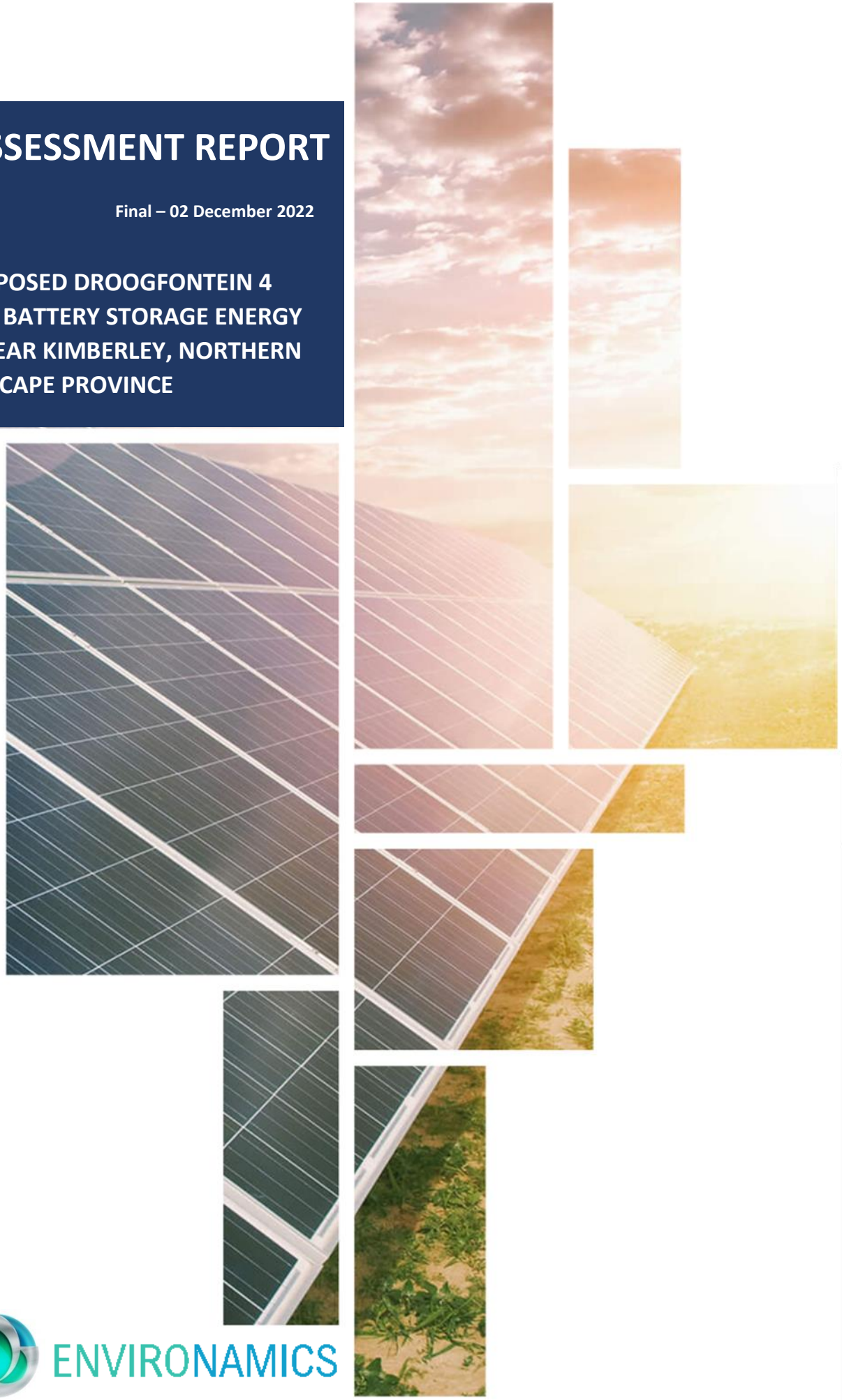
BASIC ASSESSMENT REPORT

Final – 02 December 2022

THE PROPOSED DROOGFONTEIN 4 SOLAR AND BATTERY STORAGE ENERGY FACILITY, NEAR KIMBERLEY, NORTHERN CAPE PROVINCE



ENVIRONAMICS

PROJECT DETAIL

DFFE Reference No.	:	14/12/16/3/3/1/2647
Project Title	:	The proposed Droogfontein 4 Solar and Battery Storage Energy Facility, near Kimberley, Northern Cape Province
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Client	:	Genesis Droogfontein 4 (Pty) Ltd
Report Status	:	Final Basic Assessment Report submitted to DFFE for decision-making on the Application for Environmental Authorisation
Report date	:	02 December 2022

When used as a reference this report should be cited as: Environamics (2022) Final BAR: The proposed Droogfontein 4 Solar and Battery Storage Energy Facility, near Kimberley, Northern Cape Province

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GLOSSARY OF TERMS AND ACRONYMS

BA	Basic Assessment
BAR	Basic Assessment Report
BESS	Battery Energy Storage System
CEA	Cumulative Effects Assessment
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and the Environment
DM	District Municipality
DMRE	Department of Mineral Resources and Energy
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EP	Equator Principles
EPFI	Equator Principles Financial Institutions
Environmental impact	Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects.
GNR	Government Notice Regulation
I&AP	Interested and affected party
IDP	Integrated Development Plan
IFC	International Finance Corporation
IPP	Independent Power Producer
kV	Kilo Volt
Mitigate	Activities designed to compensate for unavoidable environmental damage.
MW	Megawatt
NEMA	National Environmental Management Act No. 107 of 1998
NERSA	National Energy Regulator of South Africa
NWA	National Water Act No. 36 of 1998
PPP	Public Participation Process
PV	Photovoltaic
REDZ	Renewable Energy Development Zone
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
SAHRA	South African Heritage Resources Agency
SDF	Spatial Development Framework
SEF	Solar Energy Facility
VU	Vegetation Unit

CONTEXT FOR THE DEVELOPMENT

According to Eskom, the demand for electricity in South Africa has been growing at approximately 3% per annum. This growing demand, fuelled by increasing economic growth and social development, is placing increasing pressure on South Africa's existing power generation capacity. Coupled with this, is the growing awareness of environmentally responsible development, the impacts of climate change and the need for sustainable development. The use of renewable energy technologies, as one of a mix of technologies needed to meet future energy consumption requirements is being promoted as part of the national Department of Mineral Resources and Energy's (DMRE) (previously referred to as the Department of Energy) long-term strategic planning and research process.

The primary rationale for the proposed solar energy facility (SEF) is to add new generation capacity from renewable energy to the national electricity mix and to aid in achieving the goal of 42% share of all new installed generating capacity being derived from renewable energy forms, as targeted by DMRE (2019 Integrated Resource Plan Update 2010-2030). The technology proposed for the Droogfontein 4 SEF is photovoltaic (PV) panels. The IRP also identifies the preferred generation technologies required to meet the expected demand growth up to 2030 and incorporates government objectives including affordable electricity, reduced greenhouse gas (GHG) emissions, reduced water consumption, diversified electricity generation sources and localisation and regional development. In terms of the Integrated Resource Plan Update (2019 IRP Update, 2010-2030), over the short term, clear guidelines arose; namely to continue with the current renewable bid programme with additional annual rounds of 1000MW PV, with approximately 8.4GW of the renewable energy capacity planned to be installed from PV technologies over the next twenty years.

The proposed SEF is intended to form part of the DMREs Renewable Energy Independent Power Producer Procurement (REIPPP) Programme or any other programs/opportunities to generate power in South Africa. The REIPPP Programme aims to secure 14 725 Megawatts (MW) of new generation capacity from renewable energy sources, while simultaneously diversifying South Africa's electricity mix. According to the 2021 State of the Nation Address, Government will initiate the procurement of an additional 11 800 MW of power from renewable energy, natural gas, battery storage and coal in line with the Integrated Resource Plan 2019 and fulfilling their commitments under the United Nations Framework Convention on Climate Change and its Paris Agreement which include the reduction of greenhouse gas emissions. Eskom, the largest greenhouse gas emitter of South Africa, has committed in principle to net zero emissions by 2050 and to increase its renewable capacity. On 11 September 2022, Government announced the amended Request for Proposal (RFP) to increase the MW allocation under the REIPPP Bid Window (BW) 6 in response to the announcement by the President on 25 July 2022. The capacity to be procured currently under BW 6 will now increase from 2600MW to 4200MW.

In response to the above, Genesis Droogfontein 4 (Pty) Ltd is proposing the development of a photovoltaic solar energy facility, inclusive of a Battery Energy Storage System (BESS) and associated infrastructure for the purpose of commercial electricity generation on the Remaining Extent of the Farm Droogfontein No. 62, Registration Division Kimberley, Northern Cape Province (refer to Figure A for the locality map). The project entails the generation of up to 200MW (direct current) electrical power through photovoltaic (PV) technology. The total development footprint of the project will be approximately 300 hectares (including the BESS, grid connection infrastructure and supporting infrastructure on site). From a regional site selection perspective, this region is preferred for solar energy development due to its global horizontal irradiation value of around 2160 kwh/m^2. The region is also preferred for its inclusion within the Kimberley Renewable Energy Development Zone (REDZ) 5.

EXECUTIVE SUMMARY

Like many other small and developing municipalities in the country, the Sol Plaatje Local Municipality, within which the Droogfontein 4 SEF is proposed, faces a number of challenges in addressing the needs and improving the lives of the community. According to the Sol Plaatje Local Municipality Integrated Development Plan (2022-2027) the municipal area has been facing a decrease in economic growth as the area has reliance on a single sector, especially mining. This makes the Local Municipality vulnerable to changes in mining and international markets, and to decisions and policies made at national level; for example, the imposition or relaxation of import tariffs. Compounding this reality is the disappointing state of economic planning at local government level, or local economic development (LED). The key challenges faced by the Local Municipality with regard to Local Economic Development and social advancement includes declining economic growth, reliance on a primary economic resources, low skilled labour force, high unemployment rate, low levels of capital spending to support infrastructure maintenance and development, environmental degradation, disinvestment in the Kimberley CBD and low revenue collection rate. There is therefore a need for intervention within the municipal area to promote growth and development which will add to the socio-economic conditions of the municipal area for both the municipality and the communities.

Genesis Droogfontein 4 (Pty) Ltd intends to develop a photovoltaic solar energy facility (SEF), inclusive of a Battery Energy Storage System (BESS) and associated infrastructure on the Remaining Extent of the Farm Droogfontein No. 62, located near Kimberley in Northern Cape. The solar facility will have a generating capacity of up to 200MW (direct current) with up to 180MW alternating current. The town of Kimberley is located approximately 12 km south of the proposed development (which is the larger town) and the small town of Riverton is located directly to the north of the affected property (refer to Figure A and Figure B for the respective locality and regional maps). The total footprint of the project will be approximately 300 hectares (including BESS and supporting infrastructure on site). The site[1] was identified as being highly desirable due to its suitable climatic conditions, topography (i.e. in terms of slope), environmental conditions (i.e. agricultural potential, ecological sensitivity and archaeology), proximity to a grid connection point (i.e. for the purpose of electricity evacuation into the national grid), as well as site access via a main road (i.e. to facilitate the movement of machinery, equipment, infrastructure and people during the construction phase). Grid connection infrastructure is also being proposed and assessed within this report.

The grid connection infrastructure includes a 132kV power line to connect the facility from a new on-site facility substation / collector substation to the national grid. The power line placement is being assessed within a larger grid connection corridor to provide flexibility for the placement of the route and to enable the opportunity for the avoidance of sensitive environmental features which may be present. The grid connection corridors assessed are 300m wide.

[1] The site is defined as the affected property on which the development is proposed. The site for the Droogfontein 4 SEF is the Remaining Extent of the Farm Droogfontein No. 62. Within the site two alternative development areas have been identified by the developer for the placement of the development footprint. These two alternative development areas are assessed on an equal level as part of this Basic Assessment process to enable the identification of the preferred development area from an environmental perspective.

In terms of the National Environmental Management Act (Act 107 of 1998), with specific reference to Sections 24 and 24D, as read with GNR 324-327, as amended (2017), Environmental Authorisation is required for the Droogfontein 4 Solar and Battery Storage Energy Facility. The following listed activities have been identified with special reference to the proposed development and is listed in the EIA Regulations (as amended):

- Activity 11(i) (GNR 327): *"The development of facilities or infrastructure for the transmission and distribution of electricity outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts."*
- Activity 12(ii)(c) (GNR 327): *"The development of (ii) infrastructure or structures with a physical footprint of 100 square meters or more (c) within 32 meters of a watercourse, measured from the edge of a watercourse.*
- Activity 14 (GNR 327): *"The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres."*
- Activity 19 (GNR 327): *"The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil sand, shells, shell grit, pebbles or rock of more than 10 cubic meters from a watercourse."*
- Activity 24 (ii) (GN.R 327): *"The development of a road (ii) with reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 meters"*
- Activity 28 (ii) (GN.R 327): *"Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare."*
- Activity 56 (ii) (GN.R 327): *"The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre (ii) where no reserve exists, where the existing road is wider than 8 metres…"*
- Activity 1 (GN.R 325): *"The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more."*
- Activity 15 (GN.R 325): *"The clearance of an area of 20 hectares or more of indigenous vegetation."*
- Activity 18 (g)(ii)(ii) (GN.R 324): *"The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre (g) in the Northern Cape (ii) outside urban areas and (ii) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland."*

Activities required for the development of the solar energy facility which are listed under Listing Notice 1, 2 and 3 (GNR 327, 325 & 324) implies that the development could potentially have an impact on the environment that will require mitigation. The proposed Droogfontein 4 Solar and Battery Storage Energy Facility is located within a Renewable Energy Development Zone (REDZ) and subsequently a

Basic Assessment process is required to be followed as described in Regulations 19 and 20 of the EIA Regulations (as amended). Environamics has been appointed as the independent Environmental Assessment Practitioner to undertake the Basic Assessment (BA) on behalf of Genesius Eco-energy Developments (Pty) Ltd.

Regulation 19 of the EIA Regulations (as amended) requires that a Basic Assessment Report (BAR) must contain the information set out in Appendix 1 of the Regulations or comply with a protocol or minimum information requirements relevant to the application as identified and gazetted by the Minister in a government notice. Appendix 1 of GNR326 requires that the environmental outcomes, impacts and residual risks of the proposed activity be set out in the BAR. It has been determined through the BA process that the proposed development will have a net positive impact for the area and will subsequently ensure the optimal utilisation of resources and land as well as contribute to the growth of the municipal area albeit to a limited extent. All negative environmental impacts can be effectively mitigated through the recommended mitigation measures and no residual negative impacts are foreseen. The potentially most significant environmental impacts associated with the development are briefly summarized below.

Impacts during the construction phase:

Construction of the solar and battery storage facility will potentially result in the following impacts: habitat destruction and fragmentation, soil, air and water pollution, increased soil erosion and sedimentation, spread and establishment of alien invasive species, impact on priority and resident avifauna, loss of habitats, potential loss of productive farmland, visual impact on observers in-migration or influx of job seekers, presence of construction workers on the local communities, increased risk of veld fires, impacts on daily living and movement patterns and generation of waste. Socio-economic impacts such as the creation of local employment and business opportunities, skills development and training and technical support to local farmers and municipalities will be positive impacts emanating from the construction.

Impacts during the operational phase:

During the operational phase, the site will serve as a solar and battery storage energy facility and the potential impacts will take place over a period of 20 – 25 years. The negative impacts are generally associated with impacts on the fauna and flora, spread and establishment of alien invasive species, displacement of priority and resident avifauna, collisions of avifauna with PV array and power lines, avifauna electrocution, visual impacts and dangerous goods hazards as part of battery storage facility. The provision of sustainable service delivery from the local municipality also needs to be confirmed. The operational phase will have a direct positive impact through the provision of employment opportunities for its duration, and the generation of income to the local community. Additional electricity will also be generated from a clean renewable resource.

Impacts during the decommissioning phase:

The physical environment will benefit from the closure of the solar and battery storage energy facility since the site will be rehabilitated to an acceptable state. The decommissioning phase will however potentially result in impact on the fauna and flora, pressure on existing service infrastructure, and the loss of permanent employment. Skilled staff will be eminently employable, and a number of temporary jobs will also be created in the process.

Cumulative impacts:

According to the DFFE's database seventeen (17) PV solar plant applications (of which six (6) applications have lapsed/been withdrawn) have been submitted to the Department within the geographic area of investigation, – refer to Table 7.1. Furthermore, two of the seventeen have been developed and are located on the affected property of the Droogfontein 4 Solar and Battery Storage Energy Facility, as well as the property directly adjacent to the east.

The cumulative impact for the proposed development is expected to be medium with no high, unacceptable impacts related to the project expected. Considering the extent of the project and information presented in section 7 of this report, it can be concluded that the cumulative impacts will not result in large scale changes and impacts on the environment. This is also based on the fact that there are already two other existing solar energy developments in close proximity to the site which means that an opportunity to consolidate impacts in the landscape will be achieved rather than to distribute the impacts throughout the area.

In accordance with the EIA Regulations, this final BAR evaluates and rates each identified potential impact and identifies and recommends mitigation measures which will be required in order to ensure the reduction of the impact significance of negative impacts to acceptable levels and the avoidance of negative residual risks. This final BAR also contains information that is required by the competent authority (Department of Forestry, Fisheries and the Environment (DFFE)) to consider the Application for Environmental Authorisation and to reach a decision contemplated in Regulation 20 of GNR 326. No fatal flaws or impacts with unacceptable levels of significance were identified and the impacts from the proposed SEF and associated infrastructure are expected to be at an acceptable level with the implementation of mitigation measures and therefore the project can be authorised subject to the implementation of the recommended mitigation measures.

1 INTRODUCTION

This section aims to introduce the Basic Assessment Report (BAR) and specifically to address the following requirements of the regulations:

Appendix 1. (3) A basic assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include-
(a) details of:

(i) the EAP who prepared the report; and

(ii) the expertise of the EAP, including a curriculum vitae.

1.1 LEGAL MANDATE AND PURPOSE OF THE REPORT

The National Environmental Management Act identifies listed activities (in terms of Section 24) which are likely to have an impact on the environment. These activities cannot commence without obtaining an EA from the relevant competent authority. Sufficient information is required by the competent authority to make an informed decision and the project is therefore subject to an environmental assessment process which can be either a Basic Assessment Process or a full Scoping and Environmental Impact Assessment process.

The EIA Regulations No. 324, 325, and 327 outline the activities that may be triggered and therefore require EA. The following listed activities with special reference to the proposed development is triggered:

Table 1.1: Listed activities

Relevant notice:	**Activity No (s)**	**Description of each listed activity as per project description**:
GNR. 327 (as amended in 2017)	Activity 11(i)	• *"The development of facilities or infrastructure for the transmission and distribution of electricity (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts."* • Activity 11(i) is triggered as the proposed photovoltaic solar energy facility will transmit and distribute electricity of 132 kilovolts outside an urban area. The grid connection infrastructure includes a 132kV power line to connect the facility from a new on-site facility substation / 132kV collector substation to the national grid. Two grid connection corridors, each with a width of up to 300m, have been identified for the assessment and placement of the power line (i.e., the power line will be developed within one of the proposed corridors) to connect to one of the grid connection points available within the affected property. The two grid connection points

		available includes the Boundary-Olien 1 275kV Power Line and the Elk-Weir 1 132kV Power Line. Connection to either of these existing power lines will be via a loop-in loop-out connection.
GNR. 327 (as amended in 2017)	Activity 12(ii)(c)	• *"The development of (ii) infrastructure or structures with a physical footprint of 100 square meters or more (c) within 32 meters of a watercourse, measured from the edge of a watercourse."* • Activity 12(ii)(c) is triggered since the two alternative development areas are located within 32m of depression wetlands located just outside of the two respective development areas under assessment. Artificial wetlands are also present within the grid connection corridor.
GNR. 327 (as amended in 2017)	Activity 14	• *"The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres."* • Activity 14 is triggered since the proposed development will need to develop infrastructure for the storage and handling of dangerous goods (diesel) in containers with combined capacity of 90 cubic metres, but can be up to 100 cubic meters. The capacity will not exceed 500 cubic metres.
GNR. 327 (as amended in 2017)	Activity 19	• *"The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil sand, shells, shell grit, pebbles or rock of more than 10 cubic meters from a watercourse"* • Activity 19 is triggered since artificial wetlands are present within the grid connection corridor. This will require the removal and moving of soils of more than 10 cubic meters.
GNR. 327 (as amended in 2017)	Activity 24(ii)	• *"The development of a road (ii) with reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 meters;"* • Activity 24(ii) is triggered as the internal roads will vary between 8 and 12 meters in width. The internal roads will be 8m in width and the perimeter road will be up to 12m in width.

GNR. 327 (as amended in 2017)	Activity 28(ii)	• *"Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare."* • Activity 28(ii) is triggered as portions of the affected farm has been previously used for grazing and the property will be re-zoned to "Electricity, Utility or Industrial" use. The development footprint of the solar energy facility and associated infrastructure will be up to 300 hectares.
GNR. 327 (as amended in 2017)	Activity 56 (ii)	• *"The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre (ii) where no reserve exists, where the existing road is wider than 8 metres…"* • Activity 56 (ii) is triggered as the existing access to the affected property does not have a reserve and will need to be widened by more than 6 metres for the construction and operation of the solar energy facility.
GNR. 325 (as amended in 2017)	Activity 1	• *"The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more."* • Activity 1 is triggered since the proposed photovoltaic solar energy facility will have a generation capacity of up to 200MW (direct current) and an alternating current of up to 180MW of electricity through the use of a renewable energy resource.
GNR. 325 (as amended in 2017)	Activity 15	• *"The clearance of an area of 20 hectares or more of indigenous vegetation."* • In terms of vegetation type the site falls within the Kimberley Thornveld which is described by Mucina and Rutherford (2006) as Least Threatened. Activity 15 is triggered since portions of the site have not been lawfully disturbed during the preceding ten years; therefore, more than 20 hectares of indigenous vegetation will be removed. The development footprint of the solar energy facility and associated infrastructure will be up to 300 hectares.
GNR. 324 (as amended in 2017)	Activity 18 (g)(ii)(ii)	• *"The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre (g) in the Northern Cape (ii) outside urban areas and (ii) Areas within a*

		watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland." • Activity 18 (g)(ii)(ii) is triggered since the existing access road to the site will need to be widened by more than 4 metres. The project is located within the Northern Cape Province and falls outside of an urban area. The two alternative development areas are located within 100m of depression wetlands located just outside of the two respective development areas under assessment. Artificial wetlands are also present within the grid connection corridor.

The activities triggered under Listing Notice 1, 2 and 3 (Regulation 327, 325 & 324) for the project implies that the development is considered as potentially having an impact on the environment and therefore require the implementation of appropriate mitigation measures. Based on the location of the entire extent of the project within the Kimberley REDZ (see Figure D1), the process to be followed will be as per GNR 114, as gazetted on 16 February 2018. Therefore, the Droogfontein 4 Solar and Battery Storage Energy Facility is subject to a Basic Assessment process and not a full EIA process, as well as a shortened timeframe for the processing of the Application for Environmental Authorisation by the Department of Forestry, Fisheries and the Environment (DFFE). The Basic Assessment must be undertaken in line with the requirements stipulated under Regulations 19 – 20 of the EIA Regulations. According to Appendix 1 of Regulation 326, the objective of the basic assessment process is to, through a consultative process:

- Determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;
- Identify the alternatives considered, including the activity, location, and technology alternatives;
- Describe the need and desirability of the proposed alternatives;
- Through the undertaking of an impact and risk assessment process, inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on these aspects to determine —
    - The nature, significance, consequence, extent, duration and probability of the impacts occurring; and
    - degree to which these impacts-
        - can be reversed;
        - may cause irreplaceable loss of resources, and
        - can be avoided, managed or mitigated; and

- Through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to –
    - Identify and motivate a preferred site, activity and technology alternative;
    - Identify suitable measures to avoid, manage or mitigate identified impacts; and
    - Identify residual risks that need to be managed and monitored.

This report is the final Basic Assessment Report (BAR) submitted to the Department of Forestry, Fisheries and the Environment (DFFE) for decision-making on the Application for Environmental Authorisation. According to GNR 326 all registered interested and affected parties (I&APs) and relevant State Departments (including Organs of State) must be allowed the opportunity to review and provide comment on the report. The draft BAR was made available to registered I&APs and all relevant State Departments for a 30-day review and comment period from 27 October 2022 to 28 November 2022. They were requested to provide written comments on the draft BAR within 30 days of receiving it. All issues identified during the review period have been documented and compiled into a Comments and Response Report (Appendix C6) submitted as part of this Final BAR to DFFE for decision-making.

1.2 DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)

Environamics was appointed by the applicant as the independent EAP to conduct the BA and prepare all required reports. All correspondence to the EAP can be directed to:

Contact person:	Lisa Opperman
EAPASA Registration	2020/2150
Postal Address:	14 Kingfisher Street, Tuscany Ridge Estate, Potchefstroom, 2531
Telephone:	084 920 3111 (Cell)
Electronic Mail:	lisa@environamics.co.za

Regulation 13(1)(a) and (b) determines that an independent and suitably qualified and experienced EAP should conduct the BA. In terms of the independent status of the EAP, a declaration is attached as Appendix A to this report. The expertise of the EAP is also summarized in the curriculum vitae included as part of Appendix A.

1.3 DETAILS OF SPECIALISTS

Table 1.2 provides information of the independent specialists that have been appointed as part of the Basic Assessment process. Regulation 13(1)(a) and (b) determines that an independent and suitably qualified and experienced specialist should conduct the specialist study. In the event where the specialist is not independent, a specialist should be appointed to externally review the work of the specialist as contemplated in sub regulation (2), which must comply with sub regulation 1. In terms of the independent status of the specialists, their declarations are attached as Appendix D to this report. The expertise of the specialists is also summarized in their respective curriculum vitae's.

Table 1.2: Details of specialists

Study	Prepared by	Contact Person	Postal Address	Tel	e-mail
Avifaunal Impact Assessment	The Biodiversity Company	Lindi Steyn & Ernest Porter	-	Cell: 081 319 1225	info@thebiodiversitycompany.com
Terrestrial Ecology Impact Assessment	The Biodiversity Company	Marnus Erasmus	-	Cell: 081 319 1225	info@thebiodiversitycompany.com
Wetland Impact and Risk Assessment	The Biodiversity Company	Rian Pienaar	-	Cell: 081 319 1225	info@thebiodiversitycompany.com
Heritage Impact Assessment	McGregor Museum	Dr David Morris	-	Cell: 082 222 4777	dmorriskby@gmail.com dmorris@museumsnc.co.za
Agricultural Compliance Statement	The Biodiversity Company	Maletsatsi Mohapi	-	Cell: 081 319 1225	info@thebiodiversitycompany.com
Visual Impact Assessment	Donaway Environmental Consultants	Johan Botha	30 Fouche Street Steynsrus, 9515	Tel: 082 316 7749	johan@donaway.co.za
Social Impact Assessment	Donaway Environmental Consultants	Marelie Botha	30 Fouche Street Steynsrus, 9515	Cell: 082 493 5166	marelie@donaway.co.za
Paleontological Study	Banzai Environmental (Pty) Ltd	Elize Butler	-	Cell: 084 447 8759	elizebutler002@gmail.com

1.4 STATUS OF THE BA PROCESS

The BA process is conducted strictly in accordance with the stipulations set out in Regulations 19 – 20 and Annexure 1 of Regulation No. 326. Table 1.3 provides a summary of the BA process and future steps to be taken. It can be confirmed that to date:

- A site visit was conducted on 12 May 2022 and site notices were erected.
- A pre-application meeting request and public participation plan was submitted to DFFE on 20 May 2022.
- The DFFE accepted the public participation plan and indicated that no pre-application meeting is required in an email dated 26 May 2022.
- A newspaper advertisement was placed in the Noorkaap Bulletin on 30 June 2022 for the initial public participation.
- The Application for Environmental Authorisation and the draft BAR was submitted to the DFFE on 27 October 2022.
- The draft Basic Assessment report was made available for a 30-day review and comment period from 27 October 2022 to 28 November 2022.
- The final Basic Assessment Report has been submitted to the DFFE for decision-making on the Application for Environmental Authorisation on 02 December 2022.

It is envisaged that the BA process should be completed within approximately seven months of submitting the Application for EA and the BAR, i.e. by November/December 2022 – see Table 1.3.

Table 1.3: Project schedule

Activity	Prescribed timeframe	Timeframe
Site visits (Initial PP – Press Advertisement & Site Notices).	-	May 2022
Distribute Background Information Document to I&APs	-	03 August 2022
Undertake specialist studies (including two seasonal surveys for avifauna)	-	June – September 2022
Submit application form and DBAR	-	27 October 2022
Public participation (DBAR)	30 Days	27 October 2022 – 28 November 2022
Submit FBAR	90 Days	Start of December 2022
Department acknowledges receipt	10 Days	December 2022

Decision	57 Days	By February 2023
Department notifies of decision	5 Days	By February 2023
Registered I&APs notified of decision	14 Days	By February 2023
Appeal	20 Days	By March 2023

1.5 SPECIALIST STUDIES IDENTIFIED IN THE DFFE SCREENING TOOL REPORT

The table included below provides an indication of the specialist studies identified by the DFFE Screening Tool Report (Appendix B), an indication of whether the studies were undertaken or not and a motivation or confirmation of the studies being included or not.

Study identified in the DFFE Screening Tool and sensitivity	**Study included?**	**Confirmation / motivation**
Agricultural Impact Assessment Sensitivity: Medium	Yes	An Agricultural Compliance Statement is included in Appendix D4. The site sensitivity is confirmed in the report as low and moderate.
Landscape / Visual Impact Assessment Sensitivity: Very High	Yes	A Visual Impact Assessment is included in Appendix D3.
Archaeological and Cultural Heritage Impact Assessment Sensitivity: Low	Yes	A Heritage Impact Assessment is included in Appendix D5.
Palaeontological Impact Assessment Sensitivity: Medium	Yes	A desktop Palaeontological Impact Assessment is included in Appendix D6.
Terrestrial Biodiversity Impact Assessment Sensitivity: Low	Yes	A Terrestrial Ecology Impact Assessment is included in Appendix D1. This assessment has been undertaken in terms of the Protocols of GNR320 – refer to the content of the report.

Aquatic Biodiversity Impact Assessment Sensitivity: Low	Yes	A Wetland Impact and Risk Assessment is included in Appendix D8. This assessment has been undertaken in terms of the Protocols of GNR320 – refer to the content of the report.
Civil Aviation Assessment Sensitivity: Low	No	The Civil Aviation Authority has been consulted regarding the development of the project since the commencement of the BA Process. No specific negative impacts or issues have been raised to date by the CAA regarding the project and therefore no Civil Aviation Assessment has been undertaken. The project is also not located within an area considered to be of a medium or high sensitivity.
Defence Assessment Sensitivity: Low	No	The sensitivity for the entire extent of the site is low and therefore no assessment has been included.
RFI Assessment Sensitivity: Low	No	The RFI theme sensitivity is low for the entire extent of the project. The South African Radio Astronomy Observatory (SARAO) has been consulted regarding the development of the project since the commencement of the EIA Process. No specific negative impacts or issues have been raised to date by the SARAO regarding the project. The project is also not located within an area considered to be of a medium or high sensitivity.
Geotechnical Assessment Sensitivity: Not indicated	No	The Geotechnical Assessment will be undertaken by the Applicant as

		part of the micro-siting process for the development.
Socio-Economic Assessment Sensitivity: Not indicated	Yes	A Social Impact Assessment is included in Appendix D7.
Plant species Assessment Sensitivity: Medium	Yes	Refer to Appendix D1. The Terrestrial Ecology Impact Assessment also includes the relevant Plant Species Assessment. This assessment has been undertaken in terms of the Protocols of GNR320 – refer to the content of the report.
Animal Species Assessment Sensitivity: High	Yes	Refer to Appendix D1. The Terrestrial Ecology Impact Assessment also includes the relevant Animal Species Assessment. This assessment has been undertaken in terms of the Protocols of GNR320 – refer to the content of the report.

Further to the above it must be noted that the Screening Report indicated a rating of high and very high sensitivity for the avian theme of the area, however the screening report did not indicate that an Avifauna Impact Assessment must be undertaken. The EAP has however ensured that an Avifauna Impact Assessment is undertaken for the development based on the sensitivity of the area which is in line with the Best Practice Guidelines for Solar Development from BirdLife SA. The Avifauna Impact Assessment is included as Appendix D2 of the Basic Assessment Report.

1.6 STRUCTURE OF THE REPORT

This report is structured in accordance with the prescribed contents stipulated in Appendix 1 of Regulation No.326. It consists of seven sections demonstrating compliance to the specifications of the regulations as illustrated in Table 1.4.

Table 1.4: Structure of the report

Requirements for the contents of a BAR as specified in the Regulations		Section in report
Appendix 1. (3) - A basic assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include-		
(a)	details of -	1
	(i) the EAP who prepared the report; and	
	ii) the expertise of the EAP, including a curriculum vitae.	
(b)	the location of the activity, including-	2
	(i) the 21-digit Surveyor General code of each cadastral land parcel;	
	(ii) where available, the physical address and farm name;	
	(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	
(c)	a plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is-	
	(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or	
	(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	
(d)	a description of the scope of the proposed activity, including-	
	(i) all listed and specified activities triggered and being applied for; and	
	(ii) a description of the activities to be undertaken including associated structures and infrastructure.	
(e)	a description of the policy and legislative context within which the development is proposed including:	3
	(i) An identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are applicable to this activity and have been considered in the preparation of the report; and	

	(ii) How the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks and instruments;	
(f)	a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;	4
(g)	A motivation for the preferred site, activity and technology alternative.	5
(h)	a full description of the process followed to reach the preferred alternative within the site including –	
	(i) details of all the alternatives considered;	
	(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	
	(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them.	
	(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	
	(v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated;	6 & 7
	(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;	
	(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	
	(viii) the possible mitigation measures that could be applied and level of residual risk;	
	(ix) the outcomes of the site selection matrix;	

	(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and	
	(xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity;	
(i)	a full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including -	
	(i) a description of all environmental issues and risks that were identified during the EIA process; and	
	(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.	
(j)	an assessment of each identified potentially significant impact and risk, including-	
	(i) cumulative impacts;	
	(ii) the nature, significance and consequences of the impact and risk;	
	(iii) the extent and duration of the impact and risk;	
	(iv) the probability of the impact and risk occurring;	
	(v) the degree to which the impact and risk can be reversed;	
	(vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and	
	(vii) the degree to which the impact and risk can be mitigated;	
(k)	where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;	6
(l)	an environmental impact statement which contains-	8
	(i) a summary of the key findings of the environmental impact assessment:	
	(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and	

	(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	
(m)	based on the assessment, and where applicable, impact management measures from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr;	
(n)	Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	Not applicable
(o)	a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	8
(p)	a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	
(q)	where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded, and the post construction monitoring requirements finalised;	Not applicable
(r)	an undertaking under oath or affirmation by the EAP in relation to-	Appendix A to the report
	(i) the correctness of the information provided in the report;	
	(ii) the inclusion of comments and inputs from stakeholders and interested and affected parties (I&APs);	
	(iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and	
	(iv) any information provided by the EAP to I&APs and any responses by the EAP to comments or inputs made by I&APs; and	
(s)	where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	Not applicable
(t)	any specific information that may be required by the CA; and	Not applicable
(u)	any other matters required in terms of section 24(4)(a) and (b) of the Act.	Not applicable

2 ACTIVITY DESCRIPTION

This section aims to address the following requirements of the regulations:

Appendix 1. (3) An BAR (...) must include-

(b) the location of the activity, including-

(i) the 21-digit Surveyor General code of each cadastral land parcel;

(ii) where available, the physical address and farm name;

(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;

(c) a plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is-

(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or

(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;

(d) a description of the scope of the proposed activity, including-

(i) all listed and specified activities triggered and being applied for;

(ii) a description of the associated structures and infrastructure related to the development.

2.1 THE LOCATION OF THE ACTIVITY AND PROPERTY DESCRIPTION

The activity entails the development of a photovoltaic solar energy facility, battery energy storage system and associated infrastructure on the Remaining Extent of the Farm Droogfontein No. 62, Registration Division Kimberley. The affected property is located within Ward 29 of the Sol Plaatje Local Municipality and the larger Frances Baard District Municipality of the Northern Cape Province (refer to Figure B for the regional map). The town of Kimberley is located approximately 12 km south of the proposed development (which is the larger town) and the small town of Riverton is located directly to the north of the affected property (refer to Figure A for the locality map).

The project entails the generation of up to 200MW (direct current) electrical power through photovoltaic (PV) technology. The total development footprint of the project will be approximately 300 hectares (including the BESS, grid connection infrastructure and supporting infrastructure on site) – refer to Table 2.1 for general site information. The property on which the facility is to be constructed will be leased by Genesis Droogfontein (Pty) Ltd from the property

owner, Droogfontein Communal Property Association[2], for the lifespan of the project (minimum of 20 years).

Table 2.1: General site information

Description of affected farm portion	Solar Energy Facility Remaining Extent of the Farm Droogfontein No. 62 Grid Connection Solution Remaining Extent of the Farm Droogfontein No. 62 Portion 1 of the Farm Droogfontein No. 62 – underground cabling
Province	Northern Cape
District Municipality	Frances Baard District Municipality
Local Municipality	Sol Plaatjie Local Municipality
Ward numbers	29
Closest towns	The town of Kimberley is located approximately 12 km south of the proposed development, and the small town of Riverton is located directly to the north of the affected property. The Roodepan settlement area is located approximately 5km south west of the site.
21 Digit Surveyor General codes	Remaining Extent of the Farm Droogfontein No. 62 - C03700000000006200000 Portion 1 of the Farm Droogfontein No. 62 - C03700000000006200001
Type of technology	Photovoltaic solar facility
Structure Height	Panels up to 3m, buildings ~ 4m, power line ~32m, BESS ~3.5m
Surface area to be covered (Development footprint)	Approximately 300 ha
Structure orientation	Tracking PV with bi-facial panels. Bi-facial panels with single axis tracking is preferred over fixed-axis or double

[2] The landowner is a beneficiary of the Government's Restitution Program and the beneficiation will flow to the beneficiaries of the Droogfontein Communal Property Association. Note also that some of the Droogfontein Communal Property Association members are employed by the owners of the neighbouring existing solar energy facilities namely, Droogfontein 1 and Droogfontein 2.

	axis tracking systems and mono-facial panels due to the potential to achieve higher annual energy yields whilst minimising the balance of system (BOS) costs, resulting in the lowest levelized cost of energy (LCOE). The development of the solar energy facility will take into consideration during the final design phase the use of either mono-facial or bi-facial PV panels as well as tracker vs fixed- tilt mounting structures. Both options are considered feasible for the site.
Generation capacity	Direct Current – up to 200MW Alternating Current – up to 180MW

The site is located in a rural area to the north of Kimberley and is bordered by farms where mainly agricultural activities are undertaken. The municipal area is known for mining activities, with mining considered as the primary sector. Refer to the plates provided in the final BAR for photographs.

Further the to the above the actual affected property and the directly adjacent property (to the left) has already been transformed by the development of two solar energy facilities. The existing Droogfontein 1 Solar Power Plant is located within the Remaining Extent of the Farm Droogfontein No. 62 and is located directly to the east and south-east of the two alternative development areas under assessment. Refer to Figure 2.1. The Droogfontein 1 Solar Power Plant is owned and operation by Globeleq South Africa Management Services (Pty) Ltd.

The existing Droogfontein 2 Solar PV Park is located on the directly adjacent property to the left, i.e. Portion 1 of the Farm Droogfontein No. 62. This development is owned and operated by African Infrastructure Investment Managers (AIIM) (Pty) Ltd. Furthermore, the proposed Droogfontein 5 Solar and Battery Storage Energy Facility project is also proposed on Portion 1 of the Farm Droogfotein No. 62. The Basic Assessment process for this development is also being undertaken by Environamics. Refer to Figure 2.1.

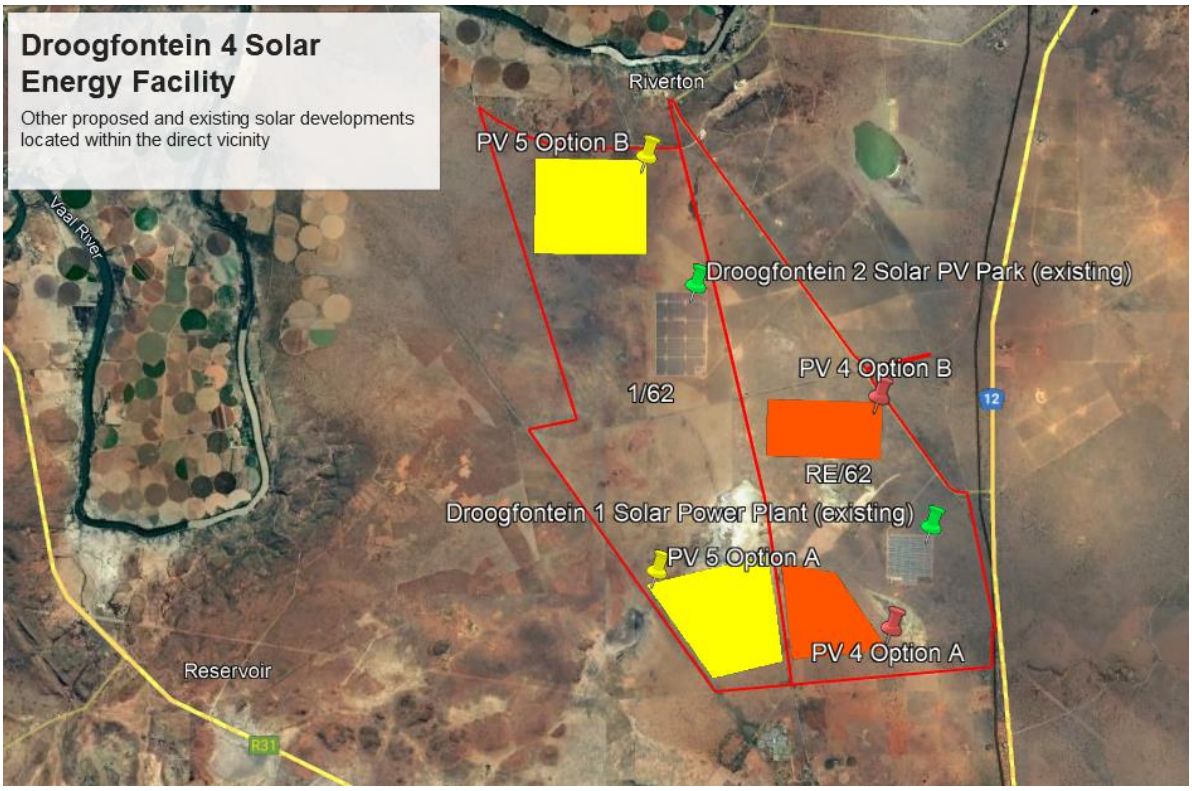


Figure 2.1: Other proposed and existing solar development located within the direct vicinity of the proposed Droogfontein 4 SEF (two orange blocks = development area alternatives for the Droogfontein 4 SEF; two yellow blocks = development area alternatives for the Droogfontein 5 SEF)

2.2 ACTIVITY DESCRIPTION

The proposed development will trigger the following activity:

Table 2.2: Listed activities

Relevant notice:	**Activity No (s)**	**Description of each listed activity as per project description**:
GNR. 327 (as amended in 2017)	Activity 11(i)	• *"The development of facilities or infrastructure for the transmission and distribution of electricity (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts."* • Activity 11(i) is triggered as the proposed photovoltaic solar energy facility will transmit and distribute electricity of 132 kilovolts outside an urban area. The grid connection infrastructure includes a 132kV power line to connect the

		facility from a new on-site facility substation / 132kV collector substation to the national grid. Two grid connection corridors, each with a width of up to 300m, have been identified for the assessment and placement of the power line (i.e., the power line will be developed within one of the proposed corridors) to connect to one of the grid connection points available within the affected property. The two grid connection points available includes the Boundary-Olien 1 275kV Power Line and the Elk-Weir 1 132kV Power Line. Connection to either of these existing power lines will be via a loop-in loop-out connection.
GNR. 327 (as amended in 2017)	Activity 12(ii)(c)	• *"The development of (ii) infrastructure or structures with a physical footprint of 100 square meters or more (c) within 32 meters of a watercourse, measured from the edge of a watercourse."* • Activity 12(ii)(c) is triggered since the two alternative development areas are located within 32m of depression wetlands located just outside of the two respective development areas under assessment. Artificial wetlands are also present within the grid connection corridor.
GNR. 327 (as amended in 2017)	Activity 14	• *"The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres."* • Activity 14 is triggered since the proposed development will need to develop infrastructure for the storage and handling of dangerous goods (diesel) in containers with combined capacity of 90 cubic metres, but can be up to 100 cubic meters. The capacity will not exceed 500 cubic metres.
GNR. 327 (as amended in 2017)	Activity 19	• *"The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil sand, shells, shell grit, pebbles or rock of more than 10 cubic meters from a watercourse"*

		• Activity 19 is triggered since artificial wetlands are present within the grid connection corridor. This will require the removal and moving of soils of more than 10 cubic meters.
GNR. 327 (as amended in 2017)	Activity 24(ii)	• *"The development of a road (ii) with reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 meters;"* • Activity 24(ii) is triggered as the internal roads will vary between 8 and 12 meters in width. The internal roads will be 8m in width and the perimeter road will be up to 12m in width.
GNR. 327 (as amended in 2017)	Activity 28(ii)	• *"Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare."* • Activity 28(ii) is triggered as portions of the affected farm has been previously used for grazing and the property will be re-zoned to "Electricity, Utility or Industrial" use. The development footprint of the solar energy facility and associated infrastructure will be up to 300 hectares.
GNR. 327 (as amended in 2017)	Activity 56 (ii)	• *"The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre (ii) where no reserve exists, where the existing road is wider than 8 metres…"* • Activity 56 (ii) is triggered as the existing access to the affected property does not have a reserve and will need to be widened by more than 6 metres for the construction and operation of the solar energy facility.
GNR. 325 (as amended in 2017)	Activity 1	• *"The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more."* • Activity 1 is triggered since the proposed photovoltaic solar energy facility will have a generation capacity of up to 200MW (direct current) and an alternating current of up

		to 180MW of electricity through the use of a renewable energy resource.
GNR. 325 (as amended in 2017)	Activity 15	• *"The clearance of an area of 20 hectares or more of indigenous vegetation."* • In terms of vegetation type the site falls within the Kimberley Thornveld which is described by Mucina and Rutherford (2006) as Least Threatened. Activity 15 is triggered since portions of the site have not been lawfully disturbed during the preceding ten years; therefore, more than 20 hectares of indigenous vegetation will be removed. The development footprint of the solar energy facility and associated infrastructure will be up to 300 hectares.
GNR. 324 (as amended in 2017)	Activity 18 (g)(ii)(ii)	• *"The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre (g) in the Northern Cape (ii) outside urban areas and (ii) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland."* • Activity 18 (g)(ii)(ii) is triggered since the existing access road to the site will need to be widened by more than 4 metres. The project is located within the Northern Cape Province and falls outside of an urban area. The two alternative development areas are located within 100m of depression wetlands located just outside of the two respective development areas under assessment. Artificial wetlands are also present within the grid connection corridor.

The potentially most significant impacts will occur during the construction phase of the development, which will include the following activities:

- Site clearing and preparation: Certain areas of the site will need to be cleared of vegetation and access to the site will need to be constructed and confirmed, as required.
- Civil works to be conducted:
    - Terrain levelling if necessary – Levelling will be minimal as the potential site chosen is relatively flat.

- Laying foundation - The structures will be connected to the ground through cement pillars, cement slabs or metal screws. The exact method will depend on the detailed geotechnical analysis.
- Construction of access roads/paths – Existing paths will be used were reasonably possible. A short access road to the facility will be constructed from the existing gravel roads off the tarred Riverton Road. Additionally, the turning circle for trucks will also be taken into consideration.
- Trenching – all Direct Current (DC) and Alternating Current (AC) wiring within the PV plant will be buried underground. Trenches will have a river sand base, space for pipes, backfill of sifted soil and soft sand and concrete layering where vehicles will pass.

