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COMPREHENSIVE DRAFT ENVIRONMENTAL MANAGEMENT PLAN (EMP) FOR:

THE OPERATIONS AND MAINTENANCE OF THE EXISTING 3-MEGAWATT (MW) SOLAR PHOTOVOLTAIC (PV) PARK WITHIN THE TOWNLANDS OF ARANDIS IN THE ERONGO REGION, NAMIBIA


ECC Application No.: **APP-0010344**

Proponent Name: **OLC Arandis Solar Energy (Pty) Ltd**

P.O Box 16 Windhoek, Namibia

OLC ARANDIS SOLAR ENERGY

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DOCUMENT INFORMATION

Title: Comprehensive Draft Environmental Management Plan (EMP) for the Operations and Maintenance of the Existing 3-Megawatt (MW) Solar Photovoltaic (PV) Park within the Townlands of Arandis in the Erongo Region, Namibia: An Application for Environmental Clearance Certificate (ECC

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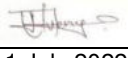
Signature:	
Date:	11 July 2022

EAP* - *Environmental Assessment Practitioner*

SERJA' STATEMENT OF INDEPENDENCE AND DISCLAIMER

As the Appointed Environmental Consultant to apply for the Environmental Clearance Certificate (ECC) and develop a Comprehensive Environmental Management Plan (EMP) for the Operations and Maintenance of the Existing 3-Megawatt (MW) Solar Photovoltaic (PV) Park within the Townlands of Arandis, Erongo Region, Serja Hydrogeo-Environmental Consultants cc declare that we:

- do not have, to our knowledge, any information or relationship with any member from OLC Arandis Solar Energy (Pty) Ltd, or the Ministry of Environment, Forestry and Tourism (MEFT)'s Department of Environmental Affairs and Forestry (DEAF) that may reasonably have potential of influencing the outcome of this Environmental Management Plant and the subsequent ECC applied for.
- have knowledge of and experience in conducting environmental assessments, the Environmental Management Act (EMA) No. 7 of 2007 and its 2012 Environmental Impact Assessment (EIA) Regulation as well as other relevant national and international legislation, guidelines, policies, and standards that govern the Project activities as presented herein.
- have performed work related to the ECC application in an objective manner, even if the results in views and findings or some of these may not be favourable to the Proponent.
- have complied with the EMA and other relevant regulations, guidelines and other applicable laws as listed in this document.
- declare that we do not have and will not have any involvement or financial interest in the undertaking / continued implementation of the Project, other than remuneration (professional fees) for work performed (to apply for the ECC compilation of this EMP in terms of the EIA Regulations' requirement as the Environmental Assessment Practitioners (EAPs) Environmental Consultants).

Disclaimer: Serja Hydrogeo-Environmental Consultants will not be held responsible for any omissions and inconsistencies that may result from information that was not available at the time this document was prepared and submitted for evaluation.

……

Signature:

Fredrika N. Shagama: Managing Member & Principal Environmental Assessment Practitioner

Date: 11 July 2022

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LIST OF ABBREVIATIONS

ABBREVIATION	MEANING
AC	Alternating Current
DC	Direct Current
DEAF	Department of Environmental Affairs and Forestry
EAP	Environmental Assessment Practitioner
ECB	Electricity Control Board of Namibia
ECC	Environmental Clearance Certificate
EIA	Environmental Impact Assessment
EMA	Environmental Management Act

ABBREVIATION	MEANING
EMP	Environmental Management Plan
EPs	Equator Principles
ErongoRed	Erongo Regional Electrical Distributor
HPP	Harambee Prosperity Plan
IFC	International Finance Corporation
MEFT	Ministry of Environment, Forestry and Tourism
MME	Ministry of Mines and Energy
MWac	Megawatt Alternating Current
MWh	Megawatt hour
NDPs	National Development Plans
O&L Centre	Ohlthaver & List Centre
PPA	Power Purchasing Agreement
PPE	Personal Protective Equipment
PV	Photovoltaic
SHE	Safety, Health and Environment
SMA STP	SMA Sunny Tripower (solar inverter brand)
UNCCD	United Nations Convention to Combat Desertification
V	Volt

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Appendix B: The Date Stamped Copy of the ECC Application

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1 INTRODUCTION

Solar (Photovoltaic (PV)) is becoming one of the most important renewable sources of energy in the world, and most governments promote its development and use to supply and/or augment existing sources of electricity. In Namibia, the use of solar energy is recommended to reduce reliance on the currently utilized non-renewable energy sources, and to expand current national generation capacity and thus reduce reliance on imports from neighbouring countries. The Government of the Republic of Namibia has named the use of renewable energy as one of the driving factors to the realisation of Namibia's economic, industrial as well as social development. This was highlighted in several policies such as the as the Namibia Vision 2030, National Development Plans (NDPs), and the new Harambee Prosperity Plan I (HPP) with the newly launched HPP II. These collectively, are aimed at steering the country towards prosperity for the entire Namibian population.

The specific sections of these National Vision Developmental plans that speak to the solar energy are as follows:

- The Namibia Vision 2030 which is one of the country's development blueprints covering the period 2004 to 2030 aimed at driving Namibia towards economic, industrial, and social development by combining a synergy of policies that will ensure prosperity for all.
- The Fifth National Development Plan (NDP5) which extends from 2017/2018 to 2021/2022 intends to involve up-scaling and modernizing of all sectors that contribute to economic development of the country. This national development plan requires that each expanding town be well catered for in terms of coordinating better energy sources, thereby necessitating the alternating current (MWac) Solar Photovoltaic (PV) Parks, that are a renewable source of power generation with zero carbon emissions.
- The Harambee Prosperity Plans aim to usher the country into a period of economic prosperity, fully supporting initiatives such as the development of renewable energy sources under the Pillars of Energy Infrastructure development.

These development policies combined aim to transform Namibia into an industrialized country with a high quality of life for all citizens and take our country to a developed nation status by 2030.

1.1 Project Background and Location

In line with National Development policies as well as the O&L Group of Companies' drive to promote the use of solar energy in Namibia, OLC Arandis Solar Energy (Pty) Ltd (hereinafter referred to as *OLC Arandis Solar Energy* or *The Proponent*) established and currently operates and maintains a 3-Megawatt (MW) Solar Park (Plant) in Arandis. The Solar Park and its associated infrastructure are located on the immediate southwestern side of Arandis (within the declared townlands) in the Erongo Region (hereinafter referred to as The Project Site or Project). The Project Site is well located in proximity (west) of the existing Arandis' Erongo Regional Electrical Distributor (ErongoRed) Substation, to ensure easy connection to the national grid. The Plant covers an area of twelve (12) hectares (Ha). The geographical location of the site is shown on the map in **Figure 1-1** and **Figure 1-2** and the coordinates of the site's boundaries are presented in **Table 1-1**.

The Site Layout of the site is shown in **Figure 1-3** and attached hereto as **Appendix A**.

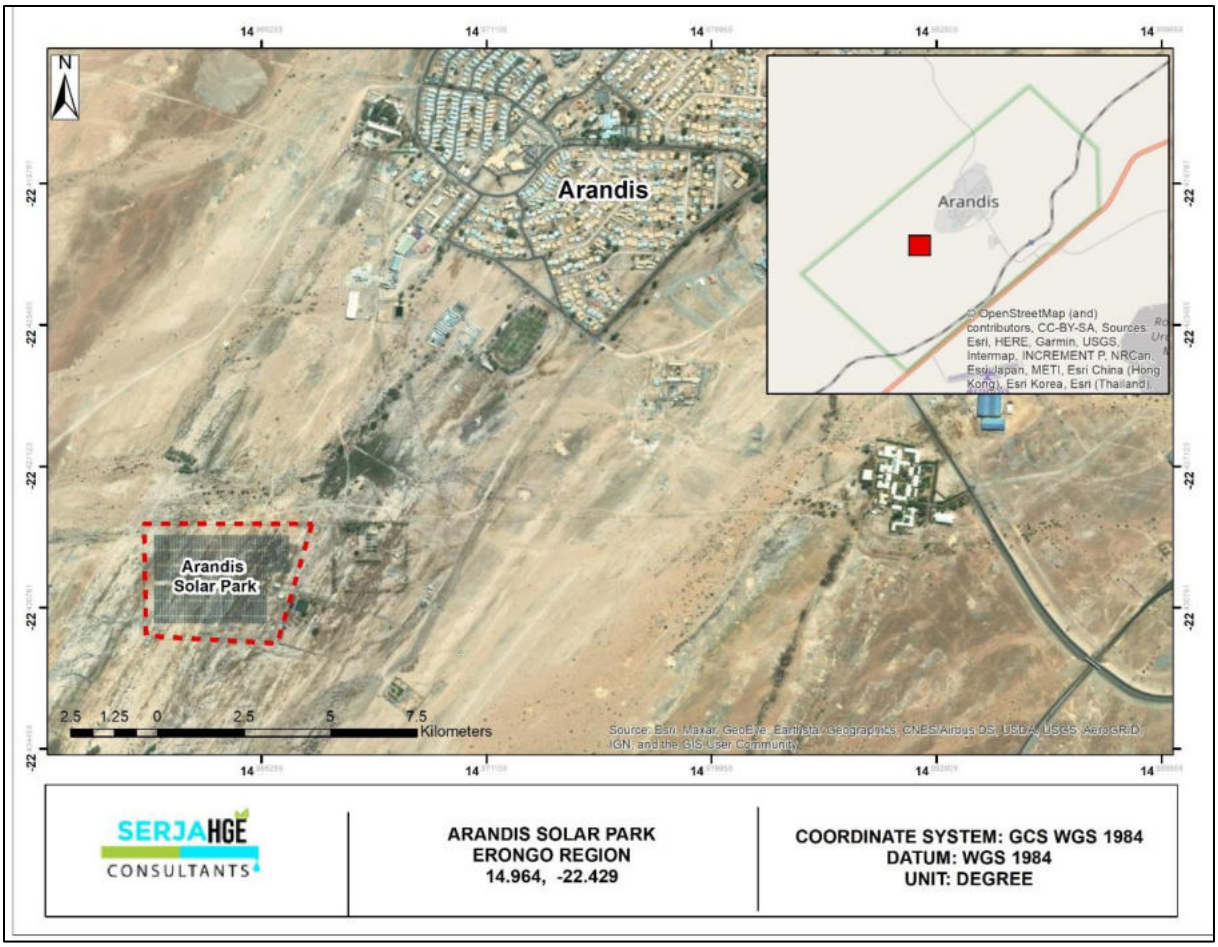

Figure 1-1: Locality map of the OLC Arandis Solar Energy Site in Arandis Town, Erongo Region.

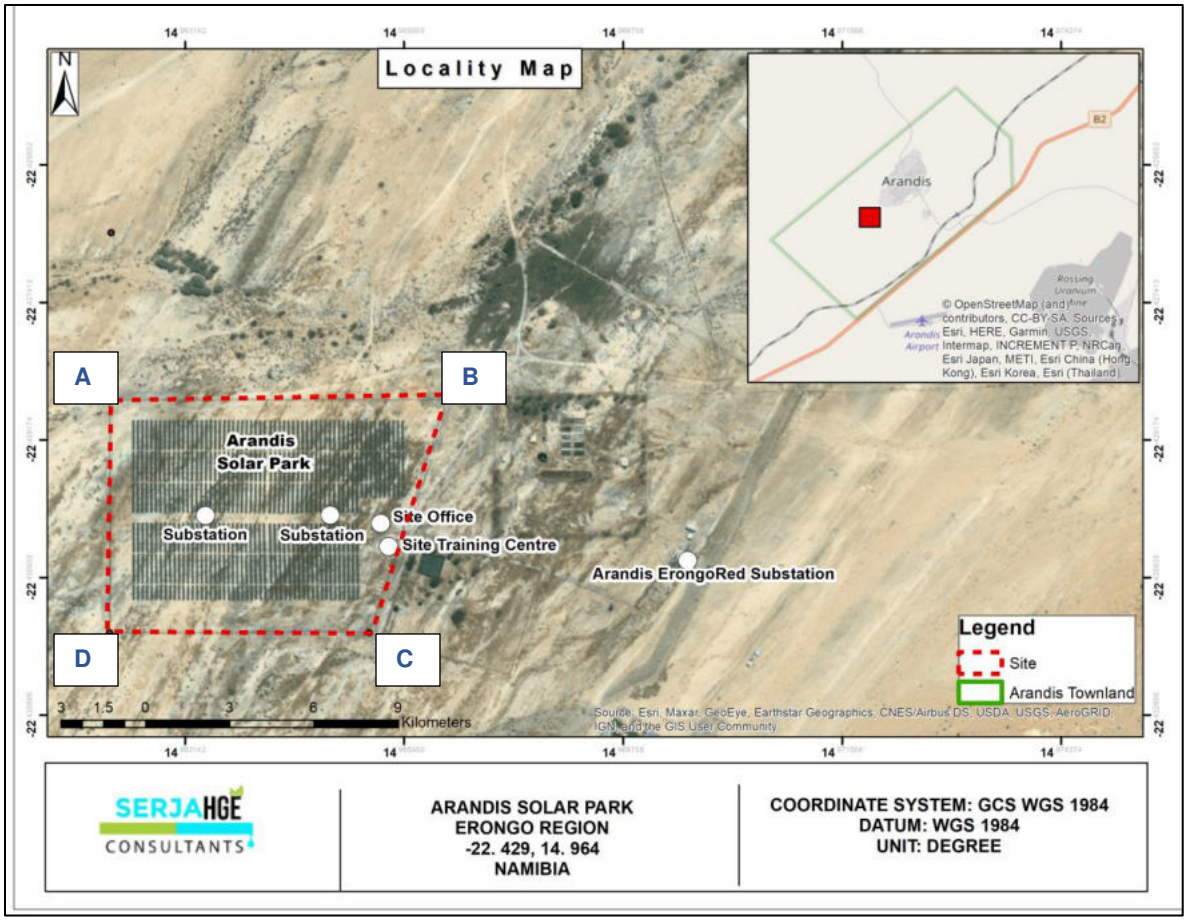

Figure 1-2: Locality map of the OLC Arandis Solar Energy Site in Arandis with site infrastructure.

Table 1-1: The GPS Coordinates of the OLC Arandis Solar Energy Site and some of its significant features

Site Feature	GPS Coordinates
Point A	-22.428652° 14.962197°
Point B	-22.428661° 14.966492°
Point C	-22.431642° 14.965503°
Point D	-22.431644° 14.962174°
Substation 1	-22.430140° 14.963403°
Substation 2	-22.430135° 14.965003°
Site Training Centre	-22.430535° 14.965750°
Site Office / OLC Arandis Transfer Substation	-22.430242° 14.965651°

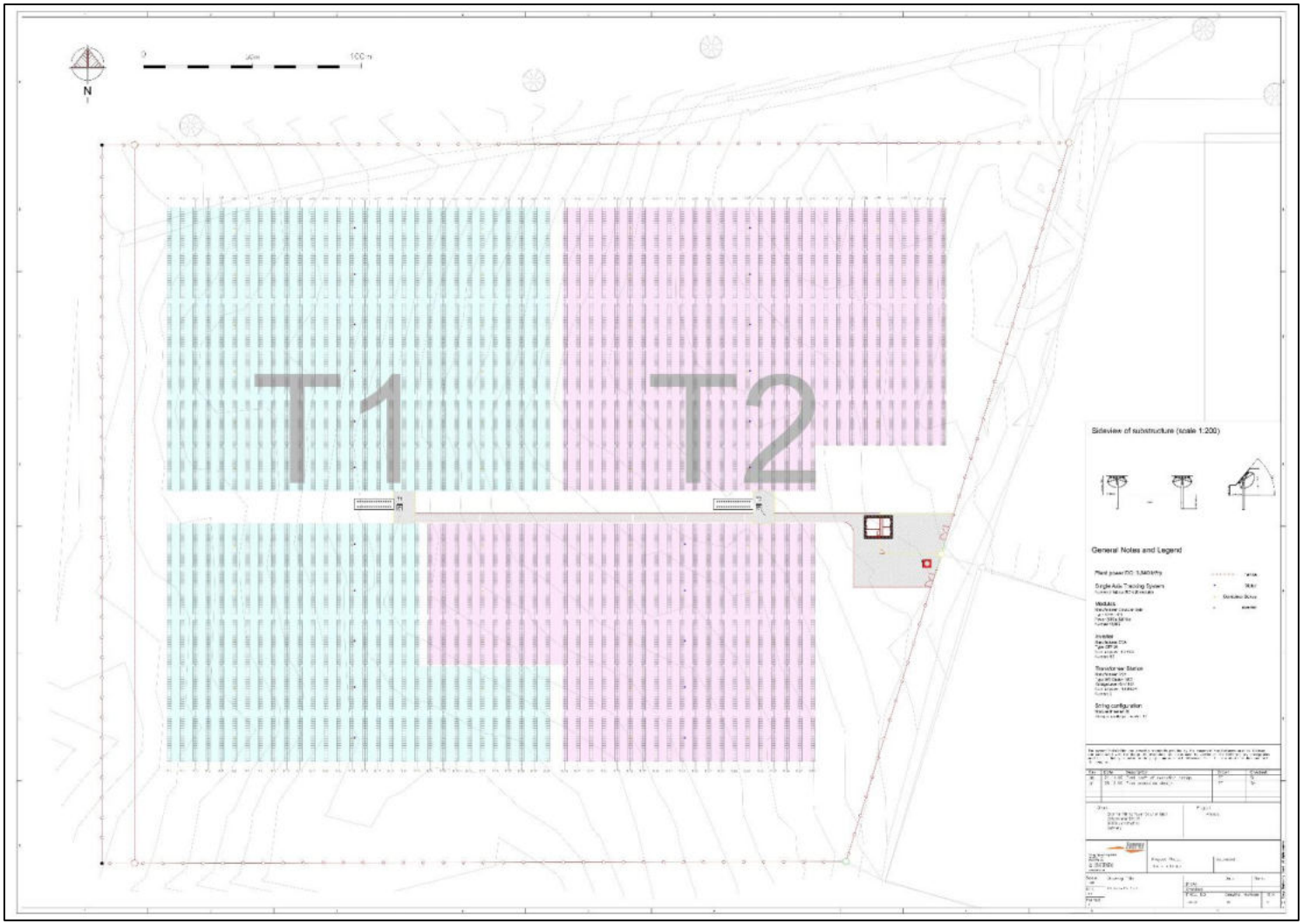

Figure 1-3: The OLC Arandis Solar Energy Site Layout

1.2 The Need for an Environmental Clearance Certificate (ECC)

The Environmental Management Act (Act No. 7 of 2007) (EMA) and its 2012 EIA Regulations lists activities that must not be undertaken without an Environmental Clearance Certificate (ECC). The OLC Arandis Solar Park includes activities listed under the 2012 Regulations' Activity No.1 (a) and (b) as follows below,

''ENERGY GENERATION, TRANSMISSION AND STORAGE ACTIVITIES

- *(1) The construction of facilities for.*
    - *(a) the generation of electricity, and*
    - *(b) transmission and supply of electricity*".

