SUN GARDEN PV FACILITY AND ASSOCIATED INFRASTRUCTURE EASTERN CAPE PROVINCE

Basic Assessment Report
November 2021

savannah environmental

t +27 (0)11 656 3237 f +27 (0)86 684 0547
e info@savannahsa.com w www.savannahsa.com

Prepared for:

Sun Garden (Pty) Ltd
Cyprus Mansions,
1 Beach Road,
Humewood,
Port Elizabeth,
6001

Prepared by:

savannah environmental

t +27 (0)11 656 3237 f +27 (0)86 684 0547 e info@savannahsa.com w www.savannahsa.com
First Floor, Block 2, 5 Woodlands Drive Office Park, Cnr Woodlands Drive & Western Service Road, Woodmead, 2191

PROJECT DETAILS

DEFF Reference	:	To be Advised
Title	:	Environmental Impact Assessment Process: Basic Assessment Report for the Sun Garden PV Facility and Associated Infrastructure, Eastern Cape Province
Authors	:	Savannah Environmental (Pty) Ltd Jo-Anne Thomas
Client	:	Sun Garden (Pty) Ltd
Report Status	:	Basic Assessment Report for public review (from 12 November to 13 December 2021)
Date	:	November 2021

When used as a reference this report should be cited as: Savannah Environmental (2021) Basic Assessment Report for the Sun Garden PV Facility and associated infrastructure, Eastern Cape Province.

PURPOSE OF THE EIA REPORT AND INVITATION TO COMMENT

Sun Garden (Pty) Ltd has appointed Savannah Environmental as the independent environmental consultant to undertake the Basic Assessment (BA) for the Sun Garden PV Facility, Eastern Cape. The BA process is being undertaken in accordance with the requirements of the 2014 EIA Regulations promulgated in terms of the National Environmental Management Act (NEMA; Act No. 107 of 1998). Due to the geographical location of the project site within the Cookhouse Renewable Energy Development Zone (REDZ), one of the eleven designated REDZ areas, the Sun Garden PV Facility is now subject to a Basic Assessment (BA) and not a full EIA process, as well as a shortened timeframe of 57 days for the processing of an Application for Environmental Authorisation. The procedure to be followed in applying for environmental authorisation for a large-scale renewable energy project within a REDZ was formally gazetted on 16 February 2018 (in Government Notice (GN) GN114). The undertaking of a basic assessment process for the project is in-line with the requirements stated in GNR 114 of 16 February 2018.

This Basic Assessment (BA) report represents the findings of the BA process and contains the following chapters:

» **Chapter 1** provides background to the Sun Garden PV Facility and the basic assessment process.
» **Chapter 2** provides a description of the solar facility and the infrastructure associated with the facility.
» **Chapter 3** provides the site selection information and identified project alternatives.
» **Chapter 4** describes solar energy as a power generation option and provides insight to technologies for solar energy.
» **Chapter 5** outlines the strategic regulatory and legal context for energy planning in South Africa and specifically for the proposed facility.
» **Chapter 6** describes the need and desirability of the Sun Garden PV Facility within the project site.
» **Chapter 7** outlines the approach to undertaking the basic assessment process.
» **Chapter 8** describes the existing biophysical and socio-economic environment within and surrounding the project site.
» **Chapter 9** provides an assessment of the potential issues and impacts associated with the solar facility and associated infrastructure and presents recommendations for the mitigation of significant impacts.
» **Chapter 10** provides an assessment of the potential for cumulative impacts.
» **Chapter 11** presents the conclusions and recommendations based on the findings of the BA Report.
» **Chapter 12** provides references used in the compilation of the BA Report.

The BA report is available for review from **12 November 2021 – 13 December 2021** on the Savannah Environmental website (https://www.savannahsa.com/public-documents/energy-generation/)

Please submit your comments by **13 December 2021** to:
Nicolene Venter of **Savannah Environmental** PO Box 148, Sunninghill, 2157 Tel: 011-656-3237 Mobile: 060 978 8396 Fax: 086-684-0547 Email: publicprocess@savannahsa.com

Comments can be made as written submission via fax, post or email.

EXECUTIVE SUMMARY

Sun Garden (Pty) Ltd is proposing the development of a commercial solar PV facility and associated infrastructure on a site located approximately 36km south-east of Somerset East and 28km south-west of Cookhouse within the Blue Crane Route Local Municipality and the Sarah Baartman District Municipality in the Eastern Cape Province (**Figure 1.1**). The entire extent of the site falls within the Cookhouse Renewable Energy Development Zone (REDZ) and within the Eastern Corridor of the Strategic Transmission Corridors. The facility is known as the Sun Garden PV Facility.

1. Overview of the Project

A preferred project site with an extent of ~4037ha has been identified by Sun Garden (Pty) Ltd as a technically suitable area for the development of the Sun Garden PV Facility. The project site consists of four affected properties:

» Portion 9 of the farm Britzkraal No 253, Division of Somerset East
» Portion 8 (a Portion of Portion 7) of the farm Britzkraal No 253, Division of Somerset East
» Portion 7 of the farm Britzkraal No 253, Division of Somerset East
» Portion 1 of farm Bothas Hoop 358, Division of Somerset East

A development envelope for the placement of the solar facility infrastructure (i.e. development footprint) has been identified within the project site and assessed as part of the BA process. The development envelope is ~500ha in extent and the much smaller development footprint of ~350ha will be placed and sited within the development envelope. The development footprint will contain the following infrastructure to enable the solar facility to generate up to 400MW:

» Solar PV array comprising PV modules and mounting structures.
» Inverters and transformers.
» Cabling between the project components, lain underground where practical.
» A 132/33kV on-site collector substation to be connected to a proposed 400kV Main Transmission Substation (MTS) located to the north-east of the site via a new 132kV overhead power line (twin turn dual circuit line). The development of the proposed 400kV Main Transmission Substation will be assessed as part of the separate BA process in order to obtain Environmental Authorisation.
» Site offices and maintenance buildings, including workshop areas for maintenance and storage.
» Temporary laydown areas.
» Access roads to the site and between project components with a width of approximately 4,5m. The main access points will be 8m wide.
» Water supply pipelines from onsite boreholes.
» A temporary concrete batching plant.
» Staff accommodation (temporary).
» Operation and Maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitor's centre.

The new 132kV overhead power line to connect the PV facility to the proposed 400kV Main Transmission Substation will follow a route north-east of the project site to complete the connection. The power line will therefore cross properties located to the north-east of the project site. The majority of these properties form part of the project sites of the adjacent proposed wind farms which forms part of the cluster of renewable energy facilities proposed. The power line is proposed parallel to that proposed for the Redding Wind Energy Facility and the Solaris Fields PV Facility, and is being assessed within a 300m grid connection corridor which will provide for the avoidance of sensitive environment areas and features and allow for the micro-siting of the power line within the corridor.

2. Evaluation of the Project

A Basic Assessment was undertaken for the proposed project in accordance with the requirements of the EIA Regulations, 2014 (as amended) and GNR114 of February 2018.

No environmental fatal flaws or unacceptable impacts were identified in the detailed specialist studies conducted, provided that the recommended mitigation measures are implemented. These measures include, amongst others, the avoidance of sensitive features within the development footprint as specified by the specialists.

The potential environmental impacts associated with the Sun Garden PV Facility identified and assessed through the BA process include:

» Impacts on ecology, flora, and fauna.
» Impacts on aquatic ecology.
» Impacts on avifauna.
» Impacts on bats.
» Impacts on land use, soils, and agricultural potential.
» Impacts on heritage resources, including archaeology, palaeontology, and the cultural landscape.
» Visual impacts on the area imposed by the components of the facility.
» Positive and negative socio- economic impacts.
» Traffic impacts, including increased pressure on the existing road network.

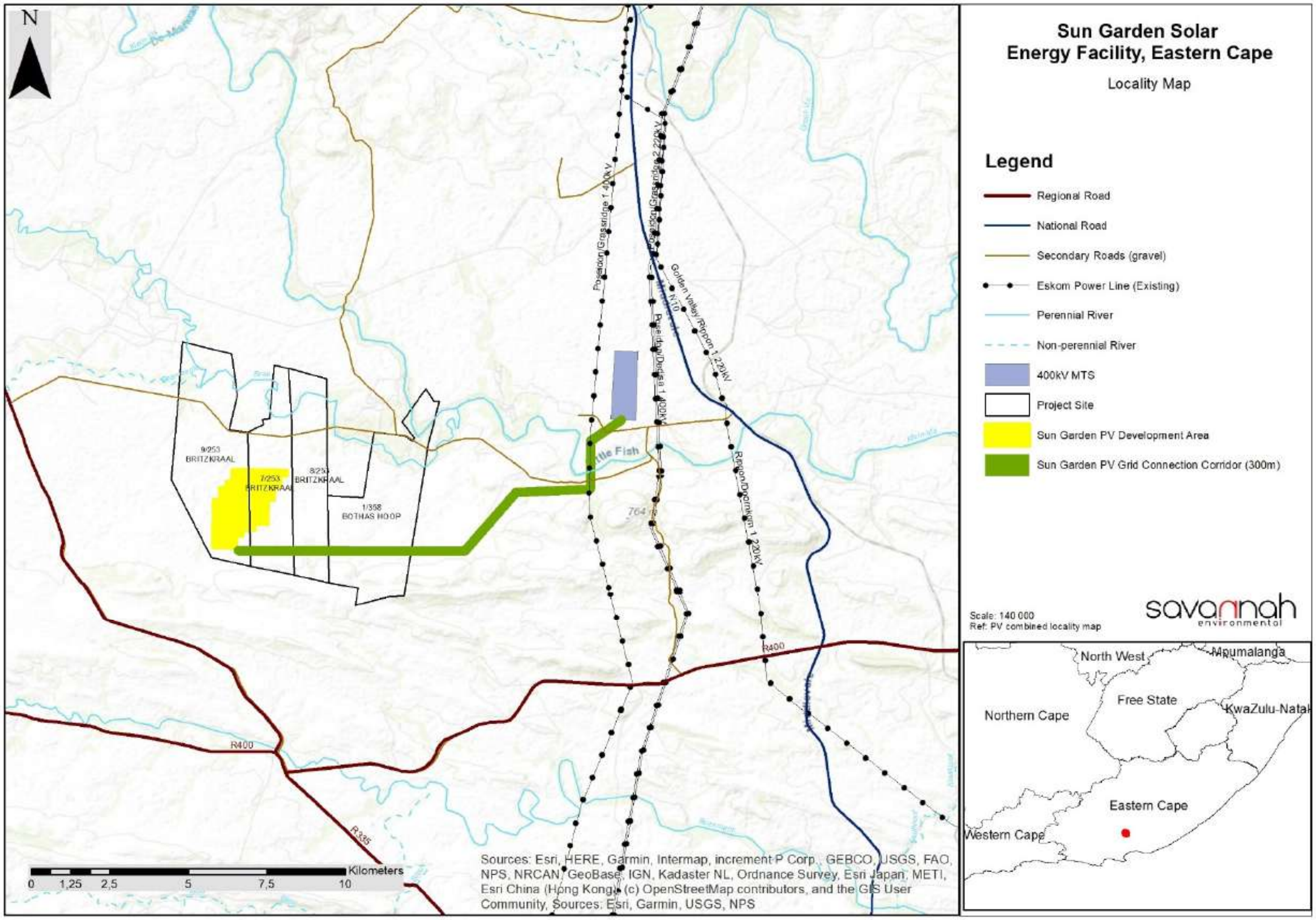

Figure 1: Site layout map

2.1. Impacts on Ecology

The Sun Garden PV Facility site falls largely within the Albany Broken Veld vegetation type and it is only the grid connection that traverses some Kowie Thicket and Southern Karoo Riviere vegetation types. The norther, lower slopes and plains of the site consist of low shrublands considered to be low sensitivity with few fauna or flora of concern likely to be present. The upper, southern slopes of the PV site are steeper or contain a higher proportion of woody species and are considered medium sensitivity. The drainage feature which occurs along the south-eastern boundary of the PV area would be vulnerable to impact and it is recommended that a freshwater specialist should demarcate the boundary of this feature in the field before construction to ensure that the PV area does not encroach into this area unnecessarily. Along the grid connection route to the MTS, there are some high sensitivity drainage features, but these can easily be spanned by the power line and are not likely to be significantly impacted by the power line. In terms of fauna, the PV area does not have any habitats present that would be of particularly high value and no specific impacts of high magnitude on fauna are expected. However, given the size of the facility (350ha) and the location within an ESA it is recommended that specific measures are put in place with regards to the design of the fence around the facility to facilitate the movement of smaller fauna in and out of the PV area.

There are no impacts associated with the Sun Garden PV Facility and associate infrastructure that cannot be mitigated to an acceptable level and as such, the assessed layout is considered acceptable. With the application of relatively simple mitigation and avoidance measures, the impact of the Sun Garden PV Facility on the local environment can be reduced to an acceptable magnitude. The contribution of the Sun Garden PV Facility to cumulative impact in the area would be low and is considered acceptable. Overall, there are no specific long-term impacts likely to be associated with the development of the Sun Garden PV Facility that cannot be reduced to a low significance. As such, there are no fatal flaws associated with the development and no terrestrial ecological considerations that should prevent it from proceeding.

2.2. Impacts on Aquatic Ecology

The proposed layout for the facility would not have a direct impact on the following:

» With the exception of the BoP area and pipeline any Very High sensitivity areas identified by the DFFE Screening Tool have been avoided by the development footprint; and
» Mainstem riparian systems (outside of the development footprint) and Pans that do contain functioning aquatic environments that received a High sensitivity rating will also be avoided .

Therefore, based on the results of the Aquatic Impact Assessment, the significance of the remaining impacts assessed for the aquatic systems after mitigation would be Low. This includes the internal roads proposed that would need to cross some of these systems. Further the proposed grid connection can span these areas thus no new impacts are expected. Access to the gird connection should not crosse any systems, resulting in additional new tracks to reach the pylons/towers.

Thus, based on the findings of this study no objection to the authorisation of any of the proposed activities is made at this point based on the current layout as provided by the developer.

As the proposed activities have the potential to create erosion, recommendations regarding the management of erosion must be implemented. It is further recommended that a comprehensive rehabilitation plan be implemented from the project onset, for all construction work to be located within watercourse areas (including buffers) to ensure a net benefit to the aquatic environment. This should from part of the suggested walk down as part of the final EMPr preparation during the pre-construction phase.

Furthermore, a Water Use License (or General Authorisation) for water uses identified in Section 21c and 21i of the National Water Act (Act 36 of 1998) would be required where activities are undertaken within 500m of watercourses and pans.

2.3. Impacts on Avifauna

The impacts of solar PV facilities on avifauna are not well understood, particularly in the South African context. Nevertheless the low and very low classification of the site ecological importance for avifaunal SCCs as assessed reduces the overall risk of significant impacts to the local avifaunal community by the proposed development, despite any gaps that may exist in our current understanding of potential impacts.

As the Species Assessment Guideline states that in areas identified to be of low SEI development activities of medium to high impact are acceptable following the implementation of appropriate minimisation and restoration mitigation measures.

Based on the impact assessment conducted for the Sun Garden PV Facility (including cumulative impacts) it is the avifaunal specialist's informed opinion that the proposed development will not have a significant negative impact on the viability or persistence of SCC populations in the area following the implementation of mitigation measures. The proposed Sun Garden PV Facility is therefore acceptable and can be approved from an avifaunal perspective.

In addition to the mitigation measures outlined for each potential impact, the requirement for post-construction/operational phase monitoring is to be included in the Environmental Management Programme (EMPr). This is necessary to determine the actual impacts of the proposed development, determine if additional mitigation is required and learn about impacts and improve future assessments.

Construction Phase monitoring is not considered to be necessary for this development as despite this period potentially being the most intense period in terms of disturbance and displacement of avifauna, no focal sites of particular concern (e.g. nearby SCC nests) have been identified in proximity to the proposed development site.

Post-construction monitoring should be started as soon as possible once the facility becomes operational. As the effects of the proposed development may change over time both activity and fatality monitoring should be conducted during the first two years of operation and then repeated every fifth year. Fatality monitoring is to be conducted both systematically and on a continuous ad-hoc basis. Systematic fatality monitoring must be conducted at least once per season and include an estimation of searcher efficiency and carcass persistence rates (determined experimentally), carcass searches, and appropriate data analyses to determine estimated mortality rates. This process is to be conducted under the direction of an avifaunal specialist. The duration and scope of post-construction monitoring should be informed by the outcomes of the previous year's monitoring, and should be reviewed annually, however a minimum of 20 % of the solar hardware is to be methodically searched for fatalities, with a search interval informed by carcass persistence trials. Systematic fatality surveys are to include the full length of the proposed overhead powerline. Ad-hoc fatality monitoring is to be conducted continuously throughout the lifespan of the project and all carcasses and feather spots found during routine operational activity by on-site personnel are to be recorded and made available for an avifaunal specialist for inclusion into subsequent reports.

The activity monitoring methods and data collection should replicate those employed during pre-construction monitoring as closely as possible in terms of effort and timing and should follow any additional recommendations of the latest best-practice guidelines available at the time.

2.4. Impacts on Bats

As per the findings presented in the specialist impact assessment (Appendix F), the specialist confirms that the classification of the project area (as low sensitivity to bats), as presented in the DFEE Screening Tool Report, is accurate and no further adjustments to this classification is necessary. It is believed, based on observations and available information, that the small extent of the project area and type of development under consideration is not expected to cause an irreplaceable loss to biodiversity, in terms of the bat community on site. No sensitive areas for avoidance have been identified on site, although several potentially sensitive features have been identified, as depicted in Figure 2. A few mitigation measures have subsequently been recommended to be followed – particularly pertaining to that of known and potential bat roosting structures/habitats, as described in Section 7. Should the above measures be adhered to, it is the opinion of the specialists that the proposed development can proceed and can be authorised from a bat perspective.

2.5. Impacts on Land Use, Soil and Agricultural Potential

It is the specialist's opinion that the baseline findings do not concur with the land capabilities identified by means of the DAFF (2017) desktop findings in regard to land capability sensitivities. Even though the land capability, in theory, is similar to that portrayed by (DEA, 2021), the climatic conditions have been deemed to be extremely poor. These poor climatic conditions have resulted in a land potential level characterised by "Low" sensitivity throughout the project area. No "High" land capability sensitivities were identified within proximity to any of the proposed activities. Considering the lack of sensitivity and the measures put in place in regard to stormwater management and erosion control, it is the specialist's opinion that all activities will have an acceptable impact on agricultural productivity. Furthermore, no measures in regard to moving components in their micro-setting were required to avoid or minimise fragmentation and disturbances of agricultural activities.

Various soil forms were identified within the Sun Garden project area, namely Swartland, Glenrosa, Mispah and Oakleaf. These soil forms were determined to be associated with three different land capabilities, namely LCIII, LCIV and LCVI. These land capability classes were then further refined to land potential levels by comparing land capability of climatic capabilities of the project area. Two land potential levels were then calculated, namely L6 and L7.

These land potential levels were used to determine the sensitivities of soil resources. Together with sensitive agricultural fields determined by means of the DFFE screening tool, only "Low" sensitivities were determined with a scattered patches of "High" sensitivity crop fields. It is worth noting that no development is expected to have an impact on these areas. Considering the low sensitivities associated with land potential resources, it is the specialist's opinion that the proposed activities will have an acceptable impact on soil resources and that the proposed activities should proceed as have been planned.

2.6. Impacts on Heritage Resources (archaeology, palaeontology and cultural landscape)

Analysis of the various components of the HIA indicates a mitigated low negative impact on heritage resources and are expanded on below.

» Historical structures: No historical structures of heritage significance were identified.
» Burial Grounds and graves: No burial grounds or graves were identified.
» Palaeontology: An assessment of the possible impacts of the proposed project on palaeontological resources has shown that unmitigated impacts consist of a medium negative impact mostly confined to the construction phase of the project. By implementing the mitigation measures as listed in this report these impacts can be managed to a neutral.
» Cultural landscape: An assessment of the possible impacts of the proposed project on the overall CL has shown that unmitigated impacts consist of a high negative impact mostly confined to the construction and operation phase of the project. By implementing the mitigation measures as listed in this report these impacts can be managed to high negative.

The assessment of the possible impacts on the archaeological, historical and palaeontological resources has shown a Low impact from the Sun Garden PV Facility project after mitigation measures. It is further considered that the project can have a potential positive influence on such resources in the region when the proposed conservation initiative from the project considers such resources as part of a larger development strategy.

The assessment of the cultural landscape indicated that the project will have a significant Moderate to High impact on the cultural landscape. The general mitigation measures for renewable energy development in areas of cultural landscape significance as proposed by Jansen and Franklin, (2021) as well as Lavin (2021) will still result in a marginal reduction of impact.

It must further be considered that the addition of the infrastructure of the Sun Garden Solar PV facility will constitute an additional layer to the CL and must be considered as such within a gazetted REDZ area. Through the implementation of the economically feasible recommendations as set out in the cultural landscape assessment and contained in this report it will be possible to preserve older layers of the cultural landscape and in some cases even enhance them through consideration such as the use of older name places in the naming of infrastructure and enhancing local heritage through the incorporation of such structures in project conservation initiatives to name a few.

Analysis of the findings of the SEIA for this project further reveals that the economic benefit for the region and the overall energy needs such project addresses outweighs the need for conservation of cultural resources at all costs. The economic benefit for the region and the overall energy needs such a project address to outweigh the need for the exclusion of the Sun Garden Solar PV facility to conserve cultural resources at all costs. Especially where a project is situated within a gazetted REDZ area.

The overall impact of the Sun Garden Solar PV facility, on the heritage resources identified during this report, is considered as acceptable after the recommendations have been implemented and therefore, impacts can be mitigated to acceptable levels allowing for the development to be authorised.

2.7. Visual Impacts

The findings of the Visual Impact Assessment undertaken for the proposed 300MW PV facility is that the visual environment surrounding the site, especially within a 1 - 3km radius, may be visually impacted during the anticipated operational lifespan of the facility (i.e. a minimum of 20 years).

This impact is applicable to the individual Sun Garden PV Facility and to the potential cumulative visual impact of the facility in relation to the proposed Solaris Fields PV Facility (and the proposed WEFs), where the combined frequency of visual impact is expected be greater. The potential area of cumulative visual exposure is however still deemed to be within acceptable limits, considering the PV facilities' close proximity to each other.

The following is a summary of impacts remaining, assuming mitigation as recommended, is exercised:

» During construction, there may be a noticeable increase in heavy vehicles utilising the roads to the development site that may cause, at the very least, a visual nuisance to other road users and landowners in the area. Construction activities may potentially result in a moderate, temporary visual impact that may be mitigated to low.
» There are no homesteads within a 1km radius of the proposed PV facility. The PV facility is expected to have a moderate visual impact on observers traveling along the Beenleegte secondary road at a distance of just over 1km from the operational PV structures.
» The PV Facility is expected to have a low visual impact within the region (1 – 3km radius of the PV facility), both before and after the implementation of mitigation measures.
» The anticipated impact of lighting at the PV facility is likely to be of moderate significance, and may be mitigated to low.
» The potential visual impact related to solar glint and glare is expected to be of low significance.
» The anticipated visual impact resulting from the construction of on-site ancillary infrastructure is likely to be of low significance both before and after mitigation.
» The anticipated visual impact of the proposed PV facility on the regional visual quality, and by implication, on the sense of place, is difficult to quantify, but is generally expected to be of low significance. This is due to the relatively low viewer incidence within close proximity to the proposed development.
» The anticipated cumulative visual impact of two proposed PV facilities is expected to be of moderate significance, which is considered to be acceptable from a visual perspective. This is mainly due to the relatively low viewer incidence within close proximity to the proposed development sites.

The anticipated visual impacts listed above (i.e. post mitigation impacts) range from moderate to low significance. Anticipated visual impacts on sensitive visual receptors (if and where present) in close proximity to the proposed facility are not considered to be fatal flaws for the proposed PV facility.

Considering all factors, it is recommended that the development of the facility as proposed be supported; subject to the implementation of the recommended mitigation measures and management programme recommended within the visual impact assessment (Appendix J).

2.8. Socio-economic Impacts

Impacts are expected to occur with the development of the Sun Garden PV Facility during the construction, operation and decommissioning phases. Both positive and negative impacts are identified and assessed.

Positive impacts during construction includes:
» Temporary stimulation of the national and local economy
» Temporary increase employment in the national and local economies
» Contribution to skills development in the country and local economy
» Temporary increase in household earnings
» Temporary increase in government revenue

Negative impacts during construction includes:
» Negative changes to the sense of place
» Negative impact on the local tourism, game industry and associated industries during construction
» Temporary increase in social conflicts associated with the influx of people
» Impact on economic and social infrastructure
» Impact on property and land value in the immediately affected area during construction

Positive impacts during operation includes:
» Sustainable increase in production and GDP nationally and locally
» Creation of sustainable employment positions nationally and locally
» Skills development of permanently employed workers
» Improved standards of living for benefiting households
» Sustainable increase in national and local government revenue
» Local economic and social development benefits derived from the project's operations
» Sustainable rental revenue for farms where the solar facility is located
» Sustainable increase in electricity available for the local region and South Africa

Negative impacts during operation includes:
» Negative changes to the sense of place
» Negative impact on local tourism, game farming and associated industries

Net effect and trade off analysis

The review of the proposed Sun Garden Solar PV Facility is associated with both positive and negative socio-economic impacts. In order to assess whether the project is beneficial, the additions to the environment brought about by the project need to be evaluated. The additional benefits of the intervention are the difference between the reference case position (i.e., the no-go option) and the position if the intervention is implemented. It involves the evaluation of the net effect and trade-offs associated with the proposed intervention.

The assessment of the proposed facility, and its net effect from a socio-economic perspective, indicates that the project would generate greater socio-economic benefits during both the construction and operational phases than the potential losses that could occur as a result of its establishment. Stimulation of production, employment, government revenue, skills development, and household income as a result of the investment in the project and its subsequent operations will outweigh possible production, employment and household income losses that could be experienced by local businesses affected by changes in the areas aesthetic and visual resources. It should be noted though that the positive and negative impacts will be distributed mostly amongst different receptors but will not result in inequality. Adherence to the proposed mitigation measures, however, would ensure that the offset of impacts is more balanced and that it also takes into account communities and businesses that will be negatively affected.

The positive effects generated by the project will not offset many of the negative impacts. These include impacts on the sense of place and property and business values that could occur during both construction and operation, the effect on social and economic infrastructure, and crime and social conflicts in the area that could be created during only the construction phase. These impacts though will only affect local communities either temporarily or over the long term. These impacts are not highly significant and can be traded off for the net positive impact created by the project in terms of production, employment, government revenue, community benefits and households' earnings. This means that when compared with the no-go option, the proposed project is associated with greater socio-economic benefits.

Recommendations

Based on the information presented in the SEIA report, it is concluded that the net positive impacts associated with the development and operation of the proposed solar energy facility are expected to outweigh the net negative effects. The project is also envisaged to have a positive stimulus on the local economy and employment creation, leading to the economy's diversification and a small reduction in the unemployment rate. The project should therefore be considered for development. It should, however, be acknowledged that any negative impacts would be largely borne by the farms in the immediate vicinity and households residing on them, whilst the positive impacts will be largely concentrated in the local and national economies. Due to this imbalance, it is recommended that the mitigation measures suggested being strictly adhered to. Application of these mitigation measures will ensure that the negative impacts on the nearby farms and businesses are minimised and that the distribution of the potential benefits of the project are more balanced.

2.9. Impacts on Traffic

The potential traffic and transport related impacts for the construction, operation and decommissioning phases of the proposed Sun Garden PV Facility were identified and assessed. The main impact on the external road network will be during the construction phase. This phase is temporary in comparison to the operational period. The number of abnormal loads vehicles was estimated and to be found to be able to be accommodated by the road network. During operation, it is expected that maintenance and security staff will periodically visit the facility. It is assumed that approximately twenty (20) full-time employees will be stationed on site. The traffic generated during this phase will be minimal and will not have an impact on the surrounding road network.

The traffic generated during the construction phase, although significant, will be temporary and impacts are considered to be negative and of medium significance before and of low significance after mitigation. The traffic generated during the decommissioning phase will be less than the construction phase traffic and the impact on the surrounding road network will also be considered negative and of medium significance before and of low significance after mitigation.

The access road and access point to the proposed site have been assessed and were found to be acceptable from a traffic engineering perspective.

The development is supported from a transport perspective provided that the recommendations and mitigations contained in this report are adhered to.

The potential impacts associated with proposed Sun Garden PV Facility and associated infrastructure are acceptable from a transport perspective and it is therefore recommended that the proposed facility be authorised.

2.10. Assessment of Cumulative Impacts

Cumulative impacts and benefits on various environmental and social receptors will occur to varying degrees with the development of several renewable energy facilities in South Africa. The degree of significance of these cumulative impacts is difficult to predict without detailed studies based on more comprehensive data/information on each of the receptors and the site-specific developments. The alignment of renewable energy developments with South Africa's National Energy Response Plan and the global drive to move away from the use of non-renewable energy resources and to reduce greenhouse gas emissions is undoubtedly positive. The economic benefits of renewable energy developments at a local, regional and national level have the potential to be significant.

The Sun Garden PV Facility falls within the Cookhouse REDZ which has been identified by the DFFE as an area highly suitable for commercial wind and solar development given a range of factors considered. Therefore, DFFE envisages dealing with multiple renewable energy applications and cumulative issues within a REDZ area. The REDZs are of strategic importance for large scale wind and solar photovoltaic development, in terms of Strategic Integrated Project (SIP) 8. These zones are considered to be areas where significant negative impacts on the environment are limited and socio-economic benefits to the country can be enhanced. Multiple projects within the area have been successfully bid under the DMRE's REIPPP programme and are currently operational. The Sun Garden PV Facility will contribute to the cumulative impact experienced within the area. The cumulative impacts associated with the Sun Garden PV Facility have been assessed to be acceptable, with no unacceptable loss or risk expected (refer to **Table 1** and Chapter 10).

Table 1: Summary of the cumulative impact significance for the Sun Garden PV Facility

Specialist assessment	Overall significance of impact of the proposed project considered in isolation	Cumulative significance of impact of the project and other projects in the area
Ecology	Low	Medium
Aquatic Ecology	Low	Medium
Avifauna	Low	Medium
Bats	Low	Medium
Land use, soil and agricultural potential	Low	Low
Heritage (archaeology, palaeontology and cultural landscape)	Medium (palaeontology) High (cultural landscape)	Low (palaeontology) High (cultural landscape)
Noise	Low	Low

Specialist assessment	**Overall significance of impact of the proposed project considered in isolation**	**Cumulative significance of impact of the project and other projects in the area**
Visual	Medium	Medium
Socio-Economic	*Positive impacts:* High or Medium (depending on the impact being considered) *Negative impacts:* Medium or Low (depending on the impact being considered)	*Positive impacts:* High or Medium (depending on the impact being considered) *Negative impacts:* Medium or Low (depending on the impact being considered)
Traffic	Low	Low

Based on the specialist cumulative assessment and findings, the development of the Sun Garden PV Facility and its contribution to the overall impact of all renewable energy facilities to be developed within a 30km radius, it can be concluded that the Sun Garden PV Facility cumulative impacts will be of a medium to low significance, with impacts of a high significance mainly relating to positive socio-economic impacts and impacts on the cultural landscape. It was concluded that the development of the Sun Garden PV Facility will not result in unacceptable, high cumulative impacts and will not result in a whole-scale change of the environment.

3. Environmental Sensitivity Analysis

As part of the specialist investigations undertaken within the project development area, specific environmental features and areas were identified. The environmental features identified within and directly adjacent to the development area and development footprint are illustrated in Figure 2.2. The following points provide a description of the sensitivities identified within the development area:

» **Ecological features:**
The lower slopes of the PV area consist of open plains considered to be low sensitivity while the upper slopes of the PV area are steeper of have a higher woody component and are considered to be medium sensitivity. Along the power line route to the MTS, there are some high sensitivity drainage features, but these can easily be spanned by the power line and are not likely to be significantly impacted by the power line. The drainage feature which occurs along the south-eastern boundary of the PV area would be vulnerable to impact and it is recommended that a freshwater specialist should demarcate the boundary of this feature in the field before construction to ensure that the PV area does not encroach into this area unnecessarily. In terms of fauna, the PV area does not have any habitats present that would be of particularly high value and no specific impact of high magnitude on fauna are expected. However, given the size of the facility and the location within an ESA it is recommended that specific measures are put in place with regards to the design of the fence around the facility to facilitate the movement of smaller fauna in and out of the PV area. Similarly, no plant species of high concern were observed within the PV and impacts on plant SCC are likely to be low. Perhaps the greatest area of concern regarding the PV facility would be the location of the facility on a fairly steep slope with soils that appear to have high erodibility. The panels would generate a lot of runoff and combined with the high levels of disturbance that would occur after construction, the potential for erosion problems at the site are very high. Consequently, specific mitigation measures to reduce and manage erosion and runoff at the site are recommended.

» **Aquatic Ecology:**
The only natural wetlands observed within or in close proximity to the development area, included seven depressions. These, inclusive of the proposed buffers (57m), will be avoided by the development footprint based on the information supplied in this report. No activities occur within 500m of these pan boundaries and only the road crossing the drainage lines will require a Water Use License, which has been initiated by the Applicant. Currently it is anticipated that all the applications will fall within a General Authorisation

» **Avifauna:**
The Site Ecological Importance has been determined for each Species of Conservation Concern (SCC) has been determined to be Low. Therefore, development activities of medium to high impact are acceptable following the implementation of appropriate minimisation and restoration mitigation measures. The proposed overhead powerline corridor is mostly positioned alongside hills and slopes, away from the flatter areas generally preferred by bustards, this is likely to reduce the probability of collisions by these species simply due to the proposed position on the landscape. No no-go areas have been identified and no buffers have been recommended.

» **Bats:**
The site as a whole yields very few sensitive features relevant for the local bat community occurring in the area. No known bat roosts occur on site, although two larger roosts are located approximately 12.5km south-east and 30 km north of the proposed facility. No no-go areas have been identified and no buffers have been recommended.

» **Soils:**
All of the components associated with the Sun Garden project area are located on "Low" sensitivity land potential areas. No no-go areas have been identified and no buffers have been recommended.

» **Heritage Resources:**
» During the survey of the Sun Garden PV Facility no heritage sites of significance were identified. According to the PalaeoMap of SAHRIS the Palaeontological Sensitivity of the site ranges from Low to Very High. No visible evidence of fossiliferous outcrops was found during the field assessment. No no-go areas have been identified and no buffers have been recommended for the PV facility. Buffers of 500m (heritage buffer) and 1000m (cultural landscape buffer) have been recommended for heritage resources identified within the Redding Wind Farm site (across which the power line is proposed) in the vicinity of the power line. Where the development encroaches into these buffers, the specialist recommended that the heritage resource be fully recorded prior to construction being undertaken.

» **Visual:**
The relatively constrained dimensions of the PV facility would amount to a fairly limited area of potential visual exposure. The visual exposure would largely be contained within a 6km radius of the proposed development site, with the predominant exposure to the north. There are no homesteads or public roads within 1km of the facility where the facility may be highly visible. Sensitive receptors within the 1km to 3km zone include the Britskraal homestead and sections of the Beenleegte secondary road. A number of sensitive receptors (4 homesteads) are located within the 3-6km zone. All but 1 of these are located within farms earmarked for the Redding Wind Farm. No no-go areas have been identified and no buffers have been recommended.

» **Socio-economic:**
Sensitive receptors from a socio-economic perspective are similar to those identified from a visual perspective, as detailed above. Most of the farms in the area are involved in a combination of crop, livestock and hunting activity. The dominant activity currently undertaken on farms that were surveyed was agriculture but, notable numbers of tourist activities occur on the farms. The immediate area surrounding the proposed Sun Garden Solar PV Facility is very similar in terms of land use however there is no evidence of any tourism accommodation facilities offering overnight opportunities. No no-go areas have been identified and no buffers have been recommended.

» **Traffic:**
The proposed main access road to the site is an existing gravel road between the N10 and R335. The proposed access road will link to the internal road network of the facility. The proposed access road and the access point to the development is deemed suitable from a traffic engineering perspective. No no-go areas have been identified and no buffers have been recommended.

Based on an analysis of the identified sensitivities for the project development area, no optimisation of the layout is required. The layout as presented within Figure 2 is therefore considered to be the most appropriate from an environmental perspective.

4. Overall Conclusion (Impact Statement)

The preferred activity was determined by the developer to be the development of a renewable energy facility on site using solar irradiation as the preferred technology, due to the availability of a suitable solar resource. Independent specialists appointed to undertake the assessment of potential impacts associated with the project assessed a larger area in order to inform the best location for the solar facility infrastructure. The Specialists considered desktop data, results from field work, existing literature and the National Web-based Environmental Screening Tool to inform the identification of sensitivities. A proposed layout was designed after provision of sensitivity data by the specialists with the aim of avoiding sensitive areas identified.

Based on the specialist investigations of the larger area, a technically viable development footprint was proposed by the developer and assessed as part of the BA process. The findings of the assessment of the development footprint undertaken by independent specialists have informed the results of this BA report. The specialist findings have indicated that there are no identified fatal flaws associated with the implementation of the project within the project site.

From a review of the relevant policy and planning framework, it was concluded that the project is well aligned with the policy framework, and a clear need for the project is seen from a policy perspective at a local, provincial and National level. The project development area is located outside of any protected area and outside of any Critical Biodiversity Areas (CBAs) as defined in the Provincial Conservation Plan. When considering biodiversity and socio-economic benefits and impacts on the affected and surrounding areas, the following is concluded from the specialist studies undertaken within this BA process.

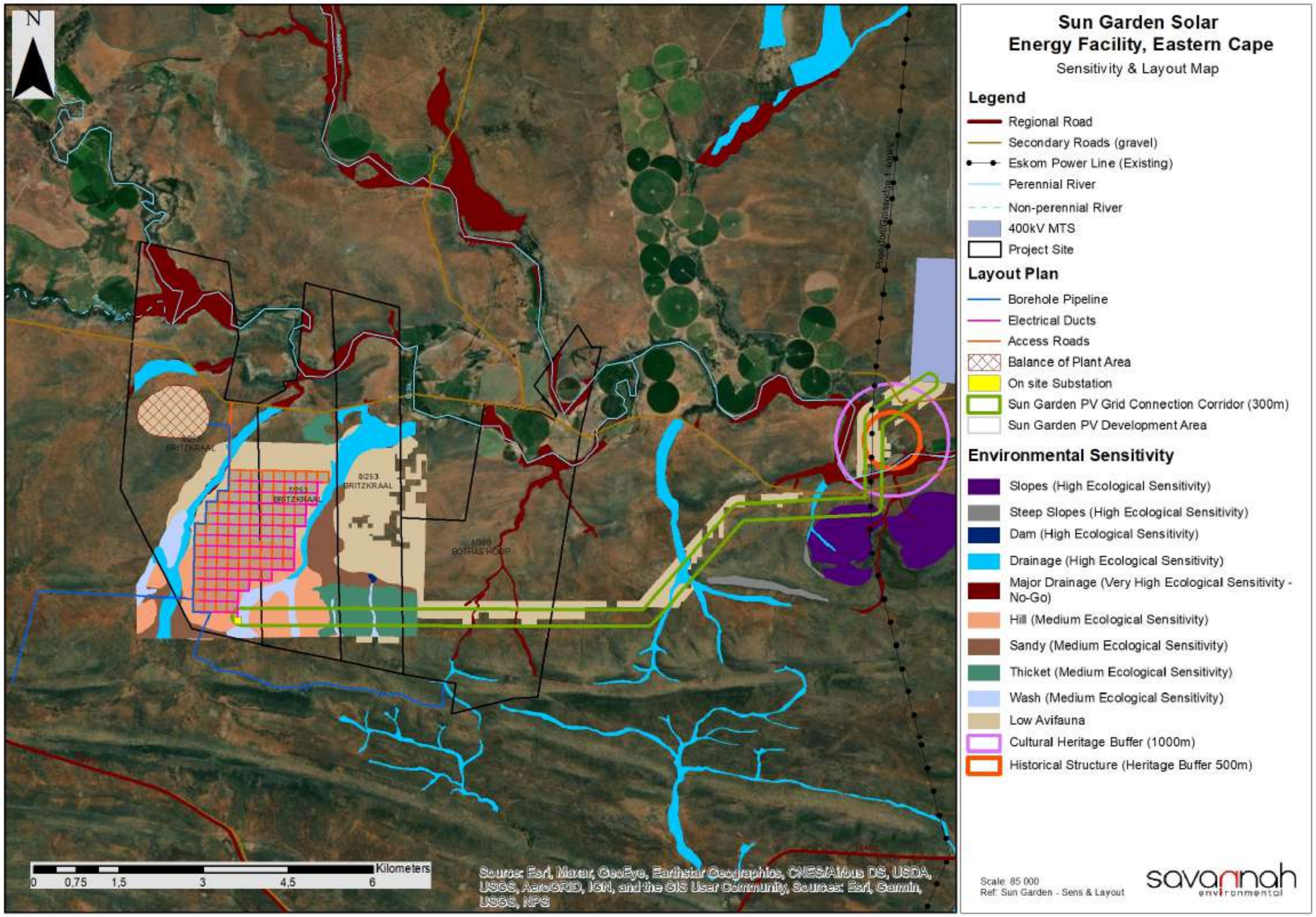

Figure 2: The development footprint (~350ha) of the Sun Garden PV Facility, as assessed within this BA Report, overlain on the identified environmental sensitive features

From a biodiversity perspective, the site is not located within a protected area. The site is located within an extensive ESA. However, overall, there are no specific long-term impacts likely to be associated with the development of the Sun Garden PV Facility that cannot be reduced to a low significance. There are no fatal flaws associated with the development and no terrestrial ecological considerations that should prevent it from proceeding. No sensitivities were identified from a bat and avifauna perspective, and the layout proposed ensures that all aquatic sensitivities identified through the BA process are avoided and recommended buffer areas are honoured. This approach is in line with the application of the mitigation hierarchy, where all the sensitive areas which could be impacted by the development have been avoided (i.e. tier 1 of the mitigation hierarchy). Where impacts could not be avoided, appropriate mitigation has been proposed to minimise impacts. It follows therefore that the project does not adversely impact on the ecological integrity of the area.