2.3 PHOTOVOLTAIC TECHNOLOGY

The term photovoltaic describes a solid-state electronic cell that produces direct current electrical energy from the radiant energy of the sun through a process known as the Photovoltaic Effect. This refers to light energy placing electrons into a higher state of energy to create electricity. Each PV cell is made of silicon (i.e. semiconductors), which is positively and negatively charged on either side, with electrical conductors attached to both sides to form a circuit. This circuit captures the released electrons in the form of an electric current (direct current). The key components of the proposed project are described below:

- PV Panel Array - To produce up to 200MW direct current and up to 180MW alternating current, the proposed SEF will require numerous linked cells placed behind a protective glass sheet to form a panel. Multiple panels will be required to form the solar PV arrays which will comprise the PV facility. The PV panels will be tilted in order to capture the most sun or using axis tracker structures to follow the sun to increase the Yield.

- Wiring to Inverters - Sections of the PV array will be wired to inverters. The inverter is a pulse width mode inverter that converts direct current (DC) electricity to alternating current (AC) electricity at grid frequency.

- Connection to the grid - Connecting the array to the electrical grid requires transformation of the voltage from 480V to 33kV to 132kV. The normal components and dimensions of a distribution rated electrical substation will be required. Output voltage from the inverter is approximately 480V and this is fed into step up transformers to 132kV. An onsite facility substation and switching stations will be required on the site to step the voltage up to 132kV, after which the power will be evacuated into the national grid via the proposed new collector substation and power line. The power line route will be assessed within a 300m wide corridor.

  As there are two alternative development areas proposed for the placement of the project development footprint, the developer has identified a suitable grid connection corridor for each of the development areas which connects the facility to an existing

power line located near to the development area. All grid connection corridors have a width of 300m.

Should development area Option A be developed the power line route will be approximately 600m in length and will connect the facility to the existing Boundary-Olien 1 275kV power line located directly to the south. The connection will be via a loop-in loop-out connection.

Should development area Option B be developed the power line route will be approximately 1km in length and will connect the facility to the existing Elk-Weir 1 132kV power line located directly to the south. The connection will be via a loop-in loop-out connection.

The respective grid connection solutions proposed for each of the alternative development areas are considered to be feasible from a technical and capacity perspective and provides an opportunity for limited linear disturbance within the landscape based on the limited power line infrastructure proposed to be developed.

Refer to the Figure 2.2 below.

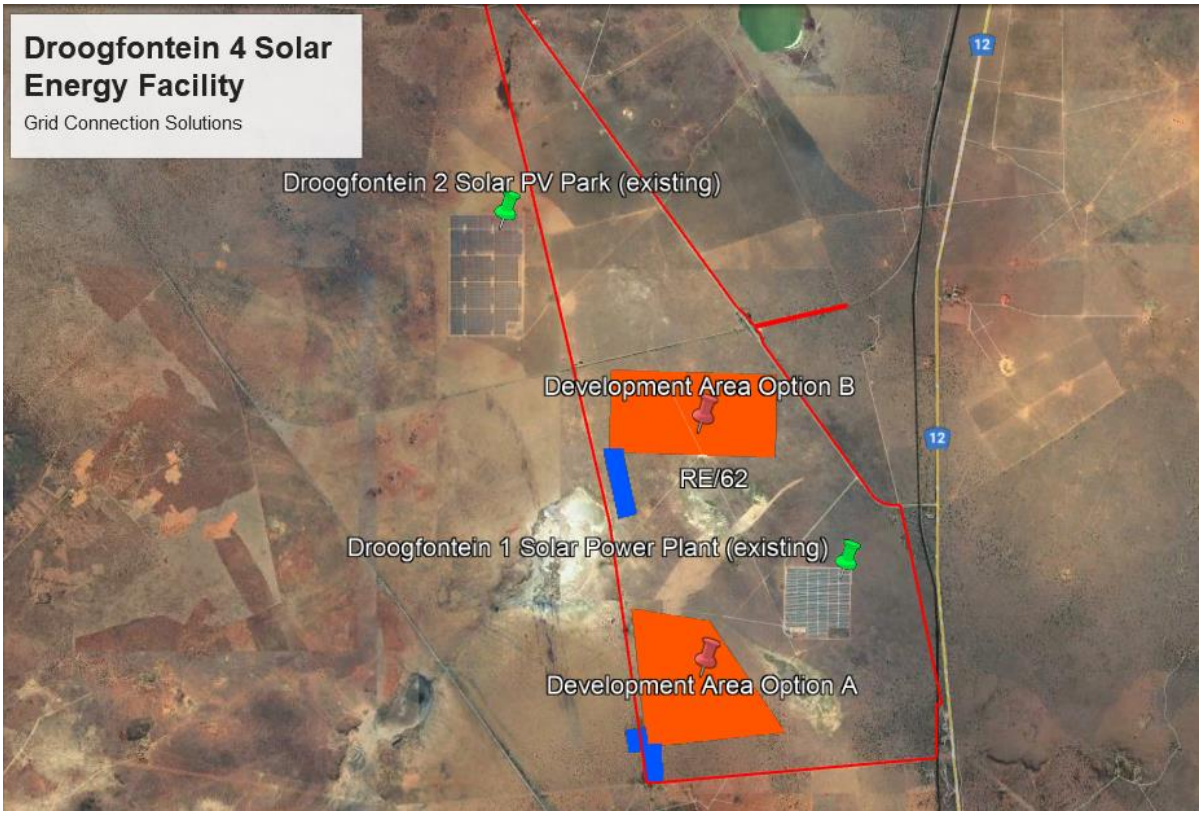


Figure 2.2: Proposed grid connection corridors (indicated in blue) associated with each of the development area options

- Electrical reticulation network – An internal electrical reticulation network will be required and will be lain ~2-4m underground as far as practically possible.
- Supporting Infrastructure – The following auxiliary buildings with basic services including water and electricity will be required:
    - Administration Office (~300m²);
    - Switch gear and relay room (~400m²);
    - Staff lockers and changing room (~200m²);
    - Security control (~60m²);
    - Operations & Maintenance (O&M) room; and
    - Warehouse.
- Battery Energy Storage System (BESS) – The battery energy storage system will make use of Lithium-ion as a preferred technology and will have a capacity of up to 40MW. The extent of the system will be 20m long, 23m high, 2.5m wide. The containers may be single stacked only to reduce the footprint. There may be up to a maximum of 40 containers of BESS. The containers will include cells, HVAC, fire, safety and control systems and will comprise of Lithium-Ion technology providing a maximum capacity of 50MW in total.
- Roads – Access will be obtained via the tarred Riverton Road and various gravel farm roads within the area and affected property. An internal site road network will also be required to provide access to the solar field and associated infrastructure. Roads are expected to be between 8m and 12m wide.
- Fencing - For health, safety and security reasons, the facility will be required to be fenced off from the surrounding farm. Fencing with a maximum height of 3 meters will be used.

2.4 LAYOUT DESCRIPTION

The layout plan will consider and adhere to the limitations of the site and aspects such as environmentally sensitive areas, roads, fencing and servitudes on site. The total surface area covered by the layout include the PV panel arrays (spaced to avoid shadowing), access and maintenance roads, buildings, power inverters, power lines, underground cabling, onsite substation and switching stations, collector substation, BESS and perimeter fences). Limited environmental features of significance exist on site, which includes wetland depressions, which are located directly adjacent to the two development area alternatives. A layout plan is included in Appendix H in the report which indicates the layouts assessed for this development. Table 2.3 below provides detailed information regarding the layout for the proposed facility as per DFFE requirements.

Table 2.3: Technical details for the proposed facility

Component	Description / dimensions
Height of PV panels	Up to 3 meters
Area of PV Array	Up to 200 hectares (within the 300ha development footprint)
Number of inverters required	To be determined as part of the final facility layout design.
Area occupied by inverter / transformer stations / substations	On-site Facility Substation: up to 3ha Collector Substation: up to 3ha BESS: up to 5ha
Capacity of the on-site substation	33kV / 132kV
Capacity of the collector substation	33kV / 132kV
Capacity of the power line	33kV / 132kV
Area occupied by both permanent and construction laydown areas	Up to 3 hectares
Area occupied by buildings	• Administration Office (~300m²); • Switch gear and relay room (~400m²); • Staff lockers and changing room (~200m²); • Security control (~60m²);
Width of internal roads	Between 8 and 12 meters
Grid connection corridor width	300m
Grid connection corridor length – as associated with each development area alternative	Option A: up to 600m Option B: up to 1km
Power line servitude width	Up to 32m
Height of fencing	Approximately 3 meters

Table 2.4 provides the coordinate points for the two development area alternatives, associated infrastructure and the respective grid connection corridors.

Table 2.4: Coordinates

Coordinates – Option A Development Area			
Development Area	A	S 28° 36' 45.77445290"	E 24° 43' 24.89294920"
	B	S 28° 36' 51.65179729"	E 24° 44' 07.06401585"
	C	S 28° 37' 42.82463024"	E 24° 43' 32.20243972"
	D	S 28° 37' 44.55711765"	E 24° 44' 48.18675761"
Proposed Access Road – bend points	A	S 28° 38' 09.30234083"	E 24° 43' 32.02392886"
	B	S 28° 37' 55.26927906"	E 24° 43' 30.67123294"

	C	S 28° 37' 47.30550679"	E 24° 43' 18.13191420"
	D	S 28° 37' 45.09641774"	E 24° 43' 34.65754529"
	E	S 28° 37' 45.90269350"	E 24° 43' 28.61349097"
Battery Energy Storage System (BESS)	A	S 28° 37' 47.87214165"	E 24° 43' 37.13714244"
	B	S 28° 37' 47.50861920"	E 24° 43' 40.63727224"
	C	S 28° 37' 51.24965327"	E 24° 43' 37.51386350"
	D	S 28° 37' 50.88612764"	E 24° 43' 41.01399474"
On-site Facility Substation	A	S 28° 37' 46.21727442"	E 24° 43' 32.94180502"
	B	S 28° 37' 45.86119802"	E 24° 43' 36.44275717"
	C	S 28° 37' 48.92941649"	E 24° 43' 33.23468669"
	D	S 28° 37' 48.56416215"	E 24° 43' 36.73462371"
Collector Substation / Switching Station	A	S 28° 37' 48.94412557"	E 24° 43' 33.23480812"
	B	S 28° 37' 48.58677956"	E 24° 43' 36.73562428"
	C	S 28° 37' 51.62629950"	E 24° 43' 33.55119193"
	D	S 28° 37' 51.28698606"	E 24° 43' 37.05393268"
Grid Connection Corridor (including underground cabling)	A	S 28°37'44.21"	E 24°43'20.98"
	B	S 28°37'42.69"	E 24°43'32.37"
	C	S 28°37'50.72"	E 24°43'33.58"
	D	S 28°37'50.31"	E 24°43'40.71"
	E	S 28°38'8.74"	E 24°43'42.10"
	F	S 28°38'9.40"	E 24°43'31.63"
	G	S 28°37'54.25"	E 24°43'30.47"
	H	S 28°37'55.42"	E 24°43'22.42"
Coordinates – Option B Development Area			
Development Area	A	S 28° 34' 50.10558504"	E 24° 43' 14.09915615"
	B	S 28° 34' 52.22994525"	E 24° 44' 35.49320099"
	C	S 28° 35' 28.07352575"	E 24° 43' 16.93415943"

	D	S 28° 35' 31.11592052"	E 24° 44' 43.12049159"
Proposed Access Road	<u>Start:</u> S 28° 34' 44.49238645"		E 24° 44' 42.02964643"
	<u>Middle:</u> S 28° 34' 46.83405137"		E 24° 44' 37.82448659"
	<u>End:</u> S 28° 34' 54.02896814"		E 24° 44' 35.88633811"
Battery Energy Storage System (BESS)	A	S 28° 35' 19.45456659"	E 24° 43' 13.01784942"
	B	S 28° 35' 19.60058343"	E 24° 43' 16.53487456"
	C	S 28° 35' 22.84720072"	E 24° 43' 12.86647395"
	D	S 28° 35' 22.99322224"	E 24° 43' 16.38350407"
On-site Facility Substation	A	S 28° 35' 23.16648761"	E 24° 43' 12.87534085"
	B	S 28° 35' 23.29898386"	E 24° 43' 16.39294306"
	C	S 28° 35' 25.89014700"	E 24° 43' 12.76174305"
	D	S 28° 35' 26.01342459"	E 24° 43' 16.27970663"
Collector Substation / Switching Station	A	S 28° 35' 25.93144663"	E 24° 43' 12.75930191"
	B	S 28° 35' 26.03534777"	E 24° 43' 16.27793675"
	C	S 28° 35' 28.62929141"	E 24° 43' 12.69594169"
	D	S 28° 35' 28.75131001"	E 24° 43' 16.21395237"
Grid Connection Corridor	A	S 28°35'27.79"	E 24°43'9.39"
	B	S 28°35'27.56"	E 24°43'19.90"
	C	S 28°35'30.57"	E 24°43'19.83"
	D	S 28°35'59.26"	E 24°43'27.32"
	E	S 28°36'1.51"	E 24°43'16.94"
	F	S 28°35'31.05"	E 24°43'9.32"

2.5 SERVICES PROVISION

The following sections provides information on services required on the site e.g. water, sewage, refuse removal, and electricity.

2.5.1 Water

Adequate provision of water will be a prerequisite for the development. Water for the proposed development will most likely be obtained from the local municipality, or alternatively from ground water resources. The Local Municipality has been requested by the Applicant to confirm the water resource availability for the development of the project in order to ensure sustainable water supply. It is foreseen that water use authorisation from the Department of Water and Sanitation would be required by the development. A full assessment of the application for water use authorisation will only be undertaken in the event that the project proponent has obtained preferred bidder status by the Department of Mineral Resources and Energy for the development of the project or is successful in any other generation opportunities/programmes.

The estimated maximum amount of water required during construction is 15 200m³ during the 12-18 months of construction. The estimated maximum amount of water required during the facility's 20-25 years of production is 5050m³ per annum. The majority of this usage is for the cleaning of the solar panels during the operation phase. Each panel requires approximately 2 litres of water for cleaning. It is estimated that the panels may only need to be washed twice per annum, but provision is made for quaternary cleaning, where required.

Drinking water supplied will comply with the SANS:241 quality requirements and it is noted that the Sol Plaatje Local Municipality remains the Water Service Authority in the area.

Water saving devices and technologies such as the use of dual flush toilets and low-flow taps, the management of stormwater, the capture and use of rainwater from gutters and roofs would be considered by the developer. Furthermore, indigenous vegetation will be used during landscaping and the staff will be trained to implement good housekeeping techniques.

2.5.2 Stormwater

To avoid soil erosion, it is recommended that the clearing of vegetation be limited. Stormwater management and mitigation measures are included in the Environmental Management Programme (EMPr) – refer to Appendix E.

2.5.3 Sanitation and waste removal

Portable chemical toilets will be utilised, that will be serviced privately or by the local municipality. Waste will be disposed of at a licensed landfill site. The construction- and hazardous waste will be removed and disposed of at licensed landfill sites accepting such kinds of wastes. During the operational phase household waste will be removed to a licensed landfill site by a private contractor or by the local municipality. The relevant Local Municipality(s) will be contacted by the proponent, to formally confirm that it has the capacity to provide the proposed development with these services for the lifetime of the project (20-25 years).

2.5.4 Electricity

During the construction phase of the development, electricity will either be generated on site through a small solar system or through the use of generators or the existing Eskom supply on the farm will be utilised. This will depend on the Engineering, Procurement, and Construction (EPC) contractor appointed. During operation electricity use will be limited and will primarily be related to the lighting of the facility and domestic use. Design measures such as the use of energy saving light bulbs will be considered by the developer. During the day, electricity will be sourced from the photovoltaic plant, and from the electricity connection at night.

2.6 Decommissioning of the facility

The operating period will be 20-25 years from the commencement date of the operation phase. Thereafter two rights of renewal periods of 40 years and 20 years will be relevant. It is anticipated that new PV technologies and equipment will be implemented, within the scope of the Environmental Authorisation, when influencing the profitability of the solar facility.

A likely extension of the plant's lifetime would involve putting new, more efficient, solar panels on the existing structures to improve the efficiency of the solar energy facility as the technology improves. The specifications of these new panels will be the same as the current panels under consideration, but the conversion efficiency of sunlight to energy will be greater (comparable to new computer chips, that are the same, but faster and more efficient). If, for whatever reason the plant halts operations, the Environmental Authorisation and contract with the landowner will be respected during the decommissioning phase.

The decommissioning process will consist of the following steps:

- The PV facility would be disconnected from the Eskom grid.
- The inverters and PV modules would be disconnected and disassembled.
- Concrete foundations (if used) would be removed and the structures would be dismantled.
- The BESS will be disposed of in a suitable manner and through the use of the relevant disposal facility.
- Wastewater storage conservancy tank would be responsibly removed (if relevant) and the area would be rehabilitated.
- The underground cables would be unearthed and removed and buildings would be demolished and removed.
- The fencing would be dismantled and removed.
- The roads can be retained should the landowner choose to retain them, alternatively the roads will be removed and the compaction will be reversed.

- Most of the wires, steel and PV modules are recyclable and would be recycled to a reasonable extent. The Silicon and Aluminium in PV modules can be removed and reused in the production of new modules.
- Any rubble and non-recyclable materials will be disposed of at a registered landfill facility.

The rehabilitation of the site would form part of the decommissioning phase. The aim would be to restore the land to its original form (or as close as possible). The rehabilitation activities would include the following:

- Removal of all structures and rubble;
- Breaking up compaction where required, loosening of the soil and the redistribution of topsoil; and
- Restoration of the surface to the original contours and application of hydro seeding.

3 LEGISLATIVE AND POLICY CONTEXT

This section aims to address the following requirements of the regulations:

Appendix 1. (3) A BAR (...) must include-

(e) a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context.

3.1 INTRODUCTION

Environmental decision making with regards to solar PV plants and associated infrastructure is based on numerous policy and legislative documents. These documents inform decisions on project level environmental authorisations issued by the National Department of Forestry, Fisheries and the Environment (DFFE) as well as comments from local and district authorities. Moreover, it is significant to note that they also inform strategic decision making reflected in IDPs and SDFs. Therefore, to ensure streamlining of environmental authorisations it is imperative for the proposed activity to align with the principles and objectives of key national, provincial and local development policies and legislation. The following acts and policies and their applicability to the proposed development are briefly summarised:

- The Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996)
- National Environmental Management Act, 1998 (Act No. 107 of 1998) [NEMA]
- The National Energy Act, 2008 (Act 34 of 2008)
- National Water Act, 1998 (Act No. 36 of 1998)
- National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
- National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)
- The National Heritage Resources Act, 1999 (Act No. 25 of 1999)
- Conservation of Agricultural Resources Act, 1983 (Act No. 85 of 1983)
- Minerals and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA)
- The National Forests Act, 1998 (Act 84 of 1998)
- Northern Cape Nature Conservation Act (Act No. 9 of 2009)
- Astronomy Geographic Advantage Act (Act No. 21 of 2007)
- The White Paper on the Energy Policy of the Republic of South Africa (1998)
- The White Paper on Renewable Energy (2003)
- Integrated Resource Plan (IRP) for South Africa (2010-2030)

- National Development Plan of 2030
- National Infrastructure Plan of South Africa
- New Growth Path Framework
- International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability, January 2012
- The Equator Principles III, June 2013
- Strategic Environmental Assessment (SEA) for wind and solar PV Energy in South Africa (2014)
- Northern Cape Provincial Spatial Development Framework (PSDF), 2012
- Frances Baard District Municipality Spatial Development Framework (SDF), 2014-2019
- Frances Baard District Municipality Integrated Development Plan (IDP), 2017/18 – 2021/22
- Sol Plaatje Local Municipality Draft Spatial Development Framework (SDF), 2018-2023
- Sol Plaatje Local Municipality Integrated Development Plan (IDP), 2022-2027

The key principles and objectives of each of the legislative and policy documents are briefly summarised in Tables 3.1 and 3.2 to provide a reference framework for the implications for the proposed activity.

3.2 LEGISLATIVE CONTEXT

Table 3.1: Legislative context for the construction of photovoltaic solar energy facilities

LEGISLATION	ADMINISTERING AUTHORITY	DATE	SUMMARY / IMPLICATIONS FOR PROPOSED DEVELOPMENT
The Constitution of South Africa **(Act No. 108 of 1996)**	National Government	1996	The Constitution is the supreme law of the Republic and all law and conduct must be consistent with the Constitution. The Chapter on the Bill of Rights contains a number of provisions, which are relevant to securing the protection of the environment. Section 24 states that "everyone has the right to (a) an environment that is not harmful to their health or well-being and (b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that – (i) prevent pollution and ecological degradation; (ii) promote conservation; and (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development. The Constitution therefore, compels government to give effect to the people's environmental right and places government under a legal duty to act as a responsible custodian of the country's environment. It compels government to pass legislation and use other measures to protect the environment, to prevent pollution and ecological degradation, promote conservation and secure sustainable development. The development of the Droogfontein 4 SEF and the aspects related thereto considers the creation of an environment which is not harmful or degraded through the implementation of appropriate mitigation measures.
The National Environmental Management Act **(Act No. 107 of 1998)**	National Department of Forestry, Fisheries and the Environment (DFFE) and the Northern Cape Department of Agriculture, Environmental	1998	NEMA provides for co-operative governance by establishing principles and procedures for decision-makers on matters affecting the environment. An important function of the Act is to serve as an enabling Act for the promulgation of legislation to effectively address integrated environmental management. Some of the principles in the Act are accountability; affordability; cradle to grave management; equity; integration; open information; polluter pays; subsidiary; waste avoidance and minimisation; co-operative governance; sustainable development; and environmental protection and justice.

	Affairs, Rural Development and Land Reform		The mandate for EIA lays with the National Environmental Management Act (107 of 1998) and the EIA Regulations No. 324, 325, 326, and 327 promulgated in terms of Section 24 of NEMA. The EIA Regulations determine that an Environmental Authorisation is required for certain listed activities, which might have a detrimental effect on the environment. The BA process undertaken for the Droogfontein 4 SEF is in-line with the requirements of NEMA for the Application for Environmental Authorisation.
The National Energy Act (Act No. 34 of 2008)	Department of Mineral Resources and Energy	2008	One of the objectives of the National Energy Act was to promote diversity of supply of energy and its sources. In this regard, the preamble makes direct reference to renewable resources, including solar: "To ensure that diverse energy resources are available, in sustainable quantities, and at affordable prices, to the South African economy, in support of economic growth and poverty alleviation, taking into account environmental management requirements (…); to provide for (…) increased generation and consumption of renewable energies…" (Preamble). Considering that the Droogfontein 4 SEF is proposed to make use of PV technology and the solar resource for the generation of electricity, the proposed project is in-line with the Act.
The National Water Act (Act No. 36 of 1998)	Department of Water and Sanitation (DWS)	1998	Sustainability and equity are identified as central guiding principles in the protection, use, development, conservation, management and control of water resources. The intention of the Act is to promote the equitable access to water and the sustainable use of water, redress past racial and gender discrimination, and facilitate economic and social development. The Act provides the rights of access to basic water supply and sanitation, and environmentally, it provides for the protection of aquatic and associated ecosystems, the reduction and prevention of pollution and degradation of water resources. As this Act is founded on the principle that National Government has overall responsibility for and authority over water resource management, including the equitable allocation and beneficial use of water in the public interest, a person can only be entitled to use water if the use is permissible under the Act. Chapter 4 of the Act lays the basis for regulating water use. The affected property is divided into two quaternary catchments C91E and C91D within the Vaal Water Management Area (WMA).

			A General Authorisation (GN 509 of 2016) is required for the water use authorisation due to the presence of depression wetlands located near the proposed development. This is as per the findings of the Wetland Risk and Impact Assessment Report (Appendix D8).
National Environmental Management: Waste Act **(Act No. 59 of 2008)**	National Department of Forestry, Fisheries and the Environment (DFFE)	2008	NEMWA has been developed as part of the law reform process enacted through the White Paper on Integrated Pollution and Waste Management and the National Waste Management Strategy (NWMS). The objectives of the Act relate to the provision of measures to protect health, well-being and the environment, to ensure that people are aware of the impact of waste on their health, well-being and the environment, to provide for compliance with the measures, and to give effect to section 24 of the Constitution in order to secure an environment that is not harmful to health and well-being. Regulations No. R921 (of 2013) promulgated in terms of Section 19(1) of the National Environmental Management: Waste Act (59 of 2008) determines that no person may commence, undertake or conduct a waste management activity listed in this schedule unless a license is issued in respect of that activity. It is not envisaged that a waste permit will be required for the proposed SEF as no listed activities in terms of waste management are expected to be triggered. .
National Environment Management: Air Quality Act **(Act No. 39 of 2004)**	National Department of Forestry, Fisheries and the Environment (DFFE)	2004	The object of this Act is to protect the environment by providing reasonable measures for the protection and enhancement of the quality of air in the Republic; the prevention of air pollution and ecological degradation; and securing ecologically sustainable development while promoting justifiable economic and social development. Regulations No. R248 (of 31 March 2010) promulgated in terms of Section 21(1)(a) of the National Environmental Management Act: Air Quality Act (39 of 2004) determine that an Atmospheric Emission License (AEL) is required for certain listed activities, which result in atmospheric emissions which have or may have a detrimental effect on the environment. The Regulation also sets out the minimum emission standards for the listed activities. It is not envisaged that an Atmospheric Emission License will be required for the proposed SEF.

The National Heritage Resources Act (Act No. 25 of 1999)	South African Heritage Resources Agency (SAHRA)	1999	The Act aims to introduce an integrated and interactive system for the management of heritage resources, to promote good governance at all levels, and empower civil society to nurture and conserve heritage resources so that they may be bequeathed to future generations and to lay down principles for governing heritage resources management throughout the Republic. It also aims to establish the South African Heritage Resources Agency together with its Council to co-ordinate and promote the management of heritage resources, to set norms and maintain essential national standards and to protect heritage resources, to provide for the protection and management of conservation-worthy places and areas by local authorities, and to provide for matters connected therewith. The Act protects and manages certain categories of heritage resources in South Africa. For the purposes of the Heritage Resources Act, a "heritage resource" includes any place or object of cultural significance. In this regard the Act makes provision for a person undertaking an activity listed in Section 28 of the Act to notify the resources authority. The resources authority may request that a heritage impact assessment be conducted if there is reason to believe that heritage resources will be affected. A case file has been opened on SAHRIS for the Droogfontein 4 Solar and Battery Storage Energy Facility and all relevant documents were submitted for their comments and approval. The Heritage Impact Assessment undertaken for the SEF is included as Appendix D5 and the Paleontological Impact Assessment report is included as Appendix D6 to this BAR.
Conservation of Agricultural Resources Act (Act No. 85 of 1983)	National and Provincial Government	1983	The objective of the Act is to provide control over the utilisation of the natural agricultural resources of the Republic in order to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants; and for matters connected therewith. Consent will be required from the Department of Rural Development and Land Reform in order to confirm that the proposed development is not located on high potential agricultural land and to approve the long-term lease agreement.

			An Agriculture Compliance Statement has been undertaken for the proposed SEF and is included as Appendix D4 of this BAR. No areas of high potential agricultural land has been identified by the specialist.
Minerals and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA)	Department of Mineral Resources and Energy (DMRE)	2002	In accordance with the provisions of the MPRDA a mining permit is required in accordance with Section 27(6) of the Act where a mineral in question is to be mined, including the mining of materials from a borrow pit. Section 53 of the MPRDA states that any person who intends to use the surface of any land in any way which may be contrary to any object of the Act, or which is likely to impede any such object must apply to the Minister for approval in the prescribed manner. Any person who wishes to apply for a mining permit in accordance with Section 27(6) must simultaneously apply for an Environmental Authorisation in terms of NEMA. No borrow pits are expected to be required for the construction of the SEF, and as a result a mining permit or EA is not required to be obtained. In terms of Section 53 of the MPRDA approval is required from the Minister of Mineral Resources to ensure that the proposed SEF does not sterilise a mineral resource that might occur on site.
The National Forests Act, 1998 (Act 84 of 1998)	Department of Agriculture, Forestry and Fisheries	1998	The purposes of this Act are to: (a) promote the sustainable management and development of forests for the benefit of all; (b) create the conditions necessary to restructure forestry in State forests; (c) provide special measures for the protection of certain forests and trees: (d) promote the sustainable use of forests for environmental, economic, educational, recreational, cultural, health and spiritual purposes. (e) promote community forestry;

			(f) promote greater participation in all aspects of forestry and the forest products industry by persons disadvantaged by unfair discrimination. Section 12(1) read with s15(1) of the NFA stated that the Minister may declare a particular tree, group of trees, woodland; or trees belonging to a particular species, to be a protected tree, group of trees, woodland or species. A list of protected tree species was gazetted in GN 635 of 6 December 2019. The effect of the declaration is that no person may (a) cut, disturb, damage or destroy; or (b) possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, or any forest product derived from a protected tree, except under a license granted by the Minister; or in terms of an exemption published by the Minister in the Gazette. A Terrestrial Ecology Impact Assessment Report has been undertaken for the proposed SEF and is included in Appendix D1 of this BAR. Camelthorn trees are present within both development area alternatives Option A and Option B.
Northern Cape Nature Conservation Act (Act No. 9 of 2009)	Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform	2009	This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project: • Boundary fences may not be altered in such a way as to prevent wild animals from freely moving onto or off of a property; • Aquatic habitats may not be destroyed or damaged; • The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species; • The Act provides lists of protected species for the Province.

			A collection/destruction permit must be obtained from Northern Cape Nature Conservation for the removal of any protected plant or animal species found on site. The Terrestrial Ecology Impact Assessment (Appendix D1) identified species protected under this Act within the development footprint.
Astronomy Geographic Advantage Act (Act No. 21 of 2007)	South African Radio Astronomy Observatory (SARAO)	2007	The Astronomy Geographic Advantage (AGA) Act (No. 21 of 2007) provides for the preservation and protection of areas within South Africa that are uniquely suited for optical and radio astronomy; for intergovernmental co-operation and public consultation on matters concerning nationally significant astronomy advantage areas and for matters connected thereto. Chapter 2 of the Act allows for the declaration of astronomy advantage areas whilst Chapter 3 pertains to the management and control of astronomy advantage areas. Management and control of astronomy advantage areas include, amongst others, the following: • Restrictions on use of radio frequency spectrum in astronomy advantage areas • Declared activities in core or central astronomy advantage area • Identified activities in coordinated astronomy advantage area; and • Authorisation to undertake identified activities. The site proposed for the development of the SEF is located within the Northern Cape Province, however the site falls outside of the areas considered to be uniquely suited in terms of nationally significant astronomy advantage areas, as per the low RFI sensitivity indicated within the Screening Report (Appendix B). Further confirmation will be sought from SARAO as part of the public participation process.

3.3 POLICY CONTEXT

Table 3.2: Policy context for the construction of photovoltaic solar energy facilities

POLICY	ADMINISTERING AUTHORITY	DATE	SUMMARY / IMPLICATIONS FOR PROPOSED DEVELOPMENT
The White Paper on the Energy Policy of the Republic of South Africa	Department of Mineral Resources and Energy	1998	The White Paper on the Energy Policy of the Republic of South Africa establishes the international and national policy context for the energy sector, and identifies the following energy policy objectives: • Increasing access to affordable energy services • Improving energy governance • Stimulating economic development • Managing energy-related environmental and health impacts • Securing supply through diversity • Energy policy priorities The White Paper sets out the advantages of renewable energy and states that Government believes that renewables can in many cases provide the least cost energy service, particularly when social and environmental costs are included. The White Paper acknowledges that South Africa has neglected the development and implementation of renewable energy applications, despite the fact that the country's renewable energy resource base is extensive, and many appropriate applications exist. The White Paper notes that renewable energy applications have specific characteristics that need to be considered. Advantages include: • Minimal environmental impacts in operation in comparison with traditional supply technologies; and • Generally lower running costs, and high labour intensities.

			Disadvantages include: • Higher capital costs in some cases; • Lower energy densities; and • Lower levels of availability, depending on specific conditions, especially with sun and wind based systems. The Droogfontein 4 SEF is in line with this policy as it proposes the generation of renewable energy from the solar resource.
The White Paper on Renewable Energy	Department of Mineral Resources and Energy	2003	This White Paper on Renewable Energy supplements the *White Paper on Energy Policy*, which recognises that the medium and long-term potential of renewable energy is significant. This Paper sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa. The White Paper notes that while South Africa is well-endowed with renewable energy resources that have the potential to become sustainable alternatives to fossil fuels, these have thus far remained largely untapped. Government's long-term goal is the establishment of a renewable energy industry producing modern energy carriers that will offer in future years a sustainable, fully non-subsidised alternative to fossil fuels. The medium-term (10-year) target set in the White Paper is: *10 000 GWh (0.8 Mtoe) renewable energy contribution to final energy consumption by 2013, to be produced mainly from biomass, wind, solar and small-scale hydro. The renewable energy is to be utilised for power generation and non-electric technologies such as solar water heating and bio-fuels. This is approximately 4% (1667 MW) of the projected electricity demand for 2013 (41539 MW)* (Executive Summary, ix). The Droogfontein 4 SEF is in line with this policy as it proposes the generation of renewable energy from the solar resource.
Integrated Resource Plan (IRP) for South Africa	Department of Mineral Resources and Energy	2010-2030	The Integrated Resource Plan for Electricity for South Africa of 2010–2030 (further referred to as the IRP) is a "living plan" which is expected to be revised and updated continuously as necessary due to changing circumstances. According to the summary of the plan the current IRP for South Africa, which was originally

initiated by the Department of Energy (DoE) in June 2010 (the Department is now known as Department of Mineral Resources and Energy), led to the Revised Balanced Scenarios (RBS) for the period 2010–2030.

"*This scenario was derived based on the cost-optimal solution for new build options (considering the direct costs of new build power plants), which was then "balanced" in accordance with qualitative measures such as local job creation".* In addition to all existing and committed power plants, the RBS included 11,4 GW of renewables. In 2010 several changes were made to the IRP model. The main changes in the IRP were the disaggregation of renewable energy technologies to explicitly display solar photovoltaic (PV), concentrated solar power (CSP), and wind options (RSA, 2011a).

The summary of the IRP further explains that traditional cost-optimal scenarios were developed based on the previously mentioned changes in the IRP. This resulted in the Policy-Adjusted IRP, which stated that:

"*The installation of renewables (solar PV, CSP and wind) have been brought forward in order to accelerate a local industry*; *To account for the uncertainties associated with the costs of renewables and fuels, a nuclear fleet of 9,6 GW is included in the IRP; The emission constraint of the RBS (275 million tons of carbon dioxide per year after 2024) is maintained; andEnergy efficiency demand-side management (EEDSM) measures are maintained at the level of the RBS*" (RSA, 2011a:6).

"The Policy-Adjusted IRP includes the same amount of coal and nuclear new builds as the RBS, while reflecting recent developments with respect to prices for renewables. In addition to all existing and committed power plants (including 10 GW committed coal), the plan includes 9,6 GW of nuclear; 6,3 GW of coal; 17,8 GW of renewables; and 8,9 GW of other generation sources" (RSA, 2011a:6).

The IRP highlights the commitments before the next IRP. The commitments pertaining to the purpose of the proposed project in renewable energy is:

"*Solar PV programme 2012-2015: In order to facilitate the connection of the first solar PV units to the grid in 2012 a firm commitment to this capacity is necessary. Furthermore, to provide the security of investment to ramp up a sustainable local industry cluster, the first four years from 2012 to 2015 require firm commitment."*

"*Solar PV 2016 to 2019: As with wind, grid upgrades might become necessary for the second round of solar PV installations from 2016 to 2019, depending on their location. To trigger the associated tasks in a timely*

manner, a firm commitment to these capacities is necessary in the next round of the IRP at the latest. By then, the assumed cost decreases for solar PV will be confirmed" (IRP, 2011a:17).

In conclusion the IRP recommends that an accelerated roll-out in renewable energy options should be allowed with regards to the benefits of the localization in renewable energy technologies (RSA, 2011a). It is however important to take note that since the release of the IRP in 2011 there has been a number of developments in the energy sector of South Africa. Therefore, the IRP has been updated and were open for comments until March of 2017. The new IRP of 2019 was formally published in October 2019. The draft IRP of 2018 was open for comments until the end of October 2018. For the revision scenario analysis were conducted and the results thereof are included in the draft IRP of 2018. The results revealed that for the period ending 2030 that: *"The committed Renewable Energy Independent Power Producers Programme, including the 27 signed projects and Eskom capacity rollout ending with the last unit of Kusile in 2022, will provide more than sufficient capacity to cover the projected demand and decommissioning of plants up to approximately 2025"; "Imposing annual build limits on renewable energy will not affect the total cumulative capacity and the energy mix for the period up to 2030*"; and *"the scenario without renewable energy annual build limits provides the least-cost option by 2030*" (RSA, 2018:34).

Lastly, the draft IRP of 2018 also included the scenario analysis for the period post 2030. Here it was observed that: "*Imposing annual build limits on renewable energy will restrict the cumulative renewable installed capacity and the energy mix for this period; adopting no annual build limits on renewables or imposing a more stringent strategy to reduce greenhouse gas emissions implies that no new coal power plants will be built in the future unless affordable cleaner forms of coal-to-power are available; and the scenario without renewable energy annual build limits provides the least-cost option by 2050*" (RSA, 2018:34–35).

In the final IRP of 2019 key considerations were taken into account together with required actions to be taken for the IRP of 2019 to be credible. In terms of renewable energy technologies like solar and wind, the IRP stated that *"The application of renewable build limits 'smoothes out' the capacity allocations for wind and solar PV which provides a constant pipeline of projects to investment; this addresses investor confidence*". The decision stated against this key consideration is to *"retain the current annual build limits on renewables (wind and PV) pending the finalization of a just transition plan"* (RSA, 2019:46). Hereby the

			IRP also recognises renewable technologies' potential to diversify the electricity mix, create new industries and job opportunities and localize across the value chain (RSA, 2019:13). The Droogfontein 4 SEF is in line with this plan as it proposes the generation of renewable energy from the solar resource and will contribute to the energy mix of the country as set out in this plan.
National Development Plan of 2030	The Presidency: National Planning Commission	-	The National Development Plan aims to "eliminate poverty and reduce inequality by 2030" (RSA, undated). In order to eliminate or reduce inequality, the economy of South Africa need to grow faster in order to benefit all South Africans. In May 2010 a draft national development plan was drafted, which highlighted the nine (9) key challenges for South Africa. The highest priority areas according to the plan are considered to be the creation of employment opportunities and to improve the quality of national education. In this regard, the plan sets out three (3) priority areas, namely to raise employment by a faster growing economy, improve the quality of education, and to build the capability of the state in order to play a more developmental and transformative role. One of the key challenges identified was that the economy is unsustainably resource intensive and the acceleration and expansion of renewable energy was identified as a key intervention strategy to address this challenge. The development of the Droogfontein 4 SEF will contribute to the intervention strategy as identified within the plan.
National Infrastructure Plan of South Africa	Presidential Infrastructure Coordinating Commission	2012	In the year 2012 the South African Government adopted a National Infrastructure Plan (hereafter referred to as the Plan). The aim of this Plan is to transform the economic landscape, while strengthening the delivery of basic services and creating new employment opportunities. This Plan also supports the integration of African communities, and also sets out the challenges and enablers that our country needs in order to respond to the planning and development of infrastructure with regards to fostering economic growth (RSA, 2012). The Plan has developed eighteen (18) strategic integrated projects (further referred to as SIPs). These SIPs stretch over all nine (9) provinces, covering social and economic infrastructure, and projects that enhances development and growth. Of the eighteen (18), five (5) are geographically focused, three (3) spatial, three (3) energy, three (3) social infrastructure, two (2) knowledge, one (1) regional integration, and one (1) water and sanitation focussed. The three (3) SIPs according to the Plan, which are energy focused and correlate to the proposed project are as follow:

			- SIP 8: Green energy in support of the South African economy; - SIP 9: Electricity generation to support socio-economic development; and - SIP 10: Electricity transmission and distribution for all. SIP 8 according to the Plan "*support sustainable green energy initiatives on a national scale through a diverse range of clean energy options as envisaged in the IRP 2010 and support bio-fuel production facilities*". The purpose of SIP 9 according to the Plan is to "*accelerate the construction of new electricity generation capacity in accordance with the IRP 2010 to meet the needs of the economy and address historical imbalances*". SIP 9 should also monitor the implementation of major projects such as new power stations like Medupi, Kusile and Ingula. Lastly, SIP 10 aims to "*expand the transmission and distribution network to address historical imbalances, provide access to electricity for all and support economic development*" (RSA, 2012:20). The development of the Droogfontein 4 SEF in line with SIP 8 and SIP 9 as it will provide "Green" energy in support of the South African Economy and will generate electricity which supports socio-economic development. The power line associated with the proposed SEF is in line with SIP 10 as it will facilitate electricity transmission and distribution for all.
New Growth Path Framework	Department of Economic Development	-	The New Growth Path was developed after 16 years of South Africa's democracy, to respond to emerging opportunities and risks while building on policies. This framework provides a dynamic vision on how to collectively achieve a more developed, equitable and democratic society and economy. This framework mainly reflects the commitment of the South African Government to create employment opportunities for its people in all economic policies (RSA, 2011b). This framework sets out the markers for job creation and growth and also identify where there are viable changes in the character and structure of production, in order to create a more inclusive, greener economy on the long-term. It is stated in the framework that in order for this framework to reach its objectives, the Government is committed to: - Identify the possible areas of employment creation; and

			- Develop a policy to facilitate employment creation especially with regards to social equity, sustainable employment and growth in the creation of employment activities (RSA, 2011b). This framework also identifies investments in five key areas, one of which is energy. This framework states that the green economy is a priority area, which includes the construction of and investment in renewable energy technologies like solar (RSA, 2011b). In this regard it will also assist in creating employment opportunities over the medium- and long-term. Considering that the construction of and investment in renewable energy is a key area identified within the framework, the Droogfontein 4 SEF is considered to be in-line with the framework.
International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability, January 2012	-	2012	The overall objectives of the IFC performance standards are to fight poverty, do no harm to people or the environment, fight climate change by promoting low carbon development, respect human rights, promote gender equality, provide information prior to project development, collaborate with the project developer in order to achieve the performance standard, provide advisory services and notify countries of trans boundary impacts. When considering the development of the proposed SEF the following performance standards are anticipated to be applicable at this stage of the BA process: • Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts • Performance Standard 2: Labour and Working Conditions • Performance Standard 3: Resource Efficiency and Pollution Prevention • Performance Standard 4: Community Health, Safety and Security • Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources • Performance Standard 8: Cultural Heritage

The Equator Principles III, June 2013	-	2013	The Equator Principles (EPs) III constitute a financial industry benchmark used for determining, assessing, and managing a project's environmental and social risks. The EPs are primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making. The EPs are applicable to large infrastructure projects and apply globally to all industry sectors. In terms of the EPs, South Africa is a non-designated country, and as such the assessment process for projects located in South Africa evaluates compliance with the applicable IFC Performance Standards on Environmental and Social Sustainability and Environmental Health and Safety (EHS) Guidelines. The Droogfontein 4 SEF is currently being assessed in accordance with the requirements of the 2014 EIA Regulations, as amended (GNR 326), published in terms of Section 24(5) of the National Environmental Management Act (No. 107 of 1998) (NEMA), which is South Africa's national legislation providing for the authorisation of certain activities. Through this assessment, all potential social and environmental risks are identified and assessed, and appropriate mitigation measures proposed.
Strategic Environmental Assessment (SEA) for wind and solar PV Energy in South Africa	National Department of Forestry, Fisheries and the Environment (DFFE)	2014	The then Department of Environmental Affairs (DEA) has committed to contribute to the implementation of the National Development Plan and National Infrastructure Plan by undertaking Strategic Environmental Assessments (SEAs) to identify adaptive processes that integrate the regulatory environmental requirements for Strategic Integrated Projects (SIPs) while safeguarding the environment. The wind and solar photovoltaic (PV) SEA was accordingly commissioned by DEA in support of SIP 8, which aims to facilitate the implementation of sustainable green energy initiatives. This SEA identifies areas where large scale wind and solar PV energy facilities can be developed in terms of SIP 8 and in a manner that limits significant negative impacts on the environment, while yielding the highest possible socio-economic benefits to the country. These areas are referred to as Renewable Energy Development Zones (REDZs). The REDZs also provide priority areas for investment into the electricity grid. Currently one of the greatest challenges to renewable energy development in South Africa is the saturation of existing grid infrastructure and the difficulties in expanding the grid. Proactive investment in grid infrastructure is the likely to be the most important factor determining the success of REDZs. Although it is intended for the SEA to facilitate proactive grid investment in REDZs, such investment should not be limited to these areas. Suitable wind and solar PV development should still be promoted across the

			country and any proposed development must be evaluated on its own merit. The proposed site falls within the Kimberley REDZ (refer to Figure D1).
Northern Cape Provincial Spatial Development Framework (PSDF), 2012	Provincial Government	2012	The PSDF seeks to advance the establishment of renewable energy supply schemes within the Province and identifies that the Northern Cape holds a potential comparative advantage due to the regular occurrence of strong winds which could be a source of renewable energy, specifically for sustainable electricity production. The PSDF also aims for renewable energy sources to constitute 25% of the Province's energy production capacity by 2020. The REIPPPP focus on Northern Cape Provincial Report Volume 1 (June 2017) indicates that the Northern Cape Province has contributed 16 991GWh actual energy to the national grid which amounts to approximately 42% of the renewable energy contribution to the grid. Of this 42%, 13% (i.e. 958 GWh) was generated by wind energy facilities and 73% (i.e. 5 218 GWh) was generated by solar energy facilities. With the developed and proposed independent power producer capacity (including the Droogfontein 4 SEF), the Province will produce more than 100% of its own electrical power needs from renewable energy resources (although this energy will be fed into the national grid).
Frances Baard District Municipality Spatial Development Framework (SDF), 2014-2019	Frances Baard District Municipality	2014	Limited reference is made in the SDF pertaining to the development of solar energy facilities within the district, however it is indicated in the SDF that the implementation of a sustainability policy is essential to manage the use of non-renewable and renewable natural resources. The policy refers to the maintenance and management of existing facilities and the implementation of modern technologies during new developments. The SDF also makes reference to measures that could be implemented in terms of energy efficiency for developments. This includes any connection to a conventional electrical supply could be supported by an alternative source for example a solar water heater system and the installation of energy efficient solar systems. The proposed Droogfontein 4 SEF is in line with the SDF based on the use of a natural renewable resources and the modern technology associated with it.
Frances Baard District Municipality Integrated	Frances Baard District Municipality	2018	The IDP indicates that availability of energy remains a serious resource challenge. In the last ten years the communities' access to electricity has significantly improved. In accordance with the Community survey 2016 over 92.7 % of the households in the district have access to electricity for lighting. This leaves a gap of 28 360 households, but with the recent completion of electricity master plans planning should improve.

Development Plan (IDP), 2017/18 – 2021/22			Issues related to energy and electricity include: • In the very rural areas the availability of bulk electricity makes connecting to the households difficult. · • Correct billing of electricity remains a problem in some local municipalities. · • Some renewable energy projects have been implemented (Droogfontein Solar) • In the very rural areas the availability of bulk electricity makes connecting to the. households difficult. Although the development of the Droogontein 4 SEF will not contribute directly to the increase of electricity availability in the municipal area, it promotes the further development of solar energy facilities and opens opportunity for investment.
Sol Plaatje Local Municipality Draft Spatial Development Framework (SDF), 2018-2023	Sol Plaatje Local Municipality	2018	According to the SDF manufacturing in the municipal area has stagnated, in line with the national trend. The construction sector is likely to have a small upturn with the Human Settlements programme to construct houses, however this will only have an impact on the trends if the project is large enough to catalyse spin off' s in other industries such as wholesale and retailing of building materials. Despite the decline in the manufacturing, there are still various opportunities for this sector. One specific opportunity highlighted is promotion of green industries, including solar energy for manufacturing. Although the development of the Droogontein 4 SEF will not contribute directly to solar energy specifically for manufacturing in the municipal area, it promotes the further development of solar energy facilities and opens opportunity for investment and further growth of green industries in the area.
Sol Plaatje Local Municipality Integrated Development Plan (IDP), 2022-2027	Sol Plaatje Local Municipality	2022	According to the IDP the municipal area has been facing a decrease in economic growth as the area has reliance on a single sector, especially mining. This makes the Local Municipality vulnerable to changes in mining and international markets, and to decisions and policies made at national level; for example, the imposition or relaxation of import tariffs. Compounding this reality is the disappointing state of economic planning at local government level, or local economic development (LED). The key challenges faced by the Local Municipality with regard to Local Economic Development and social advancement includes declining economic growth, reliance on a primary economic resources, low skilled labour force, high unemployment

	rate, low levels of capital spending to support infrastructure maintenance and development, environmental degradation, disinvestment in the Kimberley CBD and low revenue collection rate. There is therefore a need for intervention within the municipal area to promote growth and development which will add to the socio-economic conditions of the municipal area for both the municipality and the communities. The development of the Droogfontein 4 SEF will contribute to the growth of another sector, other than mining, within the municipal area.