However, the OLC Arandis Solar Energy Site and its associated activities, has never been cleared environmentally (i.e., no ECC issued before though a detailed environmental assessment was done by Risk Based Solutions in 2015). Therefore, to ensure that the project obtains full compliance with the environmental legislation and ensure long-term sustainability, an environmental clearance certificate must be issued by the Environmental Commissioner at the Ministry of Environment, Forestry and Tourism: Department of Environmental Affairs and Forestry (MEFT: DEAF). An ECC application for the OLC Arandis Solar Park was submitted to the MEFT: DEAF on the 20th of June 2022, (Application number APP-0010344). The date stamped copy of this ECC Application is attached hereto as **Appendix B**.

Since the OLC Arandis Solar Energy Site is already in the operational phase, and as per consultations with the Office of the Environmental Commissioner, the ECC Application should be accompanied by a Draft Environmental Management Plan (EMP). The Draft EMP will then be evaluated by the Environmental Commissioner for consideration of the Project ECC.

1.3 The Appointed Environmental Consultant

To ensure compliance with the EMA and its 2012 EIA Regulations, the Proponent appointed Serja Hydrogeo-Environmental Consultants cc, who are independent Environmental Consultants / Environmental Assessment Practitioners to undertake the tasks necessary for the ECC Application. The tasks include the compilation and submission of the ECC application and a comprehensive EMP (present document).

The EMP is to be submitted to the environmental custodian/regulatory authority - MEFT: DEAF for evaluation and for consideration for the granting of the ECC by the Environmental Commissioner.

1.4 Purpose of the Draft Environmental Management Plan (EMP)

The Draft EMP, the present document has been developed in accordance with Regulation 8(j) of the EIA Regulations (2012), which typically requires that a Draft EMP be a part of every new Environmental Assessment (EA) scoping reports of projects. However, given the fact that the OLC Arandis Solar Park is

already operational, its ECC application only require the Draft EMP (upon consultation with the Office of the Environmental Commissioner). The 'Management Plan' or as referred to as the Draft EMP defined as:

> *"…a plan that describes how activities that may have significant environmental effects will be mitigated, controlled and monitored."*

An EMP provides all the recommended management, mitigation and monitoring actions, set to a timeline and with specific assigned responsibilities. It provides a link between the impacts identified and the required mitigation measures to be implemented during operational and maintenance phases of this project.

It is important to note that an EMP is a statutory document and a person who contravenes the provisions of an EMP may face imprisonment and/or a fine. This Draft EMP is a living document and can be amended to adapt to project changes and/or environmental conditions and feedback from compliance monitoring.

This EMP is therefore aimed at guiding environmental management throughout the operation and maintenance of the OLC Arandis Solar Park and its associated activities. This refers to the stage during which the Solar Park is producing electricity and to all site maintenance done by the Proponent or when necessary, by an appointed specialized maintenance contractor. If the site is to be decommissioned at any stage in future, it is recommended that a detailed decommissioning impact assessment be executed, and a relevant rehabilitation management plan developed to ensure that the site can be restored to a state that closely resembles its original natural state.

2 THE PROJECT DESCRIPTION AND ACTIVITIES

To develop a comprehensive EMP, Serja Consultants consulted literature, obtained information from the Proponent, and conducted a site assessment to get a complete picture of the current project undertakings. The site visit was conducted on the 24th of June 2022. The activities currently undertaken onsite are presented under the following sections. According to a one-on-one site interview with the Plant Operator and a one-pager OLC Arandis Solar Energy (Site) Report from the 6th of May 2019, the operations started (first energy production) in July 2017. The Site Report indicated that the Plant capacity is 3.84MWp (DC) and the Output is 3.3MW AC at 11kV. According to the Site Report, the total annual energy production from the Solar Park is 9,533 MWh, and under optimal operational outputs, small deviations can occur due to a variety of factors.

2.1 The Current Operational and Maintenance Activities

The following activities have been undertaken for the generation of electricity at the OLC Arandis Solar Plant site:

- Site commissioning and licencing: The Site operations started (first energy production) in July 2017. A Generation License (with Reference No. G159-011016-25) has been issued to the Proponent by the Electricity Control Board (ECB) of Namibia. According to this Generation License (Appendix C), the total installed capacity for which the License is granted is 3.3 MW, but subject to ECB approval, should the Proponent decide to change the capacity and or make amendments.
- The installation of solar panel arrays: 12,000 solar panels are installed (**Figure 2-2)**.

Figure 2-1: Some of the solar panels at the OLC Arandis Solar Energy Plant Site

According to the Site Report (from May 2019), the 1,800 panel arrays are installed at a depth of 1.5 meters. A combination of concrete and screw pile foundations are used to support the panel arrays as shown in **Figure 2-3.** The solar panels are equipped with combiners that connect the 200-panels group to each of the 60 inverters.

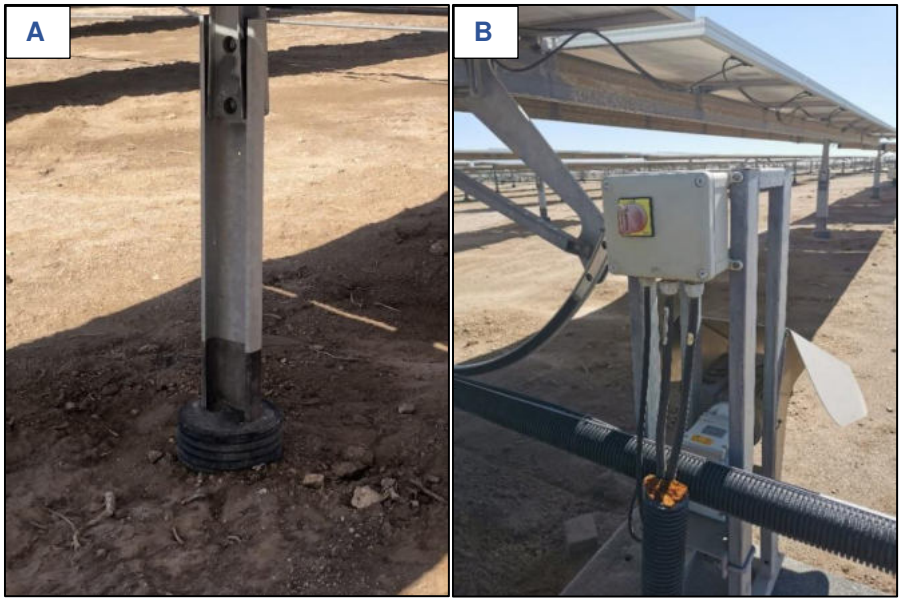

Figure 2-2: A- The screw pile foundation supporting a panel array and B- The combiner (whitish grey box with a red knob) under a panel

- Functionality: The arrays are tilted with the aid of the Exosun Tracking system, which enable them to turn (via a single axis-East to West tracking). This is setup allows maximum capturing of sunlight which ensures optimal efficiency of the panels.

  To protect the panels from heavy winds, there are two sensors (anemometers) installed on top of the Site Office / Arandis OLC Transfer Station Building - **Figure 2-3.** These sensors are used to detect air pressure. Upon detecting strong winds, the sensors will send a signal to the panels to return to the safe mode (in a horizontal position) until it is safe for the tracking system to operate again.

Figure 2-3: The wind sensors (anemometers) on top of the Site office/Transfer Station onsite

2.2 Energy Production Process

The energy production process begins with the capturing of solar energy by the panels as direct current (DC). There is no site-specific process flow available, however, the presentation of typical solar system and energy production is shown in **Figure 2-4**.

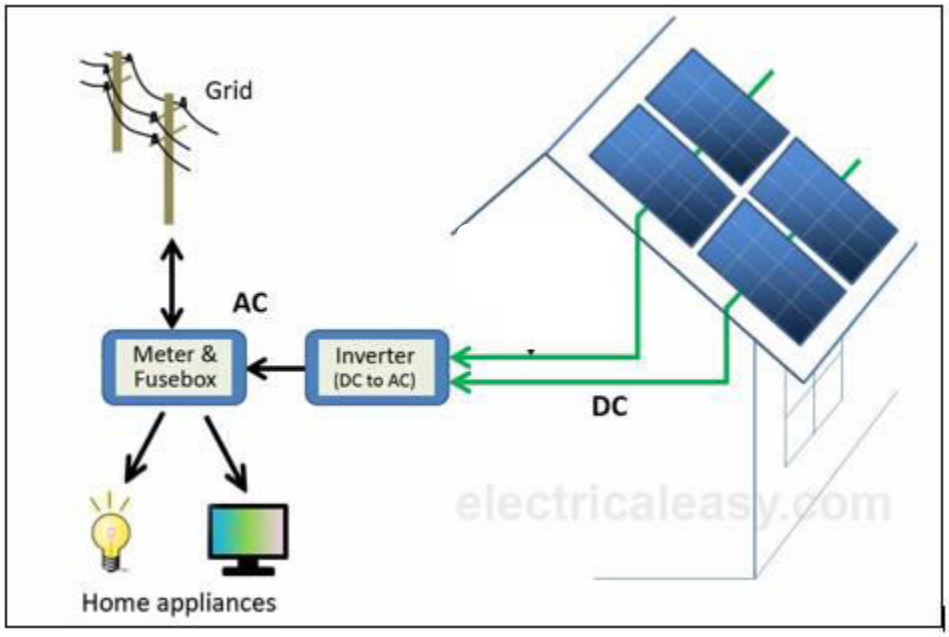

Figure 2-4: A simplified typical solar energy production process (modified after Daware, 2021)

The current is transferred to the sixty (60) site SMA Sunny Tripower (STP) inverters (solar inverter brand) that are each set up to take 60 kW maximum, shaded under two Site Substations located within the site - **Figure 2-6.**

Figure 2-5: The Site inverters' substations (Substation 1 and 2) with the 30 inverters per Substation

The inverters are set up in a way that each pair of the 60 inverters (30 inverters per Substation) converts DC from 200 panels (i.e., 60 x 200 = 12,000 panels). The panels' normal electricity production ranges between 800 and 1,000 V DC (as minor difference can occur die to radiation and other factors) to the inverters, the inverters change the DC to 400-alternating current (AC). From the inverters, the AC is transferred to the two transformers (at 11kV) adjacent to each 30-inverter substation. The transformer (**Figure 2-6**) then supplies to an existing ErongoRed Substation located west of the Site, which provides connection to the national grid. The sale of electricity is governed by a confidential power purchase agreement.

Figure 2-6: A – Some of the inverters under one of the substations and B - one of the Transformers

2.3 Solar Panel Maintenance

The solar panels are still new (the life expectancy is usually 20 to 25 years, and therefore they have not been replaced. However, the panels will be done if any of the panels are damaged. The only maintenance currently done is the cleaning of panels when required. The indication of whether the panels need to be cleaned or not (dirt), is determined by the installed sensor placed on one of the solar panel arrays next to Substation 1 onsite **– Figure 2-7**.

Figure 2-7: The sensor for detecting dirt on the panels

For cleaning, among other panel cleaning methods such as dry cleaning, wet cleaning option is used. This is normal washing with fresh water through pipelines connected from the two onsite taps – **Figure 2-8**. The pipes are designed to spray water on the solar panels once alerted by the sensor, therefore ensuring their cleanliness to promote energy production efficiency. The cleaning of the panels is done manually.

Figure 2-8: One of the Solar panels cleaning taps onsite

2.4 The Project Resources, Services, Infrastructure and Structures

The following resources, services infrastructure and structures are currently utilized and required at the Solar Park Site, respectively.

- **Project workers (staff)**: The project currently employs four (4) people, one (1) Solar Plant Operator and three (3) security guards. The operator ensures maintenance of the site, when and where necessary while the security officers work in shifts to safeguard the site with one guard on shift during the day and the other two on the night shift. All four (4) employees commute to the Site from Arandis; therefore, no onsite accommodation is required.
- **Administration/office and control rooms**: The Solar Park project is equipped with two administration buildings. One building serves as a Site Office (equipped with a toilet) on the western section and OLC Transfer Station (from the Solar Park to ErongoRed grid) on the eastern side/section. At the entrance of the Site, there is a security control room and next to it is the Site Training Centre. According to the Plant Operator, the Centre is aimed at providing opportunities for those individuals interested in the site, to learn more about its operations. The photos of the site buildings are shown in **Figure 2-9**.

Figure 2-9: Site structures (A- Training Centre, B -Security Control, C- OLC Transfer Station (eastern side), D – Site Office (western side)

- **Water:** The water required for the Project is supplied by the Arandis Town Council. The Site is connected to the Town's water supply system, where water is piped to the taps onsite, therefore no onsite water storage tanks is required. An average of 3 cubic meter (m^3) or 3,000 litres of water is consumed onsite monthly. This water is primarily used for human consumption (drinking), ablution and cleaning of solar panels when necessary.
- **Power supply**: The Site is supplied with power by ErongoRed via a local connection (substation). The power supply is used for supplying electricity to the control systems and offices on site, to ensure continued operations if the plant does not operate.
- **Fuel:** The actual solar operations do not require fuel. Therefore, there are no fuel tanks on site. The project vehicles are refuelled offsite at the fuel stations in Arandis Town.
- **Sanitation*:*** The site is provided with flush toilets that are connected to the Town Council sewer reticulation system.

- **Operational solid (general) waste:** The waste generated at the site is minimal. This waste is sorted in two waste bins on site and collected once or twice a month for disposal at the dumping site by the Town Council's waste removal contractor. From observations and absence of vegetation cover (bare desert soils), the site surface is clean with no littering nor oil spills and leaks on the ground. **Figure 2-10** below shows a white waste collection drum near the gate of the Plant (and a small plastic waste bin in the Site office.

Figure 2-10: The Site Solid waste collection containers

- **Old and or damaged solar panels (waste):** The solar panels function for a period of 20 to 25 years before they can be replaced. The Plant has been in operation for 5 years now, therefore there are no observed or recorded malfunctioning panels. Regardless, as part of maintenance check onsite, the site solar panels are inspected regularly. Should there be any damaged panels that are considered unfit for the project, their serial numbers will be recorded before they are written off. These written off panels will then be removed and disposed of at the approved and designated hazardous waste management facility.

  Considering the concept of cradle-to-grave, the damaged or inefficient Project solar panels would not be donated or distributed to private users (such as local communities) as it is done with some other unrelated solar projects, because it would lead to lack of accountability on the final disposal of these solar panels (as waste). Furthermore, from a safety perspective, if these panels are to be donated to just anyone in the communities, and incorrectly installed or connected to homes, it may result in fire incidents and blames would be put on the Proponent. Therefore, to avoid these implications, the Proponent will control and manage where the discarded solar panels end up (at an approved storage site for damaged solar panels and not in communities).

  It should be noted that the technology of the Project solar panels does not use backup batteries. Therefore, the solar panels associated waste does not contain batteries that would be an environmental concern when it comes to their handling and disposal.

- **Site accessibility (Road):** The primary access road that connects the Project site to the surrounding areas such as Usakos/Karibib and Swakopmund is the national road B2. However, to access the Site, there is a single unpaved access road from the Town (Arandis) to the Plant.
- **Health and safety:** All project workers are well equipped with personal protective equipment (PPE) while performing tasks on site. The Site is equipped with a well-furnished First Aid Kit (**Figure 2-11**) to attend to potential minor injuries.

Figure 2-11: First Aid Kit in the Site Office

- The Site Office is equipped with a 5kg CO_2 SafeQuip branded fire extinguisher as shown in **Figure 2-12**. Although the fire extinguisher appears to be new, it has no servicing date information. Therefore, it needs to be serviced and the next servicing date clearly displayed thereto. The Plant Operator indicated that this will be actioned as soon as possible.

Figure 2-12: Fire extinguishing equipment in the site Office

- **Site Safety and Security:** The Project Site is well fenced off, with animal proof wire on the outside and an electrical fence on the inside. The fencing is aimed at keeping animals out and to prevent the theft and vandalism of Site infrastructure. The electrical fence is shown in **Figure 2-13**. The electrical fence is connected to a security alarming system that reports to the Plant Operator's phone in the event of a loss of power or breach.

Figure 2-13: Meshed electric fence around the Site

For safety reasons, there is an open space (about 10m) between the panels and fence (**Figure 2-14**) to safeguard the panels from outside vandalism of people through throwing things such as stones or objects on top of the panels.

Figure 2-14: The 10m safety space between the western solar panels and the fence (view to the south). The inner fencing – electrical wire fence can also be seen on the right.

The Plant also has installed spotlights in and around the Plant to provide lighting at night for safety and security measures. These lights are self-powered through solar battery power (**Figure 2-15**)

Figure 2-15: Some of the self-powered spotlights onsite

- The Health and Safety Inductions are provided to Visitors and Contractors who visit the site as a standard procedure to ensure continued safety onsite. A manual or pamphlet seen in (**Figure 2-16**) forms part of these inductions.

