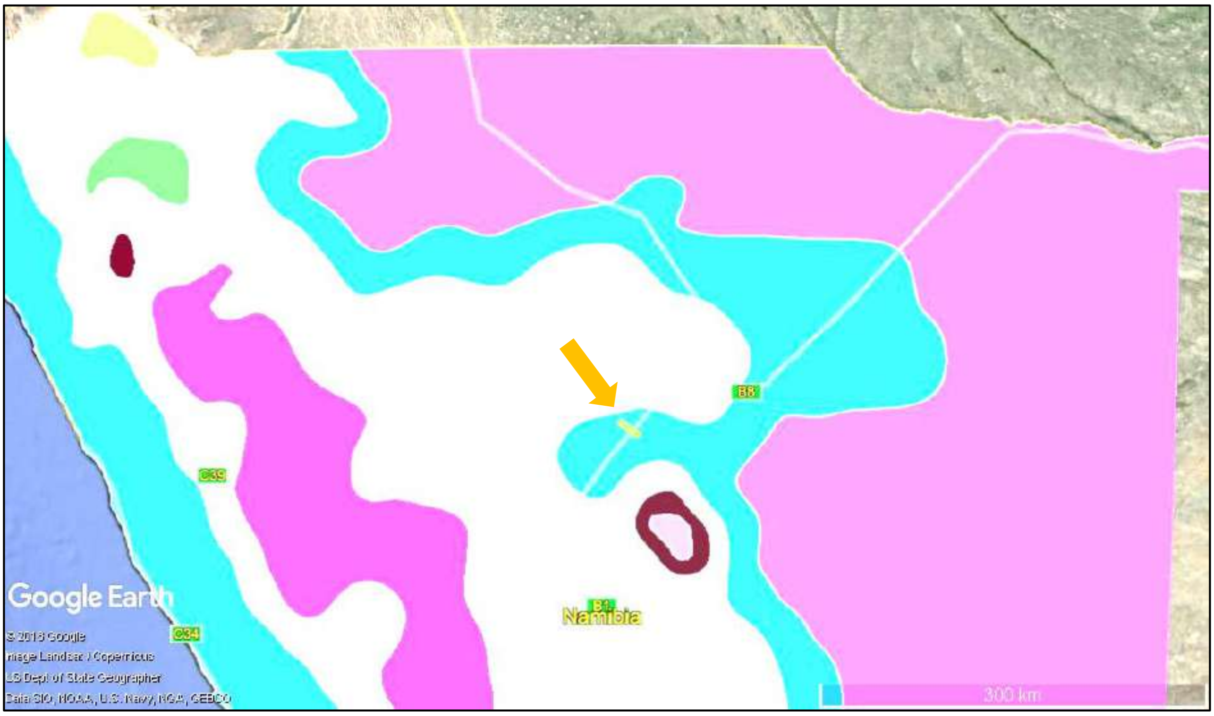


Figure 25. Bird endemism in the study area is regarded as relatively moderate (2-3 on a scale of 5) (Mendelsohn et al. 2002; based on a Google Earth map, EIS 2019).

4.2.4 Migrant status (Red Data species) and nomadism

The checklist includes four Red-listed species with migrant status (Appendix 1), namely:

- Greater Flamingo (intra-African migrant)
- Lesser Flamingo (intra-African migrant)
- Red-necked Falcon (Palearctic-breeding migrant)
- Bar-tailed Godwit (Palearctic-breeding migrant)

Several other (Red Data) species are nomadic or make extensive movements, including the vulture species and waterbirds.

Nomadic/migrant habits result in high mobility and consequently increase the risk of impacts such as collisions on overhead structures. It should be emphasised that both short-distance and longer bird movements are possible. This is particularly true under the changing conditions associated with ephemeral wetland habitats. The largest numbers of birds are potentially found in the area between October and April, when summer migrant species may be present.

Species such as flamingos are known to move extensively. They move inland from the coast after good rains, in order to breed, e.g. in Botswana and, occasionally, Etosha National Park. Details of their flight paths on such migratory routes in Namibia are not confirmed.

For much of the time, and even for years on end, there are very few birds in ephemeral river systems and associated pans, and their importance as a bird habitat could then easily be under-estimated. During and after times of good rains and occasional flooding, the habitats are transformed. Extensive nomadic movements take place and birdlife increases accordingly, and this is reflected in the SABAP data over the longer term.

4.2.5 Sensitivity to power line interactions

Bird species may be sensitive, in varying degrees, to power line impacts such as collision, electrocution and/or disturbance and habitat destruction. The incidence of Red Data power line-sensitive bird species per QDS (based on SABAP1 data) in the greater study area is shown in Figure 26. The sensitivity in the western part of the study area is relatively higher (16 species) in relation to surrounding QDSs (7-10 species).

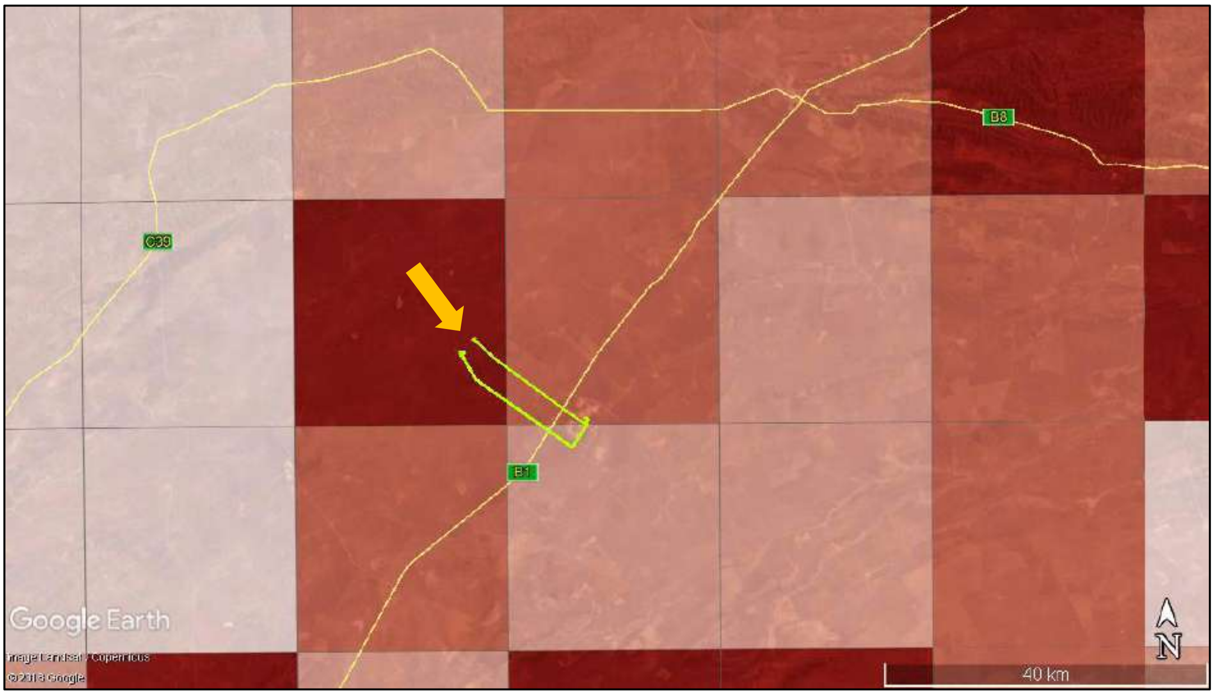


Figure 26. Relative occurrence of power line-sensitive Red Data species in the greater study area (based on SABAP1 data; range of sensitivity from low [light] to high [dark]; EIS 2019).

Examples of power line-sensitive species in the study area

Examples of the distribution of power line-sensitive species in the study area are shown below, namely for White-backed Vulture (Figure 27), Lappet-faced Vulture (Figure 28) and Kori Bustard (Figure 29).

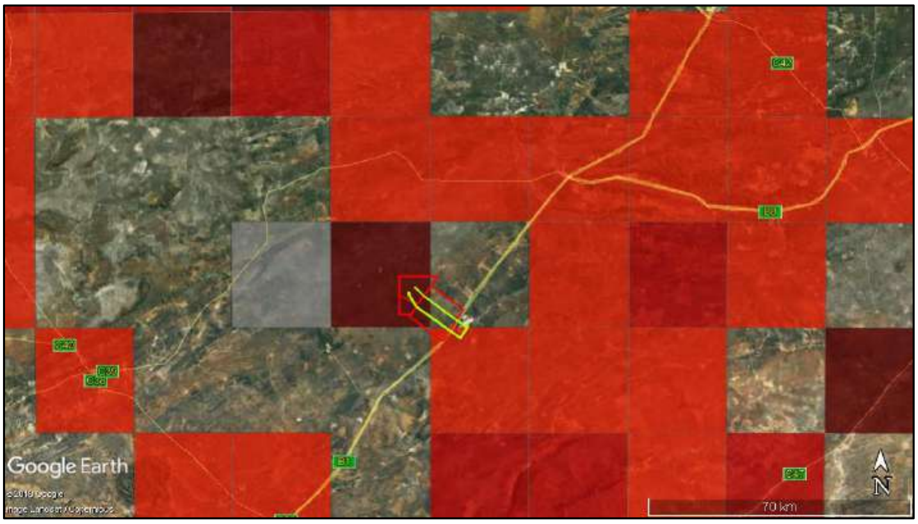


Figure 27. Reporting rates for White-backed Vulture in the greater study area (SABAP1: EIS 2019).

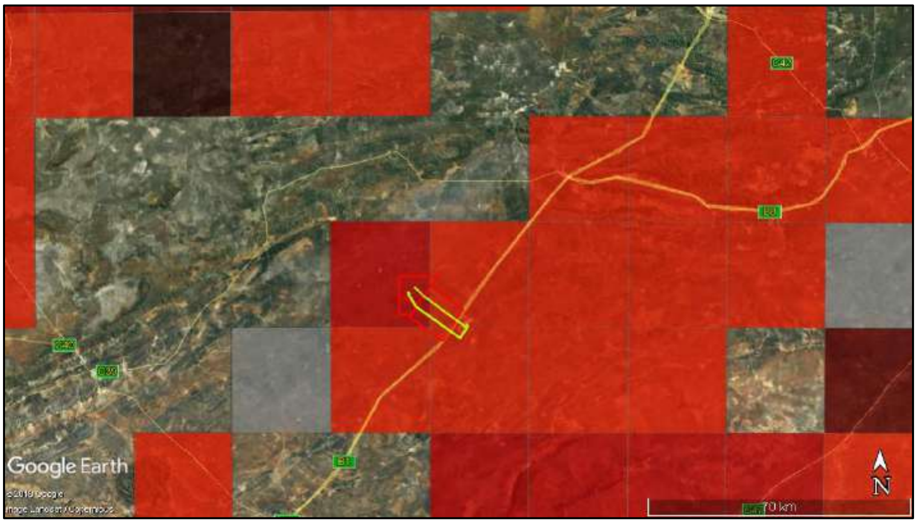


Figure 28. Reporting rates for Lappet-faced Vulture in the greater study area (SABAP1: EIS 2019).

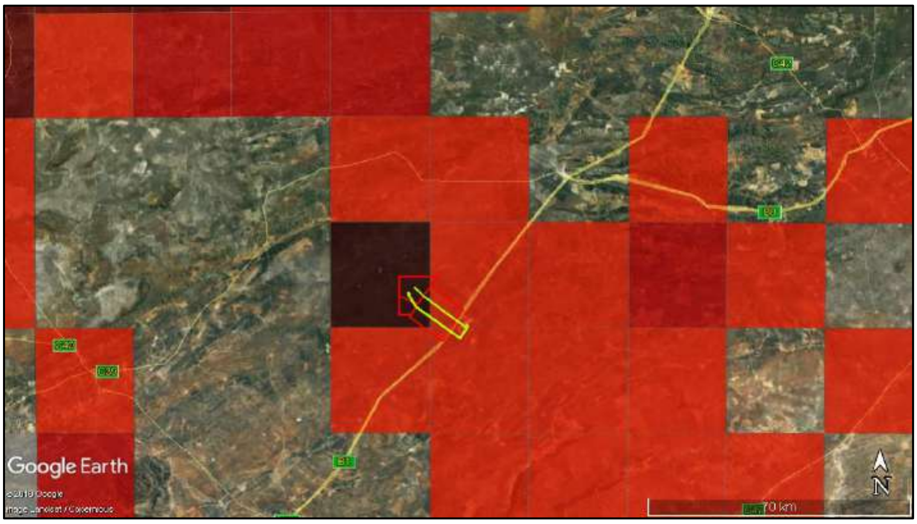


Figure 29. Reporting rates for Kori Bustard in the greater study area (SABAP1: EIS 2019).

Power line incidents on record for Namibia

The NamPower/Namibia Nature Foundation Strategic Partnership (http://www.nnf.org.na/project/nampowernnf-partnership/13/5/5.html) has documented wildlife and power line incidents from 2006 to the end of 2017, involving some 732 animals, mostly birds and mostly collisions, but also electrocutions (EIS 2019). Due to the difficulty of obtaining records in bush-encroached areas (especially in the northern and north-eastern parts of the country, including in the study area), low reporting rates and the high scavenging rates in general, it is likely that the incidents observed are an under-estimate.

Most of the incidents throughout the country have involved flamingos (39%) and bustards/korhaans (30%; Figure 30). A further 11% have involved raptors, mainly vultures as well as eagles, snake-eagles and owls; and 10% have involved other waterbirds. There are 11 Great White Pelican collisions on record for the country as a whole. Most of the incidents involving White-backed Vulture and Lappet-faced Vulture (20 individuals) have comprised electrocution on low-voltage distribution structures; however, collisions are an ongoing concern.

High mobility of bird species, e.g. among ephemeral resources, may render them prone to power line interactions. Bustards are susceptible to collisions due to their nomadic habits, a large body size with low manoeuvrability, and a visual "blind spot" when flying forwards (Martin & Shaw 2010). This proneness to collision has also been demonstrated in vultures, storks, snake-eagles and other groups.

Examples of power line incidents recorded in the vicinity of the study area to date are shown in Figure 31 (NamPower/NNF Strategic Partnership database, EIS 2019). Notably, two group flamingo collision incidents have been recorded on the 350HVDC power line ("Caprivi Link") north-east of the study area, involving 20 flamingos in December 2009 (shortly after the line was constructed) and two more flamingos in January 2015, respectively.

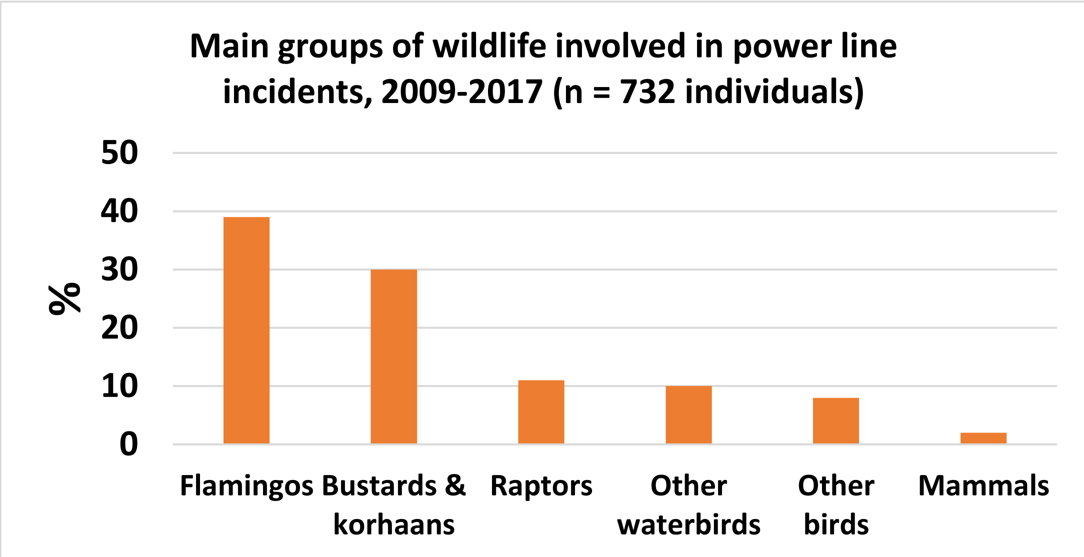


Figure 30. Numbers of birds and other wildlife involved in power line incidents in Namibia, 2006-2017 (n = 732 individuals; NamPower/NNF Strategic Partnership data 2017; EIS 2019).