3.4 OTHER LEGISLATION

Other legislation mainly refers to the following:

- Planning legislation governing the rezoning process and approval of the layout plan.
- Design standards and legislation for services provision such as water, sewerage, electricity, etc.
- Municipal bylaws related to building plans, building regulations, etc.

3.5 RELEVANT GUIDANCE

The following guidance was considered in conducting the BA:

- The Equator principles III (2013)[3]
- World Bank Group Environmental, Health and Safety General Guidelines (EHS Guidelines) (2007)
- Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution (2007)
- International Finance Corporation's Policy on Environmental and Social Sustainability (2012)
- DEA. (2013). Draft National Renewable Energy Guideline. Department of Environmental Affairs, Pretoria, South Africa
- DEA, (2012), Guideline 5 – Final companion to the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations of 2010
- DEA, (2012), Guideline 7 – Public participation in the Environmental Impact Assessment process
- DEA, (2012), Guideline 9 – Need and desirability
- DEAT, (2006), Guideline 3 – General guide to the Environmental Impact Assessment Regulations
- DEAT, (2006), Guideline 4 – Public participation in support of the Environmental Impact Assessment Regulations
- DEAT, (2006), Guideline 5 – Assessment of alternatives and impacts in support of the Environmental Impact Assessment Regulations

[3] Although this report is not written in terms of the Equator Principles (EPs), it fully acknowledges that the EPs will need to be complied with should funding for the project be required.

- BirdLife, (2017). Best Practise Guidelines Birds & Solar Energy: Guidelines for assessing and monitoring the impact of solar power generating facilities on bird in southern Africa.

3.6 CONCLUSION

The legislative and policy context plays an important role in identifying and assessing the potential social impacts associated with the proposed development. For this reason, the proposed SEF will be assessed and has been considered in terms of its fit with the key legislative, policy and planning documents discussed above.

The main findings of the review of the policy documents on all spheres of Government indicated that strong support was given towards renewable energy, specifically PV solar energy and therefore it is concluded that there is support for the development of the Droogfontein 4 Solar and Battery Storage Energy Facility. The White Paper on the Energy Policy of the Republic of South Africa of 1998 stated that due to the fact that renewable energy resources operate from an unlimited resource base, i.e. the sun, renewable energy can increasingly contribute towards a long-term sustainable energy supply for future generations. This policy further highlights that due to the unlimited resources base of renewable energy in South Africa, renewable energy applications like PV solar energy and associated infrastructure are more sustainable in terms of social and environmental costs. The Integrated Resource Planning for Electricity for South Africa of 2010–2030, the National Infrastructure Plan of South Africa and the New Growth Path Framework all support the development of the renewable energy sector. In particular, the IRP also indicated that 43% of the energy generations in South Africa is allocated to renewable energy applications. On a District and Local level limited attention is given explicitly to renewable sources like PV solar energy, however the documents reviewed do make provision for increase energy supply and efficiency in improving the quality of lives in terms of efficient physical infrastructure as well as socio-economic growth. At Provincial, District and Local level the policy documents indirectly support the applications of renewables as it will contribute to surety of electricity supply and improving the lives of the community.

The review of the relevant policies and documents related to the energy sector therefore indicate that renewables, like solar energy and the establishment of solar energy facilities and associated infrastructure, are supported on all spheres of Government. The support for development of such a nature also contributes to the need and desirability of the proposed project.

The proposed Droogfontein 4 SEF is therefore supported by the related policy and planning documents reviewed in this section of the report.

4 THE NEED AND DESIRABILITY

This section aims to address the following requirements of the regulations:

Appendix 1. (3) An BAR (...) must include-

(f) a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;

4.1 THE NEED FOR THE PROPOSED ACTIVITY

The proposed activity is a direct result of the growing demand for electricity and the need for renewable energy in South Africa. According to Eskom, the demand for electricity in South Africa has been growing at approximately 3% per annum. This growing demand, fuelled by increasing economic growth and social development, is placing increasing pressure on South Africa's existing power generation capacity. Coupled with this, is the growing awareness of environmentally responsible development, the impacts of climate change and the need for sustainable development.

Over 90% of South Africa's electricity generation is coal based, the Word bank estimates that this results in an annual, per capita carbon emission of ~8.9 tons per person. Based on 2008 fossil-fuel CO2 emissions statistics released by the Carbon Dioxide Information Analysis Centre, South Africa is the 13th largest carbon dioxide emitting country in the world and the largest emitter in Africa (Boden, et al. 2011). In August 2021 an article confirmed that South Africa is the 12th highest greenhouse gas emitter in the world (source: https://www.news24.com/fin24/economy/eskom-will-only-able-to-meet-global-air-quality-standards-by-2050-owing-to-financial-woes-20210818).

The proposed project is intended to form part of the Department of Mineral Resources and Energy's (DMREs) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme or any other appropriate energy generation programmes / opportunities. The REIPPP Programme aims to secure 14 725 Megawatts (MW) of new generation capacity from renewable energy sources, while simultaneously diversifying South Africa's electricity mix. According to the 2021 State of the Nation Address, Government will soon be initiating the procurement of an additional 11 800MW of power from renewable energy, natural gas, battery storage and coal in line with the Integrated Resource Plan 2019 and fulfilling their commitments under the United Nations Framework Convention on Climate Change and its Paris Agreement which include the reduction of greenhouse gas emissions. Eskom, the largest greenhouse gas emitter of South Africa, has committed in principle to net zero emission by 2050 and to increase its renewable capacity. During the 2022 State of the Nation Address it was indicated that during the past year the government had taken "firm steps" to bring additional generation capacity online as quickly as possible to close the shortfall in terms of electricity. As a result it was confirmed that several new generation projects will be coming online over the next few years.

On 11 September 2022, Government announced the amended Request for Proposal (RFP) to increase the MW allocation under the REIPPP Bid Window (BW) 6 in response to the

announcement by the President on 25 July 2022. The capacity to be procured currently under BW 6 will now increase from 2600MW to 4200MW.

Besides capacity additions, several assumptions have changed since the promulgation of the IRP 2010–2030. Key assumptions that changed include the electricity demand projection, Eskom's existing plant performance, as well as new technology costs. These changes necessitated the review and update of the IRP which resulted in the draft IRP 2018 as per table 4.1 below:

Table 4.1: Published Draft IRP 2018 (Approved by Cabinet for Consultation)

	Coal	Nuclear	Hydro	Storage (Pumped Storage)	PV	Wind	CSP	Gas / Diesel	Other (CoGen, Biomass, Landfill)	Embedded Generation
2018	39 126	1 860	2 196	2 912	1 474	1 980	300	3 830	499	Unknown
2019	2 155					244	300			200
2020	1 433				114	300				200
2021	1 433				300	818				200
2022	711				400					200
2023	500									200
2024	500									200
2025					670	200				200
2026					1 000	1 500		2 250		200
2027					1 000	1 600		1 200		200
2028					1 000	1 600		1 800		200
2029					1 000	1 600		2 850		200
2030			2 500		1 000	1 600				200
TOTAL INSTALLED	33 847	1 860	4 696	2 912	7 958	11 442	600	11 930	499	2600
Installed Capacity Mix (%)	44.6	2.5	6.2	3.8	10.5	15.1	0.9	15.7	0.7	

Installed Capacity
Committed / Already Contracted Capacity
New Additional Capacity (IRP Update)

According to the South African Energy Sector Overview (2021), there is currently 1 723MW of installed PV capacity, while an additional 2 600MW from wind and solar has been rewarded as part of Bid Window 5. Bid Window 6 was announced in April 2022 for submission of bids in August 2022.

4.2 THE DESIRABILITY OF THE PROPOSED ACTIVITY

Further the to the need for the activity discussed above the actual affected property and the directly adjacent property (to the left) has already been transformed by the development of two solar energy facilities. The existing Droogfontein 1 Solar Power Plant is located within the Remaining Extent of the Farm Droogfontein No. 62 and is located directly to the east and south-east of the two alternative development areas under assessment for the Droogfontein 4 SEF. The Droogfontein 1 Solar Power Plant is owned and operation by Globeleq South Africa Management Services (Pty) Ltd.

The existing Droogfontein 2 Solar PV Park is located on the directly adjacent property to the left, i.e. Portion 1 of the Farm Droogfontein No. 62. This development is owned and operated by African Infrastructure Investment Managers (AIIM) (Pty) Ltd. Furthermore, the proposed Droogfontein 5 Solar and Battery Storage Energy Facility project is also proposed on Portion 1

of the Farm Droogfotein No. 62. The Basic Assessment process for this development is also being undertaken by Environamics.

Considering the already transformed landscape for the development and operation of solar energy facilities and the opportunity presented to consolidate such facilities within a concentrated area, the affected property for the placement of the proposed Droogfontein 4 SEF is considered desirable for the placement of the development.

The facility's contribution towards sustainable development and the associated benefits to society in general is discussed below:

- Lesser dependence on fossil fuel generated power - The deployment of the SEF will have a positive macro-economic impact by reducing South Africa's dependence on fossil fuel generated power and assisting the country in meeting its growing electricity demand.
- Increased surety of supply - By diversifying the sources of power in the country, the surety of supply will increase. The power demands of South Africa are ever increasing and by adding solar power this demand can be met, even exceeded without increasing pollution in relation to the use of fossil fuels. The SEF has the potential of "securing" economic activity by assisting in removing supply constraints if Eskom generation activities result in a supply shortfall. When supply is constrained, it represents a limitation to economic growth. When a supply reserve is available, it represents an opportunity for economic growth.
- Local economic growth - The proposed Droogfontein 4 SEF will contribute to local economic growth by supporting industry development in line with provincial and regional goals and ensuring advanced skills are drawn to the Northern Cape Province. The project will likely encounter widespread support from government, civil society and businesses, all of whom see potential opportunities for revenues, employment and business opportunities locally. The development of the photovoltaic solar energy facility will in turn lead to growth in tax revenues for local municipalities and sales of carbon credits, resulting in increased foreign direct investment.
- Lower costs of alternative energy - An increase in the number of solar facilities commissioned will eventually reduce the cost of the power generated through solar facilities. This will contribute to the country's objective of utilising more renewable energy and less fossil fuel-based power sources. It will assist in achieving the goal to generate 14 725 MW of electricity from renewable energy as per the Renewable Energy Independent Power Producer Procurement (REIPPP) Programme of the Department of Mineral Resources and Energy.
- Reduction in greenhouse gas emissions - The additional power supplied through solar energy will reduce the reliance on the combustion of fossil fuels to produce power. The South African electricity grid is predominantly coal-fired and therefore Greenhouse Gas (GHG) emissions intensive (coal accounts for more than 92% of the fuel used in South Africa's electricity generation). The reduction of GHG emissions as a result of the project implementation will be achieved due to reduction of CO_2 emissions from combustion of fossil fuel at the existing grid-connected power plants and plants which would likely be built in the absence of the project activity.

- CDM Project - A solar energy facility also qualifies as a Clean Development Mechanism (CDM) project (i.e. a financial mechanism developed to encourage the development of renewable technologies).
- Climate change mitigation - On a global scale, the SEF makes a contribution to greenhouse gas emission reduction and therefore contributes toward climate change mitigation.
- Reduced environmental impacts - The reduction in electricity consumed from the grid will not only result in a reduction in greenhouse gas emissions, but also the prevention of negative impacts associated with coal mining. For example, coal power requires high volumes of water, in areas of South Africa where water supply is already over-stretched and water availability is highly variable. Photovoltaic solar energy technology also does not produce the sulphur emissions, ash or coal mining concerns associated with conventional coal fired electricity generation technologies resulting in a relatively low level of environmental impacts. It is a clean technology which contributes toward a better-quality environment for employees and nearby communities.
- Social benefits - The SEF is likely to have significant long-term, indirect positive social impacts that may extend to a regional and even national scale. The larger scale impacts are to be derived in the utilisation of solar power and the experience gained through the construction and operation of the solar energy facility and BESS. In future, this experience can be employed at other similar solar installations in South Africa.
- Provision of job opportunities - The main benefit of the proposed SEF operating in the area is that local companies or contractors will be hired for the duration of the construction period. The operational phase will provide permanent job opportunities to the local communities from the surrounding area since security guards and general labourers will be required on a full-time basis. Approximately 200 employment opportunities will be created during the construction and 20 during the operational phase.
- Indirect socio-economic benefits - The increase in the demand for services such as accommodation, transportation, security, general maintenance and catering will generate additional indirect socio-economic benefits for the local community members.
- Effective use of resources - Because of predominantly the climate the site has limited suitability for cultivated crops, and viable agricultural land use is limited to grazing only. The proposed development in this specific area will generate alternative land use income through rental for the solar energy facility, which will have a positive impact on the agricultural land uses on the property. It will provide the farming enterprise with increased cash flow and rural livelihood, and thereby improve the financial sustainability of agricultural activities by the landowner, where relevant.
- Location of the activity within a REDZ - The Renewable Energy Development Zones (REDZ) have a key role to play in the South Africa's just energy transition. The REDZ create priority areas for investment in the electricity grid. Since the site is located within a REDZ (refer to Figure D1) it contributes to the desirability of the project.

- Cumulative impacts of low to medium significance —No cumulative impacts with a high residual risk have been identified. In terms of the desirability of the development of renewable energy, it may be preferable to incur a higher cumulative loss in such a region as this one, than to lose land with a higher environmental value elsewhere in the country.

5 DESCRIPTION OF ENVIRONMENTAL ISSUES

This section aims to address the following requirements of the regulations:

Appendix 1. (3) A BAR (...) must include-

(g) A motivation for the preferred site, activity and technology alternative;

(h) a full description of the process followed to reach the proposed preferred alternative, within the site, including –

(i) details of all the alternatives considered;

(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;

(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;

(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;

(viii) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;

(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and

(xi) a concluding statement indicating the preferred alternative development location within the approved site.

5.1 CONSIDERATION OF ALTERNATIVES

The DFFE 2006 guidelines on 'assessment of alternatives and impacts' proposes the consideration of four types of alternatives namely, the no-go, location, activity, and design alternatives. It is, however, important to note that the regulation and guidelines specifically state that only 'feasible' and 'reasonable' alternatives should be explored. It also recognizes that the consideration of alternatives is an iterative process of feedback between the developer and EAP, which in some instances culminates in a single preferred project proposal.

Genesis Droogfontein 4 (Pty)Ltd considered the characteristics present on the Remaining Extent of the Farm Droogfontein No. 62. The property was found to be favourable due to its proximity to viable grid connection options, environmental conditions, relatively flat terrain, high solar radiation values and adequate site access. Some areas of the farm have been deemed less suitable for the proposed development such as areas with surface water features and existing infrastructure such as roads, railway lines, power lines and the existing operational solar energy facility present. These factors were taken into consideration and avoided as far as possible.

The following sections explore different types of alternatives in relation to the proposed SEF in more detail.

5.1.1 No-go alternative

This alternative considers the option of 'do nothing' and maintaining the *status quo* of the current environment. The description provided in section 5.3 of this report could be considered the baseline conditions (*status quo*) to persist should the no-go alternative be preferred. The site is currently used for various land uses including agriculture and the operation of a solar energy facility. Should the proposed activity not proceed, the site will remain unchanged and will continue to be used for the current land uses. It should be noted that the area surrounding the proposed project is already impacted by agricultural and mining activities. The site has limited agricultural potential due to climatic limitations (see Agriculture Compliance Statement in Appendix D4). Considering the already operational solar energy facility present within the affected property an opportunity will be lost from an environmental and social perspective to consolidate and concentrate positive and negative impacts within the landscape, rather than to distribute these impacts throughout the area. The potential opportunity costs in terms of alternative land use income through rental for the energy facility and the supporting social and economic development in the area would also be lost if the status quo persist. Therefore, the implementation of the no-go alternative is not considered as relevant for the proposed Droogfontein 4 SEF project within the affected property.

5.1.2 Location alternatives

This alternative asks the question, if there is not, from an environmental perspective, a more suitable location for the project within the general area being considered for development. No other properties have at this stage been secured by Genesis Droogfontein 4 (Pty) Ltd in the Kimberley area to potentially establish the Droogfontein 4 Solar and Battery Storage Energy Facility. It must however be noted that the directly adjacent property to the left, i.e. Portion 1 of the Farm Droogfointein No. 62, has been secured by Genesis Droogfontein 4 (Pty) Ltd for the development of the proposed Droogfontein 5 Solar and Battery Storage Energy Facility.

From a local perspective the development of Droogfontein 4 SEF is preferred on the Remaining Extent of the Farm Droogfontein No. 62 due to its suitable climatic conditions, topography (i.e. in terms of gradient), environmental conditions (i.e. agricultural potential, ecological sensitivity), proximity to feasible grid connection point options (i.e. for the purpose of electricity evacuation), as well as site access (i.e. to facilitate the movement of machinery, equipment, infrastructure and people during the construction phase).

5.1.3 Development Area Alternatives

Within the affected property proposed for development, as discussed above, Genesis Droogfontein 4 (Pty) Ltd has identified two suitable development areas which are considered as areas suitable from a technical perspective for the placement of the solar energy facility. These areas are alternatives of one another and therefore one of these options will ultimately be put forward for development. This BA Report will comparatively assess these options on an equal level to ultimately provide an indication of the preferred development area from an environmental perspective.

The two options are known as Option A and Option B. Option A is located along the southern boundary of the affected property with an extent of 300ha. Option B is located to the north of Option A within the affected property and will also be 300ha in extent. Refer to Figure 5.1.

Option A was identified as preferred from a technical perspective by Genesis Droogfontein 4 (Pty) Ltd.

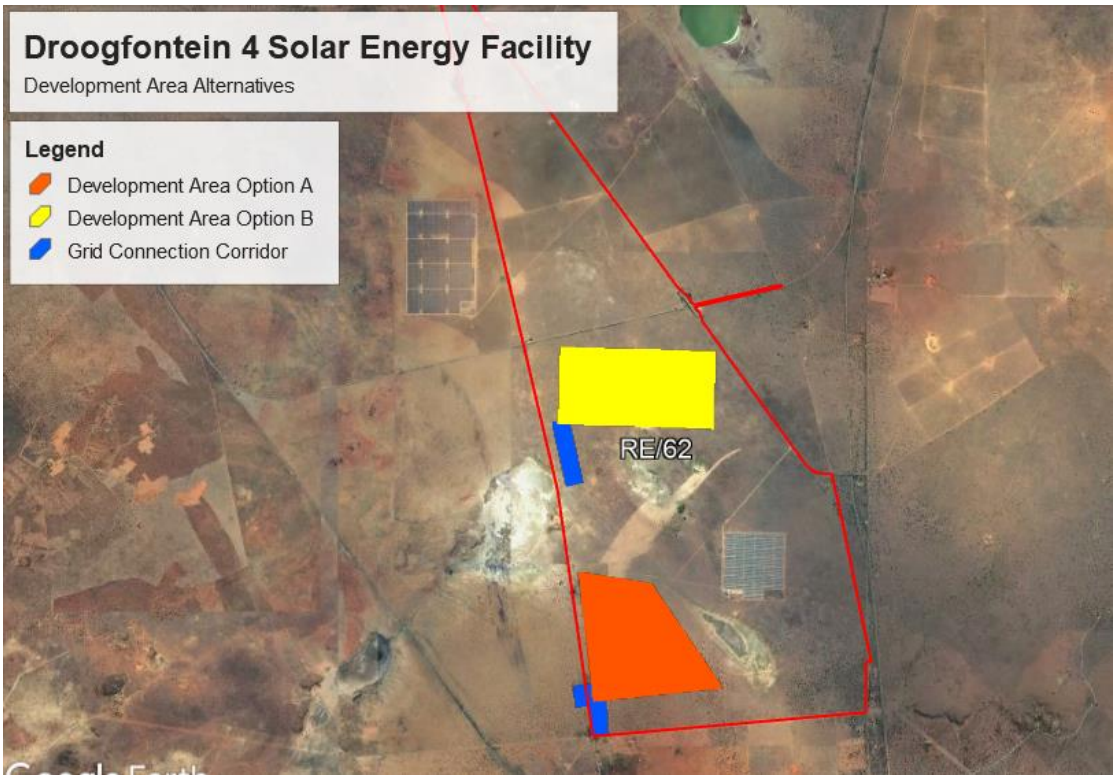


Figure 5.1: The two development area alternatives assessed for the placement of the development footprint of the Droogfontein 4 Solar and Battery Storage Energy Facility

As there are two alternative development areas proposed for the placement of the project development footprint, the developer has identified a suitable grid connection corridor for each of the development areas which connects the facility to an existing power line located near to the development area. All grid connection corridors have a width of 300m.

Should development area Option A be developed the power line route will be approximately 600m in length and will connect the facility to the existing Boundary-Olien 1 275kV power line located directly to the south. The connection will be via a loop-in loop-out connection.

Should development area Option B be developed the power line route will be approximately 1km in length and will connect the facility to the existing Elk-Weir 1 132kV power line located directly to the south. The connection will be via a loop-in loop-out connection.

5.1.4 Activity alternatives

The BA process also needs to consider if the development of a solar energy facility would be the most appropriate land use for the particular site.

- **Photovoltaic (PV) solar facility** – Genesis Droogfontein 4 (Pty) Ltd is part of a portfolio of solar PV projects throughout South Africa. Genesis Droogfontein 4 (Pty) Ltd is of the opinion that solar PV technology is perfectly suited to the site, given the high irradiation values for the Kimberley and Northern Cape Province area – refer to Figure 5.2. The technology furthermore entails low visual impacts, have relatively low water requirements, is a simple and reliable type of technology and most of the wires, steel and PV modules are recyclable and would be recycled to a reasonable extent. The Silicon and Aluminium in PV modules can be removed and reused in the production of new modules.

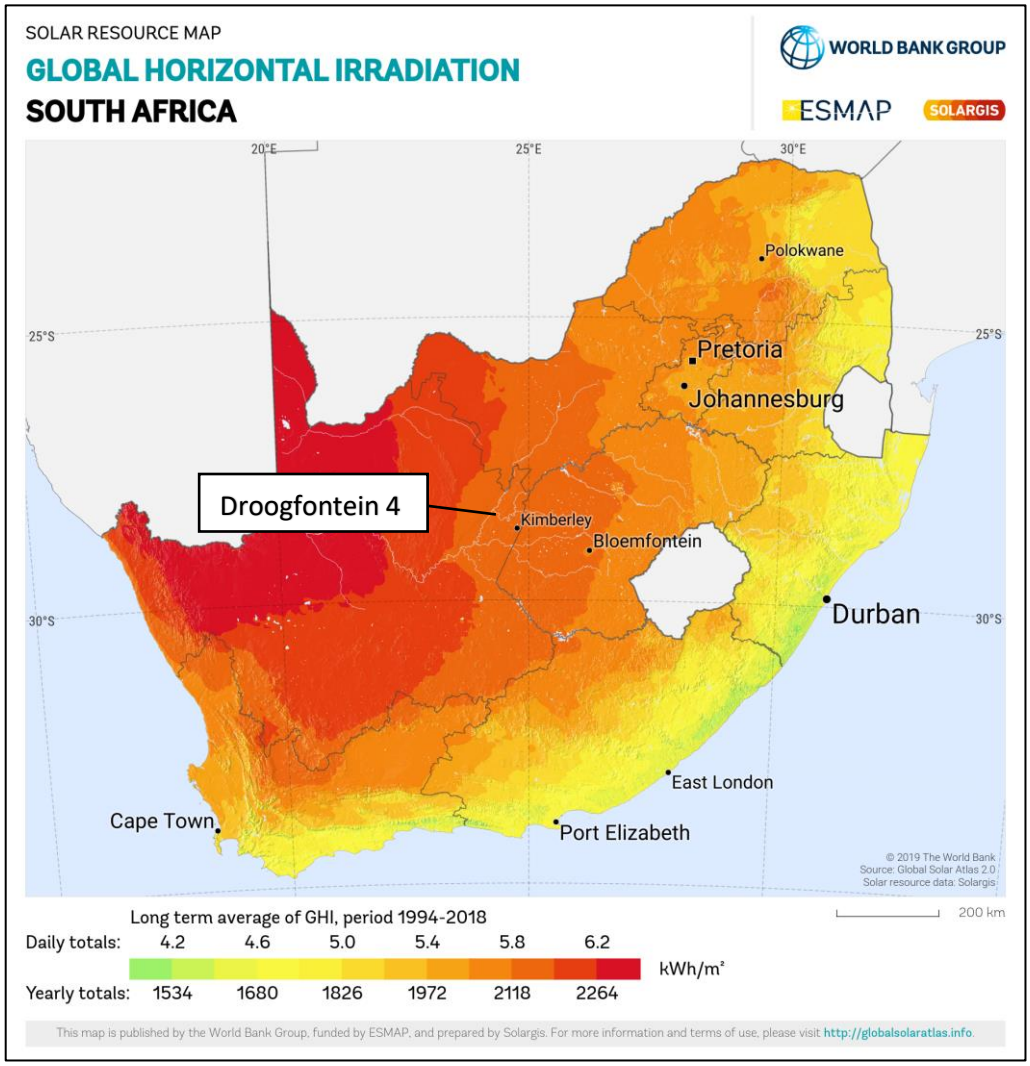


Figure 5.2: Global horizontal irradiation values for South Africa (SolarGIS, 2021) and the location of the Droogfontein 4 Solar and Battery Storage Energy Facility

- **Wind energy facility** - Due to the local climatic conditions a wind energy facility is not considered suitable as the area does not have the required wind resource. Furthermore, the applicant has opted for the generation of electricity via solar power rather than the use of wind turbines. This alternative is therefore regarded as not feasible and will not be evaluated further in this report.

- **Concentrated solar power (CSP) technology** - CSP technology requires large volumes of water and this is a major constraint for this type of technology. While the irradiation

values are high enough to generate sufficient solar power, the water constraints render this alternative not feasible. Therefore, this alternative will not be considered further in this report.

5.1.5 Technical alternatives

Possible technical alternatives for the development of a solar PV facility needs to be considered during the BA process.

5.1.5.1 Distribution lines

It is proposed for the development to connect into the national grid via a loop-in loop-out connection to either the existing Boundary-Olien 1 275kV or the existing Elk-Weir 1 132kV power line. However, the connection point will depend on which development area alternative is ultimately preferred and developed. See section 5.1.3 above for more information in this regard.

A 132kV overhead distribution line is the only preferred alternative for the applicant due to the following reasons:

- **Overhead Distribution Lines** - Overhead lines are less costly to construct than underground lines. Therefore, the preference for the development of overhead lines is mainly based on the grounds of cost. Overhead lines allow high voltage operations, and the surrounding air provides the necessary electrical insulation to earth. Further, the surrounding air cools the conductors that produce heat due to lost energy (Swingler et al, 2006).

  The overall weather conditions in the Northern Cape Province are unlikely to cause damage and faults on the proposed overhead transmission power line. Nonetheless, if a fault occurs, it can be found quickly by visual means using a manual line patrol. Repair to overhead lines is relatively simple in most cases the line can usually be put back into service within a few days. In terms of potential impacts caused by overhead transmission lines include visual intrusion and threats to sensitive habitat (where applicable).

  Furthermore, overhead power lines also provide an opportunity for the avoidance of sensitive environmental features as the overhead lines can span on-ground environmental features to ensure conservation, therefore providing more flexibility in terms of mitigation of the associated on-ground disturbance.

  The choice of structure to be used for the power line will be determined in consultation with Eskom once the Engineers have assessed the geotechnical and topographical conditions and decided on a suitable structure which meets the prescribed technical requirements. The choice of structures to be used will not have any adverse impacts on the environment. The line will be constructed according to the authorised standards for a power line approved by Eskom Holdings SoC Ltd.

  The following alternatives may be considered for the overhead power line:

  - Single Circuit Overhead Power Line

    The use of single circuit overhead power lines to distribute electricity is considered the most appropriate technology and has been designed over many years for the

existing environmental conditions and terrain as specified in the Eskom Specifications and best international practice. Based on all current technologies available, single circuit overhead power lines are considered the most environmentally practicable technology available for the distribution of power. This option is considered appropriate for the following reasons:

- More cost-effective installation costs;
- Less environmental damage during installation; and
- More effective and cheaper maintenance costs over the lifetime of the power line.

- Double Circuit Overhead Power Line

  Where sensitive environmental features are identified, and there is sufficient justification, Eskom will consider the use of double circuit (placing 2 power lines on either side of the same tower structure) to minimise impacts. However, the use of double-circuiting has a number of technical disadvantages:

  - Faults or problems on one power line may mean that the other power line is also disabled during maintenance, and this will affect the quality of supply to an area. Larger and taller towers as well as more towers are required for double-circuit power lines.

  The double-circuit overhead power line proves more feasible since the single circuit may not have the capacity to transmit the large amount of electricity generated from the plant and during maintenance the entire plant would not have to be offline as one of the double circuit lines would still be able to supply electricity. However, due to the rapid requirement changes, this will only be determined before construction.

- **Underground Distribution Lines** - Underground cables have generally been used where it is impossible to use overhead lines for example because of space constraints. Underground cables are oil cooled and are also at risk of groundwater contamination. Maintenance is also difficult on underground lines compared to overhead lines. When a fault occurs in an underground cable circuit, it is almost exclusively a permanent fault due to poor visibility. Underground lines are also more expensive to construct than overhead lines.

5.1.5.2 Battery Energy Storage Facility (BESS)

The battery energy storage system will have a capacity of up to 40MW. The extent of the system will be 20m long, 23m high, 2.5m wide. The containers may be single stacked only to reduce the footprint. There may be up to a maximum of 40 containers of BESS. The containers will include cells, HVAC, fire, safety and control systems and will comprise of Lithium-Ion technology providing a maximum capacity of 50MW in total. However, three types of battery technologies are being considered for the proposed project: Lithium-ion, Sodium-sulphur or Vanadium Redox flow battery. While there are various battery storage technologies available, the preferred alternative is the utility-scale Lithium-ion (Li-ion) battery energy storage. Li-ion batteries have emerged as the leading technology in utility-scale energy storage applications because it offers the best mix of performance specifications, such as high charge and discharge efficiency, low self-discharge, high energy density, and long cycle life (Divya KC et al., 2009).

Battery storage offers a wide range of advantages to South Africa including renewable energy time shift, renewable capacity firming, electricity supply reliability and quality improvement, voltage regulation, electricity reserve capacity improvement, transmission congestion relief, load following and time of use energy cost management. In essence, this technology allows renewable energy to enter the base load and peak power generation market and therefore can compete directly with fossil fuel sources of power generation and offer a truly sustainable electricity supply option.

5.1.6 Design and layout alternatives

Design alternatives were considered throughout the planning and design phase (i.e. what would be the best design option for the development?). In this regard discussions on the design were held between the EAP and the developer. The layout plans for the two development areas are included in Appendix H.

The layout follows the limitations of the site and aspects such as environmental sensitive areas (supported by specialist input), roads, fencing and servitudes are considered. The total surface area proposed for layout options include the PV panel arrays spaced to avoid shadowing, access and maintenance roads and associated infrastructure (buildings, power inverters, power lines and substations, BESS and perimeter fences). With regards to the structure orientation, the panels will either be fixed to a single-axis tracking structure where the orientation of the panel varies according to the time of the day, as the sun moves from east to west or tilted at a fixed angle equivalent to the latitude at which the site is located in order to capture the most sun.

The layout for the facility has been optimised following specialist input to ensure the avoidance of any sensitive environmental features or areas as per the results of the independent specialist surveys. Refer to Figures J and Appendix I.

The choice of pylon structure to be used for the power line will be determined in consultation with Eskom. The choice of pylon structure does not significantly affect the environmental impacts of the proposed development as provision has already been made for the visual, ecological, avifaunal and paleontological impacts of erecting a power line. No defined structure has been confirmed at this stage and will depend on Eskom's technical requirements. The 132kV power line must be constructed according to the authorised standards for a power line approved by Eskom Holdings SoC Ltd. The structure to be utilised for the power line towers will also be informed by the local geotechnical and topographical conditions. The following alternatives are considered with regards to the proposed structures:

<u>Steel lattice towers:</u>

The steel lattice towers provide the following advantages over the other tower types available:

- Enables multipath earthing which enhances the overall electrical performance of the power line.
- Is visually less obtrusive than the mono-pole options.
- Is more practicable that other options i.e. more cost effective and more practical to construct and maintain.

- Is safer to work on than the monopole and wood pole structures.
- Is more durable than the wood pole structures.

Steel monopoles:

The steel monopole is considered less suitable than the steel lattice towers for the following reasons:

- Is visually more intrusive than the lattice towers.
- Is more expensive than the lattice towers.
- Requires more steel than the lattice towers.
- Is more difficult to erect.
- Is not as safe to work on as the lattice towers.

Wood poles:

Wood pole structures are only used in extreme circumstances where a visual impact needs to be avoided. Wood pole structures may be cheaper to produce and to construct, but they have one tenth of the lifespan of the metal counterparts and are far more susceptible to weather conditions which makes them less efficient and practicable. The wood pole structure is also more susceptible to having the cross arms burnt off by electrical faults as well as being susceptible to deformation with height.

5.1.7 Technology alternatives

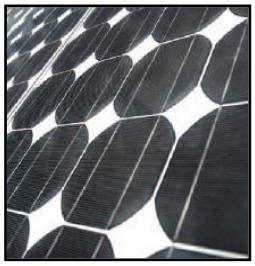
Technology alternatives for the development of a PV solar energy facility needs to be considered during the BA process.

5.1.7.1 Photovoltaic solar panels

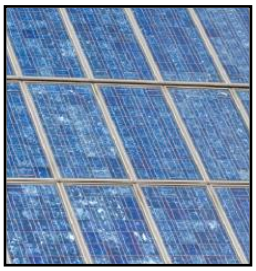
There are several types of semiconductor technologies currently available and in use for PV solar panels. Two, however, have become the most widely adopted, namely crystalline silicon, thin film or bifacial PV panels. These technologies are discussed in more detail below:

- **Crystalline (high efficiency technology at higher cost)**

  Crystalline silicon panels are constructed by first putting a single slice of silicon through a series of processing steps, creating one solar cell. These cells are then assembled together in multiples to make a solar panel. Crystalline silicon, also called wafer silicon, is the oldest and the most widely used material in commercial solar panels. Crystalline silicon modules represent 85-90% of the global annual market today. There are two main types of crystalline silicon panels that can be considered for the solar facility:



- ***Mono-crystalline Silicon*** - mono-crystalline (also called single crystal) panels use solar cells that are cut from a piece of silicon grown from a single, uniform crystal. Mono-crystalline panels are among the most efficient yet most expensive on the market. They require the highest purity silicon and have the most involved manufacturing process.



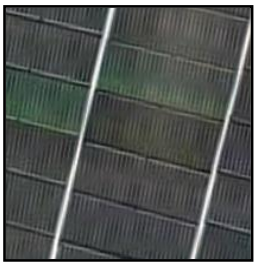
- ***Poly-crystalline Silicon*** – poly-crystalline panels use solar cells that are cut from multifaceted silicon crystals. They are less uniform in appearance than mono-crystalline cells, resembling pieces of shattered glass. These are the most common solar panels on the market, being less expensive than mono-crystalline silicon. They are also less efficient, though the performance gap has begun to close in recent years (First Solar, 2011).

- **Thin film (low-cost technology with lower efficiency)**

  Thin film solar panels are made by placing thin layers of semiconductor material onto various surfaces, usually on glass. The term *thin film* refers to the amount of semiconductor material used. It is applied in a thin film to a surface structure, such as a sheet of glass. Contrary to popular belief, most thin film panels are not flexible. Overall, thin film solar panels offer the lowest manufacturing costs, and are becoming more prevalent in the industry. Thin films currently account for 10-15% of global PV module sales. There are three main types of thin film used:

- ***Cadmium Telluride (CdTe)*** - CdTe is a semiconductor compound formed from cadmium and tellurium. CdTe solar panels are manufactured on glass. They are the most common type of thin film solar panel on the market and the most cost-effective to manufacture. CdTe panels perform significantly better in high temperatures and in low-light conditions.

- ***Amorphous Silicon*** - Amorphous silicon is the non-crystalline form of silicon and was the first thin film material to yield a commercial product, first used in consumer items such as calculators. It can be deposited in thin layers onto a variety of surfaces and offers lower costs than traditional crystalline silicon, though it is less efficient at converting sunlight into electricity.



- ***Copper, Indium, Gallium, Selenide (CIGS)*** - CIGS is a compound semiconductor that can be deposited onto many different materials. CIGS has only recently become available for small commercial applications and is considered a developing PV technology (First Solar, 2011).

- **Bifacial panels:**

  As the name suggests, bifacial solar panels have two faces, or rather, they can absorb light from both sides of the panel. A lot of potential energy transfer is lost in traditional solar cells when the light hits the back of a solar panel. Most bifacial solar panels use monocrystalline cells, whereas traditional cells use polycrystalline materials. The monocrystalline materials, alongside the clear light pathway on both sides of the panel, enable the light to be absorbed from either side of the cell, and it is thought that, that the overall efficiency of these cells can be up to 30% greater in commercial applications. Although, the exact amount is variable depending on the surface that they are installed on. The front side of the solar panel still absorbs most of the solar light, but the back side of the solar panel can absorb between 5-90% of the light absorbed by the front of the solar panel.

  Traditional solar panels use an opaque back sheet. By comparison, bifacial solar panels either have a clear/reflective back sheet or have dual panes of glass. Most of these solar panels are frameless so any issues with potential-induced degradation (PID) are reduced. To efficiently convert light into electricity from both sides, bifacial solar cells have selective-area metallization schemes that enable light to pass between the metallized areas, rather than the conventional thick metal collectors as seen with monofacial solar panels.

  The technology that (at this stage) proves more feasible and reasonable with respect to the proposed solar facility is crystalline silicon panels, due to it being non-reflective, more efficient, and with a higher durability. However, due to the rapid technological advances being made in the field of solar technology the exact type of technology to be used, such as bifacial panels, will only be confirmed at the onset of the project. Refer to Figure 5.3 below.

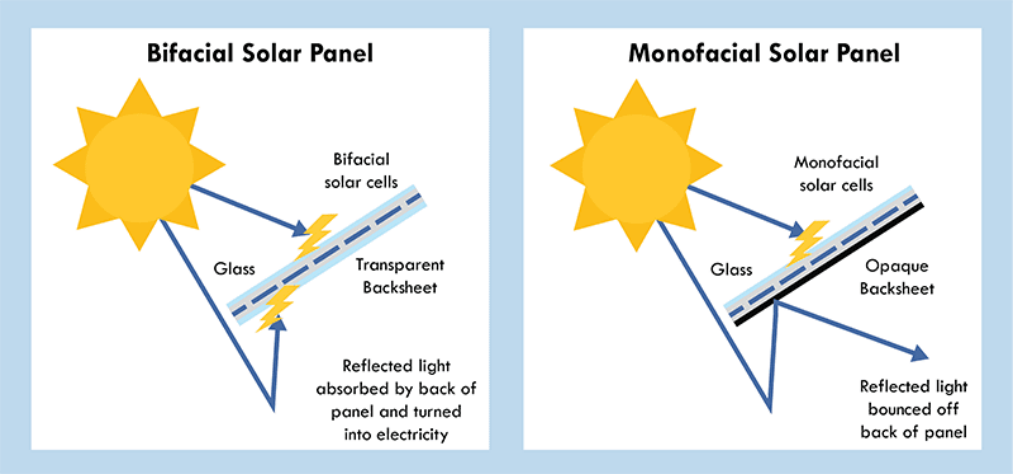


Figure 5.3: Bifacial vs Monofacial Solar Panel absorption

5.2 PUBLIC PARTICIPATION PROCESS

The following sections provide detailed information on the public participation process conducted in terms of Regulations 39 to 44.

5.2.1 General

The public participation process was conducted strictly in accordance with Regulations 39 to 44. The following three categories of variables were taken into account when deciding the required level of public participation:

- The scale of anticipated impacts
- The sensitivity of the affected environment and the degree of controversy of the project
- The characteristics of the potentially affected parties

Since the scale of anticipated impacts is low, the low environmental sensitivity of the site and the fact that no conflict was foreseen between potentially affected parties, no additional public participation mechanisms were considered at this stage of the process. The following actions have already been taken:

- <u>Newspaper advertisement</u>

  Since the proposed development is unlikely to result in any impacts that extend beyond the municipal area where it is located, it was deemed sufficient to advertise in a local newspaper. An advertisement was placed in English in the local newspaper (Noordkaap Bulletin) on the 30 June 2022 (see Appendix C1) notifying the public of the BA process and requesting Interested and Affected Parties (I&APs) to register with, and submit their comments to Environamics Environmental Consultants. I&APs were given the opportunity to raise comments within 30-days of the publishing of the advert (30 June 2022 to 01 August 2022).

- Site notices

  Site notices were placed on site in English and Afrikaans on 12 May 2022 to inform surrounding communities and immediately adjacent landowners of the proposed development. I&APs were given the opportunity to raise comments by 13 June 2022 Photographic evidence of the site notices is included in Appendix C2.

- Direct notification of identified I&APs

  Identified and registered I&APs, including key stakeholders representing various sectors, were directly informed of the Basic Assessment process via telephone calls, WhatsApps and emails (as appropriate). For a complete list of I&APs with their contact details see Appendix C3 to this report. Proof of the correspondence is also included in Appendix C.

- Direct notification of surrounding landowners and occupiers

  Written notices were provided via WhatsApp or email to all surrounding landowners and occupiers – refer to Figure 5.4. The surrounding landowners were given the opportunity to raise comments within 30 days. For a list of surrounding landowners see Appendix C3.

- Circulation of Draft Basic Assessment Report

  The registered I&APs were notified of the availability of the draft BA Report at the commencement of the 30-day review and comment period. This included the details of where the report can be accessed. They were requested to provide their comments on the report within 30 days (27 October 2022 – 28 November 2022). All issues identified, raised and recorded have been documented and compiled into a Comments and Responses Report (Appendix C6) included as part of this Final Basic Assessment Report.

- Circulation of decision and submission of appeals:

  Notice will be given to all identified and registered I&APs of the decision taken by the DFFE. The attention of all registered I&APs will also be drawn to the fact that an appeal may be lodged against the decision in terms of the National Appeals Regulations. In accordance with the provisions of Regulation 4(1) of Government Notice No. 993, an appellant must submit the appeal to the appeal administrator, and a copy of the appeal to the applicant, any registered I&APs and any organ of state with interest in the matter within 20 days from the date that the notification of the decision was sent to the applicant by the competent authority.

Figure 5.4: Surrounding Landowners to the Remaining Extent of the Farm Droogfontein No. 62 (indicated in blue)

5.2.2 Consultation process

Regulation 41 requires that the landowner, surrounding landowners, municipality, relevant ward councillor, any organ of state having jurisdiction in respect of any aspect of the activity and any other party as required by the competent authority should be given written notice of the activity. A complete list of all the consultees who received written notice as well as proof of correspondence is attached in Appendices C.

5.2.3 Registered I&APs

I&APs include all stakeholders who deem themselves affected by the proposed activity. According to Regulation 43(1) "*A registered interested and affected party is entitled to comment, in writing, on all reports or plans submitted to such party during the public participation process contemplated in these Regulations and to bring to the attention of the proponent or applicant any issues which that party believes may be of significance to the consideration of the application, provided that the interested and affected party discloses any direct business, financial, personal or other interest which that party may have in the approval or refusal of the application*."

The Draft Basic Assessment Report was made available to all potential and/or registered I&APs, Stakeholders and State Departments. They were provided with a copy of the Draft BAR and were requested to provide written comments on the report within 30 days. All issues identified during this review period have been documented and compiled into a Comments and Response Report (Appendix C6) and submitted with this final Basic Assessment Report.

All comments received prior to the release of the Draft BAR for the 30-day review and comment period was included in the draft report as Appendix C6 to provide I&APs an opportunity to confirm that their comments raised during the initial public participation phase have been included and considered.

5.2.4 Issues raised by I&APs and consultation bodies

Comments that have been received is included in the Comments and Response Report included in Appendix C6 of this final report. This includes the comments received during the circulation of the Draft BAR for the 30-day review and comment period. The full wording and original correspondence are included in Appendix C5 and Appendix C6 of this final report.

5.3 THE ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE PREFERRED ALTERNATIVE

The following sections provide general information on the biophysical and socio-economic attributed associated with the preferred alternative.

5.3.1 Biophysical environment

The biophysical environment is described with specific reference to geology, soils, agricultural potential, vegetation and landscape features, climate, biodiversity and the visual landscape. The socio-economic environment is also described, which includes the consideration of heritage and cultural characteristics of the affected environment. A number of specialists were consulted to assist with the compilation of this chapter of the report – refer to the Table 1.2.

It must be noted that the descriptions provided below are for the entire site (i.e. affected property) and includes the two site alternatives under assessment.

5.3.1.1 Geology, soils and agricultural potential

According to the Agriculture Compliance Statement (attached in Appendix D4) most of the site is characterised by a slope percentage of between 0 to 6% with some irregularities in areas with slopes reaching 7%. This illustration indicates a non-uniform topography with occurrence of some steep sloping areas being present. The Digital Elevation Model (DEM) of the project area indicates an elevation of 1 147 to 1 176 Metres Above Sea Level (MASL).

According to the land type database (Land Type Survey Staff, 1972 - 2006) the site falls within the Ae 15 land type. The Ae land types mostly consist of Hutton, Mispah and Katspruit soil forms following the South African soil classification working group (1990) with the possibility of other soils occurring throughout. The area is also characterised with shallow profiles and occurrence of rocky areas. The Ae land types are characterised with red to yellow apedal and freely drained soils. The soils have a high base status with profiles deeper than 300 mm without any occurrence of dunes. Lime is rare or absent in the upper terrain soils and generally present in the low-lying terrain soils.

The most sensitive soil forms identified within the site is the Ermelo, Hutton and Vaalbos soil forms, with other associated soils also occurring. The Ermelo soil form has an orthic topsoil with a thick yellow brown apedal subsurface horizon. The Hutton soil form consists of an orthic topsoil horizon on top of a thick red apedal subsurface diagnostic horizon below. The Vaalbos soil form consists of an orthic topsoil on top of a red apedal horizon merging into a hard rock substratum.

The land capability of the above-mentioned soils has been determined to have land capability classes of “II” and “III” with a climate capability level 8 given the low Mean Annual Precipitation (MAP) and the high Mean Annual Potential Evapotranspiration (MAPE) rates. The combination between the determined land capabilities and climate capabilities results in land potentials “L5” and “L6”. The “L5” land potential level is characterised by a restricted potential. Regular and/or moderate to severe limitations occur due to soil, slope, temperatures or rainfall. The “L6” land potential level is characterised by a very restricted potential. Regular and/or severe limitations occur due to soil, slope, temperatures or rainfall. These areas are non-arable. The “L5” and “L6” land potential are characterized with a “Low Sensitivity”.

The site is associated with both non-arable and some arable soils, due to the type of soils in the area. The climate limits crop production significantly. The harsh climatic conditions are associated with low annual rainfall and high evapotranspiration potential demands of the area. The area is not favourable for most cropping practices, which corresponds to the current livestock and game farming activities in the area.

The proposed Droogfontein 4 Solar and Battery Storage Energy Facility is mostly characterised with "Low" to "Moderate" land capability sensitivities. Some portions in the site falls within "Very Low to Low" sensitivities. Some areas are also characterised with arable soils. It therefore is the specialist's opinion that the land capability and land potential of the resources in the site is characterised by "Low" to "Moderate" sensitivities (see Figure 5.5), which conforms to the requirements of an agricultural compliance statement only. The DFFE screening tool (Appendix B) shows that there are no crop fields with "High" sensitivity within the project area. Hence, there is no segregation of crop fields with "High" sensitivity in the site (including the two site alternatives) that can limit crop production.