Figure 2-16: OLC Arandis Solar Energy Site Safety & Security Orientation Pamphlet

- **Rainwater/Stormwater management**: The project site is in the arid area of Namibia (the Namib Desert) that has low rainfall of as little as 50 to 100 mm per year. However, the area is prone to 10-year heavy rains that result in flash floods. These floods are notable for replenishing/recharging the groundwater resources (aquifers) of the coastal and desert areas. The heavy rains could fall on the tilted solar panels on site which would trigger soil erosion through runoff from site. According to the Site personnel, in the five years of operation, there has not been any flash flood experienced onsite.

  Despite the no flooding in the 5 years of operations, the Proponent should consider a monitoring and response if such events occur. This would include setting up a channel that act as a diversion of runoff (rainwater flowing down the panels) to the drainage point where the water can freely flow elsewhere in the area to recharge groundwater resources and without eroding a significant amount of site soils.

The project activities described above are governed by certain legislations, which should be complied with throughout the project life cycle. The following chapter presents the legal requirements that are applicable to the Project activities.

3 LEGAL FRAMEWORK: OPERATIONAL PERMITTING / LICENCING

The operation, maintenance and other activities associated with the OLC Arandis Solar Park are undertaken in a specific biophysical and social environment. This means they have the potential to impact some of these environmental components. It is therefore necessary to consider the legislative and legal requirements governing the project and its associated activities.

The main legal framework presented herein is that of Namibia for the relevant project components under the scope of this document. A summary of these that required permitting and licensing for certain project activities are presented under the following sections.

3.1 Local and National Legislation (Acts, Policies, Regulations, etc.)

This section presents the information on the legal obligations (legislations, policies, and guidelines) in terms of legislation, where permitting and/or licensing that may be required from different applicable regulatory authorities as a requirement to the ECC. The main Acts and Policies regulating the primary project activities are given below and the other presented under **Table 3-1.** The relevant international legal framework is outlined under **Table 3-2** of section 3.2.

Table 3-1: List of applicable legislation where required, permits or licenses for the Solar Plant activities

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this Project
Environmental Management Act EMA (No 7 of 2007) Environmental Impact Assessment (EIA) Regulations Government Notice 28-30 (Government Gazette 4878) of February 2012A **Regulated under the Ministry of Environment, Forestry and Tourism (MEFT)**	The Act and its 2012 EIA Regulations aims to ensure that the potential impacts of the development on the environment are carefully considered. The Act aims at promoting sustainable management of the environment and use of natural resources. The Environmental Management Act (EMA) is broad; it regulates land use development through environmental clearance certification and/or Environmental Impact Assessments. The Act provides for the clearance certification for '' ***(1) The construction of facilities for (a) the generation of electricity and (b) transmission and supply of electricity***" which is relevant to the Project. For new projects, the Act requires that projects with significant environmental impacts are subject to an environmental assessment process (Section 27). Regardless to the Solar Park, mitigation measures should be developed for implementation during operations.	The EMA should inform and guide this EMP development and its implementation for: **-**ECC Amendment/Transfer and Renewal: Should the Proponent consider amending/Transferring the Project activities - the need to renew the ECC (every 3 years prior to its expiry date), The applications as deem necessary should be made with the Department of Environmental Affairs and Forestry (DEAF) as follows: **Office of the Environmental Commissioner:** **Mr. Timoteus Mufeti** **Tel: 061 284 2701**
	Details requirements for public consultation within a given environmental assessment process (Government Notice No. 30 Section 21). The details the requirements for what should be included in an Environmental Scoping Report (Government Notice No. 30 S8) and an EIA Report (Government Notice No. 30 Section 15).	The Project is already in its operational phase. However, if necessary and required, constant consultations and engagements with the interested and affected parties (stakeholders) should be continued. In case of grievances raised by the neighbouring land users or the Arandis Town Council to the Proponent, this should be addressed and resolved amicably.

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this Project
Electricity Act No. 4 of 2007 **Regulated under the Ministry of Mine and Energy (with Licensing issued by the Electricity Control Board (ECB) of Namibia)**	The Act provides information on the requirements for electricity generation, trading, transmission, supply, distribution, importation, and export. The Electricity Control Board (ECB) of Namibia under the Ministry of Mines & Energy exercises control over the provision, use and consumption of electricity in Namibia; ensures efficiency and security of electricity provision; ensures a competitive environment in the electricity industry in Namibia; and promotes private sector investment in the electricity industry. The board provides for the requirements and conditions for obtaining licenses for the provision of electricity and to provide for other incidental matters. All the relevant electricity permits, and license (such as **generation**, distribution, and supply licenses) should be applied for and obtained from the relevant regulatory authorities. Part 4 (License, section 17 – Duty to obtain a license or licenses. Subsection 1 (a) generation and (d) supply of electricity. The Proponent should comply with the relevant Sections of Part 4 of the Act that govern the Project activities and ensure timely renewals or as stipulated.	The Project activities involve the generation, supply, and transmission of electricity. OLC Arandis Solar Energy is required to apply for the relevant license (electricity generation and transmission) for their operational activities. The Electricity General License should be renewed on time as per the existing License conditions. The Proponent should also notify the ECB (for approval) of any intentions to change or amend the License. **Electricity Control Board (ECB) of Namibia** **Tel: +264 (0) 61 374 300 (switchboard)** **Mr. Francois Robinson:** **Manager: Regulatory Support Services** **Tel: +264 (0) 61 374 319**
Namibia's Green Plan, 1992	The National Green Plan was drafted by the Ministry of Environment, Forestry and Tourism (MEFT). The document analysed the main environmental challenges facing Namibia and specified actions required to address them. This included a strategic plan for integrated and sustainable environmental management, which outlines key focus areas for sustainable development.	The Proponent should assist in implementing this Plan by sustainably operating in the environment and at the same time, taking care of the environment for its management and protection.

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this Project
Forestry Act No. 12 of 2001	The Act provides for the management and use of forests and related products / resources. It offers protection to any living tree, bush or shrub growing within 100 metres of a river, stream or watercourse on land that is not a surveyed erven of a local authority area. In such instances, a licence would be required to cut and remove any such vegetation. These provisions are only guidelines. The Project is in a desert environment where vegetation is scarce and of which some are sensitive species.	The Site is already disturbed from the Plant establishment and installation of services and infrastructure. However, young plants such as pax herbs seldom grows onsite under some panels and were observed during the Site visit in June 2022.
Soil Conservation Act (No 76 of 1969) **Regulated under the Ministry of Agriculture, Water and Land Reform**	The Act makes provision for the prevention and control of soil erosion and the protection, improvement and conservation of soil, vegetation and water supply sources and resources, through directives declared by the Minister.	Duty of care must be applied to soil conservation and management measures must be included in the EMP, given the sensitivity of the project site area (desert environment). This is mainly aimed at soil disturbance through unnecessary creation of new tracks and pollution from project related activities.
Forestry Act 12 of 2001 **Regulated under the Ministry of Environment, Forestry and Tourism**	Prohibits the removal of any vegetation within 100m from a watercourse (Forestry Act Section 22(1)). The Act prohibits the removal of and transport of various protected plant species.	There is seldom appearance of small desert vegetation at very few areas of the site. Although not considered protected species, they should not be disturbed nor destroyed. The priority is to first Rescue & Relocate the plants. However, if removal is necessary, a Permit should be applied from the nearest Directorate of Forestry at MEFT.

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this Project
The National Heritage Act (No. 27 of 2004) The National Monuments Act (No. 28 of 1969) **Regulated under the Ministry of Education, Arts and Culture**	The Act extends the protection of archaeological and historical sites to private and communal land and defines permit procedures regarding activities at such sites. The Act enables the proclamation of national monuments and protects archaeological sites.	Should heritage resources (e.g., artefacts, human remains/bones in the subsurface etc.) are discovered at some point on and /or around the site, these should be reported to the National Heritage Council of Namibia for relocation. **Contact: Mrs. Erica Ndalikokule (Director)** **Or Ms. Agnes Shiningayamwe (Regional Heritage Officer)** **Tel: 061 301 903**
Pollution Control and Waste Management Bill **Regulated under the Ministry of Environment, Forestry and Tourism**	The bill aims to "prevent and regulate the discharge of pollutants to the air, water and land" Of particular reference to the Project is: Section 21 "(1) Subject to sub-section (4) and section 22, no person shall cause or permit the discharge of pollutants or waste into any water or watercourse." Section 55 "(1) No person may produce, collect, transport, sort, recover, treat, store, dispose of or otherwise manage waste in a manner that results in or creates a significant risk of harm to human health or the environment."	The Proponent and their workers should continue with the good waste management work (directly or indirectly) to ensure that the waste does not cause environmental threat and degradation. **No permit or license required.**
Public Health Act (No. 36 of 1919)	Section 119 states that "no person shall cause a nuisance or shall suffer to exist on any land or premises owned or occupied by him or of which he is in charge any nuisance or other condition liable to be injurious or dangerous to health."	The Proponent and all its employees should ensure compliance with the provisions of these legal instruments.

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this Project
Health and Safety Regulations GN 156/1997 (Government Gazette 1617)	Details various requirements regarding health and safety of labourers.	This includes the provision of health and safety measures, wearing of Personal Protective Equipment (PPE), Health & Safety Trainings, etc. **No permit or license required.**
Public and Environmental Health Act No. 1 of 2015 **Regulated under the Ministry of Health and Social Services**	To provide a framework for a structured uniform public and environmental health system in Namibia; and to provide for incidental matters.	
Road Traffic and Transport Act, No. 22 of 1999 **Regulated under the Ministry of Works and Transport (Roads Authority of Namibia)**	The Act provides for the establishment of the Transportation Commission of Namibia; for the control of traffic on public roads, the licensing of drivers, the registration and licensing of vehicles, the control and regulation of road transport across Namibia's borders; and for matters incidental thereto.	Mitigation measures should be provided for if the roads and traffic impact cannot be avoided. The relevant access road permits must therefore be applied for. The Proponent should continue compliance with access roads and regulations as well as permit conditions that may had been issued to them by Ministry of Works and Transport's Roads Authority. If not in possession, a Road Access should be applied for from Roads Authority. **Contact: Mr Eugene de Paauw (Roads Authority – Specialist Road Legislation), MWT** **Tel.: (061) 284 7027**

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this Project
Labour Act (No. 6 of 1992) **Regulated under the Ministry of Labour, Industrial Relations and Employment Creation (MLIREC)**	MLIERC is aimed at ensuring harmonious labour relations through promoting social justice, occupational health and safety and enhanced labour market services for the benefit of all Namibians. This ministry ensures effective implementation of the Labour Act No. 6 of 1992, specifically its Regulations, No. 156 Labour Act, 1992: Regulations relating to the health and safety of employees at work	The Proponent should ensure that the Solar Park operations, and maintenance works, do not compromise the safety and welfare of workers. **No permit or license required.**

3.2 Applicable International Principles, Standards, Conventions, and Treaties

The Project is obliged to comply with certain International Standards presented in **Table 3-2** below. These are considered relevant because such projects are not only financed domestically (nationally), but as collaboration with international financiers (investors).

Table 3-2: List of International Policies, Principles, Standards, Treaties and Conventions relevant for the Solar Plant activities

Principle/Standards/Convention	Relevant Provisions	Implications for this Project
Equator Principles	A financial industry benchmark for determining, assessing, and managing environmental and social risk in projects (August 2013). The Equator Principles have been developed in conjunction with the International Finance Corporation (IFC), to establish an International Standard with which companies must comply with to apply for approved funding by Equator Principles Financial Institutions (EPFIs). The principles apply to all new project financings globally across all sectors. **Principle 1:** Review and Categorization, **Principle 2**: Environmental and Social Assessment	These principles are an attempt to: '…encourage the development of socially responsible projects, which subscribe to appropriately responsible environmental management practices with a minimum negative impact on project-affected ecosystems and community-based upliftment and empowering interactions.'

Principle/Standards/Convention	Relevant Provisions	Implications for this Project
	Principle 3: Applicable Environmental and Social Standards, **Principle 4:** Environmental and Social Management System and Equator Principles Action Plan **Principle 5:** Stakeholder Engagement, **Principle 6:** Grievance Mechanism **Principle 7:** Independent Review, **Principle 8:** Covenants **Principle 9:** Independent Monitoring and Reporting, and **Principle 10:** Reporting and Transparency	
The United Nations Convention to Combat Desertification (UNCCD) 1992	Addresses land degradation in arid regions with the purpose to contribute to the conservation and sustainable use of biodiversity and the mitigation of climate change. The convention objective is to forge a global partnership to reverse and prevent desertification/land degradation and to mitigate the effects of drought in affected areas to support poverty reduction and environmental sustainability.	The project activities should not be such that they contribute to desertification. The Project is within a desert already, however, further local desertification should be avoided.
Stockholm Declaration on the Human Environment, Stockholm (1972)	It recognizes the need for: "a common outlook and common principles to inspire and guide the people of the world in the preservation and enhancement of the human environment.	Protection of natural resources and prevention of any form of pollution.
Convention on Biological Diversity 1992	Regulate or manage biological resources important for the conservation of biological diversity whether within or outside protected areas, with a view to ensuring their conservation and sustainable use. Promote the protection of ecosystems, natural habitats, and the maintenance of viable populations of species in natural surroundings.	Removal of vegetation cover and destruction of natural habitats should be avoided and where not possible minimised. The Plant operates in a sensitive environment (biodiversity), therefore should be preserved.

Principle/Standards/Convention	Relevant Provisions	Implications for this Project
The International Finance Corporation (IFC) Performance Standards	The International Finance Corporation's (IFC) Sustainability Framework articulates the Corporation's strategic commitment to sustainable development and is an integral part of IFC's approach to risk management. The Sustainability Framework comprises IFC's Policy and Performance Standards on Environmental and Social Sustainability, and IFC's Access to Information Policy. The Policy on Environmental and Social Sustainability describes IFC's commitments, roles, and responsibilities related to environmental and social sustainability. As of 28 October 2018, there are ten (10) Performance Standards (Performance Standards on Environmental and Social Sustainability) that the IFC requires project Proponents to meet throughout the life of an investment. These standard requirements are briefly described below. **Performance Standard 1**: Assessment and Management of Environmental and Social Risks and Impacts **Performance Standard 2**: Labour and Working Conditions **Performance Standard 3:** Resource Efficient and Pollution Prevention and Management **Performance Standard 4:** Community Health and Safety **Performance Standard 5:** Land Acquisition, Restrictions on Land Use, and Involuntary Resettlement **Performance Standard 6:** Biodiversity Conservation and Sustainable Management of Living Natural Resources	The Performance Standards are directed towards clients, providing guidance on how to identify risks and impacts, and are designed to help avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable way, including stakeholder engagement and disclosure obligations of the client (Borrower) in relation to project-level activities. In the case of its direct investments (including project and corporate finance provided through financial intermediaries), IFC requires its project developers (client) to apply the Performance Standards to manage environmental and social risks and impacts so that development opportunities are enhanced. The IFC uses the Sustainability Framework along with other strategies, policies, and initiatives to direct the business activities of the Corporation to achieve its overall development objectives. If the Plant is fully or partly funded by an international financier, the Proponent should continue adhering to these Standards, as deemed applicable.

Principle/Standards/Convention	Relevant Provisions	Implications for this Project
	Performance Standard 7: Indigenous Peoples/Sub-Saharan African Historically Undeserved Traditional Local Communities **Performance Standard 8:** Cultural Heritage **Performance Standard 9:** Financial Intermediaries (FIs) **Performance Standard 10:** Stakeholder Engagement and Information A full description of the IFC Standards can be obtained from http://www.worldbank.org/en/projects-operations/environmental-and-social-framework/brief/environmental-and-social-standards?cq_ck=1522164538151#ess1	

4 THE PHYSICAL, BIOLOIGICAL AND SOCIAL BASELINE

This chapter provides an overview of the baseline environment (biological, physical and social environmental conditions), with which the OLC Arandis Solar Energy Project is interacting. An understanding of the existing or receiving environment can inform the management of potential impacts.

4.1 The Physical Environment

4.1.1 Climatic Conditions

According to Mendelson *et al*., (2002), Namibia is generally considered an arid country, but the temperatures vary during the day, from day to day, seasonally and over much longer periods. Towards coastal areas of Namibia where the Project site is (in Arandis), has the annual temperatures range between 18 and 22°C. The minimum and maximum temperatures range between 8 and 12°C, and 26 and 32°C, respectively. Mendelson *et al*, (2002), further stated that the coastal belt is different because the moderating effects of the coastal winds keep the temperatures above 10°C.