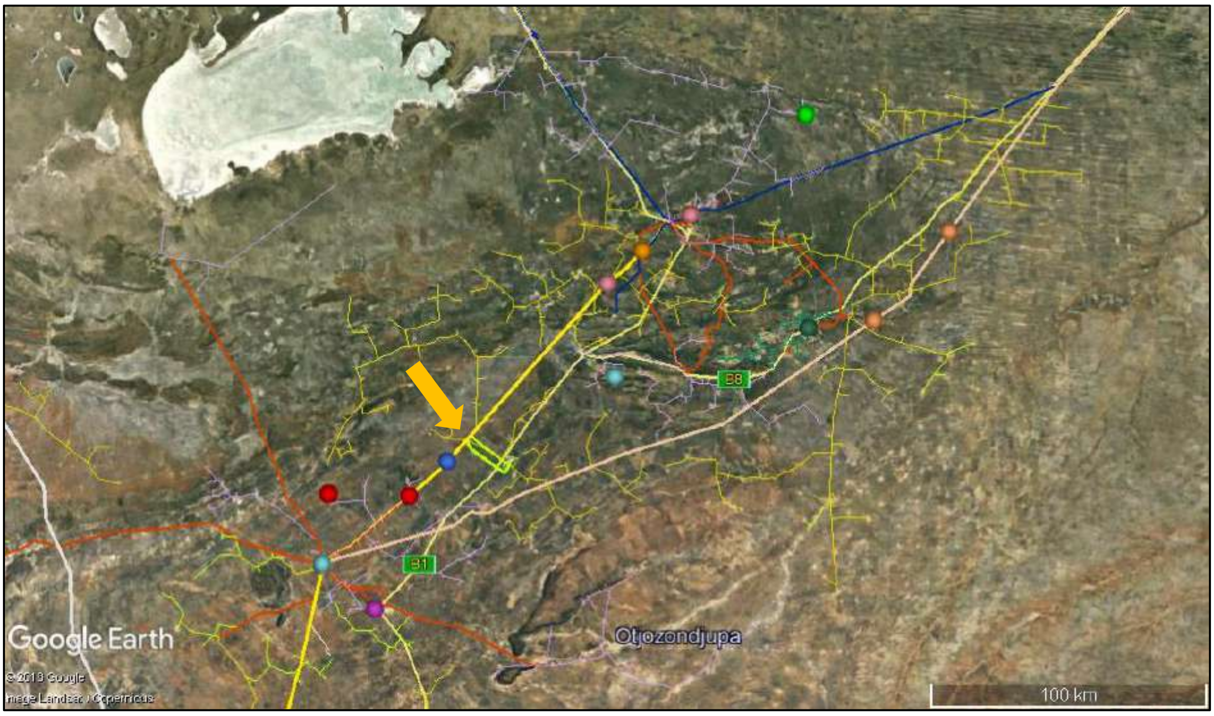


Figure 31. Power line incidents on record for the greater study area in the north of Namibia (flamingo incidents indicated by pink dots [top right]) (NamPower/NNF Strategic Partnership database; EIS 2019).

4.2.6 Potential flight paths

Satellite tracking of seven Cape Vultures in the Waterberg area in 2004-2005 (Mendelsohn, Brown, Mendelsohn, Diekmann 2005; Mendelsohn & Diekmann 2009) shows that the birds concentrated their movements and foraging to the west of the Waterberg Plateau Park, although ranging widely with very large home ranges of up to 25,000 km^2. The flight paths that were tracked also cover the study area (Figure 32). Based on 7,300 individual locations, five adult males were shown to spend the majority of their time on freehold farms. The vultures generally foraged at heights of around 250-350 m, although flying at lower altitudes at times, including at the start of the day's foraging trips and earlier in the day when thermals were weaker.

Provisional tracking data for 2004-2005 (Mendelsohn & Diekmann 2009; Figure 31) clearly indicate that these vultures have used the existing 220 kV Gerus-Otjikoto power line regularly as a perch/ roost. At that stage the power line was single, comprising the self-support steel lattice structure (see Figure 6). This perching behaviour on tall structures could potentially increase the collision risk, by bringing the bird flight paths close to the power line.

Although the above data pertain specifically to the Cape Vulture (now very rare in Namibia), these patterns are regarded as fairly typical of White-backed Vulture and other vulture species that are found in association with the Cape Vulture. High nesting densities of White-backed Vulture (namely 0.38 nests per km^2) have been recorded during a microlight survey on farms near the Waterberg area (south-east of the present study area), covering an area of approximately 150 km^2 (Doulton & Diekmann 2006).

A further group of potential flight paths for waterbirds is associated with the various aquatic habitats in the area, comprising mainly ephemeral pans, including those in the upper reaches of the Ugab River system, as well as those on the farms and B2Gold nature reserve (see above), and the mine's sewage pond (Figure 33). Such flight paths are likely to be varying, depending on conditions.

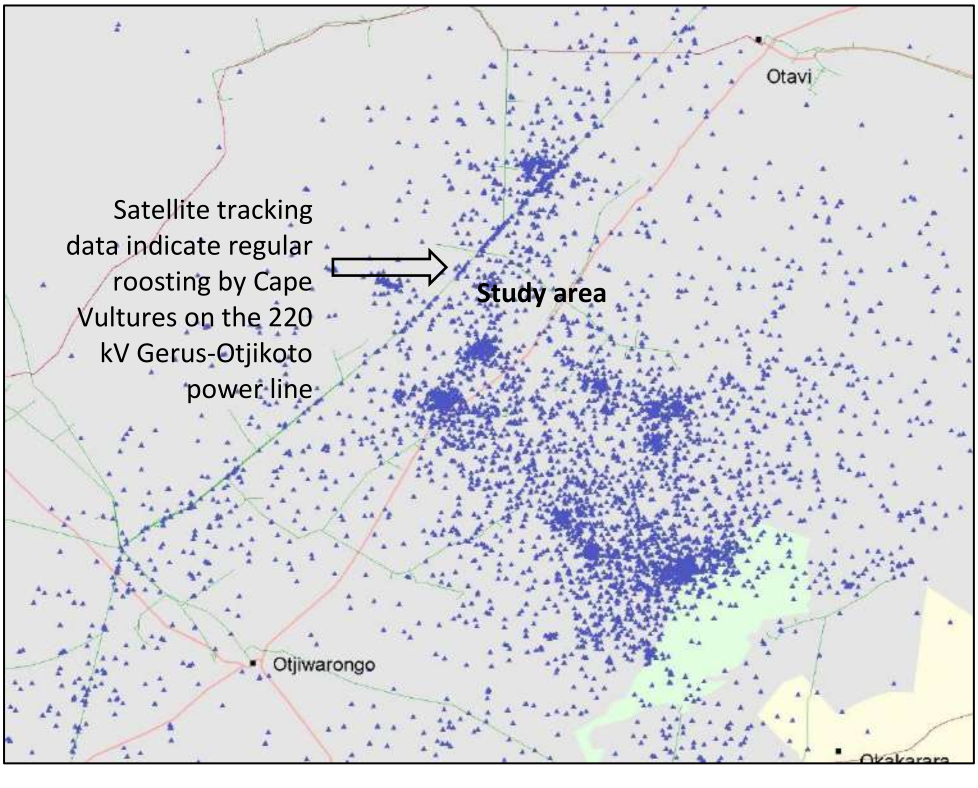


Figure 32. Regular roosting by Cape Vultures on the 220 kV Gerus-Otjikoto power line in 2004-2005, as indicated by satellite tracking (Mendelsohn & Diekmann 2009) .

Figure 33. Potential flight paths for waterbirds among ephemeral pans in the upper catchment of the Ugab River system (upper north-west) and similar habitats on farms and the B2Gold nature reserve, and the mine's sewage ponds (based on a Google Earth map, EIS 2019).

4.3 Species at risk

As mentioned above, risk assessment and mitigation efforts are directed towards those species that have a high biological significance, i.e. primarily Red Data species and/or species endemic or near-endemic to Namibia, as well as Red Data migrant species. Risk likelihood of these species to impacts is based further on relative abundance in the study area in the form of SABAP reporting rates: mainly SABAP1, but with confirmation by SABAP2 data/personal observations/local reporting, where available; and on representation in terms of existing power line incidents reported in the area and elsewhere in Namibia.

Twenty-one species are considered potentially at risk from the proposed development. These species are summarised in Table 7.

Table 7. Priority bird species that are regarded as potentially at risk from the proposed 220 kV B2Gold power line (see below for key; see also Appendix 1)

Common names	RDB / END	RES	Habitat	SABAP1 EIS	SABAP1 BVDB	SABAP2/ pers obs	Risk & pot
Species with the potential to be impacted by power lines							
Bateleur	EN, G NT	Res	T	X	X	?	C (M), E (VL)
Bustard, Kori	NT, G NT	Res, mov	T	X	X	X	C (M), D (M)
Crane, Blue	CE, G VU (rare)	Res, mov	T	X	X		C (VL)
Eagle, Martial	EN, G VU	Res	T		X	X	C (M), E (VL), D (L)
Eagle, Tawny	EN	Res	T	X	X	X	C (M), E (VL), D (L)
Falcon, Red-footed	NT, G NT	Pal mig	T	X	X	X	C (M)
Flamingo, Greater	VU	Res, intra-Afr mig, nom	A	X	X	X juv	C (M)
Flamingo, Lesser	VU, G NT	Res, intra-Afr mig, nom	A		X	Rep	C (M)
Godwit, Bar-tailed	NT, G NT	Pal mig	A	X	X		C (L)
Grebe, Black-necked	NT	Res, nom	A	X	X	X	C (M)
Hornbill, Damara (Red-billed)	NE Nam	Res, nom	T		X		C (M), D (M)
Hornbill, Monteiro's	NE Nam	Res, nom	T			X	C (M), D (M)
Parrot, Rüppell's	NT; NE Nam	Res, nom	T		X		C (M), D (M)
Pelican, Great White	VU	Res. nom	A	X	X	Rep	C (M)
Secretarybird	VU, G VU	Nom	T	X	X	X	C (M), D (L)
Stork, Marabou	NT	Res	(A)			Rep	C (M)
Stork, Saddle-billed	EN	Res	A	X	X		C (L)
Tit, Carp's	NE Nam	Res	T		X		C (VL), D (VL)
Vulture, Cape	CR, G EN (rare)		T			X	C (VL), E (VL)
Vulture, Lappet-faced	EN, G EN	Res but with large-scale movements	T	X	X	X; rep nest	C (M), E (L), D (L)
Vulture, White-backed	CR, G CR		T	X	X	X nests	C (M), E (L), D (H)

(PTO)

Common names	RDB / END	RES	Habitat	SABAP1 EIS	SABAP1 BVDB	SABAP2/ pers obs	Risk & pot
Species with the potential to impact on power line structures through their nesting activities							
Crow, Cape	LC	Res	T	X	X		N (VL)
Crow, Pied	LC	Res, mov	T			X	N (VL)
Weaver, Red-billed Buffalo	LC	Res, mov	T	X	X	X old nests	N (L)
Weaver, Sociable	LC	Res, mov	T			X old nests	N (L)

KEY:

RDB = Red Data/conservation status (Brown et al. 2017) CE = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened, LC = Least Concern; G = global status; rare = now rare in Namibia

END = Endemism: (Brown et al. 2017): NE = near-endemic; Nam = Namibia (≥90% of population in Namibia)

RES = Residency: Res = resident, Nom = nomadic, Mig = Red Data species that have migrant status, Pal = Palearctic-breeding, intra-Afr mig = intra-African migrant, mov = local/seasonal movements

SABAP1 EIS: Southern African Bird Atlas Project 1 data that was published as Harrison *et al.* (1997), available on EIS 2019

SABAP1 BVDB: Southern African Bird Atlas Project 1 and other data, available on Namibian Avifaunal Database (NAD; www.biodiversity.org.na)

SABAP2/pers obs: Southern African Bird Atlas Project 2 data, available on http://sabap2.adu.org.za; combined with personal observations September/October 2019

Risk: C = collision, D = disturbance/habitat destruction, E = electrocution (i.e. only indirectly, through "streamers" of excrement), N = potential impacts on power line structures due to nesting activities

Pot: Potential for impacts H = high, M = medium, L = low, VL = very low

The 21 species considered to have the potential to be impacted by power line structures (including 18 Red Data species, four Namibian near-endemic species and four with migrant status; Table 7), are as follows:

- *Raptors (8)*
  White-backed Vulture (Critically Endangered, also Globally Critically Endangered)
  Cape Vulture (Critically Endangered, also Globally Endangered; now rare in Namibia)
  Lappet-faced Vulture (Endangered, also Globally Endangered)
  Martial Eagle (Endangered, also Globally Vulnerable)
  Bateleur (Endangered, also Globally Near Threatened)
  Tawny Eagle (Endangered)
  Secretarybird (Vulnerable, also Globally Vulnerable)
  Red-footed Falcon (Near Threatened, also Globally Near Threatened; Palearctic-breeding migrant)
- *Large terrestrial (cursorial) species (2)*
  Blue Crane (Critically Endangered, also Globally Vulnerable; now rare in Namibia)
  Kori Bustard (Near Threatened, also Globally Near Threatened)
- *Aquatic species (7)*
  Saddle-billed Stork (Endangered)
  Lesser Flamingo (Vulnerable, also Globally Near Threatened; intra-African migrant)
  Greater Flamingo (Vulnerable) (intra-African migrant)
  Great White Pelican (Vulnerable)
  Bar-tailed Godwit (Near Threatened, also Globally Near Threatened; Palearctic-breeding migrant)

Black-necked Grebe (Near Threatened)
Marabou Stork (Near Threatened)

- *Other smaller birds/Namibian near-endemic species (4)*
  Rüppell's Parrot (Near Threatened)
  Damara (Red-billed) Hornbill
  Monteiro's Hornbill
  Carp's Tit

All the above 21 priority bird species are potentially at risk to collisions on power line structures. Further potential impacts include physical disturbance and habitat destruction/modification during the construction of power lines; and electrocution (including by streamers of excrement).

Red-billed Buffalo-Weaver and Sociable Weaver have a low potential to impact on the power supply through their nesting activities on power line structures. Cape Crow and Pied Crow both occur in the area but their nesting activities should have minimal effects on the power supply.

5 Impact assessment

5.1 Impact description

5.1.1 Introduction

The impacts of power line structures on avifauna and recommended mitigation measures are well documented, both globally and for the southern African subregion (e.g. Bevanger 1994, 1998; Lehman, Kennedy, Savidge 2007; Jenkins, Smallie, Diamond 2010; Prinsen, Smallie, Boere, Pires 2011; Pallett, Osborne 2015; Simmons 2015; Scottish Natural Heritage 2016; Shaw, Reid, Schutgens, Jenkins, Ryan 2018; D'Amico, Martins, Álvarez-Martínez, Porto, Rafael Barrientos, Moreira 2019).