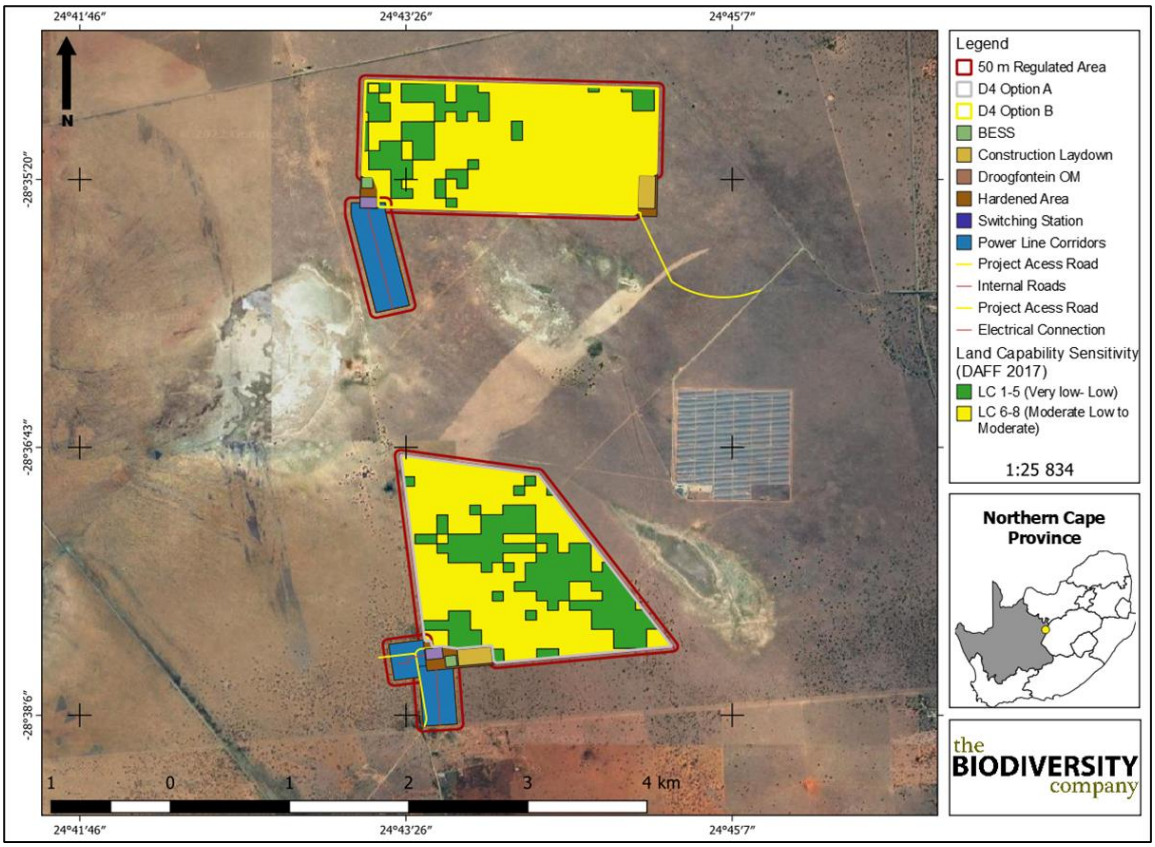


Figure 5.5: Land Capability Sensitivity (DAFF, 2017) of the two site alternatives assessed for the development

The geology of the region consists of the andesitic lavas of the Allanridge Formation as well as the fine-grained sediments of the Karoo Supergroup. It consists of deep sandy to loamy soils from the Hutton soil form (Ae and Ah land types) on top of undulating sandy plains (Mucina and Rutherford, 2006).

5.3.1.2 Vegetation, landscape and habitat features

The Terrestrial Ecology Impact Assessment (Appendix D1) has considered ecologically important landscape features for the proposed project within the site. From this consideration it was identified that the site is located within a Least Concern Ecosystem, it falls within an area considered as a Poorly Protected Ecosystem and overlaps with an area categorised as Other Natural Areas as per the Northern Cape Critical Biodivesity Areas Map.

Critical Biodiversity Areas (CBAs)

The conservation of CBAs is crucial, in that if these areas are not maintained in a natural or near-natural state, biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (SANBI-BGIS, 2017).

The purpose of the Northern Cape BSP (2016) is to inform land-use planning and development on a provincial scale and to aid in natural resource management. One of the outputs is a map of Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). These are classified into different categories, namely CBA1 areas, CBA2 areas, ESA areas and Other Natural Areas (ONAs) based on biodiversity characteristics, spatial configuration, and requirements for meeting targets for both biodiversity patterns and ecological processes.

Figure 5.6 shows the two development area alternatives superimposed on the Terrestrial CBA maps. The areas overlaps mainly with an ONA.

Figure 5.6: Locations of CBAs in relation to the two development area alternatives

Ecosystem Threat Status

The Ecosystem Threat Status is an indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition. According to the spatial dataset the proposed project overlaps with a LC ecosystem.

Ecosystem Protection Level

This is an indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems. The proposed project overlaps with a PP ecosystem.

Vegetation Type

This section pertains to the updated SANBI vegetation map of 2019, with the Vegetation Type descriptions by Mucina & Rutherford, 2006 (which are unchanged) for the relevant vegetation type in this report.

The site is situated in the Savanna biome. The savanna vegetation of South Africa represents the southernmost extension of the most widespread biome in Africa. Major macroclimatic traits that characterise the Savanna biome include a seasonal precipitation and a sub-tropical thermal regime with no or usually low incidence of frost.

The savanna biome is the largest biome in South Africa, extending throughout the east and north-eastern areas of the country. Savannas are characterised by a dominant grass layer, over-topped by a discontinuous, but distinct woody plant layer. At a structural level, Africa's savannas can be broadly categorised as either fine-leaved (microphyllous) savannas or broad-leaved savannas. Fine-leaved savannas typically occur on nutrient rich soils and are dominated by microphyllous woody plants of the Mimosaceae family (Common genera include *Vachellia* and *Albizia*) and a generally dense herbaceous layer.

On a fine-scale vegetation type, the project area overlaps with the Kimberley Thornveld vegetation type (Figure 5.7).

Figure 5.7: Vegetation type associated with the two development alternatives

Kimberley Thornveld is distributed across the North-West, Free State and Northern Cape Provinces. It covers most of the Kimberley, Hartswater, Bloemhof and Hoopstad Districts as well as substantial parts of the Warrenton, Christiana, Taung, Boshof and to some extent the Barkly West Districts. Altitudes range from 1 050 to 1 400 m.

The following species are important taxa in the Kimberley Thornveld vegetation type:

- **Tall Tree:** *Vachellia erioloba* (d).
- **Small Trees**: *Vachellia karroo* (d), *V. mellifera subsp. detinens* (d), *V. tortilis subsp. heteracantha* (d), *Searsia lancea*.
- **Tall Shrubs**: *Tarchonanthus camphoratus* (d), *Diospyros pallens*, *Ehretia rigida subsp. rigida*, *Euclea crispa subsp. ovata*, *Grewia flava, Lycium arenicola, L. hirsutum, Searsia tridactyla.*
- **Low Shrubs**: *Vachellia hebeclada subsp. hebeclada* (d), *Anthospermum rigidum subsp. pumilum, Helichrysum zeyheri, Hermannia comosa, Lycium pilifolium, Melolobium microphyllum, Pavonia burchellii, Peliostomum leucorrhizum, Plinthus sericeus, Wahlenbergia nodosa.*
- **Succulent Shrubs:** *Aloe hereroensis var. hereroensis, Lycium cinereum.*
- **Graminoids**: *Eragrostis lehmanniana* (d), *Aristida canescens, A. congesta, A. mollissima subsp. argentea, Cymbopogon pospischilii, Digitaria argyrograpta, D. eriantha subsp. eriantha, Enneapogon cenchroides, E. scoparius, Eragrostis rigidior, Heteropogon contortus, Themeda triandra.*

- **Herbs**: *Barleria macrostegia, Dicoma schinzii, Harpagophytum procumbens subsp. procumbens, Helichrysum cerastioides, Hermbstaedtia odorata, Hibiscus marlothianus, Jamesbrittenia aurantiaca, Lippia scaberrima, Osteospermum muricatum, Vahlia capensis subsp. vulgaris.*
- **Succulent Herbs**: *Aloe grandidentata, Piaranthus decipiens.*

Furthermore, biographically important taxa are also identified, including: (GW = Griqualand West endemic; K = Kalahari endemic)

- **Low Shrub**: *Blepharis marginata* (GW).
- **Succulent Shrub**: *Euphorbia bergii* (GW).
- **Graminoid**: *Panicum kalaharense* (K).
- **Herbs**: *Helichrysum arenicola* (K), *Neuradopsis bechuanensis* (K).
- **Succulent Herbs**: *Lithops aucampiae subsp. aucampiae* (GW), *Tridentea marientalensis subsp. marientalensis* (K).

According to Mucina and Rutherford (2006) Kimberley Thornveld is classified as Least Threatened, according to the NBA status listed as Least Concern and Poorly Protected. Only 2% of this vegetation type is statutorily conserved in Vaalbos National Park (now de-proclaimed) as well as in Sandveld, Bloemhof Dam and S.A. Lombard Nature Reserves. About 18% is already transformed, mostly by cultivation. Erosion is very low. Kimberley Thornveld is mostly used for cattle farming or game ranching, and overgrazing leads to encroachment of the tree *Senegalia mellifera subsp. detinens* (Mucina & Rutherford, 2006).

The POSA database indicates that 678 species of indigenous plants are expected to occur within the site. One (1) Species of Conservation Concern based on their conservation status could be expected to occur. This is *Euphorbia flanaganii*.

Indigenous Flora

The species composition of the site was consistent with typical Kimberley Thornveld vegetation type (as per the results of the specialist field survey). This is attributed to the limited transformation and disturbance to the area, due to the land use mainly being grazed land for livestock. Distinctive vegetation communities were observed within this vegetation type and can be classified into woody Thornveld, grassy Thornveld and artificial wetlands. Overall, the difference within the Thornveld habitat is mainly the presence (woody) or absence (grassy) of woody (trees) plants. Refer to Figure 5.8.

The woody Thornveld floral community was typically dominated by one main woody species, *Vachellia karoo* (Camelthorn), but also had *V. tortilis*, *V. hebeclada, Ziziphus mucronata, Searsia Lancea, Senegalia mellifera, Ehretia rigida* and *Tarchonanthus camphoratus*.

The herbaceous layer and grasses were similar in each community with species such as, Eragrostis lehmanniana, Aristida canescens, A. congesta, A. mollissima subsp. argentea, Digitaria argyrograpta, D. eriantha subsp. eriantha, Enneapogon cenchroides, E. scoparius, Eragrostis rigidior, Heteropogon contortus, Themeda triandra, Gazania krebsiana, Boophone disticha, Lycium pilifolium, Melolobium microphyllum, Dicoma schinzii, Harpagophytum procumbens, Gnidia polycephala.

Artificial wetlands included species such as *Typha capensis*.

Figure 5.8: Photographs illustrating some of the flora recorded within the site: A) *Vachellia erioloba* (Nationally Protected), B) *Melolobium microphyllum*, C) *Gnidia polycephala*, D) *Boophone disticha*.

Floral Species of Concern

During the field assessment 1 (one) species of protected tree was observed: *Vachellia erioloba* (Camelthorn). The protected trees observed are protected by the List of Protected Tree Species under the National Forests Act, 1998 (Act No. 84 of 1998) (NFA). In terms of the NFA, no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate, or in any other manner acquire or dispose of any protected tree or any product derived from a protected tree, except under a licence or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated. Contravention of this declaration is regarded as a first category offence.

Several Camelthorn trees occurred naturally spaced throughout the area, mainly located within the woody Thornveld habitat[4]. A heat map showing the Camelthorn density is shown in Figure 5.9. As seen in the figure, development area Option A has a higher density of Camlethorn in comparison to Option B.

[4] Genesis Droogfontein 4 (Pty) Ltd has indicated that a permit was obtained from the Northern Cape Provincial Department of Environment and Nature Conservation for the removal of the protected Camelthorn trees as part of the Droogfontein 1 and Droogfontein 2 that are operational.

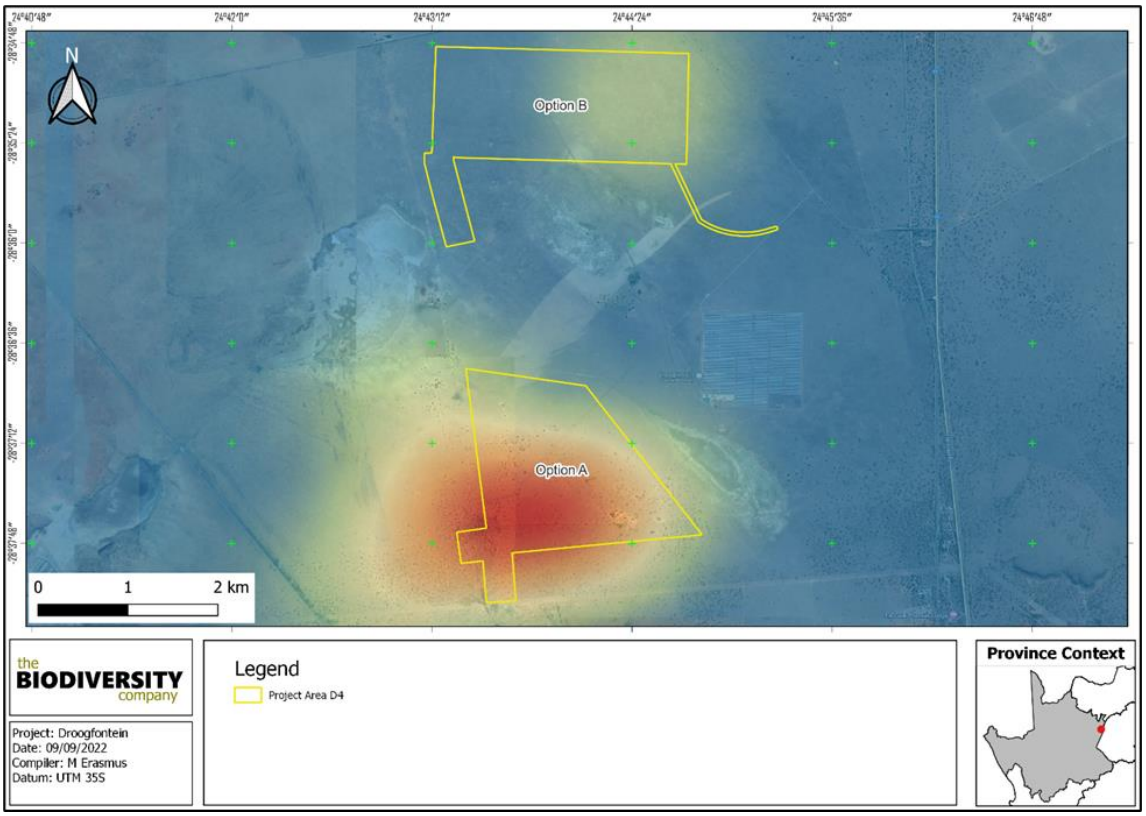


Figure 5.9: Heatmap indicating Camelthorn presence and density, from Red to Blue. Red=High number, Blue=None.

Invasive Alien Plants

Invasive Alien Plants (IAPs) tend to dominate or replace indigenous flora, thereby transforming the structure, composition and functioning of ecosystems. Therefore, it is important that these plants are controlled by means of an eradication and monitoring programme. Some invader plants may also degrade ecosystems through superior competitive capabilities to exclude native plant species.

NEMBA is the most recent legislation pertaining to alien invasive plant species. In August 2014, the list of Alien Invasive Species was published in terms of the NEMBA. The Alien and Invasive Species Regulations were published in the Government Gazette No. 44182, 24th of February 2021. The legislation calls for the removal and / or control of IAP species (Category 1 species). In addition, unless authorised thereto in terms of the NWA, no land user shall allow Category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland. Category 3 plants are also prohibited from occurring within proximity to a watercourse. Below is a brief explanation of the three categories in terms of the NEMBA:

- Category 1a: Invasive species requiring compulsory control. Remove and destroy. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.
- Category 1b: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have

such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.

- Category 2: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones.
- Category 3: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Category 3 plants to exist in riparian zones.

Note that according to the Alien and Invasive Species Regulations, a person who has under his or her control a category 1b listed invasive species must immediately:

- Notify the competent authority in writing
- Take steps to manage the listed invasive species in compliance with:
  - Section 75 of the NEMBA;
  - The relevant invasive species management programme developed in terms of regulation 4; and
  - Any directive issued in terms of section 73(3) of the NEMBA.

Two species, namely *Opuntia ficus indica* and *Opuntia stricta* were recorded within the site. Any species that are listed under the Alien and Invasive Species List 2020, Government Gazette No. GN1003 as Category 1b. Category 1b species must be controlled by implementing an IAP Management Programme, in compliance of section 75 of the NEMBA, as stated above.

Habitat Types

The main habitat types identified across the site were initially identified largely based on aerial imagery. These main habitat types were refined based on the field coverage and data collected during the survey. Emphasis was placed on limiting timed meander searches along the project area within the natural habitats and therefore habitats with a higher potential of hosting SCC. The habitats observed, coincide with the vegetation types as described by Mucina & Rutherford in 2006 and SANBI (2019). Refer to Figure 5.10.

Figure 5.10: Delineated habitats associated with the two development area alternatives

Table 5.1 below provides a summary of the habitat types and the characteristics thereof.

Table 5.1: Summary of habitat types delineated within the site

Habitat Type	Description	Ecosystem Processes and Services	Habitat Sensitivity
Thornveld (Woody)	Terrain consists of a low to zero slope with deep soils. Variable in the presence or absence of Woody species and shrub density. Semi-natural, but slightly disturbed due to the grazing by livestock and also human infringement.	Provides crucial ecological services to the area/region, including runoff and erosion control enabling rainwater percolation, nutrient cycling within the topsoil layers supporting the healthy functioning of indigenous flora and re-seeding processes, carbon sequestration, and foraging and nesting resources for livestock and local indigenous fauna species. Aids in the filtration of water permeating through the soil into the drainage lines. Important corridor for fauna dispersion within the landscape. The unit acts as a greenland which supports viable plant species populations and is also used for foraging by fauna. Woody species assists in nitrogen fixation.	High
Thornveld (Grassy)	Terrain consists of a low to zero slope with deep soils. Variable in the presence or absence of grass species and shrub density. Semi-natural, but slightly disturbed due to the grazing by livestock and also human infringement.	Provides grazing and foraging resources for indigenous fauna and livestock. Aids in the filtration of water permeating through the soil into the drainage lines. Important corridor for fauna dispersion within the landscape. Acts as buffer for high sensitivity areas. The unit acts as a greenland which supports viable plant species populations and is also used for foraging by fauna.	Medium
Artificial wetlands	An artificial system formed through a leaking pipe through which channels through, which surface water naturally collates and flows.	Water Paths, functions as important water resources. Provides surface water within the landscape.	Low

Further to Table 5.1 above, Table 5.2 below provides more detailed information on the delineated habitat types.

Table 5.2: Detailed description of the delineated habitat types present

Habitat Type	Description	Photographic information
Woody Thornveld	• Thornveld with a distinct woody component comprising of large trees. • Has not been disturbed, except for the historic and current grazing. • Semi-natural, but slightly disturbed due to the grazing by livestock, mismanagement and also human infringement. • Disturbed areas within the habitat exists, close to roads as well as kraal areas. • Intact current ecological condition, which is evident in the amount of, and importance of the species recorded in the flora and faunal assessment, and also to the type of plant species recorded corresponding to the vegetation type as described by Mucina (2006). • Even though it is partly disturbed, it supports largely intact vegetation, including a high density of Camelthorn (*Vachellia erioloba*) which is protected Nationally. • This habitat type acts as a viable greenland used for foraging and reproduction corridor for fauna dispersion within the landscape. • Its current state may be regarded as ESA. • Development area Option A contained a small portion of this habitat. • The entire development area Option B comprised of this habitat.	 

Grassy Thornveld	• Thornveld without a distinct woody component, and has not been disturbed by much, except for the historic and current grazing. • The habitat has the same ecological condition as the woody Thornveld, and acts as a greenland which supports viable plant species populations and is also used for foraging by fauna. • This habitat occupied the largest portion of Option A and is considered a viable area for development, due to the lack of woody plant species.	
Artificial Wetlands	• This habitat exists due to leaking bulk water pipelines between Kimberly and Riverton.	 

5.3.1.3 Wetlands

The Wetland Risk and Impact Assessment (Appendix D8) indicates that the site is divided into two quaternary catchments C91E and C91D within the Vaal Water Management Area (WMA).

Multiple non-perennial streams have been identified within the site by means of the "2824" quarter degree square topographical river line dataset. Multiple inland water areas have also been identified which were classified as being non-perennial pan wetlands or dams within the 500 m regulated area.

Six types of NFEPA wetlands were identified, namely channelled valley bottom wetlands, depressions, wetland flats, hillslope seeps, valleyhead seeps as well as unchannelled valley bottoms (see Figure 5.11). All the NFEPA wetlands identified within the 500 m regulated area are classified as natural with a condition of largely natural (A/B).

National Wetland Map 5 includes inland wetlands and estuaries, associated with river line data and many other datasets within the South African Inventory of Inland Aquatic Ecosystems (SAIIAE, 2018). Multiple areas were identified using the SAIIAE database all of which are classified as being depression wetlands (see Figure 5.12). The conditions of these wetlands are classified as "A/B" (largely natural).

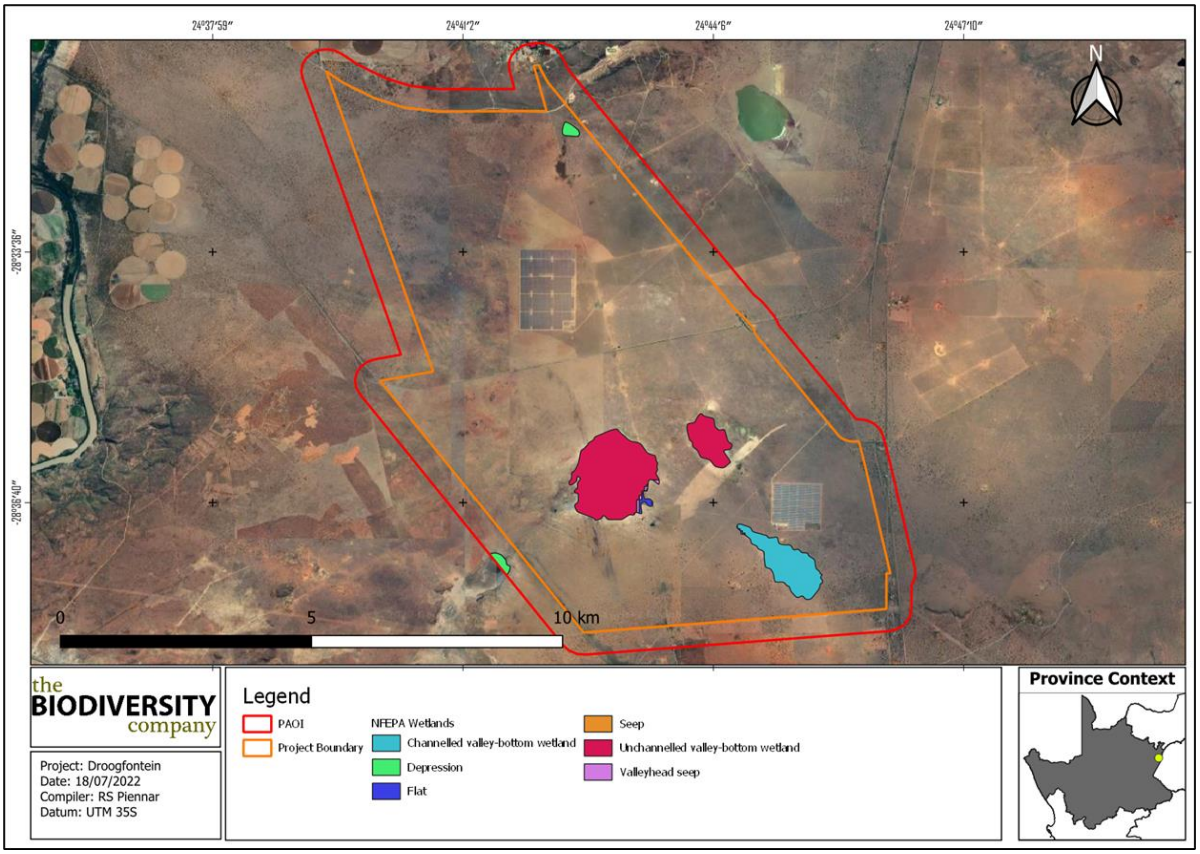


Figure 5.11: NFEPA wetlands located within the site and surrounds

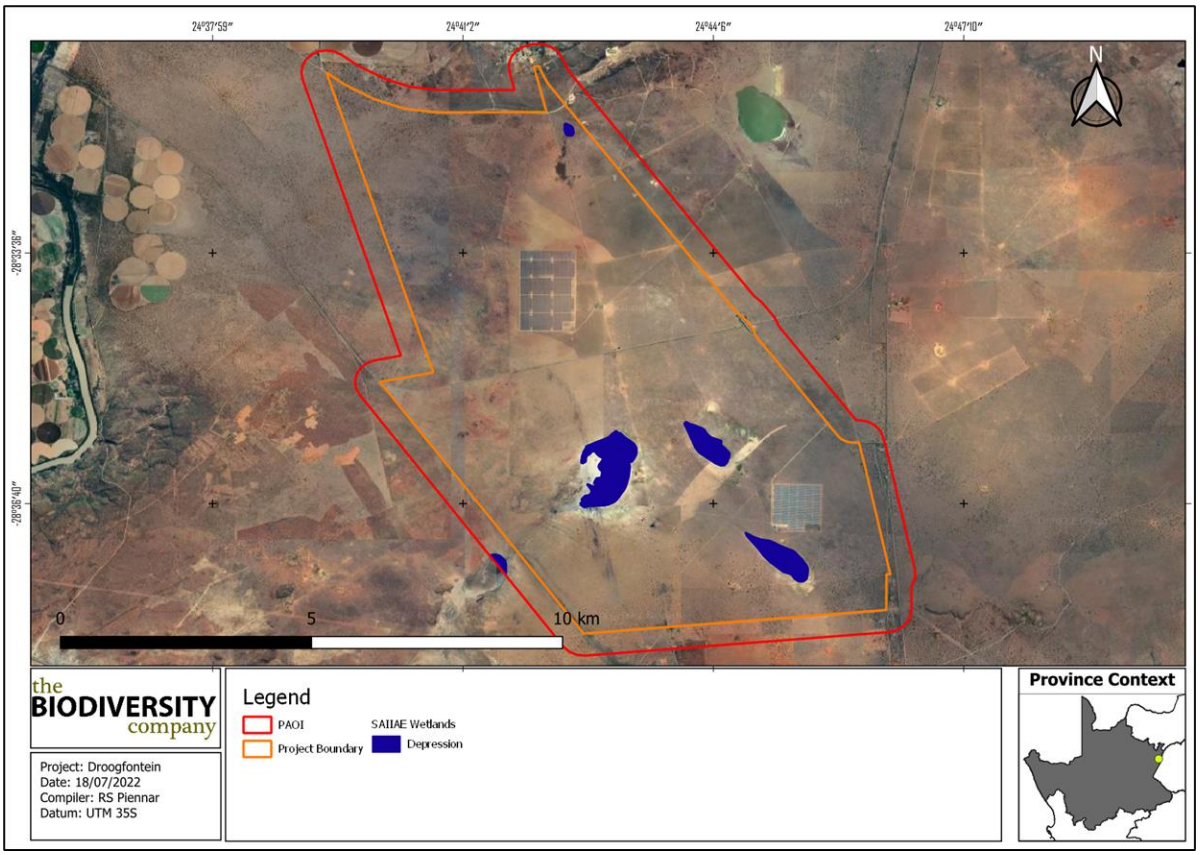


Figure 5.12: SAIIAE wetlands located within the 500 m regulated area

The specialist identified three hydrogeomorphic (HGM) units within the 500 m regulated area of the site . The wetland areas were delineated in accordance with the DWAF (2005) guidelines (see Figure 5.13 and Figure 5.14). All the HGM units have been identified as depression wetlands and have been accessed accordingly. Along with the three wetlands a few artificial wetlands (municipality water pipe leaking) and a drainage feature was identified within the 500 m regulated area. Although the artificial wetlands are not regarded to be 'natural' systems, it is important to note where they are located for any planned development in the area.

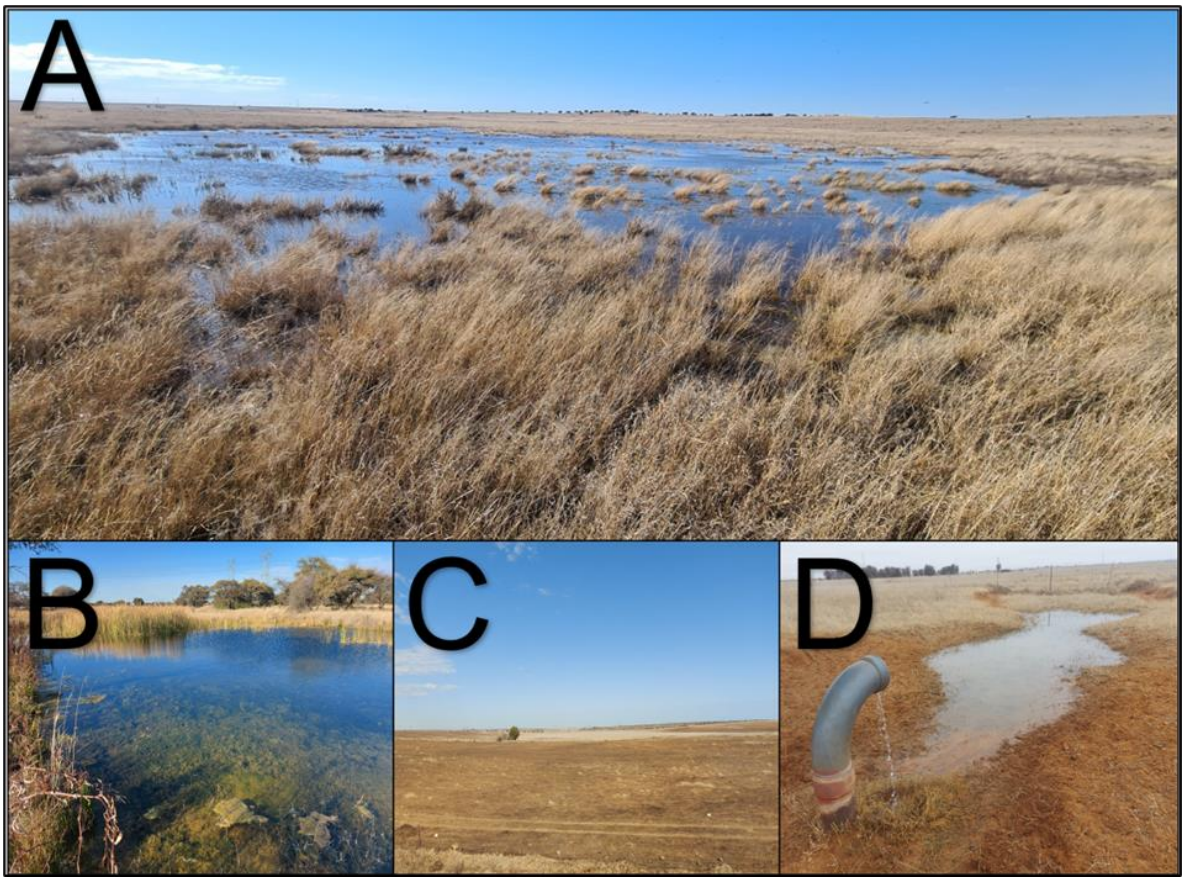


Figure 5.13: Photographical evidence of the different wet areas found within the 500 m regulated area, A) HGM 2 - Depression, B) HGM 3 – Depression, C) HGM 1 - Depression and D) Artificial wetland drainage system

The ecosystem services provided by the wetland units identified on site were assessed and rated using the WET-EcoServices method. HGM unit 2 scored “High” for ecosystem service benefits due to pollution flowing into the wetlands from a burst and dilapidated pipe. This pipe was built to evacuate surplus grey water from the Kamfer’s Dam to a property to the east of the Riverton Road. The wetland also provides a high variety of habitats for birds, amphibians and mammals. The system has a high density of hydrophytes which helps with the assimilation of nutrients and toxicants from the water column.

HGM unit 3 scored “Moderately High” for ecosystem service benefits due to the number of hydrophytes present within the wetland. This wetland however does not receive any toxicants and nutrients from the sewerage pipe.

HGM 1 scored “Intermediate” for ecosystem service benefits. The reason for the lower score is due to the lower density of hydrophytes associated with the wetlands. This will lower the ability of the wetland to provide habitat and resources for both human and animals. The HGM units have little to no signs of erosion and functions well for sediment trapping and flow attenuation.

Ecosystem services contributing to these scores include flood attenuation, streamflow regulation, sediment trapping, phosphate assimilation, nitrate assimilation, toxicant assimilation, erosion control, biodiversity maintenance and tourism and recreation.

The delineated wetland systems have been scored overall Present Ecological Status (PES) ratings ranging from “Moderately Modified” (class C) to “Seriously Modified” (class E). The wetlands that scored “Largely Modified” (HGM 3) was due to multiple anthropogenic impacts on the systems. These systems are characterised by overgrazing by cattle and some development within their delineated buffers, they are subject to anthropogenic increases in water inputs and have been affected by the removal of vegetation.

HGM 2 scored “Seriously Modified” for the ecological state due to the presence of a leaking sewerage pipe discharging into the system. The discharge will have an impact on the (water and soil) quality of the system, which will negatively influence the associated vegetation and biota. The wetland is also subject to grazing from cattle and other wildlife.

HGM 1 was determined to have the highest present ecological score of “Moderately Modified” (C). The wetlands seem to be ‘mostly’ intact with no visible anthropogenic impacts observed during the site visit. When reviewing historical imagery however, there was evidence of dirt roads traversing the wetland which would alter the hydrology of the system, and also likely contribute to sedimentation and the impaired water quality of the system.

It is worth noting that the scientific buffer calculation (Macfarlane et al., 2014) was used to determine the size of the buffer zones relevant to the proposed project. A pre-mitigation buffer zone of 33 m is recommended for the identified wetlands, which can be decreased to 15 m with the addition of all prescribed mitigation measures(Figure 5.15).

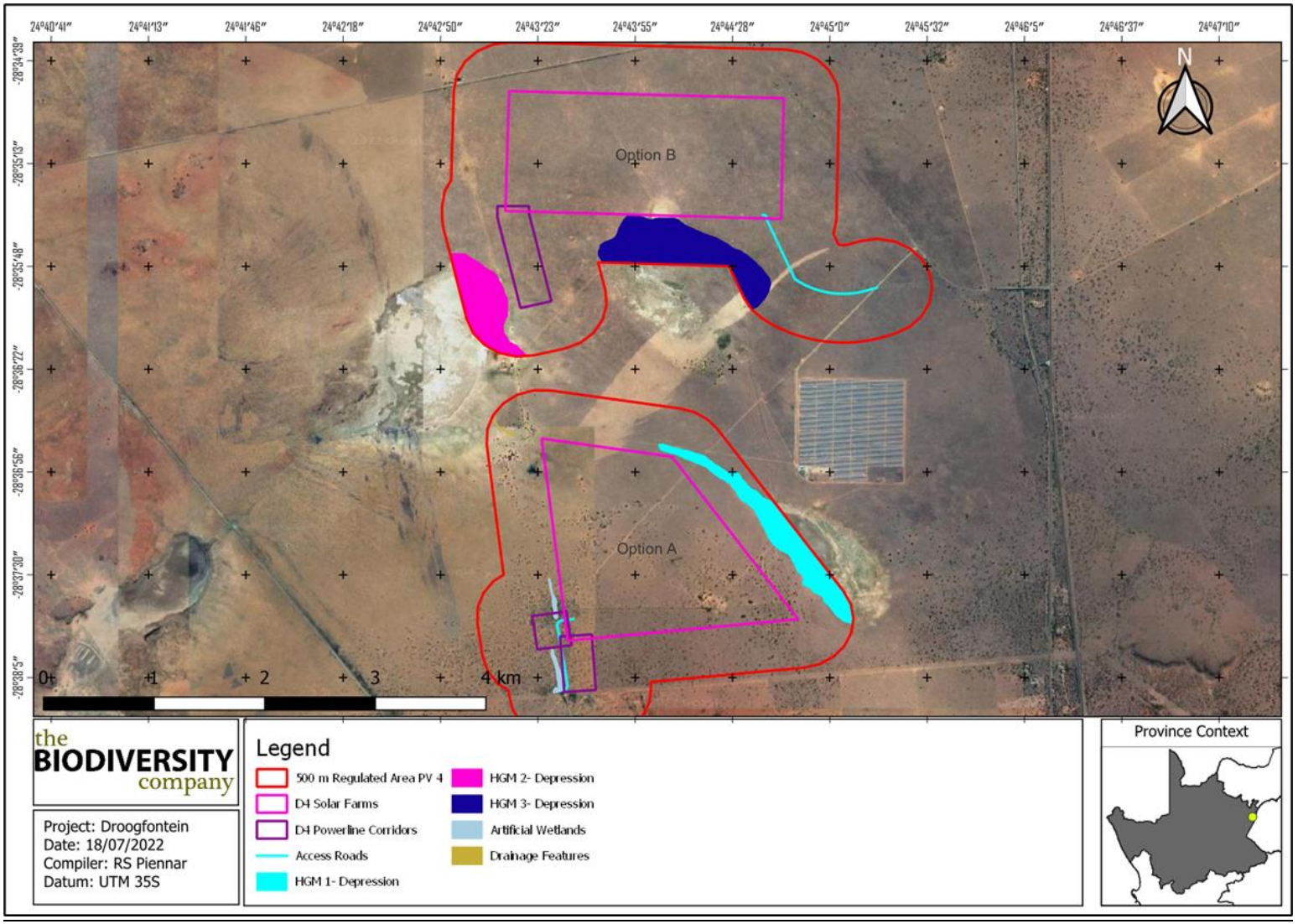


Figure 5.14: Delineation and location of the different HGM units identified

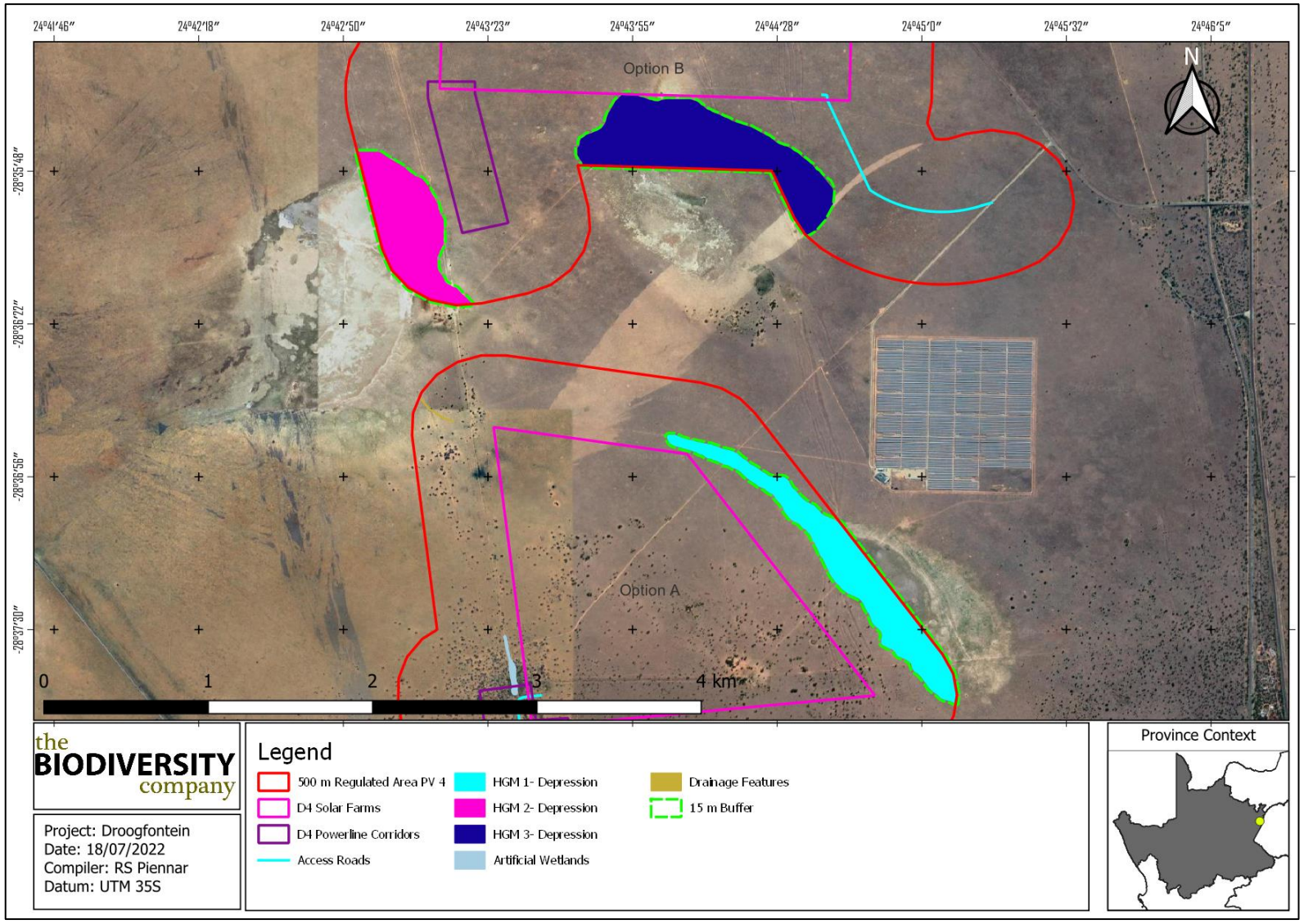


Figure 5.15: Proposed buffers for the delineated wetland areas

5.3.1.4 Climate

The SVk 4 (Kimberley Thornveld) vegetation type is characterised by a summer rainfall with a Mean Annual Precipitation (MAP) that ranges between 300 mm and 500 mm. Frost frequently occurs during the winter. Temperatures ranges from 37.5 °C in the summer to -4.1 °C in the winter. Refer to Figure 5.16.

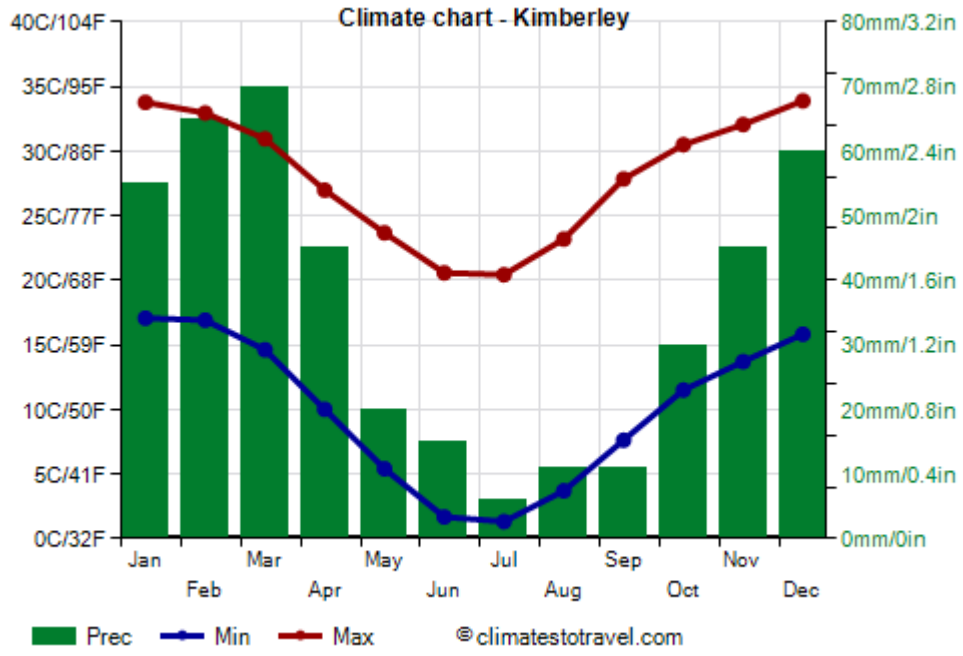


Figure 5.16: Climate diagram representative of the Droogfontein 4 Solar and Battery Storage Energy Facility

5.3.1.5 Biodiversity

The primary cause of loss of biological diversity is habitat degradation and loss (IUCN, 2004; Primack, 2006). In the case of this study special attention was given to the identification of sensitive species or animal life and birds on site. The following section will discuss the state of biodiversity on the site in more detail.

Avifaunal

The Avifauna Impact Assessment (Appendix D2) provides a description of the avifauna that is expected to occur within the site. Two field surveys were undertaken during the 4th – 8th of July 2022 (Winter) and in 5th -9th of September 2022 (Summer).

Important Bird & Biodiversity Areas (IBAs) are the sites of international significance for the conservation of the world's birds and other conservation significant species as identified by BirdLife International. These sites are also all Key Biodiversity Areas; sites that contribute significantly to the global persistence of biodiversity.

There are two IBAs near the site, the Dronfield Nature Reserve IBA located approximately 1.5 km from the site and Kamfers Dam IBA 1.8 km from the site (Figure 5.17). These are described below:

- Dronfield Nature Reserve – The reserve is located within the Savanna Biome and is close to the western edge of the Grassland Biome. One vegetation type, Kimberley Thornveld, is present. Globally threatened species are White-backed Vulture (*Gyps africanus*), Lappet-faced Vulture (*Torgos tracheliotos*), Secretarybird (*Sagittarius serpentarius*), Kori Bustard (*Ardeotis kori*) and Lesser Flamingo (*Phoeniconaias minor*). Regionally threatened species comprises of Tawny Eagle (*Aquila rapax*). Dronfield supports large numbers of breeding White-backed Vultures (99 breeding pairs) and colony comprises 41% of the breeding pairs in the Kimberley region. The numbers of this species and its breeding success have largely remained stable over the past 20 years, but the past five years have shown a slight decline in breeding success.
- Kamfers Dam – This IBA is located 6 km north of Kimberley in the ecotone of the Kalahari Savanna, Grassland and Nama Karoo biomes. This IBA provides a reliable refuge for waterbirds in a semi-arid area where wetlands are scarce. Kamfers Dam regularly holds more than 20 000 birds. Globally threatened birds are Lesser Flamingo (10 000 to 80 000) and Chestnut-banded Plover (*Charadrius pallidus*). Regionally threatened birds are Greater Flamingo (*Phoenicopterus roseus*) and African Marsh Harrier (*Circus ranivorus*). The most abundant waterbirds in recent years are *Lesser Flamingo, Greater Flamingo and Grey-headed Gull (Chroicocephalus* cirrocephalus). The highest number of waterbirds counted was 84 919 individuals in 2006.