Based on the data obtained from the World Weather Online's 13-year period, i.e., 2009 to 2022 for Arandis Town (**Figure 4-1**), recorded a minimum temperature of 12°C in September 2021, and maximum of 27°C in March 2017. The monthly average temperature for the Town is shown in **Figure 4-2.**

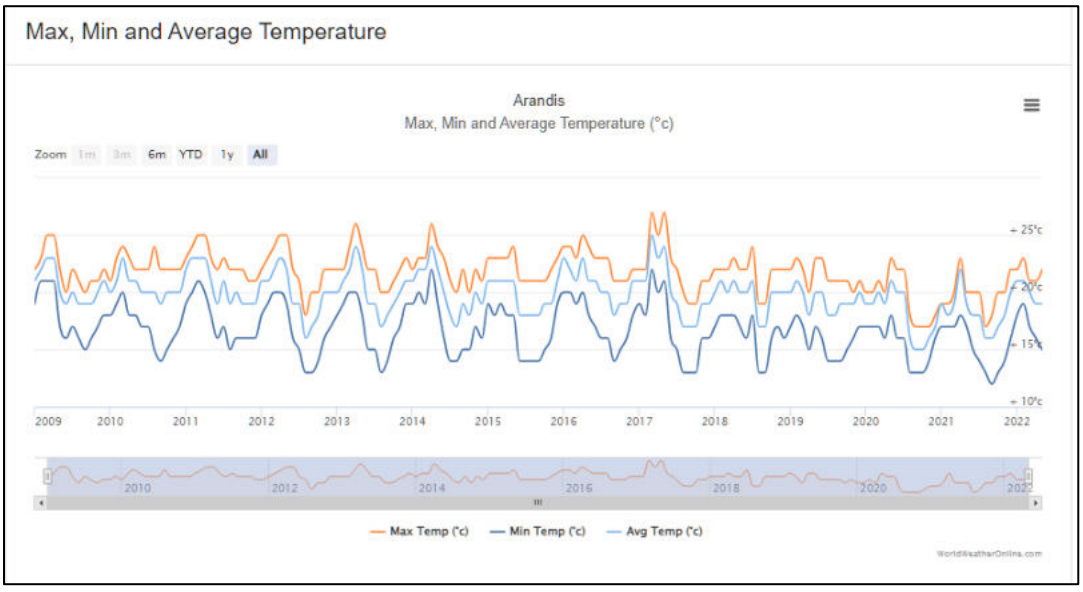

Figure 4-1: The average, minimum and maximum temperatures for Arandis (World Weather Online, 2022)

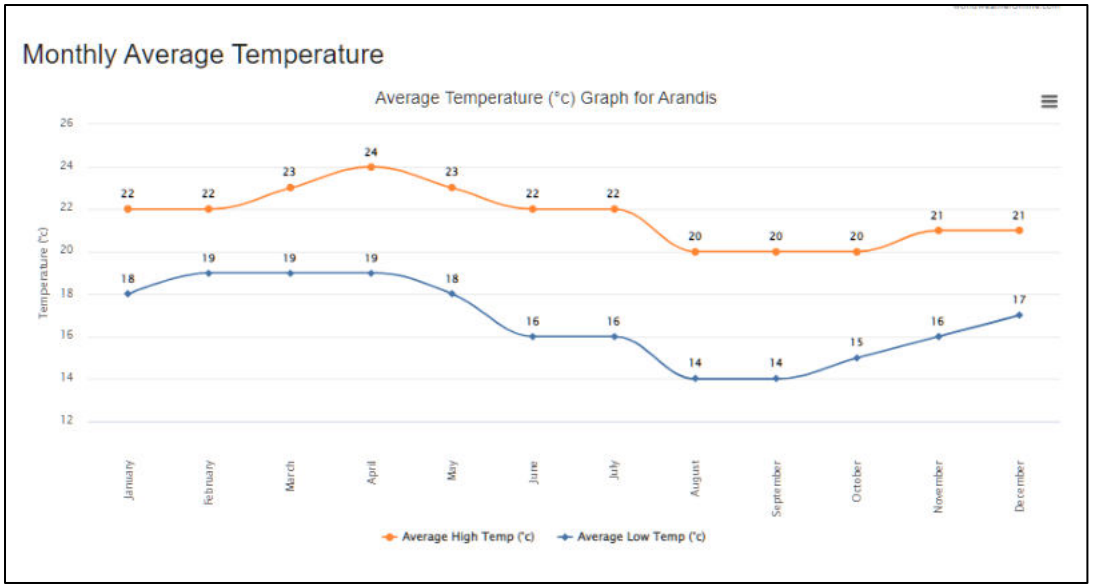

Figure 4-2: The monthly average temperatures for Arandis (World Weather Online, 2022)

The average annual rainfall for the project area ranges between 50 and 150 mm (Mendelson *et al.*, 2002). The graph in **Figure 4-3** shows a 13-year period average annual rainfall. According to the average rainfall data form World Weather Online (2022), the highest average annual rainfall was recorded in March 2011 at 162.48mm followed by 96.14mm recorded in December 2015. The highest monthly average rainfall was recorded in February at 44mm as shown in **Figure 4-4**.

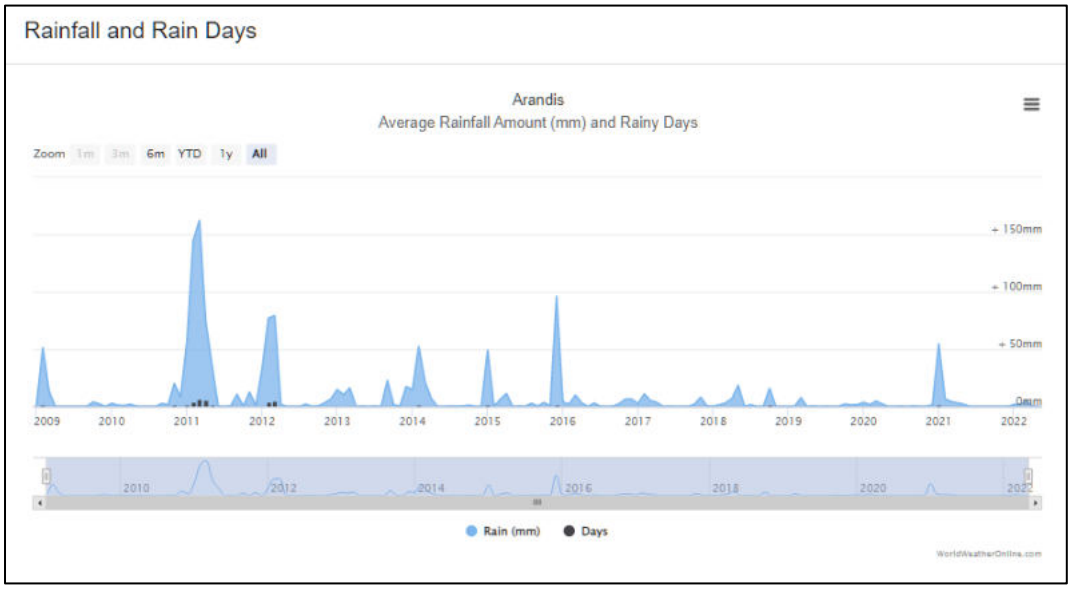

Figure 4-3: The average rainfall amount and days for Arandis (World Weather Online, 2022)

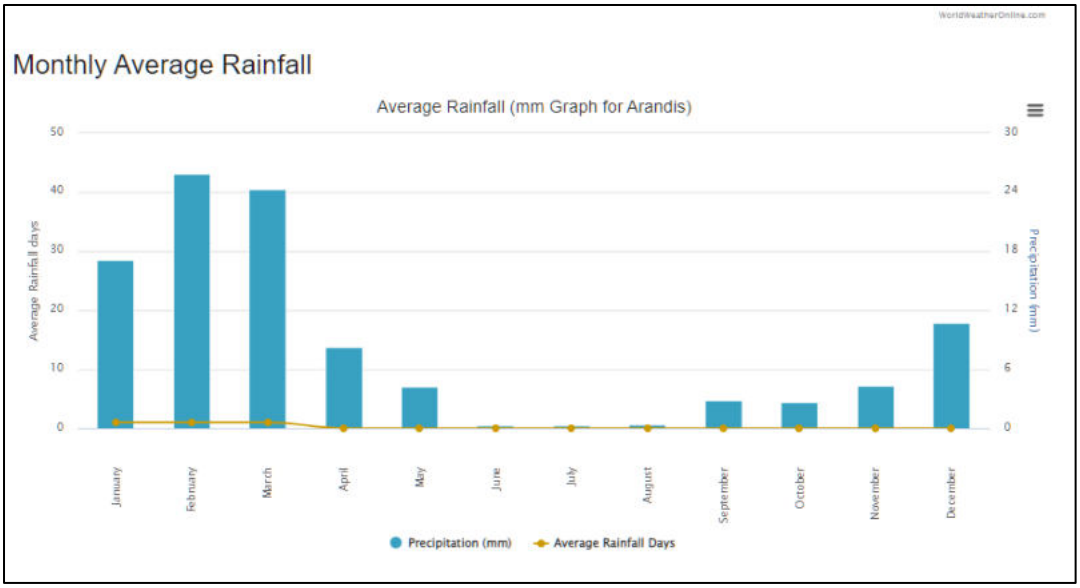

Figure 4-4: The average monthly rainfall for Arandis (World Weather Online, 2022)

4.1.2 Topography

The topography of Arandis is characterized by undulating hills and sandy valley areas. The Erongo Region land rises steadily from sea level to about 1,000 m across the breadth of the Namib. The Namib land surface is mostly flat to undulating gravel plains, punctuated with occasional ridges and isolated 'inselberg' hills and mountains (Southern African Institute for Environmental Assessment (SAIEA), 2011). The geomorphological characteristics include a shore of mixed sand and rock, with gravelly coastal plains, with the Arandis Mountain (just over 600m high) further to the east and a narrow dune belt further to the south.

The Plant Site is relatively flat. Further from the Site there are hills to the southwestern, northern, and southern sides as shown in **Figure 4-5** below (to the southwestern side).

Figure 4-5: The undulating hills characterize the Arandis topography near the Plant

4.1.3 Wind conditions

Given the fact that the Project operations can be influenced by the wind conditions (as mentioned under chapter 2), the information on the wind direction and speed is crucial for the operations. The wind speed chart for Arandis from the Meteoblue modelled climate are shown in **Figure 4-6.** High wind speeds (of more than 28 kilometers per hour (km/h)) are experienced around the months of May, June, July and August for about 2 to 3 days as indicated in the chart below.

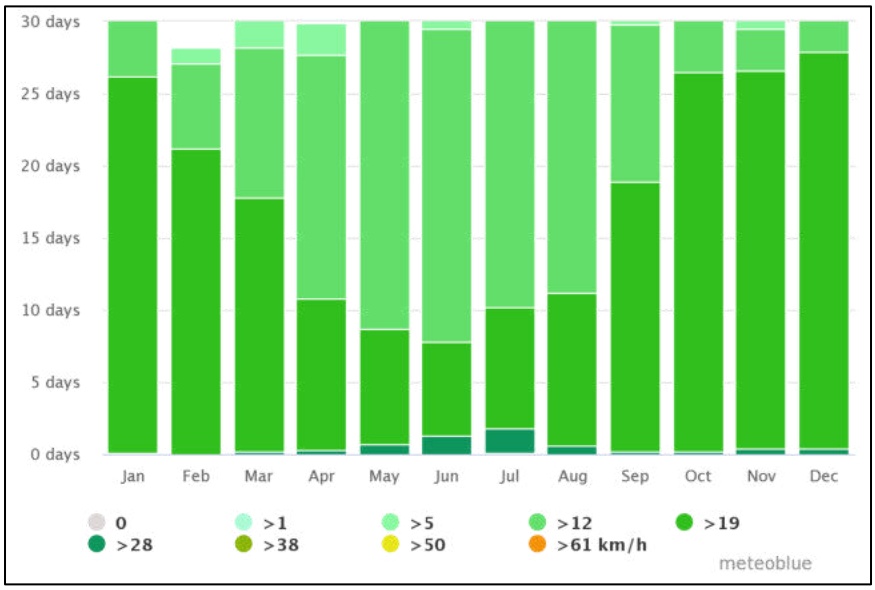

Figure 4-6: The wind speed chart of Arandis Town (Meteoblue, 2022)

The wind rose is shown in **Figure 4-7** and indicates that the wind is dominantly blowing from Southwest (SW) to Northeast (NE) with the speed ranging between 12 and 19 kilometres per hour (km/h). The presence of little vegetation to none and absence of high vegetation to capture the wind, contributes to the winds blowing across the site.

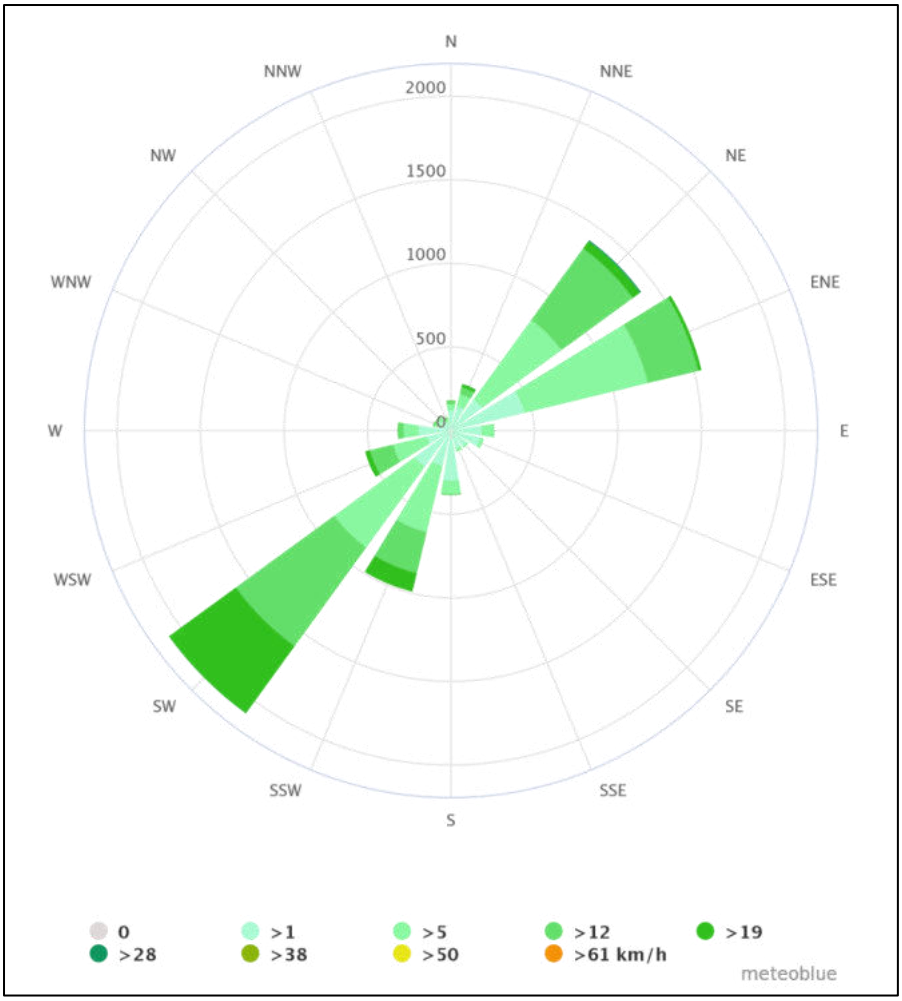

Figure 4-7: The wind rose for Arandis Town (Meteoblue, 2022)

4.1.4 Geology and Soils

Arandis is located within the southern Central Zone (sCZ) of the Neo-Proterozoic Damara Orogenic Belt. The area is underlain by the Abbabis Metamorphic Complex (AMB) characterized by basement dome structures and antifoams with northeast elongation exposed along the Swakop and Khan Rivers. The Abbabis Metamorphic Complex is overlain un-conformably by the Damara Supergroup, which comprises mainly metasedimentary rocks deposited in the period from about 900 to 700 million years ago (Miller, 1983a). The lower part of the Damara Supergroup is dominated by meta-arkoses and calc-silicate rocks of the Nosib Group, while the upper portion of the sequence consists of alternating marbles, calc-silicate rocks, and schists of the Swakop Group.

The Plant geology as shown on the map in **Figure 4-8** is characterized by mica schists, marble, and migmatite.

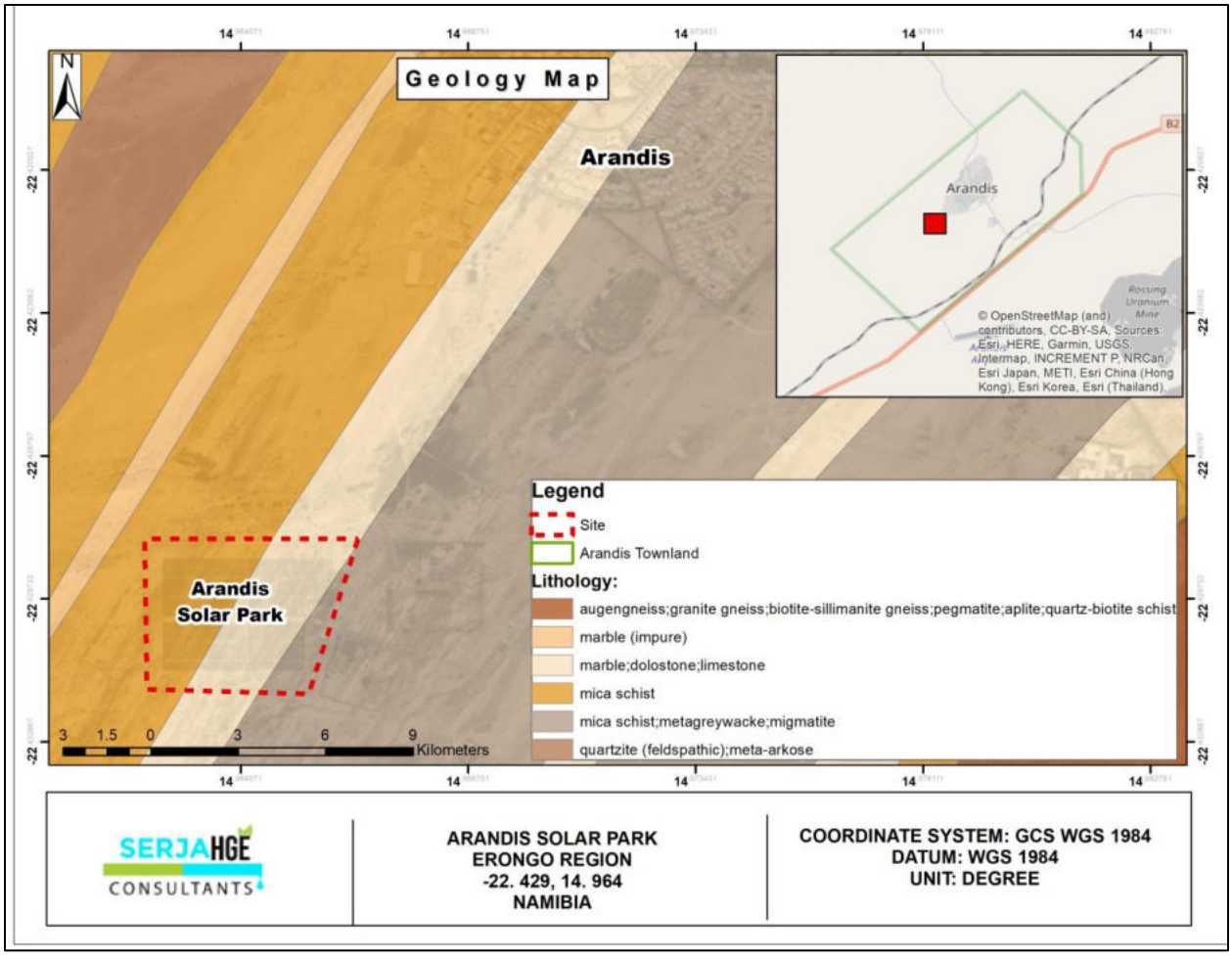

Figure 4-8: The Geology map of the Plant Site and immediate surroundings

Figure 4-9: The marble rock unit protruding onsite

In terms of soils, the soils of Namib Desert are knowns as “syrosems” and calcareous soils. The syrosem soils were formed when solid rock is exposed, mainly broken down by mechanical weathering (Scholtz, 1972). Rock fragments and exfoliation chips gather around the outcrops, where they undergo further processes of weathering. The texture of these soils is classified as coarse to moderately coarse. These soils are prone to collapse when disturbed.