In addition, consideration must also be given to the positive and negative socio-economic impact. Impacts on cultural landscape are expected to be high. It must be considered that the addition of the infrastructure of the Sun Garden PV Facility will constitute an additional layer to the cultural landscape and must be considered as such within a gazetted REDZ area. Through the implementation of the economically feasible recommendations as set out in the Heritage impact Assessment and contained in this report it will be possible to preserve older layers of the cultural landscape and in some cases even enhance them through consideration such as the use of older name places in the naming of infrastructure and enhancing local heritage through the incorporation of such structures in project conservation initiatives to name a few.

The Socio-economic Impact Assessment has identified short-term (construction related) impact indicators and operational related socio-economic impact indicators. The assessment of the proposed facility, and its net effect from a socio-economic perspective, indicates that the project would generate greater socio-economic benefits during both the construction and operational phases than the potential losses that could occur as a result of its establishment.

As detailed in the cost-benefit analysis, the benefits of the Sun Garden PV Facility are expected to occur at a national, regional and local level. As the costs to the environment at a site-specific level have been largely limited through the appropriate placement of infrastructure on the project site within lower sensitive areas through the avoidance of features and areas considered to be sensitive, the benefits of the project are expected to partially offset the localised environmental costs of the PV facility. From an economic perspective, both positive and negative impacts are expected.

Based on the conclusions of the specialist studies undertaken, it can be concluded that the development of the Sun Garden PV Facility based on the current layout as provided by the developer will not result in unacceptable environmental impacts (subject to the implementation of the recommended mitigation measures).

5. Overall Recommendation

Considering the findings of the independent specialist studies, the impacts identified, the development footprint proposed by the developer within the development envelope, the avoidance of the sensitive environmental features within the project site, as well as the potential to further minimise the impacts to acceptable levels through mitigation, it is the reasoned opinion of the EAP that the Sun Garden PV Facility is acceptable within the landscape and can reasonably be authorised. The proposed layout as provided by the developer (**Figure 2**) is considered to be the most appropriate from an environmental perspective as it avoids identified sensitivities and recommended buffer areas.

The following infrastructure would be included within an authorisation issued for the project:

» Solar PV array comprising PV modules and mounting structures.
» Inverters and transformers.
» Cabling between the project components, lain underground where practical.
» A 132/33kV on-site collector substation to be connected to a proposed 400kV Main Transmission Substation (MTS) located to the north-east of the site via a new 132kV overhead power line (twin turn dual circuit line). The development of the proposed 400kV Main Transmission Substation will be assessed as part of the separate BA process in order to obtain Environmental Authorisation.
» Site offices and maintenance buildings, including workshop areas for maintenance and storage.
» Temporary laydown areas.
» Access roads to the site and between project components with a width of approximately 4,5m. The main access points will be 8m wide.
» Water supply pipelines from onsite boreholes.
» A temporary concrete batching plant.
» Staff accommodation (temporary).
» Operation and Maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitor's centre.

The following key conditions would be required to be included within an authorisation issued for the Sun Garden PV Facility:

» All mitigation measures detailed within this BA report, as well as the specialist reports contained within **Appendices D to L** are to be implemented.
» The EMPr as contained within **Appendix M** of this BA report should form part of the contract with the Contractors appointed to construct and maintain the solar facility in order to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of the Sun Garden PV Facility is considered key in achieving the appropriate environmental management standards as detailed for this project.
» Following the final design of the Sun Garden PV Facility, a revised layout must be submitted to DFFE for review and approval prior to commencing with construction. No development is permitted within the identified no-go areas as detailed in **Figure 11.1.**
» A pre-construction walk-through of the final layout, including roads and underground cables, should be undertaken before construction commences and adjusted where required to reduce impacts on species of conservation concern and habitats of concern.
» The permitter fence of the facility must have access points for smaller fauna at least every 50m of fence. These should be a minimum of 40cm x 20cm in size and should be orientated both vertically and horizontally.
» The facility must have a detailed runoff and erosion management plan that takes account of the vulnerability of the area to erosion damage. This should be developed with input from a specialist with specific experience in this regard.
» Implement a chance finds procedure for the rescuing of any fossils or heritage resources discovered during construction.

- If any archaeological material or human burials are uncovered during construction activities, work in the immediate area should be halted, the find reported to the heritage authorities and inspected by an archaeologist. Such heritage is the property of the State and may require excavation and curation in an approved institution.
- Maintain vegetation cover (i.e. either natural or cultivated) immediately adjacent to the actual development footprint, both during construction and operation of the proposed facility.
- Monitor all rehabilitated areas for one year following decommissioning and implement remedial actions as and when required.

A validity period of 15 years of the Environmental Authorisation is requested, should the project obtain approval from DFFE.

DEFINITIONS AND TERMINOLOGY

Alternatives: Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the 'do nothing' alternative.

Commence: The start of any physical activity, including site preparation and any other activity on site furtherance of a listed activity or specified activity, but does not include any activity required for the purposes of an investigation or feasibility study as long as such investigation or feasibility study does not constitute a listed activity or specified activity.

Commercial Operation date: The date after which all testing and commissioning has been completed and is the initiation date to which the seller can start producing electricity for sale (i.e. when the project has been substantially completed).

Commissioning: Commissioning commences once construction is completed. Commissioning covers all activities including testing after all components of the wind turbine are installed.

Construction: Construction means the building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity. Construction begins with any activity which requires Environmental Authorisation.

Cumulative impacts: Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities (e.g. discharges of nutrients and heated water to a river that combine to cause algal bloom and subsequent loss of dissolved oxygen that is greater than the additive impacts of each pollutant). Cumulative impacts can occur from the collective impacts of individual minor actions over a period and can include both direct and indirect impacts.

Decommissioning: To take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it cannot be readily re-commissioned. This usually occurs at the end of the life of a facility.

Direct impacts: Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation, or maintenance of an activity and are generally obvious and quantifiable.

Disturbing noise: A noise level that exceeds the ambient sound level measured continuously at the same measuring point by 7 dB or more.

'Do nothing' alternative: The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

Endangered species: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

Emergency: An undesired/ unplanned event that results in a significant environmental impact and requires the notification of the relevant statutory body, such as a local authority.

Endemic: An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place. Whether something is endemic or not depends on the geographical boundaries of the area in question and the area can be defined at different scales.

Environment: the surroundings within which humans exist and that are made up of:
i. The land, water and atmosphere of the earth;
ii. Micro-organisms, plant and animal life;
iii. Any part or combination of (i) and (ii) and the interrelationships among and between them; and
iv. The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental impact: An action or series of actions that have an effect on the environment.

Environmental impact assessment: Environmental Impact Assessment, as defined in the NEMA EIA Regulations and in relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

Environmental management: Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

Environmental management programme: An operational plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its ongoing maintenance after implementation.

Heritage: That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act of 2000).

Indigenous: All biological organisms that occurred naturally within the study area prior to 1800.

Indirect impacts: Indirect or induced changes that may occur because of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place because of the activity.

Interested and affected party: Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups, and the public.

Method statement: A written submission to the ECO and the site manager (or engineer) by the EPC Contractor in collaboration with his/her EO.

Mitigation hierarchy: The mitigation hierarchy is a framework for managing risks and potential impacts related to biodiversity and ecosystem services. The mitigation hierarchy is used when planning and implementing development projects, to provide a logical and effective approach to protecting and conserving biodiversity and maintaining important ecosystem services. It is a tool to aid in the sustainable management of living, natural resources, which provides a mechanism for making explicit decisions that balance conservation needs with development priorities

No-go areas: Areas of environmental sensitivity that should not be impacted on or utilised during the development of a project as identified in any environmental reports.

Pollution: A change in the environment caused by substances (radio-active or other waves, noise, odours, dust or heat emitted from any activity, including the storage or treatment or waste or substances.

Pre-construction: The period prior to the commencement of construction, this may include activities which do not require Environmental Authorisation (e.g. geotechnical surveys).

Rare species: Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare."

Red data species: Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or in terms of the South African Red Data list. In terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

Rotor: The portion of the wind turbine that collects energy from the wind is called the rotor. The rotor converts the energy in the wind into rotational energy to turn the generator. The rotor has three blades that rotate at a constant speed of about 15 to 28 revolutions per minute (rpm).

Significant impact: An impact that by its magnitude, duration, intensity, or probability of occurrence may have a notable effect on one or more aspects of the environment.

ACRONYMS

BGIS	Biodiversity Geographic Information System
BOP	Balance of Plant
CBA	Critical Biodiversity Area
DFFE	Department Forestry, Fisheries of the Environment (National)
DWS	Department of Water and Sanitation
CSIR	Council for Scientific and Industrial Research
DM	District Municipality
DMRE	Department of Mineral Resources Energy
EAP	Environmental Assessment Practitioner
EGIS	Environmental Geographic Information System
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMPr	Environmental Management Programme
EN	Endangered
EP	Equator Principles
ESA	Ecological Support Area
GA	General Authorisation
IBA	Important Bird Area
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
IEP	Integrated Energy Plan
IFC	International Finance Corporation
IPP	Independent Power Producer
IRP	Integrated Resource Plan
IUCN	International Union for Conservation of Nature
I&AP	Interested and Affected Party
Km	Kilometre
kWh	Kilowatt hour
LC	Least Concern
LM	Local Municipality
M	Metre
m^2	Square meters
m^3	Cubic meters
m amsl	Metres Above Mean Sea Level
MW	Megawatts
NDP	National Development Plan
NEMA	National Environmental Management Act (No. 107 of 1998)
NEM:BA	National Environmental Management: Biodiversity Act (No. 10 of 2004)
NEM:WA	National Environmental Management: Waste Act (No. 59 of 2008)
NFA	National Forests Act (No. 84 of 1998)
NFEPA	National Freshwater Ecosystem Priority Area
NHRA	National Heritage Resources Act (No. 25 of 1999)
NT	Near Threatened
NWA	National Water Act (No. 36 of 1998)
ONA	Other Natural Area

PA	Protected Area
PV	Photovoltaic
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
TOPS	Threatened or Protected Species
VU	Vulnerable

TABLE OF CONTENTS

PAGE

PROJECT DETAILS i
PURPOSE OF THE EIA REPORT AND INVITATION TO COMMENT ii
EXECUTIVE SUMMARY iii
DEFINITIONS AND TERMINOLOGY xxii
ACRONYMS xxv
TABLE OF CONTENTS xxvii
APPENDICES LIST xxxii
CHAPTER 1: INTRODUCTION 1
1.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report 2
1.2 Project Overview 4
1.3 Details of the Environmental Assessment Practitioner and Expertise to conduct the BA process 9
CHAPTER 2: Project description 11
2.1. Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report 11
2.2 Nature and extent of the Sun Garden PV Facility 11
2.2.1. Overview of the Project Site 11
2.2.2. Components of the Sun Garden PV Facility 14
2.2.3 Project Development Phases associated with the Sun Garden PV Facility 17
CHAPTER 3: alternatives 23
3.1. Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report 23
3.2 Alternatives Considered during the BA Process 23
3.2.1 Consideration of Fundamentally Different Alternatives 24
3.2.2 Consideration of Incrementally Different Alternatives 24
3.3 Project Alternatives under Consideration for the Sun Garden PV Facility 24
3.3.1 Site-specific and Layout Alternatives 25
3.3.2 Activity Alternatives 30
3.3.3 Technology Alternatives 30
3.3.4. The 'do-nothing' Alternative 31
CHAPTER 4: SOLAR AS A POWER GENERATION TECHNOLOGY 32
4.1. Solar PV Technology 32
4.1.1. Bifacial Solar Panel Technology 33
CHAPTER 5: POLICY AND LEGISLATIVE CONTEXT 35
5.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report 35
5.2 Strategic Electricity Planning in South Africa 35
5.3 International Policy and Planning Context 37
5.4 National Policy 39
5.4.1 The National Energy Act (No. 34 of 2008) 39
5.4.2 White Paper on the Energy Policy of South Africa, 1998 39
5.4.3 White Paper on the Renewable Energy Policy, 2003 40
5.4.4 The Electricity Regulation Act (No. 04 of 2006) (ERA) 41
5.4.5 The National Development Plan (NDP) 2030 41

5.4.6 Integrated Energy Plan (IEP), November 2016 42
5.4.7 Integrated Resource Plan (IRP) for Electricity 2010 - 2030 43
5.4.8 New Growth Path (NGP) Framework, 23 November 2010 44
5.4.9 National Climate Change Bill, 2018 45
5.4.10 National Climate Change Response Policy, 2011 45
5.4.11 National Climate Change Response Strategy for South Africa, 2004 46
5.4.12 Strategic Integrated Projects (SIPs) 47
5.4.13 Renewable Energy Development Zones (REDZ) (GNR 114 of February 2018) 47
5.4.14 National Biodiversity Economy Strategy (NBES) (March 2016) 47
5.5 Provincial Planning and Context 49
5.5.1. Eastern Cape Provincial 2030 Draft Development Plan (PDP), 2014 49
5.5.2 Eastern Cape Provincial Spatial Development Framework (PSDF) (2010) 50
5.5.3 Eastern Cape Provincial Economic Strategy (PEDS) 2016) 51
5.5.4. The Eastern Cape Industrial Development Strategy, 2011 51
5.5.5 Eastern Cape Climate Change Response Strategy (2011) 52
5.5.5 Eastern Cape Sustainable Energy Strategy (2012) 53
5.5.6 Eastern Cape Environmental Management Bill (Department of Economic Development, Environmental Affairs and Tourism, 2019) 53
5.5.7 Eastern Cape Biodiversity Conservation Plan (2019) 54
5.5.8 Eastern Cape Tourism Master Plan (Department of Economic Development, Environmental Affairs and Tourism, 2014) 56
5.6 Local Policy and Planning Context 56
5.6.1. Sarah Baartman Spatial Development Framework (SDF) Final Report (2018/2019 Draft) [Adopted 21 August 2013] 57
5.6.2 Sarah Baartman District Municipality Final Reviewed Integrated Development Plan for 2017/2022 (2018/2019 Draft) 60
5.6.3 Blue Crane Route Local Municipality Integrated Development Plan Review (IDP), 2019-2020 60
5.6.4. Blue Crane Route Local Economic Development Strategy, 2008 61
CHAPTER 6: NEED AND DESIRABILITY 62
6.1. Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report 62
6.2 Need from an International Perspective 62
6.3 Need from a National Perspective 63
6.3.1 Benefits of Renewable Energy in the South African Environment 67
6.4 Need from a Provincial Perspective 70
6.4 Need from a District and Local Perspective 71
6.5 Receptiveness and Desirability of the project site to develop the Sun Garden PV Facility 72
CHAPTER 7: APPROACH TO UNDERTAKING THE BASIC ASSESSMENT PROCESS 73
7.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report 73
7.2 Relevant legislative permitting requirements 74
7.2.1 National Environmental Management Act (No. 107 of 1998) (NEMA) 74
7.2.2 National Water Act (No. 36 of 1998) (NWA) 77
7.2.3 National Heritage Resources Act (No. 25 of 1999) (NHRA) 78
7.3 Overview of the Basic Assessment Process for the Sun Garden PV Facility 79
7.3.1. Authority Consultation and Application for Authorisation in terms of the 2014 EIA Regulations (as amended) 79

7.3.2. Public Participation Process 80
7.4. Outcomes of the DFFE Web-Based Screening Tool 89
7.5. Assessment of Issues Identified through the BA Process 91
7.6 Assumptions and Limitations of the BA Process 93
7.7 Legislation and Guidelines that have informed the preparation of this Basic Assessment Report 93
7.7.1 The IFC EHS Guidelines 106
7.7.2 IFC Project Developer's Guide to Utility-Scale Solar Photovoltaic Power Plants (2015) 107
CHAPTER 8: DESCRIPTION OF THE ReceiVing ENVIRONMENT 112
8.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report 112
8.2. Regional Setting 113
8.3. Climatic Conditions 116
8.4. Biophysical Characteristics of the Study Area 116
8.4.1. Topography and Terrain 116
8.4.2. Geology, Soils and Agricultural Potential 116
8.4.3 Land Use 118
8.4.4. Ecological Profile of the Broader Study Area and the Project Site 119
8.5. Heritage Resources 136
8.5.1 Archaeological Resources 137
8.5.2 Heritage Resources 137
8.5.3. Palaeontology 138
8.5.4. Cultural Landscape 140
8.6. Visual Quality 141
8.7 Traffic Conditions 142
8.8 Socio-Economic Profile 143
CHAPTER 9: ASSESSMENT OF IMPACTS 146
9.1. Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report 148
9.2. Quantification of Areas of Disturbance on the Site 149
9.3. Potential Impacts on Ecology (Ecology, Flora and Fauna) 149
9.3.1 Description of Ecological Impacts 150
9.3.2 Impact tables summarising the significance of impacts on ecology during construction, operation and decommissioning (with and without mitigation) 151
9.3.3 Overall Result 158
9.4. Potential Impacts on Aquatic Ecology 158
9.4.1 Description of Impacts on Aquatic Ecology 158
9.4.2 Impact tables summarising the significance of impacts on aquatic ecology during construction, operation and decommissioning (with and without mitigation) 159
9.4.3 Overall Result 162
9.5. Potential Impacts on Avifauna 162
9.5.1 Description of Avifaunal Impacts 162
9.5.2 Impact tables summarising the significance of impacts on avifauna during construction, operation and decommissioning (with and without mitigation) 163
9.5.3 Overall Result 169
9.6. Potential Impacts on Bats 170
9.6.1 Description of Bat Impacts 170

9.6.2 Impact tables summarising the significance of impacts on bats during the construction, operation and decommissioning phases (with and without mitigation) 171
9.6.3 Overall Result 174
9.7. Assessment of Impacts on Land Use, Soil and Agricultural Potential 174
9.7.1 Impact Statement and recommendations 175
9.7.2 Overall Result 177
9.8. Assessment of Impacts on Heritage Resources 178
9.8.1 Description of the Heritage Impacts 178
9.8.2 Impact tables summarising the significance of impacts on heritage during construction, operation and decommissioning (with and without mitigation) 178
9.8.3 Overall Result 182
9.9. Assessment of Visual Impacts 183
9.9.1 Description of Visual Impacts 183
9.9.2 Impact table summarising the significance of visual impacts during construction and operation (with and without mitigation) 185
9.9.3 Overall Result 190
9.10. Assessment of Socio-economic Impacts 191
9.10.1 Description of Socio-economic Impacts 191
9.10.2 Impact tables summarising the significance of socio-economic impacts during construction, operation and decommissioning (with and without mitigation measures) 192
9.10.3 Overall Result 206
9.11. Assessment of Impacts on Traffic 207
9.11.1 Description of Traffic Impacts 207
9.11.2 Impact tables summarising the significance of impacts on traffic during the construction and operation phases (with and without mitigation) 207
9.11.3 Overall Result 209
9.12. Assessment of the 'Do Nothing' Alternative 210
9.12.1 Conclusion 212
CHAPTER 10: ASSESSMENT OF POTENTIAL cumulative IMPACTS 214
10.1. Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report 214
10.2 Approach taken to Assess Cumulative Impacts 214
10.3 Cumulative Impacts on Ecological Processes 218
10.4 Cumulative Impacts on Aquatic Ecology 219
10.5 Cumulative Impacts on Avifauna 219
10.6 Cumulative Impacts on Bats 220
10.7 Cumulative Impacts on Land Use, Soil and Agricultural Potential 221
10.8 Cumulative Impacts on Heritage (including archaeology, palaeontology and cultural landscape) 221
10.9 Cumulative Visual Impacts 225
10.10 Cumulative Socio-Economic Impacts 227
10.11 Cumulative Traffic Impacts 236
10.12 Conclusion regarding Cumulative Impacts 236
CHAPTER 11: CONCLUSIONS AND RECOMMENDATIONS 239
11.1. Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report 240
11.2 Evaluation of the Sun Garden PV Facility 240

11.2.1 Impacts on Ecology 241
11.2.2 Impacts on Aquatic Ecology 241
11.2.3 Impacts on Avifauna 242
11.2.4 Impacts on Bats 243
11.2.5 Impacts on Land Use, Soil and Agricultural Potential 243
11.2.6 Impacts on Heritage Resources (archaeology, palaeontology and cultural landscape) 244
11.2.7 Visual Impacts 245
11.2.8 Socio-economic Impacts 246
11.2.9 Impacts on Traffic 248
11.2.10 Assessment of Cumulative Impacts 248
11.3. Environmental Sensitivity Analysis 249
11.4. Environmental Costs versus Benefits of the Project 253
11.5. Overall Conclusion (Impact Statement) 254
11.6. Overall Recommendation 255
CHAPTER 12: References 258

APPENDICES LIST

Appendix A:	EIA Project Consulting Team and Specialist CVs
Appendix B:	Authority Consultation
Appendix C:	Public Participation Process
Appendix C1:	*Approved Public Participation Plan*
Appendix C2:	*I&AP Database*
Appendix C3:	*Site Notices and Newspaper Advertisements*
Appendix C4:	*Background Information Document*
Appendix C5:	*Organs of State Correspondence*
Appendix C6:	*Stakeholder Correspondence*
Appendix C7:	*Comments Received*
Appendix C8:	*Minutes of Meetings*
Appendix C9:	*Comments and Responses Report*
Appendix D:	Ecological Impact Assessment
Appendix E:	Avifauna Impact Assessment
Appendix E(1):	*Avifauna Peer Review Letter*
Appendix F:	Bat Impact Assessment
Appendix G:	Aquatic Impact Assessment
Appendix H:	Soils and Agricultural Impact Assessment
Appendix I:	Heritage Impact Assessment
Appendix J:	Visual Impact Assessment
Appendix K:	Socio-Economic Impact Assessment
Appendix L:	Traffic Impact Assessment
Appendix M:	Environmental Management Programme (EMPr)
Appendix M(1):	*PV Facility EMPr*
Appendix M(2):	*Generic EMPr for Overhead Power Lines*
Appendix M(3):	*Generic EMPr for Substations*
Appendix N:	Maps (A3)
Appendix O:	Specialist Declarations
Appendix P:	EAP Declaration of Independence and Affirmation
Appendix Q:	Additional Information
Appendix Q(1)	DFFE Screening Report and confirmation of appointment
Appendix Q(2):	Preliminary Geotechnical Investigation
Appendix Q(3):	Spatial Development Plan
Appendix Q(4):	Water Feasibility Study
Appendix Q(5):	Water Requirements
Appendix Q(6):	Sanitation Study

CHAPTER 1: INTRODUCTION

Sun Garden (Pty) Ltd is proposing the development of a commercial solar PV facility and associated infrastructure on a site located approximately 36km south-east of Somerset East and 28km south-west of Cookhouse within the Blue Crane Route Local Municipality and the Sarah Baartman District Municipality in the Eastern Cape Province (**Figure 1.1**). The entire extent of the site falls within the Cookhouse Renewable Energy Development Zone (REDZ)[1] and within the Eastern Corridor of the Strategic Transmission Corridors [2]. The facility is known as the Sun Garden PV Facility.

The solar facility is proposed in response to identified objectives of the national and provincial government, and local and district municipalities to develop renewable energy facilities for power generation purposes. It is the developer's intention to supply the electricity generated from the facilities to private off-takers nationally, with key customer focus areas primarily being within the industrial, mining, and commercial sectors where there is a need to shift towards cleaner and more sustainable sources of energy. The expected load requirements of potential customers are in excess of 1 000GWh. The generated electricity will be evacuated through use of the national electricity grid and through a wheeling agreement with Eskom for the use of the existing grid connection infrastructure in the area. The development will aid in the diversification and stabilisation of the country's electricity supply, in line with the objectives of the Integrated Resource Plan (IRP).

As the project has the potential to impact on the environment, an Environmental Impact Assessment process is required to be completed in support of an application for Environmental Authorisation prior to the commencement of construction of the project. As the project falls within the Cookhouse REDZ, a Basic Assessment (BA) process is applicable as per GNR114 of February 2018. This BA Report describes and assesses this proposed project and consists of the following chapters:

- **Chapter 1** provides background to the Sun Garden PV Facility and the basic assessment process.
- **Chapter 2** provides a description of the solar facility and the infrastructure associated with the facility.
- **Chapter 3** provides the site selection information and identified project alternatives.
- **Chapter 4** describes solar energy as a power generation option and provides insight to technologies for solar energy.
- **Chapter 5** outlines the strategic regulatory and legal context for energy planning in South Africa and specifically for the proposed facility.
- **Chapter 6** describes the need and desirability of the Sun Garden PV Facility within the project site.
- **Chapter 7** outlines the approach to undertaking the basic assessment process.
- **Chapter 8** describes the existing biophysical and socio-economic environment within and surrounding the project site.
- **Chapter 9** provides an assessment of the potential issues and impacts associated with the solar facility and associated infrastructure and presents recommendations for the mitigation of significant impacts.
- **Chapter 10** provides an assessment of the potential for cumulative impacts.

[1] The REDZ are zones identified by the Department of Forestry Fisheries and the Environment (DFFE) as geographical areas of strategic importance for the development of large-scale solar PV and wind energy development activities and which have been earmarked for the development of renewable energy facilities within South Africa as per GNR114 of February 2018 and GNR142 of February 2021.
[2] The Strategic Transmission Corridors are identified by the Department of Forestry Fisheries and the Environment (DFFE) as geographical areas of strategic importance for the development the supporting large scale electricity transmission and distribution infrastructure in terms of Strategic Integrated Project 10: Electricity Transmission and distribution. This is as per GNR113 of February 2018.

- **Chapter 11** presents the conclusions and recommendations based on the findings of the BA Report.
- **Chapter 12** provides references used in the compilation of the BA Report.

1.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This BA Report has been prepared in accordance with the requirements of the EIA Regulations published on 08 December 2014 (as amended) promulgated in terms of Chapter 5 of the National Environmental Management Act (Act No 107 of 1998). This chapter of the BA Report includes the following information required in terms of Appendix 1: Content of basic assessment reports:

Requirement	Relevant Section
3(a) the details of the (i) EAP who prepared the report and (ii) the expertise of the EAP, including a curriculum vitae.	The details of the EAP who prepared the report and the expertise of the EAP is included in section 1.3. The curriculum vitae of the EAP, project team and independent specialists are included in **Appendix A**.
3(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 and (iii) where the required information in items (i) and (ii) is not available, the co-ordinates of the boundary of the property or properties.	The location of the Sun Garden PV Facility is included in section 1.2, **Table 1.1** and **Figure 1.1**. The information provided includes the 21-digit Surveyor General code of the affected properties and the farm names. Additional information is also provided regarding the location of the development which includes the relevant province, local and district municipalities, ward and current land zoning.

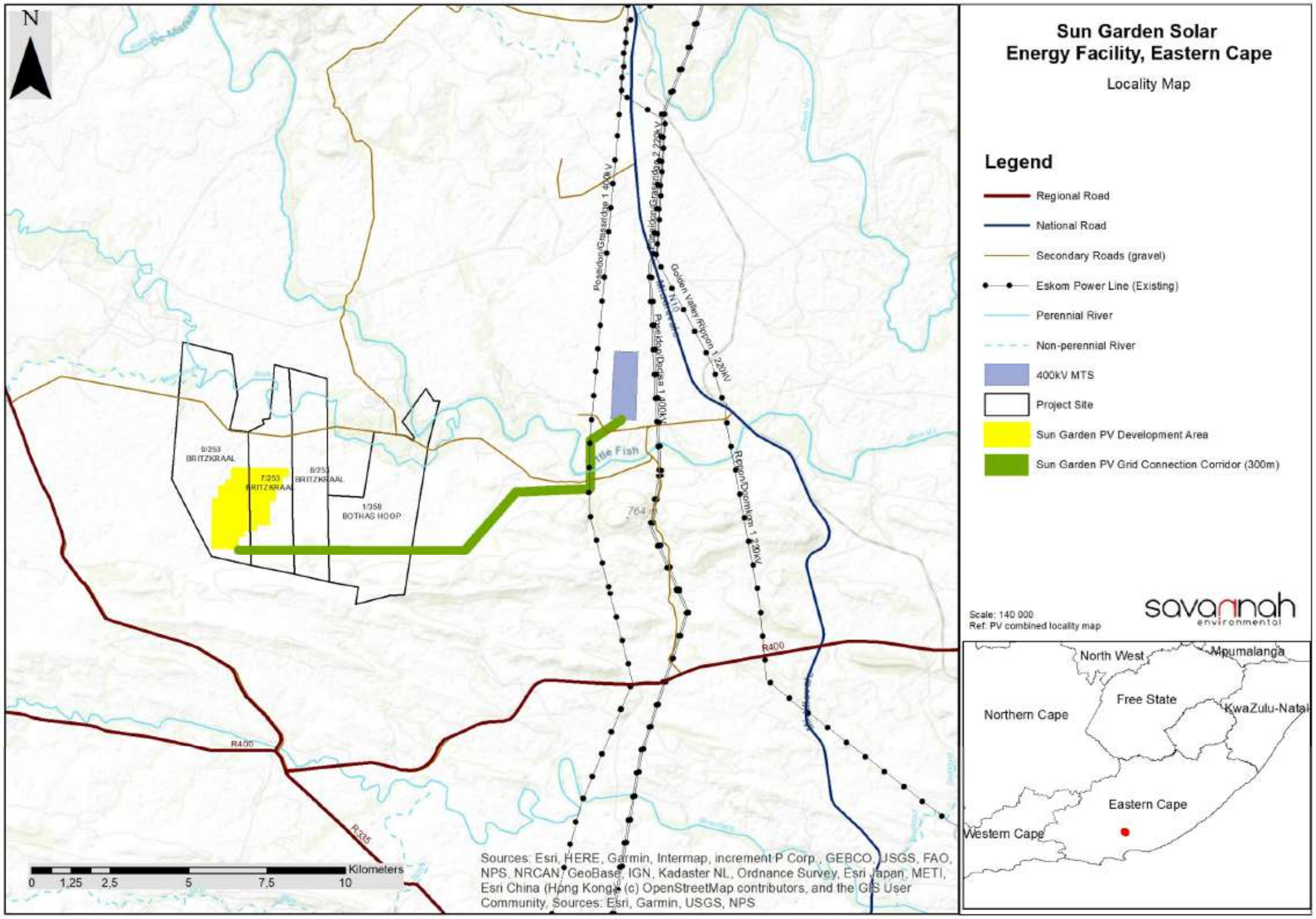

Figure 1.1: Locality map of the project site showing the location of the site in relation to the closest towns of the area

1.2 Project Overview

A preferred project site with an extent of ~4037ha has been identified by Sun Garden (Pty) Ltd as a technically suitable area for the development of the Sun Garden PV Facility. The project site consists of four affected properties:

» Portion 9 of the farm Britzkraal No 253, Division of Somerset East
» Portion 8 (a Portion of Portion 7) of the farm Britzkraal No 253, Division of Somerset East
» Portion 7 of the farm Britzkraal No 253, Division of Somerset East
» Portion 1 of farm Bothas Hoop 358, Division of Somerset East

A development envelope for the placement of the solar facility infrastructure (i.e. development footprint) has been identified within the project site and assessed as part of the BA process. The development envelope is ~500ha in extent and the much smaller development footprint of ~350ha will be placed and sited within the development envelope. The development footprint will contain the following infrastructure to enable the solar facility to generate up to 400MW:

» Solar PV array comprising PV modules and mounting structures.
» Inverters and transformers.
» Cabling between the project components, lain underground where practical.
» A 132/33kV on-site collector substation to be connected to a proposed 400kV Main Transmission Substation (MTS) located to the north-east of the site via a new 132kV overhead power line (twin turn dual circuit line). The development of the proposed 400kV Main Transmission Substation will be assessed as part of the separate BA process in order to obtain Environmental Authorisation.
» Site offices and maintenance buildings, including workshop areas for maintenance and storage.
» Temporary laydown areas.
» Access roads to the site and between project components with a width of approximately 4,5m. The main access points will be 8m wide.
» Water supply pipelines from onsite boreholes.
» A temporary concrete batching plant.
» Staff accommodation (temporary).
» Operation and Maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitor's centre.

The new 132kV overhead power line to connect the PV facility to the proposed 400kV Main Transmission Substation will follow a route north-east of the project site to complete the connection. The power line will therefore cross properties located to the north-east of the project site. The majority of these properties form part of the project sites of the adjacent proposed wind farms which forms part of the cluster of renewable energy facilities proposed. The power line is proposed parallel to that proposed for the Redding Wind Energy Facility and the Solaris Fields PV Facility, and is being assessed within a 300m grid connection corridor which will provide for the avoidance of sensitive environment areas and features and allow for the micro-siting of the power line within the corridor.

The key infrastructure components that form part of the facility are described in greater detail in Chapter 2 of this BA Report.

Sun Garden (Pty) Ltd has confirmed that the project site is particularly suitable for solar energy development from a technical perspective due to the solar resources, access to the electricity grid, compatibility with the current land use and land availability.

Table 1.1: Detailed description of the Sun Garden PV Facility project site

Province	Eastern Cape Province
District Municipality	Sarah Baartman District Municipality
Local Municipality	Blue Crane Route Local Municipality
Ward number(s)	6
Nearest town(s) (measured from the centre of the project site)	Cookhouse (~40km north-east); Somerset East (~46km north-west), Riebeek East (~37km south-east), Middleton (~18km north-east), Bracefield (~10km south), Renosterfontein (~18km south-west)
Affected Properties: Farm name(s), number(s) and portion numbers	**<u>Sun Garden PV Facility</u>** » Portion 9 of the farm Britzkraal No 253, Division of Somerset East » Portion 8 (a Portion of Portion 7) of the farm Britzkraal No 253, Division of Somerset East » Portion 7 of the farm Britzkraal No 253, Division of Somerset East » Portion 1 of farm Bothas Hoop 358, Division of Somerset East **<u>New 132kV Overhead Power Line</u>** » Portion 1 of Farm Bothas Hoop 358m » Remainder of Farm Draai Van Klein Visrivier 254 » Portion 1 (Opmeet Fontein) of farm Gras Fonteyn No 258 » Farm 434 » Portion 3 (Vlak Leegte) of Farm Driefontein No 259
SG 21 Digit Code (s)	**<u>Sun Garden Solar Facility</u>** » Portion 9 of the farm Britzkraal No 253 - C06600000000025300009 » Portion 8 (a Portion of Portion 7) of the farm Britzkraal No 253 - C06600000000025300008 » Portion 7 of the farm Britzkraal No 253 - C06600000000025300007 » Portion 1 of farm Bothas Hoop 358 - C06600000000035800001 **<u>New 132kV Overhead Power Line</u>** » Portion 1 of Farm Bothas Hoop 358m - C06600000000035800001 » Remainder of Farm Draai Van Klein Visrivier 254 - C06600000000025400000 » Portion 1 (Opmeet Fontein) of farm Gras Fonteyn No 258 - C06600000000025800001 » Farm 434 - C06600000000043400000 » Portion 3 (Vlak Leegte) of Farm Driefontein No 259 - C06600000000025900003
Current zoning and Land Use	Zoning: Agricultural Land Use: Grazing
Site co-ordinates (centre of project site)	33° 6'33.59"S 25°41'0.30"E

The overarching objective for the planning process is to maximise electricity production through exposure to the solar resource, while minimising infrastructure, operational and maintenance costs, as well as social and environmental impacts. These aspects must now be considered within site-specific specialist studies and assessments through the BA process in order to delineate areas of sensitivity within the surrounding area, project site and development envelope and ultimately inform the placement of the solar facility and associated infrastructure within the areas considered suitable for development.

The Sun Garden PV Facility forms part of a larger cluster of renewable energy facilities. The cluster consists of various project sites located between Somerset East and Grahamstown within the Cookhouse REDZ, as well as the Eastern Strategic Transmission Corridor. The cluster consists of nine (9) projects which includes six (6) wind farms, two (2) solar energy facilities and one (1) Main Transmission Substation (MTS). The cluster is divided into a western section and an eastern section, with the Sun Garden PV Facility forming part of the western section (**Figures 1.2 and 1.3**). Each project proposed as part of this cluster will be developed and operated independently and are therefore subject to separate EIA application processes.