Four potential impacts have been identified for the project. These impacts are outlined below and, where relevant, assessed in Table 8.

5.1.2 Collision of birds on power line structures

A collision occurs when a bird in mid-flight does not see the overhead cables or structures (including conductors and/or earth/optical ground wires [OPGWs]) until it is too late to take evasive action. These impacts could take place on any parts of the power line, but are more likely in sections where the line crosses flight paths/corridors or flyways, such as water courses or ridges. Collisions may also take place on stay wires (which may be included on each of the proposed two structures; the risk would be increased by the 66 kV guyed monopole in particular), for instance when a bird is flushed from its position on the ground, and on other associated structures. Collisions may take place even during the construction phase, once the conductors have been strung although not yet energised, but occur mainly during the operational phase.

Recent research has highlighted the fact that the most susceptible species to collision mortality on power lines are large, long-lived and slow-reproducing birds, often habitat specialists with hazardous behavioural traits (especially flight height and flocking flight), with high spatial exposure to collision risk with power lines and unfavourable conservation status (D'Amico et al. 2019). The collision risk is believed to be increased by factors that include a large wingspan and low manoeuvrability, nomadic/ migrant habits, flying in low light (e.g. flamingos and other waterbirds), courtship behaviour, juvenile inexperience and predation. The collision risk may also be increased under adverse weather conditions, e.g. strong wind, dust (e.g. from the mine site during east winds) and rain.

A further contributory factor to collisions is the occurrence of a visual "blind spot" when flying forwards, which has been demonstrated in some groups of birds, including vultures, snake-eagles, bustards and storks (Martin & Shaw 2010); while searching for food on the ground, or observing conspecifics, they thus fail to see overhead structures such as power lines in their path, especially cables.

A collision is a direct impact that could potentially result in:

- Bird injuries and/or mortalities

Priority bird species in the study area that may potentially be impacted by collision include:

- All of the priority bird species identified in the present study, including eight raptors (White-backed Vulture [presently nesting 110 m – 3 km from Route Option 2], Lappet-faced Vulture, Cape Vulture, Bateleur, Martial Eagle, Tawny Eagle, Red-footed Falcon, Secretarybird); two large terrestrial (cursorial) species (Kori Bustard, Blue Crane); seven aquatic species (Greater Flamingo, Lesser Flamingo, Great White Pelican, Marabou Stork, Saddle-billed Stork, Black-necked Grebe, Bar-tailed Godwit); and four other smaller near-endemic species (Damara [Red-billed] Hornbill, Monteiro's Hornbill, Rüppell's Parrot, Carp's Tit)

Areas/structures that are potentially more sensitive in terms of being associated with bird collisions on power lines include flight paths around:

- Areas with large trees, used for nesting by White-backed Vulture and other raptors
- Open areas along fence-lines/roadways/power line servitudes, used by Kori Bustard
- Areas near water points accessible to birds, and other (ephemeral) aquatic habitats, when they hold water (e.g. the large earth dam on Farm Fisher is about 125 m from the D2668 road/Option 1 route; the B2Gold sewage pond is 425 m from Route Option 2; a large tailings dam is also situated nearby)

5.1.3 Physical disturbance of birds and habitat destruction/modification

During the construction phase of a project, physical disturbance to birds, as well as habitat destruction and/or modification, will take place. Birds may be disturbed while going about their daily activities such as feeding, roosting and, in particular, breeding.

During the construction phase, vehicle and human activity on the site is at a peak. Poaching of birds (and eggs) and road mortalities are a potential threat. Once operational, the amount of disturbance should decrease.

Any removal or disturbance of natural vegetation will result in a change to the habitat available to the birds in the area, potentially impacting on their ability to breed, forage and roost in the vicinity.

The results of disturbance/habitat destruction are mainly indirect, and include:

- Displacement of birds from areas suitable for them before development, either temporarily or permanently
- A reduction in bird breeding success
- Permanent modification/destruction of sensitive habitats
- Unnatural mortalities of birds, caused by road collisions or poaching

Priority bird species in the study area that may potentially be impacted by disturbance and/or habitat destruction during construction of the new power line include:

- Nesting raptors, in particular White-backed Vulture (presently nesting 110 m – 3 km from the Option 2 route)
- The ground-nesting Kori Bustard
- Other nesting species, including the near-endemic Damara (Red-billed) Hornbill and Monteiro's Hornbill, and Rüppell's Parrot

Areas/structures that are potentially sensitive to bird disturbance/habitat destruction in terms of power line construction include:

- Large trees used for breeding by vultures and other birds (with vulture nests 110 m – 3 km from the Route Option 2)
- Water points that are accessible to birds (and pans when full)
- The rocky hilly/koppie habitat (which is adjacent to Route Option 1) may be used by bird species near-endemic to Namibia

5.1.4 Electrocution of birds by streamers on power line structures

Technical details below are based on communications with F de Wet (pers. comm., GS Fainsinger and Associates Consulting Engineers; October 2019 and February 2020).
An electrocution occurs when a bird is perched or attempts to perch on an electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components.

220 kV steel lattice tower structure

In the case of the 220 kV steel lattice tower structure option, the clearances on the two proposed tower structures are large, and designed according to SANS 10280 standards, in which the safety clearances between phase and earth are specified; thus these tower structures are designed to meet and exceed the required clearance.

If a large bird (e.g. vulture) were to perch on top of the main tower structure and touch the OPGW (earth wire) at the same time, there would be no risk of electrocution as the earth wire (OPGW) is earthed at all pylons. It is also considered technically unlikely for the bird to perch on the tower and touch a conductor at the same time; the horizontal distance from top of tower to the top conductor is 3.8 m, but the conductor is suspended below this horizontal distance by the insulators, which hang vertically by another 2.3 m. Therefore, although Lappet-faced Vultures have a wingspan of 2.8 m; Cape Vultures 2.6 m; and White-backed Vultures 2.2 m, the risk of electrocution is considered to be non-existent on this structure.

However, an electrocution could be caused should a large bird perch on top of the tower and send down a "streamer" of excrement that could hit a conductor, thereby bridging the gap between an earthed and a live component; although the chances of this happening are regarded as slim. The chances of large birds perching on the strain pole structure also appear to be very low, due to the design.

66 kV steel monopole structure

As impacts on avifauna may vary according to the powerline/pylon structure, electrocutions of large raptors, mainly vultures, are possible on the steel monopole structure, should the birds perch or attempt to perch on the insulators and simultaneously touch a conductor and the (earthed) steel pole (see above for details of wingspans of these bird species). The risk is increased by the gregarious nature of the vultures, where one or more birds may attempt to perch on the same spot; or if the bird is wet.

An electrocution is a direct impact that could potentially result in:

- Bird injuries and/or mortalities

Priority bird species in the study area that may potentially be impacted by electrocution in the above way (i.e. by direct contact, or by streamers) include:

- At least six large raptors, namely: White-backed Vulture, Lappet-faced Vulture, Cape Vulture, Martial Eagle, Tawny Eagle and Bateleur

Areas/structures that are potentially more sensitive to bird electrocutions include:

- Tower structures adjacent to areas used regularly by vultures/raptors, including breeding sites on large trees, and water points

5.1.5 Impacts on the power supply due to bird nesting and other activities

Bird nesting activity on power line structures has the potential to cause flash-overs.

Should environmental conditions be suitable (e.g. sufficient food/nesting material after rain, and accessible water), both Sociable Weaver and Red-billed Buffalo-Weaver have the potential to engage in persistent nest building on power line structures in the study area. This may potentially cause flash-overs (and even fires), especially during wet weather, requiring intensive management by power utilities.

Crow nests on power line structures may also contain pieces of wire, which could cause outages. Both Pied Crow and Cape Crow have been recorded in the study area.

The potential for any of the above four species to impact negatively on the proposed power supply structures is considered very low, however, and this impact is not discussed further.

5.2 Impact assessment

Four main potential impacts have been identified for the project. These impacts are outlined above and the three main impacts are assessed in Table 8, according to the methodology described in Section 2.2 above.

Table 8. Assessment of impacts on avifauna of the proposed 220 kV or 66 kV B2Gold power line.

8.1 The 220 kV steel lattice pylon structure

Impact	Sensitivity & value	Nature of impact	Magnitude of change	Level of certainty	Significance rating			
					Route Option 1		Route Option 2	
					Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation
1a. Collision of birds on power line structures - Route Option 1	High	Negative Direct International Short-term Permanent Likely	Minor/ moderate	Medium	Moderate (6)	Minor (3)		
1b. Collision of birds on power line structures - Route Option 2	High	Negative Direct International Short-term Permanent Certain/likely	Moderate	High / Medium			Major (9)	Moderate (6)
2. Physical disturbance of birds and habitat destruction/modification during the construction of power lines	High	Negative Indirect/(direct) International Medium-term Temporary Likely	Minor	High	Moderate (6)	Minor (3)	Moderate (6)	Minor (3)
3. Electrocution of birds by streamers	High	Negative Direct International Short-term Permanent Unlikely	Negligible	Low	Minor (3)	-	Minor (3)	-
TOTAL					**15**	**6**	**18**	**9**

8.2 The 66 kV steel monopole structure

Impact	Sensitivity & value	Nature of impact	Magnitude of change	Level of certainty	Significance rating			
					Route Option 1		Route Option 2	
					Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation
1a. Collision of birds on power line structures - Route Option 1	High	Negative Direct International Short-term Permanent Likely	Minor/ moderate	Medium	Moderate (6)	Minor (3)		
1b. Collision of birds on power line structures - Route Option 2	High	Negative Direct International Short-term Permanent Certain/likely	Moderate	High / Medium			Major (9)	Moderate (6)
2. Physical disturbance of birds and habitat destruction/modification during the construction of power lines	High	Negative Indirect/(direct) International Medium-term Temporary Likely	Minor	High	Moderate (6)	Minor (3)	Moderate (6)	Minor (3)
3a Electrocution of birds on power line structures - 66 kV steel monopole structure	High	Negative Direct International Short-term Permanent Likely	Moderate	High/ Medium	Minor (3)	-	Moderate (6)	Minor (3)
3b. Electrocution of birds by streamers	High	Negative Direct International Short-term Permanent Unlikely	Negligible	Low	Minor (3)	-	Minor (3)	-
TOTAL					**18**	**6**	**24**	**12**

Summary of impact assessment

The assessment of potential impacts from the development may be summarised as follows:

1. Collision of birds on power line structures:

Sensitivity and value high; magnitude of change moderate; significance rating major (Route Option 2) reduced to moderate by mitigation; and significance rating moderate (Route Option 1) reduced to minor by mitigation

2. Physical disturbance of birds and habitat destruction/modification during the construction of power lines:

Sensitivity and value high; magnitude of change minor; significance rating moderate (Route Option 1 & 2), reduced to minor by mitigation

3. Electrocution of birds on power line structures (66 kV structure):

Sensitivity and value high; magnitude of change moderate; significance rating moderate (Route Option 2), reduced to minor by mitigation; significance rating minor (Route Option 1); general mitigation (bird perches on top of pylons) recommended

4. Electrocution of birds by streamers on power line structures (220 kV and 66 kV structures):

Sensitivity and value high; magnitude of change negligible; significance rating minor (Route Option 1 & 2), no mitigation recommended

Route Option 1 carries an overall lower risk than Route Option 2; and the 220 kV structure a lower (electrocution) risk than the 66 kV structure (Table 8). However, it is believed that these risks can be addressed by means of mitigation.

5.3 Cumulative impacts

Although recorded mortalities may be in low numbers, the cumulative impacts of any negative interactions over the entire lifespan of the power line are an important consideration, viewed in association with the increase in power lines and other linear infrastructure in the study area, and the increasing effects of other human activities.

Sensitive species that are already under threat, including Red Data and endemic species, as well as nomads/migrants are at particular risk to such cumulative effects. In particular, the mounting threats to vulture populations throughout the region are well documented (e.g. Simmons et al. 2015 and references therein); these include poisoning (indirect and targetted); bush encroachment and its negative effect on the ability of vultures to find food; and trade in vulture parts for traditional medicine.

6. Recommendations for mitigation and monitoring

6.1 Mitigation

Mitigation measures are aimed at avoiding, minimising or rehabilitating negative impacts or enhancing potential benefits. The significance of potential impacts without and with mitigation is also provided (see Table 8 above).

Mitigation/management options are recommended below.

Ground survey and design stage

6.1.1 Routing of the power line

The primary mitigation is the choice of route options and alternatives for a power line; if possible, areas where impacts on birds are likely to take place should be avoided.

- As the main potential impact identified is considered to be bird collisions (and electrocutions) on power line structures, it is believed that this risk can be reduced by choosing Route Option 1 (Figure 2 and 34), further away from the sensitive vulture breeding area, together with the mitigation recommendations below.

Construction stage

6.1.2 Collision of birds on power line structures

- Marking of more sensitive sections of power line to increase visibility is recommended.
- Recommended sections for marking Route Option 1, or for both Route Option 2a and 2b (depending on the option selected), are indicated in Figure 34 and Table 9 below. These sections should be regarded as the minimum, and the details should be confirmed once the final route is selected.
- The top OPGW (earth/ground) wire should be marked, using large SWAN-FLIGHT Diverters (SFDs; for example, those made by Preformed Line Products [PLP]; Figure 35) in order to increase the visibility of the line. The BFDs should be alternating grey and yellow, and fitted at a distance of 5-10 m apart. The full length of each span should be marked.
- At this stage, no nocturnally visible marking is recommended, but it should become mandatory should monitoring results indicate the necessity (e.g. repeat collisions of nocturnal fliers such as flamingos). The need for fitting mitigation for collisions on stay wires should also be based on monitoring results.

6.1.3 Physical disturbance of birds and habitat destruction/modification

- Before construction starts, the proposed power line route should be inspected for any signs of bird nesting activity. Disturbance of nesting birds, in particular large raptors/vultures, or Kori Bustards, should be avoided.
- Where possible, the unnecessary destruction of habitat (including large trees) or degradation of the environment, including sensitive habitats such as water point and ephemeral pan areas, and the rocky hilly/koppie habitats, should be avoided.
- Ongoing awareness should be promoted about the value of biodiversity and the negative impacts of disturbance, especially to breeding birds, and of poaching and road mortalities. At the same time, the need for reporting power line incidents should be stressed, and reporting procedures clarified.
- Anti-poaching measures should be strictly enforced, with zero tolerance, and this should be emphasised during induction to contractors; offenders should be prosecuted.