The soils observed onsite are slightly influenced by the site activities during site establishment, operations, and maintenance. As observed the Site soils are light brown and greyish on some areas – **Figure 4-10.**

Figure 4-10: The Site soils (sandy gravel)

These soils onsite are dominated by the Petric Gypsisols as shown on the map in **Figure 4-11.** The Gypsisols can only be found in arid regions, in level or hilly land and depression areas. According to Tóth *et al*, (2008), in arid regions with hot, dry summers, gypsum ($CaSO_4.2H_2O$) dehydrates to loosen, powdery hemihydrate ($CaSO_4.0.5H_2O$), which reverts to gypsum during the moist winter. Gypsum precipitates in the soil body as fine, white, powdery crystals in former root channels (gypsum pseudomycelium) or in pockets, or as coarse crystalline gypsum sand, or in strongly cemented petrogypsic horizons. In places it forms pendants below pebbles and stones or rosettes (desert roses) (Tóth *et al*, (2008).

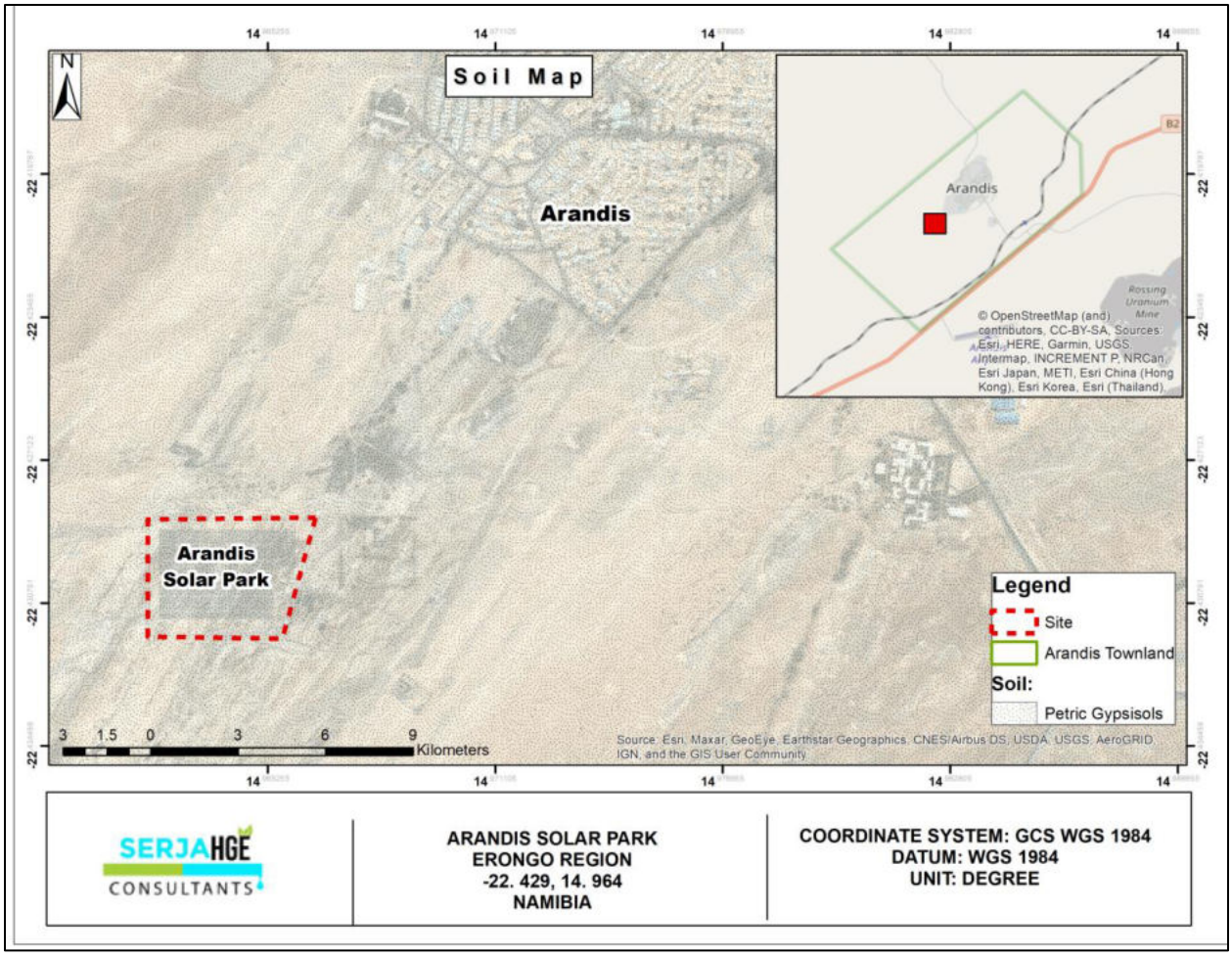

Figure 4-11: The Soil map of the Plant Site and immediate surroundings

4.1.5 Water Resources: Geohydrology and Hydrology

The groundwater conditions of the Arandis area are characterize by the rock bodies with little groundwater potential, generally low and locally moderate potentials as shown on the groundwater map in **Figure 4-12.** This is partly due to the low rainfall and lack of recharge, and partly due to the generally unfavourable aquifer properties of Damara Sequence rocks. According to Christelis and Struckmeier (2011), groundwater reserves in the vicinity of the Project Site are limited to the Kuiseb, Swakop, and Omaruru alluvial bed aquifers, which supply Henties Bay, Swakopmund and Walvis Bay as well as Arandis. The moderate yields are also encountered in the marble and schist aquifers around Karibib and the calcrete aquifer in the Kranzberg area at Usakos.

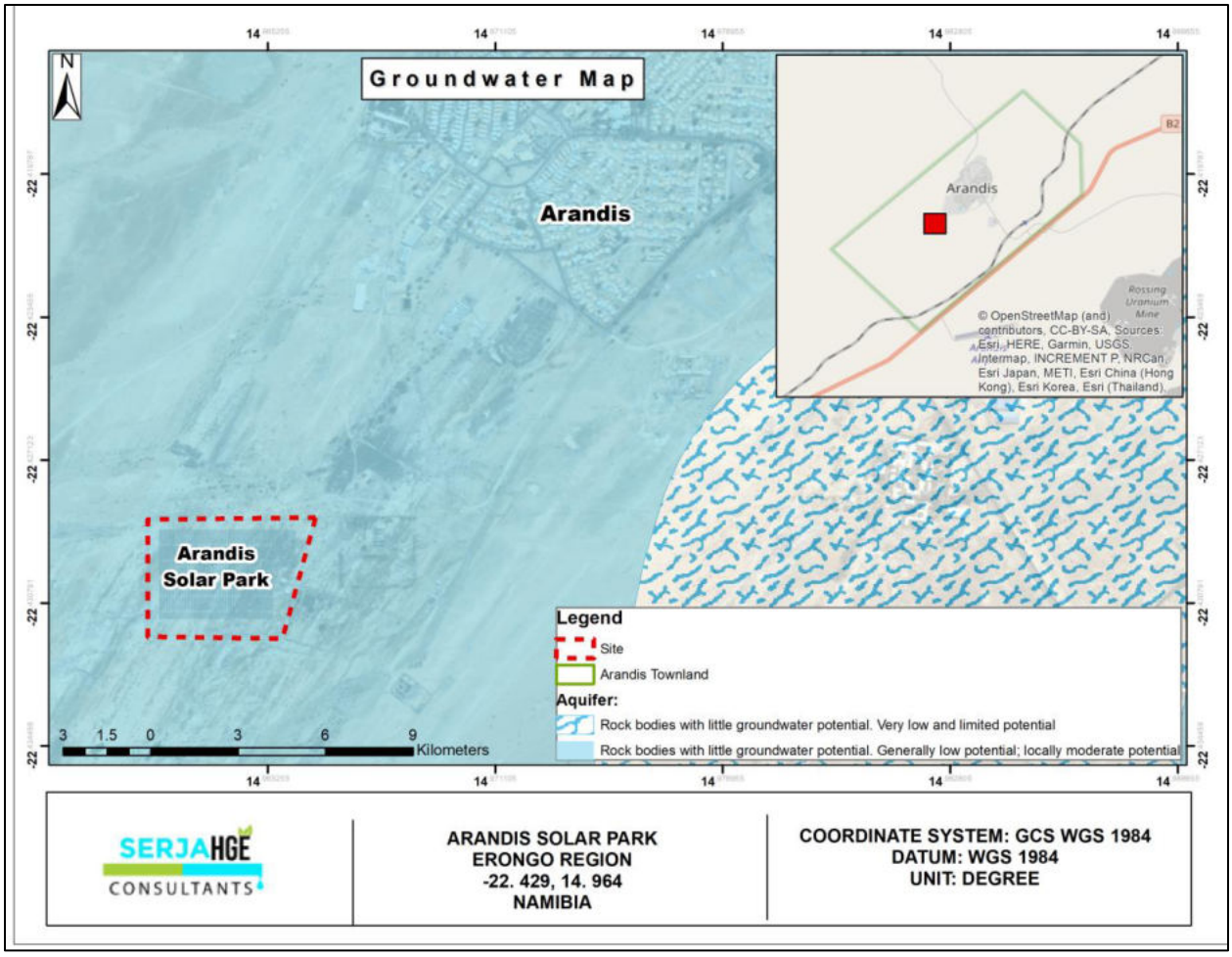

Figure 4-12: The Geohydrology (Groundwater) map of the Plant Site and immediate surroundings

The Site area and Arandis Town do not have significant natural surface bodies such as rivers. The only nearby surface water body is the Khan River, a prominent ephemeral river located about 14km south of Arandis Town. The Town therefore falls within the Khan River catchment area of which in turn is part of the greater Swakop River catchment area. Further north of the Arandis Town, there is a catchment area of the Omaruru River. All these rivers are ephemeral and are dry for most parts of the year and drain westwards into the Atlantic Ocean.

4.2 The Biological Environment

The Namib Desert is one of five coastal deserts world-wide. According to Henschel and Seely (2008), although the Namib Desert is classified as hyper arid, with rainfall extremely rare, there are several other sources of atmospheric moisture, namely, humidity, dew and fog, which make it possible for organisms to live there.

The observed fauna and flora on and around the Project Site during the visit are presented below.

4.2.1 Fauna

The faunal description of the Project site area has been sourced from a Biodiversity Report by Pallett *et al.* (2008) for the Arandis and Rössing areas. However, for this EMP, the Biodiversity Report information has been used a baseline which was tailored down to the Project Site specific observations and information. The faunal species include birds, mammals and reptiles as briefly presented below:

A. Birds

There are no birds found in the area which are restricted to the area or threatened by the Plant. Two raptor species – Martial Eagle and Lesser Kestrel – carry the International Union for Conservation of Nature's Threatened status and another – Verreaux's Eagle – is Near-Threatened, but their populations are scattered over southern Africa.

With regards to the above, there were some birds flying over and humming around the Site, but they could not be identified. According to the Site Personnel / Plant Operator there are undisturbed nests in the roofs of the Plant Substations - **Figure 4-14.**

Figure 4-13: The Plant Substation roofs that houses the nests of some local bird species

B. Mammals

According Pallett *et al.* (2008), many of the mammals such as rodents, sengi, and hare and particularly the carnivores, are naturally uncommon to rare, while few others, such as hedgehog and fruit bats, are likely to occur only very rarely as vagrants linked to the Khan River linear oasis. About eight of the mammal species are classified as Near Threatened, one as Vulnerable and one as Endangered.

From a Site perspective, there were no mammals seen or observed on and around the site. This could be explained by the fencing of the Site, and the absence around the Site could be due to the disturbance owing

to the presence and movements of people, vehicles, and other activities onsite and Arandis that would make it difficult for mammals to be in such proximities.

C. Reptiles

Reptile diversity is high in the Namib Desert and the central Namib has a surprisingly high diversity of lizards, especially geckos. total of 33 lizard species recorded or having a high probability of occurrence in the Rössing area. This comprises 15 Geckos, 2 Agamas, the Namaqua Chameleon, 7 Skinks, 7 Sand Lizards and one Plated Lizard. Of these 33 species, 8 are endemic to the Namib and one, the Husab Sand Lizard, has a distribution range that is restricted to the mountainous Rössing-Husab area (Pallett *et al.,* 2008).

From Site observations, there were no reptiles encountered onsite during the site visit. However, a Chameleon was found crossing the access road from the Site Gate towards Arandis Town (**Figure 4-14**).

Figure 4-14: A Chameleon crossing the access road from the Plant to Arandis

4.2.2 Flora

The broader area of Arandis falls within the Central Namib Desert Biome (Mendelsohn *et al*., 2002), whereby endemic plant species found within the area are drought tolerant, drought resistant or succulent. The short-lived annuals, which occur after local rainfalls and floods, provide a vital source of food for game grazing. The dominant vegetation structure is sparse shrubs and grasses. Botanical Surveys in similar habitats indicates that the common shrubs and herbs in the area are *Blepharis grossa, and Arthraerua*

*leubnitziae (*pencil bush*), Zygophyllum stapfii, Zygophyllum clavatum, Psilocaulon kuntzei* and *Salsola* sp. Occasional specimens of *Commiphora saxicola* and *Sarcocaulon marlothi* (bushman's candle) occur, often in patches in the lower lying areas of the Erongo Region.

From a local perspective, the vegetation of the Plant site area and Arandis Town is dominated by the small vegetation known as pax (*Psilicoulon salicornioides*) as per the distribution shown on the map in **Figure 4-15**.

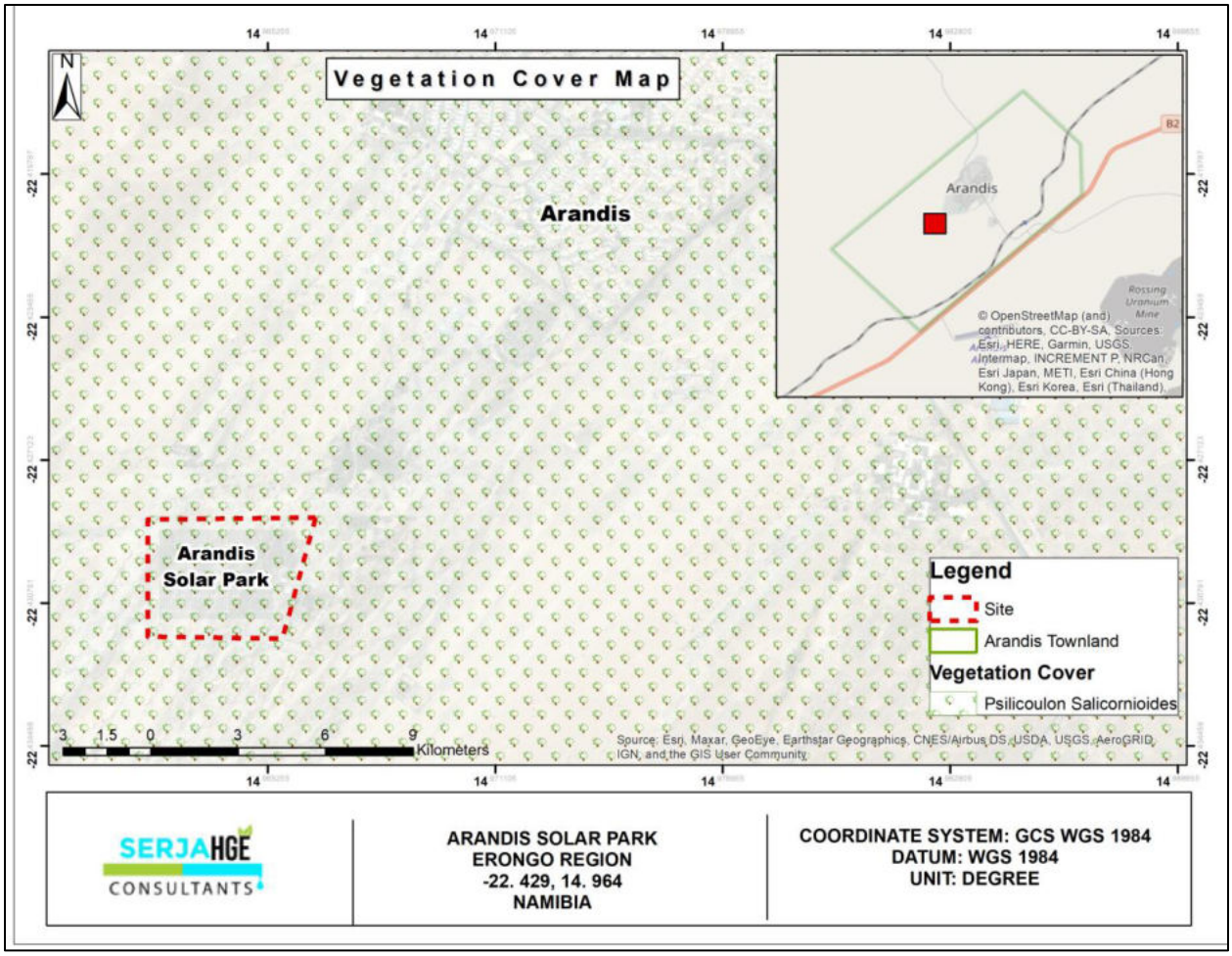

Figure 4-15: Vegetation map 1 showing the occurrence of pax vegetation on the Plant Site and immediate surroundings

Figure 4-16 below shows the sparsely distributed pax found on the western side of the Plant under the panels. Given an already rare vegetation in desert environment, the small vegetation is not to be disturbed to preserve the floral biodiversity. However, if the plants are inconveniencing the Plant operations, the Proponent should consult with the Forestry Directorate at MEFT to safely translocate the vegetation offsite.