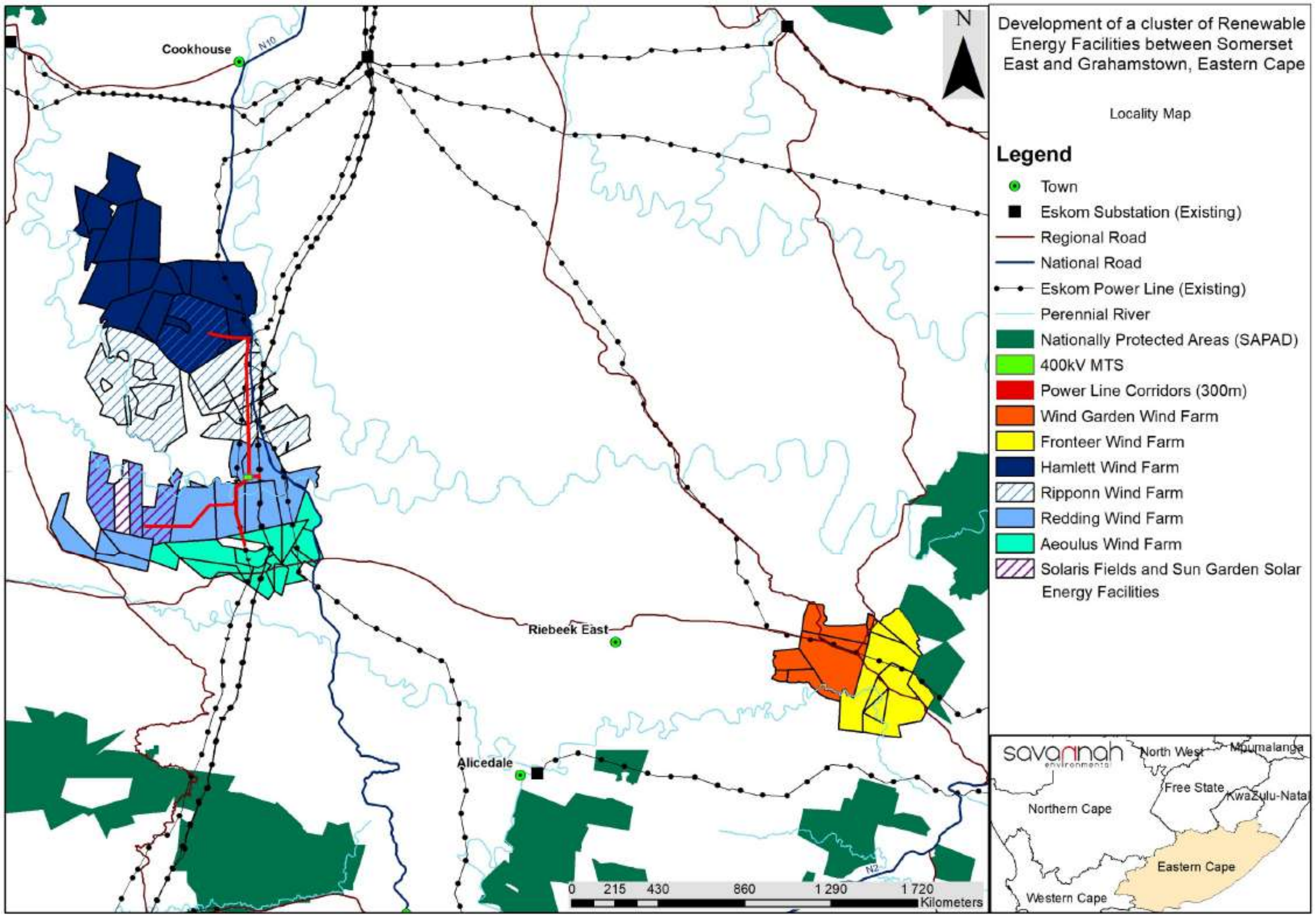

Figure 1.2: The cluster of proposed renewable energy facilities of which the Sun Garden PV Facility forms part

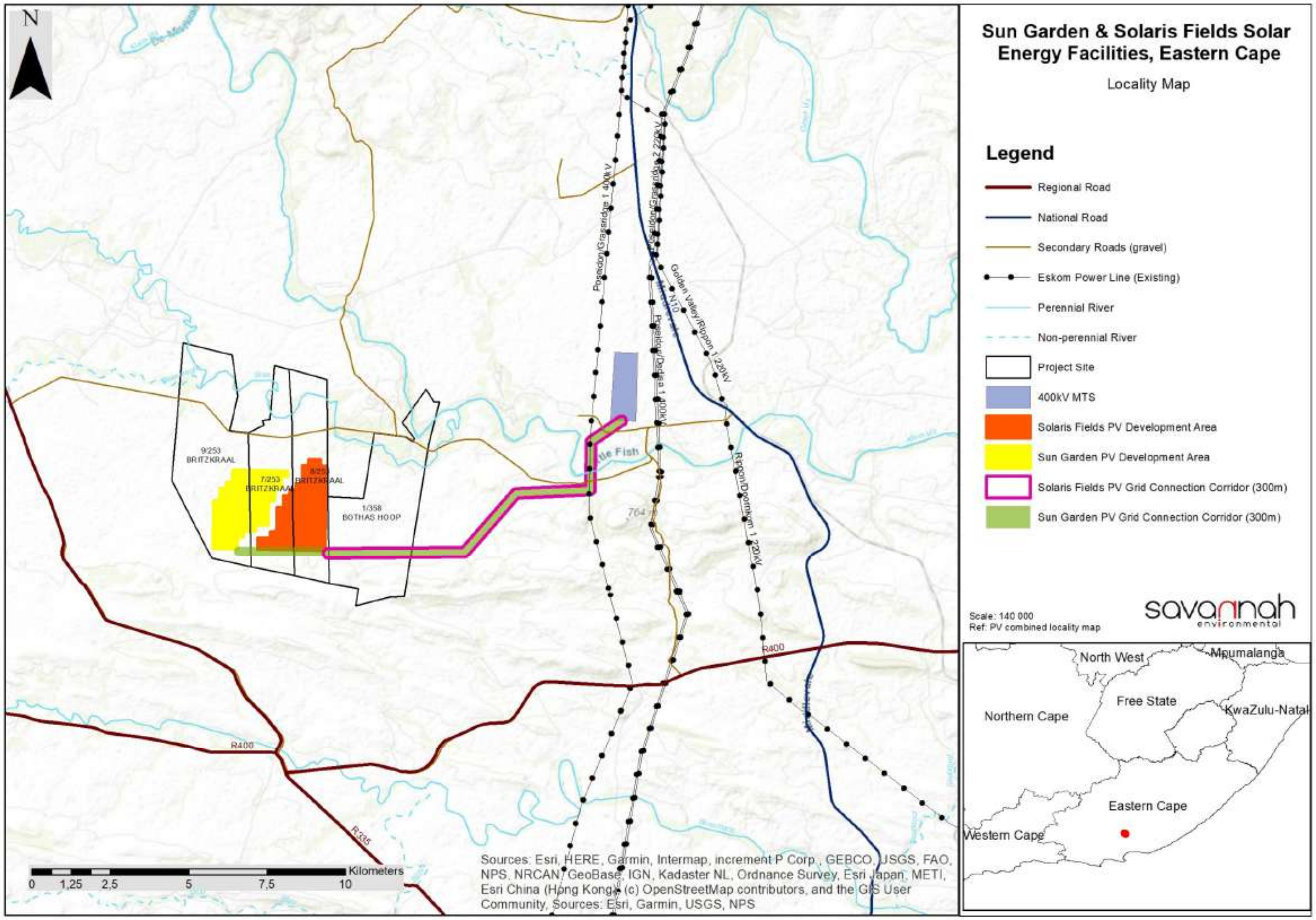

Figure 1.3: Location of the two solar facilities and associated infrastructure which form part of the larger renewable energy cluster being proposed

1.3 Details of the Environmental Assessment Practitioner and Expertise to conduct the BA process

In accordance with Regulation 12 of the 2014 EIA Regulations (GNR 326), Sun Garden (Pty) Ltd has appointed Savannah Environmental (Pty) Ltd as the independent Environmental Assessment consultant to undertake the Basic Assessment and prepare the BA Report for the Sun Garden PV Facility. Neither Savannah Environmental nor any of its specialists are subsidiaries of, or are affiliated to Sun Garden (Pty) Ltd. Furthermore, Savannah Environmental does not have any interests in secondary developments that may arise out of the authorisation of the proposed project.

Savannah Environmental is a specialist environmental consulting company providing a holistic environmental management service, including environmental assessment and planning to ensure compliance and evaluate the risk of development, and the development and implementation of environmental management tools. Savannah Environmental benefits from the pooled resources, diverse skills and experience in the environmental field held by its team.

The Savannah Environmental team have considerable experience in basic assessments and environmental management, and have been actively involved in undertaking environmental studies, for a wide variety of projects throughout South Africa, including those associated with electricity generation.

» *Jo*-Anne *Thomas* is a registered EAP with the Environmental Assessment Practitioners Association of South Africa (EAPASA) and is the registered EAP for this project. She provides technical input for projects in the environmental management field, specialising in Strategic Environmental Advice, Environmental Impact Assessment studies, environmental auditing and monitoring, environmental permitting, public participation, Environmental Management Plans and Programmes, environmental policy, strategy and guideline formulation, and integrated environmental management. Her key focus is on integration of the specialist environmental studies and findings into larger engineering-based projects, strategic assessment, and providing practical and achievable environmental management solutions and mitigation measures. Responsibilities for environmental studies include project management (including client and authority liaison and management of specialist teams); review and manipulation of data; identification and assessment of potential negative environmental impacts and benefits; review of specialist studies; and the identification of mitigation measures. She has managed the EIA processes for more than 100 renewable energy projects (including wind, solar and hydro) across South Africa.
» *Nicolene Venter,* Board Member of IAPSA (International Association for Public Participation South Africa). She holds a Higher Secretarial Diploma and has over 21 years of experience in public participation, stakeholder engagement, awareness creation processes and facilitation of various meetings (focus group, public meetings, workshops, etc.). She is responsible for project management of public participation processes for a wide range of environmental projects across South Africa and neighbouring countries.

In order to adequately identify and assess potential environmental impacts associated with the proposed wind farm, the following specialist consultants have provided input into this BA Report:

Specialist	**Field of Study**
Simon Todd of 3foxes Biodiversity Solutions	Terrestrial Ecology (including fauna and flora)
Adri Barkhuysen of East Cape Diverse Consultants and Dr Steve Percival of Ecology Consulting and Peer	Avifauna (including monitoring)

Specialist	Field of Study
Review by Owen Davies of Arcus Consultancy Services South Africa	
Michael Brits and Mark Hodgson of Arcus Consultancy Services South Africa	Bats
Dr Brian Colloty of EnviroSci	Aquatic
Andrew Husted of The Biodiversity Company	Soil, Land Use, Land Capability and Agricultural Potential
Cherene de Bruyn and Wouter Fourie of PGS Heritage and Elize Butler of Banzai Environmental	Heritage (including archaeology, palaeontology and cultural landscape)
Morné de Jager of Enviro Acoustic Research (EAR)	Noise
Lourens du Plessis of LOGIS	Visual
Conrad Swart and Matthew Keeley of Urban-Econ	Socio-economic
Iris Wink and Adrian Johnson of JG Africa	Traffic

Appendix A includes the curricula vitae for the environmental assessment practitioners from Savannah Environmental and the specialist consultants.

CHAPTER 2: PROJECT DESCRIPTION

This chapter provides an overview of the Sun Garden PV Facility and details the project scope, which includes the planning/design, construction, operation and decommissioning activities required for the development.

2.1. Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA Report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 1: Content of basic assessment reports:

Requirement	Relevant Section
3(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 and (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties.	The location of the proposed project is detailed in Chapter 1, **Table 1.1**, as well as section 2.2.1 below.
3(c)(i)(ii) 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 a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or on land where the property has not been defined, the coordinates within which the activity is to be undertaken	A layout map illustrating the development footprint of the Sun Garden PV Facility, including associated infrastructure is included as **Figure 2.3**. This development footprint has been assessed within this BA Report and the independent specialist studies.
3(d)(ii) a description of the scope of the proposed activity, including a description of the activities to be undertaken including associated structures and infrastructure	A description of the activities to be undertaken with the development of project is included in **Table 2.1** and **Table 2.2**.

2.2 Nature and extent of the Sun Garden PV Facility

The development of the Sun Garden PV facility and associated infrastructure will make electricity capacity available for use by private off takers. The project will be developed in a single phase which will comprise of solar PV technology with a total contracted capacity of up to 400MW. The project will make use of bifacial tracking PV technology.

The Sun Garden PV facility will comprise solar panels which, once installed, will stand less than 2m above ground level. The solar panels will include centralised inverter stations and string inverters mounted above ground. Central inverter height is ~2.5m, whereas string inverters are ~1m.

2.2.1. Overview of the Project Site

The project site is located within the Blue Crane Route Local Municipality and the Sarah Baartman District Municipality, with the entire extent of the site located within the Cookhouse REDZ. The preferred project site (with an extent of ~4 037ha) consists of four affected properties as follows:

» Portion 9 of the farm Britzkraal No 253, Division of Somerset East
» Portion 8 (a Portion of Portion 7) of the farm Britzkraal No 253, Division of Somerset East
» Portion 7 of the farm Britzkraal No 253, Division of Somerset East
» Portion 1 of farm Bothas Hoop 358, Division of Somerset East

The development envelope is ~500ha in extent and the much smaller development footprint[3] of ~350ha will be placed and sited within the development envelope.

Access to the project site is ample with the presence of existing roads mainly consisting of national and regional roads. The project site is situated directly adjacent, to the west, of the N10 national road, which provides access to the project site and development envelope (**Figure 2.1**). The R335 is located directly adjacent and to the west of the project site and the R400 is located to the south of the project site. The Beenleegte Secondary gravel road provides direct access to the project site and the development envelope. This route will be utilised for accessing the project site, development envelope and development footprint (**Figure 2.2**).

Figure 2.1: Location of the N10 national road, R335 and R400 regional roads in relation to the Sun Garden PV Facility project site (project site shown in light blue).

3 The footprint has been subject to detailed design by the developer through the consideration of sensitive environmental features identified by independent specialists, which need to be avoided by the solar facility.

Figure 2.2: Proposed access road for the Sun Garden PV Facility

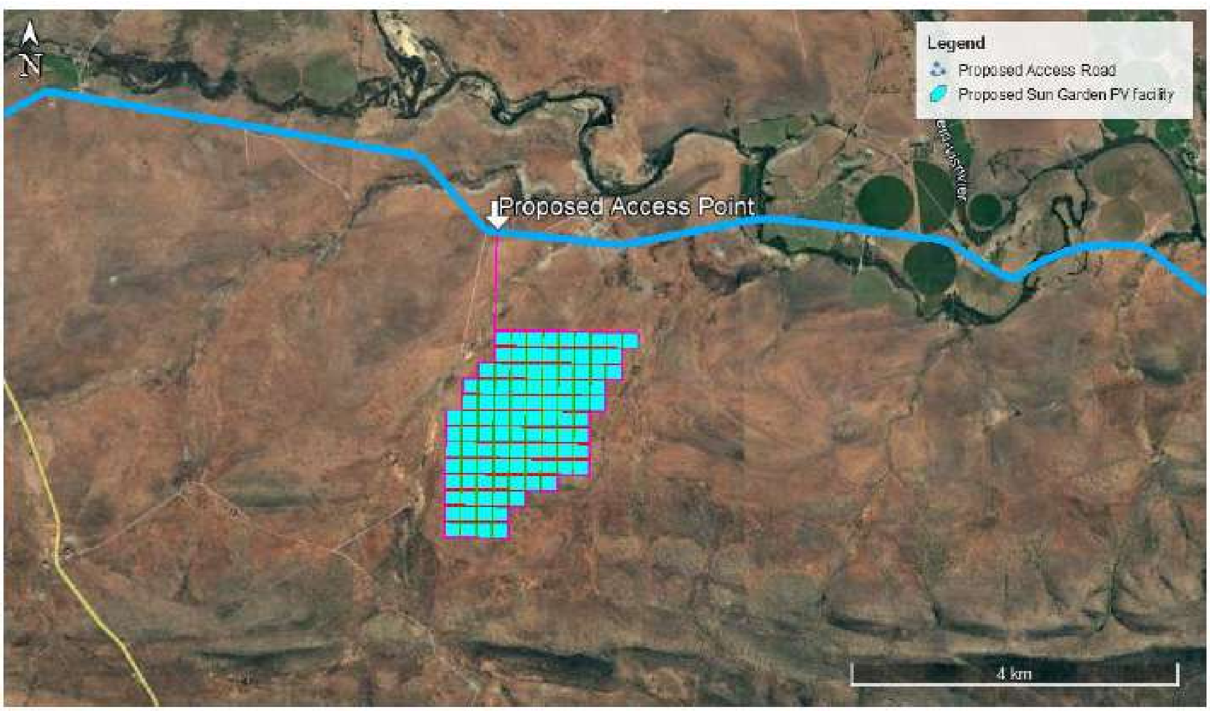

Figure 2.3: Proposed access point to the Sun Garden PV Facility

2.2.2. Components of the Sun Garden PV Facility

The project site is proposed to accommodate both the PV facility as well as most of the associated infrastructure which is required for such a facility (with portions of the power line route located on properties outside of the project site), and will include:

- » Solar PV array comprising PV modules and mounting structures.
- » Inverters and transformers.
- » Cabling between the project components, lain underground where practical.
- » A 132/33kV on-site collector substation to be connected to a proposed 400kV Main Transmission Substation (MTS) located to the north-east of the site via a new 132kV overhead power line (twin turn dual circuit line). The development of the proposed 400kV Main Transmission Substation will be assessed as part of the separate BA process in order to obtain Environmental Authorisation.
- » Site offices and maintenance buildings, including workshop areas for maintenance and storage.
- » Temporary laydown areas.
- » Access roads to the site and between project components with a width of approximately 4,5m. The main access points will be 8m wide.
- » Water supply pipelines from onsite boreholes.
- » A temporary concrete batching plant.
- » Staff accommodation (temporary).
- » Operation and Maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitor's centre.

The new 132kV overhead power line to connect the solar facility to the proposed 400kV Main Transmission Substation will follow a route within the project site to the north-east to complete the connection. The majority of the properties affected by the power line form part of the Redding Wind Farm project site.

A summary of the details and dimensions of the planned infrastructure associated with the project is provided in **Table 2.1.** The confirmed details and dimensions of the facility development footprint was assessed as part of the independent specialist studies undertaken as part of the Basic Assessment process. **Figure 2.3** illustrates the proposed development footprint of the Sun Garden PV Facility assessed as part of this BA report, as well as the full extent of the proposed power line and the connection of the power line at the proposed 400kV MTS (assessed as part of a separate BA process).

Table 2.2 provides the details regarding the requirements and the activities to be undertaken during the project development phases, and **Table 2.3** provides photographs of the construction phase of a solar facility similar in nature to the Sun Garden PV Facility.

Table 2.1: Confirmed details or dimensions of the proposed development footprint of the Sun Garden PV Facility

Infrastructure	Footprint and dimensions
Contracted capacity of the facility	Up to 400MW
Development footprint (permanent infrastructure) area	~350ha (including all associated infrastructure)
PV panels	» Height: ~2m from ground level (installed). » Up to 750 000 panels required. » Bifacial tracking PV technology
Grid connection	A proposed 132/33kV on-site collector substation to be connected to a proposed 400kV Main Transmission Substation (MTS) located to the north-east via a new 132kV overhead power line (twin turn dual circuit line). The development of the proposed 400kV Main Transmission Substation has been assessed as part of the separate BA process in support of application for Environmental Authorisation.
Area occupied by the on-site collector substation	~1ha (a larger area of 5ha is being assessed for the placement of the infrastructure as part of the development footprint to allow for the avoidance of sensitive environmental features)
Capacity of on-site collector substation	132/33kV
Length of the power line	~12km
Capacity and circuit of the power line	132kV twin turn dual circuit
Height of the power line towers (pylons)	Up to 26m
Power line servitude width	Up to 35m
Area occupied by the Balance of Plant and the infrastructure it contains	The Balance of Plant (BoP) area will be ~12ha in extent and will include the following infrastructure: » Temporary laydown areas; » A temporary concrete batching plant; » Staff accommodation (temporary); and » Operation and Maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitor's centre. No permanent laydown area is required for operation. Areas affected by temporary infrastructure will be rehabilitated following the completion of the construction phase, where it is not required for the operation phase.
Access and internal roads	Existing roads on the affected properties will be used where feasible and practical. The width of the roads at the access points will be up to 8m. The internal access roads will be up to 4.5m wide, and will have a servitude of up to 13.5m.
Underground cabling	Underground cabling will be installed to connect the string inverters to the central inverters and the central inverters to the on-site facility substation. The cabling will have a capacity of up to 33kV.

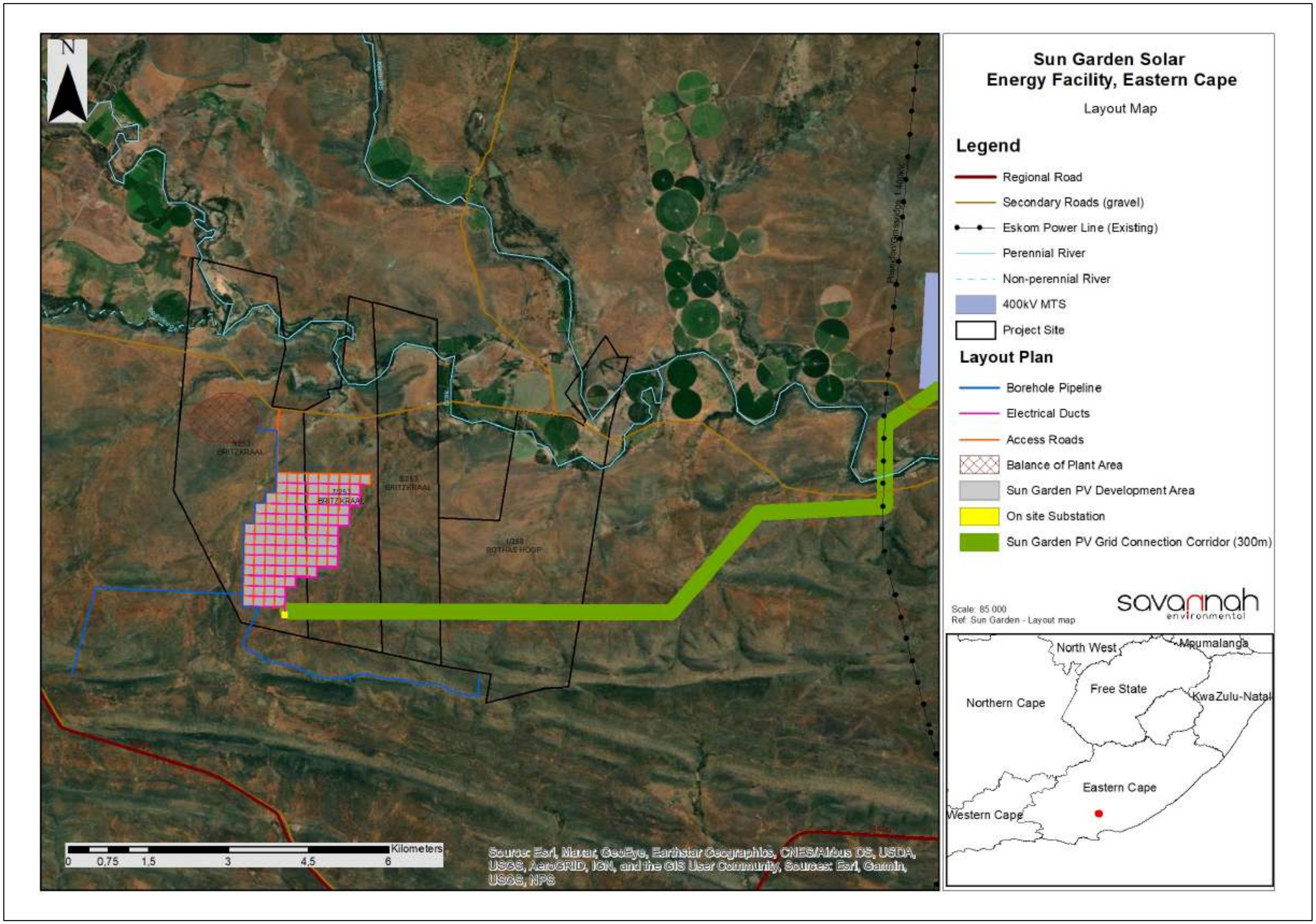

Figure 2.3: Development footprint (~350ha) assessed within this BA Report for the Sun Garden PV Facility, including the 132kV power line

2.2.3 Project Development Phases associated with the Sun Garden PV Facility

Table 2.2: Details of the project development phases (i.e. construction, operation and decommissioning)

	Pre-construction
Requirements	» Planning and Design of facility
Activities to be undertaken	
Site preparation	» Confirming the integrity of site access to accommodate the required equipment. » Preparation of the site (e.g. laydown areas). » Mobilisation of construction equipment.
Conduct surveys prior to construction	» Including, but not limited to: a detailed geotechnical survey, site survey and confirmation of the infrastructure micro-siting footprint, survey of the on-site substation site and O&M building area to determine and confirm the locations of all associated infrastructure.
	Construction Phase
Requirements	» Project requires Environmental Authorisation from DFFE, a generation license issued by NERSA, and a wheeling agreement secured with Eskom. » Duration expected to be up to 30 months for the Sun Garden PV Facility. » Create direct construction employment opportunities: Up to 698 jobs (at peak of construction) created and maintained for approximately two and a half years. » Staff accommodation will be provided on site during the construction phase which will house a maximum of 580 employees at the peak of the construction phase. » Security staff will also be present during the night-time of the construction phase. » Waste removal and sanitation will be undertaken by a sub-contractor or the municipality, where possible. Waste containers, including containers for hazardous waste, will be located at easily accessible locations on site as well as within the BoP area when construction activities are undertaken. » Electricity required for construction activities will be generated by a generator or will be sourced from available 11kV or 22kV Eskom distribution networks in the area. » Water will be required for the construction phase, which will be approximately 12512,10kl in total for the construction activities and 34004,96kl for human consumption. Water will be sourced from existing boreholes in the area.
Activities to be undertaken	
Establishment of access roads to the Site	» Access/haul roads and internal access roads within the site will be established at the commencement of construction. » Existing access roads will be utilised where possible to minimise impact and upgraded where required. » Access roads to the site will have a width of up to 8m. » Access roads to be established between the project components for construction and/or maintenance activities within the development footprint.

	» Internal service road alignment will be approximately 4,5m wide, and will have a servitude of 13.5m.
Undertake site preparation	i) Including the clearance of vegetation at the footprint of each support structure, establishment of the laydown areas, the establishment of internal access roads and excavations for foundations. ii) Stripping of topsoil to be stockpiled, backfilled, removed from site and/or spread on site. iii) To be undertaken in a systematic manner to reduce the risk of exposed ground being subjected to erosion. iv) Include search and rescue of floral Species of Conservation Concern (where required) and the identification and excavation of any sites of cultural/heritage value (where required).
Establishment of laydown areas and batching plant on site	» A laydown area for the storage of project components, including the PV panels and civil engineering construction equipment. » The laydown area will also accommodate building materials and equipment associated with the construction of buildings. » Infilling or depositing materials will be sourced from licenced borrow pits within the surrounding areas. The identification and permitting process of required borrow pits has been commenced as part of a separate EIA process and the Application for Environmental Authorisation is independent of the Sun Garden EIA application. » A temporary concrete batching plant of 50m x 50m in extent to facilitate the concrete requirements for solar facility foundations. This will be located within the Balance of Plant (BoP) area.
Transport of components and equipment to and within the site	» Transportation will take place via appropriate National and Provincial roads, and the dedicated access/haul road to the site. » Some of the components (i.e. substation transformer) may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989) by virtue of the dimensional limitations. » Typical civil engineering construction equipment will need to be brought to the site (e.g. excavators, trucks, graders, compaction equipment, cement trucks, etc.) as well as components required for the mounting of the PV support structures, construction of the substation and site preparation.
Erect PV Panels and Construct Substation, Inverters	» Installation of the solar PV panels and the structural and electrical infrastructure to make the plant operational. » For array installation, typically vertical support posts/piles are driven into the ground. Depending on the results of the geotechnical investigation a different foundation method may be required. Different options include a screw pile, helical pile, micro-pile or drilled post/pile which may or may not need to be cast in concrete underground at an appropriate depth as determined by the Geotechnical investigation. The posts will hold the support structures (tables) on which PV arrays would be mounted. Brackets attach the PV modules to the tables. » Trenches are dug for the underground AC and DC cabling and the foundations of the inverter enclosures and transformers are prepared. » Wire harnesses connect the PV modules to the electrical collection systems.
Construction of the substation	» One on-site substation to be constructed within the development footprint. » Substation will be constructed with a high-voltage yard footprint.
Establishment of ancillary infrastructure	» Operation and Maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitors centre. » Temporary staff accommodation is required for the duration of construction. » Establishment will require the clearing of vegetation, levelling and the excavation of foundations prior to construction.

Connection of PV facility to the onsite substation	» Underground cables and overhead circuits connect the string inverters to the on-site AC electrical infrastructure (central inverter) and ultimately the project's on-site substation. » Excavation of trenches are required for the installation of the cables. Trenches will be approximately 1.2m deep. » Underground cables are planned to follow the internal access roads, as far as possible.
Connect substation to the power grid	1. A 132/33kV on-site collector substation to be connected to a proposed 400kV Main Transmission Substation (MTS) located to the north-east via a new 132kV overhead power line (twin turn dual circuit line).
Undertake site rehabilitation	1. Commence with rehabilitation efforts once construction is completed in an area, and all construction equipment is removed. 2. On commissioning, access points to the site that will not be required for the operation phase will be closed and prepared for rehabilitation.
Operation Phase	
Requirements	» Duration will be 20-25 years, or longer depending on need for the project. » Requirements for security and maintenance of the facility. » Employment opportunities relating mainly to operation activities and maintenance. Up to 20 full-time and 60 temporary direct employment opportunities will be available. » Water will be required for the operation phase. Approximately 3864kl of water per annum will be required for the cleaning of the PV modules. Water will be sourced from existing boreholes in the area. » Current land-use activities being undertaken within the project site can continue during the operation of the PV facility.
Activities to be undertaken	
Operation and Maintenance	» Full time security, maintenance and control room staff. » PV facility will be operational except under circumstances of mechanical breakdown, inclement weather conditions, or maintenance activities. » PV facility to be subject to periodic maintenance and inspection. » Disposal of waste products (e.g. oil) in accordance with relevant waste management legislation. » Areas which were disturbed during the construction phase to be utilised should a laydown area be required during operation. » PV panels will be washed during operation utilising clean water or non-hazardous biodegradable cleaning products. Wastewater generated by washing can be allowed to run-off under the panels.
Decommissioning Phase	
Requirements	» Decommissioning of the Sun Garden PV Facility infrastructure at the end of its economic life. » Potential for repowering of the facility, depending on the condition of the facility at the time. » Expected lifespan of approximately 20 - 25 years (with maintenance) before decommissioning is required. » Decommissioning activities to comply with the legislation relevant at the time.
Activities to be undertaken	
Site preparation	» Confirming the integrity of site access to accommodate the required equipment. » Preparation of the site (e.g. laydown areas and construction platform).

	» Mobilisation of equipment required for decommissioning.
Disconnect, Disassemble and remove solar facility components	» Disconnect the facility from the grid. » Dismantle all panels, mounting structures and foundations in line with all relevant legislation. » Recycle, repurpose and re-use as much of the decommissioned project components as possible in accordance with regulatory requirements. » Concrete foundations will be removed to a depth as defined by an agricultural specialist. » Backfill the mounting structure holes and rehabilitate the area appropriately. » Visible cables will be removed. » Access roads will either be left for use by landowners/future landowners, or covered with topsoil or reduced in width. » A final site walkthrough will be conducted to remove debris and/or waste generated within the site during the decommissioning process. » Rehabilitation may include top soiling, raking, and/or re-seeding (whichever is appropriate).

It is expected that the areas of the project site affected by the solar facility infrastructure (development footprint) will revert back to their original land-use (i.e. primarily grazing) once the Sun Garden PV Facility has reached the end of its economic life and all infrastructure has been decommissioned.

Table 2.3: Photographs of the construction phase of a solar facility similar to the Sun Garden PV Facility

v) Water supply

A groundwater feasibility study was undertaken by JG Afrika, including consideration of water availability and feasibility of use for the project, as well as indications of areas to investigate further for the establishment of boreholes (refer to **Appendix Q**).

Based on DWS data, the project site falls within the P10C, P10D, Q70B, Q70C, Q80E, Q80F and Q80G quaternary catchments. Groundwater in all catchments is classified as under-utilised except in Q80F, which is heavily utilised. The dominant groundwater use is for livestock watering except in Q80F which has a large irrigation use portion.

The project areas are typically underlain by a fractured aquifer type which is characterised as having median borehole yields in the range 0.5 to 5.0l/s. Between 40 and 50% of boreholes within the Beaufort Group and Dwyka Formation lithologies yield under 0.5l/s. The Ecca Group shows an improvement with only 41% of boreholes yielding less than 2.0l/s. Arenaceous lithologies within the Witteberg Group also show more success with borehole yields often being above 2.0l/s. From a recharge perspective it was calculated that <1.0% of the recharge would be required to meet a batching plant demand of 30m^3/d. On this basis, the groundwater resources would not be stressed by the specified demand and groundwater is considered a suitable supply option.

Water quality within the Beaufort, Ecca and Witteberg Groups is often poor, with elevated EC, Na, Mg, Ca, Cl and SO_4 being expected. A suitable treatment method of water will be used where required, in order to render the water suitable for construction and concrete use.

vi) Handling and Disposal of Sewage During Construction and Post-Construction

A study to determine the determine the volumes of sewerage to be disposed by the Contractor's site camp, as well as permanent offices and maintenance depots and the most efficient form of sanitation that can be utilised in dealing with the effluent was undertaken by Engineering Advice & Services (Pty) Ltd (refer to **Appendix Q**).

Several different sewage technologies were researched to determine the most suitable technology for the Project. These technologies vary from simplistic, yet effective, technologies such as septic tanks, to modern on-site treatment technologies. Technologies for on-site treatment (such as Septic Tanks and a combination of the Khusela Dry Sanitation Toilets) are envisaged to be used during construction at the Contractor's main site camp, where a large demand is expected, as well as the main buildings post construction. The different sewage handling technologies (VIP toilets, portable chemical toilets etc) are expected to be used at the various locations where construction is occurring.

Wastewater and sludge shall be managed by local authorities and service providers in an environmentally acceptable manner by adhering to the *Guidelines for the Utilisation and Disposal of Wastewater Sludge Volumes 1 to 6 (Herselmann & Snyman, 2006)*. These guidelines replace all previous guidelines that are currently being implemented by the local authorities.

CHAPTER 3: ALTERNATIVES

This chapter details the preferred site location, activity and technology alternatives as well as the 'do nothing' option for the Sun Garden PV Facility.

3.1. Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA Report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 1: Content of basic assessment reports:

Requirement	Relevant Section
3(g) a motivation for the preferred site, activity and technology alternative	The identification and motivation for the preferred project site, the development footprint within the development envelope, the proposed activity and the proposed technology is included in sections 3.3.1, 3.3.2 and 3.3.3.
3(h)(i) details of the alternative considered	The details of all alternatives considered as part of the Sun Garden PV Facility is included in sections 3.3.1 – 3.3.4. A summary of the alternative is also included in section 3.3.
3(h)(ix) the outcome of the site selection matrix	The site selection process followed by the developer in order to identify the preferred project site, development envelope and development footprint is described in section 3.3.1.
3(h)(x) if no alternatives, including alternative locations for the activity were investigation, the motivation for not considering such	Where no alternatives have been considered, motivation has been included. This is included in section 3.3.

3.2 Alternatives Considered during the BA Process

In accordance with the requirements of Appendix 1 of the 2014 Environmental Impact Assessment (EIA) Regulations (GNR 326), reasonable and feasible alternatives including but not limited to site and technology alternatives, as well as the "do-nothing" alternative should be considered.

The DEA Guideline for determining alternatives states that the key criteria for consideration when identifying alternatives are that they should be "practicable", "feasible", "relevant", "reasonable" and "viable". Essentially there are two types of alternatives:

» Incrementally different (modifications) alternatives to the project.
» Fundamentally (totally) different alternatives to the project.

In this instance, 'the project' refers to Sun Garden PV Facility, a solar energy facility with capacity of up to 400MW, and associated infrastructure proposed to be developed by an Independent Power Producer (IPP) and intended to provide electricity to private off takers.

3.2.1 Consideration of Fundamentally Different Alternatives

Fundamentally different alternatives are usually assessed at a strategic level and, as a result, project-specific environmental impact assessments (including BA processes) are therefore limited in scope and ability to address fundamentally different alternatives. At a strategic level, electricity generating alternatives have been addressed as part of the DMRE's current Integrated Resource Plan for Electricity 2010 – 2030 (IRP)[4], and will continue to be addressed as part of future revisions thereto. In this regard, the need for renewable energy power generation from solar energy facilities has been identified as part of the technology mix for power generation in the country for the next 20 years.

The fundamental energy generation alternatives were assessed and considered within the development of the IRP and the need for the development of renewable energy projects has been defined. Therefore, fundamentally different alternatives to the proposed project are not considered within this BA process.

3.2.2 Consideration of Incrementally Different Alternatives

Incrementally different alternatives relate specifically to the project under investigation. "Alternatives", in relation to a proposed activity, means different ways of meeting the general purposes and requirements of the activity, which may include alternatives for:

» The property on which, or location where the activity is proposed to be undertaken.
» The type of activity to be undertaken.
» The design or layout of the activity.
» The technology to be used in the activity.
» The operational aspects of the activity.

In addition, the option of not implementing the activity (i.e. the "do-nothing" alternative) must also be considered.

The sections below describe the incrementally different alternatives being considered as part of the Sun Garden PV Facility. Where no alternative is being considered, a motivation has been provided as required by the EIA Regulations, 2014 (as amended).

3.3 Project Alternatives under Consideration for the Sun Garden PV Facility

Table 3.1 provides an overview of the alternatives being considered as part of the project:

Table 3.1: Summary of the alternatives considered as part of the Sun Garden PV Facility.

Nature of Alternatives Considered	Description of the Alternative relating to the Sun Garden PV Facility
Site-specific and Layout Alternatives	One preferred project site has been identified for the development of the Sun Garden PV Facility due to site specific characteristics such as the solar resource, land availability, topographical considerations and environmental features. The project site is 4 037ha in extent which is considered to be sufficient for the development of a solar facility with a contracted capacity of up to 400MW. The location of the project site within a REDZ has also been a significant determination for site-specific identification. The route of the grid

[4] The Integrated Resource Plan (IRP) is legislated policy which regulates power generation planning.

Nature of Alternatives Considered	Description of the Alternative relating to the Sun Garden PV Facility
	connection corridor assessed for the placement of the new 132kV power line was identified based on feedback from the specialists, specifically the avifauna specialist, who considers the consolidation of linear infrastructure as a measure to mitigate impact.
Activity Alternatives	Since the core business of the project developer/applicant is the development of renewable energy, only the development of a renewable energy facility is considered by Sun Garden (Pty) Ltd. Other development options are thus not technically feasible.
Technology Alternatives	Due to the location of the project site and the suitability of the solar resource, as well as the consideration of environmental factors and current land use, only the development of a solar facility is considered feasible. Bifacial tracking PV technology is being proposed. This is the latest solar PV technology to be adopted and has not yet been installed within South Africa.
'Do-nothing' Alternative	This is the option to not construct the Sun Garden PV Facility. No impacts (positive or negative) are expected to occur on the social and environmental sensitive features or aspects located within or within the surrounding areas of the project site. The opportunities associated with the development of the solar facility for the affected area and other surrounding towns in the area will not be made available.

These alternatives are described in more detail in the sections which follow.

3.3.1 Site-specific and Layout Alternatives

The Sun Garden PV Facility site is planned to the south-east and south-west of Somerset East and Cookhouse, respectively, and north-west of Riebeek East.

The preferred project site for the development of the Sun Garden PV Facility was identified through an investigation of prospective sites and properties in the area within the Eastern Cape. The investigation involved the consideration of specific characteristics within the Province and specifically within the areas near Somerset East, Cookhouse and Riebeek East. The characteristics considered were identified by the developer as the main aspects that play a role in the opportunities and limitations for the development of a solar facility. The characteristics considered, and the results thereof, are discussed in the sections below. The developer considered that should these characteristics not be favourable for the development of a solar facility, then some limitations and challenges may be expected and potentially hinder such development.

» **National and Provincial and Local Planning Considerations** - Renewable energy is strongly supported at a national, provincial, and local level. At a national level, the development of and investment in renewable energy is supported by the National Development Plan (NDP), New Growth Path Framework and National Infrastructure Plan, which all refer to renewable energy. Renewable energy is also supported at a provincial and local municipal level. The area considered for the Sun Garden PV Facility falls within the Cookhouse REDZ and the Eastern Strategic Transmission Corridor. The area was designated as a REDZ and Strategic Transmission Corridor by virtue of the favourable wind and solar resource and existing and planned grid connection infrastructure. As a result, Sun Garden (Pty) Ltd identified this area as a suitable area for the development of commercial renewable energy facilities, including the Sun Garden PV Facility, with the main aim to supply the electricity generated to private off-takers who have a need to shift towards cleaner and more sustainable sources of energy.

» **Prevailing climatic conditions** – The Cookhouse REDZ within which the site is located has been earmarked as a hub for the development of solar and wind energy projects due to the viability of the solar and wind resources for the area. The economic viability of a solar PV facility is directly dependent on the annual direct solar irradiation values of the area within which it will operate. The Global Horizontal Irradiation (GHI) for the study area is between 1880 kWh/m²/annum and 2000 kWh/m²/annum (refer to **Figure 3.1**).