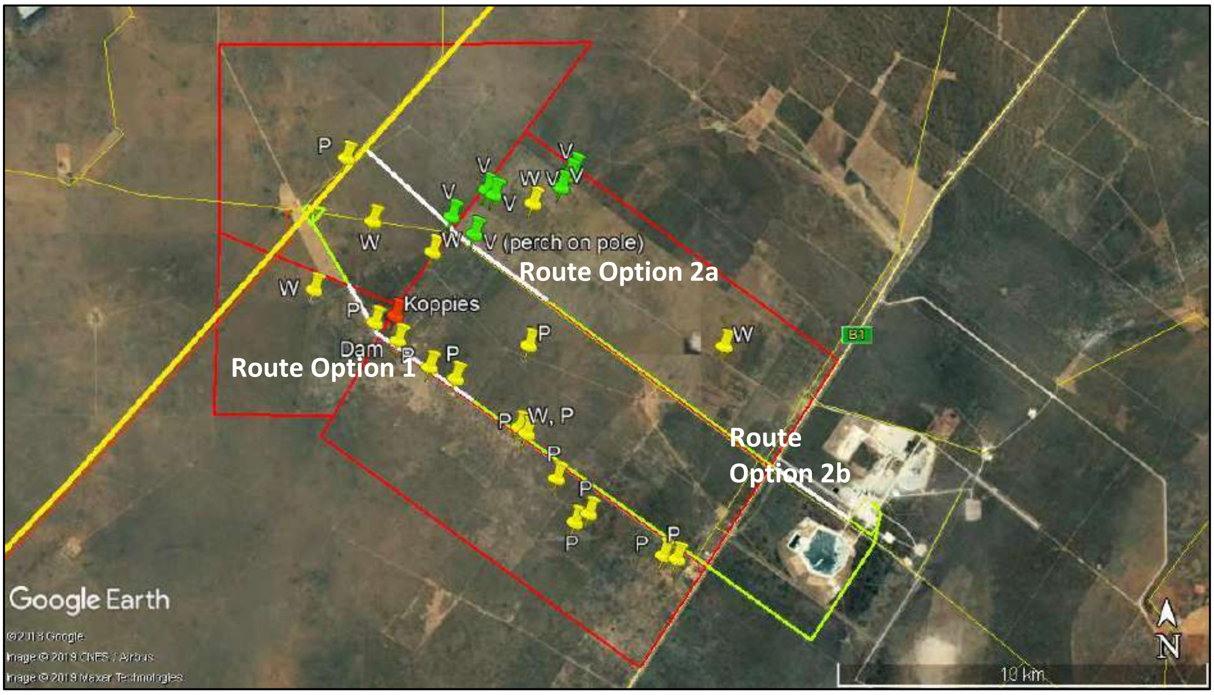
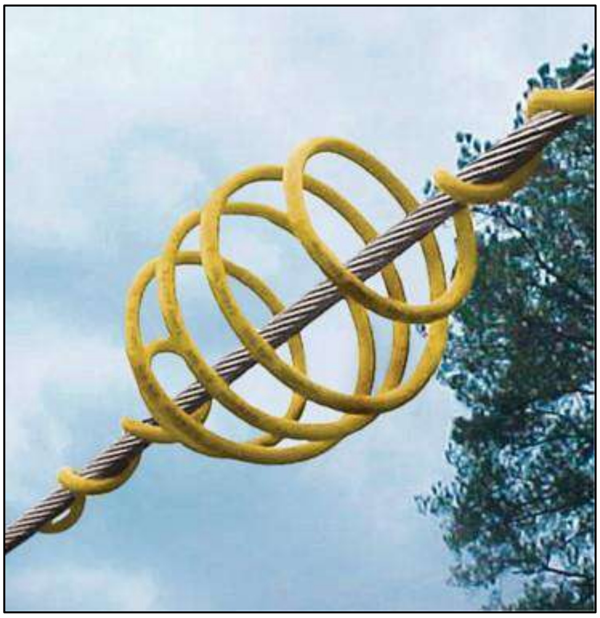


Figure 34. Recommended sections for mitigation marking for Route Option 1 and Route Option 2a and 2b for the B2Gold 220 kV power line (see Table 9 for details) (based on a Google Earth map, EIS 2019).

Table 9. Recommended sections of power line to be marked, for Route Option 1, or Route Option 2a and 2b (also see Figure 33).

Marking section (see Figure 33 above)	Distance (km)	Start	End
1	4.7	19° 56' 17.08"S / 16° 57' 25.67"E	19° 57' 59.75"S / 16° 59' 20.94"E
2a	6.5	19° 54' 18.83"S / 16° 57 42.61"E	19° 56' 31.49"S / 17° 00' 31.95"E
2b	2.5	19° 59' 01.02"S / 17° 04' 02.71"E	19° 59' 46.69"S / 17° 05' 10.90"E



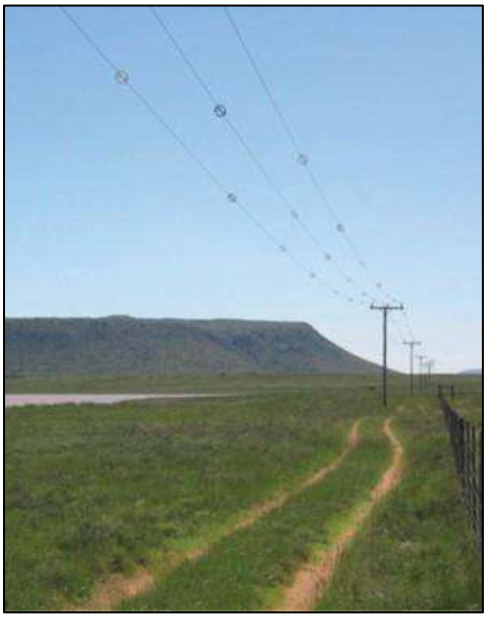


Figure 35. Example of a SWAN-FLIGHT Diverter (SFD; made by Preformed Line Products [PLP]), as a mitigation for bird collisions.

6.1.4 Electrocution of birds on power line structures

220 kV steel lattice pylon structure

- No mitigation is recommended for this structure at this stage but, should a need for mitigation measures be indicated by monitoring, it should become mandatory to apply them.

66 kV steel monopole structure

- For this structure, a simple bird perch device (Figure 36) is recommended for either route option, in order to encourage vultures and other raptors and large species to perch at the top of the tower structure, rather than on the insulators, where there would be an electrocution risk. This form of mitigation is relatively inexpensive and can easily be applied to every structure of the power line (F de Wet pers. comm.). If possible, the size should allow for two vultures to perch side by side.
- Should Route Option 2 be followed, an additional mitigation is recommended in the form of a braced/ slanting insulator (rather than a standard post insulator), where the slope of the insulator may discourage perching by large birds such as vultures (Figure 37), as a further mitigation for such electrocutions, in particular in the vulture-sensitive section (2a in Table 9; 19° 54' 18.83"S / 16° 57 42.61"E to 19° 56' 31.49"S / 17° 00' 31.95"E).

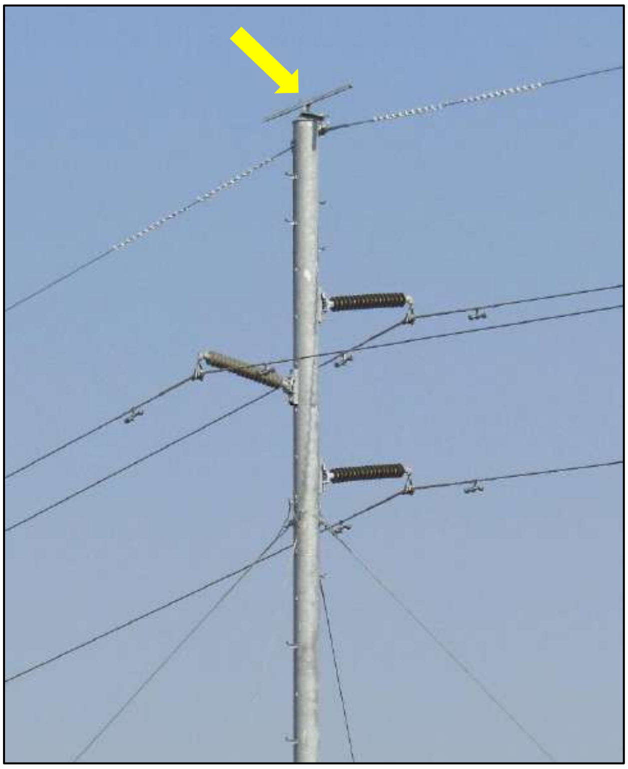


Figure 36. Example of an inexpensive bird perch device, used in order to encourage vultures and other raptors and large species to perch at the top of the tower structure, rather than on the insulators, as a mitigation for bird electrocutions on the 132 kV Auas-Naruchas power line.

Figure 37. Example of a braced/slanting insulator, where the slope of the insulator may discourage perching by large birds such as vultures, used as a mitigation for electrocutions on the 132 kV steel monopole Kuiseb-Walvis Bay power line.

Operational stage

- See monitoring below (6.2).

6.2 Monitoring

The following monitoring initiatives should be conducted by NamPower, in collaboration with and with the support of other partners including B2Gold, landowners/farmers and their staff, and the NamPower/NNF Strategic Partnership. Note that, should vulture numbers and nesting in the area increase at any stage, the need for monitoring for power line incidents would increase proportionately.

- Ensure that the entire (selected) power line route is monitored in an acceptable way for any signs of bird mortalities resulting from the construction and operation of the line; ideally, regular dedicated monitoring patrols should be carried out once a month for at least the first year after construction, and thereafter at least once per quarter. The NamPower/NNF Strategic Partnership can be contacted for assistance with monitoring procedures (see (http://www.nnf.org.na/project/nampowernnf-partnership/13/5/5.html).
- Sensitive areas such as those closest to the vulture nests and farm dams/ephemeral pans, and sewage ponds and tailings dams on the mine property should receive particular attention. Existing power lines in the area should also be inspected from time to time, for cumulative impacts.
- Set up a reporting channel, and clarify monitoring and reporting procedures to all partners. Record all bird mortalities on a standardised form, with the GPS coordinates and power line structure and other details, and photographs of the carcass (especially the head of the bird), power line structure and general habitat.
- Monitor the effectiveness of mitigation measures; should repeated collision incidents involving vultures, or any other group of birds, occur, consider the retro-fitting of further mitigation; replace mitigation devices as and when necessary.
- Monitor bird nesting and perching activities on power line structures and follow up if any electrocution incidents occur.

7 Conclusions

According to the avifauna baseline and scoping of sites and species, the study area is potentially sensitive in terms of birds and their habitats.

The study area lies 55 km north-west of the Waterberg Plateau Park, with the Etosha National Park 135 km further to the north-west. Both national parks are also classed as Important Bird Areas, or places of international significance for the conservation of birds at the Global, Regional or Sub-regional level.

The study area falls within the Tree-and-shrub Savanna biome, with heavily bush-encroached Thornbush Shrubland, dominated by *Acacia* tree and bush species. Three main avifauna habitats in the area include farmland on the plains; rocky hills/koppies; and (mainly ephemeral) aquatic habitats. On farmland, larger trees (mainly *Acacia luederitzii*) provide nesting habitats for large raptors, including at least eight known active nests for White-backed Vultures; the more open habitats are used by Kori Bustard; and accessible watering points are used by many kinds of birds. Vulture nests have been recorded between 110 m and 1-3 km from Route Option 1 for the power line. A fairly restricted rocky hills/koppie habitat in the north-western parts of Farm Lardner and neighbouring properties (close to Route Option 1) supports large trees (including *Kirkia acuminata*), and may potentially be home to several Namibian near-endemic bird species with specific habitat requirements. The group of aquatic habitats includes a system of shallow ephemeral pans, and earth dams, that are reported to hold water regularly during the rainy season, when many waterbirds may move into the area. Several such pans and dams were indicated on Farm Fisher (many of them close to Route Option 1, with one large dam being 125 m away from the proposed servitude); several pan habitats are also apparent on Farm Lardner and Farm Luckenwalde. On the adjacent B2Gold Mine property, a large ephemeral pan on the nature reserve section is also reported to hold water during the rainy season, while a large (perennial) sewage pond (450 m from Route Option 2) and tailings dam are situated on or near the main entrance road to the mine; these habitats attract a variety of waterbirds.

A relatively high diversity of bird species has been recorded in the study area and surrounds, with a total of 217 species, or 32% of the 676 species currently recorded in Namibia; however, the area is not well documented in parts. The field trip for the present study also took place under drought conditions, when the bird diversity observed was fairly low. To address these limitations, data from several sources were combined for an overall checklist.

The checklist includes 18 species (9% of the total) that are threatened in Namibia (and comprising 25% of the 71 species on the Namibian Red Data List); eleven of the 18 species are also Globally Threatened. In particular, the adjacent Waterberg area is well known for its populations of several species of threatened vultures and other raptors. Satellite tracking data indicate that Cape Vultures have regularly visited the study area in the past, and perched/roosted on the existing 220 kV Gerus-Otjikoto power line in the past, a behaviour that could increase the risk of collisions on the line.

Risk assessment and mitigation efforts are directed towards priority species, namely those that have a high biological significance, i.e. primarily Red Data species (including those with migrant status) and/or endemic or near-endemic species. Twenty-one species are considered to have the potential to be impacted by power line structures (including 18 Red Data species, four Namibian near-endemic species and four with migrant status), namely:

- *Raptors (8)*

  White-backed Vulture (Critically Endangered, also Globally Critically Endangered)

  Cape Vulture (Critically Endangered, also Globally Endangered; now rare in Namibia)

  Lappet-faced Vulture (Endangered, also Globally Endangered)

  Martial Eagle (Endangered, also Globally Vulnerable)

Bateleur (Endangered, also Globally Near Threatened)

Tawny Eagle (Endangered)

Secretarybird (Vulnerable, also Globally Vulnerable)

Red-footed Falcon (Near Threatened, also Globally Near Threatened; Palearctic-breeding migrant)

- *Large terrestrial (cursorial) species (2)*

Blue Crane (Critically Endangered, also Globally Vulnerable; now rare in Namibia)

Kori Bustard (Near Threatened, also Globally Near Threatened)

- *Aquatic species (7)*

Saddle-billed Stork (Endangered)

Lesser Flamingo (Vulnerable, also Globally Near Threatened; intra-African migrant)

Greater Flamingo (Vulnerable) (intra-African migrant)

Great White Pelican (Vulnerable)

Bar-tailed Godwit (Near Threatened, also Globally Near Threatened; Palearctic-breeding migrant)

Black-necked Grebe (Near Threatened)

Marabou Stork (Near Threatened)

- *Other smaller birds/Namibian near-endemic species (4)*

Rüppell's Parrot (Near Threatened)

Damara (Red-billed) Hornbill

Monteiro's Hornbill

Carp's Tit

The impacts of power line structures on avifauna and recommended mitigation measures are well documented, both globally and for the southern African subregion. Three main potential impacts have been identified for the project.

- *Collision of birds on power line structures*

The species most susceptible to collision mortality on power lines are large, long-lived and slow-reproducing birds, often habitat specialists with hazardous behavioural traits (especially flight height and flocking flight), with high spatial exposure to collision risk with power lines and unfavourable conservation status. The collision risk is believed to be increased by factors such as a large wingspan and low manoeuvrability, nomadic/migrant habits, flying in low light (e.g. flamingos and other waterbirds), courtship behaviour, juvenile inexperience, and predation; and flying under adverse weather conditions. Collisions may take place on overhead cables as well as on stay wires and other associated structures.

All the above 21 priority bird species are potentially at risk to collisions on power line structures. Areas of particular concern include flight paths around areas with large trees, used for nesting by White-backed Vulture and other raptors (particularly on Route Option 2); open areas along fence-lines/roadways/power line servitudes, used by Kori Bustard; and areas around water points accessible to birds, and other (ephemeral) aquatic habitats, when they hold water.

This impact is assessed as follows: sensitivity and value high; magnitude of change moderate; significance rating major (Route Option 2) reduced to moderate by mitigation; and significance rating moderate (Route Option 1), reduced to minor by mitigation.

- *Physical disturbance of birds and habitat destruction/modification during the construction of power lines*

During the construction phase of a project, physical disturbance to birds, as well as habitat destruction and/or modification, will take place. Birds may be disturbed while going about their daily activities such as feeding, roosting and, in particular, breeding.

Groups/habitats at particular risk to these impacts include nesting White-backed Vulture (especially on Route Option 2) and other raptors nesting in large trees; the ground-nesting Kori Bustard; nesting near-endemic species, including possible species on the rocky hills/koppie habitat (adjacent to Route Option 1).