Figure 4-16: The pax herbs found on the western part of the Plant

Other vegetation around the Plant site to the western side include the pencil bush (*Arthraerua leubnitziae*) as shown in **Figure 4-17** below.

Figure 4-17: The pencil bush found on the western side of the Plant fence (outside)

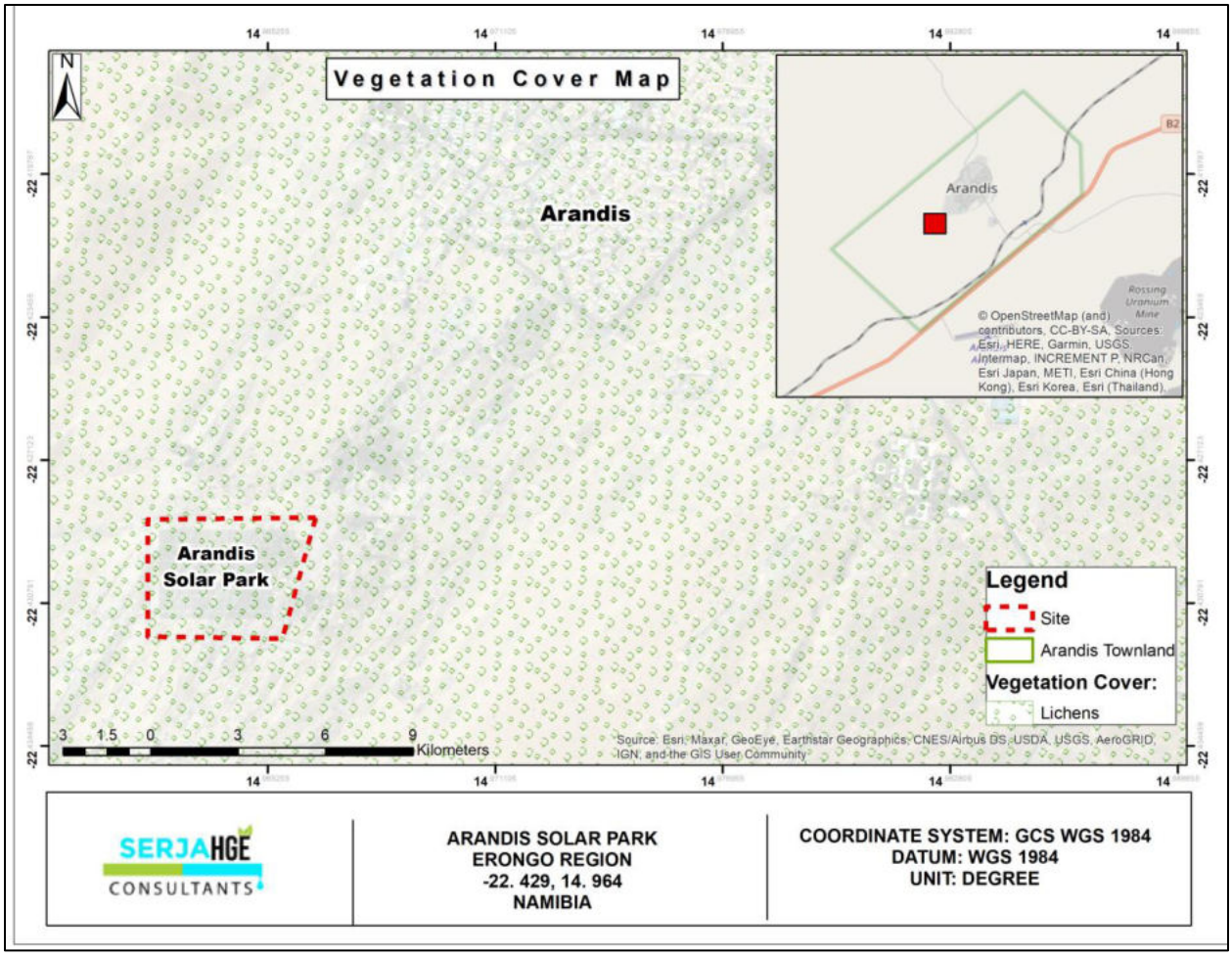

Figure 4-18: The Vegetation (lichens) Cover map 2 of the Plant Site and immediate surroundings

4.3 The Social and Economic Environment

4.3.1 Demography

The total population of the Erongo Region as per the 2011 National Population and Housing Census was recorded at 150,809, of which 70,986 were females and 79,823 males. The population density for the Region was 2.7 people per square kilometres (Namibia Statistics Agency, 2011).

According to the Namibia Statistics Agency (2014), the total population of Arandis was recorded at 10,093 in 2011, with 5,170 making up the urban population. The number of females was 4,852 and males 5,241.

4.3.2 Economic Activities

The Coastal Zone of the Erongo Region is predominantly urban, because of the unique character of the landscape, which precludes agriculture. The population is thus concentrated in the urban areas of Walvis Bay, Swakopmund, Arandis and Henties Bay and a few small settlements such as Langstrand and Wlotzkasbaken. The main economic activities in the Erongo Region are tourism, mining and farming (inland), and further to the coastal side, fishing.

According to the Namibia Statistics Agency (2014), the main source of income in households in Arandis comes from farming (1%), wages and salaries (72%), cash remittance (3%), business and non-farming (6%) and pension (10%).

4.3.3 Services and Infrastructures

The Erongo Region and the Arandis area have good services and infrastructure, and these are briefly described below:

- **Roads:** The B2 which passes through Arandis connects the Project area to Windhoek and Swakopmund. The Plant Site is the connected to this main road by local gravel (access) road.
- **Electricity:** is supplied by the Erongo Regional Electrical Distributor (ErongoRed) which is responsible for the supply and distribution of electricity in the Region, combining the electricity distribution departments of the Local Authorities, Regional Councils and NamPower.
- **Water Supply:** In the Erongo Region, water is supplied in bulk to industries, municipalities by NamWater (the bulk water supplier). NamWater abstracts water from the large Kuiseb River and Omaruru Delta (OMDEL) aquifers, which is then pumped to several reservoirs that provide water to towns in the Region such as Walvis Bay, Swakopmund, Henties Bay, Arandis and the mining industry. The water supply in the area is also supplemented by private providers such as AREVA from the Desalination Plant. Water in the rural areas is either supplied by the Directorate of Rural Water Supply or through privately owned boreholes on farms. The Plant Site is connected to the Arandis Town Council water supply line.

In terms of other basic services, there are schools and a health centre (clinic) in Arandis Town. The town also has a technical vocational training centre (Namibia Institute of Mining and Technology (NIMT)). The services and infrastructure map of the Arandis Town area is shown in **Figure 4-19.**

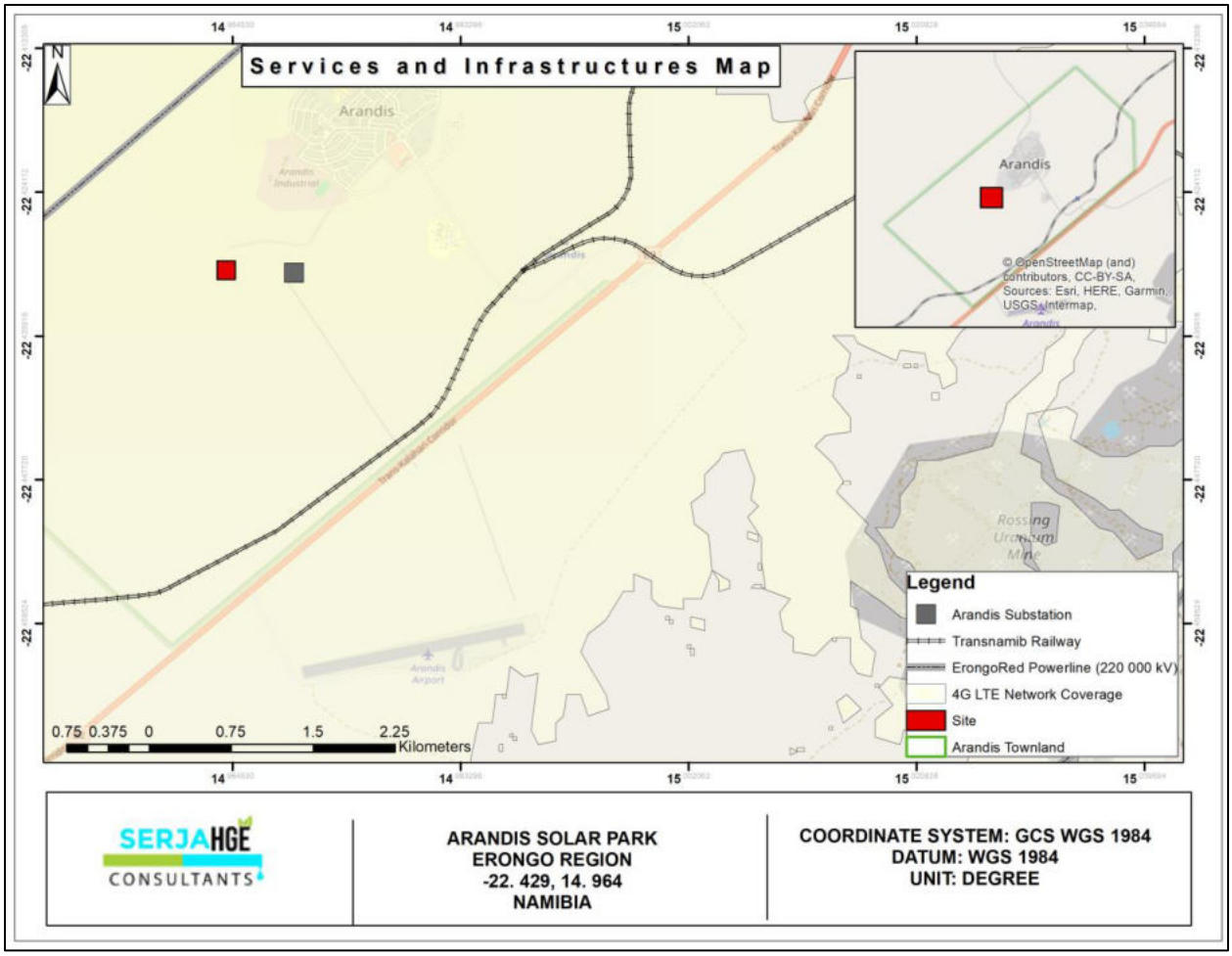

Figure 4-19: The services and infrastructure map of the Plant Site and immediate surroundings

4.3.4 Archaeology and Heritage Environment

According to Kinahan (2020), the most abundant traces of human occupation in the Namib Desert are stone artefacts. These are easily recognizable as isolated finds and as surface scatters on the gravel plains of the Namib. Other less common traces include shell middens (usually within less than 5km of the coast), natural rock shelters with evidence of occupation, including rock art, and stone features such as hut circles, hunting blinds and grave cairns. Historical sites include cemeteries, old mine workings, and remnants of World War I military camps. While some kinds of archaeological sites such as the larger grave cairns are highly visible, their significance is not obvious.

From a local perspective, there were no observed, known nor recorded surface sites or objects of archaeological significance within the Site or in its immediate proximity.

4.3.5 Surrounding Land Uses

Land uses in the surrounding areas include a small privately owned garden area to the immediate east of the Site (opposite the Site gate). According to the Plant Operator, the garden is supplied with treated sewage water from the Arandis sewage treatment facility in proximity of the garden and Site. On the southern of the Site side is the B2 road (Karibib/Usakos – Swakopmund route). Further to the western side of the Plant is an illegal dumping site by some unrelated projects' operators (not really known by the Plant Operator). The land uses around the Plant site are shown in **Figure 4-20** below.

Figure 4-20: The land uses around the Plant Site

5 ENVIRONMENTAL IMPACTS IDENTIFIED

5.1 Key Potential (and current) Positive Impacts

The benefits (positive impacts) of the Solar Park as anticipated and indicated by the Plant Operator are briefly described below:

- Production of renewable energy: The Project greatly contributes to the production and supply of energy from a renewable resource of energy to not only the Arandis area, but other areas supplied by ErongoRed in the Region and ultimately the national grid. This contributes to the social upliftment and economic development at a local, regional, and national level. Thus, the impact of renewable energy and its contribution to the energy sector is significantly high.
- Contribution to local and national rates, levies, and taxes: the operation of the Solar Park contributes to the income generation of the Arandis Town Council through the leasehold fees and rates. The energy levies paid to the Ministry of Mines and Energy as well as Value Added Tax the Namibia Revenue Authority would contribute to the development of the national coffers. The contribution made towards the national economy through the payment of energy levies and taxes is very important to Namibia, therefore this impact' significance is high.
- Employment opportunities: The Project operations have created some job opportunities to the four onsite Personnel, as well as offsite Personnel like at the offices outside Arandis (in Windhoek). Further employment opportunities are also created during the cleaning and maintenance of the Plant (Site). The income generated from the employment opportunities positively impacts the employees and their families for the improvement / betterment of their livelihoods, therefore the impact' significance is high.
- Good and Services procurement opportunities: The opportunities that were brought by the Project existence include the procurement of services such as the Site waste removal by the contractor hired by the Arandis Town Council. This may have not been a direct appointment by the Proponent, but the inclusion of the waste management contract to cater for the Project's waste removal have made a difference in the contractor's business operations. The provision of security services to guard the Site has also a good opportunity to the local security businesses. Further business opportunities (services provision) arise from materials required during Site maintenance. The opportunities created by the Project through procurement of goods and serviced positively impacts the businesses of the services' providers (contractors) who further employ other people and better their lives (through paid works). Therefore, the impact' significance is high.

- Skills development and Training: The Plant Operator indicated that the Training Centre (the first building at the Site entrance) is aimed at training and mentoring young people, especially students from tertiary institutions (universities and vocal training centres) who are passionate about gaining skills in the renewable energy sector for the country. The skills development and training offered mainly to the youth will better their understand of solar energy and inspire them to be passionate about renewable energy. This is not only from a generation / production and distribution perspective, but also with regards to raising awareness and promote the use of solar energy in communities for sustainable development. Therefore, the significance of this impact is high.

5.2 Key identified Potential Negative Impacts

The listed key potential negative impacts associated with the project activities were identified, and briefly described as follows:

- Impact on local biodiversity (fauna and flora): Although the project is already in its operational stage and the site has been cleared, the operations are undertaken in an environment that is home to some desert plants and animals (such as reptiles and birds) that would be encountered onsite. During site visit, the Site Personnel indicated that there are some bird nests in the Substations' roofs, however, they are not disturbed. There are also occasional encounters of snakes (Puff Adder) onsite in the evenings, and they are also not disturbed nor killed. The Site Personnel is aware of biodiversity protection / conservation, and therefore the potential impact is well-managed.
- Environmental pollution (solid waste and wastewater): there is minimal waste generated onsite. The solid (domestic) waste is stored in onsite waste containers and disposed of upon collection by the Arandis Town Council' waste removal contractor. Wastewater (sewage) is managed through the Town Council reticulation system that is connected to the site. There is no handling of hazardous waste onsite. Therefore, the impact significance is low.
- Health and safety risks: the mishandling of site equipment and machinery could lead to injuries of workers and visitors. The site has existing safety and health procedures (inductions and PPE) in place. Therefore, the risk is low.
- Visual impact to locals and travellers on the B2: The site is in an already disturbed area of the Arandis Townlands, with other surrounding land uses such as the Town Council' sewage management works northeast of the Plant (site) and garden to the immediate east of the Plant. Therefore, the impact significance is considered low.
- Vehicle traffic Safety: The site has low traffic flow as the only vehicles are the operational ones that are occasionally onsite. Therefore, the impact significance is low.

The relevant management and mitigation measures have been provided to the above potential negative impacts under Chapter 6 (**Table 6-1**) and roles and responsibilities of implementing these measures is provided under Chapter 7.

6 ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURES

6.1 The Environmental Management and Mitigation Measures

The management and mitigation actions are aimed at avoiding the above-listed potential negative impacts, where possible, and where it is impossible to avoid these impacts, measures are provided to reduce the impacts' significance. This will however be achieved by the effective implementations of environmental and social management & mitigation measures recommended herein. The aim will be to minimize the adverse identified impacts stemming from the project activities while maximizing the positive impacts throughout the project life cycle. The Management action plans (measures) recommended for the potential impacts assessed and rated above were based on the following phases:

- Operational and Maintenance Phase (**Table 6-1)**, and
- Decommissioning measures (**Table 6-2)** - these would be considered should the Proponent consider ceasing the Plant operations.

Table 6-1: The Environmental and Mitigation Measures for the Operational & Maintenance Phase

Aspect	Activity	Management & Mitigations measures	Responsibility	Key Performance Indicator (KPI)
OPERATIONAL AND MAINTENANCE PHASE				
EMP and training Implementation	EMP required licenses, agreements and permits	-Apply for the necessary permits or licenses from the various ministries, local authorities, and any other bodies that govern the operations of the project.	-Proponent	-All contracts, permits, certificates and other legal documents obtained and on file. -The Electricity Generation License has been issued by ECB.