»

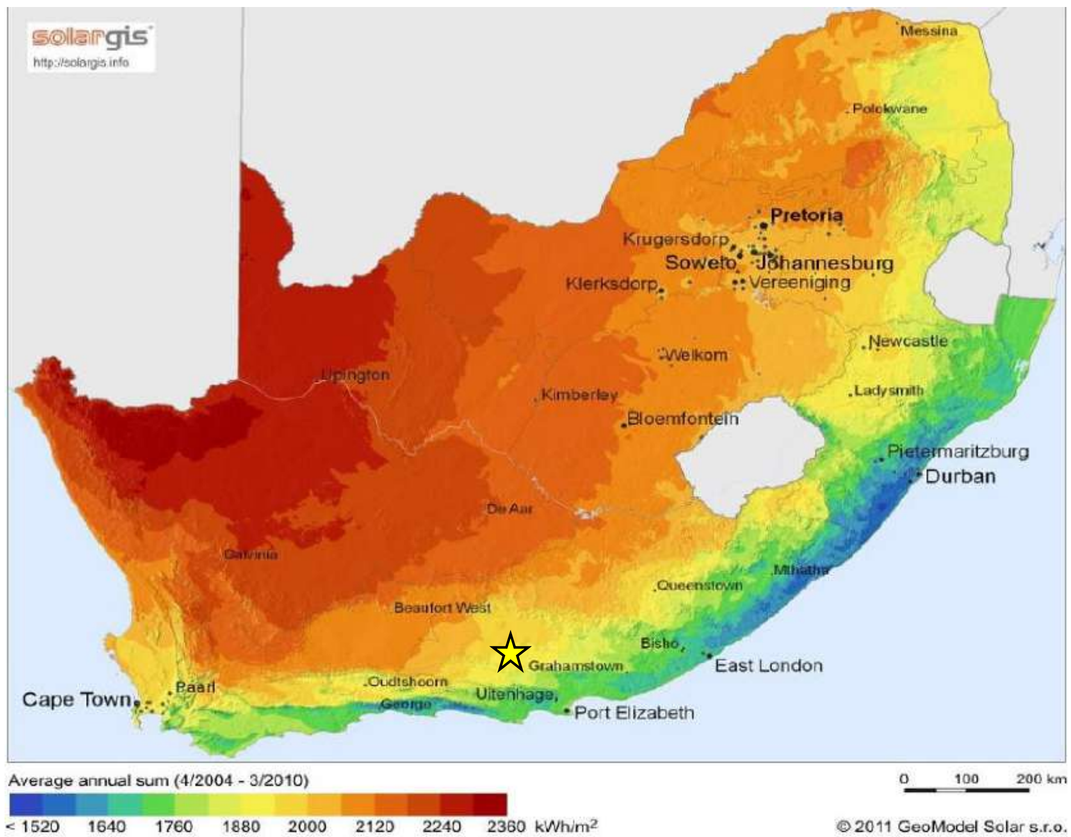

Figure 3.1: Solar irradiation map for South Africa; the proposed Sun Garden PV Pacility position is shown by the yellow star on the map. (Source: adapted from GeoModel Solar, 2011).

» **Land Availability** – In order to develop the Sun Garden PV Facility with a contracted capacity of up to 400MW (with a footprint of 350ha) sufficient space is required. The preferred project site was identified within the Eastern Cape Province and in the Somerset East / Cookhouse / Riebeek East area following the confirmation of a feasible solar resource. The properties included in the project site are privately-owned parcels available in the area for a development of this nature through agreement with the landowners and are deemed technically feasible by the project developer for such development to take place. The combination of the affected properties has an extent of ~4 037ha, which was considered by the developer as sufficient for the development of the ~350ha development footprint required for the PV facility. This footprint was informed by the consideration of environmental constraints and sensitivities, as discussed further below.

» **Access to the National Electricity Grid** – Following the confirmation of sufficient available land for the development of the solar facility, the developer considered the possible grid connection points in order to evacuate the generated electricity into the national grid. This was considered as a vital aspect by the developer for the project in order to reduce transmission costs and environmental and social impact as much as possible. The developer consulted with the Eskom network planners to understand the current capacity of the existing grid connection infrastructure and to identify feasible connection points for the solar facility. It was identified that a 400kV Main Transmission Substation (MTS) is required to facilitate the connection of the various renewable energy facilities located within the western section of the proposed cluster. This MTS is being assessed as part of a separate BA process and will cater for the connection of four wind farms and two solar energy facilities (including Sun Garden PV facility). The connection of the 400kV MTS to the national grid for the evacuation of the generated electricity will also be undertaken as part of the separate BA process as mentioned above and will include the development of two new 400kV loop-in loop-out power lines to the existing Poseidon-Grassridge No.2 400kV power line and the existing Poseidon – Dedisa No.1 400kV power line. Existing power line infrastructure is located within the surrounding are of the project site, located to the east of the project site, which includes the Golden Valley-Rippon 1 220kV power line, Poseidon-Grassridge 1 400kV power line, Poseidon-Grassridge 2 220kV power line and Ripponn-Doornkom 1 220kV power line.

» **Geographical and Topographical Considerations and Existing Infrastructure** – The greater area surrounding the project site has agricultural activities (mainly grazing, centre pivots and game farming) and eco-tourism (including nationally protected areas) as the dominant land uses. The developer considered the potential opportunity for the Sun Garden PV Facility to bring some relief to the area and the affected landowners and surrounding communities in terms of socio-economic development, skills development and upliftment. The owners have indicated that the potential revenue received from rental income derived from the PV facility could be utilised to invest in solutions to mitigate challenges currently facing the agricultural industry in the surrounding area i.e., droughts, feed prices etc.
»
» The availability of existing infrastructure was also considered by the developer as this will enable the solar facility development to make use of infrastructure already available and reduce the disturbance associated with the construction of the associated infrastructure. The existing road network within the surrounding areas and within the project site makes access to the development area readily available. The developer also considered the fact that the project site has little infrastructure related to residential or tourism uses, which may be affected by the development of a solar facility.
»
» From a topographical perspective there are very few physical constraints present which would have an effect on the construction of the PV facility.

» **Environmental Screening and consideration of sensitive environmental features** – Following the confirmation of the broader area being considered for the cluster of renewable energy developments as being technically feasible for the development of wind and solar facilities, the developer commenced with the environmental screening of the site, to evaluate the main constraints and opportunities and determine whether or not there were any potential fatal flaws or significant no-go areas within the site that might compromise or limit the development of the Sun Garden PV Facility and the potential for generating 400MW. The screening exercise took place prior to the commencement of the BA process and included specialist investigations of a broader area which considered the development of wind and solar facilities within the western section of the cluster (**Figure 3.2**). This included field investigations by the specialist team appointed to undertake the BA studies, as well as desk-top consideration of environmental constraints. The purpose of this phase of the process was to identify sensitive and no go areas, as well as determination of appropriate buffers to be considered within the development of the project layout. The sensitivity spatial data compiled by the specialist team for this larger site was provided to the applicant prior to the lodging of the application for environmental authorisation. This is a common approach in the development of renewable energy projects in order to inform the placement of infrastructure for further investigation in the BA process.

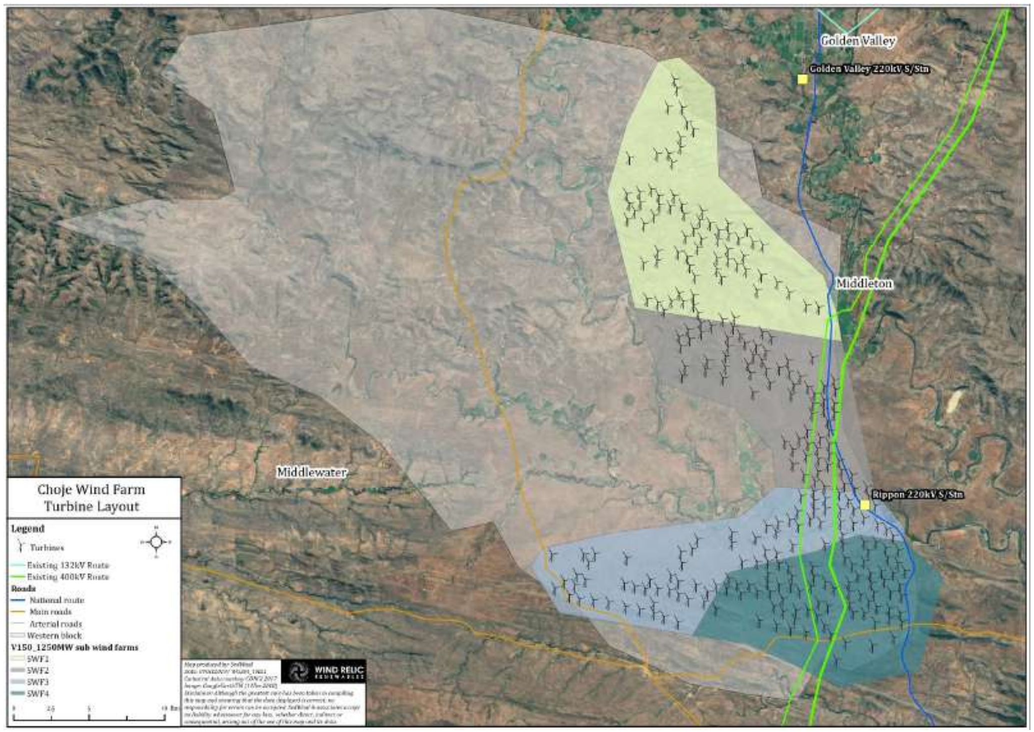

Figure 3.2: Broader area considered for the development of renewable energy facilities within the western section of the cluster

» Through the integration of the specialist sensitivity data obtained, based on field-surveys, the developer optimised the development footprint to consider areas and features of high environmental sensitivity through avoidance of these features, including the consideration for the placement of the power line corridor. Through this process, the most suitable locations for the placement of wind and solar developments were identified for further investigation through the BA process (**Figure 3.3**). Where avoidance was not possible, the developer provided details of technical mitigation planned to reduce the significance of the potential environmental impacts associated with the project. This has resulted in the consideration of a development footprint as part of the BA process which is designed to be environmentally appropriate as far as possible.

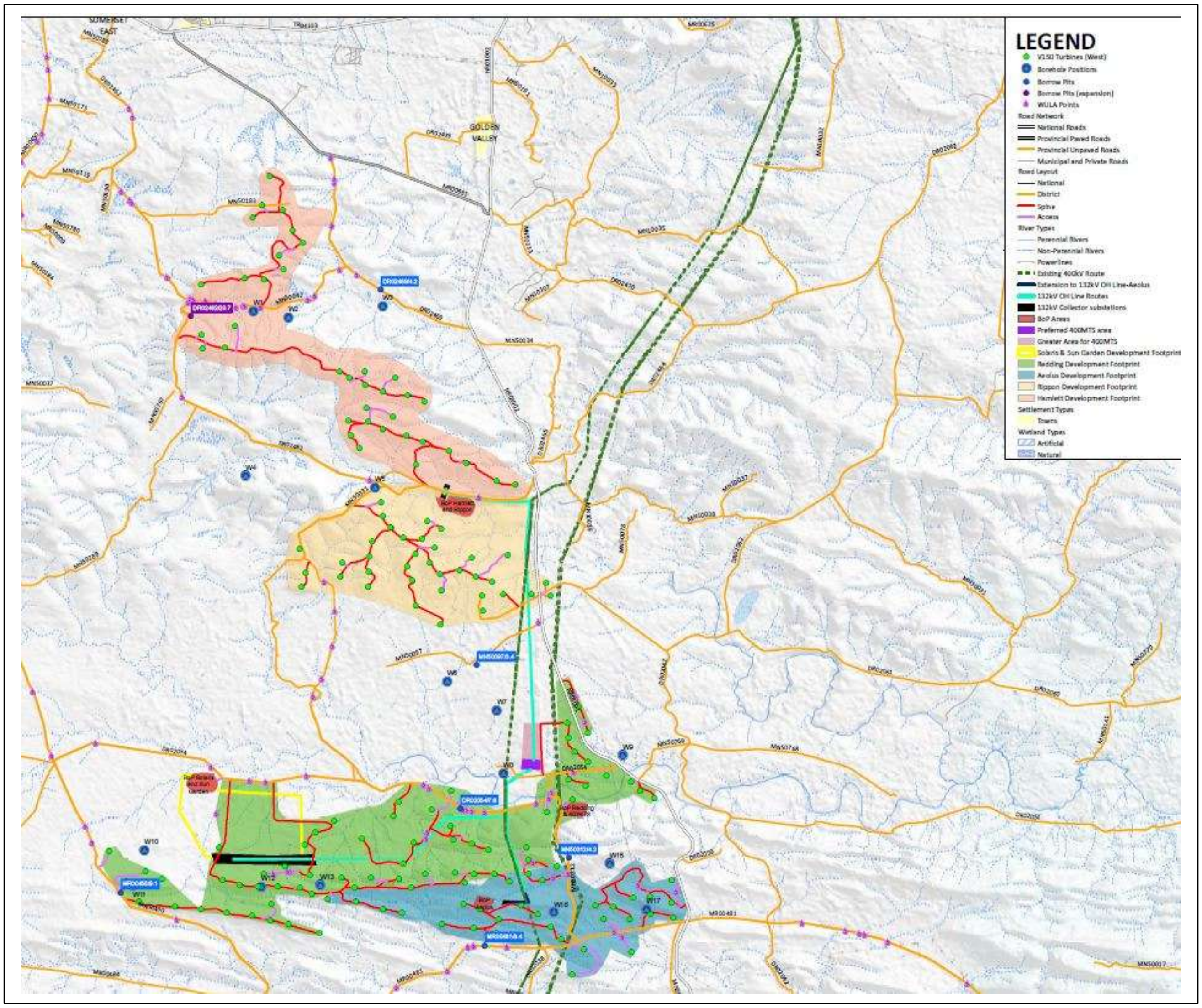

Figure 3.3: Optimised location for wind and solar facilities following consideration of specialist sensitivity inputs. These locations have been assessed through separate BA processes for each facility.

Based on the above considerations, the Sun Garden PV Facility project site was identified by the developer as being the most technically feasible and viable project site within the broader area for further investigation in support of an application for authorisation for a PV facility. No feasible alternative sites were identified for assessment as part of this BA process. The site selection and layout optimisation process applied by the developer (which includes the process followed above) demonstrates due consideration of the suitability of the project site for the Sun Garden PV Facility in line with a typical mitigation hierarchy:

1. First Mitigation: avoidance of adverse impacts as far as possible by use of preventative measures (in this instance an environmental screening and integration process assisted in the avoidance of identified sensitive areas).
2. Second Mitigation: minimisation or reduction of adverse impacts to 'as low as practicable' through implementation of mitigation and management measures (in this instance the development of technical mitigation solutions as well as recommendations from the various environmental specialists).

3. Third Mitigation: remedy or compensation for adverse residual impacts, which are unavoidable and cannot be reduced further.

As part of the site selection process and environmental screening, as described above, the first tier of avoidance has already been applied prior to the BA process. No feasible alternative layouts have been identified for investigation. Therefore, as part of the BA process the development footprint has been fully assessed and the impact of the solar facility ground-truthed by independent specialists. The significance of the impacts associated with the proposed development footprint and the appropriateness of the layout has been assessed and is included in Chapter 9 and **Appendices D – M.** No further optimisation of the layout has been recommended, as detailed in this BA Report and supporting specialist studies.

Where any further conflicts in terms of the development footprint and environmental and social sensitivities or features occur, the mitigation strategy will be further implemented to refine the layout in order to meet the objectives of the mitigation hierarchy (i.e. avoid, minimise, mitigate). This application of the mitigation strategy will result in the identification of the preferred optimised development footprint for the project.

3.3.2 Activity Alternatives

Sun Garden (Pty) Ltd is a renewable energy project developer and as such will only consider renewable energy activities in accordance with the need for such development as identified within the IRP. The only activity considered for implementation on the identified site is therefore power generation. Therefore, no activity alternatives are considered within this Basic Assessment.

3.3.3 Technology Alternatives

Considering the available natural energy resources within the area, as detailed in the previous sections, and the current significant restrictions placed on other natural resources such as water, it is considered that solar energy is the preferred option for the development of a PV facility within the preferred project site. In addition, grid connection infrastructure to connect the solar facility to the national grid is present in the surrounding area which enables an easy and short connection.

Considering the suitability of the project site for the development of a solar facility, the current land-use activities being undertaken within the project site which relate to grazing and compatibility thereof with the proposed development, the size of the development footprint for the solar facility (i.e. ~350ha) and the minimal loss to grazing carrying capacity as a result of the development due to the low agricultural potential of the site, the activity (i.e. the development of a solar PV facility) is considered to be appropriate.

Few technology options are available for solar facilities, and the use of those that are considered are usually differentiated by weather and temperature conditions that prevail in the area, so that optimality is obtained by the final site selection. The Integrated Resource Plan (IRP) 2019, excludes the procurement of power from CSP facilities until 2030; whereas new additional capacity of approximately 6 000MW will be required from solar PV facilities. Therefore, PV technology was identified as being the preferred option for the study area. Solar PV consists of a lower visual profile and limited water requirements when compared to the CSP technology option. Bifacial tracking PV technology is being proposed. This is the latest solar PV technology to be adopted and has not yet been installed within South Africa.

Considering the above, no other technology alternatives are being assessed for development on the proposed site.

3.3.4. The 'do-nothing' Alternative

The 'do-nothing' alternative is the option of Sun Garden (Pty) Ltd not constructing the Sun Garden PV Facility on the proposed site and assumes the site remains in its current state. This would result in no environmental or social impacts (positive or negative) as a result of the development of a solar facility within the preferred project site. This alternative will be used as a baseline against which the impacts will be assessed and compared in detail within Chapter 9 of this BA Report.

CHAPTER 4: SOLAR AS A POWER GENERATION TECHNOLOGY

Environmental pollution and the emission of CO_2 from the combustion of fossil fuels through the implementation of conventional power plants constitute a threat to the environment. The use of fossil fuels is reportedly responsible for ~70% of greenhouse gas emissions worldwide. The approach to addressing climate change needs to include a shift in the way that energy is generated and consumed. Worldwide, many solutions and approaches are being developed to reduce emissions. However, it is important to acknowledge that the most cost-effective solution in the short-term is not necessarily the least expensive long-term solution. This holds true not only for direct project costs, but also indirect project costs such as impacts on the environment. Renewable energy is considered a 'clean source of energy' with the potential to contribute greatly to a more ecologically, socially and economically sustainable future. The challenge however is to ensure that renewable energy projects are able to meet all economic, social and environmental sustainability criteria through the appropriate placement of these facilities.

This chapter explores the use of solar energy as a means of power generation.

4.1. Solar PV Technology

Solar energy facilities, such as those which utilise PV technology use the energy from the sun to generate electricity through a process known as the **Photovoltaic Effect**. Generating electricity using the Photovoltaic Effect is achieved through the use of the following components:

Photovoltaic Modules

PV cells are made of crystalline silicon, the commercially predominant PV technology, that includes materials such as polycrystalline and monocrystalline silicon or thin film modules manufactured from a chemical ink compound. PV cells are arranged in multiples / arrays and placed behind a protective glass sheet to form a PV module (Solar Panel). Each PV cell is positively charged on one side and negatively charged on the opposite side, with electrical conductors attached to either side to form a circuit. This circuit captures the released electrons in the form of an electric current (i.e. Direct Current (DC)). When sunlight hits the PV panels free electrons are released and flow through the panels to produce direct electrical (DC) current. DC then needs to be converted to alternating current (AC) using an inverter before it can be directly fed into the electrical grid.

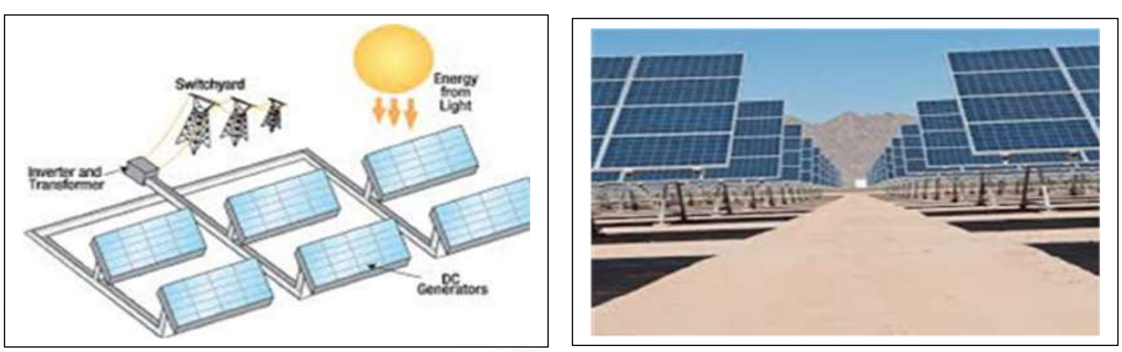

Figure 4.1: Overview of a PV cell, module and array / panel (Source: pveducation.com).

Inverters

Inverters are used to convert electricity produced by the PV panels from DC into AC, to enable the facility to be connected to the national electricity grid. In order to connect a large solar facility such as the one being proposed to the national electricity grid, numerous inverters will be arranged in several arrays to collect, and convert power produced by the facility.

Support Structures

PV panels will be fixed to a support structure. PV panels can either utilise fixed / static support structures, or alternatively they can utilise single or double axis tracking support structures. PV panels which utilise fixed / static support structures are set at an angle (fixed-tilt PV system) so as to optimise the amount of solar irradiation. With fixed / static support structures the angle of the PV panel is dependent on the latitude of the proposed development, and may be adjusted to optimise for summer and winter solar radiation characteristics. PV panels which utilise tracking support structures track the movement of the sun throughout the day so as to receive the maximum amount of solar irradiation.

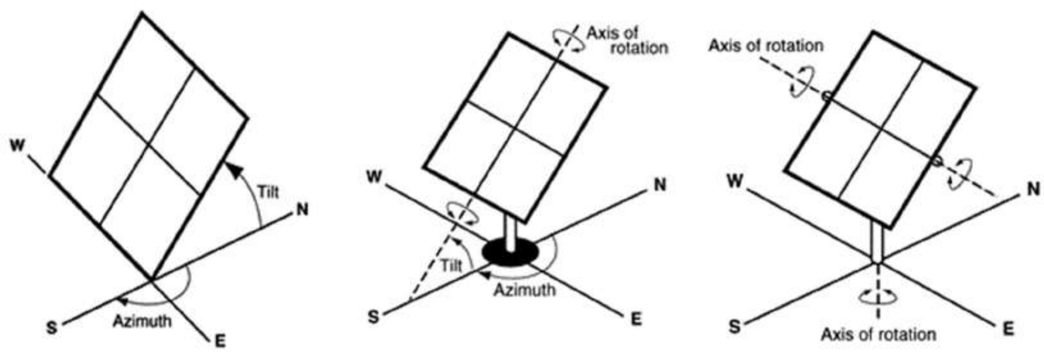

Figure 4.2: Overview of different PV tracking systems (from left to right: fixed-tilt, single-axis tracking, and double-axis tracking (Source: pveducation.com)).

PV panels are designed to operate continuously for more than 20 years, unattended and with low maintenance.

4.1.1. Bifacial Solar Panel Technology

Sun Garden (Pty) Ltd is proposing to use bifacial tracking technology. Bifacial ("two-faced") modules produce solar power from both sides of the panel. Traditional solar panels capture sunlight on one light-absorbing side. The light energy that cannot be captured is simply reflected away. Bifacial solar panels have solar cells on both sides, which enables the panels to absorb light from the back and the front (refer to Figure 4.3). Practically speaking, this means that a bifacial solar panel can absorb light reflected off the ground or another material. In general, more power can be generated from bifacial modules for the same area, without having to increase the development footprint.

The optimum tilt for a bifacial module has to be designed so as to capture a big fraction of the reflected irradiation. Use of trackers is recommended so the modules can track the sun's movement across the sky, enabling them to stay directed to receive the maximum possible sunlight to generate power.

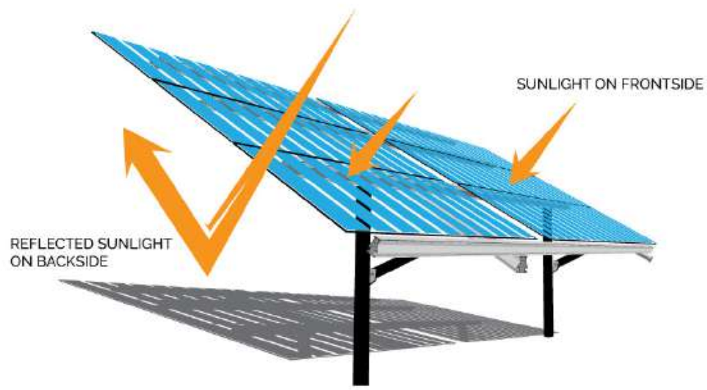

Figure 4.3: Diagram showing how bifacial Solar PV panels work (Source: https://sinovoltaics.com/learning-center/solar-cells/bifacial-solar-modules/)

CHAPTER 5: POLICY AND LEGISLATIVE CONTEXT

This Chapter provides an overview of the policy and legislative context within which the development of a solar energy facility such as the Sun Garden PV Facility and its associated infrastructure is proposed. It identifies environmental legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process which may be applicable to or have bearing on the proposed project. It also provides information which supports the need and justification for the project, as discussed in Chapter 6.

Further environmental legislation relevant to the project is described and considered in Chapter 7 of this BA Report.

5.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA Report includes the following information required in terms of Appendix 1: Content of basic assessment reports:

Requirement	Relevant Section
(e) a description of the policy and legislative context within which the development is proposed including- (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. (ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks, and instruments.	A description of the policy and legislative context within which the Sun Garden PV Facility is proposed is included and considered within this chapter.

5.2 Strategic Electricity Planning in South Africa

The energy sector in South Africa has been, and continues to be, at the centre of the economic and social development. The industry directly affects the economy by using labour and capital to produce energy. As the country`s economy continues to grow, the Department of Mineral Resources and Energy (DMRE) is mandated to ensure that energy resources are available, and that there is access to energy services in an affordable, reliable and sustainable manner, while minimizing the associated adverse environmental impacts (Department of Energy, 2019).

The expansion of electricity generation capacity in South Africa is based on national policy and informed by on-going strategic planning undertaken by the DMRE. The hierarchy of policy and planning documentation that supports the development of renewable energy projects, such as solar energy facilities, is illustrated in **Figure 5.1**. These policies are discussed in more detail in the following sections, along with the provincial and local policies and plans that have relevance to the development of the Sun Garden PV Facility.

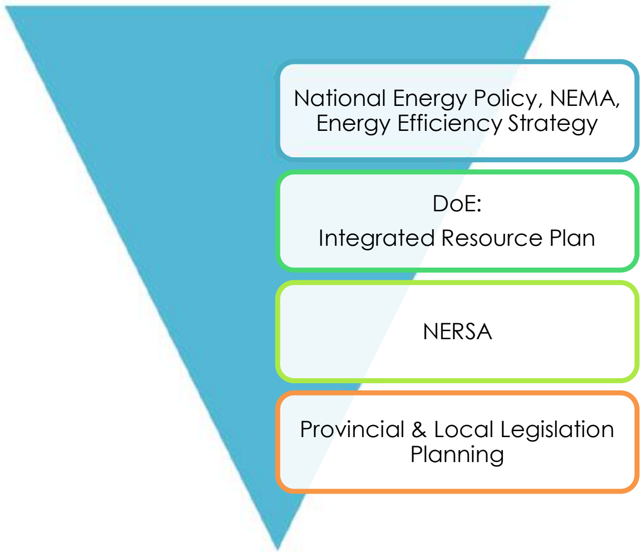

Figure 5.1: Hierarchy of electricity and planning documents

The South African energy industry is evolving rapidly, with regular changes to legislation and industry role-players. The regulatory hierarchy for an energy generation project of this nature consists of three tiers of authority who exercise control through both statutory and non-statutory instruments – that is National, Provincial and Local levels. As solar energy developments are a multi-sectoral issue (encompassing economic, spatial, biophysical, and cultural dimensions) various statutory bodies are likely to be involved in the approval process of a solar energy project and the related statutory environmental assessment process.

At **National Level**, the main regulatory agencies are:

» **Department of Mineral Resources and Energy (DMRE):** This Department is responsible for policy relating to all energy forms and for compiling and approving the Integrated Resource Plan (IRP) for electricity and since merging with the Department of Mineral Resources (DMR) is also responsible for granting approvals for the use of land which is contrary to the objects of the Mineral and Petroleum Resource Development Act (No. 28 of 2002) (MPRDA) in terms of Section 53 of the MPRDA. Therefore, in terms of the Act, approval from the Minister is required to ensure that the proposed activities do not sterilise mineral resources that may occur within the broader study area.
» **National Energy Regulator of South Africa (NERSA):** NERSA is responsible for regulating all aspects of the electricity sector and will ultimately issue licenses for IPP projects to generate electricity.
» **Department of Forestry, Fisheries and the Environment (DFFE):** This Department is responsible for environmental policy and is the controlling authority in terms of NEMA and the 2014 EIA Regulations (GN R326) as amended. DFFE is the competent authority for this project (as per GNR 779 of 01 July 2016), and is charged with considering whether to grant an EA for the project under consideration. Furthermore, the Department is also responsible for issuing permits for the disturbance or destruction of protected tree species listed under Section 15 (1) of the National Forest Act (No. 84 of 1998) (NFA). The Department is also responsible for permits for Threatened or Protected Species (TOPS) under the National Environmental Management: Biodiversity Act (No. 10 of 2004).
» **The South African Heritage Resources Agency (SAHRA):** SAHRA is a statutory organisation established under the National Heritage Resources Act (No. 25 of 1999) (NHRA), as the national administrative body responsible for the protection of South Africa's cultural heritage.

- **South African National Roads Agency Limited (SANRAL):** This Agency is responsible for the regulation and maintenance of all national road routes.
- **Department of Human Settlements, Water and Sanitation (DHSWS):** This Department is responsible for effective and efficient water resource management to ensure sustainable economic and social development. This Department is also responsible for evaluating applications and issuing licenses pertaining to water use (i.e. Water Use Licenses (WUL) and General Authorisation).
- **The Department of Agriculture, Rural Development and Land Reform (DARDLD):** This Department is the custodian of South Africa's agricultural resources and is responsible for the formulation and implementation of policies governing the agricultural sector and the initiation, facilitation, coordination and implementation of integrated rural development programmes.
-

At **Provincial Level**, the main regulatory agencies are:

- **Eastern Cape Department of Economic Development, Environmental Affairs and Tourism (DEDEAT):** This Department is the commenting authority for the BA process for the project and is responsible for the issuing of other biodiversity and conservation-related permits.
- **Eastern Cape Department of Transport:** This Department provides traffic management and road safety towards a more secure environment.
- **Eastern Cape Provincial Heritage Resources Authority (ECHRA):** This Department identifies, conserves and manage heritage resources throughout the Eastern Cape Province.

At the **Local Level,** the local and district municipal authorities are the principal regulatory authorities responsible for planning, land use and the environment. In the Eastern Cape Province, both the local and district municipalities play a role. The affected local municipality is the **Blue Crane Route Local Municipality** which forms part of the **Sarah Baartman District Municipality**. In terms of the Municipal Systems Act (No. 32 of 2000), it is compulsory for all municipalities to go through an Integrated Development Planning (IDP) process to prepare a five-year strategic development plan for the area under their control.

5.3 International Policy and Planning Context

A brief review of the most relevant international policies relevant to the establishment of the Sun Garden PV Facility are provided below in **Table 5.1**. The Sun Garden PV Facility is considered to be aligned with the aims of these policies, even if contributions to achieving the goals therein are only minor.

Table 5.1: International policies relevant to the Sun Garden PV Facility

Relevant policy	Relevance to the Sun Garden PV Facility
United Nations Framework Convention on Climate Change (UNFCCC) and Conference of the Party (COP)	The Conference of the Parties (COP), established by Article 7 of the UNFCCC, is the supreme body and highest decision-making organ of the Convention. It reviews the implementation of the Convention and any related legal instruments and takes decisions to promote the effective implementation of the Convention. The Conference of the Parties (COP) 21 was held in Paris from 30 November to 12 December 2015. From this conference, an agreement to tackle global warming was reached between 195 countries. South Africa signed the Agreement in April 2016 and ratified the agreement on 01 November 2016. The Agreement was assented to by the National Council of Provinces on 27 October 2016, and the National Assembly on 1 November 2016.

Relevant policy	Relevance to the Sun Garden PV Facility
	South Africa's National Climate Change Response Policy (NCCRP) establishes South Africa's approach to addressing climate change, including adaptation and mitigation responses. The NCCRP formalises Government's vision for a transition to a low carbon economy, through the adoption of the 'Peak, Plateau and Decline' (PPD) GHG emissions trajectory whereby South Africa's emissions should peak between 2020 and 2025, plateau for approximately a decade, and then decline in absolute terms thereafter, and based on this the country has pledged to reduce emissions by 34% and 42% below Business As Usual (BAU) emissions in 2020 and 2025, respectively. The policy provides support for the Sun Garden PV Facility which will contribute to managing climate change impacts, supporting the emergency response capacity, as well as assist in reducing GHG emissions in a sustainable manner.
The Equator Principles III (June 2013, as amended in June 2020)	The Equator Principles (EPs) III constitute a financial industry benchmark used for determining, assessing, and managing 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. In addition, these principles are used to ensure that projects financed by the Equator Principles Financial Institutions (EPFI), are developed in a manner that is socially responsible and reflects sound environmental management practices. The EPs are applicable to large infrastructure projects (such as the Sun Garden PV Facility) and apply globally to all industry sectors. Such an assessment should propose measures to minimise, mitigate, and offset adverse impacts in a manner relevant and appropriate to the nature and scale of the Sun Garden PV Facility. In terms of the EPs, South Africa is a non-designated country (as at 4 March 2020), 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 Sun Garden PV Facility is currently being assessed in accordance with the requirements of the 2014 EIA Regulations, as amended (GN R706), 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 controlled activities. Through this assessment, all potential social and environmental risks are identified and assessed, and appropriate mitigation measures proposed.
International Finance Corporation (IFC) Performance Standards and Environmental and Social Sustainability (January 2012)	The International Finance Corporation's (IFC) Performance Standards (PSs) on Environmental and Social Sustainability were developed by the IFC and were last updated on 1 January 2012. Performance Standard 1 requires that a process of environmental and social assessment be conducted, and an Environmental and Social Management System (ESMS) appropriate to the nature and scale of the project, and commensurate with the level of its environmental and social risks and impacts, be established and maintained. The above-mentioned standard is the overarching standard to which all the other standards relate. Performance Standards 2 through to 8 establish specific requirements to avoid, reduce, mitigate or compensate for impacts on people and the environment, and to improve conditions where appropriate. While all relevant social and environmental risks and potential impacts should be considered as part of the assessment, the standards 2 and 8 describe potential social and environmental impacts that require particular attention specifically within emerging markets. Where

Relevant policy	Relevance to the Sun Garden PV Facility
	social or environmental impacts are anticipated, the developer is required to manage them through its ESMS consistent with Performance Standard 1. Given the nature of the Sun Garden PV Facility, it is anticipated (at this stage of the process) that Performance Standards 1, 2, 3, 4, 6, and 8 may be applicable to the project (see box 1 below). • Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts • Performance Standard 2: Labour and Working Conditions • Performance Standard 3: Resource Efficiency and Pollution Prevention • Performance Standard 4: Community Health, Safety and Security • ~~Performance Standard 5: Land Acquisition and Involuntary Resettlement –~~ N/A • Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources • ~~Performance Standard 7: Indigenous Peoples –~~ N/A • Performance Standard 8: Cultural Heritage

5.4 National Policy

5.4.1 The National Energy Act (No. 34 of 2008)

The purpose of the National Energy Act (No. 34 of 2008) is 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, while taking into account environmental management requirements and interactions amongst economic sectors, as well as matters relating to renewable energy. The National Energy Act also provides for energy planning, increased generation and consumption of renewable energies, contingency energy supply, holding of strategic energy feedstocks and carriers, adequate investment in, appropriate upkeep and access to energy infrastructure. The Act provides measures for the furnishing of certain data and information regarding energy demand, supply and generation, and for establishing an institution to be responsible for promotion of efficient generation and consumption of energy and energy research.

The Act provides the legal framework which supports the development of power generation facilities such as the Sun Garden PV Facility.

5.4.2 White Paper on the Energy Policy of South Africa, 1998

The South African Energy Policy, published by the then Department of Minerals and Energy (DME) in December 1998 identifies five key objectives, namely:

» Increasing access to affordable energy services.
» Improving energy sector governance.
» Stimulating economic development.
» Managing energy-related environmental impacts.
» Securing supply through diversity.

In order to meet these objectives and the developmental and socio-economic objectives of South Africa, the country needs to optimally use available energy resources. The South African Government is required to address what can be done to meet these electricity needs both in the short and long-term. The Energy Policy identifies key objectives for energy supply, such as increasing access to affordable energy services, managing energy-related environmental impacts and securing energy supply through diversifying South Africa's electricity mix.

This policy recognises that renewable energy applications have specific characteristics which need to be considered. The Energy Policy is "*based on the understanding that renewables are energy sources in their own right, and are not limited to small-scale and remote applications, and have significant medium- and long-term commercial potential*." In addition, the Energy Policy states that "*Renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future*".

The support for the Energy Policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly wind and solar, and that renewable applications are, in fact, the least cost energy service in many cases from a fuel resource perspective (i.e. the cost of fuel in generating electricity from such technology), more so when social and environmental costs are taken into account. In spite of this range of resources, the National Energy Policy acknowledges that the development and implementation of renewable energy applications has been neglected in South Africa.

Government policy on renewable energy is therefore concerned with addressing the following challenges:

» Ensuring that economically feasible technologies and applications are implemented.
» Ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options.
» Addressing constraints on the development of the renewable industry.

5.4.3 White Paper on the Renewable Energy Policy, 2003

The White Paper on Renewable Energy Policy supplements the Government's overarching policy on energy as set out in its White Paper on the Energy Policy of the Republic of South Africa (DME, 1998), which pledges '*Government support for the development, demonstration and implementation of renewable energy sources for both small and large-scale applications*'.

This White Paper on Renewable Energy sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa. The main aim of the policy is to create the conditions for the development and commercial implementation of renewable technologies. The position of the White Paper on Renewable Energy is based on the integrated resource planning criterion of:

"Ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options."

The White Paper on Renewable Energy sets out the Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa. It also informs the public and the international community of the Government's vision, and how the Government intends to achieve these objectives; and informs Government agencies and organs of their roles in achieving the objectives.

South Africa relies heavily on coal to meet its energy needs because it is well-endowed with coal resources in particular. However, South Africa is endowed with renewable energy resources that can be sustainable alternatives to fossil fuels, but which have so far remained largely untapped. This White Paper fosters the uptake of renewable energy in the economy and has a number of objectives that include:

» Ensuring that equitable resources are invested in renewable technologies.
» Directing public resources for implementation of renewable energy technologies.
» Introducing suitable fiscal incentives for renewable energy.
» Creating an investment climate for the development of renewable energy sector.

The objectives of the White Paper on Renewable Energy are considered in six focal areas, namely:

i) Financial instruments.
ii) Legal instruments.
iii) Technology development.
iv) Awareness raising.
v) Capacity building and education.
vi) Market based instruments and regulatory instruments.

This policy supports the investment in renewable energy facilities as they contribute towards ensuring energy security through the diversification of energy supply, reducing Greenhouse Gas (GHG) emissions and the promotion of renewable energy sources.

5.4.4 The Electricity Regulation Act (No. 04 of 2006) (ERA)

The Electricity Regulation Act (ERA) (No. 04 of 2006) as amended by the Electricity Regulation Act (No. 28 of 2007), replaced the Electricity Act (No. 41 of 1987), as amended, with the exception of Section 5B, which provides funds for the energy regulator for the purpose of regulating the electricity industry.

The ERA establishes a national regulatory framework for the electricity supply industry and made NERSA custodian and enforcer of the National Electricity Regulatory Framework. The ERA also provides for licences and registration as the manner in which the generation, transmission, distribution, reticulation, trading, and import and export of electricity is regulated.