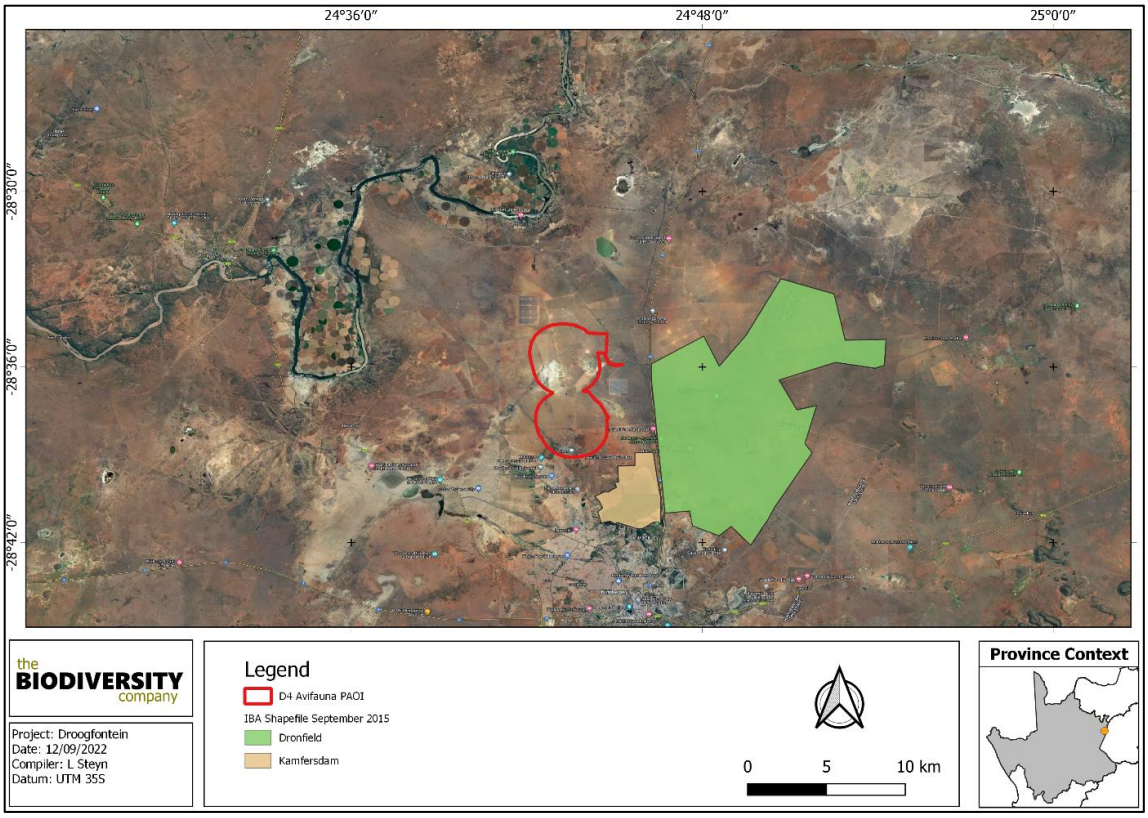


Figure 5.17: Bird and Important Biodiversity Areas in relation to the site

The SABAP2 Data lists 300 indigenous avifauna species that could be expected to occur within the site and surrounding landscape. Twenty-one (21) of these expected species are regarded as Species of Conservation Concern (SCC). Refer to the points below:

- *Aquila rapax* (Tawny Eagle) is listed as Vulnerable on a global scale (BirdLife International, 2021a) and Endangered on a regional scale (Taylor et al, 2015). The species occupies dry open areas from sea level to 3000 m and will occupy both woodland and wooded savannah. The African population is estimated at 73 860 pairs with a severely declining population at a rate of decline as > 60% over the past 50 years within South Africa, Lesotho and eSwatini. The main threats are secondary poisoning, direct persecution and collisions with power lines (BirdLife International, 2021a). Based on the available habitat in the site this species was given a high likelihood of occurrence.
- *Ardeotis kori* (Kori Bustard) is listed as Near Threatened on a regional and global scale (BirdLife International, 2016a). This species has a large but disjunct range in sub-Saharan Africa, occurring from Ethiopia and Somalia south to Tanzania, and from southern Angola and Zimbabwe south to South Africa. The global population size has not been quantified, but the population in South Africa has been estimated at 2 000-5 000 birds individuals (BirdLife International, 2016c). A major threat is collision with overhead power lines but the causes of population declines and range losses in many parts of the distribution are unknown. The habitat of the site is very suitable for the species therefore the likelihood of occurrence is high.
- *Grus regulorum* (Grey Crowned Cranes) are Endangered both regionally and internationally. In southern Africa they tend to breed in the wet season (October to March) where they breed on the edges of wetlands (IUCN, 2022a). The wetland areas in the site provide suitable breeding area however the vegetation adjacent to the wetlands are not ideal foraging areas therefore the species were given a moderate likelihood of occurrence.
- *Calidris ferruginea* (Curlew Sandpiper) is a migratory species which breeds on slightly elevated areas in the lowlands of the high Arctic, and may be seen in parts of South Africa during winter. During winter, the species occurs at the coast, but also inland on the muddy edges of marshes, large rivers and lakes (both saline and freshwater), irrigated land, flooded areas, dams and saltpans (IUCN, 2017). The wetlands, especially the large wetland in the western side of the site provide suitable habitat for this species.
- *Ciconia abdimii* (Abdim's Stork) is listed as Near Threatened on a local and international scale and the species is known to be found in open grassland and savanna woodland often near water but also in semi-arid areas, gathering beside pools and water-holes (IUCN, 2017). The habitat of the site might create suitable feeding habitat, however there is a lack of suitable water sources on site.
- *Charadrius pallidus* (Chestnut-banded Plover) is listed as Near Threatened on a regional and a global scale. The species is found in salt lakes and estuaries, they do migrate inland when the coastal waters dry up. It mainly feeds on insects and small crustaceans. Even though this species is mostly coastal it does occur inland and based

on the number of large wetlands on site and the known occurrence in the area based on SABAP2 data, the species were given a moderate likelihood of occurrence.

- *Ciconia nigra* (Black Stork) is native to South Africa, and inhabits old, undisturbed, open forests. They are known to forage in shallow streams, pools, marshes swampy patches, damp meadows, flood-plains, pools in dry riverbeds and occasionally grasslands, especially where there are stands of reeds or long grass (IUCN, 2017). It is unlikely that this species would breed in the site due to the lack of forested areas, however some suitable foraging habitat remains in the form of the open grasslands and wetland areas, and as such the likelihood of occurrence is rated as moderate.
- *Circus ranivorus* (African Marsh Harrier) is listed as Endangered in South Africa (ESKOM, 2014). This species has an extremely large distributional range in sub-equatorial Africa. South African populations of this species are declining due to the degradation of wetland habitats, loss of habitat through over-grazing and human disturbance and possibly, poisoning owing to over-use of pesticides (IUCN, 2017). This species breeds in wetlands and forages primarily over reeds and lake margins. There are some extensive wetlands and marsh areas at the site therefore the likelihood of occurrence is considered to be high.
- *Coracias garrulous* (European Roller) is a summer migrant with the population from South-central Europe and Asia occurring throughout sub-Saharan Africa. The European Roller has a preference for bushy plains and dry savannah areas. It is globally listed as Least Concern (BirdLife International, 2019a) but Near Threatened on a regional scale (Taylor et al, 2015). The habitat of the site is very suitable for the species therefore the likelihood of occurrence is high.
- *Cursorius rufus* (Burchell's Courser) is categorised as Vulnerable on a regional scale. It inhabits open short-sward grasslands, dry savannas, fallow fields, overgrazed or burnt grasslands and pastures, bare or sparsely vegetated sandy or gravelly deserts, stony areas dotted with small shrubs and saltpans (IUCN, 2017. The likelihood of occurrence in the site is rated as moderate.
- *Falco biarmicus* (Lanner Falcon) is native to South Africa and inhabits a wide variety of habitats, from lowland deserts to forested mountains (IUCN, 2017). The likelihood of incidental records of this species in the site is rated as high due to the natural veld condition and the presence of many bird species on which Lanner Falcons may predate.
- *Gyps africanus* (White-backed Vulture) is listed as Critical on a global scale (BirdLife International, 2021c). This species is the most widespread vulture in Africa. It requires tall trees for nesting but has also been recorded nesting on electricity pylons in South Africa. In southern Africa, vultures are caught and consumed for perceived medicinal and psychological benefits, and the decline and possible extirpation in Nigeria has been attributed to the trade in vulture parts for traditional juju practices. One individual of this species was observed on site, a large number of this species were also recorded at the nearby Vulture restaurant.
- *Gyps coprotheres* (Cape Vulture) is listed as Endangered on both a regional and global scale. Cape Vultures are long-lived carrion-feeders specialising on large carcasses,

they fly long distances over open country, although they are usually found near steep terrain, where they breed and roost on cliffs (IUCN, 2017). They are resident and partially nomadic, adults may travel up to about 750 km from their colony in the non-breeding season. The species has a high likelihood of occurrence in the site based on the occurrence of the White-backed Vulture in the area.

- *Mycteria ibis* (Yellow-billed Stork) is listed as Endangered on a regional scale and LC on a global scale. The presence of extensive water bodies within the site creates a high possibility that this species may occur there.
- *Neotis ludwigii* (Ludwig's Bustard) is listed as Endangered on a global scale (BirdLife International, 2018a). The species has a large range centred on the dry biomes of the Karoo and Namib in southern Africa, being found in the extreme south-west of Angola, western Namibia and South Africa. Collision rates on high voltage transmission lines in the Karoo may exceed one Ludwig's Bustard per kilometre per year. Bustards have limited frontal vision so may not see power lines, even if they are marked. The habitat of the site is very suitable for the species therefore the likelihood of occurrence is high.
- *Oxyura maccoa* (Maccoa Duck) has a large range, divided into a northern population occurring in Eritrea, Ethiopia, Kenya and Tanzania, and a southern population found in Angola, Botswana, Namibia, South Africa and Zimbabwe. During the breeding season it inhabits small temporary and permanent inland freshwater lakes, preferring those that are shallow and nutrient-rich with extensive emergent vegetation such as reeds and sedges on which it relies for nesting, although it can breed in anthropogenic systems such as farm dams and sewerage treatment plants (BirdLife International, 2021d). The water bodies on site creates the potential for this species occurring.
- *Phoeniconaias minor* (Lesser Flamingo) is widely distributed throughout sub-Saharan Africa but mainly breeds in the Rift Valley Lakes in East Africa, with smaller breeding congregations in West Africa and southern Africa. The Kamfer dam is one of the areas with the greatest congregations of flamingos in South Africa, the water sources on site are not ideal for flamingos but might be used as a stop over point, therefore this species was given a moderate likelihood of occurrence at the site.
- *Phoenicopterus roseus* (Greater Flamingo) is widely distributed throughout sub-Saharan Africa and inhabits shallow eutrophic waterbodies such as saline lagoons, saltpans and large saline or alkaline lakes (BirdLife International, 2019). Two of these species were recorded at the Kamfers Dam, it is likely that this species would move across the site.
- *Polemaetus bellicosus* (Martial Eagle) is listed as Endangered on a regional scale and Endangered on a global scale. This species has an extensive range across much of sub-Saharan Africa, but populations are declining due to deliberate and incidental poisoning, habitat loss, reduction in available prey, pollution and collisions with power lines (IUCN, 2017). This species was recorded in the second survey.
- *Rostratula benghalensis* (Greater Painted-snipe) shows a preference for recently flooded areas in shallow lowland freshwater temporary or permanent wetlands, it has a wide range of these freshwater habitats which they occur in, in this case, sewage

pools, reservoirs, mudflats overgrown with marsh grass which exist within the site, therefore the likelihood of occurrence is high.

- *Sagittarius serpentarius* (Secretarybird) is listed as Endangered on a global scale (BirdLife International, 2020). The species has a wide distribution across sub-Saharan Africa but surveyed densities suggest that the total population size does not exceed a five-figure number. The habitat of the site is very suitable for the species therefore the likelihood of occurrence is high.
- *Torgos tracheliotus* (Lappet-faced Vulture) is listed as Endangered, both on a regional and global level. Only a small, very rapidly declining population remains, owing primarily to poisoning and persecution, as well as ecosystem alterations (IUCN, 2017). The species inhabits dry savanna, arid plains, deserts and open mountain. It ranges widely when foraging and is mainly a scavenger, feeding predominantly on any large carcasses or their remains. The habitat of the site is suitable, however even at the Vulture restaurant this species was not recorded, therefore it was given a moderate likelihood of occurrence.

During the first survey performed in the winter (4th – 8th of July 2022) 115 species were recorded during the point counts and 26 during the incidental counts. Some species were observed both as incidental records and during the point counts. The total number of individual species accounts for approximately 46% of the total number of expected species. The winter conditions are most likely a contributing factor to the numbers recorded. Avifauna communities within arid and semi-arid regions exhibit temporal movements in response to shifts in resource availability.

Two of the expected SCC as mentioned was recorded within the site during the survey period i.e., *Gyps africanus* (White-backed Vulture) and *Phoenicopterus roseus* (Greater Flamingo). Two White-backed Vultures, one adult and one juvenile was observed in the site. Two Greater Flamingos were observed at the Kamfer Dam, the dam is 2.5 km from the site and increases the risk of collisions of this species on site.

The most abundant species observed during the first survey was *Columba guinea* (Speckled Pigeon) with a relative abundance of 0.17 and a frequency of occurrence of 41.30%. Additional ubiquitous species comprised of *Myrmecocichla formicivora* (Ant-eating Chat) and *Streptopelia capicola* (Cape Turtle Dove), with a frequency of occurrence of 39.13% and 47.82%, respectively.

What was observed during the first survey was that a number of water birds were moving between the Kamfer Dam and the Vaal River, or between the dam and the large wetland on the western side of the site. The two White-backed Vultures observed on site were circling above the site, it is believed they are drawn to the area as a result of the Vulture restaurant. No nest sites were recorded during the first assessment, this is mainly attributed to the winter analysis time frame. Refer to Figure 5.18.

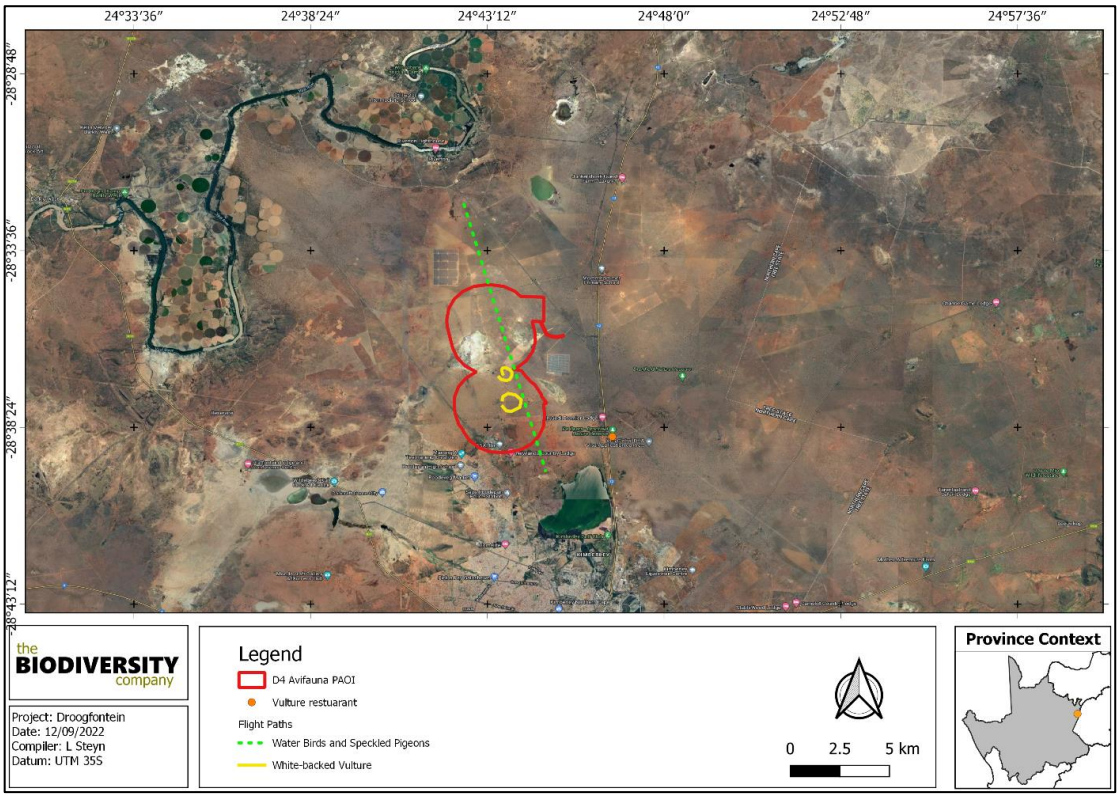


Figure 5.18: Flight direction of avifauna observed during the first survey

During the second survey performed in the summer (5th -9th of September) 119 species were recorded during the point counts and 45 during the incidental counts. The total number of individual species accounts for approximately 40% of the total number of expected species.

Three of the expected SCC was recorded within the site and vicinity during the survey period i.e., *Gyps africanus* (White-backed Vulture), *Phoenicopterus roseus* (Greater Flamingo) and *Polemaetus bellicosus* (Martial Eagle). Ninety-one White-backed Vultures were observed, of these 80 were at a point at the Vulture restaurant, while 11 were found just into the De Beers Dronfield Nature Reserve on which the restaurant is found. One Martial Eagle was recorded along the Vaal River (identified based on call) and eleven flamingos were recorded at the Kamfers dam. Both the river and dam are in close enough proximity for the species observed there to be influenced by the development.

The most abundant species observed during the second survey was *Fulica cristata* (Red-Knobbed Coot) with a relative abundance of 0.13 and a frequency of occurrence of 6.12%. Additional ubiquitous species comprised of *Afrotis afraoides* (Northern Black Korhaan) and *Myrmecocichla formicivora* (Ant-eating Chat), with a frequency of occurrence of 40.18% and 42.83%, respectively.

What was observed during the second survey was that a number of water birds were moving between Kamfer Dam and the Pan on site, some species were also observed moving between the pan and the river. The main species observed flying between the areas were the Glossy Ibis and the Spur-winged Geese. The flight paths indicated for the White-backed Vultures are only a general location of the high numbers of the birds seen soaring above the vulture restaurant. Refer to Figure 5.19.

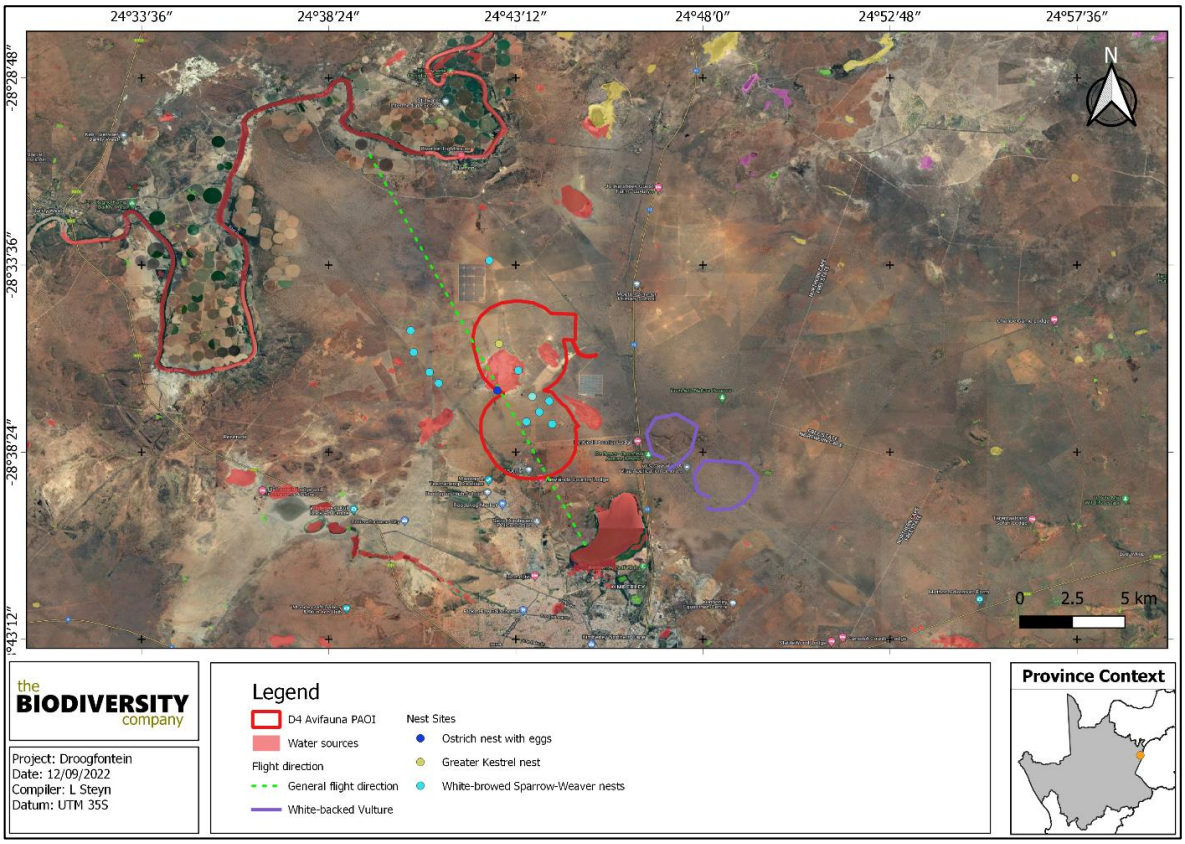


Figure 5.19: Flight direction of avifauna observed during the second survey

No nest sites of SCCs were recorded during the second assessment, nests of three other species, White-browed Sparrow Weaver, Common Ostrich and Greater Kestrel were however recorded. Between five and twenty-three White-browed Sparrow weaver nests were recorded at the observation points.

Fauna

Based on the IUCN Red List Spatial Data and FrogMap, eleven (11) amphibian species are expected to occur within the area. No amphibian SCCs are expected to occur within the site.

Based on the IUCN Red List Spatial Data and the ReptileMAP database, fifty-one (51) reptile species are expected to occur within the site. No reptile SCCs are expected to occur within the site.

No species of amphibian were recorded in the site during survey period. However, there is the possibility of more species being present, as certain species are secretive and require long-term surveys to ensure capture. Two (2) reptile species were recorded during the survey period.

The IUCN Red List Spatial Data lists 59 mammal species that could be expected to occur within the area. This list excludes large mammal species that are normally restricted to protected areas. Twelve (12) of these expected species are regarded as threatened. Of these 12 SCCs, four (4) have a low likelihood of occurrence based on the lack of suitable habitat in the site.

- *Atelerix frontalis* (South African Hedgehog) has a tolerance to a degree for habitat modification and occurs in a wide variety of semi-arid and sub-temperate habitats (IUCN, 2017). Based on the Red List of Mammals of South Africa, Lesotho and Swaziland (2016), South African Hedgehog populations are decreasing due to the threats of electrocution, veld fires, road collisions, predation from domestic pets and illegal harvesting. The presence of disturbed but suitable habitats in the site contributed to a moderate likelihood of occurrence for this species.

- *Felis nigripes* (Black-footed cat) is endemic to the arid regions of southern Africa (IUCN, 2017). This species is naturally rare, has cryptic colouring, is small in size and is nocturnal. These factors have contributed to a lack of information on this species (IUCN, 2017). The highest densities of this species have been recorded in the more arid Karoo region of South Africa (IUCN, 2017). The habitat in the site is suitable for the species and the likelihood of occurrence is therefore rated as high.

- *Leptailurus serval* (Serval) occurs widely through sub-Saharan Africa, except for tropical rainforest and the Saharan desert (IUCN, 2017). Servals occupy dense, well-watered grassland and reedbeds and are always near water (Apps, 2012). Outside of protected areas in southern Africa, their habitats are destroyed by agriculture and forestry developments (Apps, 2012). The presence of open habitats in the site as well as wetlands near the site contributed to a moderate likelihood of occurrence for this species.

- *Parahyaena brunnea* (Brown Hyaena) is endemic to southern Africa (IUCN, 2017). This species occurs in dry areas, generally with annual rainfall less than 100 mm, particularly along the coast, semi-desert, open scrub and open woodland savanna (IUCN, 2017). Human-wildlife conflict is the main threat to Brown Hyaenas outside of protected areas, where they are persecuted or hunted for the traditional medicine trade (IUCN, 2017). Despite this, given its known ability to persist outside of formally protected areas the likelihood of occurrence of this species in the site is moderate. The species was not observed within the site.

- *Poecilogale albinucha* (African Striped Weasel) occurs from southwestern Uganda and Kenya to the Western Cape in South Africa (IUCN, 2017). It lives in moist grassland or open woodland with soils suitable for digging burrows (Apps, 2012). In southern Africa, this species is generally rare and the main threat is habitat destruction, due to tree plantations, crops and overgrazing (Apps, 2012). African Striped Weasels are also being heavily exploited so that their body parts can be used in traditional charms and magic (Apps, 2012). The presence of open habitat in the site contributed to a moderate likelihood of occurrence for this species.

- *Rhinolophus clivosus* (Geoffrey's Horseshoe Bat) has a widespread distribution in North, East and southern Africa as well as parts of southwest Asia (IUCN, 2017). In southern Africa it occupies a wide range of habitats and roosts in caves, mines and rock cavities (Apps, 2012). Human disturbance poses a possible threat to large roosts in caves, as well as indirect poisoning due to pesticides, insecticides and other chemicals (Apps, 2012; IUCN, 2017). The tendency of this species to occupy a variety of habitats contributed to a moderate likelihood of occurrence for this species in the site.

- *Rhinolophus dentii* (Dent's Horseshoe Bat) has a wide but patchy distribution in West and southern Africa (IUCN, 2017). It mostly occupies savanna habitats and drier areas (but not desert) and is dependent on suitable roosting habitats such as caves, rock crevices, thatched roofs, abandoned mines and hollow trees (Apps, 2012; IUCN, 2017). Large roosts in caves may be locally threatened by human disturbance (Apps, 2012: IUCN, 2017). The presence of savanna habitats in the site contributed to a moderate likelihood of occurrence for this species.

Nine (9) mammal species were observed during the survey of the site based on either direct observation or the presence of visual tracks and signs (Figure 5.20). None of the species recorded are regarded as SCCs form an international or national perspective but all are protected provincially.

Personal communication with the Landowner confirmed the presence of Black-footed Cat (*Felis nigripes*), however no direct observations were made during diurnal and nocturnal surveys. The presence of this SCC should be confirmed.

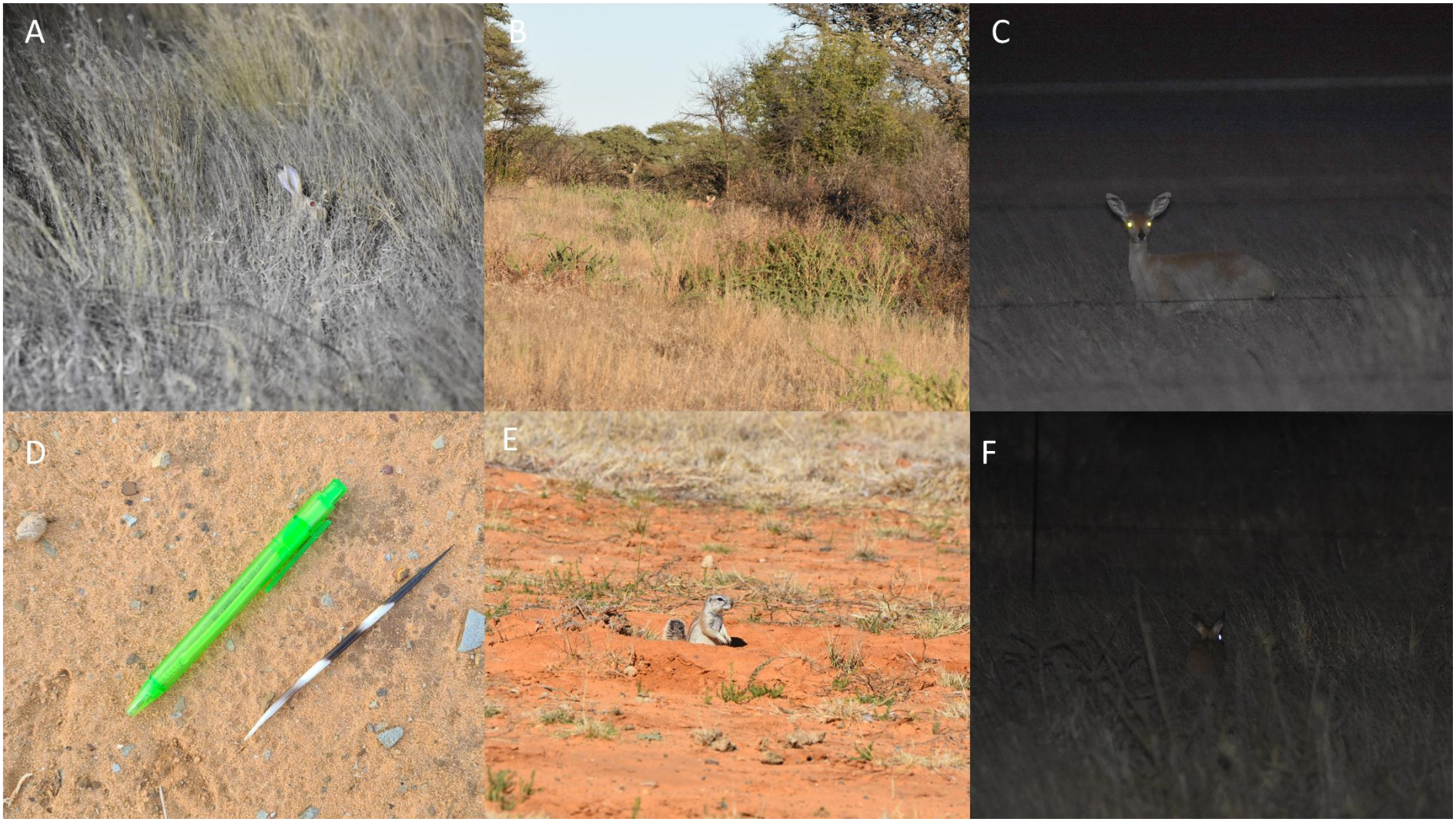


Figure 5.20: Some of the mammal species recorded during the field assessment: A) Scrub Hare (*Lepus saxatilis*), B) Common Duiker (*Sylvicapra grimmia*), C) Steenbok (*Raphicerus campestris*) , D) Cape Porcupine (*Hystrix africaeaustralis*), E) South African Ground Squirrel (*Xerus inauris*) and F) Springhare (*Pedetes capensis*)

5.3.1.6 Visual landscape and Visual Receptors

The landscape character is a composite of influencing factors including landform and drainage, vegetation patterns and nature and density of development.

The landform is characterised by a relatively low elevation, meaning that the site is not located on a mountain, at the foot of a mountain or in an area with a significant difference in elevation. The site drains towards the west. The landform and drainage described is unlikely to limit visibility. The highest amsl point in a 20km radius around the proposed sites is 1338m, approximately 18km towards the south east on top of an isolated ridge. This a difference of approximately 166m in an extreme case. The rest of the area is rather level with much lower difference in amsl. Areas within 5km from the proposed development might have a clear view without taking existing screening into account.

The vegetation and landscape features can be described as plains, often slightly irregular, with a well-developed tree layer consisting of *Acacia erioloba, A. tortilis, A. karroo* and *Boscia albitrunca* and a well-developed shrub layer with occasional dense stands of *Tarchonanthus camphoratus* and *A. mellifera*. The grass layer is open with much uncovered soil.

When considering the nature and density of development the following is relevant to the area:

- **Industrial Development**; Industrial development associated with urban development. Mining plays a big role in the area. Large scale diamond mining is present south east near Kimberley and smaller scale mining and prospecting towards the north.
- **Urban Development**; The city of Kimberley and associated suburbs like Roodepan, Bunn and Galeshewe, all to the south, covering approximately 6500 hectares. Smaller urban development is present to the north and north west. Towns include Riverton and Barkley West.
- **Sports and Recreational Development**; Facilities associated with urban development like sports clubs, sport stadiums and the Vaal River towards the north west.
- **Agricultural Development**; This is the main development type in the area consisting mostly out of cattle, sheep, irrigation and game farming.
- **Service Development**; Facilities and infrastructure associated with development. This includes roads, power infrastructure, water infrastructure etc. Most services are linked to urban and mining development.
- **Tourism Development**; A number of guest houses, lodges and hunting/game farms are present within the study area. The most significant tourism developments are within Kimberley. Irrigation farming and mining dominate the banks of the Vaal River and tourism development along the Vaal River is very limited.

Visual Receptors can be defined as: “Individuals, groups or communities who are subject to the visual influence of a particular project.”

A Zone of Theoretical Visibility (ZTV) is a Geographic Information System (GIS)-generated tool to identify the likely (or theoretical) extent of visibility of a development. The tool used in this model does not take existing screening into account but only the above mean sea level of the landscape.

Refer to Table 5.3 and Table 5.4 indicates the visibility rating in terms of proximity on sensitive receptors of the two alternative sites under assessment.

Table 5.3: ZTV Visibility Rating in terms of Proximity to development area alternative Option A

Radius	Visual Receptors	Visibility rating in terms of proximity
0-1km	No sensitive visual receptors are present within this radius.	Very High
1-5km	- 15 homesteads on farms - Dronfield Nature Reserve - N12 National Road	High
5-10km	- Two homesteads on farms - Roodepan - Galeshewe - Bunn - Kimberley - Dronfiled Nature Reserve - Flamingo Casino - Kimberley Golf Course - N12 National Road - One isolated school	Medium
10-15km	- Bunn - Galeshewe - Kimberley - Platfontein - Two homesteads on farm	Low
15-20km	- N8 National Road - Two lodging facilities - 8 homesteads on farms	Very Low

Table 5.4: ZTV Visibility Rating in terms of Proximity to development area alternative Option B

Radius	Visual Receptors	Visibility rating in terms of proximity
0-1km	No sensitive visual receptors are present within this radius.	Very High
1-5km	- Two homesteads on farms - One isolated school - Dronfield Nature Reserve - N12 National Road	High
5-10km	- Dronfield Nature reserve - N12 National Road - 13 homesteads on farms - Roodepan	Medium

10-15km	- Platfontein - Roodepan - Galeshewe - Bunn - Kimberley - Kimberley Golf Course - Flamingo Casino - Three homesteads on farms - N12 National Road - R31 Road	Low
15-20km	- Kimberley - N8 National Road - Bunn - Four homesteads on farms	Very Low

The ZTV assessment did not consider existing screening such as buildings and vegetation cover but rather the terrain's above mean sea level (AMSL) which indicates line of sight.

Refer to Figure 5.21 and 5.22 for the ZTV maps of the two development area alternatives.

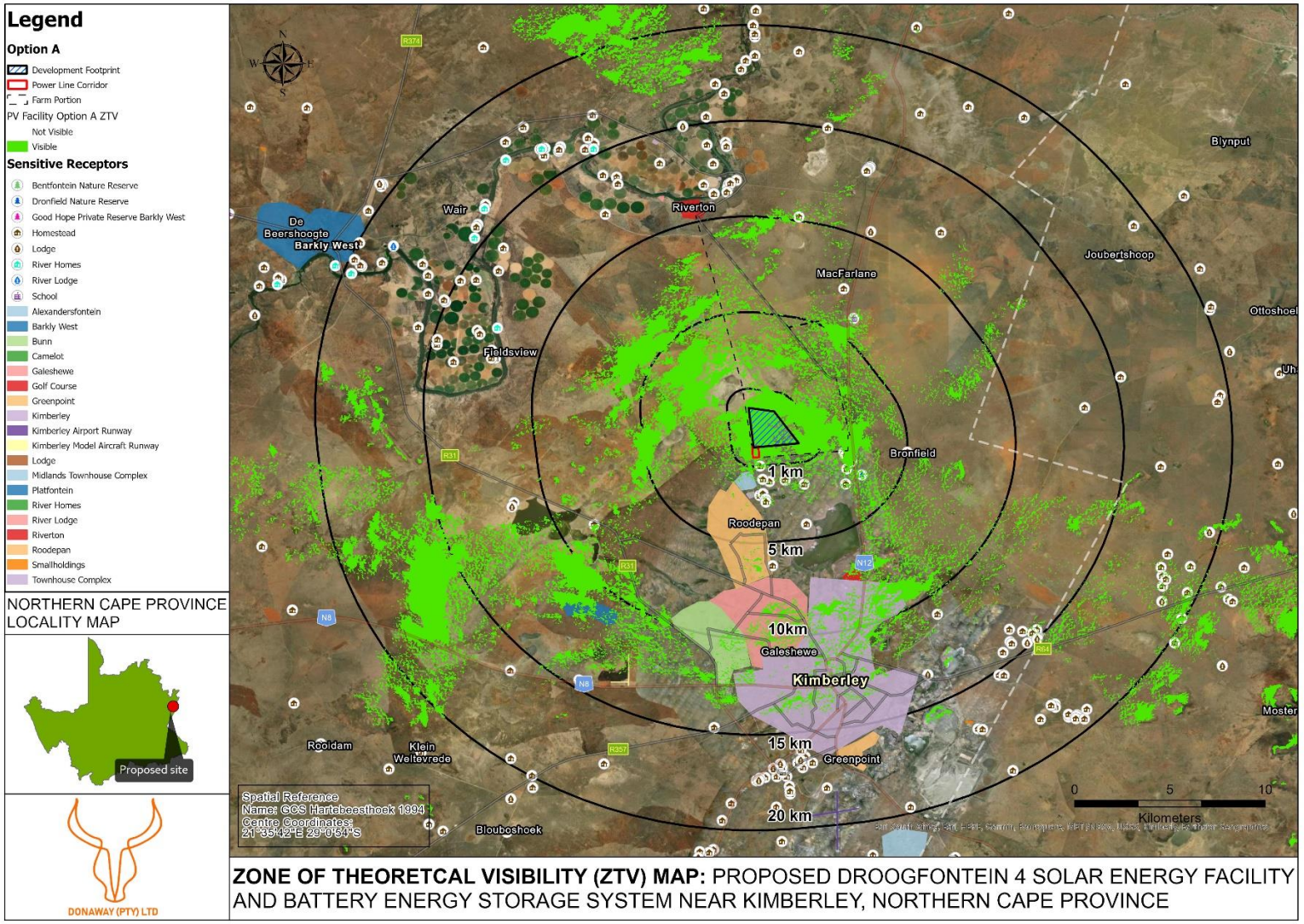


Figure 5.21: Zone of Theoretical Visibility (ZTV) for the development area alternative Option A

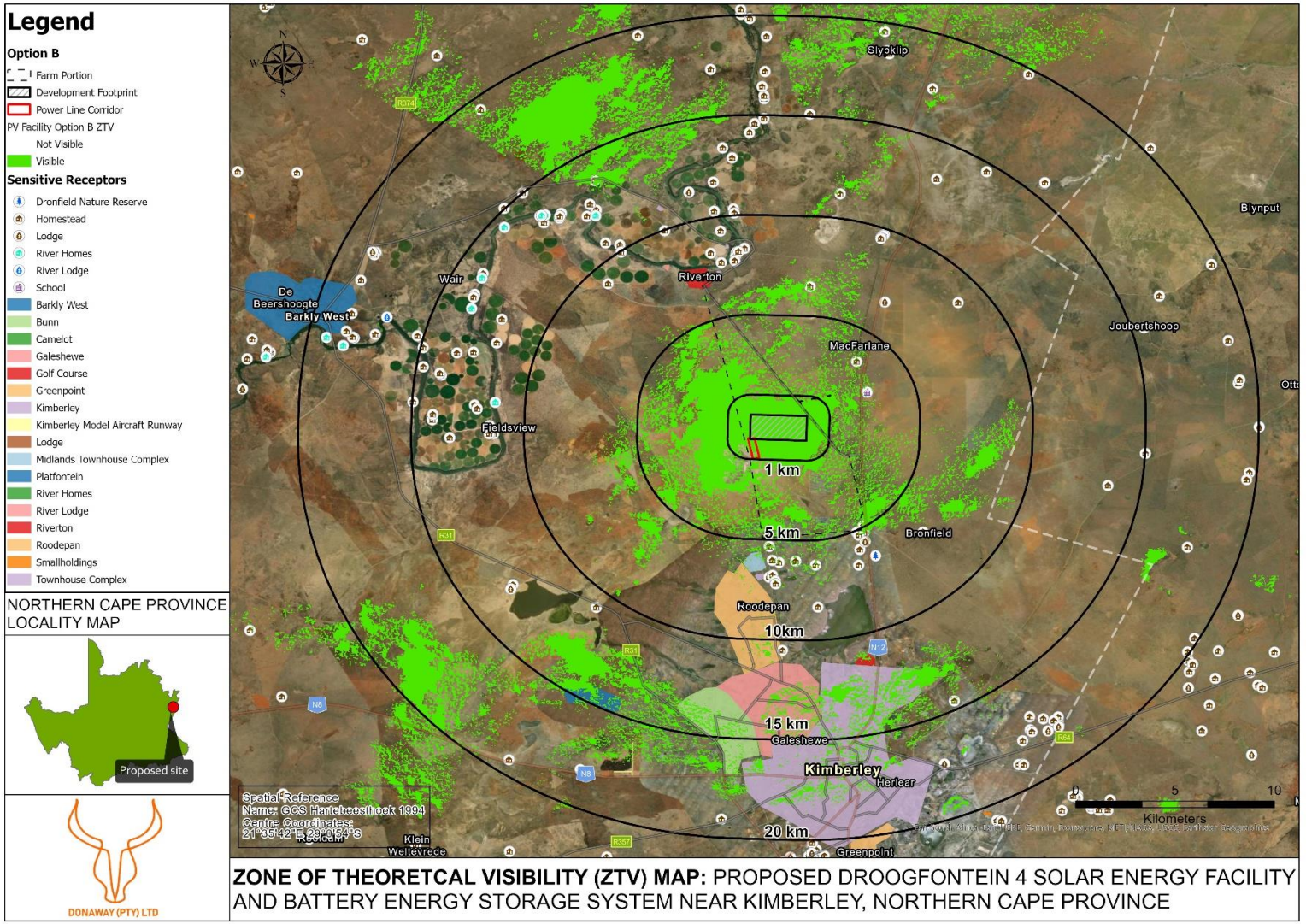


Figure 5.22: Zone of Theoretical Visibility (ZTV) for the development area alternative Option B

5.3.2 Description of the socio-economic environment

The socio-economic environment is described with specific reference to social, economic, heritage and cultural aspects.

5.3.2.1 Socio-economic profile

According to the Social Impact Assessment (Appendix D7) the Northern Cape is the largest and most sparsely populated province of South Africa. It was created in 1994 when the Cape Province was split up. Its capital is Kimberley. It includes the Kalahari Gemsbok National Park, part of the Kgalagadi Transfrontier Park and an international park shared with Botswana. It also includes the Augrabies Falls and the diamond mining regions in Kimberley and Alexander Bay.

The economy of the Northern Cape mainly relies heavily on two sectors, namely the mining and agriculture sectors. These two sectors employ approximately 57% of all employees in the province. Over the past eight (8) years there has been little to no increase or decrease in the overall standard of living of the communities in the Northern Cape Province. According to the PSDF Review of 2017 this trend is unlikely to change in the foreseeable future, mainly due to the marginal economic base of the poorer areas, and the consolidation of the economic base in the relatively better-off areas of the province.

The Northern Cape PSDF of 2012 reports that the percentage of the people living in the Northern Cape province, that lives below the poverty line and has decreased from 40% in 1995 to 27% in 2011, while the poverty gap has decreased from 11% in 1995 to 8% in 2011. It is the province's goal to decrease the percentage of people living below the poverty line by 2015 to 20%.

As reported by the Northern Cape Provincial Government, unemployment still remains a big challenge in the province. Unemployment was reported to be at 24.9% during the fourth quarter of 2013. Unemployment also declined from 119000 unemployed people in the fourth quarter of 2012 to 109000 unemployed people in the fourth quarter of 2013.

The overall economic growth of the province has shown significant recovery since 2000/2001 when it had a negative economic growth rate of -1.5%. However, the province is still the smallest contributing province to South Africa's economy (only 2% to South Africa GDP per region in 2007).

The Frances Baard District Municipality is a Category C municipality located in the far eastern portion of the Northern Cape Province. It comprises the four local municipalities of Dikgatlong, Magareng, Phokwane and Sol Plaatje. Kimberley, which is where the district municipality is located, is less than 500km away from Johannesburg in the north, less than 1 000km away from Cape Town in the south, and less than 800km away from the Port of Durban in the east. The municipality is covering an area of13 002km^2.

The main attraction site, the Big Hole, this hole is known for being one of the deepest holes excavated by hand. The main economic sectors include Community services (28%), finance (22%), trade (15%), transport (12%), mining (10%), agriculture (4%), manufacturing (4%), construction (3%), electricity (2%).

In 2011 the unemployment rate was 34% and a youth unemployment rate of 43.9%. By 2016 only 48.4% of dwellings had piped water inside their dwellings and 9.8% of household still did not have electricity in their dwellings.

The Sol Plaatje Local Municipality is a Category B municipality located in the Frances Baard District in the Northern Cape Province. The population increased from 2011 at 248 041 to 255 041 in 2016. In 2011 the unemployment rate stood at 31.9% and the youth unemployment rate at 41.7%. In 2016 89.7% of households had flush toilets connected to sewerage and 90.8% of households had electricity for lighting in their dwellings.

The Municipality consists of 2 towns namely Kimberley and Ritchie. The town of Kimberley is known for the big hole that is the main tourist attraction in the area. The Main economic sectors are Community services (33%), finance (24%), trade (14%), mining (8%).

Most of the surrounding area to the project site has a low number of farmsteads/buildings that are sparsely populated. The area is located within an agricultural region, and the immediate area is presently used mainly for livestock farming as well as crop production.

5.3.2.2 Cultural and heritage aspects

Archaeology

A Heritage Impact Assessment (Appendix D5) has been undertaken. The field survey resulted in observations of the development areas alternatives under assessment which includes the following:

No rocky exposures were found, hence no engravings. Background scatter occurrences of Pleistocene age material (Beaumont & Morris 1990; Underhill 2011) are known to occur in the wider area, typically within and at the base of the red Hutton Sands overlying calcrete or dolerite/andesite. Almost no such material was observed in the area of archaeological investigation, since essentially all of the proposed development footprint is mantled by Hutton Sands. However, three observations outside of the specific area were made in situations where 1) the Hutton Sands were eroded and 2) where two borrow pits occur adjacent to the railway which crosses the Droogfontein property area. The sides of the borrow pits were closely examined and revealed very low/close-to-zero density occurrences of stone artefacts. It can be anticipated that subsurface densities would vary but nowhere amount to much other than 'background scatter' (using Orton's [2016] classification).

No colonial era graves were found or were reported in previous studies (Fourie 2012, Morris 2018). Of other farm heritage infrastructure, only farm fences and cattle post features of recent date were noted.

Running between Riverton and Kimberley, and adjacent to the western edge of development area alternative Option A, and beyond the western edge of Option B, is the water pipeline that supplies Kimberley, which is not due to be impacted, and, while following the historic early pipeline route (dating from the late nineteenth century), is subject to on-going maintenance.

On archaeological grounds, the limited occurrences observed can be said to be of low significance.

Palaeontology

A Palaeontological Desktop Assessment (Appendix D6) has been undertaken for the site. The Droogfontein 4 Solar and Battery Storage Energy Facility near Kimberley in the Northern Cape is depicted on the 1: 250 000 Kimberley 2824 (1993) Geological Map (Council for Geosciences, Pretoria (Figure 5.23).

The proposed development is underlain by Quaternary to Recent red and grey aeolian dune sand (Qs, yellow) (Qs) and at depth by sediments of the older Karoo and Ventersdorp Supergroup. According to the PalaeoMap of the South African Heritage Resources Information System (SAHRIS) the Palaeontological Sensitivity of the Quaternary sands is Medium.

The geology has recently been updated (Council of Geosciences, Pretoria) and now indicates that the proposed Droogfontein 4 Solar and Battery Storage Energy Facility is underlain by the sediments of the Kalahari Group. These sediments overlay the older Karoo and Ventersdorp Supergroup sediments.

The Quaternary superficial deposits are the youngest geological deposits formed during the most recent period of geological time (approximately 2.6 million years ago to present). Most of the superficial deposits are unconsolidated sediments and consist of gravel, sand, silt, and clay, and they form relatively thin, often discontinuous patches of sediments or larger spreads onshore.

The Quaternary deposits are of significant importance due to the palaeoclimatic changes that are reflected in the different geological formations. During the climate fluctuations in the Cenozoic Era most geomorphologic features in southern Africa where formed (Maud, 2012). Barnosky (2005) indicated that various warming and cooling events occurred in the Cenozoic but states that climatic changes during the Quaternary Period, specifically the last 1.8 Ma, were the most drastic climate changes relative to all climate variations in the past. Climate variations that occurred in the Quaternary Period were both drier and wetter than the present and resulted in changes in river flow patterns, sedimentation processes and vegetation variation (Tooth et al., 2004).

The sands and calcretes of the Kalahari Group range in thickness from a few metres to more than 180m (Partridge et al., 2006). The pan sediments of the area originated from the Gordonia Formation and contains white to brown fine-grained silts, sands and clays. Some of the pans consist of clayey material mixed with evaporates that shows seasonal effects of shallow saline groundwaters (De Witt et al., 2000; Johnsen et al, 2006). The Gordonia dune sands are dated as Late Pliocene/Early Pleistocene to Recent times by the Middle to Later Stone Age stone tools recovered from them (Dingle et al., (1983). The boundary of the Pliocene-Pleistocene has been extended back from 1.8 Ma to 2.588 Ma placing the Gordonia Formation almost entirely within the Pleistocene Epoch. The fossil assemblages of the Kalahari are generally low in diversity and occur over a wide range. These fossils represent terrestrial plants and animals with a close resemblance to living forms. Fossil assemblages include bivalves, diatoms, gastropod shells, ostracods and trace fossils. The palaeontology of the Quaternary superficial deposits has been relatively neglected in the past. Late Cenozoic calcrete may comprise of bones, horn corns as well as mammalian teeth (Klein, 1984). Tortoise remains have also been uncovered as well as trace fossils which includes termite and insect's

burrows and mammalian trackways. Amphibian and crocodile skeletons have been uncovered where the depositional settings in the past were wetter.