Aspect	Activity	Management & Mitigations measures	Responsibility	Key Performance Indicator (KPI)
				-The Power Purchase Agreement (PPA) has been entered to with ErongoRed and on file and Contracts on file
ECC Renewal every three years	Environmental Clearance Certificate (ECC) Renewal	-Appoint an Independent Environmental Consultant to update the EMP and apply for renewal of the Environmental Clearance Certificate prior to expiry of the valid ECC.	-Proponent -Project Manager	-The Environmental Clearance Certificate is renewed with the Environmental Commissioner on time
Labour and Recruitments	Appointments	-Appointment of contractors and employees and enter into an agreement which includes the EMP. -Ensure that the contents of the EMP are understood by the employees, contractors, and all personnel present on site.	-Proponent	-The contractors and employees are aware of the EMP and understand its contents.
Management system in Safety, Health and Environment (SHE)	Provision and effective implementation of SHE management systems	-Make provisions to have an SHE Coordinator to implement the EMP and oversee occupational health and safety onsite. -Risk Management / Mitigation / Emergency Response Plan and SHE Manuals such as Induction pamphlets should be in place and updated as deemed necessary. -There should be adequate protection and liability insurance cover for incidents. -Ensure compliance with the provisions of all relevant safety standards. -There should be procedures, equipment, and materials required for emergencies.	-Proponent	-There Safety and Environmental Officers conduct respective audits onsite -Documentation on file -Personal Protection Equipment (PPE) on site and appropriately worn by site workers -Signage related to restricted areas, dangerous areas, and PPE requirements are on site. -Emergency response material on site

Aspect	Activity	Management & Mitigations measures	Responsibility	Key Performance Indicator (KPI)
Environmental restoration or pollution remediation if ever required in the future	Restoration Fund / Insurance	-To establish a fund for future ecological restoration of the project site should project activities cease and the site is decommissioned, and environmental restoration or pollution remediation is required	-Proponent -Project Manager	-Financial statements of restoration fund/insurance
Reporting system on monitoring aspects of operations and maintenance as outlined herein	Reporting	-Establish a reporting system to report on aspects of operation and maintenance. -Keep monitoring reports (Bi-annual reporting) on file for submission with ECC renewal applications where needed.	-Project Manager	-Bi-Annual Monitoring Reports
Employment	Employment and hiring of local and skilled people to run the Plant and local contractors for specialized Site operational and maintenance	-Where skills exist, local Namibian contractors and employees must be contracted and employed, respectively. Deviations from this must be justified. -The tenders for the provision of locally available goods and services should be given to local small-medium business.	-Proponent -Project Manager	-Proof of appointment of local contractors and employees on file
Vehicular Traffic use and Safety	The site is located off the main B2 road and operational activities are may potentially have some impact on the movement of traffic to the site (on the B2 and site access roads) when transporting material, supplies and equipment.	-The project activities and vehicles should only make use of the existing access road to the site and avoid creation of new tracks. -The vehicle drivers should be in possession of valid and appropriate driver's licenses.	-Project Manager	-A register of trucks arriving and leaving the site is kept. -A report is compiled every month of the daily number of trucks accessing the sites. -Access road permit is issued by the Roads Authority.

Aspect	Activity	Management & Mitigations measures	Responsibility	Key Performance Indicator (KPI)
		-No person shall drive or use any vehicle on site whilst under the influence of alcohol or any other narcotic substance or in such a way that is dangerous to human life or that may cause damage to any property or the environment. -Proper traffic management systems in place. -Adherence to speed limit to avoid running over reptiles and amphibians. -Appropriate road signage and warnings should be erected or put up at the site access roads. -Existing tracks leading to the site should be used and unnecessary new tracks or roads should not be created. -Traffic management plans on and around the site should be developed when necessary.		-Any complaints received regarding traffic issues should be recorded in the report together with steps taken to mitigate the impacts.
Water Resources Use	Over-utilization and wastage of water resources	-Water should be used efficiently, and recycling and re-using of water onsite should be encouraged. -Water conservation awareness and saving measures training should be provided to all the Site Personnel so that they understand the importance of conserving water and become accountable.	-Project Manager -Plant Operator and Environmental Officer	-Office and restroom taps are turned off when not in use (not left running) -The solar panel cleaning taps are only turned on when cleaning is done.

Aspect	Activity	Management & Mitigations measures	Responsibility	Key Performance Indicator (KPI)
Accidental Fires	Outbreak of uncontrolled or accidental fires due to the use of machinery or presence of open fires made by workers onsite.	-Firefighting measures as per the Material Safety Data should be provided, implemented, and adhered to. -The fire extinguisher should be properly serviced, service date plans clearly indicated. -Open fires are strictly prohibited onsite. -All personnel must be sensitised about responsible fire protection measures and good housekeeping such as the removal of flammable materials including waste, dry wood and hydrocarbon-soaked soil from the vicinity of the site. Regular inspections should be carried out to check and remove these materials at the site. -The Site should be equipped with sufficient firefighting resources. Regular surveys of the fire-fighting equipment should be carried out. -A responsive fire prevention plan does not solely include the availability of firefighting equipment, but more importantly, it involves premeditated measures and activities to timeously prevent, curb and avoid conditions that may result in fires.	-Project Manager -Plant Operator -Safety Officer	-Supervision of work and reports of safe and unsafe practice brought to the attention of the health safety and environmental officer. -Any incidents reported recorded together with steps taken to mitigate the impacts. -Fire extinguisher serviced as recommended by the Supplier / Manufacturer, the next service plans clearly indicated and provided to the Plant Operator for record keeping.
Health, Safety and Security	Mishandling of different operational equipment, materials and tools may lead to injuries and health or life-threatening risks	-All Health and Safety standards specified in the Labour Act should be complied with. The responsible contractor must ensure that all staff members are briefed about the potential risks of injuries on site.	-Project Manager -Plant Operator -Safety Officer	-A register of all incidents must be maintained daily. This should include measures taken to ensure that such incidents do not re-occur. -Inventory of all safety and health stock to be reported on a weekly basis.

Aspect	Activity	Management & Mitigations measures	Responsibility	Key Performance Indicator (KPI)
		-Appropriate signage and warnings should be erected or put up at risky or danger prone site areas, if any. -Ensure all workers are issued with protective eyewear and applicable PPE when working with photovoltaic panels or handling other materials and equipment on site. -Adhere to Health and Safety Regulations pertaining to personal protective clothing, first aid kits, warning signs, etc. -Ensure that adequate emergency facilities, including first aid kits, are available on site and knowledge of administering it is provided to workers. A **SHE Induction should be provided to every new person entering the Site.** -Equipment that must be locked away on site and must be placed in a way that does not encourage criminal activities. -Security personnel should prohibit unauthorised entry to Site.		

Aspect	Activity	Management & Mitigations measures	Responsibility	Key Performance Indicator (KPI)
Soils	Physical disturbance of sensitive desert land (soils) by the movement of operational vehicles and machinery and physical site works	-Adjacent areas to the project site and unused areas within the site areas should not be disturbed. -The use of existing tracks such as access roads is essential to minimize the footprints on the already sensitive desert soils over time. -Ensure that when areas outside the project site boundaries are disturbed by project related activities, rehabilitation should be conducted immediately once the activity has been completed. -Consider a Monitoring and Response Approach if the 10-year period splash flooding events occur. This would include setting up a channel that act as a diversion of runoff (rainwater flowing down the panels) to the drainage point where the water can freely flow elsewhere in the area to recharge groundwater resources and without eroding a significant amount of site soils.	-Project Manager -Plant Operator -Environmental Officer	-Little to no visible unnecessary soil disturbance on site. -Vehicles making use of provided access roads to and within the site
Dust and gaseous emissions	Dust and emissions generated during the operations is expected from untarred roads, particularly on windy days from exposed desert soils.	-Site Personnel are to be issued with dust masks for health reasons when needed.	-Project Manager -Plant Operator -Safety Officer	-Regular visual inspection. -Complaint register kept on site.

Aspect	Activity	Management & Mitigations measures	Responsibility	Key Performance Indicator (KPI)
Waste generation and management	There is a generation of both general, and human waste on site. Potential soil polluted by hydrocarbons that may be handled on site especially from accidental oil or fuel leaks from vehicles or equipment should be treated as hazardous waste	-The waste should continue to be disposed of at approved and appropriate waste site (in Arandis). -Temporary waste disposal facilities should be present on site. This should include separate containers for products that can be re-used or recycled. -Recycling of solid waste should be encouraged to minimise the amount of waste that goes to landfill. -The Site Personnel and visitors should continue using the provided ablution facilities to ensure continued better sewage management. **-Solid waste removal from the Plant:** The issue of waste falling and blown off the garbage trucks during transportation from Site should be reported to the Arandis Town Council for their waste collection / removal contractor to secure the waste and improve on this, thus preventing further environmental pollution. -For solar panels that will be unfit for the project or damaged, the Proponent should control and manage the storage and disposal of these, by ensuring that they end up at an approved waste site.	-Proponent -Project Manager -Environmental Officer	-Regular visual inspection. -A register of waste produced, and disposal methods should be maintained. -Regular disposal of waste from site to approved disposal /management sites.

Aspect	Activity	Management & Mitigations measures	Responsibility	Key Performance Indicator (KPI)
	Management of old and damaged solar panels	-Full installation inspection should be conducted monthly, and results of inspection will be included in the Operational Maintenance Report. If any of them is found to be faulty and beyond repair, they should be removed, handled with care, and disposed at the approved waste management facility in Arandis, or any waste disposal or storage facility preferred by the Proponent. -Old solar panels should be stored separately on site, i.e., in their own secured space until such a time that they can be safely transported away to the approved waste management facility off site. -No written off/damaged or project unfit solar panels should be disposed of at any other waste facility other than the designated waste facility.	-Project Manager -Plant Operator -Environmental Officer	-Solar panels are well-kept and maintained -Old and damaged panels are removed and disposed of at the waste facility (site) in Arandis.
Water resources (groundwater) and soil contamination	Porous surface substrate can allow unwanted hazardous and ecologically detrimental substances to seep down to the water table either at the site of spill or after being washed away by surface flow during heavy rainy seasons (flash floods).	-All precautions are to be taken to prevent contamination of the soil as this could enter the ecosystem. -Proper training of project personnel would reduce the possibility of the impact occurring, especially with onsite soil contamination. -Any fuel spills must be reported, and remediation action taken.	-Project Manager -Plant Operator -Environmental Officer	-Report for all spills or leaks on site to be completed by the Plant Operator (as assisted by the Environmental Officer) and submitted to Project Manager for reporting -Potential soil pollutants/waste carried away to disposal sites

Aspect	Activity	Management & Mitigations measures	Responsibility	Key Performance Indicator (KPI)
	Accidental spills of fuel, and other chemicals that may be used on site might occur.	-Contaminated soil must be transported away from the site to an approved, appropriately classified waste disposal site. Contaminated soil should be remediated.		
Heritage Impact	Sites or objects with archaeologically or cultural significance might be uncovered on site. These can include graves, stone walls or cultural artefacts.	-Upon discovery of such sites or objects at some point on site or surroundings, it must be reported to the National Heritage Council of Namibia for further action/handling and permit issuance for possible conservation. Chance Find Procedure (CFP) attached hereto as **Appendix D** should be implemented. -The destruction, damage or displacement of such sites is not allowed but should be reported to the National Heritage Council of Namibia.	-Project Manager -Plant Operator -Environmental Officer	-Record of any discoveries and proof of notifications to authorities (National Heritage Council) on file.
Visual Impact	This is an impact that affects the aesthetic appearance of the site	-Keep site neat and dispose of waste regularly. -The current colour of the solar panels and associated structures should be maintained and keep the same colour but not repainted to a colour that will further cause a significant contrast leading to visual nuisance (uncomfortable glare) to visitors or travellers.	-Project Manager -Plant Operator	-A Visual complaints register kept on site and to be acted upon when the need arises.

Aspect	Activity	Management & Mitigations measures	Responsibility	Key Performance Indicator (KPI)
Impact on biodiversity (fauna and flora) and ecosystem	Impacts on the ecosystem from the increase in the human footprint to the area may lead to land degradation, illegal collection of plant materials and poaching by project workers, and others.	-Operational activities should be limited within the site boundaries. Further land clearing should be avoided to prevent unnecessary habitat loss. -All employees should be educated about the value of biodiversity preservation. -Strict conditions prohibiting harvesting of fauna and poaching of fauna should be incorporated into employment contracts. -Killing, injuring, hunting, capturing, disturbing, or feeding of any wild animal (reptiles or mammals) or remove any part of any wild animal, whether alive or dead is prohibited. -The removal, destroying, damage or disturb of any egg, nest, or burrow on and around the site is strictly prohibited. -The birds that are nesting in the roofs of the Site Substations should not be disturbed nor removed. The removal of nests should only be done unless they pose a health risk or interfere with the operations. This should be communicated with M'FT's Park Directorate.	-Project Manager -Plant Operator -Environmental Officer	-A register of unusual animals onsite, dead animals and any bird strikes / electrocuted animals

Aspect	Activity	Management & Mitigations measures	Responsibility	Key Performance Indicator (KPI)
		-There are encounters of Puff Adder (*Bitis arietans*) snakes crossing the Site. These should not be killed nor harmed but allowed to move away. Alternatively, the MEFT should be notified for safe removal and releasing into the wildness. -It is prohibited to pick, collect, destroy, damage, tamper with, disturb or remove any vegetation mineral or any other object of botanical, zoological, geological, archaeological, historical or any other scientific interest, or part thereof. A**ppropriate permits should be obtained if there would be intentions to carry out any or some of these forms of ''disturbance'' to biodiversity.** **-Should the encountered pax (the small plants under the panels) found to be inconveniencing the Plant operations, the Proponent should consult with the Forestry Directorate at MEFT to safely translocate the vegetation offsite.**		

Aspect	Activity	Management & Mitigations measures	Responsibility	Key Performance Indicator (KPI)
		-A register of plant species and dead animals or snakes found on site should be kept. Photos should be taken and recorded. The details should include date of encounter, animal / plant name and location (location reference/description or GPS coordinates).		

Table 6-2: The Decommissioning and Rehabilitation Measures of Project Activities

Aspect	Impact	Rehabilitation Measures	Responsibility	Key Performance Indicator (KPI)
DECOMMISSIONING OF SITE WORKS AND REHABILITATION				
Rehabilitation	Disturbance and damaging of land (site areas)	-All drilled holes related to the project activities such as array establishment should be backfilled. -All waste generated and stored on site at the time of closure should be disposed of at the respective nearest solid waste management site. -The stockpiled topsoil should be levelled. -Any temporary setup on site should be dismantled, and the area rehabilitated as far as practicable. -Disturbed site areas should be progressively rehabilitated by stockpiling and backfilling. -Provision of both financial and technical resources for rehabilitation should be made.	-Proponent	-Backfilled holes and level stockpiled topsoil and overburden rocks -No sign of waste or littering seen on site and around site areas and carrying away of waste, and removal of vehicles and equipment from site -Site structures are dismantled, and materials taken away from site.

6.2 The Environmental Monitoring

To ensure that the implementation of recommended environmental management measures is working and produces the desired results (to maintain the low significance ratings of impacts), the impacts and implementation of measures will need to be monitored and reported on.

Monitoring reports are to be compiled by the Proponent's availed resources (by O&L Centre), audited by an Independent Environmental Consultant, and submitted to the DEAF for archiving on a bi-annual basis (every 6 months throughout the project operations) or as required by the Environmental Commissioner (as per the ECC conditions).

7 EMP IMPLEMENTATION ROLES AND RESPONSIBILITIES

OLC Arandis Solar Energy (the Proponent) is ultimately responsible for the implementation of this EMP as provided under Chapter 6.

To ensure the full implementation of the EMP, the O&L Centre will be committed to provide and assign the following resources to OLC Arandis Solar Energy (the Proponent) who will:

- Assist with safety related inspections and audits (the Safety Officer); and
- Conduct Bi-annual reporting and assist with inspections and audits from an environmental perspective (Environmental Officer).

The roles and responsibilities of all delegates/parties involved in the effective implementation of this EMP are set in **Table 7-1**.

Table 7-1: The EMP implementation roles and responsibilities

Role	Responsibilities
OLC Arandis Solar Energy (The Proponent)	-Managing the implementation of this EMP and updating and maintaining it when necessary. -Management and monitoring of individuals and/ or equipment on-site in terms of compliance with this EMP

Role	Responsibilities
	-Liaising between the local and regional leadership and community. -Ensure effective communication with stakeholders, media (if necessary) and the public. -Managing public relation issues and collaborating with personnel and maintaining project-related open communication among personnel.
Project or Site Manager (as appropriate)	-Ensure that relevant commitments contained in the EMP Action Plans are adhered to. -Ensure relevant staff is trained in procedures entailed in their duties. -Maintain records of all relevant environmental documentation for the project. -Cooperate with all relevant interested and affected parties/stakeholders. -Development and management of schedules for daily activities.
Plant Operator (as assisted by the assigned O&L Centre resource for safety and environment)	-Conducting site inspections of all areas with respect to the implementation of this EMP (monitor and audit the implementation of the EMP). -Advising the Project Manager on the removal of person(s) and/or equipment not complying with the provisions of this EMP. -Undertaking an annual review of the EMP and recommending additions and/or changes thereto (this document). -Ensuring that the Project activities on site are conducted in accordance with the International System organization (ISO) standard 14001: 2015. -Reviewing the EMP annually and amending the document when necessary.
Site (Project) Workers and Visitors	The project workers have a personal responsibility of aiding in the implementation of the EMP while present and working on site. Therefore, they will be required to adhere to the relevant management and mitigation measures to collectively protect the environment and promote environmental sustainability. Site visitors should be inducted on the site operational procedures, particularly environmental, health and safety measures.