5.4.5 The National Development Plan (NDP) 2030

The National Development Plan (NDP) 2030 offers a long-term plan for the country. It defines desired destinations where inequality and unemployment are reduced and poverty is eliminated so that all South Africans can attain a decent standard of living. Electricity is one of the core elements of a decent standard of living.

While the achievement of the objectives of the NDP requires progress on a broad front, three priorities stand out, namely:

- Raising employment through faster economic growth
- Improving the quality of education, skills development and innovation
- Building the capability of the state to play a developmental, transformative role

In terms of the Energy Sector's role in empowering South Africa, the NDP envisages that, by 2030, South Africa will have an energy sector that promotes:

- Economic growth and development through adequate investment in energy infrastructure. The sector should provide reliable and efficient energy service at competitive rates, while supporting economic growth through job creation.
- Social equity through expanded access to energy at affordable tariffs and through targeted, sustainable subsidies for needy households.
- Environmental sustainability through efforts to reduce pollution and mitigate the effects of climate change.

In formulating its vision for the energy sector, the NDP took the IRP 2010 as its point of departure. Therefore, although electricity generation from coal is still seen as part of the energy mix within the NDP, the plan sets out steps that aim to ensure that, by 2030, South Africa's energy system will look very different to the current situation: coal will contribute proportionately less to primary-energy needs, while gas and renewable energy resources – especially wind, solar, and imported hydroelectricity – will play a much larger role.

5.4.6 Integrated Energy Plan (IEP), November 2016

The purpose and objectives of the Integrated Energy Plan (IEP) are derived from the National Energy Act (No. 34 of 2008). The IEP takes into consideration the crucial role that energy plays in the entire economy of the country and is informed by the output of analyses founded on a solid fact base. It is a multi-faceted, long-term energy framework which has multiple aims, some of which include:

- To guide the development of energy policies and, where relevant, set the framework for regulations in the energy sector.
- To guide the selection of appropriate technologies to meet energy demand (i.e. the types and sizes of new power plants and refineries to be built and the prices that should be charged for fuels).
- To guide investment in and the development of energy infrastructure in South Africa.
- To propose alternative energy strategies which are informed by testing the potential impacts of various factors such as proposed policies, introduction of new technologies, and effects of exogenous macro-economic factors.

A draft version of the IEP was released for comment on 25 November 2016. The purpose of the IEP is to provide a roadmap of the future energy landscape for South Africa which guides future energy infrastructure investments and policy development. The development of the IEP is an ongoing continuous process. It is reviewed periodically to take into account changes in the macroeconomic environment, developments in new technologies and changes in national priorities and imperatives, amongst others.

The 8 key objectives of the integrated energy planning process are as follows:

- Objective 1: Ensure security of supply.
- Objective 2: Minimise the cost of energy.

» Objective 3: Promote the creation of jobs and localisation.
» Objective 4: Minimise negative environmental impacts from the energy sector.
» Objective 5: Promote the conservation of water.
» Objective 6: Diversify supply sources and primary sources of energy.
» Objective 7: Promote energy efficiency in the economy.
» Objective 8: Increase access to modern energy.

5.4.7 Integrated Resource Plan (IRP) for Electricity 2010 - 2030

The Integrated Resource Plan (IRP) for Electricity is a subset of the IEP and constitutes South Africa's National electricity plan. The IRP is an electricity infrastructure development plan based on least-cost electricity supply and demand balance, taking into account security of supply and the environment. The primary objective of the IRP is to determine the long term electricity demand and detail how this demand should be met in terms of generating capacity, type, timing and cost. The IRP also serves as input to other planning functions, including amongst others, economic development and funding, and environmental and social policy formulation.

The promulgated IRP 2010–2030 identified the preferred generation technology required to meet expected demand growth up to 2030. It incorporated government objectives such as affordable electricity, reduced greenhouse gas (GHG) emissions, reduced water consumption, diversified electricity generation sources, localisation and regional development.

Following the promulgation of the IRP 2010–2030, implementation followed in line with Ministerial Determinations issued under Section 34 of the Electricity Regulation Act (Act No. 4 of 2006). The Ministerial Determinations give effect to planned infrastructure by facilitating the procurement of the required electricity capacity.

Since the promulgated IRP 2010–2030, the following capacity developments have taken place:

» A total 6 422MW under the Renewable Energy Independent Power Producers Programme (REIPPP) has been procured, with 3 876MW operational and made available to the grid.
» IPPs have commissioned 1 005MW from two Open Cycle Gas Turbine (OCGT) peaking plants.
» Under the Eskom build programme, the following capacity has been commissioned:
    * 1 332MW of Ingula pumped storage, 1 588MW of Medupi, 800MW of Kusile and
    * 100MW of Sere Wind Farm.
» 18 000MW of new generation capacity has been committed to.

Besides capacity additions, a number of assumptions have changed since the promulgation of IRP 2010–2030. Key assumptions that changed include the electricity demand projection, Eskom's existing plant performance, as well as new technology costs. In addition, environmental considerations such as South Africa's contribution to Greenhouse gases which contribute to climate change, local air quality and water availability have come to the fore.

These considerations necessitated the review and update of the IRP and ultimately the promulgation of a revised plan in October 2019. In terms of the IRP 2019, South Africa continues to pursue a diversified energy mix that reduces reliance on a single or a few primary energy sources. In the period prior to 2030, the system requirements are largely for incremental capacity addition (modular) and flexible technology, to complement the existing installed inflexible capacity. South Africa is a signatory to the Paris Agreement on Climate Change and has ratified the agreement. In line with INDCs (submitted to the UNFCCC in November 2016), South Africa's emissions are expected to peak, plateau and from year 2025 decline.

Following consideration of all these factors, the following Plan was promulgated.

	Coal	Coal (Decommis-sioning)	Nuclear	Hydro	Storage	PV	Wind	CSP	Gas & Diesel	Other (Distributed Generation, CoGen, Biomass, Landfill)
Current Base	37,149		1 860	2,100	2 912	1 474	1 980	300	3 830	499
2019	2,155	-2,373					244	300		Allocation to the extent of the short term capacity and energy gap.
2020	1,433	-557				114	300			
2021	1,433	-1403				300	818			
2022	711	-844			513	400 1,000	1,600			
2023	750	-555				1000	1,600			500
2024			1,860				1,600		1000	500
2025						1000	1,600			500
2026		-1,219					1,600			500
2027	750	-847					1,600		2000	500
2028		-475				1000	1,600			500
2029		-1,694			1575	1000	1,600			500
2030		-1,050		2,500		1000	1,600			500
TOTAL INSTALLED CAPACITY by 2030 (MW)	33,364		1,860	4,600	5,000	8,288	17,742	600	6,380	
% Total Installed Capacity (% of MW)	43		2.36	5.84	6.35	10.52	22.53	0.76	8.1	
% Annual Energy Contribution (% of MWh)	58.8		4.5	8.4	1.2*	6.3	17.8	0.6	1.3	

Installed Capacity
Committed/Already Contracted Capacity
Capacity Decommissioned
New Additional Capacity
Extension of Koeberg Plant Design Life
Includes Distributed Generation Capacity for own use

- 2030 Coal Installed Capacity is less capacity decommissioned between years 2020 and 2030.
- Koeberg power station rated/installed capacity will revert to 1,926MW (original design capacity) following design life extension work.
- Other/ Distributed generation includes all generation facilities in circumstances in which the facility is operated solely to supply electricity to an end-use customer within the same property with the facility.
- Short term capacity gap is estimated at 2,000MW.

Figure 5.2: IRP 2019 as promulgated in October 2019[5]

This plan provides for the development of 6000MW of new capacity from large scale PV. The Sun Garden PV Facility project would contribute towards this goal through the generation of 400MW.

5.4.8 New Growth Path (NGP) Framework, 23 November 2010

The purpose of the New Growth Path (NGP) Framework is to provide effective strategies towards accelerated job-creation through the development of an equitable economy and sustained growth. The target of the NGP is to create 5 million jobs by 2020. With economic growth and employment creation as the key indicators identified in the NGP. The framework seeks to identify key structural changes in the economy that can improve performance in term of labour absorption and the composition and rate of growth.

5 source: https://www.cliffedekkerhofmeyr.com/en/news/publications/2019/Corporate/energy-alert-22-october-The-Integrated-Resource-Plan-2019-A-promising-future-roadmap-for-generation-capacity-in-South-Africa.html

To achieve this, government will seek to, amongst other things, identify key areas for large-scale employment creation, as a result of changes in conditions in South Africa and globally, and to develop a policy package to facilitate employment creation in these areas.

5.4.9 National Climate Change Bill, 2018

On 08 June 2018 the Minister of Environmental Affairs published the National Climate Change Bill ("the Bill") for public comment. The purpose of the Bill is to build an effective climate change response and ensure the long-term, just transition to a climate resilient and lower carbon economy and society. This will be done within the context of sustainable development for South Africa, and will provide for all matters related to climate change.

The National Climate Change Bill addresses issues related to institutional and coordination arrangement across the three spheres of government namely national, provincial and local. It further highlights the need for the spheres of government and entities, sectors as well business to respond to challenges of climate change. The Bill further addresses the matters relating to, the national adaptation to impacts of climate change, greenhouse gas emissions and removals, and policy alignment and institutional arrangements. The Bill provides a procedural outline that will be developed through the creation of frameworks and plans. The following objectives are set within the Bill:

a) Provide for the coordinated and integrated response to climate change and its impacts by all spheres of government in accordance with the principles of cooperative governance;
b) Provide for the effective management of inevitable climate change impacts through enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to building social, economic, and environmental resilience and an adequate national adaptation response in the context of the global climate change response;
c) Make a fair contribution to the global effort to stabilise greenhouse gas concentrations in the atmosphere at a level that avoids dangerous anthropogenic interference with the climate system within a timeframe and in a manner that enables economic, employment, social and environmental development to proceed in a sustainable manner.

Sun Garden PV Facility comprises a renewable energy generation facility and would not result in the generation or release of emissions during its operation.

5.4.10 National Climate Change Response Policy, 2011

South Africa's National Climate Change Response Policy (NCCRP) establishes South Africa's approach to addressing climate change, including adaptation and mitigation responses. The NCCRP formalises Government's vision for a transition to a low carbon economy, through the adoption of the 'Peak, Plateau and Decline' (PPD) GHG emissions trajectory whereby South Africa's emissions should peak between 2020 and 2025, plateau for approximately a decade, and then decline in absolute terms thereafter, and based on this the country has pledged to reduce emissions by 34% and 42% below Business As Usual (BAU) emissions in 2020 and 2025, respectively.

As an integral part of the policy, a set of near-term priority flagship programmes will be implemented to address the challenges of climate change, one of which includes the Renewable Energy Flagship

Programme. This flagship programme includes a scaled-up renewable energy programme, based on the current programme specified in the IRP 2010, and using the evolving South African Renewables Initiative led by the Department of Public Enterprise and Department of Trade and Industry (DTI), as a driver for the deployment of renewable energy technologies. The programme will be informed by enhanced domestic manufacturing potential and the implementation of energy efficiency and renewable energy plans by local government.

The development of the Sun Garden PV Facility is aligned with the Renewable Energy Flagship Programme identified under South Africa's NCCRP and could therefore be argued to be aligned with the country's approach to addressing climate change.

5.4.11 National Climate Change Response Strategy for South Africa, 2004

The need for a national climate change policy for South Africa was identified as an urgent requirement during the preparations for the ratification of the UNFCCC in 1997. A process to develop such a policy was thus instituted under the auspices of the National Committee for Climate Change (NCCC), a non-statutory stakeholder body set up in 1994 to advise the Minister on climate change issues and chaired by the then Department of Environmental Affairs and Tourism (DEAT). It was determined that a national climate change response strategy will promote integration between the programmes of the various government departments involved to maximise the benefits to the country as a whole, while minimising negative impacts. Further, as climate change response actions can potentially act as a significant factor in boosting sustainable economic and social development, a national strategy specifically designed to bring this about is clearly in the national interest, supporting the major objectives of the government including poverty alleviation and the creation of jobs.

A number of principles and factors guided the conception of the strategy and is required to be implemented. These are:

» Ensuring that the strategy is consistent with national priorities, including poverty alleviation, access to basic amenities including infrastructure development, job creation, rural development, foreign investment, human resource development and improved health, leading to sustainable economic growth;
» Ensuring alignment with the need to consistently use locally available resources;
» Ensuring compliance with international obligations;
» Recognizing that climate change is a cross cutting issue that demands integration across the work programmes of other departments and stakeholders, and across many sectors of industry, business and the community;
» Focussing on those areas that promote sustainable development;
» Promoting programmes that will build capacity, raise awareness and improve education in climate change issues;
» Encouraging programmes that will harness existing national technological competencies;
» Reviewing the strategy constantly in the light of national priorities and international trends;
» Recognizing that South Africa's emissions will continue to increase as development is realised.

The strategy was devised through an integrated approach and considers policies and programmes of other government departments and the fact that South Africa is a developing country. This will ensure that the principles of sustainable development are adequately served and do not conflict with existing development policies.

5.4.12 Strategic Integrated Projects (SIPs)

The Presidential Infrastructure Coordinating Committee (PICC) is integrating and phasing investment plans across 18 Strategic Infrastructure Projects (SIPs) which have five core functions: to unlock opportunity, transform the economic landscape, create new jobs, strengthen the delivery of basic services and support the integration of African economies. A balanced approach is being fostered through greening of the economy, boosting energy security, promoting integrated municipal infrastructure investment, facilitating integrated urban development, accelerating skills development, investing in rural development and enabling regional integration. SIP 8 and 9 of the energy SIPs supports the development of the solar energy facility:

» SIP 8: Green energy in support of the South African economy: Support sustainable green energy initiatives on a national scale through a diverse range of clean energy options as envisaged in the Integrated Resource Plan (IRP 2010 – 2030) and supports bio-fuel production facilities.
» SIP 9: Electricity generation to support socio-economic development: The proposed Sun Garden PV Facility is a potential SIP 9 Project as electricity will be generated and social and economic upliftment, development and growth will take place within the surrounding communities. It would become a SIP 9 project if selected as a Preferred Bidder project by the Department Mineral Resources and Energy. SIP 9 supports the acceleration of the construction of new electricity generation capacity in accordance with the IRP 2010 to meet the needs of the economy and address historical imbalances.

The Sun Garden PV Facility could be registered as a SIP project once it is under development. The project would then contribute to the above-mentioned SIPs.

5.4.13 Renewable Energy Development Zones (REDZ) (GNR 114 of February 2018)

The Strategic Environmental Assessment (SEA) for Wind and Solar Photovoltaic Energy in South Africa, 2015, has identified 8 Renewable Energy Development Zones (REDZs) that are of strategic importance for large-scale wind and solar photovoltaic energy development, including the roll-out of its supporting transmission and distribution infrastructure, in terms of Strategic Integrated Project (SIP) 8: Green Energy in support of the South African Economy. The Sun Garden PV Facility is located within the Cookhouse REDZ.

5.4.14 National Biodiversity Economy Strategy (NBES) (March 2016)

The biodiversity economy of South Africa encompasses the businesses and economic activities that either directly depend on biodiversity for their core business or that contribute to conservation of biodiversity through their activities. The commercial wildlife and the bioprospecting industries of South Africa provide cornerstones for the biodiversity economy and are the focus of this strategy.

Both the wildlife and bioprospecting sub-sectors of the biodiversity economy have already demonstrated the potential for significant future development and growth. In the study commissioned on the situational analysis of the biodiversity economy, the contribution of the biodiversity economy to the national economy can be measured in terms of Gross Domestic Product (GDP), with the wildlife and bioprospecting industries contributing approximately R3 billion to GDP in 2013. Growth in the wildlife and bioprospecting industries can make a significant impact on the national economy, while contributing to national imperatives such as job creation, rural development and conservation of our natural resources.

The Wildlife Industry value chain is centred on game and wildlife farming/ranching activities that relate to the stocking, trading, breeding, and hunting of game, and all the services and goods required to support this value chain. The key drivers of this value chain include domestic hunters, international hunters and a growing retail market demand for wildlife products such as game meat and taxidermy products. This sector is therefore characterised by an interesting combination of agriculture, eco-tourism and conservation characteristics.

Over the period 2008-2013, the total Wildlife Industry market grew by more than 14% per year. This growth comprised an average annual growth exceeding 6% in domestic hunting, a decrease in international hunting, and an exponential growth in live auction sales. It is considered likely that the consolidated Wildlife Industry has the potential to experience a weighted average annual growth rate of between 4 %-14 % per year up to 2030.

In order for the wildlife and bioprospecting sub-sectors of the biodiversity economy to achieve its full potential, a strategic partnership between the state, private sector and communities is required. To this end, a National Biodiversity Economy Strategy (NBES) is required to guide the sustainable growth of the wildlife and bioprospecting industries and to provide a basis for addressing constraints to growth, ensuring sustainability, identifying clear stakeholder's responsibilities and monitoring progress of the Enabling Actions.

The Vision of NBES is to optimise the total economic benefits of the wildlife and bioprospecting industries through its sustainable use, in line with the Vision of the Department of Environmental Affairs. The purpose of NBES is to provide a 14-year national coordination, leadership and guidance to the development and growth of the biodiversity economy.

NBES has set an industry growth goal stating that by 2030, the South African biodiversity economy will achieve an average annualised GDP growth rate of 10% per annum. This envisioned growth curve extends into the year 2030 and is aligned to the efforts of the country's National Development Plan, Vision 2030. The NBES seeks to contribute to the transformation of the biodiversity economy in South Africa through inclusive economic opportunities, reflected by a sector which is equitable - equitable access to resources, equitable and fair processes and procedures and equitable in distribution of resources (i.e. business, human, financial, indigenous species, land, water) in the market.

To address these transformation NBES imperatives, NBES has the principles of:

» Conservation of biodiversity and ecological infrastructure
» Sustainable use of indigenous resources
» Fair and equitable beneficiation
» Socio-economic sustainability
» Incentive driven compliance to regulation
» Ethical practices
» Improving quality and standards of products.

The NBES provides the opportunity to redistribute South Africa's indigenous biological/ genetic resources in an equitable manner, across various income categories and settlement areas of the country. The NBES has prioritised nodes in the country for biodiversity economy transformation, referred to as BET nodes. NBES prioritises 18 BET nodes, 13 rural and 5 urban districts across the nine provinces of the country (refer to **Figure 5.1**), with communities having been prioritised for development of small and medium size enterprises and community-based initiatives which sustainably use of indigenous biological and/or genetic resources. The Sarah Baartman District Municipality within which the Sun Garden PV Facility is proposed is not included as one of these nodes.

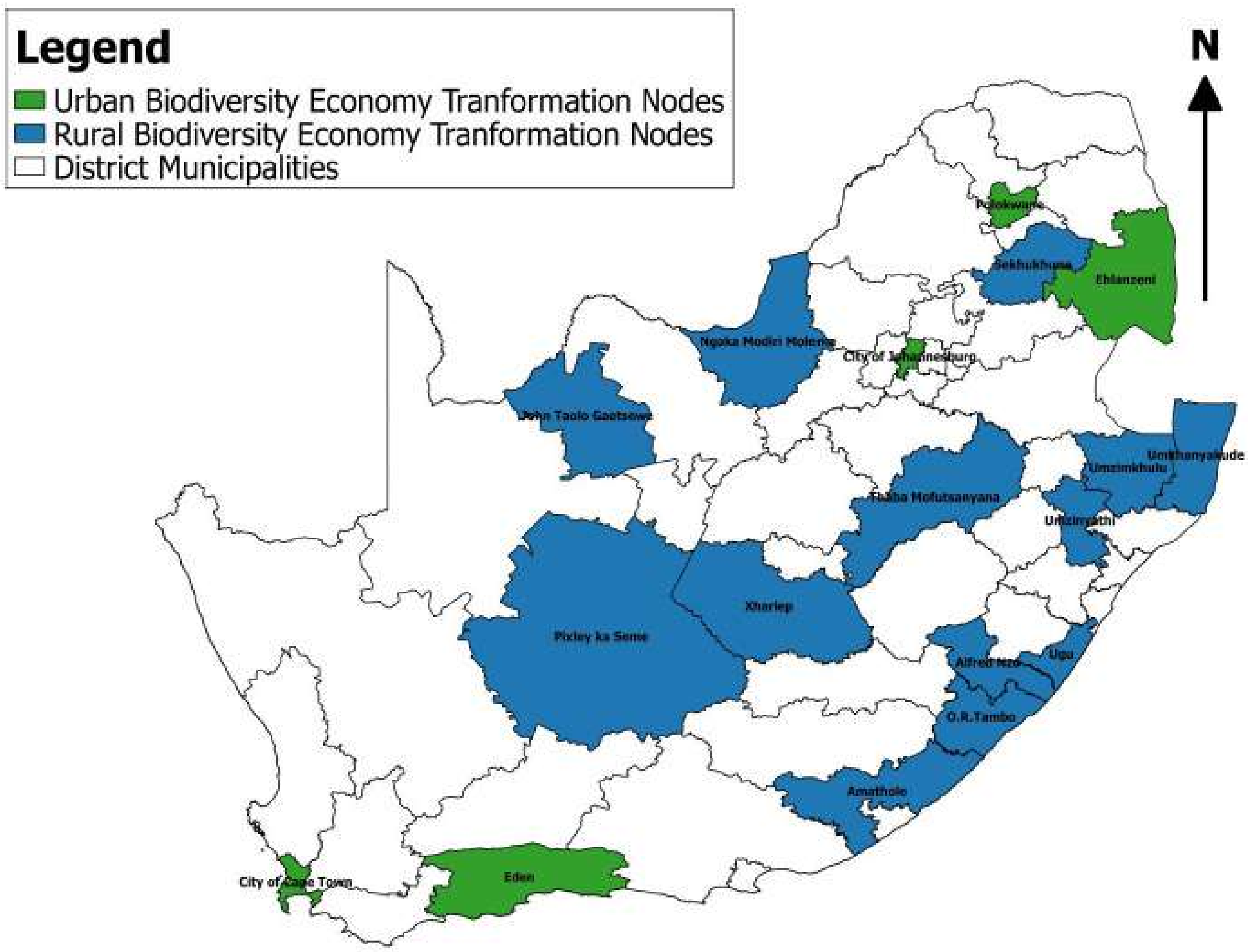

Figure 5.1: Map of the Biodiversity Economy Transformation (BET) nodes which are the transformation priorities of the NBES

5.5 Provincial Planning and Context

5.5.1. Eastern Cape Provincial 2030 Draft Development Plan (PDP), 2014

The Eastern Cape Provincial 2030 Draft Provincial Development Plan (PDP) states that one of the five goals for the Province is an inclusive, equitable and growing economy for the province in order to ensure sustainable development. The Province considers people centred development and economic development as imperative in order to address the most significant challenge facing the Eastern Cape, which is material poverty and deprivation.

The PDP draws from the 2010 BRICS Rural Transformation Conference's resolutions to be cognisant of the climate and environmental challenges, enhance environmental resilience and sustainability, use scarce natural resources efficiently, promote renewable sources of energy and leverage a green agenda for new jobs and income for the poor.

The PDP identifies key strategic objectives and actions in achieving the goal of a growing and inclusive economy. In support of the Strategic *Objective 1.1.* which is *Improved Economic Infrastructure that promotes new economic activity*; strategic actions are proposed within the PDP. *Strategic Action 1.1.6* refers to the need to position the province as a key investment hub in the energy sector and ensure reliable energy supply to high potential sectors. The province indicates that pre- authorisation arrangement in the "renewable energy zones" will allow this industry to expand to its full potential. Further to this, the "green/renewables" sector was identified as one of the industries for potential expansion based on the existing pipeline of new renewable energy (mainly wind) projects within the Province.

In addition, the Eastern Cape Vision 2030 Provincial Development Plan states that municipalities need to improve their maintenance and upgrading of electricity distribution and review their mark-ups on electricity prices. It is also stated that this work should be led by the Department of Economic Development, Environmental Affairs and Tourism (DEDEAT).

The overall energy objective for the Province also includes promoting the development of renewable energy supply schemes which are considered to be strategically important for increasing the economic opportunities for the affected communities, while also minimising the detrimental environmental impacts. The implementation of sustainable renewable energy is also to be promoted within the Province through appropriate financial and fiscal instruments.

Considering the above, the Sun Garden PV Facility falls within the overall energy objective for the Province.

5.5.2 Eastern Cape Provincial Spatial Development Framework (PSDF) (2010)

This plan gives guidance on the principles that should underpin the strategic approach to spatial development and management in the Province. To this end, a targeted and phased approach to development is recommended based on:

» Settlement hierarchy: This involves focusing investment strategically at three levels of support. The plan
» promotes identification of nodes and corridors with opportunity and targets development initiatives which promote consolidation of settlements to facilitate cost effective development
» Flexible zoning: allowing for flexibility for special kinds of investment
» Resources sustainability: Monitoring of the use of resources to ensure sustainability and minimization of
» environmental impacts in all land developments
» Restricted development zone: identification of environmentally sensitive areas and ensuring that developments
» do not occur, for example wetlands, state forest, dune systems, river estuaries, game and nature reserves, heritage sites, etc.
» Spatial integration: promotion of integrated development with maximum spatial benefits, integrating communities and the spatial economy.

The implications of the above is that the District and Local municipality SDFs should be aligned with Provincial SDF, District SDF and also other SDFs of surrounding municipalities, as this a legal requirement. In this regard the PSDF plays a particularly important role in defining the future spatial structure of the region indicating development corridors, a desired settlement pattern and linkages and alignments with local municipalities. The Local municipalities have to align their spatial vision to that of the Provincial SDF and District SDF.

5.5.3 Eastern Cape Provincial Economic Strategy (PEDS) 2016)

The Eastern Cape PEDS (developed by the Department of Economic Development, Environmental Affairs and Tourism) seeks to create a clear, long-term vision and strategy for the growth and development of the Eastern Cape by building on the strength and opportunities of the province, while at the same time addressing its weaknesses and threats.

In pursuit of this goal, PEDS identifies six high potential economic sectors that can catalyse growth in the province. These sectors are:

- Agri-industry
- Sustainable energy
- Ocean economy
- Automotive
- Light manufacturing
- Tourism

With respect to sustainable energy, PEDS notes that it is imperative that the province aligns all its energy opportunities so as to:

- Create the optimal institutional environment for the location of sustainable energy projects in the Eastern Cape
- Harness the maximum possible value chain, localisation and industrialisation opportunities from sustainable energy projects
- Ensure adequate and aligned skills development
- Link innovation, entrepreneurial and small business opportunities to sustainable energy projects
- Link black industrialist opportunities to sustainable energy projects.

5.5.4. The Eastern Cape Industrial Development Strategy, 2011

The Eastern Cape Industrial Development Strategy sets out a number of strategic goals which include positive economic growth, ensuring that economic growth leads to labour absorption and ensuring that existing jobs are retained. In pursuit of these goals the Industrial Development Strategy identifies the need for:

- Research and development (R&D) and innovation
- Skills development
- Improving infrastructure and logistics
- Providing developmental finance
- Promoting investment, trade, and exports
- Developing institutional structures

The achievement of these strategic goals is planned through the development of several key sectors including:

» Tourism
» Capital goods
» Chemicals and Petrochemicals
» Green industries
» Agriculture and agro-processing
» Automotive

The Industrial Development Strategy also seeks to develop an industrial base for the manufacturing of components required for the production of solar cells, solar panels and certain components of wind turbines.

5.5.5 Eastern Cape Climate Change Response Strategy (2011)

The Eastern Cape Climate Response Strategy (ECCCRS) was initiated by the Eastern Cape Provincial Department of Economic Development, Environmental Affairs and Tourism (DEDEAT) in January 2010. The province recognised itself as a contributor of climate change whilst simultaneously being vulnerable to the effects of climate change. The key aspects of the Eastern Cape Climate Change Response Strategy (ECCCRS) Report were discussed in the MEC's (DEDEA: Department of Economic Development, Environmental Affairs) 2011 budget speech: "*The recent completion of the Eastern Cape Climate Change Response Strategy paves the way for the Province to explore alternative industrial models supporting a Green Economy and Decent Work. Avenues that hold potential include alternate building materials, reducing emissions, and the establishment of alternate energy generation. We concur with the Ministers of Economic Development and Environmental Affairs, who believe that the renewable energy industry could boost Government's plans to halve unemployment by 2014. Minister Patel estimates that up to 300 000 jobs can be created in the green economy over ten years. He projects that the benefits, which include health and pollution management, waste collection, disposal and storage activities, could generate between R22 billion and R36 billion within the environment sector*".

Key points from the ECCCRS in line with the MEC's address include the DEDEAT's commitment to develop and implement policy in accordance with the National Green Paper for the National Climate Change Response Strategy (2010), and an acknowledgement of the Eastern Cape Province's vulnerability to climate-change. The development and promotion of a provincial green economy, including green jobs, and environmental learnership is regarded as an important provincial intervention in addressing climate change. The renewable energy sector, including solar and wind energy (including also biofuels and energy from waste), is explicitly indicated as an important element of the Provincial Climate Change Response Strategy.

As part of the strategy, Greenhouse Gas (GHG) mitigation programmes have been developed and include the following:

» Mainstreaming GHG mitigation in provincial and local government and in industry
» Promotion of renewable energy in the Eastern Cape
» Mitigation and opportunities for rural livelihoods
» Mitigation in solid waste and wastewater treatment
» Greenhouse gas mitigation in transport

The development of the Sun Garden PV Facility contributes towards the strategy as it is in line with some of the mitigation measures that have been developed in an effort to reduce GHG emissions, albeit only to a limited extent.

5.5.5 Eastern Cape Sustainable Energy Strategy (2012)

The Eastern Cape Sustainable Energy Strategy identifies six (6) goals to assist in achieving the Province's vision of creating an enabling environment for sustainable energy investment and implementation, and these goals include:

» Job creation and skills development
» Alleviate energy poverty
» Alleviate CO_2 emissions and environmental pollution
» Improve industrial competitiveness
» Promote renewable energy production in the Province
» Promote the development of a renewable energy manufacturing industry and technology development

The focus of the strategy is to encourage sustainable, affordable, and environmentally friendly energy production by creating an enabling environment for energy production and sustainable technology, skills, and industry development. This is to be achieved through several initiatives including:

» An intensive training programme among relevant decision-makers concerning renewable energy project approvals
» The establishment of an implementation task team to provide potential investors with a one-stop-shop for renewable energy information in the province
» Development of a provincial locational perspective of renewable energy
» Lobbying Eskom to expedite and strengthen the transmission capacity of the former Transkei area
» Lobbying the Department of Energy to set out a long-term programme for the procurement of renewable energy generation

the Eastern Cape Province seeks to become a leading and preferred destination for renewable energy investment in South Africa. Considering the goal to promote renewable energy production and the associated manufacturing industry in the Province, the development of the Sun Garden PV Facility is considered to contribute to the goals.

5.5.6 Eastern Cape Environmental Management Bill (Department of Economic Development, Environmental Affairs and Tourism, 2019)

This Bill ensures that the government of the Province of the Eastern Cape shall manage the environment in such a way that the basic right of every citizen can be realised. The Bill seeks to ensure that an adverse impact on the environment is limited and that the rights of all that live in the province with regard to the environment are protected.

Applicable clauses within the bill in the context of this study include:

» Provides for the transfer of hunting and other rights of a holder of a certificate of adequate enclosure.

» Provides for the MEC's general powers in respect of wild animals.
» Details restricted activities involving provincially protected and endangered species.
» Stipulates obligations of holders of certificates of adequate enclosure.
» Details permit requirements of persons and businesses operating game parks etc.

5.5.7 Eastern Cape Biodiversity Conservation Plan (2019)

A Biodiversity Conservation Plan (BCP), also known as a Biodiversity Sector Plan, is a tool that guides and informs land use and resource-use planning and decision-making by a full range of sectors whose policies, programmes and decisions impact on biodiversity, in order to preserve long-term functioning and health of priority areas known as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). The purpose of the plan is to provide a map of these important biodiversity areas and develop associated land use management guidelines to inform:

1. Cross-sectoral spatial planning at all levels of government, relevant to sectors whose policies, actions and decisions impact on biodiversity;
2. Environmental assessment and authorisations; and
3. Natural resource management and protected area expansion programmes.

A complete revision of the first version of the Eastern Cape Biodiversity Conservation Plan (ECBCP, 2007) was undertaken. The Eastern Cape Biodiversity Conservation Plan (ECBCP, 2019) was developed in line with the principles and methods gazetted in the National Environmental Management: Biodiversity Act No. 291 of 2009, "*Guideline regarding the determination of Bioregions and the Preparation of and publication of Bioregional Plans*".

The Eastern Cape Biodiversity Conservation Plan (ECBCP) is responsible for mapping areas that are priorities for conservation in the province, and defines Terrestrial and Aquatic CBAs. The Terrestrial CBA map and the Aquatic CBA maps developed in the current assessment replace, in their entirety, the ECBCP (2007) maps and are presented in Part C of the ECBCP (2019).

Land use guidelines have been developed to influence planning and development. These are detailed in Part D of the ECBCP (2019) and summarised below.

Table 5.2: Terrestrial Critical biodiversity Areas and Biodiversity Land Management Classes as described by the Eastern Cape Biodiversity Conservation Plan

CBA Map Category	Desired State	Land management objective
Protected Areas	Natural	Protected Areas are managed through Protected Area Management Plans and are therefore not managed through the ECBCP (2019).
Critical Biodiversity Area 1	Natural	Maintain in a natural state (or near-natural state if this is the current condition of the site) that secures the retention of biodiversity pattern and ecological processes. For areas classified as CBA1, the following objectives must apply: » Ecosystem and species must remain intact and undisturbed; » Since these areas demonstrate high irreplaceability, if disturbed or lost, biodiversity targets will not be met; » Important: these biodiversity features are at, or beyond, their limits of acceptable change.

CBA Map Category	Desired State	Land management objective
		If land use activities are unavoidable in these areas, and depending on expert opinion of the condition of the site, a Biodiversity Offset must be designed and implemented
Critical Biodiversity Area 2	Natural	Maintain in natural (or near-natural state if this is the current condition of the site) that secures the retention of biodiversity pattern and ecological processes. For areas classified as CBA2, the following objectives must apply: » Ecosystem and species must remain intact and undisturbed; » There is some flexibility in the landscape to achieve biodiversity targets in these areas. It must be noted that the loss of a CBA2 area may elevate other CBA 2 areas to a CBA 1 category. » These biodiversity features are at risk of reaching their limits of acceptable change. If land use activities are unavoidable in these areas, and depending on the condition of the site, set-aside areas must be designed in the layout and implemented. If site specific data confirms that biodiversity is significant, unique and/or highly threatened or that a Critically Endangered or Endangered species is present, Biodiversity Offsets must be implemented.
Ecological Support Area 1	Functional	Maintain ecological function within the localised and broader landscape. A functional state in this context means that the area must be maintained in a semi-natural state such that ecological function and ecosystem services are maintained. For areas classified as ESA1, the following objectives apply: » These areas are not required to meet biodiversity targets, but they still perform essential roles in terms of connectivity, ecosystem service delivery and climate change resilience. » These systems may vary in condition and maintaining function is the main objective, therefore: ∗ Ecosystems still in natural, near natural state should be maintained. ∗ Ecosystems that are moderately disturbed/degraded should be restored
Ecological Support Area 2	Functional	Maintain current land use with no intensification for areas classified as ESA2, the following objectives apply: » These areas have already been subjected to severe and/or irreversible modification » These areas are not required to meet biodiversity targets, but they may still perform some function with respect to connectivity, ecosystem service delivery and climate change resilience » Objective is to maintain remaining function, therefore: ∗ Areas should not undergo any further deterioration in ecological function.

CBA Map Category	Desired State	Land management objective
		* Opportunities to change land use practices to improve ecological function (i.e. cultivation agriculture to livestock grazing agriculture) are desirable in ESA2 areas.
Other Natural Areas and No Natural Habitat Remaining	Production	No desired state or management objective is provided for ONA or NNR.

The ECBCP (2019) states the following regarding the development of the development of solar energy facilities:

Solar PV facilities are area-hungry activities which typically require considerable landscaping and the clearance of indigenous vegetation. Even if vegetation is left intact, a change in sunlight regime may alter the natural species composition. This activity is, therefore, not appropriate in CBAs or ESA1s. In some cases, it may be acceptable to utilise ESA2s, provided that connectivity is maintained in the development design.

The Sun Garden PV Facility is located within an Ecological Support Area (ESA) (refer to Appendix E for more details).

5.5.8 Eastern Cape Tourism Master Plan (Department of Economic Development, Environmental Affairs and Tourism, 2014)

The master plan emphasises that the Eastern Cape possesses significant potential to capture large numbers of international and domestic tourists. In particular, the long and largely pristine coastline, natural and cultural and historical heritage are attractions that are in demand by all tourist groups.

The plan states that the environmental sector often puts much emphasis on biodiversity conservation without necessarily linking it with eco-tourism. The plan states that much naivety has been observed about what ecotourism can do. The plan calls for improved implementation of policy that will see biodiversity promotion being embraced by the broader tourism industry and the need for improved awareness from players within the sector to reduce the adverse environmental impacts of tourism.

It is recognised that the province does well to promote its own game reserves and general wildlife destinations and natural attractions in the marketing of the province, but the province battles to compete with provinces such as Mpumalanga, Limpopo and KZN as a destination to fill all nature-based tourism demands.

5.6 Local Policy and Planning Context

The local tiers of government within which the Sun Garden PV Facility is located is the Blue Crane Route Local Municipality which falls within the jurisdiction of the Sarah Baartman District Municipality. The development instruments or policies at both the district and local level contain objectives which are in line with the development of the Sun Garden PV Facility. These include, economic growth, job creation, community upliftment and poverty alleviation.

5.6.1. Sarah Baartman Spatial Development Framework (SDF) Final Report (2018/2019 Draft) [Adopted 21 August 2013]

The Sarah Baartman SDF observes that the district's economy is dependent on the natural resources of the area (tourism and production). As such, spatial planning initiatives need to support the implementation of the district's Socio-Economic and Enterprise Development Strategy (SEEDS) by:

- » Implementing effective spatial planning land use management
- » Ensuring that the SDP identifies areas for renewable energy production
- » Recognizing that game reserves and farming are playing a greater role in the economy
- » Undertaking urban regeneration projects
- » Identifying where infrastructure upgrading is required.
- » Providing the spatial framework for the district's Area Based Plan (ABP)

The Sarah Baartman SDF further notes that the introduction of alternative energy generation infrastructure and the associated land use change will provide both economic opportunities but may also have a negative impact on the ecotourism of the district (in the form of potential changes to the visual and cultural landscapes). This is an important consideration as part of the proposed site falls in an area identified by the SDF as the N2 development corridor which plans to link to area to regional projects such as the Wild Coast N2 Toll Road.

According to the SDF, the proposed project site falls outside of protected areas and expanded conservation areas (refer to **Figure 5.2**), and outside of areas defined as Tourism Focus Areas (refer to **Figure 5.3**).