This impact is assessed as follows: sensitivity and value high; magnitude of change minor; significance rating moderate, reduced to minor by mitigation (Route Option 1 & 2).

- *Electrocution of birds by streamers on power line structures*

The risk of electrocution on the proposed 220 kV steel lattice tower structure is considered to be non-existent, due to the large clearances involved. However, an electrocution could be caused should a large bird perch on top of the tower and send down a "streamer" of excrement that could hit a conductor, thereby bridging the gap between an earthed and a live component.

Electrocutions of large raptors, mainly vultures are, however, possible on the 66 kV steel monopole structure, should the birds perch or attempt to perch on the insulators and simultaneously touch a conductor and the (earthed) steel pole. The risk is increased by the large wingspans of such bird species, and by the gregarious nature of the vultures, where one or more birds may attempt to perch on the same spot; or if the bird is wet. Electrocutions by means of streamers of excrement (see above) are also possible on this structure.

Priority bird species in the study area that may potentially be impacted by electrocution in the above way include at least six large raptors, namely White-backed Vulture, Lappet-faced Vulture, Cape Vulture, Martial Eagle, Tawny Eagle and Bateleur. Tower structures adjacent to areas used regularly by vultures/raptors, including breeding sites on large trees, and water points would be more sensitive to such risks.

Electrocution of birds on power line structures (66 kV structure) are assessed as follows: sensitivity and value high; magnitude of change moderate; significance rating moderate (Route Option 2), reduced to minor by mitigation; significance rating minor (Route Option 1); general mitigation (bird perches on pylons) recommended.

Electrocution of birds by streamers on power line structures (220 kV and 66 kV structures): sensitivity and value high; magnitude of change negligible; significance rating minor (Route Option 1 & 2), no mitigation recommended.

Route Option 1 carries an overall lower risk than Route Option 2; and the 220 kV steel lattice pylon structure a lower (electrocution) risk than the 66 kV steel monopole structure. However, it is believed that these risks can be addressed by means of mitigation.

Although recorded mortalities may be in low numbers, the cumulative impacts of any negative interactions over the entire lifespan of the power line are an important consideration, viewed in association with the increase in power lines and other linear infrastructure in the study area, and the increasing effects of other human activities. Sensitive species that are already under threat, including Red Data and (near-)endemic species, as well as nomads/migrants are at particular risk to such cumulative effects. In particular, the mounting threats to vulture populations throughout the region are well documented; these include poisoning (both indirect and targetted); disturbance and loss of habitat; bush encroachment and its negative effect on the ability of vultures to find food; and trade in vulture parts for traditional medicine.

Mitigation measures are aimed at avoiding, minimising or rehabilitating negative impacts or enhancing potential benefits. The primary mitigation is the choice of route options and alternatives for a power line; if possible, areas where impacts on birds are likely to take place should be avoided.

As the main potential impact identified is bird collisions (and electrocutions) on power line structures, it is believed that these risks can be reduced by choosing Route Option 1. Marking of more sensitive sections of power line to increase visibility is also recommended, at identified sites and according to specified design. Recommendations are also made to reduce the impacts of physical disturbance to birds and habitat destruction/modification during the construction of the power line. Mitigations to reduce the impacts of electrocutions on the 66 kV structure are included; however, no mitigation is recommended for electrocution of birds by streamers on power line structures at this stage.

Detailed monitoring initiatives are recommended that should be conducted by NamPower and B2Gold, with the support of other partners.

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Appendix 1: Checklist of bird species recorded in the B2Gold study area, Otjiwarongo

*Scientific and common names according to Roberts Bird Guide 2016 (Chittenden et al. 2016)

KEY:

RDB = Red Data/conservation status (Brown et al. 2017) CE = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened, LC = Least Concern; G = global status; rare = now rare in Namibia

END = Endemism: (Brown et al. 2017): NE = near-endemic; Nam = Namibia (≥90% of population in Namibia)

RES = Residency (for Red Data species): Res = resident, Nom = nomadic, Mig = Red Data species that have migrant status, Pal = Palearctic-breeding, intra-Afr mig = intra-African migrant, mov = local/seasonal movements

SABAP1 EIS: Southern African Bird Atlas Project 1 data that was published as Harrison *et al.* (1997), available on EIS 2019

SABAP1 BVDB: Southern African Bird Atlas Project 1 and other data, available on Namibian Avifaunal Database (NAD; www.biodiversity.org.na)

SABAP2: Southern African Bird Atlas Project 2 data, available on http://sabap2.adu.org.za

Oct 2019:personal observations September/October 2019

Common names	Scientific names	RDB / END	RES (RDB)	SABAP1 EIS	SABAP1 BVDB	SABAP2	Oct 2019
Avocet, Pied	*Recurvirostra avosetta*				X		
Babbler, Southern Pied	*Turdoides bicolor*			X	X	X	
Barbet, Acacia Pied	*Tricholaema leucomelas*			X	X	X	X
Bateleur	*Terathropius ecaudatus*	EN, G NT	Res	X	X		?
Batis, Chinspot	*Batis molitor*			X	X		
Batis, Pririt	*Batis pririt*			X	X	X	X
Bee-eater, European	*Merops apiaster*			X	X	X	
Bee-eater, Swallow-tailed	*Merops hirundineus*			X	X	X	
Brubru	*Nilaus afer*			X	X	X	
Bulbul, African Red-eyed	*Pycnonotus nigricans*			X	X	X	X
Bunting, Cinnamon-breasted	*Emberiza tahapisi*					X	
Bunting, Golden-breasted	*Emberiza flaviventris*			X	X	X	
Bustard, Kori	*Ardeotis kori*	NT, G NT	Res, move	X	X	X	X

Common names	Scientific names	RDB / END	RES (RDB)	SABAP1 EIS	SABAP1 BVDB	SABAP2	Oct 2019
Buttonquail, Kurrichane	*Turnix sylvaticus*					X	
Buzzard, Steppe (Common)	*Buteo vulpinus = buteo*			X		X	
Camaroptera, Grey-backed	*Camaroptera brevicaudata*					X	
Canary, Black-throated	*Crithagra atrogularis*			X		X	
Canary, Yellow	*Crithagra flaviventris*					X	
Chat, Ant-eating	*Myrmecocichla formicivora*				X		
Chat, Familiar	*Emarginata familiaris*					X	
Cisticola, Desert	*Cisticola aridulus*					X	?
Cisticola, Rattling	*Cisticola chiniana*				X	X	
Cisticola, Tinkling	*Cisticola rufilatus*					X	
Cisticola, Zitting	*Cisticola juncidis*					X	
Coot, Red-knobbed	*Fulica cristata*			X	X		
Courser, Bronze-winged	*Rhinoptilus chalcopterus*			X	X		
Courser, Double-banded	*Rhinoptilus africanus*			X			X
Courser, Temminck's	*Cursorius temminckii*			X	X	X	X
Crane, Blue	*Anthropoides paradiseus (Grus paradisea)*	CE, G VU	Res, move	X	X		
Crombec, Long-billed	*Sylvietta rufescens*			X	X	X	
Crow, Cape	*Corvus capensis*			X	X		
Crow, Pied	*Corvus albus*					X	
Cuckoo, African	*Cuculus gularis*				X	X	
Cuckoo, Black	*Cuculus clamosus*			X	X	X	
Cuckoo, Diederick	*Chrysococcyx caprius*				X		
Cuckoo, Great Spotted	*Clamator glandarius*			X	X	X	
Cuckoo, Jacobin	*Clamator jacobinus*				X	X	
Dove, Emerald-spotted Wood	*Turtur chalcospilos*			X	X	X	
Dove, Laughing	*Spilopelia senegalensis*			X	X	X	X

Common names	Scientific names	RDB / END	RES (RDB)	SABAP1 EIS	SABAP1 BVDB	SABAP2	Oct 2019
Dove, Namaqua	*Oena capensis*			X	X	X	
Dove, Ring-necked (Cape Turtle)	*Streptopelia capicola*			X	X	X	
Drongo, Fork-tailed	*Dicrurus adsimilis*			X	X	X	X
Eagle, African Hawk	*Aquila spilogaster*					X	
Eagle, Black-chested Snake	*Circaetus pectoralis*					X	Rep
Eagle, Brown Snake	*Circaetus cinereus*					X	
Eagle, Lesser Spotted	*Clanga pomarina*				X		
Eagle, Martial	*Polemaetus bellicosus*	EN, G VU	Res		X	X	
Eagle, Tawny	*Aquila rapax*	EN	Res	X	X	X	
Eagle, Wahlberg's	*Hieraaetus wahlbergi*				X		
Eagle-Owl, Spotted	*Bubo africanus*					X	Rep?
Egret, Little	*Egretta garzetta*						Rep
Egret, Western Cattle	*Bubulcus ibis*			X	X		
Eremomela, Yellow-bellied	*Eremomela icteropygialis*				X		
Eremomela, Burnt-necked	*Eremomela usticollis*				X		
Falcon, Red-footed	*Falco vespertinus*	NT, G NT	Pal mig	X	X	X	
Finch, Red-headed	*Amadina erythrocephala*			X	X	X	
Fiscal, Common (Southern)	*Lanius collaris*				X		
Flamingo, Greater	*Phoenicopterus roseus*	VU	IA mig	X	X		X juv
Flamingo, Lesser	*Phoeniconaias minor*	VU, G NT	IA mig		X		Rep
Flycatcher, African Paradise	*Terpsiphone viridis*					X	
Flycatcher, Marico	*Meleanornis mariquensis*			X		X	
Flycatcher, Spotted	*Muscicapa striata*					X	
Francolin, Crested	*Dendroperdix sephaena*			X		X	
Go-away-bird, Grey	*Corythaixoides concolor*			X	X	X	X
Godwit, Bar-tailed	*Limosa lapponica*	NT, G NT	Pal mig	X	X		
Goose, Egyptian	*Alopochen aegyptiaca*			X	X		Rep

Common names	Scientific names	RDB / END	RES (RDB)	SABAP1 EIS	SABAP1 BVDB	SABAP2	Oct 2019
Goshawk, Gabar	*Micronisus gabar*					X	
Goshawk, Southern Pale Chanting	*Melierax canorus*			X	X	X	X
Grebe, Black-necked	*Podiceps nigricollis*	NT	Nom	X	X		X
Grebe, Little	*Tachybaptus ruficollis*			X	X		
Greenshank, Common	*Tringa nebularia*				X	X	
Guineafowl, Helmeted	*Numida meleagris*			X	X	X	X
Gull, Grey-headed	*Chroicocephalus cirrocephalus*			X	X		Rep
Hamerkop	*Scopus umbretta*			X	X		Rep
Harrier-Hawk, African	*Polyboroides typus*				X		
Heron, Grey	*Ardea cinerea*			X	X		X
Honeyguide, Lesser	*Indicator minor*					X	
Hoopoe, African	*Upupa africana*			X	X	X	
Hoopoe, Green Wood	*Phoeniculus purpureus*				X		
Hornbill, African Grey	*Lophhoceros nasutus*			X	X	X	
Hornbill, Damara (Red-billed)	*Tockus damarensis*	NE Nam			X		
Hornbill, Monteiro's	*Tockus monteiri*	NE Nam				X	
Hornbill, (Southern) Red-billed	*Tockus erythrorhynchus*			X	X	X	X
Hornbill, Southern Yellow-billed	*Tockus leucomelas*			X	X	X	X
Jacana, African	*Actophilornis africanus*			X	X		
Kestrel, Greater	*Falco rupicoloides*			X	X		
Kestrel, Rock	*Falco rupicolus*			X		X	
Kingfisher, Pied	*Ceryle rudis*			X	X		
Kingfisher, Woodland	*Halcyon senegalensis*					X	Rep?
Kite, Black-shouldered (Black-winged)	*Elanus caeruleus*			X	X	X	
Kite, Yellow-billed	*Milvus aegyptius*					X	
Korhaan, Northern Black	*Afrotis afraoides*					X	
Korhaan, Red-crested	*Lophotis ruficrista*			X	X	X	X

Common names	Scientific names	RDB / END	RES (RDB)	SABAP1 EIS	SABAP1 BVDB	SABAP2	Oct 2019
Korhaan, Southern Black	*Afrotis afra = afraoides*			X			
Lapwing, African Wattled	*Vanellus senegallus*			X	X	X	
Lapwing, Blacksmith	*Vanellus armatus*			X	X	X	
Lapwing, Crowned	*Vanellus coronatus*			X	X	X	X
Lark, Dusky	*Pinarocorys nigricans*			X	X		
Lark, Eastern Clapper	*Mirafra fasciolata*				X		
Lark, Fawn-coloured	*Calendulauda africanoides*					X	
Lark, Monotonous	*Mirafra passerina*				X	X	
Lark, Red-capped	*Calandrella cinerea*				X	X	
Lark, Rufous-naped	*Mirafra africana*			X	X		
Lark, Sabota	*Calendulauda sabota*			X		X	
Lovebird, Rosy-faced	*Agapornis roseicollis*			X	X		X
Martin, Banded	*Riparia cincta*					X	
Martin, Common House	*Delichon urbicum*					X	?
Martin, Rock	*Ptyonoprogne fuligula*				X	X	
Masked-weaver, Lesser	*Ploceus intermedius*					X	Nests
Masked-weaver, Southern	*Ploceus velatus*			X	X	X	
Moorhen, Common	*Gallinula chloropus*				X		
Mousebird, Red-faced	*Urocolius indicus*				X	X	
Mousebird, White-backed	*Colius colius*					X	
Nightjar, European	*Caprimulgus europaeus*					X	
Nightjar, Fiery-necked	*Caprimulgus pectoralis*				X	X	
Nightjar, Freckled	*Caprimulgus tristigma*				X	X	
Nightjar, Rufous-cheeked	*Caprimulgus rufigena*				X		
Openbill, African	*Anastomus lamelligerus*			X	X		
Oriole, African Golden	*Oriolus auratus*					X	
Ostrich, Common	*Struthio camelus*			X	X	X	

Common names	Scientific names	RDB / END	RES (RDB)	SABAP1 EIS	SABAP1 BVDB	SABAP2	Oct 2019
Owl, African Scops	*Otus senegalensis*			X	X	X	
Owl, (Western) Barn	*Tyto alba*			X	X	X	
Owl, Southern White-faced	*Ptilopsis granti*					X	
Owlet, Pearl-spotted	*Glaucidium perlatum*				X	X	
Parrot, Meyer's	*Poicephalus meyeri*				X		
Parrot, Rüppell's	*Poicephalus rueppellii*	NT; NE Nam	Res, nom		X		
Pelican, Great White	*Pelecanus onocrotalus*	VU	Res, nom	X	X		Rep
Pipit, African	*Anthus cinnamomeus*				X	X	
Plover, Kittlitz's	*Charadrius pecuarius*						Rep
Plover, Three-banded	*Charadrius tricollaris*			X	X		X
Plover, White-fronted	*Charadrius marginatus*				X		
Prinia, Black-chested	*Prinia flavicans*			X	X	X	
Puffback, Black-backed	*Dryoscopus cubla*			X	X		
Pytilia, Green-winged	*Pytilia melba*			X	X	X	
Quelea, Red-billed	*Quelea quelea*			X	X	X	
Robin, Kalahari Scrub	*Cercotrichas paena*			X		X	X
Robin, White-browed Scrub	*Cercotrichas leucophrys*			X		X	
Roller, European	*Coracias garrulus*			X	X		
Roller, Lilac-breasted	*Coracias caudatus*			X		X	X
Roller, Purple	*Coracias naevius*			X		X	
Ruff	*Philomachus pugnax*				X		
Sandgrouse, Burchell's	*Pterocles burchelli*				X		
Sandgrouse, Double-banded	*Pterocles bicinctus*			X	X		
Sandgrouse, Namaqua	*Pterocles namaqua*				X	X	
Sandpiper, Marsh	*Tringa stagnatilis*				X		
Sandpiper, Wood	*Tringa glareola*					X	
Scimitarbill, Common	*Rhinopomastus cyanomelas*			X	X	X	