8 RECOMMENDATIONS AND CONCLUSIONS

The Solar Park site was visited to assess the current situation with regards to environmental management. The Site visit and assessment were done to collect information that was used to prepare the Comprehensive EMP for the continued operations of the OLC Arandis Solar Energy. The project is of medium-scale level and activities are well limited within the Site boundaries. As the result of the site observations and Personnel interviews, it was found that although a detailed site assessment was conducted by Risk Based Solutions in 2015, the Project activities had not been environmentally cleared before. Despite this, the Proponent has been doing their best to ensure that environmental and social impacts are avoided and minimized where avoidance is impossible. To achieve compliance with the Environmental and related laws governing the Project and its associated activities, the Proponent will be required to begin with the implementation of the management and mitigation measures provided in this EMP.

The Proponent will also be required to carry out EMP Compliance Monitoring (Audit) / Bi- Annual Monitoring upon issuance of the ECC. The monitoring of EMP implementation can be greatly improved on the way forward by conducting Bi-Annual Environmental Auditing of the site (internally or externally) to ensure environmental compliance and promote environmental protection and sustainability.

8.1 Recommendations

With the above said, Serja Hydrogeo-Environmental Consultants are confident that the potential negative impacts associated with the Project activities can continue to be mitigated by effectively implementing the recommended management action measures. This will be ensured and improved by the effort and commitment put towards implementation monitoring (Bi-Annual Monitoring and reporting). Therefore, it is recommended that the OLC Arandis Solar (PV) Park Project and associated activities be granted an Environmental Clearance Certificate, provided that:

- All the management and mitigation measures provided in this EMP continue to be implemented effectively and where required, improvement should be effectively put in place.
- All required permits, licenses, approvals, and document renewals that may be required for the project activities in future are obtained as required (please refer to the Permitting and Licensing in **Table 3-1** of this document).
- Where required and emphasized, improvements should be made with full commitment and effectively put in place.
- The Proponent and all their project workers, contractors and or specialists comply with the legal requirements governing the project and its associated activities.

- All the necessary environmental and social (occupational health and safety) precautions provided are adhered to.
- The Proponent's Environmental Officer or Consultant should effectively conduct Environmental (EMP) Compliance Bi-Annual Monitoring and most importantly, ensure timely renewal of the ECC. A Renewal application can be submitted at least 2 months before the expiry date of the valid ECC to allow time for the evaluation of the ECC Renewal report by the DEAF and approval by the Environmental Commissioner; and
- The next EMP Compliance check (Bi-Annual Monitoring) should be every 6 months from the issuance date of the ECC which will see progress reporting on the current and activities. The monitoring exercise can be undertaken either by the project Environmental Officer, or an independently appointed Environmental Consultant. An Environmental Audit/Compliance/Bi-Annual Report shall be compiled for every monitoring and submitted to the DEAF at the Ministry of Environment, Forestry and Tourism for archiving (via the ECC Online Portal under the valid ECC details). This would make the next ECC Renewal easier due to an in-between track record of monitoring progress prior to the expiry date of the valid ECC.

8.2 Conclusions

The Site is generally well-kept and equipped with the necessary and required infrastructure. It is well-maintained and adheres to the site and activity-specific pre-existing environmental management requirements. Therefore, the Environmental Consultant is of the hope that the Proponent will continue to maintain the same commitment towards environmental sustainability and ethics even after the issuance of the ECC and most importantly, will ensure timely renewal of the ECC.

Therefore, it is crucial for the Proponent, their workers, contractors and or specialists to continue with the effective implementation of the recommended management measures to protect both the biophysical and social environment. The aim would be to promote sustainable and safe development while ensuring a smooth and harmonious existence of the Project activities and the host environment.

9 LIST OF REFERENCES

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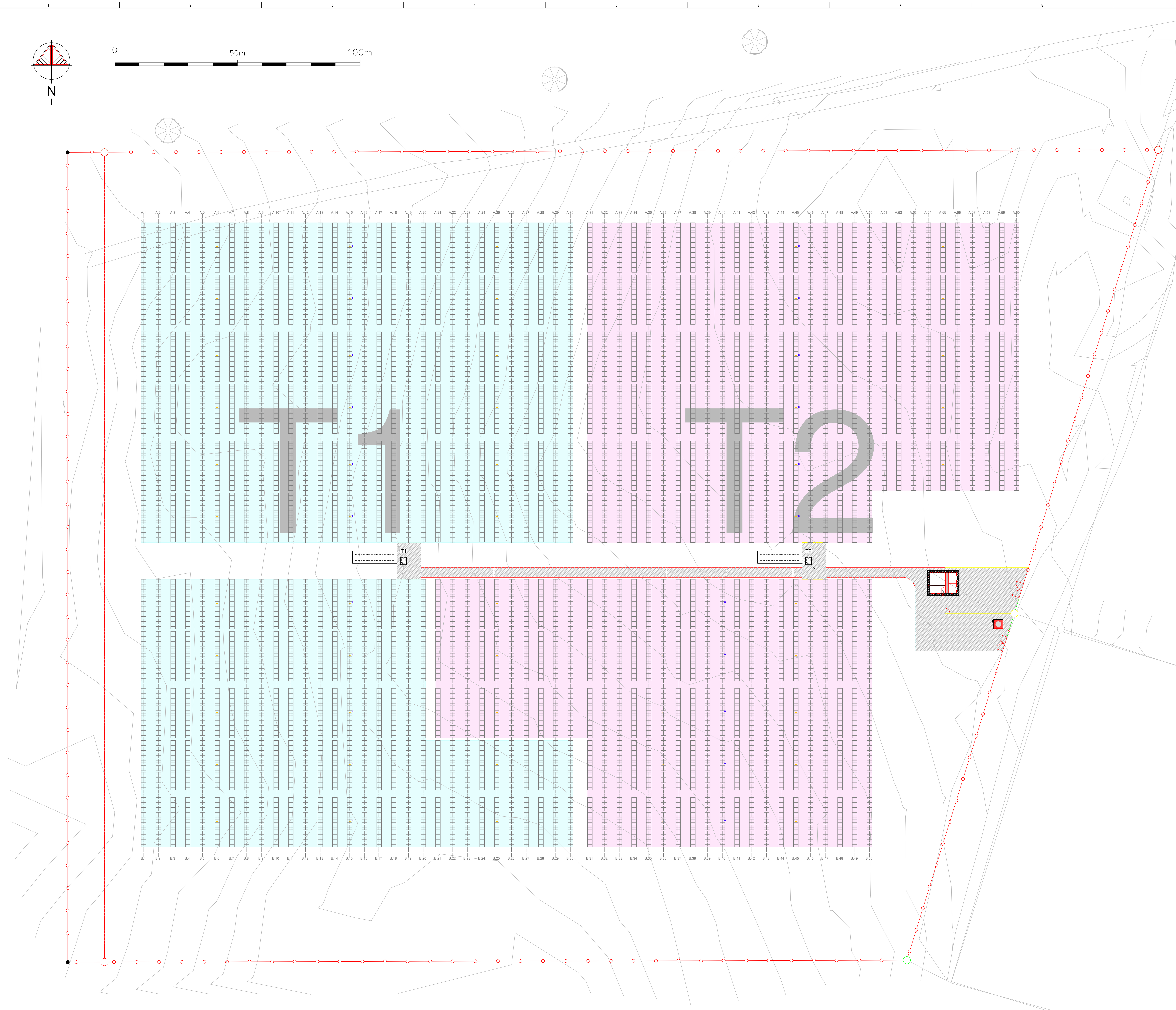
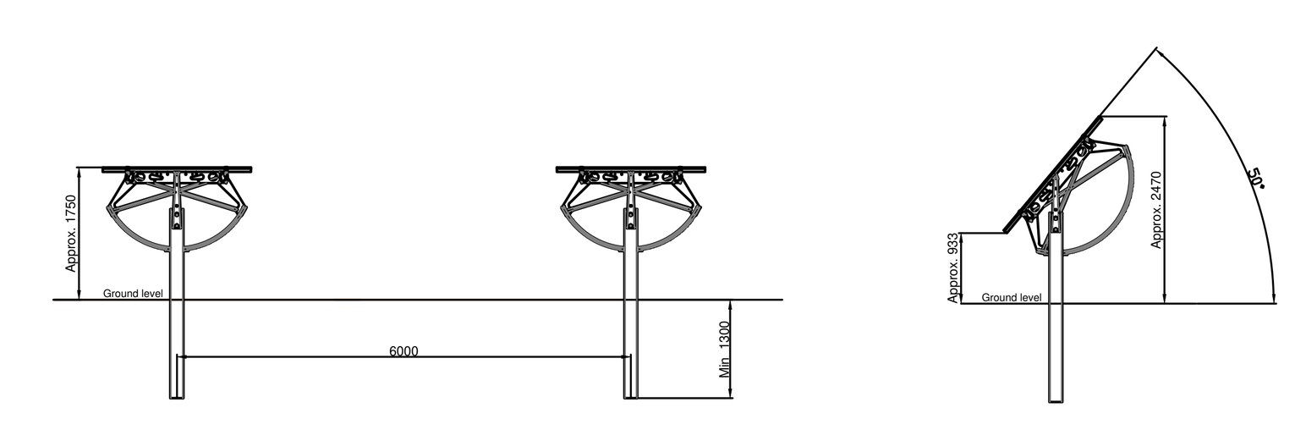
APPENDIX A: PROJECT SITE LAYOUT



Sideview of substructure (scale 1:200)



General Notes and Legend

Plant power DC: 3,840 kWp

Single Axis Tracking System
Number of tables: 600 x 20 modules

Modules
Manufacturer: Canadian Solar
Type: CS6U-320
Power (STC): 320 Wp
Number:12,000

Inverter
Manufacturer: SMA
Type: STP 60
Nominal power: 60 KVA
Number: 60

Transformer Station
Manufacturer: SMA
Type: MV Station 1800
Voltage Level: 0.4/11kV
Nominal power: 1,800kVA
Number: 2

String configuration
Modules in series: 20
String in parallel per inverter: 10

Legend:
- Fence
- Motor
- Combiner Boxes
- Inverter

The current installation and assembly standards provided by the component manufacturers must be followed and coordinated with the design. All dimensions and plans must be verified on the field and any discrepancies must be immediately reported to the project manager. All differences from the plan should be discussed with the designer.

Rev	Date	Description	Drawn	Checked
00	21.11.16	First draft of execution design	ST	SH
01	20.12.16	Final execution design	ST	SH

Client: Cronimet Mining Power Solution GmbH, Ottobrunner Str. 39, 82008 Unterhaching, Germany

Project: Arandis

Evergy
Evergy Engineering GmbH
Malsenstr. 84
80638 München
Fon: +49 89 189 289 30
Fax: +49 89 189 289 89
www.evergy.de

Project Phase: Execution Design

Approved

Scale	Unit	Format	Drawing Title	PROJ. NO	Drawing Number	REV
1:500	mm	A0	Overview PV Plant	NAM-001	00	01

	Date	Name
Drawn		
Checked		

APPENDIX B: THE DATE STAMPED COPY OF THE ECC APPLICATION

Revenue Stamps

ANNEXURE 1

FORMS

Form 1

REPUBLIC OF NAMIBIA

ENVIRONMENTAL MANAGEMENT ACT (No. 7 of 2007)

(Section 32)

APPLICATION FOR ENVIRONMENTAL CLEARANCE CERTIFICATE (APP-0010344)

PART A: DETAILS OF APPLICATION

1.	Name:	OLC Arandis Solar Energy (Pty) Ltd
2.	Business Registration No.:	CY/1944/0280
3.	Correspondence Address:	P.O. Box 16 Windhoek, Namibia
4.	Name of Contact Person:	Ms. Gloudi De Beer
5.	Position of Contact Person:	Group Manager: Environmental
6.	Telephone No.:	+264 (0) 61 207 5382
7.	Fax No:	N/A
8.	E-mail Address:	Gloudi.DeBeer@ol.na

MINISTRY OF ENVIRONMENT, FORESTRY AND TOURISM
DIRECTORATE OF ENVIRONMENTAL AFFAIRS
20 JUN 2022
RECEIVED 1
Signature: Adelia Taapopa

PART B: SCOPE OF THE ENVIRONMENTAL CLEARANCE CERTIFICATE

1. THE ENVIRONMENTAL CLEARANCE CERTIFICATE IS FOR:

The 'listed activities' that are relevant or related to the project activities are listed below:

"ENERGY GENERATION, TRANSMISSION AND STORAGE ACTIVITIES

1. The construction of facilities for -

(a) the generation of electricity,

(b) the transmission and supply of electricity.

2. DETAILS OF THE ACTIVITY(S) COVERED BY THE ENVIRONMENTAL CLEARANCE CERTIFICATE:

2.1 Title of Activity

The Operations and Maintenance of the Existing 3-Megawatt (MW) Solar Photovoltaic (PV) Park within the Townlands of Arandis, Erongo Region

2.2 Location of Activity

The 3-Megawatt (MW) solar park (the Site) and associated activities are located on the immediate western side of Arandis Town (within the Townlands) in the Erongo Region. The Site produced its first energy in June 2017. The locality map is shown in Figure 1 of the Background Information Document (BID). The approximate coordinates of the project site are provided below.

- -22.428652° 14.962197°,
- -22.428661° 14.966492°,
- -22.431642° 14.965503°, and
- -22.431644° 14.962174.

2.3 Nature of Activity

The solar park comprises of a single axis tracking PV power plant, which is synchronised to the existing ErongoRed grid infrastructure. Approximately 12,000 crystalline solar modules are used to produce the Direct Current (DC) power, which is then inverted to Alternating Current (AC) and stepped up via a transformer to feed into the network.

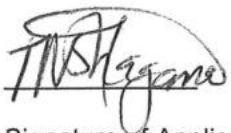
Maintenance is done in accordance with the documented maintenance schedule and will be done continuously for the envisaged twenty-five-year lifespan of the facility to ensure correct operation and enhanced energy yield.

2.4 Scale and Scope of the Activity

The scale of the project is considered medium, and the activities are limited within the site boundaries and footprints. The project activities entail the production of solar energy from 12,000 solar modules.

PART C: DECLARATION BY APPLICANT

I hereby certify that the particulars given above are correct and true to the best of my knowledge and belief. I understand the environmental clearance certificate may be suspended, amended, or cancelled if any information given above is false, misleading, wrong, or incomplete.



FREDRIKA SHAGAMA — **Environmental Assessment Practitioner**

Signature of Applicant | Full Name in Block letters | Position

on behalf of **OLC ARANDIS SOLAR ENERGY (PTY) LTD** — 26/06/2022

Date

APPENDIX C: ELECTRICITY GENERATION LICENSE FROM THE ELECTRICITY CONTORL BOARD (ECB) OF NAMIBIA

ELECTRICITY CONTROL BOARD

GENERATION LICENCE

NO G-159-011016-25

Issued to

OLC Arandis Solar Energy (Pty) Ltd

(Registration number: 06/00280/06)

The ELECTRICITY CONTROL BOARD, in exercise of the powers conferred by section 20 (8) of the Electricity Act, 2007, and upon approval to grant a Generation Licence by the Minister in terms of section 20(6), hereby issues a Generation Licence to **OLC Arandis Solar Energy (Pty) Ltd** to generate electricity from Solar PV at Arandis for the purpose of enabling a supply to be offered by suppliers to customers subject to the conditions as imposed by the Minister and set out in this Licence and the Electricity Act, 2007.

Gottlieb Hinda
Chairman

Foibe L. Namene
Chief Executive Officer

APPENDIX D: ARCHAEOLOGICAL & HERITAGE CHANCE FINDS PROCEDURE (CFP) AFTER KINAHAN, 2020

The development and project sites are usually subject to heritage survey and assessment at their planning stages. These surveys are based on surface indications alone, and it is therefore possible that sites or items of heritage significance would be found during development work (project operations). However, this was not done for the Solar Park, and therefore, this CFP is provided to the EMP to set out here the reporting and management of such finds.

Scope: The "*chance finds*" procedure covers the actions to be taken from the discovery of a heritage site or item to its investigation and assessment by a trained archaeologist or other appropriately qualified person.

Compliance: The "chance finds" procedure is intended to ensure compliance with relevant provisions of the National Heritage Act (27 of 2004), especially Section 55 (4): "*a person who discovers any archaeological …. object ……must as soon as practicable report the discovery to the Council*". The procedure of reporting set out below must be observed so that heritage remains reported to the NHC are correctly identified in the field.
Manager/Supervisor must report the finding to the following competent authorities:

- **National Heritage Council of Namibia (061 244 375)**
- **National Museum (061 276 800)**
- **National Forensic Laboratory (061 240 461).**

Archaeological material must NOT be touched. Tempering with the materials is an offence under the Heritage act and punishable upon conviction by the law.

Responsibility:

Operator:	To exercise due caution if archaeological remains are found
Foreman:	To secure site and advise management timeously
Superintendent:	To determine safe working boundary and request inspection
Archaeologist:	To inspect, identify, advise management, and recover remains

Procedure:

Action by person identifying archaeological or heritage material:

a) If operating machinery or equipment stop work

b) Identify the site with flag tape

c) Determine GPS position if possible

d) Report findings to foreman

Action by foreman

a) Report findings, site location and actions taken to superintendent

b) Cease any works in immediate vicinity

Action by superintendent

a) Visit site and determine whether work can proceed without damage to findings

b) Determine and mark exclusion boundary

c) Site location and details to be added to project GIS for field confirmation by archaeologist

Action by Archaeologist

a) Inspect site and confirm addition to project GIS

b) Advise NHC and request written permission to remove findings from work area

c) Recovery, packaging and labelling of findings for transfer to National Museum

In the event of discovering human remains

a) Actions as above

b) Field inspection by archaeologist to confirm that remains are human

c) Advise and liaise with NHC and Police

d) Recovery of remains and removal to National Museum or National Forensic Laboratory, as directed.