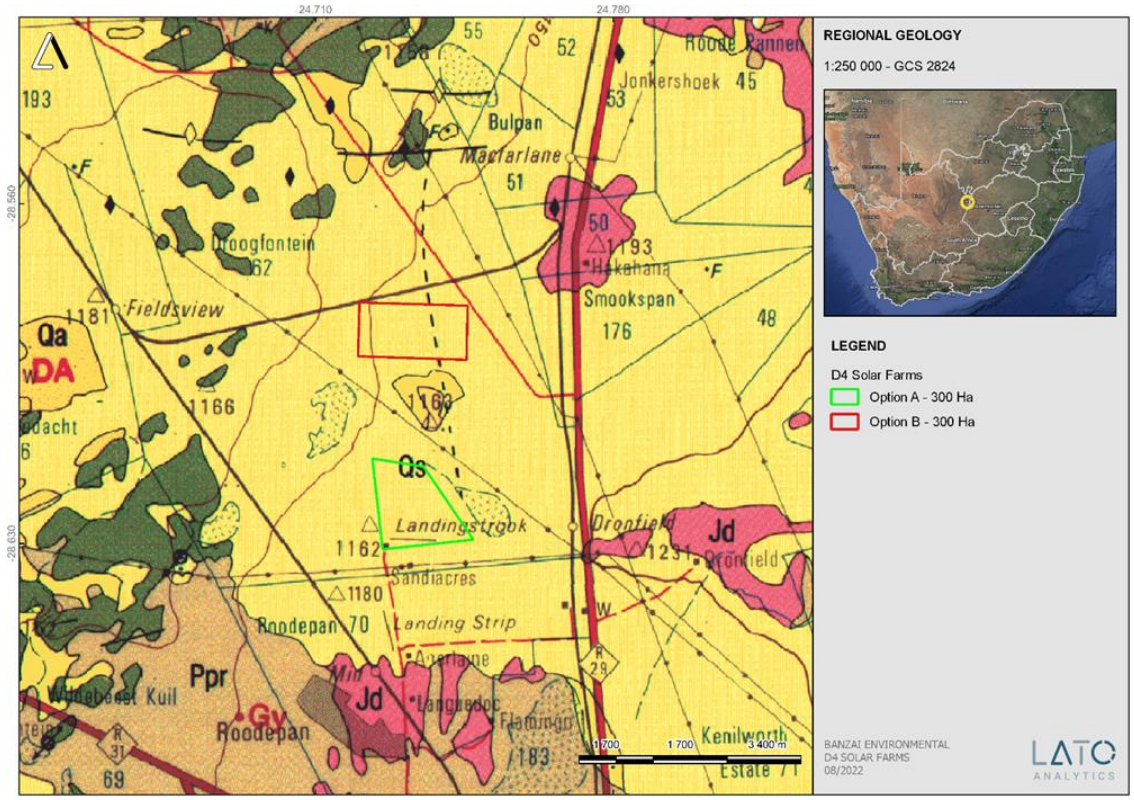


Figure 5.23: Extract of the 1:250 000 Kimberly 2824 (1986) Geological Map (Council for Geosciences, Pretoria) indicating the two alternative sites proposed for the Droogfontein 4 Solar and Battery Storage Energy Facility near Kimberly in the Northern Cape.

5.4 SITE SELECTION MATRIX

Due to the nature of the proposed development, the location of the facility is largely dependent on technical and environmental factors such as solar irradiation, climatic conditions, topography of the site, access to the grid and capacity of the grid. Studies of solar irradiation worldwide indicate that the Northern Cape Province has a huge potential for the generation of power from solar.

The receptiveness of the site to PV development includes the presence of optimal conditions for the sitting of a solar energy facility due to high irradiation values and optimum grid connection opportunities. The Remaining Extent of Farm Droogfontein No.62, where the project is proposed to be located is considered favourable and suitable from a technical perspective due to the following characteristics:

- **Climatic conditions:** Climatic conditions determine if the project will be viable from an economic perspective as the solar energy facility is directly dependent on the annual direct solar irradiation values of a particular area. The Northern Cape Province receives a high average of direct normal and global horizontal irradiation daily. This is an indication that the regional location of the project includes a low number of rainy

days and a high number of daylight hours experienced in the region. Global Horizontal Radiation of 2160 kwh/m^2 per year is relevant in the area.

- **Renewable Energy Development Zone (REDZ):** The site is also located in the Kimberley Renewable Energy Development Zones (REDZ). The solar PV assessment domain was based on the location of the majority of existing solar PV project applications at the commencement of the Strategic Environmental Assessment (SEA) and includes the five provinces of Northern Cape, Western Cape, Eastern Cape, Free State and North West.

- **Site availability and access:** The land is available for lease by the developer and consent has been provided by the affected landowner for the undertaking of the BA process. Reluctant farm owners or farmers over capitalizing hamper efforts to find suitable farms. Access will be easily obtained via the tarred Riverton Road.

- **Grid connection**: In order for the solar and battery storage energy facility to connect to the national grid a 132kV power line and substations will be constructed. As there are two alternative development areas proposed for the placement of the project development footprint, the developer has identified a suitable grid connection corridor for each of the development areas which connects the facility to an existing power line located near to the development area. All grid connection corridors have a width of 300m.

  Should development area Option A be developed the power line route will be approximately 600m in length and will connect the facility to the existing Boundary-Olien 1 275kV power line located directly to the south. The connection will be via a loop-in loop-out connection. Should development area Option B be developed the power line route will be approximately 1km in length and will connect the facility to the existing Elk-Weir 1 132kV power line located directly to the south. The connection will be via a loop-in loop-out connection. Available grid connections are becoming scarce and play a significant role when selecting a viable site.

- **Environmental sensitivities:** From an environmental perspective the proposed site is considered highly desirable due to the opportunity to avoid environmental sensitivities in terms of geology, and soils, agricultural potential, vegetation and landscape features, climate, biodiversity and ecological features (such as wetlands) and the visual landscape. When considering the two development area alternatives within the site at a closer level Option A is more sensitive from a terrestrial ecology perspective based on the habitat present and the density of camelthorn trees. – refer to Section 5.3.1 of this report. The ecologist has therefore recommended that development area Option B be developed in order to reduce the negative impacts on the terrestrial biodiversity of the site. Furthermore, the avifauna specialist has recommended that the development footprint located within Option B be optimised to avoid development in an area of very high avifauna sensitivity associated with a pan feature located near the area.

It is evident from the discussion above that the Remaining Extent of the Farm Droogfontein No. 62, may be considered favourable and suitable in terms of these site characteristics, however development area Option B is more preferred based on the ecological habitat and

density of protected tree species present compared to Option A. A comparative assessment of the two development area alternatives is included in section 6.5.

5.5 CONCLUDING STATEMENT ON ALTERNATIVES

When considering the information provided by the specialists with regards to the site selection criteria and the comparison, the site (i.e. affected property) is identified as preferred due to the fact that the opportunities presented on the site to develop the project in such a way which avoids the areas and features (including the associated buffers) of environmental sensitivity.

Therefore, development of the Droogfontein 4 Solar and Battery Storage Energy Facility on the Remaining Extent of Farm Droogfontein No. 62, is the preferred option. The preferred layout for each development area alternative assessed is presented in Appendix H.

When considering the two development area alternatives provided by the Applicant for review, Option A was indicated as being the technically preferred option for the placement of the development footprint. However, the results of the Terrestrial Ecology Impact Assessment (Appendix D1) and Avifauna Impact Assessment (Appendix D2) recommends that the development rather be undertaken in development area Option B based on the habitat present and the presence of a nationally protected tree. A comparative assessment of the two development area alternatives is included in section 6.5 and provides more in depth consideration and details of the two areas proposed for development.

6 DESCRIPTION OF THE IMPACTS AND RISKS

This section aims to address the following requirements of the regulations:

Appendix 1. (3)(i) An BAR (...) must include-

(i) a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred location through the life of the activity, including-

(i) a description of all environmental issues and risks that were identified during the EIA process; and

(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.

(j) an assessment of each identified potentially significant impact and risk, including-

(i) cumulative impacts;

(ii) the nature, significance and consequences of the impact and risk;

(iii) the extent and duration of the impact and risk;

(iv) the probability of the impact and risk occurring;

(v) the degree to which the impact and risk can be reversed;

(vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and

(vii) the degree to which the impact and risk can be mitigated;

(k) where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final report;

6.1 SCOPING METHODOLOGY

The contents and methodology of the basic assessment report aimed to provide, as far as possible, a user-friendly analysis of information to allow for easy interpretation.

- Checklist (see section 6.1.1): The checklist consists of a list of structured questions related to the environmental parameters and specific human actions. They assist in ordering thinking, data collection, presentation and alert against the omission of possible impacts.
- Matrix (see section 6.1.2): The matrix analysis provides a holistic indication of the relationship and interaction between the various activities, development phases and the impact thereof on the environment. The method aims at providing a first order cause and effect relationship between the environment and the proposed activity. The matrix is designed to indicate the relationship between the different stressors and

receptors which leads to specific impacts. The matrix also indicates the specialist studies that have been conducted to address the potentially most significant impacts.

6.1.1 Checklist analysis

The independent consultant conducted a site visit on 12 May 2022. The site visit was conducted to ensure a proper analysis of the site specific characteristics of the site. Table 6.1 provides a checklist, which is designed to stimulate thought regarding possible consequences of specific actions and to assist scoping of key issues. It consists of a list of structured questions related to the environmental parameters and specific human actions. They assist in ordering thinking, data collection, presentation and alert against the omission of possible impacts. The table highlights certain issues, which are further analysed in matrix format in section 6.2.

Table 6.1: Environmental checklist

QUESTION	YES	NO	Un-sure	Description
1. Are any of the following located on the site earmarked for the development?				
I. A river, stream, dam or wetland	×			Depression wetlands and artificial wetlands and drainage features are located in the areas directly adjacent to the two development area alternatives.
II. A conservation or open space area	×			The majority of the site, including both development area alternatives are classified as Other Natural Areas by the Northern Cape Critical Biodiversity Area Map.
III. An area that is of cultural importance		×		None.
IV. Site of geological/palaeontological		×		None.
V. Areas of outstanding natural beauty		×		None.
VI. Highly productive agricultural land		×		None.
VII. Floodplain		×		None.
VIII. Indigenous Forest		×		None.
IX. Grass land	×			The whole site falls within the Kimberley Thornveld vegetation unit which is classified by Mucina and Rutherford as Least Threatened.

X. Bird nesting sites	×			No nest sites of SCCs were recorded during the second assessment, nests of three other species, White-browed Sparrow Weaver, Common Ostrich and Greater Kestrel were however recorded. Between five and twenty-three White-browed Sparrow weaver nests were recorded.
XI. Red data species	×			The nationally protected Camelthorn tree is present within both development area alternatives under assessment.
XII. Tourist resort		×		None.
2. Will the project potentially result in potential?				
I. Removal of people		×		None.
II. Visual Impacts	×			The VIA (refer to Annexure D3) confirmed that the development of the solar power plant and associated power lines will have a visual impact on observers.
III. Noise pollution		×		Construction activities will result in the generation of noise over a period of months. However, there are mines located in the general Kimberley area. The noise impact is therefore insignificant in comparison to the noise generated by the mines in the area and will only be temporary in nature.
IV. Construction of an access road	×			Access will be obtained via the tarred Riverton Road. Internal access roads will be constructed for the facility.
V. Risk to human or valuable ecosystems due to explosion/fire/ discharge of waste into water or air.		×		None.

VI. Accumulation of large workforce (>50 manual workers) into the site.	×			Approximately 200 employment opportunities will be created during the construction and 20 employment opportunities during the operation phase of the project.
VII. Utilisation of significant volumes of local raw materials such as water, wood etc.	×			The estimated maximum amount of water required during construction is 15 200m³ during the 12-18 months of construction. The estimated maximum amount of water required during the facility's 20-25 years of production is 5050m³ per annum.
VIII. Job creation	×			Approximately 200 employment opportunities will be created during the construction and 20 employment opportunities during the operation phase of the project.
IX. Traffic generation	×			There will be an increase in traffic per day over the 12-18 month construction period for the project.
X. Soil erosion	×			The site will need to be cleared or graded, which may potentially result in a degree of dust being created, increased runoff and potentially soil erosion. The time that these areas are left bare will be limited to the construction phase, since vegetation will be allowed to grow back after construction. No existing areas of erosion was identified.
XI. Installation of additional bulk telecommunication, transmission lines or facilities	×			There is existing Eskom infrastructure in the area and the solar energy facility will require additional power lines to be constructed.Furthermore, a railway line traveres the site.

3. Is the proposed project located near the following?				
I. A river, stream, dam or wetland	×			Depression wetlands and artificial wetlands and drainage features are located in the areas directly adjacent to the two development area alternatives. The Vaal River is also located directly to the north of the affected property.
II. A conservation or open space area	×			The nearest protected area (Tarentaalrand Safari Lodge) is located 11 km from the site. Furthermore, two IBAs are located near the site, including the Dronfield Nature Reserve IBA located approximately 1.5km from the site and Kamfers Dam IBA located 1.8 km from the site.
III. An area that is of cultural importance		×		None.
IV. A site of geological/palaeontological resources significance		×		None.
V. An area of outstanding natural beauty		×		None.
VI. Highly productive agricultural land		×		None.
VII. A tourist resort	×			The Tarentaalrand Safari Lodge is located 11 km from the site and the Dronfield Nature Reserve is located approximately 1.5km from the site. Furthermore the Milk and Honey events venue and restaurant is located on the adjacent property directly to the south.
VIII. A formal or informal settlement	×			The town of Kimberley is located approximately 12 km south of the proposed development, and the small town of Riverton is located directly to the north of the affected property. The Roodepan settlement area is located approximately 5km south west of the site.

6.1.2 Matrix analysis

The matrix describes the relevant listed activities, the aspects of the development that will apply to the specific listed activity, a description of the environmental issues and potential impacts, the significance and magnitude of the potential impacts and possible mitigation measures. The matrix also highlights areas of particular concern (see Table 6.3) for more in-depth assessment. An indication is provided of the specialist studies which were conducted and that informed the initial assessment. Each cell is evaluated individually in terms of the nature of the impact, duration and its significance – should no mitigation measures be applied. This is important since many impacts would not be considered insignificant if proper mitigation measures were implemented.

In order to conceptualise the different impacts, the matrix specify the following:

- **Stressor**: Indicates the aspect of the proposed activity, which initiates and cause impacts on elements of the environment.
- **Receptor**: Highlights the recipient and most important components of the environment affected by the stressor.
- **Impacts**: Indicates the net result of the cause-effect between the stressor and receptor.
- **Mitigation**: Impacts need to be mitigated to minimise the effect on the environment.

Detailed impact assessments have been undertaken by each of the respective specialists (refer to the specialist studies included in Appendix D) which has informed the matrix analysis as included in Table 6.3, as well as the key issues identified as included in sections 6.2.1-6.2.3. The Table 6.2 includes reference to the sections in the respective specialist studies where the details of the in-depth assessment of potential environmental impacts can be obtained.

It must be noted that the Terrestrial Ecology Impact Assessment (Appendix D1) provided an impact assessment for the Option B development area alternative only as Option A is not considered appropriate for development from an ecological perspective. Therefore, the details pertaining to the associated impacts included in Table 6.3 below are only relevant to the Option B development area alternative.

The remainder of the specialists assessed both the Option A and Option B development area alternatives on the same level, as per the information provided in Table 6.3 below.

Table 6.2: Reference to the sections in the respective specialist studies where the details of the in-depth assessment of potential environmental impacts can be obtained

Specialist Study	Impact Assessment (pg.)	Cumulative Impacts (pg.)	Mitigation Measures (pg.)
Terrestrial Ecology Impact Assessment (Appendix D1)	42-50	50-54	55-60
Avifauna Impact Assessment (Appendix D2)	55-84	84-86	87-91
Visual Impact Assessment (Appendix D3)	49-78	79-82	Same as the assessment sections
Agriculture Compliance Statement (Appendix D4)	N/A – A Compliance Statement is undertaken based on the site sensitivity and therefore no impact assessment or mitigation measures are relevant		
Heritage Impact Assessment (Appendix D5)	18	No direct impacts expected on heritage and therefore cumulative impacts are not applicable	23
Palaeontological Impact Assessment (Appendix D6)	40	40	40
Social Impact Assessment (Appendix D7)	68-92	92-97	Same as the assessment sections
Wetland Risk and Impact Assessment (Appendix D8)	23-27	No direct impacts expected on wetlands and therefore cumulative impacts are not applicable	28

Table 6.3: Matrix analysis

For ease of reference the significance of the impacts is colour-coded as follow:

Low significance	Medium significance	High significance	Positive impact

LISTED ACTIVITY (The Stressor)	ASPECTS OF THE DEVELOPMENT /ACTIVITY		POTENTIAL IMPACTS		SIGNIFICANCE AND MAGNITUDE OF POTENTIAL IMPACTS							MITIGATION OF POTENTIAL IMPACTS			SPECIALIST STUDIES / INFORMATION
			Receptors	Impact description / consequence	Minor	Major	Extent	Duration	Probability	Reversibility	Irreplaceable loss of resources	Possible Mitigation	Possible mitigation measures	Level of residual risk	
CONSTRUCTION PHASE															
Activity 11(i) (GNR 327): *"The development of facilities or infrastructure for the transmission and distribution of electricity outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts."* Activity 12(ii)(c) (GNR 327): *"The development of (ii) infrastructure or structures with a physical footprint of 100 square meters or more (c) within 32 meters of a watercourse, measured from the edge of a watercourse.* Activity 14 (GNR 327): *"The development and*	Site clearing and preparation Certain areas of the site will need to be cleared of vegetation and some areas may need to be levelled. Civil works The main civil works are: • Terrain levelling if necessary– Levelling will be minimal as the potential site chosen is relatively flat. • Laying foundation- The structures will be connected to the ground through cement pillars, cement slabs or metal screws. The exact method will depend on	BIOPHYSICAL ENVIRONMENT	Fauna & Flora	• Destruction, loss and fragmentation of habitats, ecosystems and the vegetation community. • Introduction of IAP species and invasive fauna. • Displacement of the indigenous faunal community (including SCC) due to habitat loss, direct mortalities, and disturbance (road collisions, noise, dust, light, vibration, and poaching).		-	L/R	P/L	D	PR	SL/ML	Yes	- See Table 6.4	M	Terrestrial Ecology Impact Assessment (Appendix D1)
			Wetlands/ Watercourse	Only indirect impacts are expected to occur: • Altered surface flow dynamics; • Erosion; • Alteration of sub-surface flow dynamics; • Sedimentation of the water resource; • Water quality impairment; • Compaction; • Decrease in vegetation; • Change of drainage patterns; • Altering hydromorphic properties; and	-		S	S	U	PR	NL	Yes	- See Table 6.4	L	Wetland Risk and Impact Assessment (Appendix D8)

related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres." <u>Activity 19 (GNR 327):</u> *"The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil sand, shells, shell grit, pebbles or rock of more than 10 cubic meters from a watercourse."* <u>Activity 24 (ii) (GN.R 327):</u> *"The development of a road (ii) with reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 meters"* <u>Activity 28 (ii) (GN.R 327):</u> *"Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after*	the detailed geotechnical analysis. • Construction of access and inside roads/paths – existing paths will be used were reasonably possible. Additionally, the turning circle for trucks will also be taken into consideration. <u>Transportation and installation of PV panels into an Array</u> The panels are assembled at the supplier's premises and will be transported from the factory to the site on trucks. The panels will be mounted on metal structures which are fixed into the ground either through a concrete foundation or a deep-seated screw. <u>Wiring to the Central Inverters</u> Sections of the PV array would be wired to central inverters. The inverter is a pulse width mode inverter that converts DC electricity to alternating electricity (AC) at grid frequency.			• Indirect loss of wetland areas.										
			Avifauna	• Habitat destruction within the project footprint • Destruction, degradation and fragmentation of surrounding habitats • Displacement/emigration of avifauna community (including SCC) due to noise pollution • Direct mortality from persecution or poaching of avifauna species and collection of eggs • Direct mortality from increased vehicle and heavy machinery traffic		-	S/R	P/L	D	IR	sL	Yes	- See Table 6.4	M	Avifauna Impact Assessment (Appendix D2)
			Air	• Air pollution due to the increase of traffic of construction vehicles and the undertaking of construction activities.	-		S	S	D	CR	NL	Yes	• A speed limit should be enforced on dirt roads (preferably 20km/h). • Implement standard dust control measures, including periodic spraying (frequency will depend on many factors including weather conditions, soil composition and traffic intensity and must thus be adapted on an on-going basis) of construction areas and access roads, and ensure that these are continuously monitored to ensure effective implementation. • Regular maintenance of equipment to ensure reduced exhaust emissions.	L	-
			Existing services infrastructure	• Generation of waste that needs to be accommodated at a licensed landfill site. • Generation of sewage that need to be accommodated by the local sewage plant. • Increase in construction vehicles on existing roads.		-	L	S	D	PR	ML	Yes	-	L	Confirmation from the Local Municipality to provide services
			Groundwater	• Pollution due to construction vehicles and the storage and handling of dangerous goods.	-		S	S	Pr	CR	ML	Yes	• A groundwater monitoring programme (quality and groundwater levels) should be designed and installed for the site where ground water is proposed to	L	-

1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare." Activity 56 (ii) (GN.R 327): *"The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre (ii) where no reserve exists, where the existing road is wider than 8 metres…"* Activity 1 (GN.R 325): *"The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more."* Activity 15 (GN.R 325): *"The clearance of an area of 20 hectares or more of indigenous vegetation."* Activity 18 (g)(ii)(ii) (GN.R 324): *"The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre (g) in the Northern Cape (ii) outside urban areas and (ii) Areas within a*													be utilised. Monitoring boreholes should be securely capped (where used), and must be fitted with a suitable sanitary seal to prevent surface water flowing down the outside of the casing. Full construction details of monitoring boreholes must be recorded when they are drilled (e.g. screen and casing lengths, diameters, total depth, etc). • Sampling of monitoring boreholes should be done according to recognised standards.		
			General Environment (risks associated with BESS)	• Mechanical breakdown / Exposure to high temperatures • Fires, electrocutions and spillage of toxic substances into the surrounding environment. • Spillage of hazardous substances into the surrounding environment. • Soil contamination – leachate from spillages which could lead to an impact of the productivity of soil forms in affected areas. • Water Pollution – spillages into surrounding watercourses as well as groundwater. • Health impacts – on the surrounding communities, particularly those relying on watercourses (i.e. rivers, streams, etc) as a primary source of water. • Generation of hazardous waste	-	S	M	Pr	PR	ML	Yes	L	-	• Operators are trained and competent to operate the BESS. Training should include the discussion of the following: - Potential impact of electrolyte spills on groundwater; - Suitable disposal of waste and effluent; - Key measures in the EMPr relevant to worker's activities; - How incidents and suggestions for improvement can be reported. • Training records should be kept on file and be made available during audits. • Battery supplier user manuals safety specifications and Material Safety Data Sheets (MSDS) are filed on site at all times. • Compile method statements for approval by the Technical/SHEQ Manager for the operation and management and replacement of the battery units / electrolyte for the duration of the project life cycle. Method statements should be kept on site at all times. • Provide signage on site specifying the types of batteries in use and the risk of exposure to harzardous		

watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland."													material and electric shock. Signage should also specify how electrical and chemical fires should be dealt with by first responders, and the potential risks to first responders (e.g. the inhalation of toxic fumes, etc.). • Firefighting equipment should readily be available at the BESS area and within the site. • Maintain strict access control to the BESS area. • Ensure all maintenance contractors / staff are familiar with the supplier's specifications. • Undertake daily risk assessment prior to the commencement of daily tasks at the BESS. This should consider any aspects which could result in fire or spillage, and appropriate actions should be taken to prevent these. • Standard Operating Procedures (SOPs) should be made available by the Supplier to ensure that the batteries are handled in accordance with required best practices. • Spill kits must be made available to address any incidents associated with the flow of chemicals from the batteries into the surrounding environment. • The assembly of the batteries on-site should be avoided as far as possible. Activities on-site for the BESS should only be limited to the placement of the container wherein the batteries are placed. • Undertake periodic inspections on the BESS to ensure issues are identified timeously and addressed with the supplier where relevant. • The applicant in consultation with the supplier must compile and		

													implement a Leak and Detection Monitoring Programme during the project life cycle of the BESS. • Batteries must be strictly maintained by the supplier or suitably qualified persons for the duration of the project life cycle. No unauthorised personnel should be allowed to maintain the BESS. • Damaged and used batteries must be removed from site by the supplier or any other suitably qualified professional for recycling or appropriate disposal. • The applicant should obtain a cradle to grave battery management plan from the supplier during the planning and design phase of the system. The plan must be kept on site and adhered to.		
		SOCIAL/ECONOMIC ENVIRONMENT	Local unemployment rate	• Job creation. • Business opportunities. • Skills development. • Economic multiplier effect		+	L/R	S	D	R	NL	Yes	• See Table 6.4	M	Social Impact Assessment (Appendix D7)
			Visual landscape	• Visual impact of construction activities on sensitive visual receptors		-	L	S	D	PR	ML	Yes	• See Table 6.4	L	Visual Impact Assessment (Appendix D3)
			Traffic volumes	• Traffic Congestion and the associated dust and noise pollution. • Transport of equipment, material and staff to site will lead to congestion.	-		L	S	D	CR	NL	Yes	• Stagger component delivery to site • Reduce the construction period • Make use of mobile batch plants and quarries in close proximity to the site • Staff and general trips must occur outside of peak traffic periods. • Regular maintenance of gravel roads by the Contractor during the construction phase and by Client/Facility Manager during operation phase	L	-

			Health, Safety and Socio-Economic	• Air/dust pollution. • Road safety. • Impacts associated with the presence of construction workers on site and in the area. • Influx of job seekers to the area. • Increased safety risk to farmers, risk of stock theft and damage to farm infrastructure associated with presence of construction workers on the site. • Increased risk of veld fires. • Potential loss of productive farmland • Safety and security concerns • Impacts on daily living and movement patterns • Visual and sense of place impacts		-	L	S	Pr / D	PR	ML/ SL	Yes	• See Table 6.4	L	Social Impact Assessment (Appendix D7)
			Noise levels	• The generation of noise as a result of construction vehicles, the use of machinery such as drills and people working on the site.	-	-	L	S	D	CR	NL	Yes	• See Table 6.4	L	Social Impact Assessment (Appendix D7)
			Tourism industry	• Disturbance to daily operations of tourism facilities located directly adjacent to the facility such as Milk and Honey		-	L	S	D	CR	ML	Yes	• Refer to the recommended mitigation measures included in Table 6.4 as recommended by the Social Impact Assessment	M	Social Impact Assessment (Appendix D7)
			Heritage resources	• Direct or physical impacts, implying alteration or destruction of heritage features within the project boundaries	-		S	S	U	PR	NL	Yes	• See Table 6.4	L	Heritage Impact Assessment (Appendix D5)
			Paleontological Heritage	• Destroy or permanently seal-in fossils at or below the surface that are then no longer available for scientific study	-		S	P	U	BR	CL	Yes	• See Table 6.4	L	Paleontological Impact Assessment (Appendix D6)

OPERATIONAL PHASE																
Activity 11(i) (GNR 327): *"The development of facilities or infrastructure for the transmission and distribution of electricity outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts."* Activity 14 (GNR 327): *"The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres."* Activity 1 (GN.R 325): *"The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more."*	The key components of the proposed project are described below: • PV Panel Array - To produce up to 200MW direct current and up to 180MW alternating current, the proposed SEF will require numerous linked cells placed behind a protective glass sheet to form a panel. Multiple panels will be required to form the solar PV arrays which will comprise the PV facility. The PV panels will be tilted in order to capture the most sun or using axis tracker structures to follow the sun to increase the Yield. • Wiring to Inverters - Sections of the PV array will be wired to inverters. The inverter is a pulse width mode inverter that converts direct current (DC) electricity to alternating current (AC) electricity at grid frequency.	BIOPHYSICAL ENVIRONMENT	Fauna and Flora	• Continued fragmentation and degradation of natural habitats and ecosystems. • Continuing spread of IAP and weed species. • Ongoing displacement and direct mortalities of the faunal community (including SCC) due to continued disturbance (road collisions, noise, light, dust, vibration, poaching, etc.).		-	S	M	Pr	PR	ML	Yes	• See Table 6.5	L	Terrestrial Ecology Impact Assessment Report (Appendix D1)
			Avifauna	• Collisions with infrastructure associated with the PV Facility. • Electrocution due to infrastructure associated with the PV Facility. • Direct mortality from persecution or poaching of avifauna species and collection of eggs. • Direct mortality by roadkill during maintenance procedures. • Pollution of water sources and surrounding habitat due to cleaning products of the PV panels. • Heat radiation form the BESS and PV panels. • Encroachment of Invasive Alien Plants into disturbed areas.		-	S/R	P/L	D	IR	SL/ CL	Yes	• See Table 6.5	M	Avifauna Impact Assessment (Appendix D2)
			Air quality	• The proposed development will not result in any air pollution during the operational phase.	N/ A	N/ A	N/ A	N/ A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Groundwater	• Leakage of hazardous materials. The development will comprise of a distribution substation and switching station and will include transformer bays which will contain transformer oils. Leakage of these oils can contaminate water supplies.	-		L	L	Po	PR	ML	Yes	• All areas in which substances potentially hazardous to groundwater are stored, loaded, worked with or disposed of should be securely bunded (impermeable floor and sides) to prevent accidental discharge to groundwater.	L	-

	• Connection to the grid - Connecting the array to the electrical grid requires transformation of the voltage from 480V to 33kV to 132kV. The normal components and dimensions of a distribution rated electrical substation will be required. Output voltage from the inverter is approximately 480V and this is fed into step up transformers to 132kV. An onsite facility substation and switching stations will be required on the site to step the voltage up to 132kV, after which the power will be evacuated into the national grid via the proposed new collector substation and power line. The power line route will be assessed within a 300m wide corridor. • Electrical reticulation network – An internal electrical reticulation network will be required and will be lain ~2-4m underground as far as practically possible.		Wetlands/ Watercourse	Only indirect impacts are expected to occur: • Altered surface flow dynamics; • Erosion; • Alteration of sub-surface flow dynamics; • Sedimentation of the water resource; • Water quality impairment; • Compaction; • Decrease in vegetation; • Change of drainage patterns; • Altering hydromorphic properties; and • Indirect loss of wetland areas.	-	-	S	M	U	PR	NL	Yes	• See Table 6.5	L	Wetland Risk and Impact Assessment (Appendix D8)
		SOCIAL/ECONOMIC	Visual landscape	• Visual impacts on sensitive visual receptors within a 1km radius from the development • Visual impacts on sensitive visual receptors within a 1km radius from the power line • Visual impacts on sensitive visual receptors between a 1km and 5km radius from the development • Visual impacts on sensitive visual receptors between a 1km and 5km radius from the power line • Visual impacts on sensitive visual receptors between a 5km and 10km radius from the development • Visual impacts on sensitive visual receptors between a 5km and 10km radius from the power line • Significance of visual impacts of lighting at night on sensitive visual receptors in close proximity to the development • Visual impacts of solar glint and glare as a visual distraction and possible air travel hazard of the development • Impacts on sense of place	-	L	L	Pr / D	PR	ML/ SL	Yes	• See Table 6.5	L	Visual Impact Assessment (Appendix D3)

	• Supporting Infrastructure – Auxiliary buildings with basic services including water and electricity will be required. • Battery Energy Storage System (BESS) – The battery energy storage system will make use of Lithium-ion as a preferred technology and will have a capacity of up to 40MW. The extent of the system will be 20m long, 23m high, 2.5m wide. • Roads – Access will be obtained via the tarred Riverton Road and various gravel farm roads within the area and affected property. An internal site road network will also be required. • Fencing - For health, safety and security reasons, the facility will be required to be fenced off from the surrounding farm.		Traffic volumes	• The proposed development will not result in any traffic impacts during the operational phase.			-	-	-	-	-	-	The traffic generated during this phase will be negligible and will not have any impact on the surrounding road network.	-	-
			Tourism industry	• Disturbance to daily operations of tourism facilities located directly adjacent to the facility such as Milk and Honey		-	L	L	Pr	R	ML	Yes	• Refer to the recommended mitigation measures included in Table 6.5 as recommended by the Social Impact Assessment	L	Social Impact Assessment (Appendix D7)
			Health, Safety and socio-economic	• Direct and indirect employment opportunities and skills development • Development of non-polluting, renewable energy infrastructure • Potential loss of agricultural land • Contribution to Local Economic Development (LED) and social upliftment • Visual and sense of place impacts		- / +	L/ R	L	Pr/ D	BR/ PR	NL	Yes	• See Table 6.5	M	Social Impact Assessment (Appendix D7)
			Noise levels	• The proposed development will not result in any noise pollution during the operational phase.	N/ A	N/ A	N/ A	N/ A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Heritage resources	• Direct or physical impacts, implying alteration or destruction of heritage features within the project boundaries	-		S	S	U	PR	NL	Yes	• See Table 6.4	L	Heritage Impact Assessment (Appendix D5)
			Electricity supply	• Generation of additional electricity. • The power line will transport generated electricity into the grid.	+		I	L	D	I	N/A	Yes	-	N/A	-
			Electrical infrastructure	• Additional electrical infrastructure. The proposed solar facility will add to the existing electrical infrastructure and aid to lessen the reliance of electricity generation from coal-fired power stations.	+		I	L	D	I	N/A	Yes	-	N/A	-
DECOMMISSIONING PHASE															
-	Dismantlement of infrastructure	BIOPHYSICAL	Fauna & Flora	• Destruction, loss and fragmentation of habitats, ecosystems and the vegetation community.		-	L/R	P/L	D	PR	SL/M L	Yes	• See Table 6.4	M	Terrestrial Ecology

	During the decommissioning phase the Solar PV Energy facility and its associated infrastructure will be dismantled. <u>Rehabilitation of biophysical environment</u> The biophysical environment will be rehabilitated.			• Introduction of IAP species and invasive fauna. • Displacement of the indigenous faunal community (including SCC) due to habitat loss, direct mortalities, and disturbance (road collisions, noise, dust, light, vibration, and poaching).											Impact Assessment (Appendix D1)
			Avifauna	• Direct mortality due to earthworks, vehicle collisions and persecution • Continued habitat degradation due to Invasive Alien Plant encroachment and erosion.		-	S/R	P/L	D	IR	SL/ CL	Yes	• See Table 6.6	L	Avifauna Impact Assessment (Appendix D2)
			Air quality	• Air pollution due to the increase of traffic of construction vehicles	-		S	S	D	CR	NL	Yes	• Regular maintenance of equipment to ensure reduced exhaust emissions.	L	-
			Existing services infrastructure	• Generation of waste that needs to be accommodated at a licensed landfill site • Generation of sewage that needs to be accommodated by the municipal sewerage system and the local sewage plant • Increase in construction vehicles	-		L	S	D	I	NL	Yes	-	L	Confirmation from the Local Municipality to provide services
			Groundwater	• Pollution due to construction vehicles	-		S	S	Pr	CR	ML	Yes	• All vehicles should be inspected for oil and fuel leaks on a regular basis. • Vehicle maintenance yards on site should make provision for drip trays that will be used to capture any spills. Drip trays should be emptied into a holding tank and returned to the supplier.	L	-
			Wetlands/ Watercourse	Only indirect impacts are expected to occur: • Altered surface flow dynamics; • Erosion; • Alteration of sub-surface flow dynamics; • Sedimentation of the water resource;	-		S	S	U	PR	NL	Yes	• See Table 6.6	L	Wetland Risk and Impact Assessment (Appendix D1)

				• Water quality impairment; • Compaction; • Decrease in vegetation; • Change of drainage patterns; • Altering hydromorphic properties; and • Indirect loss of wetland areas.											
			Visual landscape	• The decommissioning phase of the project will result in the same visual impacts experienced during the construction phase of the project.		-	L	S	D	PR	ML	Yes	• See Table 6.4	L	Visual Impact Assessment (Appendix D3)
			Traffic volumes	• Traffic Congestion and the associated dust and noise pollution. • Transport of equipment, material and staff to site will lead to congestion.	-		L	S	D	CR	NL	Yes	• Stagger component delivery to site. • Reduce the construction period. • Make use of mobile batch plants and quarries in close proximity to the site • Staff and general trips should occur outside of peak traffic periods. • Regular maintenance of gravel roads by the Contractor must be undertaken.	L	-
			Health & Safety	• Air/dust pollution. • Road safety. • Increased crime levels. The presence of construction workers on the site may increase security risks associated with an increase in crime levels as a result of influx of people in the rural area.	-		L	S	Pr	PR	ML	Yes	• Demarcated routes to be established for construction vehicles to ensure the safety of communities, especially in terms of road safety and communities to be informed of these demarcated routes. • Where dust is generated by trucks passing on gravel roads, dust mitigation must be enforced. • Any infrastructure that would not be decommissioned must be appropriately locked and/or fenced off to ensure that it does not pose any danger to the community. • Components that are dismantled must be recycled / reduced as far as possible.	L	Social Impact Assessment (Appendix D7)

			Noise levels	• The generation of noise as a result of construction vehicles, the use of machinery and people working on the site	-		L	S	D	CR	NL	Yes	• The decommissioning phase must aim to adhere to the relevant noise regulations and limit noise within standard working hours in order to reduce disturbance of dwellings in close proximity to the development.	L	Social Impact Assessment (Appendix D7)
			Tourism industry	• Disturbance to daily operations of tourism facilities located directly adjacent to the facility such as Milk and Honey		-	L	L	Po	CR	ML	Yes	• Refer to the recommended mitigation measures included in Table 6.4 as recommended by the Social Impact Assessment	M	Social Impact Assessment (Appendix D7)
			Heritage resources	• Direct or physical impacts, implying alteration or destruction of heritage features within the project boundaries	-		S	S	U	PR	NL	Yes	• See Table 6.4	L	Heritage Impact Assessment (Appendix D5)

Nature of the impact:	(N/A) No impact	(+) Positive Impact	(-) Negative Impact	
Geographical extent:	(S) Site;	(L) Local/District;	(P) Province/Region;	(I) International and National
Probability:	(U) Unlikely;	(Po) Possible;	(Pr) Probable;	(D) Definite
Duration:	(S) Short Term;	(M) Medium Term;	(L) Long Term;	(P) Permanent
Intensity / Magnitude:	(L) Low;	(M) Medium;	(H) High;	(VH) Very High
Reversibility:	(CR) Completely Reversible;	(PR) Partly Reversible;	(BR) Barely Reversible;	-
Irreplaceable loss of resources:	(IR) Irreversible	(NL) No Loss;	(ML) Marginal Loss;	(SL) Significant Loss;	(CL) Complete Loss
Level of residual risk:	(L) Low;	(M) Medium;	(H) High;	(VH) Very High	-

The recommended mitigation measures are included in the Environmental Management Programme for the project. The EMPr for the Solar Power Plant is included in Appendix E1. The EMPr for the power line is included in Appendix E2 and the EMPr for the substation is included in Appendix E3. The alien and invasive management plan is included as Appendix E4.

An Environmental Awareness and Fire Management Plan is included in Appendix I of the EMPr in Appendix F1.

6.2 KEY ISSUES IDENTIFIED

From the above it is evident that mitigation measures should be available for potential impacts associated with the proposed activity and development phases. The scoping methodology identified the following key issues which were addressed in more detail in the BA report.

6.2.1 Impacts during the construction phase

During the construction phase the following activities will have various potential impacts on the biophysical and socio-economic environment:

- Activity 11(i) (GNR 327): *"The development of facilities or infrastructure for the transmission and distribution of electricity outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts."*
- Activity 12(ii)(c) (GNR 327): *"The development of (ii) infrastructure or structures with a physical footprint of 100 square meters or more (c) within 32 meters of a watercourse, measured from the edge of a watercourse.*
- Activity 14 (GNR 327): *"The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres."*
- Activity 19 (GNR 327): *"The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil sand, shells, shell grit, pebbles or rock of more than 10 cubic meters from a watercourse."*
- Activity 24 (ii) (GN.R 327): *"The development of a road (ii) with reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 meters"*
- Activity 28 (ii) (GN.R 327): *"Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare."*
- Activity 56 (ii) (GN.R 327): *"The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre (ii) where no reserve exists, where the existing road is wider than 8 metres…"*
- Activity 1 (GN.R 325): *"The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more."*
- Activity 15 (GN.R 325): *"The clearance of an area of 20 hectares or more of indigenous vegetation."*
- Activity 18 (g)(ii)(ii) (GN.R 324): *"The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre (g) in the Northern Cape (ii) outside*

urban areas and (ii) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland."

During the construction phase negative impacts are foreseen over the short term. The latter refers to a period of months. Table 6.4 summarises the potentially most significant impacts and the mitigation measures that are proposed during the construction phase.

Table 6.4: Impacts and the mitigation measures during the construction phase

SPECIALIST STUDY	IMPACT	PRE-MITIGATION RATING	POST MITIGATION RATING	SUMMARY OF MITIGATION MEASURES
Terrestrial Ecology Impact Assessment Report (Appendix D1)	Destruction, loss and fragmentation of habitats, ecosystems and the vegetation community.	Negative Medium	Negative Low	• Areas rated as High sensitivity outside of the direct project development areas should be declared as 'no-go' areas during the life of the project, and all efforts must be made to prevent access to these areas from construction workers and machinery. The infrastructure should be realigned to prioritise development within medium sensitivity areas. Mitigated development in High sensitivity areas is permissible, this includes brush-cutting beneath panels and not complete vegetation clearance. • Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further than that proposed for the project. Clearing of vegetation should be minimized and avoided where possible. Brush cutting of vegetation beneath the panels should be, implemented, otherwise controlled grazing by small livestock like sheep. Technology alternatives should preferably avoid the clearing of vegetation underneath the panels • Where possible, existing access routes and walking paths must be made use of. • All laydown, chemical toilets etc. should be restricted to medium sensitivity areas. Any materials may not be stored for extended periods of time and must be removed from the project area once the construction/closure phase has been concluded. No storage of vehicles or equipment will be allowed outside of the designated project areas.

				• Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood and wind events. This will also reduce the likelihood of encroachment by alien invasive plant species. • Any woody material removed, if necessary, can be shredded and used in conjunction with the topsoil to augment soil moisture and prevent further erosion or could be sustainably provided to the surrounding communities. • A hydrocarbon spill management plan must be put in place, to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. No servicing of equipment may occur on site, unless necessary. All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers. Appropriately contain any generator diesel storage tanks, machinery spills (e.g. accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them leaking and entering the environment. • Storm Water run-off & Discharge Water Quality monitoring • A carefully considered surface water/drainage management plan must be developed for the site including attention to the use of environmentally friendly cleaning chemicals for cleaning of panels during the operational phase. • It should be made an offence for any staff to take/ bring any plant species into/out of any portion of the project area. No plant species whether indigenous or exotic should be brought into/taken from the project area,

				to prevent the spread of exotic or invasive species or the illegal collection of plants. • Consult a fire expert and compile and implement a fire management plan to minimise the risk of veld fires around the project site • Any individual of the protected plants that was observed needs a relocation or destruction permit in order for any individual that may be removed or destroyed due to the development. Preferably, the trees/plants should be avoided. Hi visibility flags must be placed near any protected plants in order to avoid any damage or destruction of the species. If left undisturbed the sensitivity and importance of these species needs to be part of the environmental awareness program. • Dust-reducing mitigation measures must be put in place and strictly adhered to. This includes wetting of exposed soft soil surfaces. No non environmentally friendly suppressants may be used, as this could result in pollution of water sources. • All personnel and contractors to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on sensitive environmental receptors within the project area to inform contractors and site staff of the presence of Red / Orange List species, their identification, conservation status and importance; and biology, habitat requirements and management requirements in the EA and EMPr. The avoidance and protection of the wetland areas must be included into a site induction. Contractors and employees must all undergo the induction and made aware of the “no-go” areas to be avoided.

				• Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site. • Refuse bins will be emptied and secured. • Temporary storage of domestic waste shall be in covered waste skips. • Maximum domestic waste storage period will be 10 days. • Toilets at the recommended Health and Safety standards must be provided. These should be emptied twice a day, to prevent staff from using the surrounding vegetation. • The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected shall be disposed of at a licensed disposal facility. Under no circumstances may domestic waste be burned on site. • Refuse bins will be emptied and secured. Temporary storage of domestic waste shall be in covered waste skips. Maximum domestic waste storage period will be 10 days. • Suitable temporary solid waste facilities are to be incorporated into the design to prevent unsanitary conditions. These are to be cleared weekly and waste collected by the local waste management department. The residents must be encouraged to recycle. • Speed limits must be put in place to reduce erosion. • Reducing the dust generated by the listed activities above, especially the earthmoving machinery, through wetting the soil surface; putting up signs to enforce speed limit; and speed bumps built to force slow speeds. Signs must be put up to enforce this.

				• Where possible, existing access routes and walking paths must be made use of. • Areas that are denuded during construction need to be re-vegetated with indigenous vegetation, to prevent erosion during flood events and strong winds. • A storm water management plan must be compiled and implemented.
	Introduction of IAP species and invasive fauna.	Negative Medium	Negative Low	• Compilation of and implementation of an alien vegetation management plan. • The footprint area of the construction site should be kept to a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas • Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site • A pest control plan must be put in place and implemented; it is imperative that poisons not be used due to the likely presence of SCCs
	Displacement of the indigenous faunal community (including SCC) due to habitat loss, direct mortalities, and disturbance (road collisions, noise, dust, light, vibration, and poaching).	Negative Medium	Negative Low	• The areas to be developed must be specifically demarcated to prevent movement of staff or any individual into the surrounding environments. Signs must be put up to enforce this. • Noise must be kept to an absolute minimum during the evenings and at night, to minimize all possible disturbances to amphibian species and nocturnal mammals. • No trapping, killing, or poisoning of any wildlife is to be allowed. Signs must be put up to enforce this. • Outside lighting should be designed and limited to minimize impacts on fauna. All outside lighting should be directed away from highly sensitive areas. Fluorescent and mercury vapor lighting should be avoided and

				sodium vapor (green/red) lights should be used wherever possible. Try incorporating motion detection lights as much as possible to reduce the duration of illumination. Heights of light columns to be minimised to reduce light spill. Baffles, hoods, or louvres to also be used to reduce light spill • All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits must still be enforced to ensure that road killings and erosion is limited. • Any holes/deep excavations must be dug and planted in a progressive manner; • Should the holes be left open overnight they must be covered temporarily to ensure no small fauna species fall in and subsequently inspected prior to backfilling • A qualified environmental control officer must be on site when construction begins. A site walk through is recommended by a suitably qualified ecologist prior to any construction activities, preferably during the wet season and any SSC should be noted. In situations where the threatened and protected plants must be removed, the proponent may only do so after the required permission/permits have been obtained in accordance with national and provincial legislation. In the abovementioned situation the development of a search, rescue and recovery program is suggested for the protection of these species. Should animals not move out of the area on their own relevant specialists must be contacted to advise on how the species can be relocated • Once the development layout has been confirmed, the open areas must be fenced off appropriately pre-construction in order to allow animals to move or be moved into these areas before breaking ground activities occur.

				Construction activities must take place systemically, especially in relation to the game farm area.
				• Wildlife-permeable fencing with holes large enough for mongoose and other smaller mammals should be installed, the holes must not be placed in the fence where it is next to a major road as this will increase road killings in the area
				• Fencing mitigations:
				  ○ Top 2 strands must be smooth wire
				  ○ Routinely retention loose wires
				  ○ Minimum 30cm between wires
				  ○ Place markers on fences

Wetland Risk and Impact Assessment (Appendix D8) Indirect Impacts	Altered surface flow dynamics Erosion Alteration of sub-surface flow dynamics Sedimentation of the water resource Water quality impairment Compaction Decrease in vegetation	Negative Low	Negative Low	• The wetlands and associated buffer areas must be avoided. • A stormwater management plan must be compiled and implemented for the project, facilitating the diversion of clean water to the delineated resources. • The construction vehicles and machinery must make use of existing access routes as much as possible, before adjacent areas are considered for access. • Laydown yards, camps and storage areas must be within the project area. • The contractors used for the project should have spill kits available to ensure that any fuel or oil spills are cleaned-up and discarded correctly. • It is preferable that construction takes place during the dry season to reduce the erosion potential of the exposed surfaces. • All chemicals and toxicants to be used for the construction must be stored within the construction site and in a bunded area.