Common names	Scientific names	RDB / END	RES (RDB)	SABAP1 EIS	SABAP1 BVDB	SABAP2	Oct 2019
Secretarybird	*Sagittarius serpentarius*	VU, G VU	Nom	X	X	X	
Shelduck, South African	*Tadorna cana*						X
Shoveler, Cape	*Anas smithii*						Rep
Shikra	*Accipiter badius*			X	X	X	
Shrike, Crimson-breasted	*Laniarius atrococcineus*			X	X	X	X
Shrike, Lesser Grey	*Lanius minor*			X	X	X	
Shrike, Magpie	*Urolestes melanoleucus*			X	X	X	
Shrike, Red-backed	*Lanius collurio*			X	X	X	
Shrike, Southern White-crowned	*Eurocephalus anguitimens*			X	X		
Snipe, African	*Gallinago nigripennis*			X	X		
Sparrow, Great	*Passer motitensis*			X	X	X	
Sparrow, House	*Passer domesticus*				X		
Sparrow, Southern Grey-headed	*Passer diffusus*			X	X	X	
Sparrow-Lark, Chestnut-backed	*Eremopterix leucotis*				X		
Sparrow-Lark, Grey-backed	*Eremopterix verticalis*				X		
Sparrow-Weaver, White-browed	*Plocepasser mahali*			X	X	X	X
Spoonbill, African	*Platalea alba*				X		
Spurfowl, Red-billed	*Pternistis adspersus*			X		X	X
Spurfowl, Swainson's	*Pternistis swainsonii*			X		X	
Starling, Burchell's	*Lamprotornis australis*			X	X	X	
Starling, Cape (Glossy)	*Lamprotornis nitens*			X	X	X	X
Starling, Pale-winged	*Onychognathus nabouroup*			X	X		
Starling, Violet-backed	*Cinnyricinclus leucogaster*					X	
Starling, Wattled	*Creatophora cinerea*				X	X	
Stilt, Black-winged	*Himantopus himantopus*				X		X
Stint, Little	*Calidris minuta*						Rep
Stork, Marabou	*Leptoptilos crumenifer*	NT	Res			X	Rep

Common names	Scientific names	RDB / END	RES (RDB)	SABAP1 EIS	SABAP1 BVDB	SABAP2	Oct 2019
Stork, Saddle-billed	*Ephippiorhynchus senegalensis*	EN	Res	X	X		
Stork, Yellow-billed	*Mycteria ibis*					X	
Sunbird, Dusky	*Cinnyris fuscus*			X			
Sunbird, Marico	*Cinnyris mariquensis*					X	X
Sunbird, Scarlet-chested	*Chalcomitra senegalensis*					X	
Sunbird, White-bellied	*Cinnyris talatala*					X	
Swallow, Barn	*Hirundo rustica*			X	X	X	?
Swallow, Greater Striped	*Cecropis cucullata*			X	X	X	
Swallow, Lesser Striped	*Cecropis abyssinica*				X	X	
Swallow, Red-breasted	*Cecropis semirufa*				X	X	
Swift, African Palm	*Cypsiurus parvus*			X	X	X	
Swift, Alpine	*Tachymarptis melba*			X	X		
Swift, Common	*Apus apus*			X	X	X	
Swift, Little	*Apus affinis*			X	X	X	
Swift, White-rumped	*Apus caffer*			X	X	X	
Tchagra, Brown-crowned	*Tchagra australis*			X	X	X	
Teal, Cape	*Anas capensis*				X		X
Teal, Red-billed	*Anas erythrorhyncha*			X	X		X
Thick-knee, Spotted	*Burhinus capensis*				X	X	
Thrush, Groundscraper	*Turdus litsipsirupa*			X		X	X
Thrush, Short-toed Rock	*Monticola brevipes*				X	X	
Tit, Ashy	*Melaniparus cinerascens*				X	X	
Tit, Cape Penduline	*Anthoscopus minutus*				X	X	
Tit, Carp's	*Melaniparus carpi*	NE Nam			X		
Vulture, Cape	*Gyps coprotheres*	CR, G EN	Res but wide move-ments			X	
Vulture, Lappet-faced	*Torgos tracheliotos*	EN, G EN		X	X	X	Rep: nest
Vulture, White-backed	*Gyps africanus*	CR, G CR		X	X	X	X Nests

Common names	Scientific names	RDB / END	RES (RDB)	SABAP1 EIS	SABAP1 BVDB	SABAP2	Oct 2019
Wagtail, Cape	*Motacilla capensis*				X	X	
Warbler (Tit-babbler), Chestnut-vented	*Sylvia subcaerulea*			X	X	X	
Waxbill, Black-faced	*Estrilda erythronotos*			X	X	X	
Waxbill, Blue	*Uraeginthus angolensis*			X	X	X	
Waxbill, Violet-eared	*Granatina granatina*			X		X	
Weaver, Red-billed Buffalo	*Bubalornis niger*			X	X	X	Old nests
Weaver (Finch), Scaly-feathered	*Sporopipes squamifrons*			X	X	X	
Weaver, Sociable	*Philetairus socius*						X old nests
Wheatear, Capped	*Oenanthe pileata*				X		
White-Eye, African Yellow	*Zosterops senegalensis*			X	X		
Whydah, Long-tailed Paradise	*Vidua paradisaea*				X	X	
Whydah, Shaft-tailed	*Vidua regia*			X	X	X	
Woodpecker, Bearded	*Dendropicos namaquus*			X		X	
Woodpecker, Cardinal	*Dendropicos fuscesens*			X	X	X	
Woodpecker, Golden-tailed	*Campethera abingoni*					X	
Wren-Warbler, Barred	*Calamonastes fasciolatus*				X	X	
TOTAL 217				**121**	**157**	**146**	**(54)**

SPECIES	ENDEMISM	PROTECTED	IUCN 1	IUCN 2
Rhus marlothii Engl.				
Barleria damarensis T.Anderson	Endemic			
Barleria meeuseana P.G.Mey.	Endemic			
Blepharis obmitrata C.B.Clarke				
Petalidium rossmannianum P.G.Mey.	Endemic			
Commiphora africana (A.Rich.) Engl. var. africana				
Commiphora angolensis Engl.				
Commiphora glandulosa Schinz				
Maerua schinzii Pax		Forestry protected		
Coccinia rehmannii Cogn.				
Cyperus marginatus Thunb.				
Euclea undulata Thunb.				
Euphorbia guerichiana Pax				
Euphorbia monteiroi Hook.f. subsp. brandbergensis B.Nord.	Endemic			
Flueggea virosa (Roxb. ex Willd.) Voigt subsp. virosa				
Phyllanthus reticulatus Poir. var. reticulatus				
Ehretia alba Retief & A.E.van Wyk				
Lapeirousia bainesii Baker				
Leucas pechuelii (Kuntze) Gürke	Near endemic			
Tapinanthus guerichii (Engl.) Danser				
Abutilon hirtum (Lam.) Sweet var. hirtum				
Ficus cordata Thunb. subsp. cordata		Forestry protected		
Actiniopteris radiata (J.König ex Sw.) Link				
Cheilanthes marlothii (Hieron.) Schelpe				
Aristida pilgeri Henrard				
Kohautia caespitosa Schnizl. subsp. brachyloba (Sond.) D.Mantell				
Thamnosma africana Engl.				
Gnidia polycephala (C.A.Mey.) Gilg				
Xerophyta equisetoides Baker var. pauciramosa L.B.Sm. & Ayensu				
Lantana dinteri Moldenke				
Jamesbrittenia concinna (Hiern) Hilliard				
Melhania acuminata Mast. var. acuminata				
Melhania virescens (K.Schum.) K.Schum.				
Elaeodendron transvaalense (Burtt Davy) R.H.Archer				

SPECIES	ENDEMISM	PROTECTED	IUCN 1	IUCN 2
Gymnosporia senegalensis (Lam.) Loes.				
Dicoma macrocephala DC.				
Flaveria bidentis (L.) Kuntze				
Geigeria alata (Hochst. & Steud.) Benth & Hook.f. ex Oliv. & Hiern				
Helichrysum candolleanum H.Buek				
Helichrysum tomentosulum (Klatt) Merxm. subsp. tomentosulum				
Pteronia eenii S.Moore	Endemic			
Elephantorrhiza suffruticosa Schinz				
Tylosema esculentum (Burch.) A.Schreib.				
Chrysanthellum indicum DC. subsp. afroamericanum B.L.Turner				
Hypertelis cerviana (L.) Thulin				

SPECIES	PLANTDESC	MINORAREA	LOCNOTES	HABITATTXT	QDS
Cyperus marginatus Thunb.		Grootfontein District	Karidabis 80 Farm. Brack pan.		1916DD
Tylosema esculentum (Burch.) A.Schreib.		Grootfontein District	Farm Nassau.		1916DD
Melhania virescens (K.Schum.) K.Schum.		Grootfontein District	Karidabis 80 Farm. Brackish pan.		1916DD
Lantana dinteri Moldenke		Grootfontein District	Farm Karidabis (Bitterwater).		1916DD
Pteronia eenii S.Moore		Grootfontein District	Farm Nassau, on calcrete rocks.		1916DD
Dicoma macrocephala DC.		Grootfontein District	Farm Plesston 71.	Tarchonanthus camphoratus veld. Lime is close to surface.	1916DD
Aristida pilgeri Henrard	Grass	Grootfontein District	Farm Nassau 91.	Growing on sand.	1916DD
Leucas pechuelii (Kuntze) Gürke	Shrublet to 1 m high, flowers white.	Grootfontein District	Gobaub. Farm Norabis 387; red loam thornveld.		1916DD

SPECIES	PLANTDESC	MINORAREA	LOCNOTES	HABITATTXT	QDS
Lapeirousia bainesii Baker	Flowers whitish with red markings in the throat and on the lower tepals; corms very deep in soil.	Grootfontein District	Farm Norabis 387; red loam thornveld.		1916DD
Coccinia rehmannii Cogn.	Creeper on fence and over Protasparagus sp. Fruits ovoid-elongate, with dull green and pale green longitudinal stripes, turning crimson red when ripe. Seeds enveloped in red jelly-sacs. Flowers with creamy white petals. Leaves almost entire to 5-palmate. Also seen: Cucumis meeusei.	Grootfontein District	Farm 'Robbies Rus' along district road D2873.	Locally scarce.	1916DD
Rhus marlothii Engl.	Leaves olive green, trifoliate, ovate, apex rounded. Stem: rough, grey-black. Occurring on farms: 330, 331, 384, 387.	Grootfontein District	Farm Norabis - bad road in front of gate.	Growing in humus rich gravelly soil, with dolomite. Full sun.	1916DD
Combretum hereroense Schinz	Shrub 120 cm high. Leaves somewhat olive green, opposite, ovate, entire, rounded apex with tip. Bark rough. Occuring on farms: 330, 331, 384, 387.	Grootfontein District	Farm Norabis - bad road in front of gate.	Growing in humus rich, gravelly soil, with dolomite. Full sun.	1916DD
Flueggea virosa (Roxb. ex Willd.) Voigt subsp. virosa	Shrub. Leaves: light green, alternate, elliptic, entire, rounded.	Grootfontein District	Farm Norabis 387 - bad road in front of gate.	Rare. Growing in humus rich, loamy clay with gravel. Dolomite	1916DD

SPECIES	PLANTDESC	MINORAREA	LOCNOTES	HABITATTXT	QDS
	Stem: smooth, greyish with white speckles. Occuring on farms: 330, 331, 384, 387.			with black turf. Full sun.	
Gnidia polycephala (C.A.Mey.) Gilg	Shrub 50 cm high. Flowers/inflorescence: yellow. Many small flowers protruding from a large flower. Leaves: very small, elongated, on stem, green. Stem and bark: thin, branched, somewhat purple at base. Other occuring on farms 330, 331, 387, 384.	Grootfontein District	Passage Vaalbank/Norabis.	Rare. Thornbush savanna. Growing on rocky outcrop. Full sun.	1916DD
Euclea undulata Thunb.	Shrub 150 cm high. Leaves: elongated, opposite, greenish, evergreen. Stem and bark: smooth, greyish. Fruits and seeds: small, round, in a small raceme, up to 5 cm in diameter. When fruit is getting ripe, it is shading purple-red. Other: occuring on farms 330, 331, 384, 387.	Grootfontein District	Passage Vaalbank/Norabis.	Rare. Thornbush savanna. Growing on rocky outcrop in loamy clay with gravel. Full sun.	1916DD

SPECIES	PLANTDESC	MINORAREA	LOCNOTES	HABITATTXT	QDS
Gymnosporia senegalensis (Lam.) Loes.	Shrub 80 - 250 cm high. Flower/Inflorescence: yellowish green, very small, 2 mm in diameter, an umbel, mostly found on spines. Leaves: more at tip of spines, alternate, pale green, shading to olive green. Stems and bark: upper twigs light brown/grey. Stem darker at bottom. Fruits and seeds: small, round fruits, without pulp.	Grootfontein District	Border Norabis/Mooiplaas, on mountain slope.	Rare. Growing on rocky outcrop with loam.	1916DD
Elaeodendron transvaalense (Burtt Davy) R.H.Archer	Tree 8 - 10 m high. Leaves: elongated, somewhat serrated. Stems and bark: grey-black at bottom, smooth and grey at top. Other: occuring on farms 330, 384, 387.	Grootfontein District	Vaalbank, on plateau.	Rare. Growing in gravelly loam.	1916DD
Mundulea sericea (Willd.) A.Chev.	Shrub 180 cm high. Leaves: green above, somewhat silvery below, compound, opposite, lanceolate, entire. Stem: grey, smooth. Fruits and seed: elongated. Occuring on farms 330, 331, 384,387. Indigenous name: Pferdebusch? (German).	Grootfontein District	Farm Norabis - bad road in front of gate.		1916DD

SPECIES	PLANTDESC	MINORAREA	LOCNOTES	HABITATTXT	QDS
Euphorbia monteiroi Hook.f. subsp. brandbergensis B.Nord.	Shrub 45 cm high. Flowers: flower spherical, rusty-brown in colour, with yellow margin. Petals large, three. Leaves elongated, olive-green. Stems and bark: stem olive-green, with scars from old leaves and inflorescences. White latex present. Other: only found at Narabis on Bakenkuppe.	Grootfontein District	Bakenkuppe, Norabis, Anzio, Mooiplaas.	Growing on rocky outcrop of mountain, in humus rich dolomite.	1916DD
Elephantorrhiza suffruticosa Schinz	Perennial shrub 180 cm high. Leaves: bipinnate, green. Stems and bark: stem smooth, red-brown. Fruits and seed: pods elongated, smooth, turning red-brown when getting dry.	Grootfontein District	On Naidaus NR 78 (Gross Naidaus). First wire in direction to Abachaus.	Rare. Growing in stony/rocky soil with gravel.	1916DD
Commiphora africana (A.Rich.) Engl. var. africana	Perennial shrub 185 cm high. Leaves: pale green. Stems: smooth, greyish. Fruit: 8 mm in diameter, with red-brown spots.	Grootfontein District	Baken Koppie, Norabis, Anzio, Mooiplaas.	Growing in sandy loam soil with gravel/dolomite.	1916DD
Commiphora angolensis Engl.	Shrub 120 cm high. Flowers: typical Commiphora flowers on short pedicel. Flowers greenish yellow.	Grootfontein District	Westland post.	Common. Closed woodland/thornbush savanna. Growing on a plain in stony/rocky soil with gravel.	1916DD