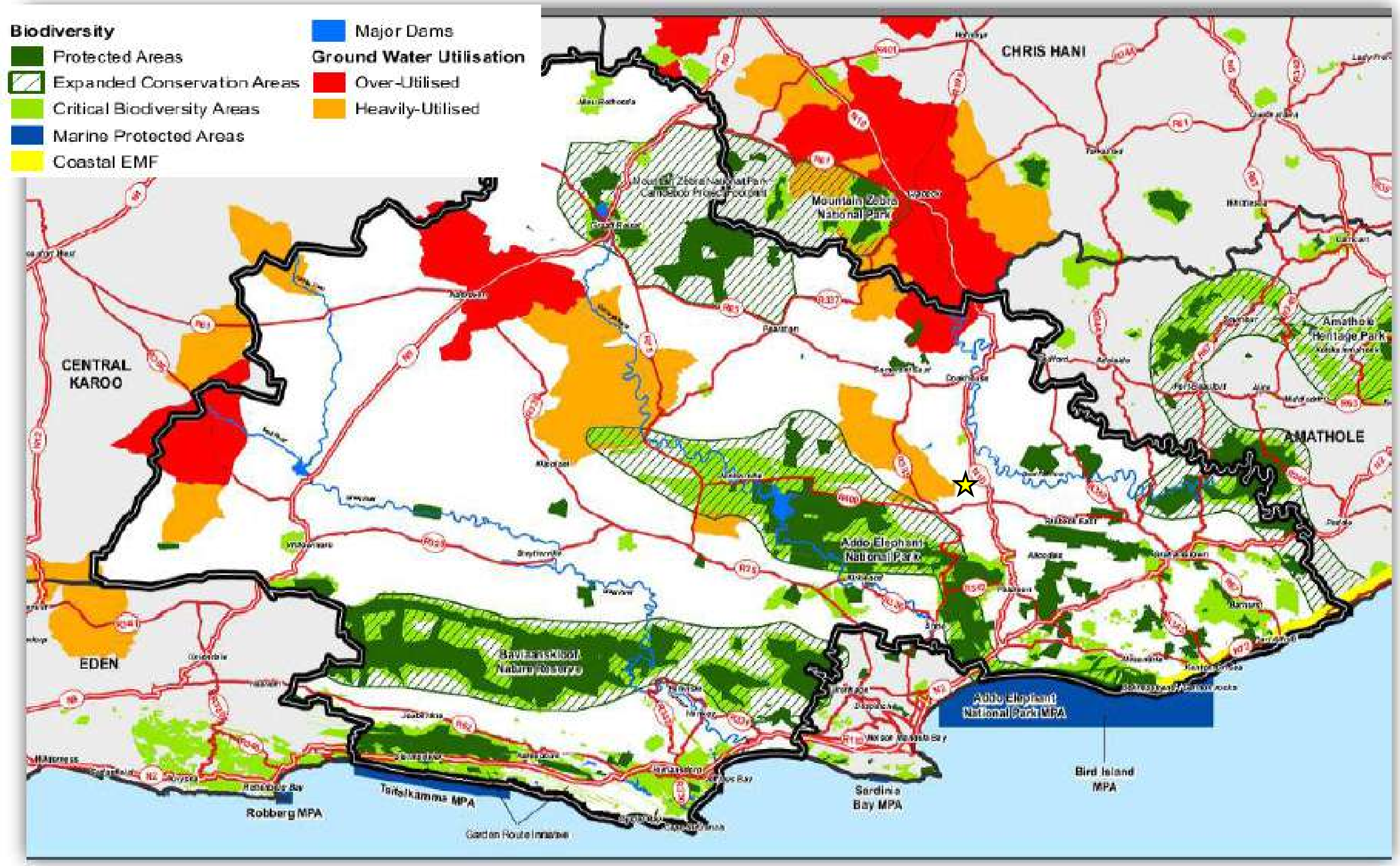

Figure 5.2: Environmental synopsis map detailed within the Sarah Baartman SDF (position of Sun Garden PV Facility shown by yellow star)

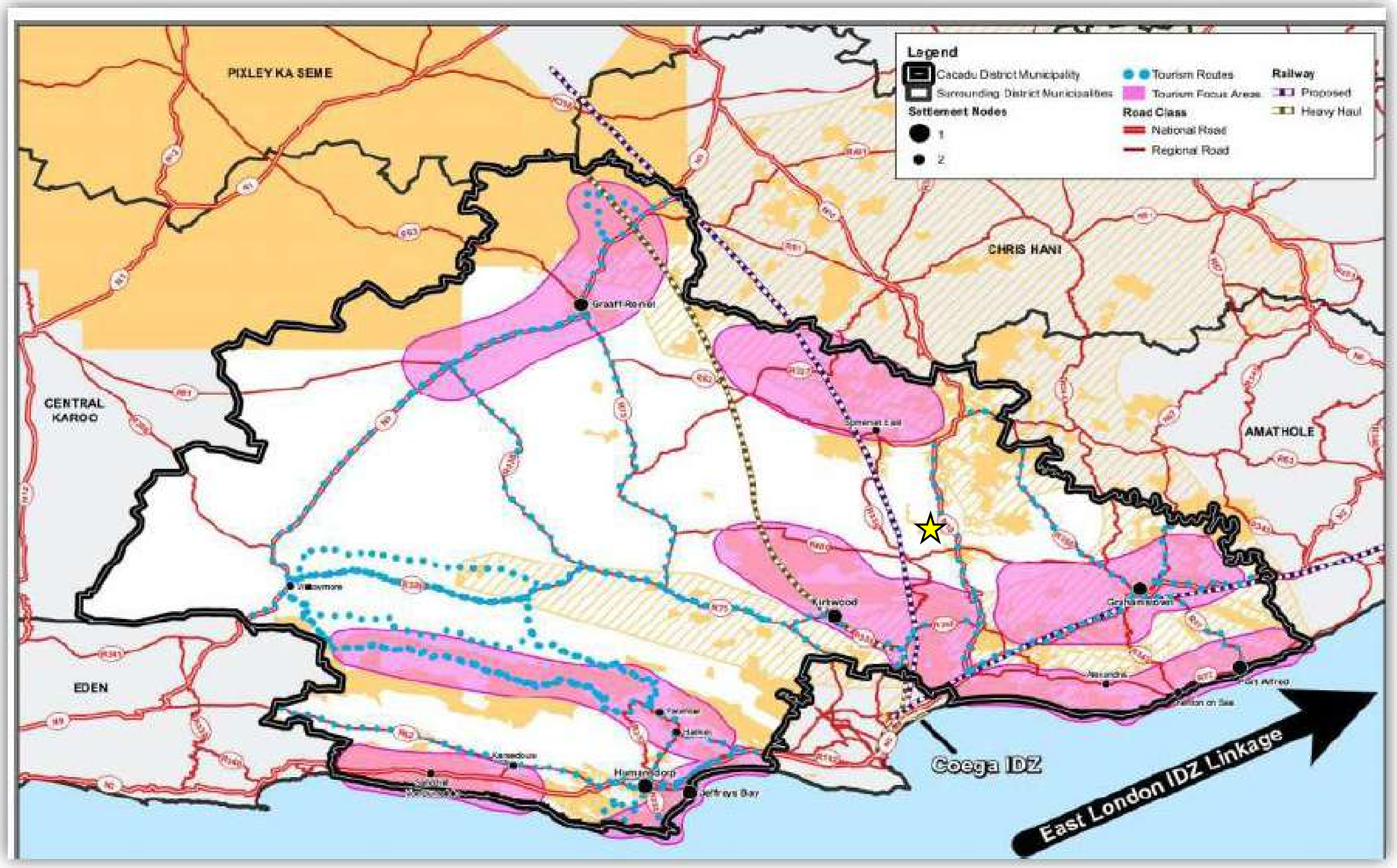

Figure 5.3: Economic development synopsis map detailed within the Sarah Baartman SDF (position of Sun Garden PV Facility shown by yellow star)

5.6.2 Sarah Baartman District Municipality Final Reviewed Integrated Development Plan for 2017/2022 (2018/2019 Draft)

The vision of the Sarah Baartman District Municipality (DM) is "An innovative and dynamic municipality striving to improve the quality of life for all communities in the District". The mission of the Sarah Baartman DM is to "Co-ordinate, support and provide sustainable services and promote socio-economic development".

The following strategic and local economic development objectives have been identified for the Sarah Baartman DM:

» Facilitate Investment in natural capital to contribute towards government's target of creating "green" and "blue" jobs by 2020.
» Broaden economic participation and inclusion by increasing the number and support to small enterprises.
» Developing skills and an education base by increasing the number of semi-skilled and skilled employment opportunities.
» Regenerating at least one core town as a service and economic hub.
» Building local and regional networks and collaboration through the creation of partnerships with government, the private sector and education / research.

The Sarah Baartman IDP identifies the green economy (including, but not limited to renewable energy and ecosystem services) as a focal point of economic development in the district, noting that such investments are likely to have significant economic spinoffs for the region. To achieve this, the IDP proposes investing in natural capital so as to create a new generation of green and blue economy jobs rooted in renewable energy. The development of the Sun Garden PV Facility is in line with the objectives of the IDP and will contribute to the achieving of the objectives, albeit to a limited extent.

The contribution of the tourism as a key private sector driven industry, is noted within the IDP, however concern is drawn to the fact that from a district-wide perspective the contribution of the tourism economy to the regional economy in terms of total spending as a percentage of GDP, has reduced from 13.8% in 2006 to 7.4% a decade later.

5.6.3 Blue Crane Route Local Municipality Integrated Development Plan Review (IDP), 2019-2020

The vision of the Blue Crane Route Local Municipality (LM) is "A Municipality that strives to provide a better life for all its citizens". The mission of the Blue Crane Route LM is "Through responsible local government, zero tolerance for corruption and creating an environment for upliftment and sustainable economic growth".

The following strategic and development objectives have been identified for the Blue Crane Route LM:

» To ensure uninterrupted supply of competent Human Resources.
» To promote employment equity and ensure competent workforce by 2022.
» To ensure health and safety of the employees in the workplace and compliance with OHS Act by 2022.
» To ensure efficient, economical and quality provision of water and sewer services by 2022.
» To ensure quality electricity supply and reduction of electricity losses by 2022.
» To ensure a healthy environment to improve human health by 2022.

- To ensure promotion of local economic development and job creation by 2022.
- To facilitate the mainstreaming of SMMEs and business into the formal economy by 2022.
- To strive for education on household poverty by labour intensive construction methods in 2022.
- To ensure that the municipality is financially viable to sustain short-, medium- and long-term obligations and to be able to provide services to the community in a sustained manner by 2022.
- To ensure effective efficient and compliant public participation by 2022.

The LM identified, through the undertaking of a community and stakeholder analysis, key priority issues. Issues relating to energy and electricity have been identified through this process and includes electricity provision to all in need and the upgrading of electricity infrastructure.

The electricity sector is one of the fastest growing sectors in the municipality and it is considered that the sector must be exploited to ensure the creation of new job opportunities for local people.

The Blue Crane Route Municipality identified renewable energy as a crucial aspect in securing energy for future development of the municipality. The municipality strives to be the leaders in renewable energy generation in the province. The municipality is identified as having potential to generate renewable energy and it also encompasses some of the largest energy generating wind farms in the country and currently supply electricity to the national grid, namely:

- Cookhouse Wind Farm
- Amakhala Emoyeni Wind Farm
- Nojoli Wind Farm
- Golden Valley Wind Farm
- Nxuba Wind Farm

The development of the Sun Garden PV Facility is therefore in line with the IDP.

5.6.4. Blue Crane Route Local Economic Development Strategy, 2008

The Blue Crane Route LED notes that there is potential to generate hydroelectricity in the municipality to mitigate the electricity supply shortcomings in the area. In addition, opportunities were identified to generate green energy in the municipality, with the following projects proposed for the municipality under the pillar of alternative sources of energy:

- Identification of suitable sites and the construction of hydro-electric stations
- Implement integrated electricity master plan
- Energy crisis management committee
- Recycling
- Energy awareness campaign
- Green energy e.g., solar energy.

CHAPTER 6: NEED AND DESIRABILITY

One of the objectives of the EIA process is to motivate for "*the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred development footprint*". The need and desirability of a development needs to consider whether it is the right time and right place for locating the type of land-use/activity being proposed. Need and desirability is therefore equated to the wise use of land and should be able to answer the question of what the most sustainable use of land is.

This chapter provides a description of the need and desirability of the Sun Garden PV Facility at the project site considered to be reasonable and feasible by the project Applicant.

6.1. Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 1: Content of basic assessment reports:

Requirement	**Relevant Section**
3(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.	The need and desirability of the Sun Garden PV Facility is included and discussed as a whole within this chapter. The need and desirability for the development of the Sun Garden PV Facility has been considered from an international, national, regional and site-specific perspective.

6.2 Need from an International Perspective

The need and desirability of the Sun Garden PV Facility, from an international perspective, can be described through the project's alignment with internationally recognised and adopted agreements, protocols, and conventions. South Africa is signatory to a number of international treaties and initiatives, including the United Nation's Development Programme's (UNDP's) Sustainable Development Goals (SDGs). The SDGs address social and economic development issues such as poverty, hunger, health, education, climate change, gender equality, water, sanitation, energy, urbanization, environment and social justice. The SDGs comprise 17 global goals set by the United Nations. The 17 SDGs are characterised by 169 targets, and 304 indicators.

Goal 7 of the SGDs relates to "Affordable and Clean Energy", with the aim of the goal being to ensure access to affordable, reliable, sustainable and modern energy for all. The following targets and indicators have been set for Goal 7:

Targets	**Indicators**
7.1 By 2030, ensure universal access to affordable, reliable and modern energy services.	7.1.1 Proportion of population with access to electricity.

Targets		Indicators	
		7.1.2	Proportion of population with primary reliance on clean fuels and technology.
7.2	By 2030, increase substantially the share of renewable energy in the global energy mix.	7.2.1	Renewable energy share in the total final energy consumption.
7.3	By 2030, double the global rate of improvement in energy efficiency.	7.3.1	Energy intensity measured in terms of primary energy and GDP.
7.A	By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology.	7.A.1	Mobilised amount of United States dollars per year starting in 2020 accountable towards the $100 billion commitment.
7.B	By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support.	7.B.1	Investments in energy efficiency as a percentage of GDP and the amount of foreign direct investment in financial transfer for infrastructure and technology to sustainable development services.

The development of the Sun Garden PV Facility would contribute positively towards achieving Goal 7 (and specifically 7.2.1) of the SGDs through the following means:

» By generating up to 400MW of affordable and clean energy.
  * A study published by the CSIR on 14 October 2016 ("Cost of new power generators in South Africa Comparative analysis based on recent IPP announcements", Dr Tobias Bischof-Niemz and Ruan Fourie) which took into consideration the results of the cost prices bid successfully under the DoE's REIPPP and Coal Baseload IPP Procurement (CBIPPP) Programmes found that solar PV and wind were 40% cheaper than new baseload coal (i.e. R0.62/kWh for PV and wind vs R1.03 for coal).
  * PV technology is one of the cleanest electricity generation technologies, as it is not a consumptive technology and does not result in the release of emissions during its operation.
» By contributing towards South Africa's total generation capacity, specifically through the utilisation of renewable energy resources.

The Kyoto Protocol (1997) is also relevant to the need of the development of the Sun Garden PV Facility from an international perspective. The protocol calls for the reduction of South Africa's greenhouse gas emissions through actively cutting down on using fossil fuels, or by utilising more renewable resources. The development of the Sun Garden PV Facility will add capacity to the renewable energy sector of the country and strengthen the commitment and action plan to achieve the requirements, as set out in the protocol, through the generation of energy without the emission of greenhouse gasses.

6.3 Need from a National Perspective

The National Development Plan (NDP) envisages that, by 2030, South Africa will have an energy sector that provides reliable and efficient energy service at competitive rates; that is socially equitable through expanded access to energy at affordable tariffs; and that is environmentally sustainable through reduced emissions and pollution. Historically, coal has provided the primary fuel resource for baseload electricity generation in South Africa. Consequently, Eskom, who is the main electricity generating company in the country, generates approximately 85% of the country's electricity from coal resources (Stats SA, 2016), resulting in a large carbon footprint. Taking into consideration the need to ensure adequate supply of electricity and meet international obligations in terms of addressing climate change, Government has identified the need to diversify the energy mix within the country.

The Sun Garden PV Facility is proposed in specific response to the identified energy mix of South Africa as per the requirements set out in the IRP with regards to renewable energy targets. As a result, the need and desirability of the project from a national perspective can largely be assimilated from the project's alignment with national government policies, plans, and programmes which have relevance to energy planning and production (as discussed in detail in Chapter 5). The following key policies have been developed by Government to take into account South Africa's current energy production and projected future demands, and provides the necessary framework within which energy generation projects can be developed:

» Integrated Energy Plan (IEP)
» Integrated Resource Plan (IRP)

The abovementioned energy plans have been extensively researched and are updated on an ongoing basis to take into consideration changing scenarios, new information, developments in new technologies, and to reflect updated demands and requirements for energy production within the South African context. These plans form the basis of South Africa's energy generation sector and dictate national priorities for energy production.

The IEP is intended to provide a roadmap of South Africa's future energy landscape and guide future energy infrastructure investments and policy development. The latest iteration of the IEP (25 November 2016) contained the following statement regarding solar power in South Africa:

"*South Africa experiences some of the highest levels of solar radiation in the world and this renewable resource holds great potential for the country. The daily solar radiation in South Africa varies between 4.5 and 6.5 kilowatt hours per square meter (kWh/m²) (16 and 23 megajoules per square meter [MJ/m²]) (Stassen, 1996), compared to about 3.6kWh/m² in parts of the United States and about 2.5kWh/m² in Europe and the United Kingdom. The total area of high radiation in South Africa amounts to approximately 194 000km², including the Northern Cape, which is one of the best solar resource areas in the world. With electricity production per square kilometre of mirror surface in a solar thermal power station being 30.2MW, and just 1% of the high radiation area in the country being made available for solar power generation, the generation potential is approximately 64GW. Solar energy has the potential to contribute quite substantially to South Africa's future energy needs. This would, however, require large investments in transmission lines from the areas of high radiation to the main electricity consumer centres*."

In terms of electricity generation, the IEP states that South Africa should continue to pursue a diversified energy mix which reduces reliance on a single or a few primary energy sources, and includes the following statement regarding solar energy's contribution to the diversified energy mix:

- *Solar should play a much more significant role in the electricity generation mix than it has done historically, and constitutes the greatest share of primary energy (in terms of total installed capacity) by 2050. The contribution of solar in the energy mix comprises both CSP and solar PV. Solar PV includes large scale installations for power generation which supply to the grid and individual, off-grid solar home systems and rooftop panels.*
- *A thorough solar resource assessment for South Africa should continue to be undertaken in the Northern Cape Province and extended to other provinces deemed to have high solar radiation levels.*
- *Investments should be made to upgrade the grid in order to accommodate increasing solar and other renewable energy contributions.*

The IRP for Electricity 2010 – 2030 is a subset of the IEP and constitutes South Africa's current gazetted energy plan. The purpose of the plan is to ensure sustainable electricity development which takes into consideration technical, economic, and social constraints, and identifies investments in the electricity sector which are required to meet the country's forecasted electricity demands at minimum costs. The IRP 2010 included 9.6GW of nuclear, 6.25GW of coal, **17.8GW of renewables**, and approximately 8.9GW of other generation sources such as hydro and gas in addition to all existing and committed power plants.

Besides capacity additions, a number of assumptions changed since the promulgation of IRP 2010–2030. Key assumptions that changed include the electricity demand projection, Eskom's existing plant performance, as well as new technology costs. In addition, environmental considerations such as South Africa's contribution to Greenhouse gases which contribute to climate change, local air quality and water availability have come to the fore. These considerations necessitated the review and update of the IRP and ultimately the promulgation of a revised plan in October 2019. In terms of the IRP 2019, South Africa continues to pursue a diversified energy mix that reduces reliance on a single or a few primary energy sources. In the period prior to 2030, the system requirements are largely for incremental capacity addition (modular) and flexible technology, to complement the existing installed inflexible capacity. South Africa is a signatory to the Paris Agreement on Climate Change and has ratified the agreement. In line with NDCs (submitted to the UNFCCC in November 2016), South Africa's emissions are expected to peak, plateau and from year 2025 decline. As detailed previously, the IRP 2019 provides for the development of 6000MW of new capacity from large scale PV.

In addition to the policy considerations detailed above, Government has prioritised post COVID-19 turnaround plans in terms of renewable energies within the Just Energy Transition (JET), coupled with key development objectives of the various spheres of government. These policies share the same ideals, such as:

- The utilisation, application and investment in renewable energy resources in South Africa is considered to be an essential means of reducing the carbon footprint of the country,
- Diversifying the national economy,
- Reducing poverty, and
- Providing critical additional energy to that of Eskom.

Government has compiled an Economic Reconstruction and Recovery Plan which was presented to Parliament in October 2020. According to this plan, the economic survey will rely on a massive investment in infrastructure, including energy, telecommunications, ports and rail. The core elements of the Economic Reconstruction and Recovery Plan are as follows:

1. Priority interventions for economic recovery: the plan sets out eight priority interventions that will ignite South Africa's recovery and reconstruction effort. These are the flagship initiatives that all of society will rally around to build a new economy (**Figure 6.1**).
2. Enabling conditions for growth: these are growth-enhancing reforms and other preconditions for an inclusive, competitive and growing economy.
3. Macroeconomic framework: economic reconstruction and recovery requires careful mobilisation of resources to ensure fiscal sustainability.
4. Institutional arrangements: the plan focuses on execution, and is supported by enhanced institutional arrangements to ensure implementation and accountability.

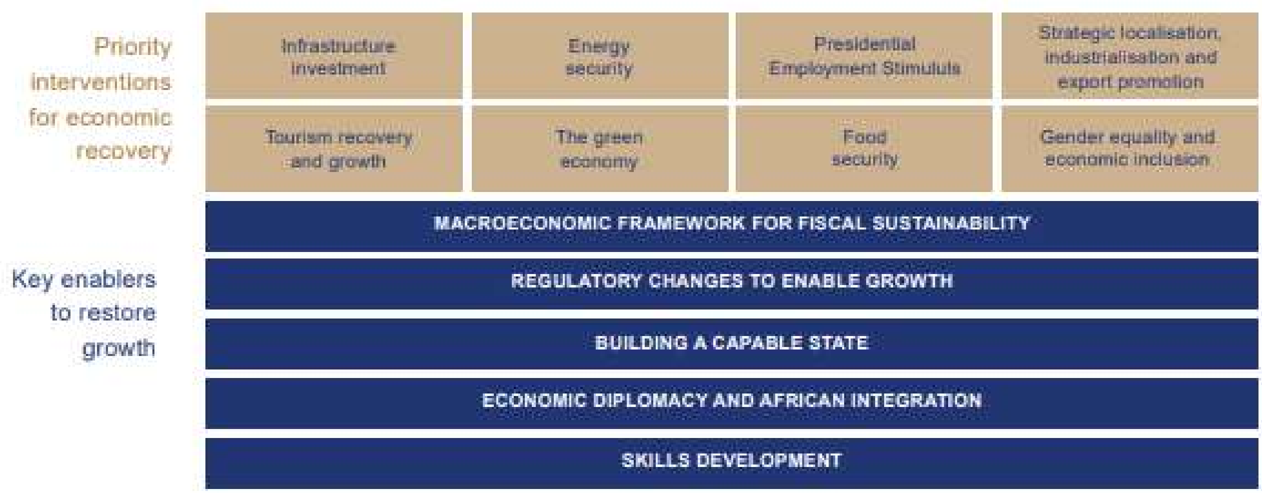

Figure 6.1: Core elements of the Economic Reconstruction and Recovery Plan (source: Building a new economy - Highlights of the Reconstruction and Recovery Plan, Presidency of the Republic of South Africa)

The plan recognises energy security as the most important prerequisite for the recovery agenda and states that renewed investment in a diversified energy mix can be achieved within a short time horizon, while alleviating a crippling energy crisis and facilitating a necessary transition to a less carbon-intensive economy. One of the key commitments of the plan is therefore to implement the IRP 2019 without delay to provide a substantial increase in the contribution of renewable energy sources by 2030, alongside other sources including battery storage, gas and clean coal. The transition to green energy is recognised as contributing towards the realisation of the low-carbon, climate-resilient and inclusive economy envisaged by the National Development Plan. The development of the Sun Garden PV Facility is identified as a mechanism for securing additional power generation capacity for private off-takers, reducing the reliance for electricity on Eskom.

The cluster of renewable energy facilities, which the Sun Garden PV Facility forms part of, will ensure the optimisation of a supply of steady state baseload type power, as well as play a significant role in the Just Energy Transition ("JET") by supplying low-cost energy to the national grid. At the same time, it will contribute to a JET fund to assist in transitioning jobs from the fossil fuel sector in Mpumalanga to renewable energy. The available solar resource, proximity to the transmission infrastructure and scale of the portfolio may also play a possible role in in contributing to the hydrogen economy in South Africa, with Europe as a possible export market.

Furthermore, the solar facility will contribute to the economic recovery and reconstruction as part of the Government's plan.

It is the developer's intention to supply the electricity generated from the Sun Garden PV Facility to private off-takers in the region, with key customer focus areas primarily being within the industrial, mining and commercial sectors where there is a need to shift towards cleaner and more sustainable sources of energy. The project therefore does not form part of the Renewable Energy Independent Power Producer Procurement (REIPPP) programme of the DMRE. The expected load requirements of potential customers are in excess of 1 000 GWh.

The South African government has identified the green economy as one of 12 job drivers that could help contribute to creating 5 million additional jobs by 2020. The New Growth Path, in which the sectoral job targets are disaggregated, envisages that as many as 300 000 new direct jobs could be created in the areas of natural resource management and renewable energy construction (Department of Energy, 2019). Even though the project will not form part of the REIPPP programme, the Applicant will implement similar social and economic development strategies, including amongst others, job creation, local content, skills development, enterprise and supplier development, and socio-economic development. In addition to electricity generation and supply the project will therefore also contribute positively towards socio-economic development of a region, over and above job creation.

The need for new power generation from renewable energy has therefore been identified and assessed by Government at a national scale considering the national energy requirements as well as international commitments to address climate change under the Paris Agreement, and provision has been made for the inclusion of new solar power generation capacity in South Africa's energy mix. The implementation of the Sun Garden PV Facility, therefore, has the potential to contribute positively towards the identified national need, while simultaneously contributing to job creation and socio-economic development, which is identified as a need for the country within the National Development Plan. The solar facility will make use of renewable energy technology and would contribute positively towards reducing South Africa's GHG emissions and the Just Energy Transition of the country. In addition, by making use of solar power technology, the project would have reduced water requirements, when compared with some other generation technologies such as coal and gas, in alignment with one of the vision 2030 themes of DWS's National Water Resource Strategy 2 (2013) (i.e. transitioning to a low carbon economy through stimulating renewable energy and retrofitting buildings).

6.3.1 Benefits of Renewable Energy in the South African Environment

The generation of electricity from renewable energy resources offers a range of potential socio-economic and environmental benefits for South Africa. These benefits include:

Increased energy security: Given that renewables can often be deployed in a short timeframe and in a decentralised manner close to consumers, they offer the opportunity for improving grid strength and supply quality in the short-term, while reducing expensive distribution losses. As a result of the power constraints in the first half of 2015, power generators, meant to be the "barely-ever-used" safety net for the system (diesel-fired gas turbines), were running at > 30% average load factor in the first half of 2015. Load shedding occurred during 82 days in the first half of 2015 (out of 181 days). Results of a CSIR Energy Centre study for the period January to June 2015 (CSIR, August 2015), concluded that the already implemented renewable projects (wind and solar) within the country avoided 203 hours of so-called 'unserved energy'. During these hours the supply situation was so tight that some customers' energy supply would have had to be curtailed ('unserved') if it had not been for the renewables. The avoidance of unserved energy cumulated into the effect that during 15 days from January to June 2015, load shedding was avoided entirely, delayed, or a higher stage of load shedding was prevented due to the contribution of the wind and PV projects[6].

Resource saving: It is estimated that the achievement of the targets in the Renewable Energy White Paper will result in water savings of approximately 16.5 million kilolitres per annum. As an already water-stressed nation, it is critical that South Africa engages in a variety of water conservation measures, particularly due to the detrimental effects of climate change on water availability. Renewable energy also translates into revenue savings, as fuel for renewable energy facilities is free compared to the continual purchase of fuel for conventional power stations. Results of a CSIR Energy Centre study for January to June 2015 (CSIR, August 2015) have quantified the contribution from renewable energy to the national power system and the economy over the first 6 months of 2015 compared to the 12 months of 2014:

2014 (12 months)	**2015 (6 months)**
R3.64 billion saving in diesel and coal fuel costs	R3.60 billion saving in diesel and coal fuel costs
120 hours of unserved energy avoided, saving at least an additional R1.67 billion for the economy	200 hours of unserved energy avoided, saving at least an additional R1.20 billion–R4.60 billion for the economy
Generated R0.8 billion more financial benefits than cost	Generated R4.0 billion more financial benefits than cost

The overview of the Independent Power Producers Procurement Report (March 2019) has indicated that water savings of 42.8 million kilolitres has been realised by the programme from inception until the end of March 2019, of which 3.4 million kilolitres is reported on in this 2019 reporting quarter.

Exploitation of our significant renewable energy resource: At present, valuable renewable resources including biomass by-products, solar radiation and wind power remain largely unexploited. The use of these energy flows will strengthen energy security through the development of a diverse energy portfolio in South Africa.

By the end of March 2019, the REIPPPP had made the following significant impacts in terms of energy supply:

» 6 422MW of electricity had been procured from 112 Renewable Energy Independent Power Producers (IPPs) in seven bid rounds;
» 3 976 MW of electricity generation capacity from 64 IPP projects has been connected to the national grid;
» 35 669 GWh6 of energy has been generated by renewable energy sources procured under the REIPPPP since the first project became operational. Renewable energy IPPs have proved to be very reliable. Of the 64 projects that have reached COD, 62 projects have been operational for longer than a year. The energy generated over the past 12 month period for these 62 projects is 10 648 GWh, which is 96% of their annual energy contribution projections of 11 146 GWh over a 12 month delivery period. Twenty-eight (28) of the 62 projects (45%) have individually exceeded their projections.

Economics: As a result of the excellent resource and competitive procurement processes, both wind power and solar PV power are now proven in South Africa as cheaper forms of energy generation than coal power. They offer excellent value for money to the economy and citizens of South Africa while benefitting society as a whole through the development of clean energy.

[6] (http://ntww1.csir.co.za/plsql/ptl0002/PTL0002_PGE157_MEDIA_REL?MEDIA_RELEASE_NO=7526896)

The following has been achieved by the IPP programme (March 2019) in terms of investment and economics:

» Investment (equity and debt) to the value of R209.7 billion10, of which R41.8 billion (20%) is foreign investment, was attracted;
» Socio-economic development contributions of R860.1 million to date, of which R81.1 million was spent in this 2019 reporting quarter; and
» Enterprise development contributions of R276.7 million to date, of which R26.5 million was spent in this 2019 reporting quarter.

Pollution reduction: The release of by-products through the burning of fossil fuels for electricity generation has a particularly hazardous impact on human health and contributes to ecosystem degradation. The use of solar radiation or wind for power generation is a non-consumptive use of a natural resource which produces zero emissions during its operation.

The overview of the Independent Power Producers Procurement Report (March 2019) indicates that carbon emission reductions of 36.2 Mton CO_2 has been realised by the IPP programme from inception to date, of which 2.91 Mton is in this 2019 reporting quarter.

Climate friendly development: The uptake of renewable energy offers the opportunity to address energy needs in an environmentally responsible manner and thereby allows South Africa to contribute towards mitigating climate change through the reduction of greenhouse gas (GHG) emissions. South Africa is estimated to be currently responsible for approximately 1% of global GHG emissions (and circa half of those for which Africa is responsible) and is currently ranked 9th worldwide in terms of per capita carbon dioxide emissions. The renewable energy sector saved South Africa 1.4 million tons of carbon emissions over the first 6 months of 2015[7].

Support for international agreements: The effective deployment of renewable energy provides a tangible means for South Africa to demonstrate its commitment to its international agreements under the Kyoto Protocol and the Paris Agreement, and for cementing its status as a leading player within the international community.

Employment creation: The development, procurement, installation, maintenance and management of renewable energy facilities have significant potential for job creation and skills development in South Africa. The construction phase will create temporary employment opportunities and the operation phase will create limited full-time employment opportunities.

The overview of the Independent Power Producers Procurement Report (March 2019), indicates that all IPP projects to date have created 40 134 job years for South African citizens.

Acceptability to society: Renewable energy offers a number of tangible benefits to society including reduced pollution concerns, improved human and ecosystem health, the use of clean energy and climate friendly development.

[7] http://www.iol.co.za/capetimes/renewable-energy-saving-sa-billions-csir-1.1903409#.VkNjdJq6FeU

Support to a new industry sector: The development of renewable energy offers the opportunity to establish a new industry within the South African economy, which will create jobs and skill local communities and result in community upliftment for the affected areas.

Protecting the natural foundations of life for future generations: Actions to reduce the disproportionate carbon footprint can play an important part in ensuring the human role in preventing dangerous anthropogenic climate change, thereby securing the natural foundations of life for generations to come; this is the basis of sustainable development.

6.4 Need from a Provincial Perspective

South Africa's electricity generation mix has historically been dominated by coal. This can be attributed to the fact that South Africa has abundant coal deposits, which are relatively shallow with thick seams, and are therefore easy and comparatively cost effective to mine. In 2016, South Africa had a total generation capacity of 237 006GWh; approximately 85.7% (equivalent to 203 054GWh) of this figure was generated by coal, and only 0.9% (equivalent to 2 151GWh) was generated by solar (refer to **Figure 6.2**).

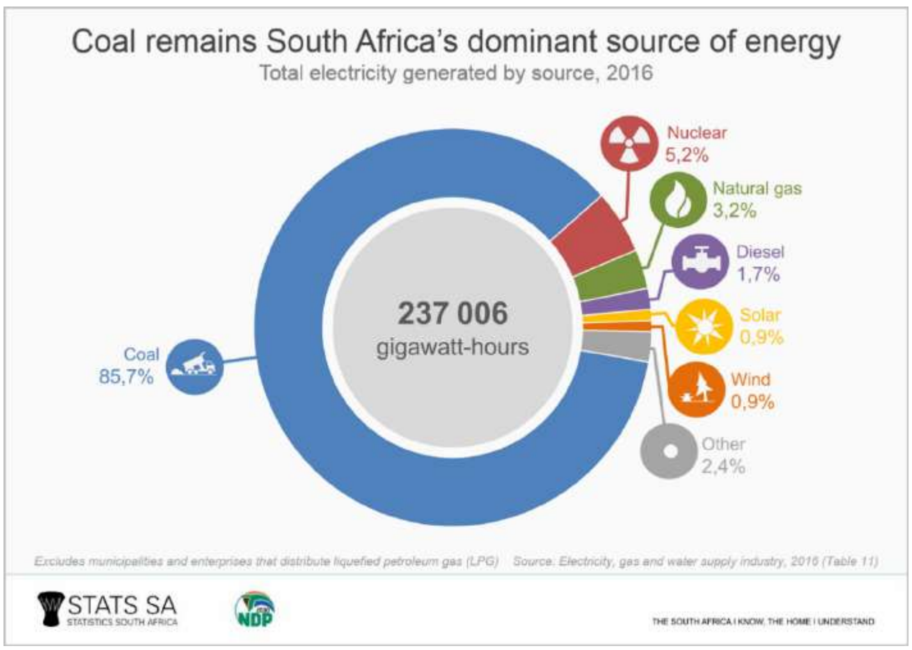

Figure 6.2: Overview of South Africa's electricity generation by source (source: StatsSA 2016 Electricity, gas and water supply industry)

Whereas the majority of South Africa's electricity generation infrastructure is currently located within Mpumalanga Province due to the location of coal resources within this province, the Eastern Cape Province ("the Province") has been identified as an area where the development of renewable energy facilities is a feasible and suitable option for electricity generation.

The Eastern Cape Provincial 2030 Draft Development Plan indicates that sustainable development must be ensured in the Province and that people-centred development and economic development is imperative to address the most significant challenge facing the Eastern Cape, i.e. material poverty and deprivation. The Province also acknowledges climate and environmental challenges, the need to enhance environmental resilience and sustainability, the efficient use of scarce natural resources, the promotion of renewable sources of energy and new jobs and income for the poor in terms of a green agenda.

The overall energy objective for the Province also includes promoting the development of renewable energy supply schemes which are considered to be strategically important for increasing the economic opportunities for affected communities, while also minimising the detrimental environmental impacts. The implementation of sustainable renewable energy is also to be promoted within the Province through appropriate financial and fiscal instruments.

6.4 Need from a District and Local Perspective

As detailed in Chapter 3 of this report, the area under consideration has been confirmed as an area with sufficient solar resources for a solar development.

From a district level the need for the development of the Sun Garden PV Facility is reflected within the Sarah Baartman District Municipality and Blue Crane Route Local Municipality planning documentation. The following planning policies make reference to the need for the development of renewable energy facilities within the municipal area:

» The Sarah Baartman SDF notes that the introduction of alternative energy generation infrastructure and the associated land use change will provide both economic opportunities but may also have a negative impact on the ecotourism of the district (in the form of potential changes to the visual and cultural landscapes).

» The Sarah Baartman District Municipality Final Reviewed Integrated Development Plan for 2017/2022 has determined that the creation of new generation green jobs and local income streams are rooted in renewable energy. The anticipated growth in the renewable energy sector provides major opportunities for growth in job creation in the province because of the potential of the area to host renewable energy generation infrastructure as well as the potential to be a major manufacturer of such infrastructure leveraging off the automotive sector.

» The Blue Crane Route Local Municipality Integrated Development Plan Review (IDP), 2019-2020 confirmed that the electricity sector is one of the fastest growing sectors in the municipality and it is considered that the sector must be exploited to ensure the creation of new job opportunities for local people.

In addition, the project site is located within the Cookhouse Renewable Energy Development Zone (REDZ), an area designated for the development of large-scale wind and solar energy facilities (REDZ 3 as per GNR114 of February 2018). The Blue Crane Route Municipality IDP identifies renewable energy as a crucial aspect in securing energy for future development of the municipality. The municipality has outlined the importance of its renewable energy resources and the need to take advantage of the resources for the development of the local and regional economy. The municipality also strives to be the leaders in renewable energy generation in the province.

From the above, it is clear that the need and desirability for the project is supported from a planning and policy perspective on a district, and local level, as well as from a technical perspective when considering solar resource. It is however important to also consider the potential impacts and benefits that the proposed solar facility may have for the affected site and surrounding area from both a biodiversity sustainability perspective and a socio-economic perspective. Therefore, it has been imperative for the assessment undertaken for the project to consider this project not only from a policy (national, provincial and local level) perspective, but also from a biodiversity and socio-economic perspective. The aim of this Basic Assessment process has been to ensure a balance between these three spheres and the key chapters of this report (Chapters 9 to 11) draw on both the positive and negative consequences of the proposed development, as well as the potential for impacts to be compounded through the development of the solar facility and its associated infrastructure in proximity to other similar developments (i.e. cumulative impact).

6.5 Receptiveness and Desirability of the project site to develop the Sun Garden PV Facility

The feasibility of the project site and development envelope for the development of the Sun Garden PV Facility also provides an indication of the desirability of the development within the site-specific location. As detailed in Chapter 3 of this report, the site has specifically been identified by the project proponent as being highly desirable for the development of a PV facility due to its suitable topography (i.e. in terms of slope and local topography), site access (i.e. to facilitate the movement of machinery during the construction phase and operations staff in the long-term), land availability (i.e. the land is secured for the intended use), the extent of the site (i.e. the land parcel is able to accommodate the 350ha required for the facility), and enabling optimal placement of the infrastructure considering potential environmental sensitivities or technical constraints, access to the electricity grid, as well as the consolidation of renewable projects within an already identified node, being within an identified REDZ. As indicated in the previous section, it is important to consider the potential impacts and benefits that the proposed solar facility may have for the affected site and surrounding area from both a biodiversity sustainability perspective and a socio-economic perspective on order to confirm the desirability of the proposed development on the identified site. This assessment has been undertaken within the current Basic Assessment process and is presented in this report.

CHAPTER 7: APPROACH TO UNDERTAKING THE BASIC ASSESSMENT PROCESS

In terms of the EIA Regulations of December 2014 (as amended) published in terms of the NEMA (Act No. 107 of 1998) as amended, the construction and operation of the Sun Garden PV Facility is a listed activity requiring environmental authorisation. In terms of GN R114 of February 2018, the application for environmental authorisation is required to be supported by a BA process based on the location of the project site within the Cookhouse REDZ.

The BA process aims at identifying and describing potential environmental issues associated with the development of the proposed PV facility and the associated infrastructure. In order to ensure that a comprehensive assessment is provided to the competent authority and I&APs regarding the impacts of the facility, detailed independent specialist studies were undertaken as part of the BA process.

South Africa has been subject to the enforcement of Government Gazette 43096 which places the country in a national state of disaster limiting the movement of people to curb the spread of the COVID-19 virus. The status of national state of disaster was still relevant at the commencement of the BA process. Considering the limitations in place, a comprehensive consultation process was designed and implemented to cater for the undertaking of a full-scale, innovative public participation process which included I&APs, the competent authority, directly impacted landowners/occupiers, adjacent landowners/occupiers, relevant Organs of State departments, ward councillors and other key stakeholders, while remaining within the limits as stipulated by the National Government. This chapter serves to outline the process that was followed during the BA process.