	Change of drainage patterns; Altering hydromorphic properties Indirect loss of wetland areas			• All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site. • All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping". • Adequate sanitary facilities and ablutions must be provided for all personnel throughout the project area. Use of these facilities must be enforced (these facilities must be kept clean so that they are a desired alternative to the surrounding vegetation). • Have action plans on site, and training for contractors and employees in the event of spills, leaks and other impacts to the aquatic systems. • Any exposed earth should be rehabilitated promptly by planting suitable vegetation (vigorous indigenous grasses) to protect the exposed soil. • No dumping of material on-site may take place. • All waste generated on-site during construction must be adequately managed. Separation and recycling of different waste materials should be supported.
Avifauna Impact Assessment (Appendix D2)	Habitat destruction within the project footprint (Option A)	Negative Very High	Negative Medium	• Solar panels must be mounted on pile driven or screw foundations, such as post support spikes, rather than heavy foundations, such as trench-fill or mass concrete foundations, to reduce the negative effects on natural soil functioning, such as its filtering and buffering characteristics, while maintaining habitats for both fossorial and epigeic biodiversity (Bennun et al, 2021). If concrete foundations are used that would increase the impact of the project as there would be direct impacts to soil permeability and characteristics, thereby influencing inhabitant fauna. In addition, stormwater runoff and runoff from cleaning the panels would be increased, increasing erosion in the surrounding areas.
	Habitat destruction within the project footprint (Option B)	Negative High	Negative Low	

				• Indigenous vegetation to be maintained under the solar panels to ensure biodiversity is maintained and to prevent soil erosion (Beatty et al, 2017; Sinha et al, 2018). • Vegetation clearing to commence only after the necessary permits have been obtained. • Environmental Officer (EO) to provide supervision and oversight of vegetation clearing activities. • Option B is the preferred option but only if the solar panels are moved to the north or east to avoid the Very High sensitivity areas.
	Destruction, degradation and fragmentation of surrounding habitats	Negative Very High	Negative Low	• Pre-construction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness of no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, remaining within demarcated construction areas etc. • All solid waste must be managed in accordance with the Solid Waste Management Plan. Recycling is encouraged. • All construction activity and roads to be within the clearly defined and demarcated areas. • Temporary laydown areas should be clearly demarcated and rehabilitated with indigenous vegetation subsequent to end of us. • Appropriate dust control measures to be implemented. • Suitable sanitary facilities to be provided for construction staff as per the guidelines in Health and Safety Act. • No cement/concrete may be mixed on site and must be brought in off site to ensure the water sources does not get polluted and that successful rehabilitation of the construction areas can take place.

				• All hazardous materials, if any, should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner.
	Displacement/ emigration of avifauna community (including SCC) due to noise pollution	Negative High	Negative Low	• No construction activity is to occur at night, as nocturnal species are highly dependent on sound and/or vocalisations for behavioural processes. • All vehicles speed must be restricted to 20 km/h, to reduce the noise emitted by them. • If generators are to be used these must be soundproofed.
	Direct mortality from persecution or poaching of avifauna species and collection of eggs	Negative Medium	Negative Low	• All personnel should undergo environmental awareness training that includes educating on not poaching/persecuting species and collecting eggs. • Prior to commencing work each day, two individuals should traverse the working area in order to disturb any avifauna and so they have a chance to vacate the area. • Any avifauna threatened by the construction activities that does not vacate the area should be removed safely by an appropriately qualified environmental officer or removal specialist.
	Direct mortality from increased vehicle and heavy machinery traffic	Negative Medium	Negative Low	• All personnel should undergo environmental induction with regards to awareness about speed limits and roadkill. • All construction vehicles should adhere to a speed limit of maximum 20km/h to avoid collisions. Appropriate speed control measures and signs must be erected.
Heritage Impact Assessment (Appendix D5)	Direct or physical impacts, implying alteration or destruction of heritage features	Negative Low	Negative Low	• In the event of finding evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources during the proposed development, SAHRA APM Unit (Natasha Higgitt 021 462 5402) must be

				alerted. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Mimi Seetelo 012 320 8490), must be alerted immediately. A professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the findings at the expense of the developer. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required at the expense of the developer.
Palaeontological Impact Assessment (Appendix D6)	Destroy or permanently seal-in fossils at or below the surface that are then no longer available for scientific study	Negative Medium	Negative Low	• If fossil remains are discovered during any phase of construction, either on the surface or uncovered by excavations the ECO/site manager in charge of these developments must be notified immediately (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za). These discoveries must be secured and the ECO/site manager must alert SAHRA so that appropriate mitigation (documented and collection) can be undertaken by a professional palaeontologist. The specialist would need a collection permit from SAHRA. Fossil material must be curated in an approved collection (museum or university) and all fieldwork and reports must meet the minimum standards for palaeontological impact studies developed by SAHRA.
Visual Impact Assessment (Appendix D3)		Negative Medium	Negative Low	<u>Planning</u> • Retain and maintain natural vegetation immediately adjacent to the development footprint. <u>Construction</u> • Ensure that vegetation is not unnecessarily removed during the construction phase.

				• Plan the placement of laydown areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e., in already disturbed areas) where possible. • Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads. • Ensure that rubble, litter, etc. are appropriately stored (if it can't be removed daily) and then disposed of regularly at a licenced waste site. • Reduce and control dust during construction by utilising dust suppression measures. • Limit construction activities between 07:00 and 18:00, where possible, in order to reduce the impacts of construction lighting. • Rehabilitate all disturbed areas immediately after the completion of construction work and maintain good housekeeping.
	Visual impact of construction activities on sensitive visual receptors to the proposed development (Option A)	Negative Low	Negative Low	<u>Planning</u> • Retain and maintain natural vegetation immediately adjacent to the development footprint. <u>Construction</u> • Ensure that vegetation is not unnecessarily removed during the construction phase. • Plan the placement of laydown areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e., in already disturbed areas) where possible. • Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads. • Ensure that rubble, litter, etc. are appropriately stored (if it can't be removed daily) and then disposed of regularly at a licenced waste site. • Reduce and control dust during construction by utilising dust suppression measures.

				• Limit construction activities between 07:00 and 18:00, where possible, in order to reduce the impacts of construction lighting. • Rehabilitate all disturbed areas immediately after the completion of construction work and maintain good housekeeping.
Social Impact Assessment (Appendix D7)	Direct and indirect employment opportunities and skills development	Positive Low	Positive Medium	Enhancement: • A local employment policy should be adopted to maximise opportunities made available to the local labour force. • Labour should be sourced from the local labour pool, and only if the necessary skills are unavailable should labour be sourced from (in order of preference) the greater Sol Plaatjie Local Municipality, Frances Baard District Municipality, Northern Cape Province, South Africa, or elsewhere. • Where feasible, training and skills development programmes should be initiated prior to the commencement of the construction phase. • As with the labour force, suppliers should also as far as possible be sourced locally. • As far as possible local contractors that are compliant with Broad-Based Black Economic Empowerment (B-BBEE) criteria should be used. • The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.
	Economic Multiplier effect	Positive Low	Positive Medium	Enhancement: • It is recommended that a local procurement policy is adopted to maximise the benefit to the local economy. • A database of local companies, specifically Historically Disadvantaged Individuals (HDIs) which qualify as potential service providers (e.g., construction companies, security companies, catering companies, waste collection companies, transportation companies etc.) should be created and companies listed thereon should be invited to bid for project-related work where applicable.

				• Local procurement is encouraged along with engagement with local authorities and business organisations to investigate the possibility of procurement of construction materials, goods and products from local suppliers where feasible.
	Potential loss of productive farmland	Negative Medium	Negative Low	• The proposed site for the project needs to be fenced off prior to the construction phase and all construction related activities should be confined in this fenced off area. • Livestock grazing on the proposed site need to be relocated. • All affected areas, which are disturbed during the construction phase, need to be rehabilitated prior to the operational phase and should be continuously monitored by the Environmental Control Officer (ECO). • Implement, manage and monitor a grievance mechanism for the recording and management of social issues and complaints.
	Influx of jobseekers and change in population	Negative Medium	Negative Low	• Develop and implement a local procurement policy which prioritises "locals first" to prevent the movement of people into the area in search of work. • Engage with local community representatives prior to construction to facilitate the adoption of the locals first procurement policy. • Provide transportation for workers (from Kimberley and surrounds) to ensure workers can easily access their place of employment and do not need to move closer to the project site. • Working hours should be kept between daylight hours during the construction phase, and / or as any deviation that is approved by the relevant authorities. • Compile and implement a grievance mechanism. • Appoint a Community Liaison Officer (CLO) to assist with the procurement of local labour. • Prevent the recruitment of workers at the project site.

				• Implement, manage and monitor a grievance mechanism for the recording and management of social issues and complaints. • Establish clear rules and regulations for access to the proposed site. • Appoint a security company and implement appropriate security procedures to ensure that workers do not remain onsite after working hours. • Inform local community organisations and policing forums of construction times and the duration of the construction phase. • Establish procedures for the control and removal of loiterers from the construction site.
	Safety and security impacts	Negative Medium	Negative Low	• Working hours should be kept within daylight hours during the construction phase, and / or as any deviation that is approved by the relevant authorities. • Provide transportation for workers to prevent loitering within or near the project site outside of working hours. • The perimeter of the construction site should be appropriately secured to prevent any unauthorised access to the site. The fencing of the site should be maintained throughout the construction period. • The appointed EPC Contractor must appoint a security company to ensure appropriate security procedures and measures are implemented. • Access in and out of the construction site should be strictly controlled by a security company appointed to the project. • A CLO should be appointed as a grievance mechanism. A method of communication should be implemented whereby procedures to lodge complaints are set out for the local community to express any complaints or grievances with the construction process. • The EPC Contractor should implement a stakeholder management plan to address neighbouring farmer concerns regarding safety and security.

				• The project proposed must prepare and implement a Fire Management Plan; this must be done in conjunction with surrounding landowners. • The EPC Contractor must prepare a Method Statement which deals with fire prevention and management.
	Impacts on daily living and movement patterns	Negative Medium	Negative Low	• All vehicles must be road worthy, and drivers must be qualified, obey traffic rules, follow speed limits and be made aware of the potential road safety issues. • Heavy vehicles should be inspected regularly to ensure their road worthiness. • Provision of adequate and strategically placed traffic warning signs, that have to be maintained for the duration of the construction phase, and control measures along the N12 road and tarred Riverton Road to warn road users of the construction activities taking place for the duration of the construction phase. Warning signs must be always visible, especially at night. • Implement penalties for reckless driving to enforce compliance to traffic rules. • Avoid heavy vehicle activity during “peak” hours (when children are taken to school, or people are driving to work). • The developer and EPC Contractor must ensure that all fencing along access roads is maintained in the present condition or repaired if disturbed due to construction activities. • The developer and EPC Contractor must ensure that the roads utilised for construction activities are either maintained in the present condition or upgraded if disturbed due to construction activities. • The EPC Contractor must ensure that damage / wear and tear caused by construction related traffic to the access roads is repaired before the completion of the construction phase.

				• A method of communication must be implemented whereby procedures to lodge complaints are set out for the local community to express any complaints or grievances with the construction process.
	Nuisance impacts (noise and dust)	Negative Medium	Negative Low	• The movement of heavy vehicles associated with the construction phase should be timed to avoid weekends, public holidays, and holiday periods where feasible. • Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers. • Ensure all vehicles are road worthy, drivers are qualified and are made aware of the potential noise and dust issues. • A CLO should be appointed, and a grievance mechanism implemented.
	Increased risk of potential veld fires	Negative Medium	Negative Low	• A firebreak should be implemented before the construction phase. The firebreak should be controlled and implemented around the perimeters of the project site. • Adequate fire-fighting equipment should be provided and readily available on site and all staff should be trained in firefighting and how to use the fire-fighting equipment. • No staff (except security) should be accommodated overnight on site and the contractor should ensure that no open fires are allowed on site. The use of cooking or heating implements should only be used in designated areas. • Contractors need to ensure that any construction related activities that might pose potential fire risks, are done in the designated areas where it is also managed properly. • Precautionary measures need to be taken during high wind conditions or during the winter months when the fields are dry.

				• The contractor should enter an agreement with the local farmers before the construction phase that any damages or losses during the construction phase related to the risk of fire and that are created by staff during the construction phase, are borne by the contractor.
	Visual and sense of place impacts	Negative Low	Negative Low	• Implement mitigation measures identified in the Visual Impact Assessment (VIA) prepared for the project. • Limit noise generating activities to normal daylight working hours and avoid weekends and public holidays. • The movement of heavy vehicles associated with the construction phase should be timed to avoid weekends, public holidays, and holiday periods where feasible. • Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers. • All vehicles must be road-worthy, and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits. • Communication, complaints, and grievance channels must be implemented and contact details of the CLO must be provided to the local community in the study area.

6.2.2 Impacts during the operational phase

During the operational phase the study area will serve as a solar plant. The potential impacts will take place over a period of 20 – 25 years. During the operational phase the following activities will have various potential impacts on the biophysical and socio-economic environment:

- Activity 11(i) (GNR 327): *"The development of facilities or infrastructure for the transmission and distribution of electricity outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts."*
- Activity 14 (GNR 327): *"The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres."*
- Activity 1 (GN.R 325): *"The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more."*

Table 6.5 summarised the negative impacts are generally associated with the solar and battery storage energy facility (including other associated infrastructure) and power line, which include impacts on the fauna and flora, soils, geology, surface water, the pressure on existing services infrastructure, and visual impacts. The provision of sustainable services delivery also needs to be confirmed. The operational phase will have a direct positive impact through the provision of employment opportunities for its duration, and the generation of income to the local community.

Table 6.5: Impacts and the mitigation measures during the operational phase

SPECIALIST STUDY	IMPACT	PRE-MITIGATION RATING	POST MITIGATION RATING	SUMMARY OF MITIGATION MEASURES
Terrestrial Ecology Impact Assessment (Appendix D1)	Continued fragmentation and degradation of natural habitats and ecosystems.	Negative Medium	Negative Low	• Areas rated as High sensitivity outside of the direct project development areas should be declared as 'no-go' areas during the life of the project, and all efforts must be made to prevent access to these areas from workers and machinery. Mitigated development in High sensitivity areas is permissible, this includes brush-cutting beneath panels and not complete vegetation clearance. • Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further than that proposed for the project. Clearing of vegetation should be minimized and avoided where possible. Brush cutting of vegetation beneath the panels should be, implemented, otherwise controlled grazing by small livestock like sheep. Technology alternatives should preferably avoid the clearing of vegetation underneath the panels. • Where possible, existing access routes and walking paths must be made use of. • No storage of vehicles or equipment will be allowed outside of the designated project areas. • Any woody material removed, if necessary, can be shredded and used in conjunction with the topsoil to augment soil

				moisture and prevent further erosion or could be sustainably provided to the surrounding communities. • A hydrocarbon spill management plan must be put in place, to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. No servicing of equipment may occur on site, unless necessary. All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers. Appropriately contain any generator diesel storage tanks, machinery spills (e.g. accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them leaking and entering the environment. • A carefully considered surface water/drainage management plan must be developed for the site including attention to the use of environmentally friendly cleaning chemicals for cleaning of panels during the operational phase. • It should be made an offence for any staff to take/ bring any plant species into/out of any portion of the project area. No plant species whether indigenous or exotic should be brought into/taken from the project area, to prevent the spread of exotic or invasive species or the illegal collection of plants.

				• Consult a fire expert and compile and implement a fire management plan to minimise the risk of veld fires around the project area. • Dust-reducing mitigation measures must be put in place and strictly adhered to. This includes wetting of exposed soft soil surfaces. No non environmentally friendly suppressants may be used, as this could result in pollution of water sources. • All personnel and contractors to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on sensitive environmental receptors within the project area to inform contractors and site staff of the presence of Red / Orange List species, their identification, conservation status and importance; and biology, habitat requirements and management requirements in the EA and EMPr. The avoidance and protection of the wetland areas must be included into a site induction. Contractors and employees must all undergo the induction and made aware of the "no-go" areas to be avoided. • Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site. • Refuse bins will be emptied and secured. • Temporary storage of domestic waste shall be in covered waste skips. • Maximum domestic waste storage period will be 10 days.

				• Toilets at the recommended Health and Safety standards must be provided. • The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected shall be disposed of at a licensed disposal facility. Under no circumstances may domestic waste be burned on site. • Refuse bins will be emptied and secured. Temporary storage of domestic waste shall be in covered waste skips. Maximum domestic waste storage period will be 10 days. • Speed limits must be put in place to reduce erosion. • Reducing the dust generated by the listed activities above, especially the earthmoving machinery, through wetting the soil surface; putting up signs to enforce speed limit; and speed bumps built to force slow speeds. Signs must be put up to enforce this. • Where possible, existing access routes and walking paths must be made use of. • A storm water management plan must be implemented.
	Continuing spread of IAP and weed species.	Negative Medium	Negative Low	• Implementation of an alien vegetation management plan. • Avoid unnecessary disturbances to adjacent areas • Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site • A pest control plan must be put in place and implemented; it is imperative that poisons not be used due to the likely presence of SCCs

	Ongoing displacement and direct mortalities of the faunal community (including SCC) due to continued disturbance (road collisions, noise, light, dust, vibration, poaching, etc.).	Negative Medium	Negative Low	• Prevent movement of staff or any individual into the surrounding environments. Signs must be put up to enforce this. • Noise must be kept to an absolute minimum during the evenings and at night, to minimize all possible disturbances to amphibian species and nocturnal mammals. • No trapping, killing, or poisoning of any wildlife is to be allowed. Signs must be put up to enforce this. • Outside lighting should be designed and limited to minimize impacts on fauna. All outside lighting should be directed away from highly sensitive areas. Fluorescent and mercury vapor lighting should be avoided and sodium vapor (green/red) lights should be used wherever possible. Try incorporating motion detection lights as much as possible to reduce the duration of illumination. Heights of light columns to be minimised to reduce light spill. Baffles, hoods, or louvres to also be used to reduce light spill • All maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits must still be enforced to ensure that road killings and erosion is limited. • Any holes/deep excavations must be dug and planted in a progressive manner. • Should the holes be left open overnight they must be covered temporarily to ensure no small fauna species fall in and subsequently inspected prior to backfilling.

Wetland Risk and Impact Assessment (Appendix D8) Indirect Impacts	Altered surface flow dynamics	Negative Low	Negative Low	• The wetlands and associated buffer areas must be avoided. • A stormwater management plan must be compiled and implemented for the project, facilitating the diversion of clean water to the delineated resources. • The contractors used for the project should have spill kits available to ensure that any fuel or oil spills are cleaned-up and discarded correctly. • All chemicals and toxicants must be stored within the construction site and in a bunded area. • All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site. • All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping". • Adequate sanitary facilities and ablutions must be provided for all personnel throughout the project area. Use of these facilities must be enforced (these facilities must be kept clean so that they are a desired alternative to the surrounding vegetation). • Have action plans on site, and training for contractors and employees in the event of spills, leaks and other impacts to the aquatic systems. • Any exposed earth should be rehabilitated promptly by planting suitable vegetation (vigorous indigenous grasses) to protect the exposed soil.
	Erosion			
	Alteration of sub-surface flow dynamics			
	Sedimentation of the water resource			
	Water quality impairment			
	Compaction			
	Decrease in vegetation			
	Change of drainage patterns;			
	Altering hydromorphic properties			
	Indirect loss of wetland areas			

				• No dumping of material on-site may take place.
Avifauna Impact Assessment (Appendix D2)	Collisions with infrastructure associated with the PV Facility	Negative Very High	Negative Medium	• The design of the proposed solar plant must be of a type or similar structure as endorsed by the Eskom-Endangered Wildlife Trust (EWT) Strategic Partnership on Birds and Energy, considering the mitigation guidelines recommended by Birdlife South Africa. • Infrastructure should be consolidated where possible in order to minimise the amount of ground and air space used. This would involve using existing/approved pylons and associated infrastructure for different lines. • The loop in loop out lines must join in at closest point to the existing line as possible. • Non-polarising white tape can be used around and/or across panels to minimise reflection (Bennun et al, 2021). This is especially pertinent to waders and aquatic species that may recognise the panel array as water bodies (lake effect as described above) and collide with the panels, causing mortality. • Overhead cables/lines must be fitted with industry standard bird flight diverters in order to make the lines as visible as possible to collision-susceptible species. Shaw et al (2021) demonstrated that large avifauna species mortality was reduced by 51% (95% CI: 23–68%). Recommended bird diverters such as flapping devices (dynamic device) and thickened wire spirals (static device) that increase the visibility of the lines should be fitted 5 m apart. The Inotec BFD88 bird diverter is highly recommended due to its

				visibility under low light conditions when most species move from roosting to feeding sites.
				• Fencing mitigations:
				  ○ Top 2 strands must be smooth wire;
				  ○ Routinely retention loose wires;
				  ○ Minimum distance between wires is 300 mm; and
				  ○ Place markers on fences.

	Electrocution due to infrastructure associated with the PV Facility	Negative High	Negative Low	• The design of the proposed solar plant and grid lines must be of a type or similar structure as endorsed by the Eskom-EWT Strategic Partnership on Birds and Energy, considering the mitigation guidelines recommended by Birdlife South Africa • Insulation where energised parts and/or grounded parts are covered with materials appropriate for providing incidental contact protection to birds. It is best to use suspended insulators and vertical disconnectors, if upright insulators or horizontal disconnectors are present, these should be covered. • Perch discouragers can be used such as perch guards or spikes. Considerable success achieved by providing artificial bird safe perches, which are placed at a safe distance from the energised parts (Prinsen et al, 2012).
	Direct mortality from persecution or poaching of avifauna species and collection of eggs	Negative Medium	Negative Low	• All personnel should undergo environmental awareness training that includes educating on not poaching/persecuting avifauna species and collecting eggs. • Signs must be put up to enforce this, should someone be caught a R1000 fine must be enforced.

	Direct mortality by roadkill during maintenance procedures	Negative Medium	Negative Low	• All personnel should undergo environmental induction with regards to awareness about speed limits and roadkill. • All vehicles should adhere to a speed limit of maximum 20 km/h to avoid collisions. Appropriate speed control measures and signs must be erected.
	Pollution of water sources and surrounding habitat due to cleaning products of the PV panels	Negative High	Negative Low	• Only environmentally friendly chemicals are to be used for cleaning of the panels.
	Heat radiation form the BESS and PV panels	Negative Medium	Negative Low	• The BESS must be enclosed in a structure with a non-reflective surface. • A fire management plan needs to be put in place. • Grass must be kept under the panels to ensure that additional reflection is not taking place from the surface below the panels.
	Encroachment of Invasive Alien Plants (IAP) into disturbed areas	Negative Very High	Negative Low	• An IAP Management Plan must be written and implemented for the development. The developer must contract a specialist to develop the plan and the developer is responsible for its implementation. • Regular monitoring for IAP encroachment during the operation phase must be undertaken to ensure that no alien invasion problems have developed as result of the disturbance. This should be every 3 months during the first two years of the operation phase and every six months for the life of the project.

				• All IAP species must be removed/controlled using the appropriate techniques as indicated in the IAP management plan.
Visual Impact Assessment (Appendix D3)	Potential visual impacts on sensitive visual receptors located within a 1km radius from the development (Option A & B)	Negative Medium	Negative Low	Planning • Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint. • Where insufficient natural vegetation exists next to the property, a 'screen' can be planted if the landowner requests additional mitigation. This can be done using endemic, fast growers that are water efficient. Operations • Maintain general appearance of the facility as a whole.
	Potential visual impacts on sensitive visual receptors located within a 1km radius from the power line (Option A & B)	Negative Medium	Negative Medium	Planning • Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint. Operations • Maintain general appearance of the power line corridor. • Screening can be established near sensitive receptors, upon request, rather than to mitigate the impact at the source.
	Potential visual impacts on sensitive visual receptors between a 1km and 5km radius from the development (Option A & B)	Negative Medium	Negative Low	Planning • Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint. • Where insufficient natural vegetation exists next to the property, a 'screen' can be planted if the landowner requests additional mitigation. This can be done using endemic, fast growers that are water efficient. Operations • Maintain general appearance of the facility as a whole.

	Potential visual impacts on sensitive visual receptors between a 1km and 5km radius from the power line (Option A & B)	Negative Medium	Negative Low	Planning • Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint. Operations • Maintain general appearance of the power line corridor. • Screening can be established near sensitive receptors, upon request, rather than to mitigate the impact at the source.
	Potential visual impacts on sensitive visual receptors located between a 5km and 10km radius from the development (Option A & B)	Negative Low	Negative Low	Planning • Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint. • Where insufficient natural vegetation exists next to the property, a 'screen' can be planted if the landowner requests additional mitigation. This can be done using endemic, fast growers that are water efficient. Operations • Maintain general appearance of the facility as a whole.
	Potential visual impacts on sensitive visual receptors located between a 5km and 10km radius from the power line (Option A & B)	Negative Low	Negative Low	Planning • Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint. Operations • Maintain general appearance of the power line corridor. • Screening can be established near sensitive receptors, upon request, rather than to mitigate the impact at the source.
	Lighting impacts of the development (Option A & B)	Negative High	Negative Low	As far as practically possible: • Shield the source of light by physical barriers (walls, vegetation etc.) • Limit mounting heights of lighting fixtures, or alternatively use footlights or bollard level lights.

				• Make use of minimum lumen or wattage in fixtures. • Make use of down-lighters, or shield fixtures. • Make use of low-pressure sodium lighting or other types of low impact lighting. • Make use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes. • The use of night vision or thermal security cameras are very effective and can replace security lighting entirely.
	Solar glint and glare impacts (Option A & B)	Negative Low	N/A	• No mitigation measures required / recommended
	Visual and sense of place impacts of the development (Option A & B)	Negative Medium	Negative Low	• The subjectivity towards the project in its entirety can be influenced by creating a "Green Energy" awareness campaign, educating the local community and potentially tourists on the benefits of renewable energy. This can be achieved by also hosting an 'open day' where the local community can have the opportunity to view the completed project which may enlist a sense of pride in the renewable energy project in their area. • Implement good housekeeping measures.
	Visual and sense of place impacts of the power line (Option A & B)	Negative Low	Negative Low	• The subjectivity towards the project in its entirety can be influenced by creating a "Green Energy" awareness campaign, educating the local community and potentially tourists on the benefits of renewable energy. This can be achieved by also hosting an 'open day' where the local community can have the opportunity to view the completed

				project which may enlist a sense of pride in the renewable energy project in their area. • Implement good housekeeping measures.
Social Impact Assessment (Appendix D7)	Direct and Indirect employment opportunities and skills development	Positive Low	Positive Medium	Enhancement: • It is recommended that local employment policy is adopted to maximise the opportunities made available to the local community. • The recruitment selection process should seek to promote gender equality and the employment of women wherever possible. • Vocational training programs should be established to promote the development of skills.
	Development of non-polluting, renewable energy infrastructure	Positive Medium	Positive Medium	• No enhancement identified
	Potential loss of agricultural land	Negative Medium	Negative Low	• The proposed mitigation measures for the construction phase should have been implemented at this stage. • Mitigation measures from the Agricultural and Soil Report, should also be implemented.
	Contribution to Local Economic Development (LED) and social upliftment	Positive Medium	Positive High	Enhancement: • A CNA must be conducted to ensure that the LED and social upliftment programmes proposed by the project are meaningful. • Ongoing communication and reporting are required to ensure that maximum benefit is obtained from the programmes identified, and to prevent the possibility for such programmes to be misused.

						• The programmes should be reviewed on an ongoing basis to ensure that they are best suited to the needs of the community at the time (bearing in mind that these are likely to change over time).
	Impact on tourism	Negative Low	Positive Low	Negative Low	Positive Low	• The impact rating is dependent on how the development is perceived by tourism. In some cases, renewable energy developments can be seen as an addition to the tourist industry in the area (positive low) or it can be viewed as a negative. The rating is subjective. • - Due to the extent of the project no viable mitigation measures can be implemented to eliminate the visual impact of the PV panels, but the subjectivity towards the PV panels can be influenced by creating a "Green Energy" awareness campaign, educating the local community and tourists on the benefits of renewable energy. Tourists visiting the area should be made aware of South Africa's movement towards renewable energy. This might create a positive feeling of a country moving forward in terms of environmental sustainability. This could be implemented by constructing a visitor's centre on the property allocated to the proposed solar farm which should be opened to school fieldtrips, the local community, and tourists.
	Visual and sense of place impacts	Negative Low		Negative Low		• To effectively mitigate the visual impact and the impact on sense of place during the operational phase of the proposed project, it is suggested that the recommendations made in the Visual Impact Assessment (specialist study) should be followed in this regard.

6.2.3 Impacts during the decommissioning phase

The physical environment will benefit from the closure of the solar and battery storage energy facility since the site will be restored to its natural state. Table 6.6 provides a summary of the impacts during the decommissioning phase. The decommissioning phase will however potentially result in impact on soils, pressure on existing service infrastructure, surface water and the loss of permanent employment. Skilled staff will be eminently employable, and a number of temporary jobs will also be created in the process. Decommissioning of a solar and battery storage energy facility will leave a positive impact on the habitat and biodiversity in the area as the area will be rehabilitated to its natural state.

Table 6.6: Impacts and the mitigation measures during the decommissioning phase

SPECIALIST STUDY	IMPACT	PRE-MITIGATION RATING	POST MITIGATION RATING	SUMMARY OF MITIGATION MEASURES
Wetland Risk and Impact Assessment (Appendix D8) Indirect Impacts	Altered surface flow dynamics Erosion Alteration of sub-surface flow dynamics Sedimentation of the water resource Water quality impairment Compaction Decrease in vegetation Change of drainage patterns; Altering hydromorphic properties Indirect loss of wetland areas	Negative Low	Negative Low	• The wetlands and associated buffer areas must be avoided. • A stormwater management plan must be compiled and implemented for the project, facilitating the diversion of clean water to the delineated resources. • The construction vehicles and machinery must make use of existing access routes as much as possible, before adjacent areas are considered for access. • Laydown yards, camps and storage areas must be within the project area. • The contractors used for the project should have spill kits available to ensure that any fuel or oil spills are cleaned-up and discarded correctly. • It is preferable that construction takes place during the dry season to reduce the erosion potential of the exposed surfaces. • All chemicals and toxicants to be used for the construction must be stored within the construction site and in a bunded area. • All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site. • All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good “housekeeping”. • Adequate sanitary facilities and ablutions must be provided for all personnel throughout the project area. Use of these facilities must be

				enforced (these facilities must be kept clean so that they are a desired alternative to the surrounding vegetation). • Have action plans on site, and training for contractors and employees in the event of spills, leaks and other impacts to the aquatic systems. • Any exposed earth should be rehabilitated promptly by planting suitable vegetation (vigorous indigenous grasses) to protect the exposed soil. • No dumping of material on-site may take place. • All waste generated on-site during construction must be adequately managed. Separation and recycling of different waste materials should be supported.
Avifaunal Assessment (Appendix D2)	Direct mortality due to earthworks, vehicle collisions and persecution	Negative Medium	Negative Low	• All personnel should undergo environmental awareness training including educating about not harming or collecting species. • Prior to commencing work each day, two individuals should traverse the working area in order to disturb any fauna and so they have a chance to vacate. • Any fauna threatened by the construction activities should be removed safely by an appropriately qualified environmental officer or removal specialist. • All construction vehicles should adhere to a speed limit of maximum 20 km/h to avoid collisions. Appropriate speed control measures and signs must be erected. • All hazardous materials, if any, should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner. • Any excavations should not be left open for extended periods of time as fauna may fall in and become trapped in them. Excavations should only be dug when they are required and should be used and filled shortly thereafter.

				• All infrastructure, including power lines, must be removed if the facility is decommissioned. • The project area must be rehabilitated, and a management plan must be in place to ensure that it is done successfully.
	Continued habitat degradation due to Invasive Alien Plant encroachment and erosion	Negative Very High	Negative Low	• Rehabilitation in accordance with the Rehabilitation Plan for the development must be undertaken in areas disturbed during the decommissioning phase. • Monitoring of the rehabilitated area must be undertaken at quarterly intervals for 3 years after the decommissioning phase. • All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. • There should be follow-up rehabilitation and revegetation of any remaining bare areas with indigenous flora.

6.3 SUMMARY OF RECOMMENDATIONS FROM SPECIALIST STUDIES

To address the key issues highlighted in the previous section the following specialist studies and processes were commissioned:

- Terrestrial Ecology Impact Assessment – The Biodiversity Company (see Appendix D1)
- Avifauna Impact Assessment – The Biodiversity Company (see Appendix D2)
- Visual Impact Assessment – Donaway Environmental (see Appendix D3)
- Agriculture Compliance Statement – The Biodiversity Company (see Appendix D4)
- Heritage Impact Assessment – Dr David Morris (see Appendix D5)
- Palaeontological Impact Assessment – Banzai Environmental (see Appendix D6)
- Social Impact Assessment – Donaway Environmental (see Appendix D7)
- Wetland Risk and Impact Assessment – The Biodiversity Company (see Appendix D8)

The following sections summarise the main findings from the specialist reports in relation to the key issues raised as part of the Basic Assessment process.

6.3.1 Issue 1: Heritage and Archaeological Impacts

South Africa's heritage resources comprise a wide range of sites, features, objects and beliefs. According to Section 27(18) of the National Heritage Resources Act (NHRA), No. 25 of 1999, no person may destroy, damage, deface, excavate, alter, remove from its original position, subdivide or change the planning status of any heritage site without a permit issued by the heritage resources authority responsible for the protection of such site. In accordance with Section 38 of the NHRA, an independent heritage consultant was therefore appointed to conduct a Heritage Impact Assessment (HIA) to determine if any sites, features or objects of cultural heritage significance occur within the proposed site. The main question which needs to be addressed is:

"Will the proposed development impact on any heritage or archaeological artefacts?"

According to the Heritage Impact Assessment (Appendix D5), the site has extremely sparse heritage traces of low significance (in borrow pits and an erosion feature) which are located outside of the two development area alternatives (these being the only archaeological artefacts seen in a landscape otherwise completely masked by Hutton Sands). No colonial era traces of significance were observed.

Therefore, no impacts to heritage resources are expected to occur and the impact of the proposed development will be of a low significance.

6.3.2 Issue 2: Ecological Impacts

The potential impact of the proposed development on threatened flora and fauna and overall biodiversity known to occur in the Northern Cape Province had to be determined. The main question which needs to be addressed is:

"How will the proposed development impact on the ecology?"

According to the Terrestrial Ecology Impact Assessment (Appendix D1), the main anticipated impact during the construction phase includes the clearing of vegetation, proliferation of alien plant species along the roads and cleared areas as well as the severing of movement corridors for fauna, and the fragmentation of habitat. The following potential impacts to terrestrial biodiversity were considered:

- Destruction, further loss and fragmentation of the habitats, ecosystems and vegetation community, including protected tree species;
- Introduction of alien species, especially plants;
- Displacement of the indigenous faunal community (including SCC) due to habitat loss, direct mortalities, and disturbance (road collisions, noise, dust, light, vibration, and poaching).

All likely impacts are rated as Medium-High negative significance pre-mitigation but may be reduced to Low-Medium significance through the proper implementation of effective mitigation measures. The most important mitigation measures for this phase are as follows:

- Ensure that the site footprint is as small as possible and responsibly positioned, the development area must be properly fenced off during construction;
- Protected plants must be avoided or destruction permits obtained;
- Land clearing must be done over at least three days and conducted linearly and successively from the north to the south; and
- No trapping, killing, or poisoning of any wildlife is to be allowed and signs must be put up to enforce this. Monitoring must take place in this regard.

The operational phase of the impact of daily activities is anticipated to further spread the Invasive Alien Plants, as well as the deterioration of the habitats due to the increase of dust and edge effect impacts. Dust reduces the ability of plants to photosynthesize and thus leads to degradation/retrogression of the veld. Moving maintenance vehicles do not only cause sensory disturbances to fauna, affecting their life cycles and movement, but will lead to direct mortalities due to collisions.

The following potential impacts were considered:

- Continued fragmentation and degradation of natural habitats and ecosystems;
- Continuing spread of IAP and weed species; and
- Ongoing displacement and direct mortalities of the faunal community (including SCC) due to continued disturbance (road collisions, noise, light, dust, vibration, poaching, etc.).

All potential impacts may be reduced from a significance rating of High to Low with the proper implementation of ongoing mitigation measures. The most important mitigation measures to implement during this phase include:

- The continual usage of the same roadways, parking areas and walkways, and the following of speed limits;
- The responsible management of all waste; and

- An IAP management and habitat rehabilitation plan must be implemented and updated annually.

It must be noted that the Terrestrial Ecology Impact Assessment (Appendix D1) provided an impact assessment for the Option B development area alternative only as Option A is not considered appropriate for development from an ecological perspective. The consideration of the two development area alternatives is discussed further in section 6.5 which provides a comparative analysis of the two options.

The Woody Thornveld habitat units can be regarded as important, not only within the local landscape, but also regionally; as they are the only remaining areas used for habitat, reproduction foraging and movement corridors for fauna. The habitat sensitivity of the Woody Thornveld is regarded as high, due to floral and faunal species recorded as well as the role of this intact habitat to biodiversity within the local landscape, not to mention the sensitivity according to various ecological datasets, the high sensitivity areas still:

- Serve as and represent ONA, as identified by the conservation plan, however, may be considered as ESA;
- Provide overall intermediate ecological benefits for the area; and
- Support various organisms (including SCC) and may play an important role in the ecosystem if left to recover from the superficial impacts.

The ecological integrity, importance and functioning of these areas play a crucial role and an important habitat for various fauna and flora. The preservation of this system is the most important aspect to consider for the proposed project, even more so due to the sensitivity of the areas. These habitats need to be protected and improved due to the role of this crucial and limited habitat, as well as a water resource within this disturbed local area.

Mitigation measures as described by the specialist must be implemented to reduce the significance of the risk. Considering that the area that has been identified as being of significance for biodiversity maintenance and ecological processes (Moderate and High sensitivity), development may proceed but with caution and only with the implementation of mitigation measures.

6.3.3 Issue 3: Wetland Impacts

The potential impact of the proposed development on wetlands known to occur on site, had to be determined. The main question which needs to be addressed is:

"How will the proposed development impact on the wetlands?"

According to the Wetland Risk and Impact Assessment (Appendix D8) direct impacts to the wetlands (and buffers) will be avoided. Therefore, there is expected Low levels of risk posed to the wetland areas. It is expected that the proposed activities will pose low residual risks on the wetlands and therefore no fatal flaws were identified for the project.

6.3.4 Issue 4: Avifaunal Impacts

The potential impact of the proposed development on birds known to occur in the Northern Cape Province had to be determined. The main question which needs to be addressed is:

"How will the proposed development impact on the avifauna?"

According to the Avifaunal Assessment (Appendix D2), potential impacts on avifauna associated with the construction and operational phases of the proposed development is expected to occur.

During the construction phase vegetation clearing for the associated infrastructure will lead to direct habitat loss. Vegetation clearing will create a disturbance and will therefore potentially lead to the displacement of avifaunal species. The operation of construction machinery on site will generate noise pollution. Increased human presence can lead to poaching and the increase in vehicle traffic and heavy machinery will potentially lead to roadkill.

The principal impacts of the operational phase are electrocution, collisions, fencing, chemical pollution due to chemical cleaning of the PV panels and habitat loss. Solar panels have been implicated as a potential risk for bird collisions. Collisions are thought to arise when birds (particularly waterbirds) mistake the panels for waterbodies, known as the "lake effect" (Lovich & Ennen, 2011), or when migrating or dispersing birds become disorientated by the polarised light reflected by the panels. This "lake-effect" hypothesis has not been substantiated or refuted to date (Visser et al, 2019). It can however be said that the combination of power lines, fencing and large infrastructure will influence avifauna species. Visser et al (2019) performed a study at a utility-scale PV solar energy facility in the Northern Cape and found that most of the species affected by the facility were passerine species. This is due to collisions with solar panels from underneath. During a predator attack while foraging under the panels, individuals may alight and then collide with the panel. Larger species were said to be more influenced by the facilities when they were found foraging close by and were disturbed by predators which resulted in collisions with infrastructure.

Large passerines are particularly susceptible to electrocution because owing to their relatively large bodies, they are able to touch conductors and ground/earth wires or earthed devices simultaneously. The chances of electrocution are increased when feathers are wet, during periods of high humidity or during defecation. Prevailing wind direction also influences the rate of electrocution casualties.

Chemical pollution from PV cleaning, if not environmentally friendly will result in either acute or chronic affects. Should this chemical penetrate into the surrounding environment, it would impact populations on a larger scale and not just species found in and around the PV footprint.

The main expected impacts of the proposed development and associated infrastructure will include the following:

- Habitat loss and fragmentation;
- Electrocutions; and
- Collisions.

Mitigation measures as described in this report can be implemented to reduce the significance of the risk to an acceptable residual risk level.

6.3.5 Issue 5: Visual Impacts

Due to the extent of the proposed solar and battery storage energy facility it is expected that the plant will result in potential visual impacts. The main question which needs to be addressed is:

"To what extent will the proposed development be visible to observers and to what extent will the landscape provides any significant visual absorption capacity"

The Visual Impact Assessment (Appendix D3) confirms that the construction and operational phase of the proposed development, and its associated infrastructure will have a visual impact on the area, especially within (but not restricted to) a 1km radius of the proposed project. The visual impact will differ amongst places, depending on the distance to the solar and battery storage energy facility. Receptors that might be the most sensitive to the proposed development are residents living in Roodepan, a suburb of Kimberley. Roodepan is located a mere 1.6km south west from the proposed development, specifically development area Option A.

Due to the extent of the project, no viable mitigation measures can be implemented to eliminate the visual impact of the facility entirely, but the possible visual impacts can be reduced. Several mitigation measures have however been proposed regardless of whether mitigation measures will reduce the significance of the of the anticipated impacts, they are considered good practice and should be implemented and maintained throughout the construction, operational and decommissioning phases of the project, if possible.

The significance of the visual impact will be a "Negative Low Impact". The only receptors likely to be impacted by the proposed development are the nearby property owners and nearby roads. However, a large part of the visual landscape is still reflecting a farming landscape with a better visual appearance.

6.3.6 Issue 6: Agricultural Impacts

In order to determine the potential impacts that the proposed development will have on agricultural production, the soil forms and current land capability of the area where the proposed project will be situated a soil survey has been conducted. The main question which needs to be addressed is:

"To what extent will the proposed development compromise (negative impacts) or enhance (positive impacts) current and/or potential future agricultural production?"

The Agriculture Compliance Statement (Appendix D4), the most sensitive soil forms identified within the site (including the two site alternatives) is the Ermelo, Hutton and Vaalbos soil forms. The land capability sensitivities (DAFF, 2017) indicate land capabilities with "Very low to Moderate" sensitivities, which correlates with the findings from the soil baseline assessment. The regulated footprint area is associated with non-arable and arable lands.

The site is associated with both non-arable and some arable soils, due to the type of soils in the area. The available climate limits crop production significantly. The harsh climatic conditions are associated with low annual rainfall and high evapotranspiration potential demands of the area. The area is not favourable for most cropping practices, which corresponds to the current livestock and game farming activities in the area.

It is the specialist's opinion that the proposed project and associated infrastructure will have no impacts on the agricultural production ability of the land. There is no segregation of crop fields with "High" sensitivity in the proposed site following the DFFE screening tool, (2022). The baseline soil results and the DAFF, (2017) sensitivities concur for the assessment area, categorised as "Low" sensitivity for the land capability. It is, therefore, the specialist`s recommendation that, the proposed project and associate infrastructure may be favourably considered without mitigation as it has limited impacts on the land capability of the resources in the project area.

6.3.7 Issue 7: Socio-economic Impacts

A Social Impact Assessment has been compiled in order to provide a description of the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed facility; to provide a description and assessment of the potential social issues associated with the proposed facility; and the identification of enhancement and mitigation aimed at maximizing opportunities and avoiding and or reducing negative impacts (refer to Appendix D7). The main question which needs to be addressed is:

"How will the proposed development impact on the socio-economic environment?"

There are some vulnerable communities within the project area that may be affected by the development and its associated infrastructure. Traditionally, the construction phase of a PV solar development is associated with most social impacts. Many of the social impacts are unavoidable and will take place to some extent but can be managed through the careful planning and implementation of appropriate mitigation measures. Several potential positive and negative social impacts have been identified for the project, however an assessment of the potential social impacts indicated that there are no perceived negative impacts that are sufficiently significant to allow them to be classified as "fatal flaws".

Based on the social impact assessment, the following general conclusions and findings can be made:

- The potential negative social impacts associated with the construction phase are typical of construction related projects and not just focussed on the construction of solar PV projects (these relate to an influx of non-local workforce and jobseekers, intrusion and disturbance impacts (i.e., noise and dust, wear and tear on roads) and safety and security risks) and could be reduced with the implementation of the mitigation measures proposed. The significance of such impacts on the local communities can therefore be mitigated.
- The development will introduce employment opportunities during the construction phase (temporary employment) and a limited number of permanent employment opportunities during operation phase.
- The proposed project could assist the local economy in creating entrepreneurial growth and opportunities, especially if local business is involved in the provision of general material, goods and services during the construction and operational phases. This positive impact is likely to be compounded by the cumulative impact associated with the development of several other solar facilities within the surrounding area, and

because of the project's location within an area which is characterised by high levels of solar irradiation, and which is therefore well suited to the development of commercial solar energy facilities.

- The proposed development also represents an investment in infrastructure for the generation of non-polluting, Renewable Energy, which, when compared to energy generated because of burning polluting fossil fuels, represents a positive social benefit for society.
- It should be noted that the perceived benefits associated with the project, which include RE generation and local economic and social development, outweigh the perceived impacts associated with the project.

The following recommendations are made based on the SIA. The proposed mitigation measures should be implemented to limit the negative impacts and enhance the positive impacts associated with the project. Based on the social assessment, the following recommendations are made:

- The appointment of a CLO to assist with the management of social impacts and to deal with community issues, if feasible.
- It is imperative that local labour be sourced, wherever possible, to ensure that benefits accrue to the local communities. Efforts should be made to involve local businesses during the construction activities, where possible. Local procurement of labour and services / products would greatly benefit the community during the construction and operational phases of the project.
- Local procurement of services and equipment is required where possible in order to enhance the multiplier effect.
- Involve the community in the process as far as possible (encourage co-operative decision making and partnerships with local entrepreneurs).
- Employ mitigation measures to minimise the dust and noise pollution and damage to existing roads.
- Safety and security risks should be considered during the planning / construction phase of the proposed project. Access control, security and management should be implemented to limit the risk of crime increasing in the area.

The proposed project and associated infrastructure are unlikely to result in permanent damaging social impacts. From a social perspective it is concluded that the project could be developed subject to the implementation of recommended mitigation measures and management actions identified for the project.

6.3.8 Issue 8: Palaeontological Impacts

South Africa's heritage resources comprise a wide range of sites, features, objects and beliefs. According to Section 27(18) of the National Heritage Resources Act (NHRA), No. 25 of 1999, no person may destroy, damage, deface, excavate, alter, remove from its original position, subdivide or change the planning status of any heritage site without a permit issued by the

heritage resources authority responsible for the protection of such site. The main question which needs to be addressed is:

"How will the proposed development impact on the Palaeontological resources?"

According to the Palaeontological Impact Assessment (Appendix D6), the development is underlain by Quaternary Superficial Sediments and at depth by sediments of the Ecca and Ventersdorp Groups. According to the PalaeoMap on the South African Heritage Resources Information System (SAHRIS) database, the Palaeontological Sensitivity of the Quaternary Superficial Sediments is moderate (Almond and Pether; 2009).

It is therefore considered that the proposed Droogfontein 4 Solar and Battery Storage Energy Facility in the Northern Cape will not lead to detrimental impacts on the palaeontological resources of the area. The construction of the development may therefore be authorised as the area is not considered sensitive in terms of palaeontological resources. It is consequently recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils.

6.3.9 Issue 9: Risk Assessment for battery storage system

Battery storage facilities are a relatively new technology, particularly in South Africa. Batteries, as with most electrical equipment, can be dangerous and may catch fire, explode or leak dangerous pollutants if damaged, possibly injuring people working at the facility or polluting the environment. Common failure scenarios of Li-ion batteries include: electrical, mechanical, and thermal. The potential hazards associated with them are fire with consequent emission of gas and explosion. The major risks include thermal runaway, difficulty of fighting battery fires, failure of control systems and the sensitivity of Li-ion batteries to mechanical damage and electrical transients.