SPECIES	PLANTDESC	MINORAR EA	LOCNOTES	HABITATTXT	QDS
	Leaves: greenish, with long petioles. Shrub, greenish, much branched. Bark yellowish, peeling off.				
Ehretia alba Retief & A.E.van Wyk	Perennial dwarf shrub 0.80 m high. Flowers small, whitish, in racemes, close to stem, turning brownish when older Petals very narrow and elongated. Leaves are pale green, elongated, finely dentate. Stem: smooth, grey.	Grootfontein District	Border Norabis Mooiplaas: Grebbel omuramba.	Rare. Omuramba with closed shrubland. Growing on a plain in clay with stony/ rocky soil. Seasonally waterlogged. Full sun.	1916DD
Barleria damarensis T.Anderson	Perennial shrub, 1 m high. Leaves: green, elongated. Stems and bark: stem whitish, much-branched.	Grootfontein District	Bakenkuppe, Norabis, Anzio, Mooiplaas.	Rare. Growing on mountain slopes, in humus-rich/gravel on rocky outcrop.	1916DD
Tapinanthus guerichii (Engl.) Danser	Parasite 90 cm long. Flowers: elongated, greenish/yellowish. Leaves: woolly hairy. Stem: smooth steel grey. Other: occurs on the farms 330,331,384,387. Mispel (German).	Grootfontein District	Farm Vaalbank 384.	Common.	1916DD
Maerua schinzii Pax	Shrub to tree, 4 m high. Flowers yellowish. Leaves green. Stem greyish, smooth. Seen on farms	Grootfontein District	Beacon 34, maize field.	Uncommon.	1916DD

SPECIES	PLANTDESC	MINORAREA	LOCNOTES	HABITATTXT	QDS
	330, 331, 384, 387.				
Combretum hereroense Schinz	Shrub 2.5 m high. Little Combretum which flowers first. Flowers: little yellow flower 8 - 10 mm in diameter, flowers without leaves at first. Leaves: blue-green which stays green a long time. Stem: greyish and rough. Fruits: first becomes green then later when becoming ripe, yellow-brown. Other: is visited often by bees. Often browsed by game and cattle. Occurs on the farms 330, 331, 387.	Grootfontein District	Farm Vaalbank 384.	Uncommon to common.	1916DD
Xerophyta equisetoides Baker var. pauciramosa L.B.Sm. & Ayensu	Shrub, 10 - 80 cm high. After 11 mm rain old, dry leaves from winter turned green again. Leaves pale green (see old sample). Stem round, fibrous, difficult to break off.Only seen on 387 and Salema.	Grootfontein District	At border Norabis/Anzio. On mountain slope.	Rare.	1916DD
Ficus cordata Thunb. subsp. cordata	Tree, 4 - 8 m high. Leaves dark green, acute. Stem pale, smooth. Fruits eaten by birds. Uncommon tree in	Grootfontein District	Border Norabis/Anzio. On mountain slope.		1916DD

SPECIES	PLANTDESC	MINORAREA	LOCNOTES	HABITATTXT	QDS
	mountains. Seen on 331, 387.				
Cheilanthes marlothii (Hieron.) Schelpe	Fern, 25 - 30 cm high.	Grootfontein District	At border Norabis/Anzio.	Common.	1916DD
Actiniopteris radiata (J.König ex Sw.) Link	Fern, 5 - 8 cm high.	Grootfontein District	At border Norabis/Anzio.	Rare.	1916DD
Euphorbia guerichiana Pax	Shrub 230 - 230 cm high, small. Flowers: 3 mm in diameter, yellowish green, arising from stem. Bark pale, peeling off, dark below. Branches reddsih brown. Fruits 5 cm in diameter, green (appear to be unripe). Only single plant seen on Farm 387.	Grootfontein District	Gorge to 'Falschen Abachaus'.	Rare.	1916DD
Melhania acuminata Mast. var. acuminata	Small shrub, 1.30 - 1.50 m high. Leaves with acute tip, pubescent. Stem pale.	Grootfontein District	Below 'Falschen Abachaus'.	Uncommon. Growing on red sand, below 'Falschen Abachaus'.	1916DD
Commiphora glandulosa Schinz	Shrub, 150 cm high. Flowers elongated, somewhat pink-red. Stem greenish. Bark peeling off, yellowish. Fruits unripe, sessile, with acute tip. During droughts roots can be eaten. Roots contain a lot of water and are tasting sweet	Grootfontein District	On road from Westland camp to Elf.	Growing on plain.	1916DD

SPECIES	PLANTDESC	MINORAREA	LOCNOTES	HABITATTXT	QDS
	(according to Damaras). Common name: Booie '(Damara)', Balsambaum (German).				
Flueggea virosa (Roxb. ex Willd.) Voigt subsp. virosa	Shrub, 180 cm high. Leaves pale green, with notched tip. Stem rust-brown, smooth. Seen at 330, 331, 387.	Grootfontein District	Norabis, Veruruns-chungstal.		1916DD
Petalidium rossmannianum P.G.Mey.	Perennial shrub, 1.80 m high. Leaves olive-green, elongated. Stem pale, whitish.	Grootfontein District	Mooiplaas 462 Farm. Bakenkuppe, Norabis.	Rare. Open woodland. Growing in well-drained, gravel, on mountain slope.	1916DD
Flaveria bidentis (L.) Kuntze	Inflorescence yellow.	Grootfontein District	Along road 2782 Cunningham farm.	Woodland. Growng on gentle slope, in well-drained loam soil. Full sun.	1916DD
Abutilon hirtum (Lam.) Sweet var. hirtum	Flower orange-yellow.	Grootfontein District	Along road 2782, Cunningham farm.	Occasional. Woodland. Growing on gentle slope, in well-drained, loamy soil.	1916DD
Chrysanthellum indicum DC. subsp. afroamericanum B.L.Turner	Tiny perennial. Inflorescence yellow-brown.	Grootfontein District	Along road 2782, Cunningham farm.	Growing on level slope, near riverbank, in well-drained loam. Full sun.	1916DD
Kohautia caespitosa Schnizl. subsp. brachyloba (Sond.) D.Mantell	Flowers small, tubular, purple.	Grootfontein District	Along road 2782, Cunningham farm.	Growing near riverbank, on level slope, in loamy soil. Full sun.	1916DD
Jamesbrittenia concinna (Hiern) Hilliard	Small herb. Inflorescence yellow.	Grootfontein District	Along road 2782, Cunningham farm.	Growing near riverbank, on level slope, in	1916DD

SPECIES	PLANTDESC	MINORAREA	LOCNOTES	HABITATTXT	QDS
				loam soil. Full sun.	
Phyllanthus reticulatus Poir. var. reticulatus	Tree. Fruit round, white.	Grootfontein District	Along road 2782, Cunningham farm.	Growing near riverbank, on gentle slope, in loam soil. Full sun.	1916DD
Hypertelis cerviana (L.) Thulin	Small slender plant. Flowers white.	Grootfontein District	Along road 2782, Cunningham farm.	Growing near riverbank, in sandy soil. Full sun.	1916DD
Barleria meeuseana P.G.Mey.	Shrub to 1 m, corollas faded white, also fruiting.	Grootfontein District	Vryheid Farm, on D2667, 6 km W of C35 highway, small granite bouldery hillside, 3.5 km E of farm gate.	Habitat dominated by Acacia and Mopane. Plants abundant.	1916DD
Blepharis obmitrata C.B.Clarke	Shrub with red internodes, corollas purple and striated.	Grootfontein District	Vryheid Farm, on D2667, 6 km W of C35 highway, small granite bouldery hillside, 3.8 km E of farm gate.	Habitat dominated by Acacia and Mopane. Abundant.	1916DD
Geigeria alata (Hochst. & Steud.) Benth & Hook.f. ex Oliv. & Hiern	Plants to 0.4 m high, clustered yellow heads.	Grootfontein District	Vryheid farm, on D2667, 6km W of C35 highway, small granite bouldery hillside, 3.8 km of farm gate.	Habitat dominated by Acacia and Mopane.	1916DD
Helichrysum tomentosulum (Klatt) Merxm. subsp. tomentosulum	Plants to 0.5 m, phyllaries drying brown, disk flowers yellow.	Grootfontein District	Vryheid farm, on D2667, 6 km W of C35 highway, small granite bouldery hillside, 3.8 km E of the farm gate.	Habitat dominated by Acacia and Mopane.	1916DD

SPECIES	PLANTDESC	MINORAREA	LOCNOTES	HABITATTXT	QDS
Petalidium rossmannianum P.G.Mey.	Shrubs glaucous white, seeds already dispersed.	Grootfontein District	on D2650, 28.6 km of the junction with D2667.	Growing on clay banks of dry riverbed.	1916DD
Thamnosma africana Engl.	Young corollas burgundy, anthers bright yellow, bright yellow root cambium and plant covered with pellucid dots.	Grootfontein District	On D2650, 28.6 km W of the junction with D2667.	Growing on clay banks of dry riverbed.	1916DD
Helichrysum candolleanum H.Buek	Phyllaries translucent white with pink tinges towards the center, flowers yellow.	Grootfontein District	On D2650, 28.6 km W of junction with D2667.	Growing on clay banks of dry riverbed.	1916DD

TERM SHEET: B2GOLD SOLAR PROJECT (OTJIKOTO MINE)

Parties	This **Term Sheet** is concluded between: (1) **SUSTAINABLE POWER SOLUTIONS INVESTMENTS (PROPRIETARY) LIMITED**, a private company registered in accordance with the laws of South Africa under registration number 2016/215610/07 ("**SPS**"); (2) **MAXWELL CC**, a close corporation registered in accordance with the laws of Namibia under registration number 94/00397 ("**Landlord")**; (3) **B2GOLD NAMIBIA (PROPRIETARY) LIMITED** a private company registered in accordance with the laws of Namibia under registration number 93/613 ("**B2Gold**"); each a "**Party**" and hereinafter collectively described as the "**Parties**".
Introduction	SPS's principal business is developing and funding commercial and industrial scale solar photovoltaic systems in sub-Sahara Africa. SPS is a subsidiary of the UK's development finance institution, CDC Group Plc. B2Gold Corp is an international senior gold producer headquartered in Vancouver, Canada. Through its subsidiaries, it owns 90% of the Otjikoto Mine located in the north-central part of Namibia. The Landlord owns the farmland surrounding the area on which a 40 MVA substation (the "**Substation**") is to be constructed in order to bring grid power to B2Gold at its Otjikoto Mine, which Premises is in the process B2Gold will cover the cost for the construction of the Substation but the ownership thereof will vest in Nampower. Should the Project set out in this Term Sheet proceed, B2Gold will recover approximately half the cost of

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	the Substation from Solar SPV or NamPower, depending on the final arrangement between the parties. This Term Sheet sets out the principal terms on which SPS and the Landlord will fund, construct, commission and operate a solar photovoltaic plant through a newly incorporated company ("**Solar SPV**") to deliver clean renewable energy to B2Gold for consumption at its Otjikoto Mine.
Project	Means the solar photovoltaic plant to be constructed, commissioned and operated on certain areas of the farm, the details of which are set out in Annexure B hereto, owned by the Landlord in the Otjozondjupa region, Grootfontein District of Namibia (the "**Premises**"), and connected to the Nampower Substation located on the same Premises, to deliver clean renewable energy to B2Gold for consumption at their Otjikoto mine in terms of the Modified Single Buyer (MSB) model in Namibia (the "**Project**").
Legal Status	**This Term Sheet shall be non-binding on the Parties and is intended to record the details of the proposed Project and to provide confirmation of the Parties' respective commitment to proceed with the next steps of the Project.** The signing of this project will allow SPS and the Landlord to incorporate Solar SPV and to start the application for the generation license and the various application processes under the MSB model.
Description of Solar Plant	A ground mounted single axis tracking solar photovoltaic plant with a nominal capacity of approximately **13,000 kWp** (DC), the specification of which are set in **Annexure A** hereto (the "**Solar Plant**"). The final size will depend on any limitations imposed by the the Electricity Control Board of Namibia (ECB) and final designs on the Solar Plant.
Location of Solar Plant	The Project will be installed on certain portions of the Premises as depicted in **Annexure B** hereto. A written

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	lease agreement will be concluded between the Landlord and Solar SPV in respect of the use of the Premises for the installation of the Solar Plant for the duration of the Project (the "**Land Lease Agreement**").
Power Purchase Agreement	B2Gold and Solar SPV shall enter into a power purchase agreement (the "**PPA**") in terms of which Solar SPV shall sell the energy generated by the Solar Plant to B2Gold over a period of 10 (ten) years (the "**Term**"). The terms of the PPA shall be negotiated between the Parties, and shall be based on the standard PPA approved by the ECB, taking into account any input from Solar SPV's financiers. It is envisaged that the material terms of the PPA will be: • The duration of the PPA shall be 10 (ten) years as from successful commissioning of the solar plant (the "**Term**"); • Based on a forward selling exchange rate of NAD14.00 to the US$, the base tariff shall be [**NAD 1.08** (one Namibian Dollar and eight cents)] per kWh of energy delivered into the Nampower grid (the "**Base Tariff**"). Note that the final Base Tariff will be set once the main components for the Solar Plant have been procured, as the costs thereof will depend on the exchange rate at the time. • The Base Tariff shall escalate on each anniversary of the commissioning date with 4% (four percent); • In addition to the Base Tariff, Solar SPV shall be entitled to recover any cost levied by Nampower and/or the ECB for connecting to the Nampower grid via the Substation and delivering energy to B2Gold in terms of the MSB model (the "**Additional Costs**"). • Solar SPV shall guarantee that the Solar Plant will provide at least 95% of the modelled production energy in the first year of operation, reducing with

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	0.7% per year thereafter ("**Production Guarantee Threshold**"); • Provided Solar SPV meets the Production Guarantee Threshold, B2Gold likewise commits to procure an amount of not less than the Production Guarantee Threshold from Solar SPV each year; • Solar SPV shall at its cost ensure that the solar plant is properly maintained, insured and operated for the duration of the Term; • Provision for payment of a termination fee shall be made in the event of the agreement being terminated early due to B2Gold's mining licence not being extended (it being recorded B2Gold's current mining licence is set to expire in 2026). A draft of the PPA shall be provided to Solar SPV's financiers to ensure that the PPA is "bankable". The Parties undertake to incorporate any reasonable commentary from such financiers into account.
Parties' Obligations	<u>SPS shall:</u> • refund to B2Gold an amount equal to 50% of the costs of the Substation to be installed on the Premises in return for its use of up to 20MW of capacity; • provide the necessary funding for the development of the Project as well as for the costs of the engineering design, procurement, installation and commissioning the Project; • arrange for the necessary long-term refinancing for the Project post-commissioning; • obtain all necessary licences and regulatory approvals at its own cost in respect of the Project; • arrange for the preparation of all legal agreements to be entered into between the Parties, at its' cost;

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	• generally, act as project manager in relation to all aspects of the Project; • manage the corporate affairs of Solar SPV and report to all stakeholders on an ongoing basis; • manage the ongoing asset management and O&M services in relation to the Project. <u>The Landlord shall:</u> • make the Premises available to Solar SPV on which the Solar Plant is to be installed, on terms agreed between it and Solar SPV as per the Land Lease Agreement; • provide certain civil and mechanical installation services to the Project as agreed between it and Solar SPV. <u>B2Gold shall:</u> • provide the capital for the construction of the Substation at the Premises, as agreed between it and Nampower; • provide SPS/Solar SPV with the information necessary to design an optimised solar plant; • work together in good faith with Solar SPV and the Landlord to conclude the PPA and all other agreements and necessary regulatory approvals in respect of the Project.
Next Steps	Once this Term Sheet is signed, the following next steps are expected to be: a) the incorporation of Solar SPV by SPS and the Landlord; b) Solar SPV and the Landlord agreeing on the terms of the Land Lease Agreement; c) Solar SPV submitting the necessary applications for the approval of the Project under the MSB model which shall include: (i) commissioning an Environmental Impact Assessment for the Project;

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	(ii) applying for a generation license; (iii) applying for the necessary approvals under the Modified Single Buyer (MSB) model in Namibia; d) B2Gold and Solar SPV agreeing on the terms of the PPA.
Good faith	This Term Sheet commits the Parties to act in good faith and use their best efforts to realise the Project.
Confidentiality	Each Party agrees to keep strictly confidential both the contents and existence of this Term Sheet and the fact that the Parties are in discussions in relation thereto and agrees not to disclose any such matters without the prior written approval of the other Party. No public announcements of any nature whatsoever will be made by or on behalf of either Party, without the prior written consent of the other Party.
General	SPS will provide the Parties with a first draft of the PPA which, once signed, shall replace this Term Sheet. This Term Sheet may be executed in counterparts, each of which shall be deemed to be an original and which together shall constitute the same agreement.