7.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 1: Content of basic assessment reports:

Requirement	Relevant Section
3(d)(i) a description of the scope of the proposed activity, including all listed and specified activities triggered and being applied for.	All listed activities triggered as a result of the development of the Sun Garden PV Facility have been included in section 7.2, **Table 7.1**. The specific project activity relating to the relevant triggered listed activity has also been included in **Table 7.1**.
3(h)(ii) details of the public participation process undertaken in terms of Regulation 41 of the Regulations, including copies of the supporting documents and inputs.	A public participation plan was prepared and approved by the DFFE (**Appendix C1**). The details of the public participation process undertaken have been included and described in section 7.3.2.
3(h)(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.	All comments received from the commencement of the BA process has been included and responded to in the Comments and Responses (C&R) Report (**Appendix C9**). All comments raised during the 30-day review and comment period of the BA Report and through on-going consultation with I&APs will be included and responded to as part of a C&R report (**Appendix C9**) to be submitted as part of the Final BA Report to DFFE for decision-making.

Requirement	Relevant Section
3(h)(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.	The methodology used to assess the significance of the impacts of the Sun Garden PV Facility has been included in section 7.4.
(o) a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed.	The assumptions and limitations of the BA process being undertaken for the Sun Garden PV Facility is included in section 7.6.

7.2 Relevant legislative permitting requirements

The legislative permitting requirements applicable to the Sun Garden PV Facility, as identified at this stage in the process, are described in more detail under the respective sub-headings.

7.2.1 National Environmental Management Act (No. 107 of 1998) (NEMA)

NEMA is South Africa's key piece of national environmental legislation that provides for the authorisation of certain controlled activities known as "listed activities". In terms of Section 24(5) of NEMA, the potential impact on the environment associated with listed activities must be considered, investigated, assessed and reported on to the competent authority (the decision-maker) charged by NEMA with granting of the relevant EA. Due to the fact that the PV facility is a power generation project and therefore relates to the IRP 2010 – 2030, the National Department of Forestry, Fisheries and the Environment, (DFFE) has been determined as the Competent Authority in terms of GN R779 of 01 July 2016. The Provincial Eastern Cape Department of Economic Development, Environmental Affairs and Tourism (DEDEAT) is the Commenting Authority on the project.

The need to comply with the requirements of the EIA Regulations published under the NEMA ensures that proponents are provided the opportunity to consider the potential environmental impacts of their activities early in the project development process, and also allows for an assessment to be made as to whether environmental impacts can be avoided, minimised or mitigated to acceptable levels. Comprehensive, independent environmental studies are required to be undertaken in accordance with the EIA Regulations to provide the competent authority with sufficient information in order for an informed decision to be taken regarding the project and Application for Environmental Authorisation (EA).

The BA process being conducted for the Sun Garden PV Facility is undertaken in accordance with Section 24(5) of the NEMA, which defines the procedure to be followed in applying for EA, and requires that the potential consequences for, or impacts of, listed or specified activities on the environment be considered, investigated, assessed, and reported on to the competent authority. Listed Activities are activities identified in terms of Section 24 of the NEMA which are likely to have a detrimental effect on the environment, and which may not commence without an EA from the competent authority subject to the completion of an environmental assessment process (either a Basic Assessment (BA) or full Scoping and EIA).

As the proposed development is located within Zone 3 of the REDZ (also known as the Cookhouse REDZ), one of the eight (8) designated REDZ areas, the EIA process to be followed for the PV facility will be as per GN R114, as formally gazetted on 16 February 2018. The Sun Garden PV Facility is now subject to a Basic Assessment process and not a full EIA process, as well as a shortened timeframe of 57 days for the processing of an application for environmental authorisation.

Table 7.1 details the listed activities in terms of the EIA Regulations, 2014 (as amended) that apply to the Sun Garden PV Facility, and for which an application for EA has been submitted to the DFFE. The table also includes a description of the specific project activities that relate to the applicable listed activities.

Table 7.1: Listed activities as per the EIA regulations that are triggered by the Sun Garden PV Facility

Indicate the number and date of the relevant notice:	**Activity No (s) (in terms of the relevant notice):**	**Describe each listed activity as per project description**
GN R327, 08 December 2014 (as amended on 07 April 2017)	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. ***The Sun Garden PV Facility will require the construction and operation of a 132/33kV on-site collector substation to be connected to a proposed 400kV Main Transmission Substation (MTS) via a 132kV overhead power line (twin turn dual circuit) to facilitate the connection of the facility to the national grid. The project site assessed for the siting of the Sun Garden PV Facility is located outside of an urban area.***
GN R327, 08 December 2014 (as amended on 07 April 2017)	12(ii)(a)(c)	The development of (ii) infrastructure or structures with a physical footprint of 100 square meters or more; where such development occurs (a) within a watercourse or (c) within 32 meters of a watercourse, measured from the edge of a watercourse. ***The development of the Sun Garden PV Facility will require the establishment of infrastructure (including internal access roads) with a physical footprint exceeding 100m² within a watercourse or within 32m of a watercourse identified within the project site. The development footprint of the PV facility will be ~350ha in extent.***
GN R327, 08 December 2014 (as amended on 07 April 2017)	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 meters or more but not exceeding 500 cubic meters. ***The development and operation of the Sun Garden PV Facility will require infrastructure for 120 cubic metres of storage of dangerous goods, which will include flammable and combustible liquids such as oils associated with the on-site collector substation and switching station transformers, lubricants and solvents.***
GN R327, 08 December 2014 (as amended on 07 April 2017)	19	The infilling or depositing of any material of more than 10 cubic meters 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. ***Watercourses are located within the development footprint for the facility. Therefore, during the construction phase, 10 cubic metres of rock will be removed from the watercourses for the***

Indicate the number and date of the relevant notice:	Activity No (s) (in terms of the relevant notice):	Describe each listed activity as per project description
		development of the Sun Garden PV Facility and associated infrastructure.
GN R327, 08 December 2014 (as amended on 07 April 2017)	24(ii)	The development of a road with a reserve wider than 13,5 meters, or where no reserve exists the road is wider than 8 meters. ***The width of the roads at the access points will be up to 8m. The internal access roads will be up to 4.5m wide, and will have a servitude of up to 13.5m.***
GN R327, 08 December 2014 (as amended on 07 April 2017)	28(ii)	Residential, mixed, retail, commercial, industrial, or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare. ***The Sun Garden PV Facility (considered to be an industrial development) will be constructed and operated on land currently used for agricultural purposes, mainly grazing. The development footprint considered for the establishment of the PV facility is ~350ha in extent and is located outside an urban area.***
GN R325, 08 December 2014 (as amended on 07 April 2017)	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. ***The Sun Garden PV Facility will make use of solar energy as a renewable energy resource. The project will have a contracted capacity of up to 400MW.***
GN R325, 08 December 2014 (as amended on 07 April 2017)	15	The clearance of an area of 20 hectares or more of indigenous vegetation. ***The project will require the clearance of an area of ~350ha (equivalent to the development footprint) of vegetation. The project is proposed on a property where the predominant land use is grazing and comprises of indigenous vegetation. The project would therefore result in the clearance of an area of indigenous vegetation greater than 20ha in extent.***
GN R324, 08 December 2014 (as amended on 07 April 2017)	4(a)(i)(ee)	The development of a road wider than 4 metres with a reserve less than 13,5 metres (a) in the Eastern Cape, (i) outside urban areas, (ee) within critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans. ***The Sun Garden PV Facility will require main access roads up to 8m wide and internal access roads up to 4,5m wide. The project site is located within the Eastern Cape Province, outside of an urban area and falls within Ecological Support Area 1 (ESA1) as per the Eastern Cape Biodiversity Plan.***

Indicate the number and date of the relevant notice:	Activity No (s) (in terms of the relevant notice):	Describe each listed activity as per project description
GN R324, 08 December 2014 (as amended on 07 April 2017)	12(a)(ii)	The clearance of an area of 300 square metres or more of indigenous vegetation (a) in the Eastern Cape, (ii) within critical biodiversity areas identified within bioregional plans. ***The Sun Garden PV Facility requires the clearance of ~88.2ha of indigenous vegetation. The project site is located within the Ecological Support Area 1 (ESA1) as per the Eastern Cape Biodiversity Plan.***
GN R324, 08 December 2014 (as amended on 07 April 2017)	14(ii)(a)(c)(a)(i)(ff)	The development of (ii) infrastructure or structures with a physical footprint of 10 square metres or more, where such development occurs (a) within a watercourse, and (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse, (a) in the Eastern Cape, (i) outside urban areas and (ff) within critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans. ***The development of the Sun Garden PV Facility will require the establishment of infrastructure (including internal access roads) with a physical footprint exceeding 10m^2 within a watercourse or within 32m of a watercourse identified within the project site. The development footprint of the PV facility will be ~350ha in extent. The project site is located within the Eastern Cape, outside of an urban area and within areas identified as Ecological Support Area 1 (ESA1) as identified in the Eastern Cape Biodiversity Plan.***
GN R324, 08 December 2014 (as amended on 07 April 2017)	18(a)(i)(ee)(ii)(KK)	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre (a) in the Eastern Cape, (i) outside urban areas, (ee) within critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (ii) in areas on the watercourse side of the development setback line or within 100 metres from the edge of a watercourse where no such setback line has been determined and (KK) within a watercourse. ***Existing roads within the project site will need to be upgraded and widened by more than 4m. The project site is located in the Eastern Cape, outside of urban areas and falls within an area defined as Ecological Support Area 1 (ESA1) as per the Eastern Cape Biodiversity Plan. Watercourses are present within the project site.***

7.2.2 National Water Act (No. 36 of 1998) (NWA)

In accordance with the provisions of the National Water Act (No. 36 of 1998) (NWA), all water uses must be licensed with the Competent Authority (i.e. the Regional Department of Water and Sanitation). Water use is defined broadly, and includes taking and storing water, activities which reduce stream flow, waste discharges and disposals, controlled activities (activities which impact detrimentally on a water resource), altering a watercourse, removing water found underground for certain purposes, and recreation.

Table 7.1 lists the possible Water Uses associated with the proposed project and identified in terms of the NWA which require licensing either in the form of a General Authorisation (GA), or in the form of a Water Use License (WUL). The table also includes a description of those project activities which relate to the applicable Water Uses.

Table 7.1: List of Water Uses published under Section 21 of NWA, as amended.

Activity No.	Description of Water Use
Section 21 (a)	Taking water from a water resource. ***Groundwater from existing boreholes will be abstracted for use during the construction and operation phases for the PV facility.***
Section 21 (c)	Impeding or diverting the flow of water in a watercourse. ***The development footprint considered for the establishment of the PV facility is associated with the presence of watercourses and pans. Activities pertaining to the establishment of the PV facility might encroach on watercourses/pans which may lead to an impediment and diversion of the flow of water in the watercourses.***
Section 21 (g)	Disposing of waste in a manner which may detrimentally impact on a water resource. ***Typically, the conservancy tanks at construction camps and then O/M buildings require a license (GA if volumes are below 10 000m^3), however the relevance of this to the Sun Garden PV Facility is still to be determined.***
Section 21 (i)	Altering the bed, banks, course or characteristics of a watercourse. ***The development footprint considered for the establishment of the PV facility is associated with the presence of watercourses and pans. Activities pertaining to the establishment of the PV facility might encroach on watercourses/pans which may lead to the altering of the characteristics of the watercourses/pans.***

An application for a Water Use Authorisation for the above-mentioned identified water uses has been made by the applicant. The process of applying for a WUL or GA registration will only be completed once a positive EA has been received. This is in line with the requirements of the Department of Water and Sanitation.

7.2.3 National Heritage Resources Act (No. 25 of 1999) (NHRA)

The National Heritage Resources Act (No. 25 of 1999) (NHRA) provides an integrated system which allows for the management of national heritage resources and to empower civil society to conserve heritage resources for future generations. Section 38 of NHRA provides a list of activities which potentially require the undertaking of a Heritage Impact Assessment.

<u>Section 38: Heritage Resources Management</u>

1). Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as –

- *a. the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;*
- *b. the construction of a bridge or similar structure exceeding 50m in length;*
- *c. any development or other activity which will change the character of a site –*
  - *i). exceeding 5 000m² in extent; or*

ii). involving three or more existing erven or subdivisions thereof; or

iii). involving three or more erven or divisions thereof which have been consolidated within the past five years; or

iv). the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;

Must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

In terms of Section 38(8), approval from the heritage authority is not required if an evaluation of the impact of such development on heritage resources is required in terms of any other legislation (such as NEMA), provided that the consenting authority ensures that the evaluation of impacts fulfils the requirements of the relevant heritage resources authority in terms of Section 38(3) and any comments and recommendations of the relevant resources authority with regard to such development have been taken into account prior to the granting of the consent. However, should heritage resources of significance be affected by the Sun Garden PV Facility, a permit is required to be obtained prior to disturbing or destroying such resources as per the requirements of Section 48 of the NHRA, and the SAHRA Permit Regulations (GN R668).

7.3 Overview of the Basic Assessment Process for the Sun Garden PV Facility

Key tasks undertaken for the BA included:

» Consultation with relevant decision-making and regulating authorities (at National, Provincial and Local levels).
» Submission of the completed Application for Environmental Authorisation to the competent authority (i.e. DFFE) in terms of Regulations 5 and 6 of the EIA Regulations, 2014 (GNR 326), as amended.
» Undertaking a public participation process in accordance with Chapter 6 of GNR326, and the Department of Environmental Affairs (2017), Public Participation guidelines in terms of NEMA EIA Regulations, Department of Environmental Affairs, Pretoria, South Africa (hereinafter referred to as "the Guidelines") in order to identify issues and concerns associated with the proposed project.
» Undertaking of independent specialist studies in accordance with Appendix 6 of the EIA Regulations, 2014 (GNR326), as amended, and the requirements of the Specialist Protocols published in Regulation GNR 320, issued 20 March 2020 and 30 October 2020.
» Preparation of a BA Report and EMPr in accordance with the requirements of Appendix 1 and Appendix 4 of GN R326.
» 30-day public and authority review period of the BA report.
» Compilation of a C&R report detailing the comments raised by I&APs, addressing these comments in detail and finalisation of the BA report.
» Submission of a final BA report to the DFFE for review and decision-making.

The tasks are discussed in detail in the sub-sections below.

7.3.1. Authority Consultation and Application for Authorisation in terms of the 2014 EIA Regulations (as amended)

In terms of Government Notice 779 of 01 July 2016, the National Department of Forestry, Fisheries and the Environment (DFFE) is the competent authority for all projects related to the IRP. As the project is located within the Eastern Cape Province, the Provincial Eastern Cape Department of Economic Development, Environmental Affairs and Tourism (DEDEAT) is the commenting authority. Consultation with the regulating authorities (i.e. DFFE and DEDEAT) as well as with all other relevant Organs of State will continue throughout the BA process. To date, this consultation has included the following:

» Holding of a Pre-application Meeting with the DFFE on 09 October 2020 (via the Microsoft Teams Platform) during which the project details, progress and proposed Public Participation Plan was presented. The Public Participation Plan was approved following the pre-application meeting by the Case Officer (Mr Lunga Dlova) via email on 02 November 2020.
» Submission of the application form for Environmental Authorisation to the DFFE via the use of the DFFE Novell Filr System.
» Submission of the BA Report for review and comment by:
    * The competent and commenting authorities.
    * State departments that administer laws relating to a matter affecting the environment relevant to an application for Environmental Authorisation.
    * Organs of State which have jurisdiction in respect of the activity to which the application relates.

The submissions, as listed above, were undertaken electronically, as required by the DFFE (in line with the directions for new Applications for Environmental Authorisations provided for in GNR650 of 05 June 2020).

A record of all authority correspondence undertaken during the BA process is included in **Appendix B** and **Appendix C**.

7.3.2. Public Participation Process

Public participation is an essential and regulatory requirement for an environmental authorisation process and is guided by Regulations 41 to 44 of the EIA Regulations 2014 (GN R326) (as amended). The purpose of public participation is clearly outlined in Regulation 40 of the EIA Regulations 2014 (GN R326) (as amended) and is being followed for this proposed project.

The Public Participation Process undertaken for the proposed development of the Sun Garden PV Facility considers the restrictions and limitations imposed by Government through section 27 (2) of the Disaster Management Act (Act No. 57 of 2002) of 2002 and the Directions issued by the Minister of Forestry and Fisheries (DFFE) in terms of consultations with I&APs. A Public Participation Plan was prepared and submitted to the DFFE. Approval of the Plan was provided by the DFFE Case Officer via email on 02 November 2020 following the pre-application meeting (**Appendix B**).

The alternative means of undertaking consultation have been designed and implemented by Savannah Environmental to ensure that I&APs are afforded sufficient opportunity to access project information and raise comments on the project through an interactive web-based platform (i.e. online stakeholder engagement platform) readily available and accessible to any person registering their interest in the project, and ensures that the public participation process is undertaken in line with Regulations 41 to 44 of the EIA Regulations, 2014 as amended. The Public Participation Plan (**Appendix C1**) considers the limitations applied by the Disaster Management Act Regulations prohibiting the gathering of people, as well as limitations which certain I&APs may have in terms of access to computers and internet as well as access to public spaces currently not open for operation that inhibits access to hard copy documentation. The online stakeholder engagement platform implemented by Savannah Environmental for the project allowed the EAP to visually present details regarding the project as well as consultation documentation, including project maps and plans, presentations and posters. The platform also contains the BA report available for review. The use of an online tool enables stakeholders and I&APs to explore the project-specific content in their own time, and still enables them to participate in a meaningful way in the consultation process.

The sharing of information forms the basis of the public participation process and offers the opportunity for I&APs to become actively involved in the BA process from the outset. The public participation process is designed to provide sufficient and accessible information to I&APs in an objective manner. The public participation process affords I&APs opportunities to provide input into and receive information regarding the BA process in the following ways:

During the BA process:

» Provide an opportunity to submit comments regarding the project;
» Assist in identifying reasonable and feasible alternatives;
» Contribute relevant local information and knowledge to the environmental assessment;
» Allow registered I&APs to verify that their comments have been recorded, considered and addressed, where applicable, in the environmental investigations;
» Foster trust and co-operation;
» Generate a sense of joint responsibility and ownership of the environment; and
» Comment on the findings of the environmental assessments.

During the decision-making phase:

» To advise I&APs of the outcome of the competent authority's decision, and how and by when the decision can be appealed.

The public participation process therefore aims to ensure that:

» Information containing all relevant facts in respect of the application is made available to potential stakeholders and I&APs for their review.
» The information presented during the public participation process is presented in such a manner, i.e. local language and technical issues, that it avoids the possible alienation of the public and prevents them from participating.
» Public participation is facilitated in such a manner that I&APs are provided with a reasonable opportunity to comment on the project.
» Various ways are provided to I&APs to correspond and submit their comments i.e. fax, post, email, SMS, WhatsApp or by sending a Please-call-me notification.
» An adequate review period is provided for I&APs to comment on the findings of the BA Report.

In terms of the requirement of Chapter 6 of the EIA Regulations of December 2014, as amended, the following key public participation tasks are required to be undertaken:

» Fix a notice board at a place conspicuous to the public at the boundary or on the fence of—
    (i) the site where the activity to which the application relates is or is to be undertaken; and
    (ii) any alternative site mentioned in the application;
» Give written notice to:
    (i) the owner or person in control of that land if the applicant is not the owner or person in control of the land;

(ii) the occupiers of the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;
(iii) owners and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;
(iv) the municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area;
(v) the municipality which has jurisdiction in the area;
(vi) any organ of state having jurisdiction in respect of any aspect of the activity; and
(vii) any other party as required by the competent authority.

» Place an advertisement in one local newspaper and one regional newspaper.
» Open and maintain a register of I&APs and Organs of State.
» Release of a BA Report for a 30-day review and comment period.
» Prepare a Comments and Responses (C&R) report which documents the comments received on the BA process and during the 30-day review and comment period and the responses provided by the project team.

In compliance with the requirements of Chapter 6: Public Participation of the EIA Regulations, 2014 (as amended), and the approved Public Participation Plan, the following summarises the key public participation activities implemented. The schematic below provides an overview of the tools that are available to I&APs and stakeholders to access project information and interact with the public participation team to obtain project information and resolve any queries that may arise, and to meet the requirements for public participation.

i. Stakeholder identification and register of I&APs	• Register as an I&AP on the online platform or via completion of a form and provison of contact information, by responding to an advert, or sending a 'please call me' which will be responded to with a telephone call. • State interest in the project. • Receive all project related information via email, post or other appropriate means.
ii. Advertisments and notifications	• Advertisements, site notices and/or radio announcements and notifications provide information and details on the project and where to access project information. • Notifications regarding the EIA process and availability of project report for public review to be sent via email, post or SMS notifications.
iii. Public Involvement and consultation	• Distribution of a BID providing details on the project and how I&APs can become involved in the process. • Submission of comments or queries via email or post to the PP team. • Virtual presentations available via the online platform. • Availability of project information via the online platform, email, post and telephonic platforms such as WhatsApp, and including telephonic discussions to provide description of information verbally. • An opportunity for I&APs and stakeholders to request virtual meetings with the project team.
iv. Comment on the BA Report	• Availability of the project report via the online platform for 30-day comment period. Hard copies to be available only where sanitary conditions can be assured. • Submission of comments via email or post to the PP team. • Comments recorded and responded to, as part of the process.
v. Identification and recording of comments	• Comments and Responses Report, including all comments received to be included in the reporting. • Comments received during BA process to be included in the draft reports.

i. <u>Stakeholder identification and Register of Interested and Affected Parties</u>

42. A proponent or applicant must ensure the opening and maintenance of a register of I&APs and submit such a register to the competent authority, which register must contain the names, contact details and addresses of –
    (a) All persons who, as a consequence of the public participation process conducted in respect of that application, have submitted written comments or attended meetings with the proponent, applicant or EAP;
    (b) All persons who have requested the proponent or applicant, in writing, for their names to be placed on the register; and
    (c) All organs of state which have jurisdiction in respect of the activity to which the application relates.

I&APs have been identified through a process of networking and referral, obtaining information from Savannah Environmental's existing stakeholder database, liaison with potentially affected parties in the greater surrounding area and a registration process involving the completion of a reply form. Key stakeholders and affected and surrounding landowners (including occupiers) have been identified and registered on the project database. Other stakeholders are required to formally register their interest in the project through either directly contacting the Savannah Environmental Public Participation team via phone, message (SMS and WhatsApp), email or fax, or registering their interest via the online stakeholder engagement platform. An initial list of key stakeholders identified and registered is listed in **Table 7.3**.

Table 7.3: Initial list of Stakeholders identified for the inclusion in the project database during the public participation process for the Sun Garden PV Facility

Organs of State
National Government Departments
Department of Forestry, Fisheries and the Environment
Department of Mineral Resources and Energy
Department of Agriculture, Land Reform and Rural Development
Department of Human Settlements, Water and Sanitation
Government Bodies and State-Owned Companies
Eskom Holdings SOC Limited
National Energy Regulator of South Africa (NERSA)
South African Civil Aviation Authority (CAA)
South African Heritage Resources Agency (SAHRA)
South African National Roads Agency Limited (SANRAL)
South African Radio Astronomy Observatory (SARAO)
Telkom SA SOC Limited
Transnet SA SOC Limited
Provincial Government Departments
Eastern Cape Department of Economic Development, Environmental Affairs and Tourism
Eastern Cape Department of Transport
Eastern Cape Provincial Heritage Resources Authority
Local Government Departments
Sarah Baartman District Municipality
Blue Crane Route Local Municipality – including the Ward Councillor, ward committee members, community representative or local community forum members
Commenting Stakeholders
BirdLife South Africa
Endangered Wildlife Trust (EWT)

SENTECH	
Wildlife and Environment Society of South Africa (WESSA)	
Landowners	
Affected landowners, tenants and occupiers	
Neighbouring landowners, tenants and occupiers	

As per Regulation 42 of the EIA Regulations, 2014 (as amended), all relevant stakeholder and I&AP information has been recorded within a register of I&APs (refer to **Appendix C2** for a listing of the recorded parties). In addition to the above-mentioned EIA Regulations, point 4.1 of the Public Participation Guidelines has also been followed. The register of I&APs contains the names[8] of:

» all persons who requested to be registered on the database through the use of the online stakeholder engagement platform or in writing and disclosed their interest in the project;
» all Organs of State which hold jurisdiction in respect of the activity to which the application relates; and
» all persons who submitted written comments or attended virtual meetings and viewed the narrated presentations on the Savannah Environmental online platform during the public participation process.

I&APs have been encouraged to register their interest in the BA process from the onset of the project, and the identification and registration of I&APs will be on-going for the duration of the BA process. The database of I&APs will be updated throughout the BA process and will act as a record of the I&APs involved in the public participation process.

ii. <u>Advertisements and Notifications</u>

40.(2)(a)	Fixing a notice board at a place conspicuous to and accessible by the public at the boundary, on the fence or along the corridor of – (i) The site where the activity to which the application or proposed application relates is or is to be undertaken; and (ii) Any alternative site.
40.(2)(b)	Giving written notice, in any of the manners provided for in section 47Dof the Act, to – (i) The occupiers of the site and, if the proponent or applicant is not the owner or person in control of the site on which the activity is to be undertaken, the owner or person in control of the site where the activity is or is to be undertaken and to any alternative site where the activity is to be undertaken; (ii) Owners, persons in control of, and occupiers of land adjacent to the site where the activity is or is to be undertaken and to any alternative site where the activity is to be undertaken; (iii) The municipal councillor of the ward in which the site and alternative site is situated and any organisation of ratepayers that represent the community in the area; (iv) The municipality which has jurisdiction in the area; (v) Any organ of state having jurisdiction in respect of any aspect of the activity; and (vi) Any other party as required by the competent authority.
40.(2)(c)	Placing an advertisement in – (i) One local newspaper; or (ii) Any official Gazette that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations;
40.(2)(d)	Placing an advertisement in at least one provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the metropolitan or district municipality in

[8] Contact details and addresses have not been included in the I&AP database as this information is protected by the Protection of Personal Information Act (No 4 of 2013).

	which it is or will be undertaken: Provided that this paragraph need not be complied with if an advertisement has been placed in an official Gazette referred to in paragraph (c)(ii); and
40.(2)(e)	Using reasonable alternative methods, as agreed to by the competent authority, in those instances where a person is desirous of but unable to participate in the process due to – (i) Illiteracy; (ii) Disability; or (iii) Any other disadvantage.

The BA process was announced with an invitation to the Organs of State, potentially affected and neighbouring landowners (including occupiers) and general public to register as I&APs and to actively participate in the process. This was achieved via the following:

» Compilation of a background information document (BID) (refer to **Appendix C4**) providing technical details on the project, details of the EIA process being undertaken and how I&APs can become involved in the BA process. The BID and the BA process notification letter announcing the BA process and inviting I&APs to register on the project's database were distributed via email on **17 November 2020**. The evidence of the distribution is contained in **Appendix C** of the BA Report. The BID is also available electronically on the Savannah Environmental website (https://www.savannahsa.com/public-documents/energy-generation/).
» Placement of site notices announcing the BA process at visible points along the boundary of the project site (i.e. the boundaries of the affected properties), in accordance with the requirements of the EIA Regulations on **03 December – 06 December 2020**. Photographs of the site notices are included in **Appendix C3** of the BA Report.
» Placement of an advertisement in two newspapers (The Herald (in English) and Hartland Nuus (In Afrikaans) on **12 November 2021** at the commencement of the BA process (**Appendix C3**). These adverts:
  * announced the availability of the BA Report and details of the review period; and
  * provided all relevant details to access the Savannah Environmental online stakeholder engagement platform.
» The BA Report has been made available for review and comment by I&APs from **12 November 2021** to **13 December 2021.** The BA Report has been made available on the Savannah Environmental website and all registered I&APs have been notified of the availability on **12 November 2021** via email which included the link to access the report on the Savannah Environmental website. The evidence of distribution of the BA Report will be included in the final BA Report, which will be submitted to the DFFE.

iii. Public Involvement and Consultation

In order to accommodate the varying needs of stakeholders and I&APs within the surrounding area, as well as capture their views, comments, issues and concerns regarding the project, various opportunities have been and will continue to be provided to I&APs to note their comments and issues. I&APs are being consulted through the following means:

Table 7.4: Public involvement for the Sun Garden PV Facility

Activity	Date
Announcement of the BA process in one regional and one local newspaper: » Regional – Herald Newspaper (English advertisement) » Local – Hartland Nuus (Afrikaans advertisement)	12 November 2020
Distribution of the BID, process notification letters and stakeholder reply form announcing the BA process and inviting I&APs to register on the project database. The BID and electronic reply form was also made available on the online stakeholder engagement platform.	17 November 2020
Placement of site notices, including placement of further notices and distributions of the BID at the Public Libraries in Somerset East.	Public Libraries located within the Local municipal area: » Makhanda Public Library – 03 December 2020 » Duna Public Library – 04 December 2020 » Extension 6 Public Library – 04 December 2020 Public Libraries located outside the Local municipal area: » Langenhoven Library – 07 January 2021 » Dr NG Cipe Library – 08 January 2021 » WD West Library - 12 January 2021
Consultation with the affected and adjacent landowners at the commencement of the BA process	03 December 2020
Information session showing posters of the project and providing I&APs with an opportunity to gain clarity on the project was undertaken at the Springbok pub in Golden Valley.	26 March 2021
Announcement of the availability of the BA Report for a 30-day review and comment period, including details on how to access the BA Report via the online stakeholder engagement platform, in one regional and one local newspaper: » Regional – Herald Newspaper (English advertisement) Local – Hartland Nuus (Afrikaans advertisement)	12 November 2021
Distribution of notification letters announcing the availability of the BA Report for a 30-day review and comment period. These letters were distributed to Organs of State, Government Departments, Ward Councillors, landowners within the surrounding area (including neighbouring landowners), registered I&APs and key stakeholder groups.	12 November 2021

Activity	Date
45-day review and comment period of the BA Report.	12 November 2021 – 13 December 2021
Virtual meetings through the use of virtual platforms as determined through discussions with the relevant stakeholder group: » Landowners » Authorities and key stakeholders (including Organs of State, local municipality and official representatives of community-based organisations. » Where an I&AP does not have access to a computer and/or internet to participate in a virtual meeting telephonic discussions (including WhatsApp video call) will be set-up and minuted for inclusion. The preferred language of the I&AP has been considered when setting up these discussions. » Face-to-face meetings could be held where sanitary conditions can be assured.	To be held during the 30-day review and comment period.
On-going consultation (i.e. telephone liaison; e-mail communication) with all I&APs.	Throughout BA process

iv. Registered I&APs entitled to Comment on the BA Report

43.(1) A registered I&AP 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.

(2) In order to give effect to section 24O of the Act, any State department that administers a law relating to a matter affecting the environment must be requested, subject to regulation 7(2), to comment within 30 days.

44.(1) The applicant must ensure that the comments of interested and affected parties are recorded in reports and plans and that such written comments, including responses to such comments and records of meetings, are attached to the reports and plans that are submitted to the competent authority in terms of these Regulations.

(2) Where a person desires but is unable to access written comments as contemplated in subregulation (1) due to –

(a) A lack of skills to read or write;
(b) Disability; or
(c) Any other disadvantage;

Reasonable alternative methods of recording comments must be provided for.

I&APs registered on the database have been notified via letter of the release of the BA Report for a 30-day review and comment period, invited to provide comment on the BA Report, and informed of the manner in which, and timeframe within which such comment must be made. The report has been made available in soft copies to I&APs due to restrictions and limitations on public spaces during the national state of disaster related to COVID-19. No hard copies of the report have been made available for review and comment in accordance with the approved public participation plan.

The BA Report has also been made available on the Savannah Environmental website (i.e. online stakeholder engagement platform) (https://www.savannahsa.com/public-documents/energy-generation/). The notification was distributed at the commencement of the 30-day review and comment period, on **12 November 2021**. Where I&APs were not able to provide written comments (including SMS and

WhatsApp), other means of consultation, such as telephonic discussions will be used to provide the I&APs with a platform to verbally raise their comments on the proposed development.

All comments raised as part of the discussions and written comments submitted during the 45-day review and comment period will recorded and included in **Appendix C9** of the BA Report.

v. Identification and Recording of Comments

Comments raised by I&APs to date have been collated into a Comments and Responses (C&R) Report which is included in **Appendix C9** of the BA Report. The C&R Report includes detailed responses from members of the EIA project team and/or the project proponent to the issues and comments raised. The C&R Report will consist of written comments received.

Meeting notes of all the telephonic discussions and virtual meetings conducted at the commencement of the BA process are included in **Appendix C8**. Meeting notes of all virtual meetings and discussions undertaken during the 30-day review and comment period will be included in **Appendix C8** of the final BA Report.

The C&R Report will be updated with all comments received during the 30-day review and comment period and will be included as **Appendix C9** in the final BA Report that will be submitted to the DFFE for decision-making.

7.4. Outcomes of the DFFE Web-Based Screening Tool

In terms of GN R960 (promulgated on 5 July 2019) and Regulation 16(1)(b)(v) of the 2014 EIA Regulations (as amended), the submission of a Screening Report generated from the national web based environmental screening tool is compulsory for the submission of applications in terms of Regulations 19 and 21 of the EIA Regulations.

The requirement for the submission of a Screening Report (included as **Appendix Q** of the BA Report) for the Sun Garden PV Facility is applicable as it triggers Regulation 19 of the EIA Regulations, 2014 (as amended). **Table 7.5** provides a summary of the specialist assessments identified in terms of the screening tool and responses to each assessment from the project team considering the development area under consideration.

Table 7.5: Sensitivity ratings from the DFFE's web-based online Screening Tool associated with the development of the Sun Garden PV Facility

Specialist Assessment	Sensitivity Rating as per the Screening Tool (relating to the need for the study)	Project Team Response
Agricultural Impact Assessment	High	The Soils, Land Use and Agriculture Impact Assessment is included in this BA Report as **Appendix H**.
Landscape/Visual Impact Assessment	Very high	A Visual Impact Assessment has been undertaken for the PV facility and is included in this BA Report as **Appendix J.**
Archaeological and Cultural Heritage Impact Assessment	Medium	A Heritage Impact Assessment (which covers both archaeological and cultural aspects of project site and development footprint) has been undertaken for the PV facility and is included in this BA Report as **Appendix I**.

Specialist Assessment	Sensitivity Rating as per the Screening Tool (relating to the need for the study)	Project Team Response
Palaeontology Impact Assessment	High	The Heritage Impact Assessment (included as **Appendix I**) of the BA Report includes an assessment of palaeontological resources within the project site and development footprint.
Terrestrial Biodiversity Impact Assessment	Very high	An Ecological Impact Assessment (including flora and fauna) has been undertaken for the PV facility and is included as **Appendix D** of the BA Report.
Aquatic Biodiversity Impact Assessment	Very high	An Aquatic Impact Assessment has been undertaken for the PV facility and is included as **Appendix G** of the BA Report.
Avian Impact Assessment	High	An Avifauna Impact Assessment Report (including 12-months monitoring as per the BirdLife SA Best Practice Guidelines) has been undertaken for the PV facility and included as **Appendix E** of the BA Report.
Civil Aviation Assessment	Medium	The Civil Aviation Authority will be consulted throughout the BA process to obtain input.
Defence Assessment	Low	The project site is located to the west of the 6 South African Infantry Battalion. The military base will be consulted for inputs as part of the BA process.
RFI Assessment	Low	The project site under consideration for the development of the Sun Garden PV Facility, is outside the radius of the Karoo Central Astronomy Advantage Area declared in terms of the Astronomy Geographic Advantage Act (Act No. 21 of 2007) of 2007. The South African Radio Astronomy Observatory (SARAO) will however be consulted during the 30-day review and comment period of the BA Report to provide written comment on the proposed development.
Traffic Impact Assessment	The screening report does not indicate a rating for this theme.	A Traffic Impact Assessment has been undertaken for the PV facility and is included as **Appendix L** of the BA Report.
Geotechnical Assessment	The screening report does not indicate a rating for this theme.	A technical report considering Geotechnical aspects of the site is included as **Appendix Q** of the BA Report.
Socio-Economic Assessment	The screening report does not indicate a rating for this theme.	A Socio-Economic Impact Assessment has been undertaken and is included in the BA Report as **Appendix K**.
Plant Species Assessment	Medium	An Ecological Impact Assessment (including flora and fauna) has been undertaken for the Sun Garden PV Facility and is included as **Appendix D** of the BA Report.
Animal Species Assessment	Low	

It must be noted that the appointment of specialists for the Sun Garden PV Facility commenced prior to the Gazetting of the specialist protocols in March 2020. Therefore, the protocols are not considered to be specifically relevant, however the protocols have been considered by some specialists where deemed relevant.

7.5. Assessment of Issues Identified through the BA Process

From the screening tool results, as well as through consideration of the questions as detailed within the DFFE Guideline on Need and Desirability, issues identified as requiring investigation within the BA Process were identified. The specialist studies undertaken as well as the specialist consultants involved in the assessment of these impacts are indicated in **Table 7.6** below.

Table 7.6: Specialist consultants appointed to evaluate the potential impacts associated with the Sun Garden PV Facility

Specialist	Field of Study	Appendix
Simon Todd of 3foxes Biodiversity Solutions	Terrestrial Ecology (including fauna and flora)	Appendix D
Owen Davies pf Arcus Consulting and Dr Steve Percival of Ecology Consulting	Avifauna (including monitoring)	Appendix E
Craig Campbell of Arcus Consultancy Services South Africa	Bats	Appendix F
Dr Brian Colloty of EnviroSci	Aquatic	Appendix G
Andrew Husted and Ivan Baker of The Biodiversity Company	Soil, Land Use, Land Capability and Agricultural Potential	Appendix H
Cherene de Bruyn and Wouter Fourie of PGS Heritage and Elize Butler of Banzai Environmental	Heritage (including archaeology, palaeontology and cultural landscape)	Appendix I
Lourens du Plessis of LOGIS	Visual	Appendix J
Matthew Keeley of Urban-Econ	Socio-economic	Appendix K
Iris Wink and Adrian Johnson of JG Africa	Traffic	Appendix L

Specialist studies considered direct and indirect environmental impacts associated with the development of all components of the Sun Garden PV Facility. Issues were assessed in terms of the following criteria:

» The **nature**, a description of what causes the effect, what will be affected, and how it will be affected;
» The **extent**, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international. A score of between 1 and 5 is assigned as appropriate (with a score of 1 being low and a score of 5 being high);
» The **duration**, wherein it is indicated whether:
  * The lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
  * The lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
  * Medium-term (5–15 years) – assigned a score of 3;
  * Long term (> 15 years) - assigned a score of 4;
  * Permanent - assigned a score of 5.
» The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
  * 0 is small and will have no effect on the environment;
  * 2 is minor and will not result in an impact on processes;
  * 4 is low and will cause a slight impact on processes;
  * 6 is moderate and will result in processes continuing but in a modified way;
  * 8 is high (processes are altered to the extent that they temporarily cease);
  * 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
» The **probability of occurrence**, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale, and a score assigned:

  * Assigned a score of 1–5, where 1 is very improbable (probably will not happen);
  * Assigned a score of 2 is improbable (some possibility, but low likelihood);
  * Assigned a score of 3 is probable (distinct possibility);
  * Assigned a score of 4 is highly probable (most likely);
  * Assigned a score of 5 is definite (impact will occur regardless of any prevention measures).
- The **significance**, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high;
- The **status**, which is described as either positive, negative or neutral;
- The degree to which the impact can be reversed;
- The degree to which the impact may cause irreplaceable loss of resources;
- The degree to which the impact can be mitigated.

The **significance** is determined by combining the criteria in the following formula:

S = (E+D+M) P; where

S = Significance weighting.
E = Extent.
D = Duration.
M = Magnitude.
P = Probability.

The **significance weightings** for each potential impact are as follows:
- **< 30 points:** Low (i.e. where this impact would not have a direct influence on the decision to develop in the area);
- **30-60 points:** Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated);
- **> 60 points:** High (i.e. where the impact must have an influence on the decision process to develop in the area).