As with any fire or explosion, a potential consequence of Li-ion battery fires is the endangerment of life and property. These consequences are assessed based on their severity and likelihood. First, the severity of this consequence changes based on the quantity of cells in a system, as well as the system's proximity to people and property. Therefore, the size and location of the installation should be taken into consideration. For the Droogfontein 4 Solar and Battery Storage Energy Facility the location of the BESS and the fact that the area is sparsely populated will reduce the risk associated with toxic chemicals, flammability and overpressure from explosions. The risk level is seen to be of a low risk that is unlikely to occur with the proper safety measures taken as mitigation. Provided that the facility is designed and managed properly, and the batteries are handled in the manner prescribed by the manufacturer, an incident is unlikely to happen. However, because of the risk special management actions are recommended in the EMPr to reduce the risk of an incident and manage an incident should one ever occur.

6.4 SENSITIVITY ANALYSIS AND COMPARATIVE ASSESSMENT OF THE TWO DEVELOPMENT AREA ALTERNATIVES

The sensitivity analysis undertaken as part of the BA Report focusses on providing an understanding of the environmentally sensitive areas and features identified within the site, and specifically the two development area alternatives. This section considers the findings of

each of the independent specialist studies undertaken for the development and describes the sensitive features and areas identified, including the location, the sensitivity rating of the features or areas as well as the associated buffers recommended by the specialist (where a buffer is considered to be relevant). The sensitive areas and features identified are also displayed on the sensitivity maping included as Figure H1-H4 of this BA report.

The following sections below provide a sensitivity analysis for each of the fields of study and also provide input on which development area alternative (Option A or Option B) is considered to be preferred based on the outcome of the studies and inputs from the specialists. Refer to Table 6.6.

Terrestrial Ecology:

From a Terrestrial Ecology perspective (refer to Appendix D1), three habitats were identified within the site. These include the Woody Thornveld, Grass Thornveld, Artificial Wetlands and Transformed Areas.

The Woody Thornveld has been awarded a sensitivity rating of High Ecological Sensitivity. This habitat is mainly present within the development area Option A.

The Grassy Thornveld has been awarded a sensitivity rating of Medium Ecological Sensitivity. Almost the entire extent of development area Option B includes this habitat. And a few smaller areas of Option A along the northern and south-western boundary includes this habitat.

The Artificial Wetlands and transformed areas were awarded a rating of low and very low respectively. These habitats are minimal within the two development area alternatives.

Figure 6.1 provides the ecological sensitivity map as per the descriptions provided above.

Avifauna:

The Avifauna Impact Assessment (Appendix D2) has considered the habitats available within the area and has accordingly rated the habitats in terms of the sensitivity from an avifauna perspective.

The habitats identified include water resources (very high sensitivity), grassland (medium sensitivity), woody thornveld (high sensitivity) and transformed areas (very low sensitivity).

When considering the two development areas under assessment the following habitats are located within the two alternative areas. Option A is located primarily in the woody thornveld habitat which is of a high avifauna sensitivity, with a small section of the northern extent of the development area alternative located within a grassland area (medium sensitivity).

Option B however is located primarily within the grassland habitat (medium sensitivity) with a small section along the southern boundary infringing into an area of very high avifauna sensitivity which is associated with a water feature (pan).

The specialist has indicated that the optimization of the development footprint of Option B must be undertaken to ensure the avoidance of the very high sensitivity area. Refer to Figure 6.2.

Wetlands:

The Wetland Risk and Impact Assessment (Appendix D8) has identified wetland features located within the directly adjacent areas of the two development area alternatives. Three hydrogeomorphic units were identified and assessed within the 500 m regulated area of the two development area alternatives. These comprise of three depression wetlands. The wetlands are “Moderately Modified” to “Seriously Modified” due to the modification to both the hydrology and vegetation of the wetlands through anthropogenic activities. The wetlands scored “Moderate” importance and sensitivity due to the low threat status, protection level and integrity of systems. The average ecosystem service score was determined to range from “Intermediate” to “High” due to the vegetation cover and amount of pollution running into the wetlands. A 15 m post mitigation buffer was assigned to the wetland systems.

No wetlands (or the associated 15m buffer) are present within either of the two development area alternatives. Refer to Figure 6.3.

Visual:

No specific areas of sensitivity have been identified from a visual perspective (Visual Impact Assessment, Appendix D3). Therefore, from a visual perspective, no areas have been identified as no-go or sensitive for the development of the facility and associated infrastructure.

Heritage:

No sites, features or objects of cultural significance were identified from a heritage perspective (Heritage Impact Assessment, Appendix D5). Therefore, from a heritage perspective, no areas have been identified as no-go or sensitive for the development of the facility and associated infrastructure.

Palaeontology:

The palaeontological sensitivity have been confirmed as being of a **moderate** sensitivity (Palaeontological Impact Assessment, Appendix D6). Therefore, from a palaeontological perspective, no areas have been identified as no-go or high sensitivity for the development of the project and associated infrastructure.

Social:

No specific areas of sensitivity have been identified from a social perspective (Social Impact Assessment, Appendix D7). Therefore, from a social perspective, no areas have been identified as no-go for the development of the SPP and associated infrastructure.

Agriculture:

No specific areas of sensitivity have been identified from an agricultures perspective (Agricultural Compliance Statement, Appendix D4). Therefore, from an agricultural perspective, no areas have been identified as no-go/sensitive for the development of the project and associated infrastructure.

Figure 6.1: Ecological sensitivity map

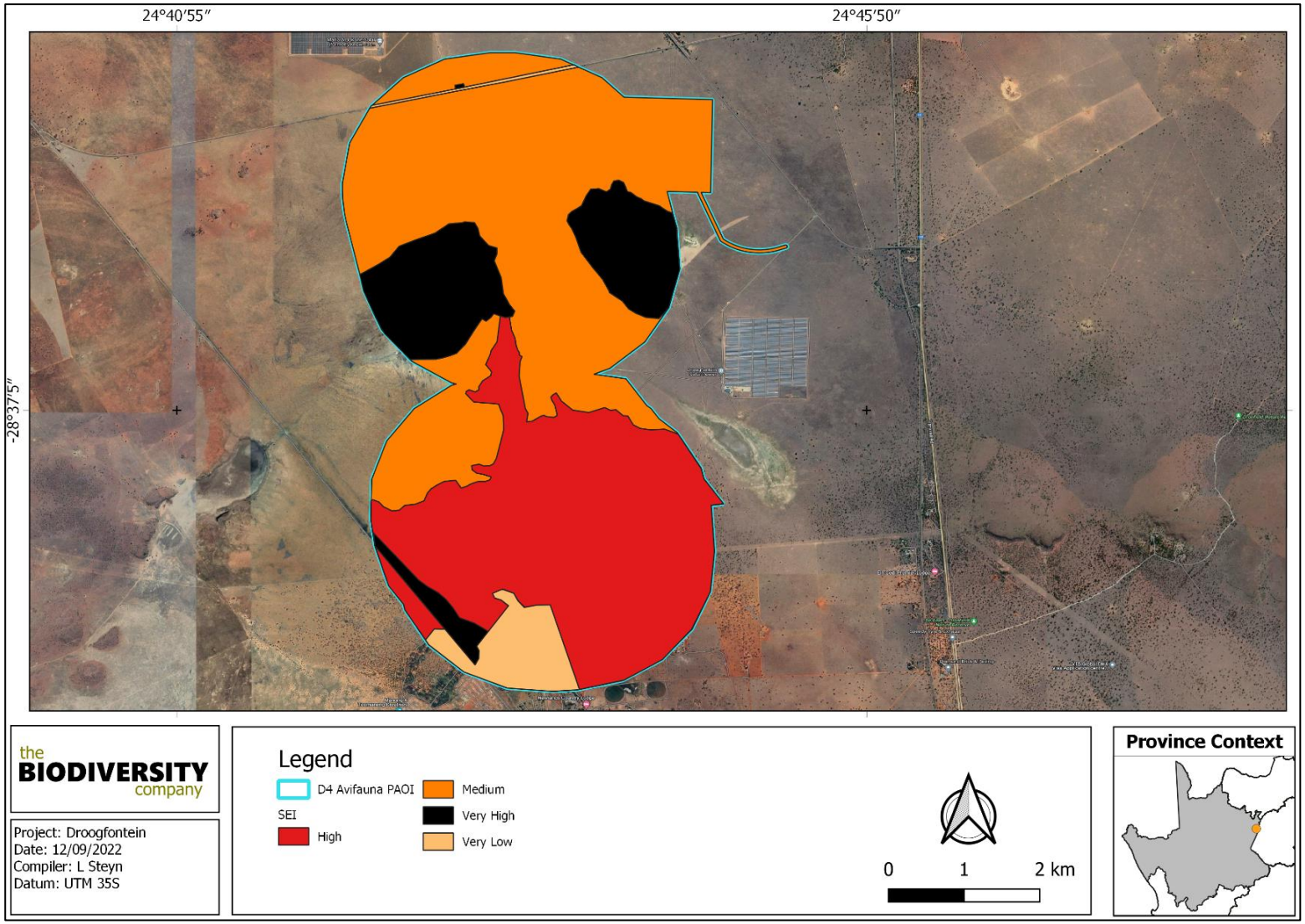


Figure 6.2: Avifauna sensitivity map

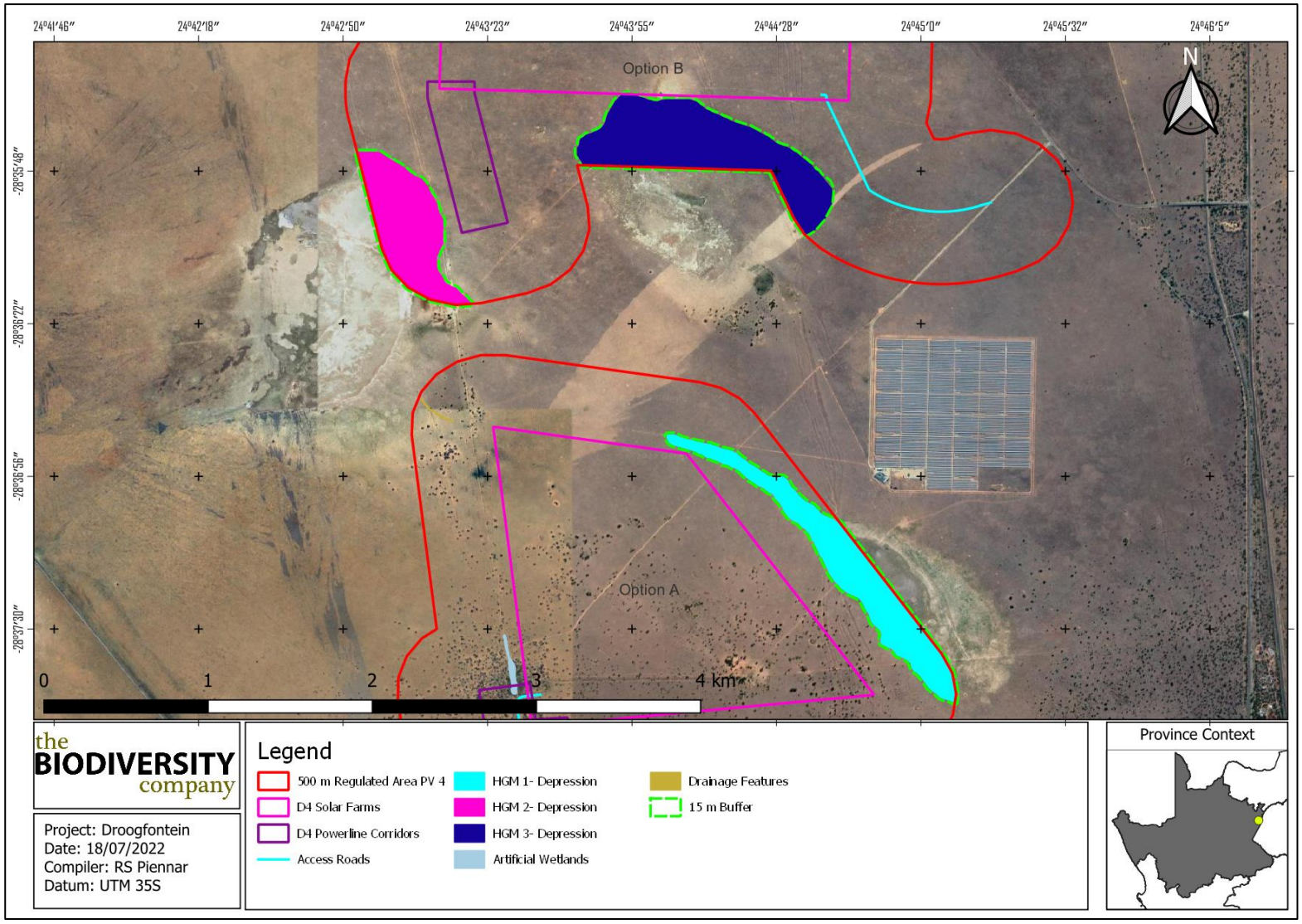


Figure 6.3: Wetland sensitivity map

The results of the specialist studies considering the two development area alternatives are included in the table below.

Table 6.7: Specialist input on the two development area alternatives

Field of Study	Development Area Option A	Development Area Option B
Terrestrial Ecology	• Not preferred • Located within an area of high sensitivity • Higher loss of Woody Thornveld which includes not only a high density of Nationally Protected Trees, Camelthorn (Vachellia Erioloba) but also other woody plants	• Preferred • Located within an area of medium sensitivity. • Less loss of Woody Thornveld which includes not only a high density of Nationally Protected Trees, Camelthorn (*Vachellia Erioloba*) but also other woody plants
Avifauna	• Not preferred • Utilised more frequently by avifauna species for nesting • Located within an area of high sensitivity	• Preferred • Located within an area of medium sensitivity • Optimisation of the development footprint within the development area is required to ensure avoidance of the limited infringement of the facility into the very high sensitivity area
Visual	• Less preferred, but still acceptable	• Preferred • Slightly less impact significance than that of Option B • Further from Roodepan settlement
Heritage	• Acceptable	• Acceptable
Palaeontology	• Acceptable	• Acceptable
Agriculture	• Acceptable	• Acceptable
Social	• Acceptable	• Preferred • Located further away from tourism activities located on

		an adjacent property to the south
Wetlands	• Preferred • Located further away from wetland features present	• Acceptable

From the above it can be concluded that the development area Option B is preferred from an overall environmental perspective, subject to the optimisation of the development footprint within the development area to ensure avoidance of the very high avifauna sensitivity area. This is based on the findings of the specialist studies which indicated that development area alternative Option A presents an area of a higher environmental sensitivity and is therefore not preferred, specifically from a terrestrial ecology and avifauna perspective.

6.5 METHOD OF ENVIRONMENTAL ASSESSMENT

The environmental assessment aims to identify the various possible environmental impacts that could results from the proposed activity. Different impacts need to be evaluated in terms of its significance and in doing so highlight the most critical issues to be addressed.

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale i.e. site, local, national or global whereas intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in Table 6.7.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

6.5.1 Impact Rating System

Impact assessment must take account of the nature, scale and duration of impacts on the environment whether such impacts are positive or negative. Each impact is also assessed according to the project phases:

- planning
- construction
- operation
- decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance should also be included. The rating system is applied to the potential impacts on the receiving environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each impact the following criteria is used:

Table 6.8: The rating system

NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be experienced.		
1	Site	The impact will only affect the site.
2	Local/district	Will affect the local area or district.
3	Province/region	Will affect the entire province or region.
4	International and National	Will affect the entire country.
PROBABILITY		
This describes the chance of occurrence of an impact.		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
DURATION		
This describes the duration of the impacts. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by

		direct human action or by natural processes thereafter (10 – 30 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.
INTENSITY/ MAGNITUDE		
Describes the severity of an impact.		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
REVERSIBILITY		
This describes the degree to which an impact can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures.
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		

This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts. A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible cumulative impact	The impact would result in negligible to no cumulative effects.
2	Low cumulative impact	The impact would result in insignificant cumulative effects.
3	Medium cumulative impact	The impact would result in minor cumulative effects.
4	High cumulative impact	The impact would result in significant cumulative effects
SIGNIFICANCE		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The calculation of the significance of an impact uses the following formula: (Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity. The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
Points	Impact significance rating	Description
6 to 28	Negative low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative high impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.

51 to 73	Positive high impact	The anticipated impact will have significant positive effects.
74 to 96	Negative very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive very high impact	The anticipated impact will have highly significant positive effects.

6.6 CONCLUSION

Overall, the two development alternatives include areas of very high, high and medium sensitivity areas. Option B has been identified as the preferred development area for the placement of the project development footprint based on the fact that the area mainly consists of medium sensitivity with only a small portion along the southern boundary being of a very high sensitivity. The extent of the development area is large enough to accommodate an optimized layout which avoids this area of very high sensitivity and thereby results in the most appropriate placement for the project. The optimized layout will still be able to meet the capacity requirements of the facility. Refer to Appendix I for the optimized layout and Figures J for the optimized layout and sensitivity map.

Therefore, the sensitivity analysis and impact assessment has guided the developer in optimising the final layout of the Droogfontein 4 Solar and Battery Storage Energy Facility through identifying specific environmental areas and features present within the site which needs to be avoided through the careful placement of infrastructure as part of the development footprint.

From the above assessment it can be concluded that the development of the solar and battery energy storage facility can be supported from an environmental perspective when developed on development area Option B should all the recommended mitigation measures be implemented, and the sensitive environments be avoided. No fatal flaws were identified by the specialists.

7 CUMULATIVE EFFECTS ASSESSMENT

This section aims to address the following requirements of the regulations:

Appendix 1. (3)(i) An BAR (...) must include-
(j) an assessment of each identified potentially significant impact and risk, including- (i) cumulative impacts.

7.1 INTRODUCTION

The EIA Regulations (as amended in 2017) determine that cumulative impacts, "*in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities*." Cumulative impacts can be incremental, interactive, sequential or synergistic. EIAs have traditionally failed to come to terms with such impacts, largely as a result of the following considerations:

- Cumulative effects may be local, regional or global in scale and dealing with such impacts requires coordinated institutional arrangements;
- Complexity - dependent on numerous fluctuating influencing factors which may be completely independent of the controllable actions of the proponent or communities; and
- Project level investigations are ill-equipped to deal with broader biophysical, social and economic considerations.

Despite these challenges, cumulative impacts have been afforded increased attention in this Basic Assessment Report and for each impact a separate section has been added which discusses any cumulative issues, and where applicable, draws attention to other issues that may contextualise or add value to the interpretation of the impact. This chapter analyses the proposed project's potential cumulative impacts in more detail by: (1) defining the geographic area considered for the cumulative effects analysis; (2) providing an overview of relevant past and present actions in the project vicinity that may affect cumulative impacts; (3) presenting the reasonably foreseeable actions in the geographic area of consideration; and (4) determining whether there are adverse cumulative effects associated with the resource areas analysed.

The term "Cumulative Effect" has for the purpose of this report been defined as: the summation of effects over time which can be attributed to the operation of the project itself, and the overall effects on the ecosystem of the site that can be attributed to the project and other existing and planned future projects.

7.2 GEOGRAPHIC AREA OF EVALUATION

The geographic area of evaluation is the spatial boundary in which the cumulative effects analysis was undertaken. The spatial boundary evaluated in this cumulative effects analysis generally includes an area of a 30km radius surrounding the proposed development – refer to Figure 7.1 below.

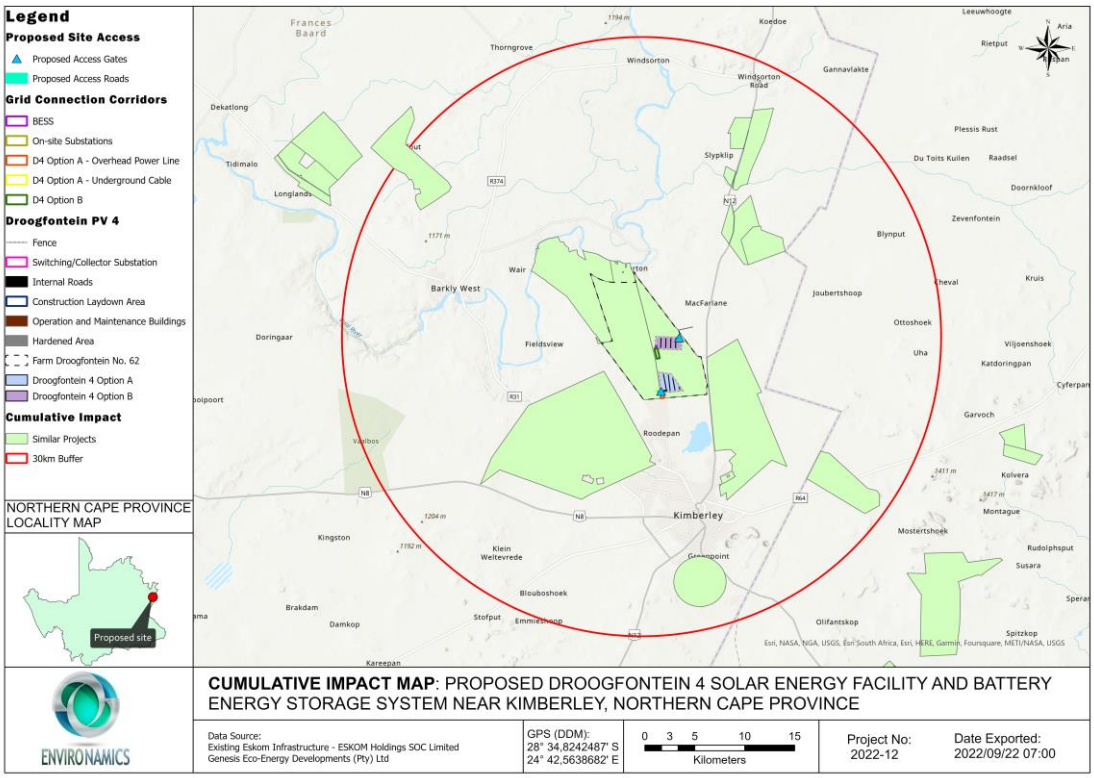


Figure 7.1: Geographic area of evaluation with utility-scale renewable energy generation sites and power lines

The geographic spread of PV solar projects, administrative boundaries and any environmental features (the nature of the landscape) were considered when determining the geographic area of investigation. It was argued that a radius of 30km would generally confine the potential for cumulative effects within this particular environmental landscape. The geographic area includes projects located within the Northern Cape Province. A larger geographic area may be used to analyse cumulative impacts based on the specific temporal or spatial impacts of a resource. For example, the socioeconomic cumulative analysis may include a larger area, as the construction workforce may draw from a much wider area. The geographic area of analysis is specified in the discussion of the cumulative impacts for that resource where it differs from the general area of evaluation described above.

7.3 TEMPORAL BOUNDARY OF EVALUATION

A temporal boundary is the timeframe during which the cumulative effects are reasonably expected to occur. The temporal parameters for these cumulative effects analysis is the anticipated lifespan of the Proposed Project, beginning in 2024 and extending out at least 20 years, which is the minimum expected project life of the proposed project. Where

appropriate, particular focus is on near-term cumulative impacts of overlapping construction schedules for proposed projects in the area of evaluation.

7.4 OTHER PROJECTS IN THE AREA

The following section provides details on existing, and project being proposed in the geographical area of evaluation.

7.4.1 Other projects in the area (existing and proposed)

According to the DFFE's database seventeen (17) PV solar plant applications (of which six (6) applications have lapsed/been withdrawn) have been submitted to the Department within the geographic area of investigation, – refer to Table 7.1. Furthermore, two of the seventeen have been developed and are located on the affected property of the Droogfontein 4 Solar and Battery Storage Energy Facility, as well as the property directly adjacent to the east. It however should be noted that there is uncertainty with regards to the accuracy and validity of the information obtained from the Departments database.

Table 7.1: A summary of related facilities, that may have a cumulative impact, in a 30 km radius of the study area

Site name	Distance from study area	Proposed generating capacity	DEFF reference	EIA process	Project status
Droogfontein 1	<1km	150MW	12/12/20/2024/1/1	Scoping and EIA	Constructed and operational
Droogfontein 2	<1km	150MW	14/12/16/3/3/1/2369	Scoping and EIA	Constructed and operational
Kabi Kimberly PV	~1km	150MW	12/12/20/2124	Basic Assessment	Approved
De Beers Kenilwood	~8km	150MW	12/12/20/2138	Basic Assessment	Approved
Kimberly Airport	~18km	100MW	12/12/20/2148	Basic Assessment	Approved
Platfontein	~12km	75 MW	12/12/20/225/1	Scoping and EIA	Approved
Kenilworth	~2km	100 MW	12/12/20/2440	Scoping and EIA	Withdrawn/Lapsed
Inyanga PV Facility	~20km	75 MW	12/12/20/2581	Scoping and EIA	Withdrawn/Lapsed

Morgenzon PV 1	~17km	75 MW	12/12/20/2581	Basic Assessment	In Process
PV Plant 198	~15km	19 MW	14/12/16/3/3/1/423	Basic Assessment	In Process
Zoutpan PV	~17km	75 MW	14/12/16/3/3/1/505	Basic Assessment	Approved
Kimberly PV Phase 1	~15km	0 MW	14/12/16/3/3/2/264	Scoping and EIA	Withdrawn/Lapsed
Kimberly PV Phase 2	~15km	0 MW	14/12/16/3/3/2/265	Scoping and EIA	Withdrawn/Lapsed
Kimberly PV Phase 3	~15km	0 MW	14/12/16/3/3/1/266	Scoping and EIA	Withdrawn/Lapsed
Hanskopfontein	~17km	75 MW	14/12/16/3/3/2/307	Scoping and EIA	Approved
Tiger Solar Facility	~18km	25 MW	14/12/16/3/3/2/402	Scoping and EIA	In Process
Table Farm PV	~30km	0 MW	14/12/16/3/3/2/527	Scoping and EIA	Withdrawn/Lapsed

Further to the above Environamics is also undertaking the Basic Assessment Process for the proposed Droogfontein 5 Solar and Battery Storage Energy Facility on the adjacent property to the east known as Portion 1 of the Farm Droogfontein No. 62.

It is unclear whether other projects not related to renewable energy is or has been constructed in this area, and whether other projects are proposed. In general, development activity in the area is focused on agriculture and mining. It is quite possible that future solar farm development may take place within the general area as it is located within a Renewable Energy Development Zone (REDZ).

The next section of this report will aim to evaluate the potential for solar projects for this area in the foreseeable future.

7.5 SPECIALIST INFORMATION ON CUMULATIVE EFFECTS

In line with the Terms of Reference (ToR) provided, specialists were asked to, where possible, take into consideration the cumulative effects associated with the proposed development and other projects which are either developed or in the process of being developed in the local area – refer to Figure 7.2 for a process flow. The following sections present their findings.

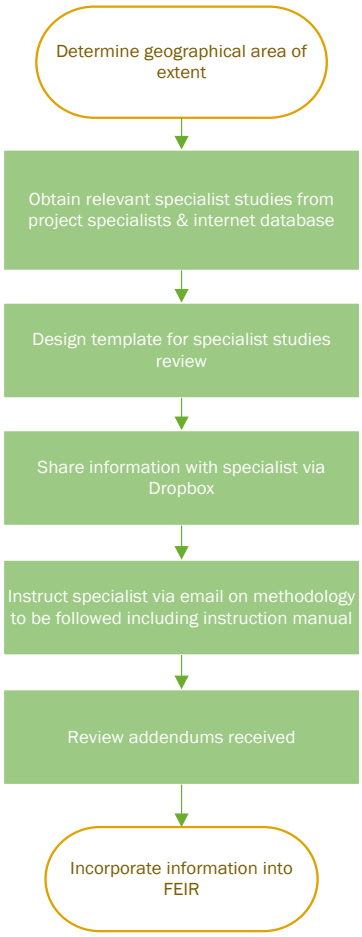


Figure 7.2: Process flow diagram for determining cumulative effects

It must be noted that some of the specialists have not identified cumulative impacts to be associated with the proposed development based on the findings of the impact assessment of the project considered in isolation. This includes the Heritage Impact Assessment due to the lack of heritage resources located on the site, the Palaeontological Impact Assessment due to the lack of potential fossils located within the site, the Agricultural Compliance Statement due to this report only being in line with the requirements of a compliance statement for the verification of the site sensitivity which is medium and low and the Wetland Risk and Impact Assessment due to the absence of wetland features within the development area alternatives and the avoidance of direct impacts to these features based on the placement of the development within the site. Therefore, due to the lack of impact identified for the development in isolation for the beforementioned fields of studies no cumulative impacts were considered by the respective specialists to be relevant to the project.

7.5.1 Terrestrial Ecology

The impacts of projects are often assessed by comparing the post-project situation to a pre-existing baseline. Where projects can be considered in isolation this provides a good method of assessing a project's impact. However, in areas where baselines have already been affected, or where future development will continue to add to the impacts pre-existing in an area or region, it is appropriate to consider the cumulative effects of development or disturbance activities. This is similar to the concept of shifting baselines, which describes how the environmental baseline at a specific point in time may actually represent a significant change from the original state of the system. This section describes the potential cumulative impacts of the project on local fauna and flora specifically.

Cumulative impacts are assessed within the context of the extent of the proposed site, other similar developments and activities in the area (existing and in-process), and general habitat loss and transformation resulting from any other activities in the area. Localised cumulative impacts include those from operations that are close enough (within 30 km) to potentially cause additive effects on the local environment or any sensitive receptors (relevant operations include nearby large road networks, other solar PV facilities, and power infrastructure). Relevant impacts include the overall reduction of foraging and habitat where reproduction takes place, dust deposition, noise and vibration, disruption of functional corridors of habitat important for movement and migration, disruption of waterways, groundwater drawdown, increase risk of collisions; and groundwater and surface water quality depletion.

Long-term cumulative impacts associated with the site development activities can lead to the loss of endemic and threatened species, including natural habitat and vegetation types, and these impacts can even lead to the degradation of conserved areas such as the adjacent game parks and reserves. In order to spatially quantify the cumulative effects of the proposed development, the project in isolation is compared with the overall effects of surrounding development (including total transformation and transformation as a result of new and proposed developments of a similar type, i.e., solar).

The total area within the 30 km buffer around the project area amounts to 299232.30 ha, but when considering the transformation (36869.42 ha) that has taken place within this radius, 262362.88 of intact habitat remains according to the 2018 National Biodiversity Assessment. Therefore, the area within 30 km of the project has experienced approximately 12.32 % loss in natural habitat. Considering this context, the project footprint and similar project exists in the 30 km region measuring a maximum of 186357.21 ha, which includes the project area (as per the latest South African Renewable Energy EIA Application Database). This means that the total amount of remaining habitat lost as a result of solar projects in the region amounts to 13.21% (the sum of all related developments as a percentage of the total remaining habitat). Cumulatively the total amount of habitat loss is calculated at 23.91% (the sum of all related developments as a percentage of the total habitat).

Approximately 12.32% of the habitat has already been lost, and as discussed above the proposed solar developments will result in a cumulative loss of approximately 13.21 % from only similar developments (Solar, approved and in process) in the area, as such the cumulative impact from the proposed development is rated as "high", with overall medium significance. This means that the careful spatial management and planning of the entire region must be a

priority, and existing large infrastructure projects must be carefully monitored over the long term.

7.5.2 Avifaunal Assessment

Cumulative impacts are assessed within the context of the extent of the proposed site, other developments and activities in the area (existing and proposed) and general habitat loss and disturbance resulting from any other anthropogenic activities in the area. The impacts of projects are often assessed by comparing the post-project situation to a pre-existing baseline. Where projects can be considered in isolation this provides a good method of assessing a project's impact. However, in areas where baselines have already been affected, or where future development will continue to add to the impacts in an area or region, it is appropriate to consider the cumulative effects of development or disturbance activities. This is similar to the concept of shifting baselines, which describes how the environmental baseline at a specific point in time may actually represent a significant change from the original state of the system. This section describes the potential cumulative impacts of the project on the local and regional avifauna community.

Localised cumulative impacts include those from operations that are close enough to potentially cause additive effects on the local environment or any sensitive receivers (such as nearby large road networks, other solar PV facilities, and power infrastructure). Relevant activities and impacts include dust deposition, noise and vibration, loss of corridors or habitat, disruption of waterways, groundwater drawdown, groundwater and surface water depletion, and transport activities. Long-term cumulative impacts associated with the site development activities can lead to the loss of endemic and threatened species, including natural habitat and vegetation types, and these impacts can even lead to the degradation of conserved areas such as the adjacent game parks and reserves.

A total area of 30 km surrounding the site were used to assess the total habitat loss in the area and subsequently the cumulative impact. To determine the intact remnant habitat the NBA (2018) remnant spatial data was utilised. The future renewable energy projects were also considered by utilising the REEA Q1 (2022) spatial dataset. In order to remove any duplication, only the areas that overlap with the remanence areas were considered. The total cumulative loss was found to be 23.91%.

The proposed Droogfontein 4 Solar and Battery Storage Energy Facility in isolation has a Negative Low impact significance. In consideration of the aforementioned information, the cumulative impact was determined to be of a Negative Medium significance

7.5.3 Social Impact Assessment

The potential for cumulative impacts to occur as a result of the proposed project and other projects in the area is likely. Potential cumulative impacts identified for the project include positive impacts on the economy, business development, and employment, as well as negative impacts such as an influx of jobseekers and change in the area's sense of place.

The proposed development and the establishment of other solar power projects within the area has the potential to result in significant positive cumulative impacts, specifically with regards to the creation of a number of socio-economic opportunities for the region, which in

turn, can result in positive social benefits. The positive cumulative impacts include creation of employment, skills development and training opportunities, and downstream business opportunities. The cumulative benefits to the local, regional, and national economy through employment and procurement of services are more considerable than that of Droogfontein 4 alone.

While the development of a single solar energy facility may not result in a major influx of people into an area, the development of several projects may have a cumulative impact on the in-migration and movement of people. In addition, the fact that the project is proposed within an area characterised by good levels of solar irradiation suitable for the development of commercial solar energy facilities implies that the surrounding area is likely to be subject to considerable future applications for solar energy facilities. Levels of unemployment, and the low level of earning potential may attract individuals to the area in search of better employment opportunities and higher standards of living.

It is exceedingly difficult to control an influx of people into an area, especially in a country where unemployment rates are high. It is therefore important that the project proponent implement and maintain strict adherence with a local employment policy in order to reduce the potential of such an impact occurring.

7.5.4 Visual Impact Assessment

The potential for cumulative impacts to occur as a result of the proposed project and other projects is likely. On the other hand, the location of the solar energy facilities within the study area will contribute to the consolidation of solar energy structures to this locality and avoid a potentially scattered proliferation of solar energy infrastructure throughout the region.

The anticipated cumulative visual impacts are expected to include the change in sense of place, as well as the precedent being set for solar development in the area where currently there is only a precedent for agricultural and mining related activities, and some limited existing solar development. Further construction and operation of the development in the area is likely to have a negative impact.

7.6 IMPACT ASSESSMENT

Following the definitions of the term, the “residual effects on the environment”, i.e. effects after mitigation measures have been put in place, combined with the environmental effects of past, present and future projects and activities will be considered in this assessment. Also, a “combination of different individual environmental effects of the project acting on the same environmental component” can result in cumulative effects.

7.6.1 Potential Cumulative Effects

A summary of the cumulative effects discussed are summarized in Table 7.2. There have been specific VECs identified with reference to the Solar Project (Table 6.2), which relates to the biophysical and socio-economic environments. Table 7.2 indicates the potential cumulative effects VECs and the rationale for inclusion/exclusion.

Table 7.2: Potential Cumulative Effects for the proposed project

	Valued Ecosystem Components (VECs)	Rationale for Inclusion / Exclusion	Level of Cumulative Effect
Construction Phase			
Terrestrial Ecology Impact Assessment	Loss of habitat, and disruption of surrounding ecological corridors.	Loss of habitat and disruption is identified as the main cumulative impact from a terrestrial ecology perspective. The overall significance will be negative medium. The impact will alter the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	- Medium
Avifauna Impact Assessment	Loss of habitat, and disruption of surrounding ecological corridors	Loss of habitat and disruption is identified as the main cumulative impact from an avifaunal perspective. The significance will be negative medium. The impact will alter the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	- Medium
Social Impact Assessment	Impacts of employment opportunities, business opportunities and skills development	The proposed project could assist the local economy in creating entrepreneurial growth and opportunities, especially if local business is involved in the provision of general material, goods and services during the construction and operational phases. This positive impact is likely to be compounded by the cumulative impact associated with the development of several other solar facilities within the surrounding area, and because of the project's location within an area which is characterised by high levels of solar irradiation, and which is therefore well suited to the development of commercial solar energy facilities. When considering the proposed project, it is also important to consider the cumulative social impacts that may arise with other proposed solar energy facilities in the area.	+ Medium
	Impact with large-scale in-migration of people	While the development of a single solar energy facility may not result in a major influx of people into an area, the development of several projects may	- Medium

		have a cumulative impact on the in-migration and movement of people. In addition, the fact that the project is proposed within an area characterised by good levels of solar irradiation suitable for the development of commercial solar energy facilities implies that the surrounding area is likely to be subject to considerable future applications for solar energy facilities. Levels of unemployment, and the low level of earning potential may attract individuals to the area in search of better employment opportunities and higher standards of living.	
Visual Impact Assessment	Visual impact on the landscape	The potential for cumulative impacts to occur as a result of the proposed project and other projects is likely. On the other hand, the location of the solar energy facilities within the study area will contribute to the consolidation of solar energy structures to this locality and avoid a potentially scattered proliferation of solar energy infrastructure throughout the region.	- Medium
Other	Generation of waste	An additional demand on municipal services could result in significant cumulative impacts with regards to the availability of landfill space.	- Medium

7.7 CONCLUSION

This chapter of the final Basic Assessment Report (BAR) addressed the cumulative environmental effects of the construction, operation and decommissioning project phases. The information to date has shown that no significant adverse residual impacts are likely. However, cumulative impacts could arise as other similar projects are constructed in the area.

The potential most significant cumulative impacts relate to:

- Loss of habitat, and disruption of surrounding ecological corridors (-Medium)
- Impacts of employment opportunities, business opportunities and skills development (+Medium)
- Impact with large-scale in-migration of people (-Medium)
- Visual impact on the landscape (-Medium)
- Generation of Waste (-Medium)

The cumulative impact for the proposed development is expected to be medium with no high, unacceptable impacts related to the project expected. Considering the extent of the project and information presented in section 7 of this report, it can be concluded that the cumulative impacts will not result in large scale changes and impacts on the environment. This is also based on the fact that there are already two other existing solar energy developments in close

proximity to the site which means that an opportunity to consolidate impacts in the landscape will be achieved rather than to distribute the impacts throughout the area. With the cumulative impacts being of a medium significance and the location of the development on a property already affected by solar development the desirability of the site for the placement of the project is strengthened. In terms of the desirability of the development of renewable energy, it may be preferable to incur a higher cumulative loss in such a region as this one (which has already been degraded by mining, agricultural activities and solar development), than to lose land with a higher environmental value elsewhere in the country.

Photovoltaic solar energy technology is a clean technology which contributes toward a better-quality environment. The proposed project will contribute to local economic growth by supporting industry development in line with provincial and regional goals and ensuring advanced skills are drawn to the Northern Cape Province. No cumulative impacts with a high residual risk have been identified. Also, the acceptable cumulative impacts expected will not result in a whole-scale change of the environment and therefore are considered to be acceptable, and considering the associated positive impacts associated with the development of solar energy facilities the proposed facility is considered desirable overall. It is therefore recommended that the proposed development must proceed.

8 ENVIRONMENTAL IMPACT STATEMENT

This section aims to address the following requirements of the regulations:

Appendix 3. (3) An BAR (...) must include-

(l) an environmental impact statement which contains-

(i) a summary of the key findings of the environmental impact assessment:

(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and

(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;

(m) based on the assessment, and where applicable, impact management measures from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr;

(n) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;

(o) a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;

(q) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;

8.1 SUMMARY OF KEY FINDINGS AND ASSESSMENT RESULTS

Based on the contents of the report the following key environmental issues were identified, which were addressed in this BA report. The ratings provided gives an indication of the impact significance with the implementation of the recommended mitigation measures. Only the most significant impacts are listed below -the rest of the impacts identified and assessed will be of a low significance with the implementation of the recommended mitigation measures. Refer to Section 6 for a full list.

- Impacts during construction phase:
  - Habitat destruction within the project footprint (- Medium)
  - Direct and indirect employment opportunities and skills development (+ Medium)
  - Economic multiplier effect (+ Medium)
- Impacts during the operational phase:
  - Collision with infrastructure by avifauna species (- Medium)

- Potential visual impacts on sensitive visual receptors located within a 1km radius from the power line (-Medium)
- Direct and Indirect employment opportunities and skills development (+ Medium)
- Development of non-polluting, renewable energy infrastructure (+ Medium)
- Contribution to Local Economic Development (LED) and social upliftment (+ High)

- Impacts during the decommissioning phase: all impacts identified will be of a low significance with the implementation of the recommended mitigation measures.
- Cumulative biophysical impacts resulting from similar development in close proximity to the proposed activity (Negative Medium).

8.2 SENSITIVITY ANALYSIS SUMMARY AND SITE-SPECIFIC CONDITIONS

The sensitivity analysis and impact assessment has guided the developer in optimising the final layout of the Droogfontein 4 Solar and Battery Storage Energy Facility through identifying specific environmental areas and features present within the site which needs to be avoided through the careful placement of infrastructure as part of the development footprint.

Overall, the two development alternatives include areas of very high, high and medium sensitivity areas. Option B has been identified as the preferred development area for the placement of the project development footprint based on the fact that the area mainly consists of medium sensitivity with only a small portion along the southern boundary being of a very high sensitivity. The extent of the development area is large enough to accommodate an optimized layout which avoids this area of very high sensitivity and thereby results in the most appropriate placement for the project. The optimized layout will still be able to meet the capacity requirements of the facility. Refer to Appendix I for the optimized layout and Figures J for the optimized layout and sensitivity map.

From the above assessment it can be concluded that the development of the solar and battery energy storage facility can be supported from an environmental perspective when developed on development area Option B should all the recommended mitigation measures be implemented, and the sensitive environments be avoided. No fatal flaws were identified by the specialists.

Further mitigation measures for the development, as recommended by the independent specialists, have been included in the EMPr(s) for the project as per Appendix E1-E4.

8.3 TECHNICAL DETAILS OF THE PROPOSED INFRASTRUCTURE TO BE AUTHORISED

- PV Panel Array - To produce up to 200MW direct current and up to 180MW alternating current, the proposed SEF will require numerous linked cells placed behind a protective glass sheet to form a panel. Multiple panels will be required to form the solar PV arrays which will comprise the PV facility. The PV panels will be tilted in order to capture the most sun or using axis tracker structures to follow the sun to increase the Yield.

- Wiring to Inverters - Sections of the PV array will be wired to inverters. The inverter is a pulse width mode inverter that converts direct current (DC) electricity to alternating current (AC) electricity at grid frequency.

- Connection to the grid - Connecting the array to the electrical grid requires transformation of the voltage from 480V to 33kV to 132kV. The normal components and dimensions of a distribution rated electrical substation will be required. Output voltage from the inverter is approximately 480V and this is fed into step up transformers to 132kV. An onsite facility substation and switching stations will be required on the site to step the voltage up to 132kV, after which the power will be evacuated into the national grid via the proposed new collector substation and power line. The power line route will be assessed within a 300m wide corridor.

  As there are two alternative development areas proposed for the placement of the project development footprint, the developer has identified a suitable grid connection corridor for each of the development areas which connects the facility to an existing power line located near to the development area. All grid connection corridors have a width of 300m.

  Should development area Option A be developed the power line route will be approximately 600m in length and will connect the facility to the existing Boundary-Olien 1 275kV power line located directly to the south. The connection will be via a loop-in loop-out connection.

  Should development area Option B be developed the power line route will be approximately 1km in length and will connect the facility to the existing Elk-Weir 1 132kV power line located directly to the south. The connection will be via a loop-in loop-out connection.

  The respective grid connection solutions proposed for each of the alternative development areas are considered to be feasible from a technical and capacity perspective and provides an opportunity for limited linear disturbance within the landscape based on the limited power line infrastructure proposed to be developed.

- Electrical reticulation network – An internal electrical reticulation network will be required and will be lain ~2-4m underground as far as practically possible.

- Supporting Infrastructure – The following auxiliary buildings with basic services including water and electricity will be required:

  - Administration Office (~300m²);
  - Switch gear and relay room (~400m²);
  - Staff lockers and changing room (~200m²);
  - Security control (~60m²);
  - Operations & Maintenance (O&M) room; and
  - Warehouse.

- Battery Energy Storage System (BESS) – The battery energy storage system will make use of Lithium-ion as a preferred technology and will have a capacity of up to 40MW. The extent of the system will be 20m long, 23m high, 2.5m wide. The containers may be single stacked only to reduce the footprint. There may be up to a maximum of 40 containers of BESS. The containers will include cells, HVAC, fire, safety and control systems and will comprise of Lithium-Ion technology providing a maximum capacity of 50MW in total.

- Roads – Access will be obtained via the tarred Riverton Road and various gravel farm roads within the area and affected property. An internal site road network will also be required to provide access to the solar field and associated infrastructure. Roads are expected to be between 8m and 12m wide.

- Fencing - For health, safety and security reasons, the facility will be required to be fenced off from the surrounding farm. Fencing with a maximum height of 3 meters will be used.

8.4 RECOMMENDATION OF EAP

The final recommendation by the EAP considered firstly if the legal requirements for the EIA process had been met and secondly the validity and reliability of the substance of the information contained in the BA report. In terms of the legal requirements it is concluded that:

- All key consultees have been consulted as required by Chapter 6 of the EIA Regulations (as amended in 2017)
- The Basic Assessment process has been conducted as required by the EIA Regulations (as amended in 2017), Regulations 19 and Appendix 1.
- The EMPr was compiled in conjunction with the Generic EMPr for overhead electricity transmission and distribution infrastructure as per Government Notice 435, which was published in Government Gazette 42323 on 22 March 2019.
- The EMPr was compiled in conjunction with the Generic EMPr for the development of the associated substation infrastructure for transmission and distribution of electricity as per Government Notice 435, which was published in Government Gazette 42323 on 22 March 2019.
- The EMPr was compiled for the Droogfontein 4 Solar and Battery Storage Energy Facility as per Appendix 4 of the EIA Regulations (GN.R. 326), published in Government Gazette 40772 on 07 April 2017.
- The proposed mitigation measures will be sufficient to mitigate the identified impacts to an acceptable level.
- No additional specialist studies are proposed on any environmental issue raised and therefore, no terms of reference are provided for such studies.
- Development area alternative Option B, including the associated optimized layout, is preferred from an environmental perspective and is therefore recommended for approval as part of the EA.

- The the period for which the Environmental Authorisation is required is ten (10) years.

In terms of the contents and substance of the BA report the EAP is confident that all key environmental issues were identified. These key issues were adequately assessed during the BA process to provide the competent authority with sufficient information to allow them to make an informed decision.

The final recommendation of the EAP is that:

It is the opinion of the independent EAP that the proposed development will have a net positive impact for the area and will subsequently ensure the optimal utilisation of resources. All negative environmental impacts can further be effectively mitigated through the proposed mitigation measures. Based on the contents of the report it is proposed that an environmental authorisation be issued, which states (amongst other general conditions) that the Droogfontein 4 Solar and Battery Storage Energy Facility on the Remaining Extent of the Farm Droogfontein No. 62., Northern Cape Province be approved subject to the following conditions:

- Implementation of the proposed mitigation measures set out in the EMPr(s).
- Implementation of the proposed mitigation measures set out in the specialist studies.
- The proposed facility must comply with all relevant national environmental laws and regulations.
- All actions and tasks allocated in the EMPr(s) should not be neglected and a copy of the EMPr(s) should be made available onsite at all times.
- Should archaeological/ heritage / palaeontological sites or graves be exposed during construction work, it must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.
- Undertake an ecological walkthrough of the development footprint to identify any protected species that may be impacted and may require permits for the removal of the individuals.
- A search and rescue plan needs to be implemented for the proposed project for the floral and faunal component, especially for Black Footed Cat which was indicated by the landowner as relevant to the property.
- The optimised layout proposed for the Option B development area must be implemented.

We trust that the department find the report in order and eagerly await your comments in this regard.

Lisa de Lange

Environamics - Environmental Consultants

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