Signed by the Parties as acceptance of the terms and conditions detailed in this document.

Signed at Stellenbosch on 7 July 2021

for **SUSTAINABLE POWER SOLUTIONS INVESTMENTS (PROPRIETARY) LIMITED**

F U T Lemaat

who warrants that he is duly authorised hereto

Signed at on 2021

for **B2GOLD NAMIBIA (PROPRIETARY) LIMITED**

M.T. DAWE

who warrants that he is duly authorised M.D.
hereto

Signed at on 2021

for **MAXWELL CC**

who warrants that he is duly authorised
hereto

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ANNEXURE A: TECHNICAL DETAILS OF THE SOLAR PLANT

The Solar Plant which consists of a 13,000 kWp (nominal DC capacity) ground-mounted single-axis tracking solar photovoltaic plant

The main technical specifications are:

Solar plant nominal capacity	13,000 kWp
Specific yield	2,452 kWh/kWp/p.a
Annual Solar Plant output (first year)	Approx 31,940,782 kWh/p.a
Modules	Bi-facial, 640Wp (likely Canadian Solar) Tier 1 rated
Inverters (centralised, string)	String inverters 250Wp (likely Sungrow) Tier 1 rated
Tracker	Single axis (East - West) tracker (likely Bi-STI-Norland)

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ANNEXURE B: LOCATION OF SOLAR PLANT

Description of the Premises

ID	FMB/00082
FARM_NAME	MAXWELL
OWNERSHIP	MAXWELL CC
POSTAL_ADD	P O BOX 81 Kalkfeld
DISTRICT	GROOTFONTEIN
REGION	Otjozondjupa
AREA (Ha)	4775.25
X_COORD	16.9727
Y_COORD	-19.91

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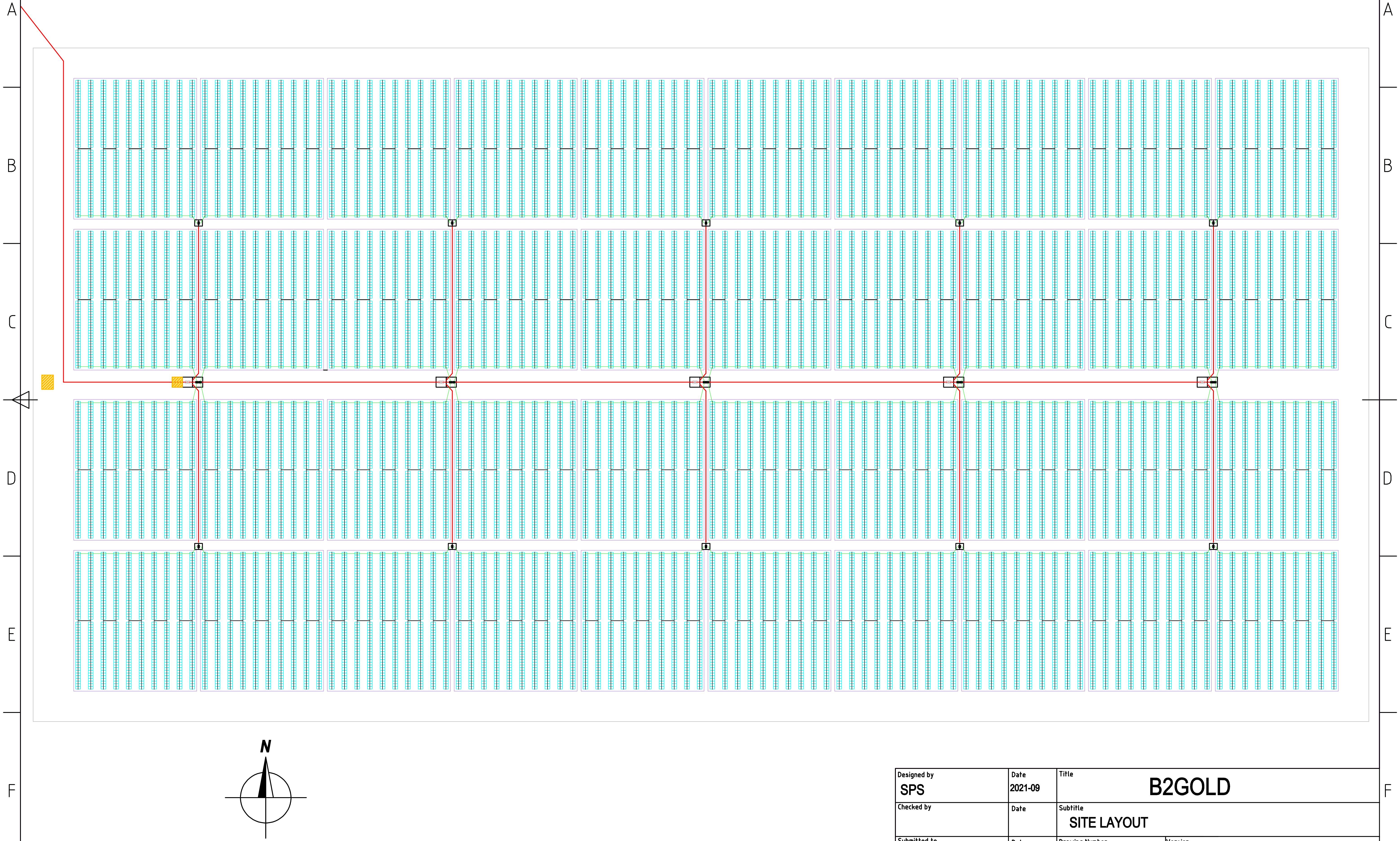
RevNo	Revision note	Date	Signature	Checked

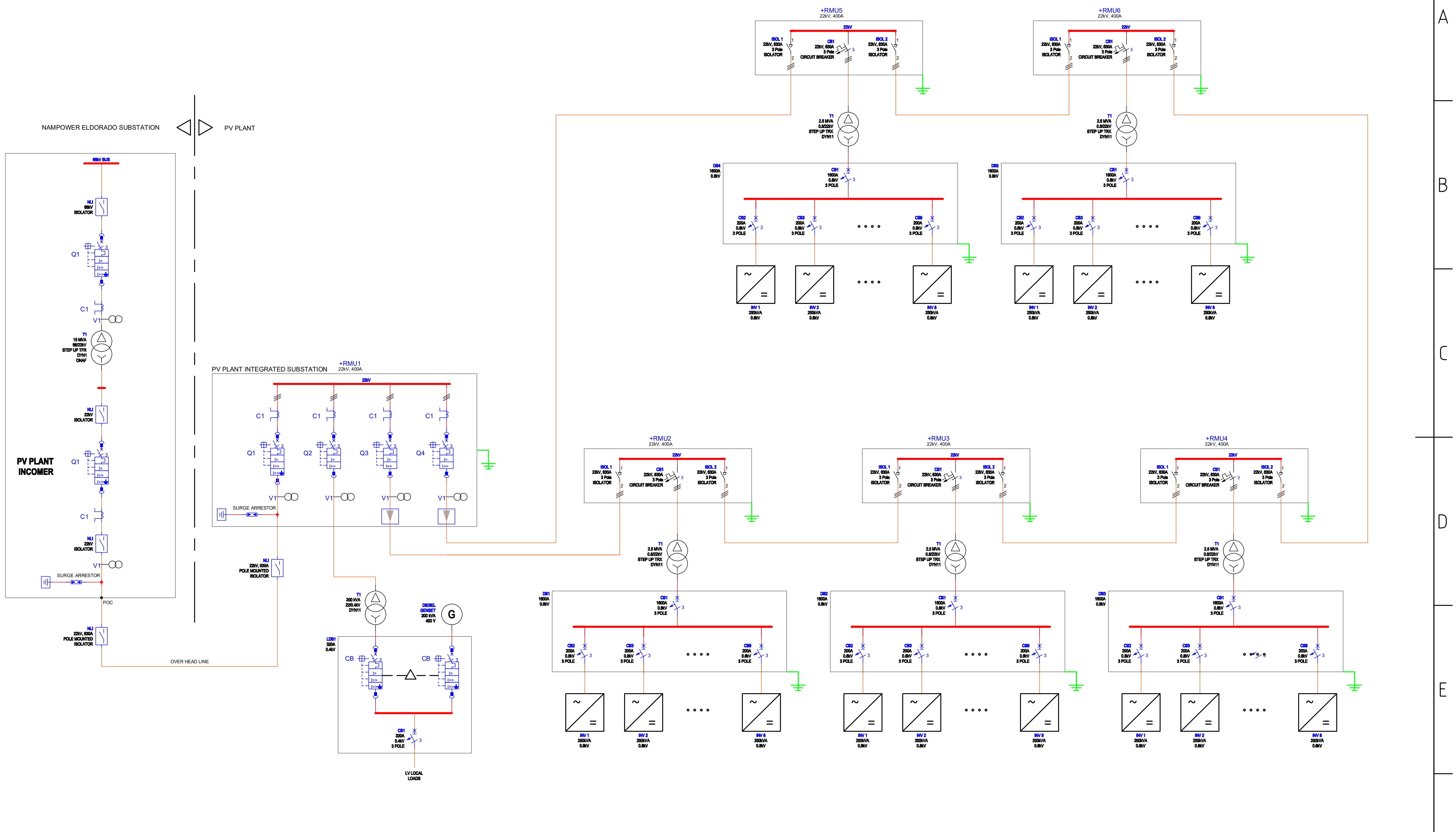
Designed by	Date	Title	
SPS	2021-09	B2GOLD	
Checked by	Date	Subtitle	
		SITE LAYOUT	
Submitted to	Date	Drawing Number	Version
MSB Application	2021-09	EQ820-01	1.0

RevNo	Revision note	Date	Signature	Checked



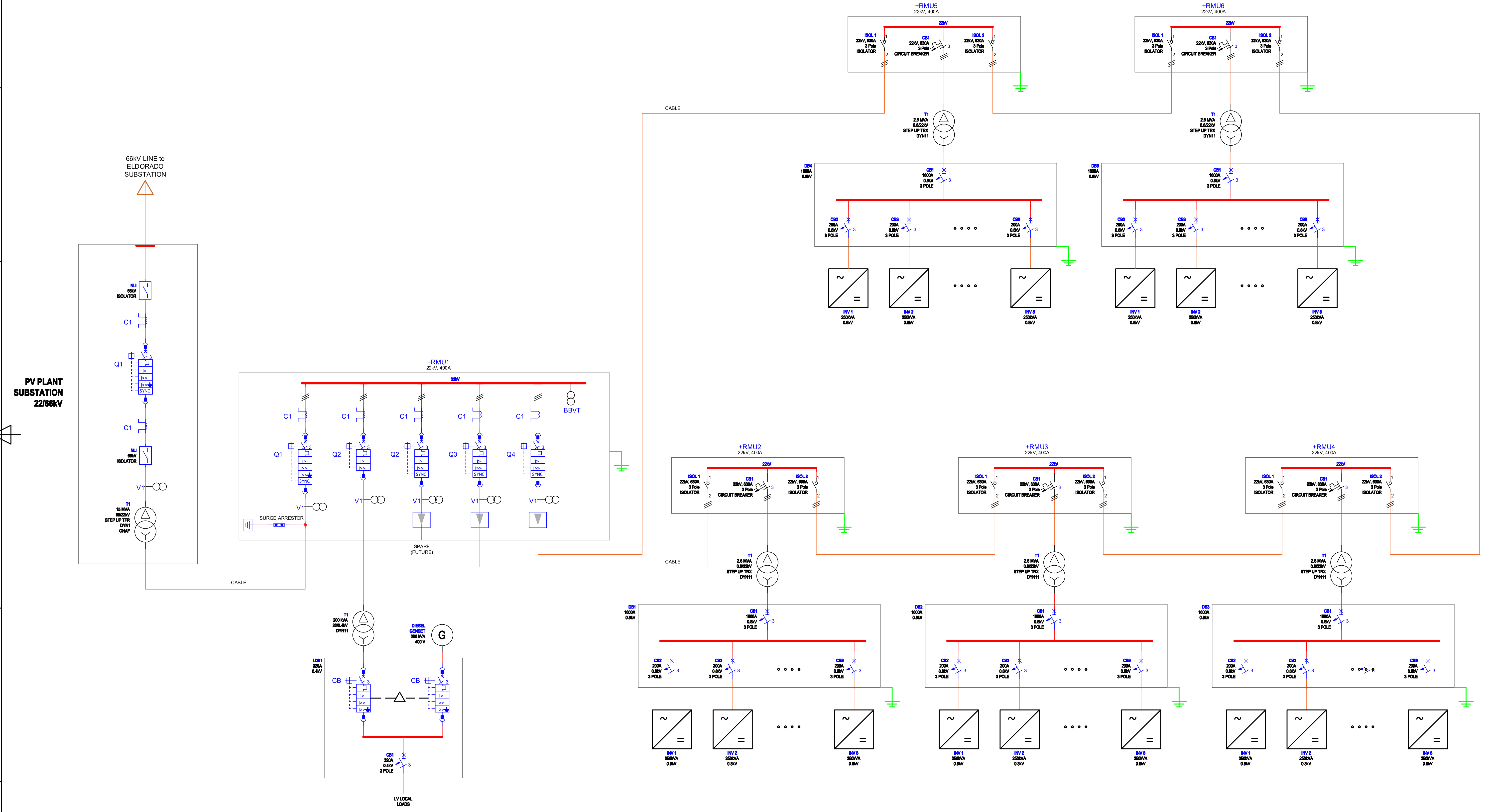
Designed by SPS	Date 2021-09	Title B2GOLD	
Checked by	Date	Subtitle SITE LAYOUT	
Submitted to MSB Application	Date 2021-09	Drawing Number EQ820-01	Version 1.0

RevNo	Revision note	Date	Signature	Checked



Designed by	Date	Title	
SPS	2021-09	B2GOLD	
Checked by	Date	Subtitle	
		SLD - GENERAL SCHEMATIC	
Submitted to	Date	Drawing Number	Version
MSB APPLIC.	2021-09	EQ820-02	0.0

RevNo	Revision note	Date	Signature	Checked



Designed by	Date	Title
SPS	2021-09	B2GOLD
Checked by	Date	Subtitle: SLD - GENERAL SCHEMATIC
Submitted to	Date	Drawing Number / Version
MSB APPLIC.	2021-09	EQ820-02 / 0.0