Specialist studies also considered cumulative impacts associated with similar developments within a 30km radius of the proposed project. The purpose of the cumulative assessment is to test if such impacts are relevant to the proposed project in the proposed location (i.e. whether the addition of the proposed project in the area will increase the impact). In this regard, specialist studies considered whether the construction of the proposed development will result in:

- Unacceptable risk
- Unacceptable loss
- Complete or whole-scale changes to the environment or sense of place
- Unacceptable increase in impact

A conclusion regarding whether the proposed development will result in any unacceptable loss or impact considering all the projects proposed in the area is included in the respective specialist reports.

As the proponent has the responsibility to avoid or minimise impacts and plan for their management (in terms of the EIA Regulations, 2014 (as amended)), the mitigation of significant impacts is discussed. An assessment of impacts with mitigation is made in order to demonstrate the effectiveness of the proposed mitigation measures. An Environmental Management Programme (EMPr) that includes all the mitigation measures recommended by the specialists for the management of significant impacts is included as **Appendix M**.

7.6 Assumptions and Limitations of the BA Process

The following assumptions and limitations are applicable to the studies undertaken within this BA process:

» All information provided by the developer and I&APs to the environmental team was correct and valid at the time it was provided.
» It is assumed that the project site, development envelope and development footprint for the PV facility identified by the developer represents a technically suitable site for the establishment of the Sun Garden PV Facility which is based on the design undertaken by technical consultants for the project.
» This report and its investigations are project-specific, and consequently the environmental team did not evaluate any other power generation alternatives.

Refer to the specialist studies in **Appendices D – L** for specialist study specific limitations.

7.7 Legislation and Guidelines that have informed the preparation of this Basic Assessment Report

The following legislation and guidelines have informed the scope and content of this BA Report:

» National Environmental Management Act (Act No. 107 of 1998);
» EIA Regulations of December 2014, published under Chapter 5 of NEMA (as amended);
» Department of Environmental Affairs (2017), Public Participation guidelines in terms of NEMA EIA Regulations;
» Department of Environmental Affairs (2017), Integrated Environmental Management Guideline: Guideline on Need and Desirability;
» Procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for environmental authorisation; and
» International guidelines – the Equator Principles, the IFC Performance Standards, the Sustainable Development Goals, World Bank Environmental and Social Framework, and the and World Bank Group Environmental, Health, and Safety Guidelines (EHS Guidelines).

Table 7.7 provides an outline of the legislative permitting requirements applicable to the Sun Garden PV Facility as identified at this stage in the project process.

Table 7.7: Applicable Legislation, Policies and/or Guidelines associated with the development of the Sun Garden PV Facility

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Legislation			
Constitution of the Republic of South Africa (No. 108 of 1996)	In terms of Section 24, the State has an obligation to give effect to the environmental right. The environmental right states that: "*Everyone has the right –* » *To an environment that is not harmful to their health or well-being, and* » *To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:* ∗ *Prevent pollution and ecological degradation,* ∗ *Promote conservation, and* ∗ *Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.*"	Applicable to all authorities	There are no permitting requirements associated with this Act. The application of the Environmental Right however implies that environmental impacts associated with proposed developments are considered separately and cumulatively. It is also important to note that the "right to an environment clause" includes the notion that justifiable economic and social development should be promoted, through the use of natural resources and ecologically sustainable development.
National Environmental Management Act (No 107 of 1998) (NEMA)	The 2014 EIA Regulations have been promulgated in terms of Chapter 5 of NEMA. Listed activities which may not commence without EA are identified within the Listing Notices (GNR 327, GNR 325 and GNR 324) which form part of these Regulations (GNR 326). In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these listed activities must be assessed and reported on to the competent authority charged by NEMA with granting of the relevant environmental authorisation. Considering the location of the project site within the Cookhouse Renewable Energy Development Zone and the requirements GNR114 of 16 February 2018, a Basic Assessment Process is required to be undertaken for the	DFFE – Competent Authority Eastern Cape DEDEAT – Commenting Authority	The listed activities triggered by the proposed project have been identified and are being assessed as part of the BA process currently underway for the project. The BA process will culminate in the submission of a final BA Report to the competent authority in support of the application for EA.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	proposed project. All relevant listing notices for the project (GN R327, GN R325 and GN R324) will be applied for.		
National Environmental Management Act (No 107 of 1998) (NEMA)	In terms of the "Duty of Care and Remediation of Environmental Damage" provision in Section 28(1) of NEMA every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment. In terms of NEMA, it is the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts.	DFFE Eastern Cape DEDEAT	While no permitting or licensing requirements arise directly by virtue of the proposed project, this section finds application through the consideration of potential cumulative, direct, and indirect impacts. It will continue to apply throughout the life cycle of the project.
Environment Conservation Act (No. 73 of 1989) (ECA)	The Noise Control Regulations in terms of Section 25 of the ECA contain regulations applicable for the control of noise in the Provinces of Limpopo, North West, Mpumalanga, Northern Cape, Eastern Cape, and KwaZulu-Natal Provinces. The Noise Control Regulations cover the powers of a local authority, general prohibitions, prohibitions of disturbing noise, prohibitions of noise nuisance, use of measuring instruments, exemptions, attachments, and penalties. In terms of the Noise Control Regulations, no person shall make, produce or cause a disturbing noise, or allow it to be made, produced or caused by any person, machine, device or apparatus or any combination thereof (Regulation 04).	DFFE Eastern Cape DEDEAT Blue Crane Route Local Municipality	Noise impacts are expected to be associated with the construction phase of the project. Minimal noise is expected during operation. As the site is located away from noise sensitive receptors and communities, construction noise is unlikely to present a significant intrusion to the local community. There is therefore no requirement for a noise permit in terms of the legislation.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	Furthermore, the South African noise control regulations describe a disturbing noise as any noise that exceeds the ambient noise by more than 7dB (ambient noise in rural areas being approximately 45dB). This difference is usually measured at the complainant's location should a noise complaint arise. Therefore, if a new noise source is introduced into the environment, irrespective of the current noise levels, and the new source is louder than the existing ambient environmental noise by more than 7dB, the complainant will have a legitimate complaint.		
National Water Act (No. 36 of 1998) (NWA)	A water use listed under Section 21 of the NWA must be licensed with the Regional DWS, unless it is listed in Schedule 1 of the NWA (i.e. is an existing lawful use), is permissible under a GA, or if a responsible authority waives the need for a licence. Water use is defined broadly, and includes consumptive and non-consumptive water uses, taking and storing water, activities which reduce stream flow, waste discharges and disposals, controlled activities (activities which impact detrimentally on a water resource), altering a watercourse, removing water found underground for certain purposes, and recreation. Consumptive water uses may include taking water from a water resource (Section 21(a)) and storing water (Section 21(b)). Non-consumptive water uses may include impeding or diverting of flow in a water course (Section 21(c)), and altering of bed, banks or characteristics of a watercourse (Section 21(i)).	Regional Department of Water and Sanitation	Watercourses and pans are present within the development footprint of the Sun Garden PV Facility as identified in the Aquatic Impact Assessment (**Appendix G**). Where the development activities impede or divert the flow of water in a watercourse, or alter the bed, banks, course or characteristics of a watercourse, Section 21(c) and 21(i) of the NWA (Act 36 of 1998) would be triggered and the project proponent would need to apply for a WUL or register a GA with the DWS.
	In accordance with the provisions of the MPRDA a mining permit is required in accordance with Section 27(6) of the		Any person who wishes to apply for a mining permit in accordance with Section

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
Minerals and Petroleum Resources Development Act (No. 28 of 2002) (MPRDA)	Act where a mineral in question is to be mined, including the mining of materials from a borrow pit.	Department of Mineral Resources and Energy (DMRE)	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 project, and as a result a mining permit or EA in this regard is not required to be obtained.
	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.		In terms of Section 53 of the MPRDA approval is required from the Minister of Mineral Resources and Energy to ensure that the proposed development does not sterilise a mineral resource that might occur on site.
National Environmental Management: Air Quality Act (No. 39 of 2004) (NEM:AQA)	The National Dust Control Regulations (GNR 827) published under Section 32 of NEM:AQA prescribe the general measures for the control of dust in all areas, and provide a standard for acceptable dustfall rates for residential and non-residential areas. In accordance with the Regulations (GNR 827) any person who conducts any activity in such a way as to give rise to dust in quantities and concentrations that may exceed the dustfall standard set out in Regulation 03 must, upon receipt of a notice from the air quality officer, implement a dustfall monitoring programme. Any person who has exceeded the dustfall standard set out in Regulation 03 must, within three months after submission of the dustfall monitoring report, develop and submit a dust management plan to the air quality officer for approval.	Eastern Cape DEDEAT / Sarah Baartman District Municipality	In the event that the project results in the generation of excessive levels of dust the possibility could exist that a dustfall monitoring programme would be required for the project, in which case dustfall monitoring results from the dustfall monitoring programme would need to be included in a dust monitoring report, and a dust management plan would need to be developed. However, with mitigation measures implemented, the Sun Garden PV Facility is not anticipated to result in significant dust generation and at this stage a dust fall monitoring programme is not deemed required.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Heritage Resources Act (No. 25 of 1999) (NHRA)	Section 07 of the NHRA stipulates assessment criteria and categories of heritage resources according to their significance. Section 35 of the NHRA provides for the protection of all archaeological and palaeontological sites, and meteorites. Section 36 of the NHRA provides for the conservation and care of cemeteries and graves by SAHRA where this is not the responsibility of any other authority. Section 38 of the NHRA lists activities which require developers or any person who intends to undertake a listed activity to notify the responsible heritage resources authority and furnish it with details regarding the location, nature, and extent of the proposed development. Section 44 of the NHRA requires the compilation of a Conservation Management Plan as well as a permit from SAHRA for the presentation of archaeological sites as part of tourism attraction.	South African Heritage Resources Agency (SAHRA) Eastern Cape Provincial Heritage Resources Authority – provincial heritage authority (ECPHRA)	A full Heritage Impact Assessment (HIA) (with field work) has been undertaken as part of the BA process (refer to **Appendix I** of this BA Report). No sites of significance have been identified within the project site. Should a heritage resource be impacted upon, a permit may be required from SAHRA or the Eastern Cape Provincial Heritage Resources Authority (ECPHRA) in accordance with of Section 48 of the NHRA, and the SAHRA Permit Regulations (GN R668). This will be determined as part of the final walk-through survey once the final location of the development footprint and its associated infrastructure has been determined.
National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA)	Section 53 of NEM:BA provides for the MEC / Minister to identify any process or activity in such a listed ecosystem as a threatening process. Three government notices have been published in terms of Section 56(1) of NEM:BA as follows: » Commencement of TOPS Regulations, 2007 (GNR 150). » Lists of critically endangered, vulnerable and protected species (GNR 151). » TOPS Regulations (GNR 152).	DFFE Eastern Cape DEDEAT	Under NEM:BA, a permit would be required for any activity that is of a nature that may negatively impact on the survival of a listed protected species. The Ecological Impact Assessment (**Appendix D**) identified listed species. Based on the SANBI POSA records for the site and surrounding area, 3 species of conservation concern are potentially present on the site.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	It provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), and vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (NEM:BA: National list of ecosystems that are threatened and in need of protection, (Government Gazette 37596, GNR 324), 29 April 2014).		Species of concern that are potentially present include *Drosanthemum crissum* (NT), *Crinum campanulatum* (NT), *Crassula decidua* (NT).
National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA)	Chapter 5 of NEM:BA pertains to alien and invasive species, and states that a person may not carry out a restricted activity involving a specimen of an alien species without a permit issued in terms of Chapter 7 of NEM:BA, and that a permit may only be issued after a prescribed assessment of risks and potential impacts on biodiversity is carried out. Applicable, and exempted alien and invasive species are contained within the Alien and Invasive Species List (GNR 864). The updated NEMBA AIS Regs were gazetted 25 Sept 2020 (in force from 1 March 2021) and in the updated AIS list was gazetted 18 Sept 2020 (in force 1 March 2021).	DFFE Eastern Cape DEDEAT	The Ecological Impact Assessment (**Appendix D**) identified some woody aliens present in the area and additional alien plant invasion following construction is highly likely and regular alien plant clearing activities would be required.
Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA)	Section 05 of CARA provides for the prohibition of the spreading of weeds. Regulation 15 of GN R1048 published under CARA provides for the classification of categories of weeds and invader plants, and restrictions in terms of where these species may occur.	Department of Agriculture, Land Reform and Rural Development (DALRD)	CARA will find application throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies need to be developed and implemented. In addition, a weed control and management plan must be implemented.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	Regulation 15E of GN R1048 published under CARA provides requirement and methods to implement control measures for different categories of alien and invasive plant species. It should be noted that the CARA regulations for the legal obligations regarding alien invasive plants in South Africa have been superseded by the National Environmental Management: Biodiversity Act, 2004 (Act no. 10 of 2004) – Alien and Invasive Species (AIS) Regulations which was promulgated on 1 October 2014 (as amended in 2020). However, CARA has not been repealed and is still included as a reference point to use in terms of the management of AIS where certain species may not be included in the NEM: BA AIS list.		In terms of Regulation 15E (GN R1048) where Category 1, 2 or 3 plants occur a land user is required to control such plants by means of one or more of the following methods: » Uprooting, felling, cutting or burning. » Treatment with a weed killer that is registered for use in connection with such plants in accordance with the directions for the use of such a weed killer. » Biological control carried out in accordance with the stipulations of the Agricultural Pests Act (No. 36 of 1983), the ECA and any other applicable legislation. » Any other method of treatment recognised by the executive officer that has as its object the control of plants concerned, subject to the provisions of sub-regulation 4. » A combination of one or more of the methods prescribed, save that biological control reserves and areas where biological control agents are effective shall not be disturbed by other control methods to the extent that the agents are destroyed or become ineffective.
National Forests Act (No. 84 of 1998) (NFA)	According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. Notice of the List of Protected Tree Species	Department of Agriculture, Land	A licence is required for the removal of protected trees. It is therefore necessary to conduct a survey that will determine the

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	under the National Forests Act (No. 84 of 1998) was published in GNR 734 (as updated in 2018). The prohibitions provide that "no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister".	Reform and Rural Development (DALRD)	number and relevant details pertaining to protected tree species present in the development footprint for the submission of relevant permits to authorities prior to the disturbance of these individuals. The Ecological Impact Assessment (**Appendix D**) identified no protected trees on site.
National Veld and Forest Fire Act (No. 101 of 1998) (NVFFA)	Chapter 4 of the NVFFA places a duty on owners to prepare and maintain firebreaks, the procedure in this regard, and the role of adjoining owners and the fire protection association. Provision is also made for the making of firebreaks on the international boundary of the Republic of South Africa. The applicant must ensure that firebreaks are wide and long enough to have a reasonable chance of preventing a veldfire from spreading to or from neighbouring land, it does not cause soil erosion, and it is reasonably free of inflammable material capable of carrying a veldfire across it. Chapter 5 of the Act places a duty on all owners to acquire equipment and have available personnel to fight fires. Every owner on whose land a veldfire may start or burn or from whose land it may spread must have such equipment, protective clothing and trained personnel for extinguishing fires, and ensure that in his or her absence responsible persons are present on or near his or her land who, in the event of fire, will extinguish the fire or assist in doing so, and take all reasonable steps to alert the owners of adjoining land and the relevant fire protection association, if any.	DFFE	While no permitting or licensing requirements arise from this legislation, this Act will be applicable during the construction and operation of the Sun Garden PV Facility, in terms of the preparation and maintenance of firebreaks, and the need to provide appropriate equipment and trained personnel for firefighting purposes.
Hazardous Substances Act (No. 15 of 1973) (HAS)	This Act regulates the control of substances that may cause injury, or ill health, or death due to their toxic,	Department of Health (DoH)	It is necessary to identify and list all Group I, II, III, and IV hazardous substances that may

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	corrosive, irritant, strongly sensitising or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger, to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products. » Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc., nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared as Group I or Group II substance » Group IV: any electronic product, and » Group V: any radioactive material. The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.		be on site and in what operational context they are used, stored or handled. If applicable, a license would be required to be obtained from the Department of Health (DoH).
National Environmental Management: Waste Act (No. 59 of 2008) (NEM:WA)	The Minister may by notice in the Gazette publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. The Minister may amend the list by – » Adding other waste management activities to the list. » Removing waste management activities from the list. » Making other changes to the particulars on the list. In terms of the Regulations published in terms of NEM:WA (GNR 912), a BA or EIA is required to be undertaken for identified listed activities.	DFFE – Hazardous Waste Eastern Cape DEDEAT – general waste	No waste listed activities are triggered by the Sun Garden PV Facility, therefore, no Waste Management License is required to be obtained. General and hazardous waste handling, storage and disposal will be required during construction and operation. The National Norms and Standards for the Storage of Waste (GNR 926) published under Section 7(1)(c) of NEM:WA will need to be considered in this regard.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that: » The containers in which any waste is stored, are intact and not corroded or in » Any other way rendered unlit for the safe storage of waste. » Adequate measures are taken to prevent accidental spillage or leaking. » The waste cannot be blown away. » Nuisances such as odour, visual impacts and breeding of vectors do not arise, and » Pollution of the environment and harm to health are prevented.		
National Road Traffic Act (No. 93 of 1996) (NRTA)	The technical recommendations for highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts. The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads	South African National Roads Agency (SANRAL) – national roads Eastern Cape Department of Transport	An abnormal load/vehicle permit will be required to transport the various components to site for construction. These include: » Route clearances and permits will be required for vehicles carrying abnormally heavy or abnormally dimensioned loads. » Depending on the trailer configuration and height when loaded, some of the project components may not meet specified dimensional limitations (height and width).

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.		
Astronomy Geographic Advantage Act (Act No. 21 of 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.	Department of Science and Technology.	The site proposed for the development of the Sun Garden PV Facility is located within the Eastern Cape Province and therefore falls outside of the areas considered to be uniquely suited in terms of nationally significant astronomy advantage areas.
Aviation Act (Act No 74 of 1962) 13th amendment of the Civil Aviation Regulations (CARS) 1997	Any structure exceeding 45m above ground level or structures where the top of the structure exceeds 150m above the mean ground level, the mean ground level considered to be the lowest point in a 3km radius around such structure. Structures lower than 45m, which are considered as a danger to aviation shall be marked as such when specified.	Civil Aviation Authority (CAA) Air Traffic and Navigation Services SOC Limited (ATNS)	This Act will find application during the operation phase of the Sun Garden PV Facility. An obstacle approval for the power line associated with the Sun Garden PV Facility is required to be obtained from the CAA and/or ATNS.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	Overhead wires, cables etc., crossing a river, valley or major roads shall be marked and in addition their supporting towers marked and lighted if an aeronautical study indicates it could constitute a hazard to aircraft.		
	Provincial Policies / Legislation		
Nature and Environmental Conservation Ordinance (Act 19 of 1974)	This Act provides for the establishment of nature reserves, conservation measures, protection of wild animals, protection of Rhinoceroses, protection of fish in inland waters and protection of flora. The Act also provides schedules of endangered wild animals, protected wild animals, endangered flora and protected floral. Permits will be required for the disturbance and destruction of any of the species listed on the respective schedules.	Eastern Cape DEDEAT	A collection/destruction permit must be obtained from the Eastern Cape DEDEAT for the removal of any protected plant or animal species found on site. The Ecological Impact Assessment (**Appendix D**) identified listed species. Based on the SANBI POSA records for the site and surrounding area, species of conservation concern are potentially present on the site. Species of concern that are potentially present include *Brachystelma luteum* (VU), *Eriospermum bracteatum* (VU), *Apodolirion macowanii* (VU), *Ornithogalum britteniae* (VU) and *Agathosma bicornuta* (EN).

7.7.1 The IFC EHS Guidelines

The IFC EHS Guidelines are technical reference documents with general and industry specific examples of Good International Industry Practice (GIIP). The following IFC EHS Guidelines have relevance to the Sun Garden PV Facility:

- IFC EHS General Guidelines
- IFC Project Developer's Guide to Utility-Scale Solar Photovoltaic Power Plants

The application of the General EHS Guidelines should be tailored to the hazards and risks associated with a project and should take into consideration site-specific variables which may be applicable, such as host country context, assimilative capacity of the environment, and other project factors. In instances where host country regulations differ from the standards presented in the EHS Guidelines, whichever is the more stringent of the two in this regard should be applied.

The General EHS Guidelines include consideration of the following:

- Environmental:
  - Air Emissions and Ambient Air Quality
  - Energy Conservation
  - Wastewater and Ambient Water Quality
  - Water Conservation
  - Hazardous Materials Management
  - Waste Management
  - Noise
  - Contaminated Land
- Occupational Health and Safety:
  - General Facility Design and Operation
  - Communication and Training
  - Physical Hazards
  - Chemical Hazards
  - Biological Hazards
  - Radiological Hazards
  - Personal Protective Equipment (PPE)
  - Special Hazard Environments
  - Monitoring
- Community Health and Safety:
  - Water Quality and Availability
  - Structural Safety of Project Infrastructure
  - Life and Fire Safety (L&FS)
  - Traffic Safety
  - Transport of Hazardous Materials
  - Disease Prevention
  - Emergency Preparedness and Response
- Construction and Decommissioning:
  - Environment
  - Occupational Health & Safety

* Community Health & Safety

7.7.2 IFC Project Developer's Guide to Utility-Scale Solar Photovoltaic Power Plants (2015)

While no Industry Sector EHS Guidelines have been developed for PV Solar Power, the IFC has published a Project Developer's Guide to Utility-Scale Solar Photovoltaic Power Plants (IFC, 2015). Chapter 8 of the Project Developer's Guide pertains to Permits, Licensing and Environmental Considerations, and states that in order to deliver a project which will be acceptable to international lending institutions, environmental and social assessments should be carried out in accordance with the requirements of the key international standards and principles, namely the Equator Principles and the IFC Performance Standards.

Some of the key environmental considerations for solar PV power plants contained within the Project Developer's Guide include:

Construction Phase Impacts

Construction activities lead to temporary air emissions (dust and vehicle emissions), noise related to excavation, construction and vehicle transit, solid waste generation and wastewater generation from temporary building sites and worker accommodation. In addition, Occupational Health and Safety (OHS) is an issue that needs to be properly managed during construction in order to minimise the risk of preventable accidents leading to injuries and / or fatalities. Proper OHS risk identification and management measures should be incorporated in every project's management plan and standard Engineering, Procurement and Construction (EPC) contractual clauses.

Response:
Impacts associated with the construction phase of the development have been identified and assessed as part of the detailed independent specialist studies undertaken as part of the BA process. Where applicable, appropriate mitigation measures with which to minimise the significance of construction phase impacts have been identified and included in the EMPr prepared for Sun Garden PV Facility and attached as **Appendix M** to this BA Report.

Water Usage

Although water use requirements are typically low for solar PV plants, clusters of PV plants may have a high cumulative water use requirement in arid areas where local communities rely upon scarce groundwater resources. In such scenarios, water consumption should be estimated and compared to local water abstraction by communities (if any), to ensure no adverse impacts on local people. O&M methods in relation to water availability and use should be carefully reviewed where risks of adverse impacts to community usage are identified.

Further, many projects are likely to be constructed in areas with a scarcity of water and electricity. Therefore the use of these resources during construction and operation of the plant may have an impact on the local economy. Careful siting and design of the projects should minimise this potential impact.

Response:
Water will be required for the construction and operation phases of the facility. Water will be abstracted from existing onsite boreholes. It has been confirmed that sufficient water would be available for this purpose (refer to **Appendix Q**). Based on this Water demand report, it is evident that the water requirements for the cleaning operations will be minimal for the 400MW plant (i.e. under 4000kl per annum). A Water Use Authorisation process has been commenced by the developer for the applicable water uses.

Land Matters

As solar power is one of the most land-intensive power generation technologies, land acquisition procedures and in particular the avoidance or proper mitigation of involuntary land acquisition / resettlement are critical to the success of the project. This includes land acquired either temporarily or permanently for the project site itself and any associated infrastructure – i.e., access roads, powerlines and construction camps (if any). If involuntary land acquisition is unavoidable, a Resettlement Action Plan (RAP) (dealing with physical displacement and any associated economic displacement) or Livelihood Restoration Plan (LRP) (dealing with economic displacement only) will be required. This is often a crucial issue with respect to local social license to operate, and needs to be handled with due care and attention by suitably qualified persons.

Response:
Sun Garden PV Facility and its associated infrastructure is proposed on privately owned properties. A landowner / lease agreement has been entered into between the project developer and the respective landowners to provide for the utilisation of the land for the development of the solar facility and its associated infrastructure. No involuntary land acquisition or resettlement is required or will take place as a result of the project.

Landscape and Visual Impacts

Key impacts can include the visibility of the solar panels within the wider landscape and associated impacts on landscape designations, character types and surrounding communities. Common mitigation measures to reduce impacts can include consideration of layout, size and scale during the design process and landscaping / planting in order to screen the modules from surrounding receptors. Note that it is important that the impact of shading on energy yield is considered for any new planting requirements. Solar panels are designed to absorb, not reflect, irradiation. However, glint and glare should be a consideration in the environmental assessment process to account for potential impacts on landscape / visual and aviation aspects.

Response:
Potential visual impacts associated with the development of Sun Garden PV Facility have been assessed as part of the Visual Impact Assessment specialist study conducted as part of the BA process. Measures required to avoid, or if avoidance is not possible minimise, and mitigate any negative visual impacts have been identified, and are contained within the EMPr prepared for the project and attached as **Appendix M** to this BA Report.

Ecology and Natural Resources

Potential impacts on ecology can include habitat loss / fragmentation, impacts on designated areas and disturbance or displacement of protected or vulnerable species. Receptors of key consideration are likely to include nationally and internationally important sites for wildlife and protected species such as bats, breeding birds and reptiles. Ecological baseline surveys should be carried out where potentially sensitive habitat, including undisturbed natural habitat, is to be impacted, to determine key receptors of relevance to each site. Mitigation measures can include careful site layout and design to avoid areas of high ecological value or translocation of valued ecological receptors. Habitat enhancement measures could be considered where appropriate to offset adverse impacts on sensitive habitat at a site, though avoidance of such habitats is a far more preferable option.

Response:
Potential ecological impacts associated with the development of Sun Garden PV Facility have been assessed as part of the Ecology Impact Assessment (refer to **Appendix D**) and Avifauna Impact Assessment (refer to **Appendix E**) conducted as part of the BA process. Measures with which to avoid, or if avoidance is not possible minimise, and mitigate any negative ecological impacts have been identified, and are contained within the EMPr prepared for the project and attached as **Appendix M** to this BA Report. Areas of ecological sensitivity are reflected in an environmental sensitivity map prepared for the project (refer to Chapter 11) and have been utilised to inform the development footprint so that such areas are suitably avoided.

Cultural Heritage

Potential impacts on cultural heritage can include impacts on the setting of designated sites or direct impacts on below-ground archaeological deposits as a result of ground disturbance during construction. Where indicated as a potential issue by the initial environmental review / scoping study, field surveys should be carried out prior to construction to determine key heritage and archaeological features at, or in proximity to, the site. Mitigation measures can include careful site layout and design to avoid areas of cultural heritage or archaeological value and implementation of a 'chance find' procedure that addresses and protects cultural heritage finds made during a project's construction and/or operation phases.

Response:
Heritage impacts associated with the development of Sun Garden PV Facility have been assessed as part of the Heritage Impact Assessment conducted as part of the BA process (refer to **Appendix I**), which includes the consideration of heritage, archaeological, and palaeontological resources. Measures with which to avoid, or if avoidance is not possible minimise, and mitigate any negative heritage impacts (including those on heritage, archaeology, and palaeontology) have been identified, and are contained within the EMPr prepared for the project and attached as **Appendix M** to this BA Report.

Transport and Access

The impacts of transportation of materials and personnel should be assessed in order to identify the most appropriate transport route to the site while minimising the impacts on project-affected communities. The requirement for any oversized vehicles / abnormal loads should be considered to ensure access is appropriate. Onsite access tracks should be permeable and developed to minimise disturbance to agricultural land. Where project construction traffic has to traverse local communities, traffic management plans should be incorporated into the environmental and social management plan and EPC requirements for the project.

Response:
The project site can be readily accessed via existing access roads in the region. Within the facility development footprint, access will be required from new / existing roads for construction purposes (and limited access for maintenance during operation). The facility layout has been determined following the identification of site related sensitivities.

The national, regional, secondary and proposed internal access roads will be used to transport all components and equipment required during the construction phase of the solar PV facility. Some of the components (i.e. on-site substation transformer) may be defined as abnormal loads in terms of the National Road Traffic Act (No. 93 of 1996) (NRTO) by virtue of the dimensional limitations. A permit will be required in accordance with Section 81 of the National Road Traffic Act (No. 93 of 1996) (NRTA) which pertains to vehicles and loads which may be exempted from provisions of the Act.

Drainage / Flooding

A review of flood risk should be undertaken to determine if there are any areas of high flood risk associated with the site. Existing and new drainage should also be considered to ensure run-off is controlled to minimise erosion.

Response:
A stormwater management plan has been prepared for the project and is included within the project EMPr attached as **Appendix M** of this BA Report.

Consultation and Disclosure

It is recommended that early-stage consultation is sought with key authorities, statutory bodies, affected communities and other relevant stakeholders. This is valuable in the assessment of project viability, and may guide and increase the efficiency of the development process. Early consultation can also inform the design process to minimise potential environmental impacts and maintain overall sustainability of the project. The authorities, statutory bodies and stakeholders that should be consulted vary from country to country but usually include the following organisation types:

» Local and / or regional consenting authority.
» Government energy department / ministry.
» Environmental agencies / departments.
» Archaeological agencies / departments.
» Civil aviation authorities / Ministry of Defence (if located near an airport).
» Roads authority.
» Health and safety agencies / departments.
» Electricity utilities.
» Military authorities.

Community engagement is an important part of project development and should be an on-going process involving the disclosure of information to project-affected communities. The purpose of community engagement is to build and maintain over time a constructive relationship with communities located in close proximity to the project and to identify and mitigate the key impacts on project-affected communities. The nature and frequency of community engagement should reflect the project's risks to, and adverse impacts on, the affected communities.

Response:
A Public Participation Process as prescribed by Chapter 6 of the 2014 EIA Regulations (GNR 326) is being conducted as part of the BA process being undertaken for the project. This Public Participation Process includes consultation with key authorities, affected and surrounding landowners, local communities, and other relevant stakeholders.

Environmental and Social Management Plan (ESMP)

Whether or not an ESIA or equivalent has been completed for the site, an ESMP should be compiled to ensure that mitigation measures for relevant impacts of the type identified above (and any others) are identified and incorporated into project construction procedures and contracts. Mitigation measures may include, for example, dust suppression during construction, safety induction, training and monitoring programs for workers, traffic management measures where routes traverse local communities, implementation of proper waste management procedures, introduction of periodic community engagement activities, implementation of chance find procedures for cultural heritage, erosion control measures, fencing off of any vulnerable or threatened flora species, and so forth. The ESMP should indicate which party will be responsible for (a) funding, and (b) implementing each action, and how this will be monitored and reported on at the project level. The plan should be commensurate to the nature and type of impacts identified.

Response:
Impacts associated with the construction phase of development have been identified and assessed as part of the independent specialist studies undertaken as part of the BA process. Appropriate mitigation measures with which to minimise the significance of negative impacts have been identified and are included in the EMPr prepared for the project and attached as **Appendix M** to this BA Report.

CHAPTER 8: DESCRIPTION OF THE RECEIVING ENVIRONMENT

This chapter provides a description of the local environment that will be affected by the development of the Sun Garden PV Facility. This information is provided to assist the reader in understanding the features present within the project site and development envelope and the possible effects of the project on the environment within which it is proposed. Aspects of the biophysical, social and economic environment that could be directly or indirectly affected by, or could affect, the proposed development have been described. This information has been sourced from both existing information available for the area as well as collected field data by specialist consultants and aims to provide the context within which this BA process is being conducted.

8.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 1: Content of basic assessment reports:

Requirement	Relevant Section
3(h)(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	The environmental attributes associated with the project site and development envelope, as well as the broader environment, are described and considered within this chapter and includes the following:
	The regional setting within which the project site and development envelope are located is described in section 8.2.
	The climatic conditions of the area within which the project is located is discussed in section 8.3.
	The biophysical characteristics of the project site, development envelope and the surrounding areas is described in section 8.4. This includes the topography and terrain, geology, soils and agricultural potential and the ecological profile of the site (i.e. broad-scale vegetation patterns, fine-scale vegetation patterns, critical biodiversity areas and broad-scale processes, surface water features, terrestrial fauna, bats and avifauna).
	The heritage of the project site, development envelope and the surrounding areas (including the archaeology, palaeontology and cultural landscape) is discussed in section 8.5.
	The visual quality of the affected environment is discussed in section 8.6.
	The current traffic conditions for the area surrounding the project site are included in section 8.7.
	The social context within which the project site is located is described in section 8.8.

A more detailed description of each aspect of the affected environment is included in the specialist reports contained within the **Appendices D - L**.

8.2. Regional Setting

The Eastern Cape Province, within which the project site is located, is in the south-eastern extent of South Africa and constitutes South Africa's second largest province, occupying an area of 168 966km², representing 13.9% of South Africa's land mass. The dry western interior is one of the country's premier sheep-rearing destinations. Currently, the population of the province is estimated at 6 734 001, with a population density of 39km². The capital city of the Eastern Cape Province is Bhiso. Other important towns include Gqeberha (previously Port Elizabeth), East London, Makhanda (previously Grahamstown), Mthatha (previously Umtata), Graaff Reinet and Cradock. The province is bordered by the Western Cape, and Northern Cape provinces to the west and north-west, Free State and Lesotho, and KwaZulu-Natal provinces to the north and east, and the Indian Ocean to the south. The Great Fish River is a significant feature running 644km through the province.

The Eastern Cape is considered as one of South Africa's poorest provinces. Widespread poverty is evident in the province as subsistence agriculture dominates in the former homelands. The province has excellent agricultural and forestry potential. The fertile Langkloof Valley in the south-west has enormous deciduous fruit orchards, while the Karoo interior is an important sheep-farming area. The Alexandria-Makhanda area produces pineapples, chicory, and dairy products, while coffee and tea are cultivated at Magwa. People in the former Transkei region are dependent on the farming of cattle, maize, and sorghum.

The metropolitan economies of Gqeberha (previously Port Elizabeth) and East London are based primarily on manufacturing, with the most important industry being motor manufacturing. The Eastern Cape Province is the hub of South Africa's automotive industry.

The Eastern Cape Province comprises six (6) district municipalities, namely, Alfred Nzo, Amathole, Chris Hani, Joe Gqabi, OR Tambo, and Sarah Baartman (refer to **Figure 8.1**), with the project site being located within the Sarah Baartman District Municipality.

The Sarah Baartman District Municipality (DM) is situated in the south-western extent of the Eastern Cape Province and is a Category C municipality. The Sarah Baartman DM stretches from Graaff-Reinet in the north to the Indian Ocean in the south and between the Great Fish River in the east and Bloukrans River in the west. Sarah Baartman is the biggest district in the province, making up approximately a third of its geographical area. The main economic sectors of the District Municipality include agriculture (mainly mohair production from the Angora Goat) and tourism.

The seat of the Sarah Baartman DM is the city of Gqeberha (previously Port Elizabeth), although Gqeberha is not itself in the district. Other prominent cities and towns located within the DM include, Cookhouse, Graaff-Reinet, Makhanda, and Somerset East. The main economic activities within the DM include agriculture (mohair) and tourism.

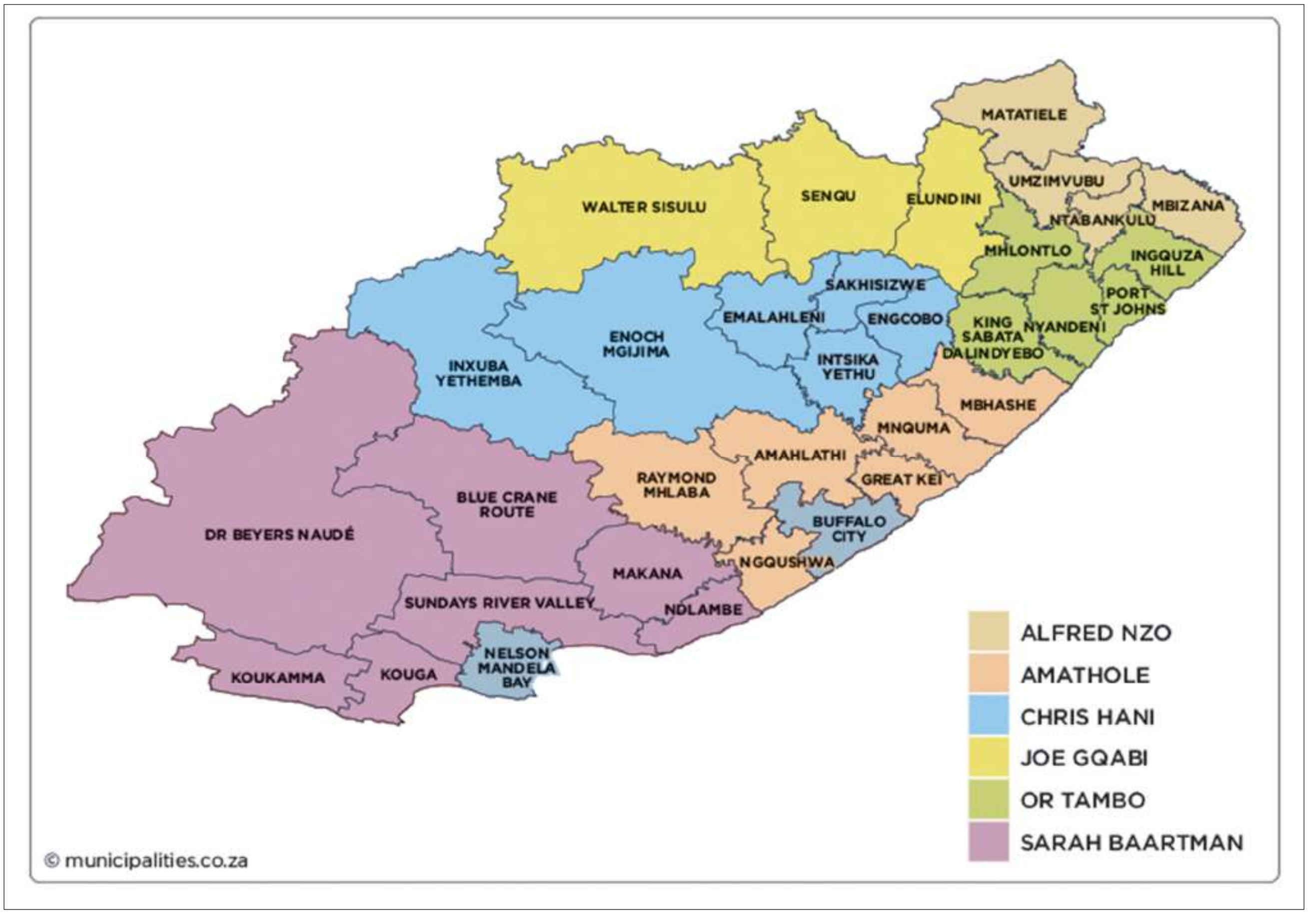

Figure 8.1: District municipalities of the Eastern Cape Province (Source: Municipalities of South Africa)

The Sarah Baartman DM comprises seven (7) local municipalities (LMs), namely, Blue Crane Route, Dr Beyers Naude, Kouga, Koukamma, Makana, Ndlambe, and Sundays River Valley (refer to **Figure 6.2**). The project site is located within Ward 6 of the Blue Crane Route Local Municipality which forms part of the greater Sarah Baartman District Municipality. The Blue Crane Route Local Municipality is a Category B municipality is the second largest in the Sarah Baartman DM covering an extent of 11 068km². The key towns in the LM include Cookhouse, Somerset East and Petersburg. The municipal area has nearly a million hectares devoted to game farming and related activities such as eco-tourism. The main economic sectors of the Local Municipality include Government (18.8%), trade (24.1%), finance and business services (17.1%), manufacturing (14.1%), agriculture (6.3%), transport and communication (12.1%), construction (4.4%).

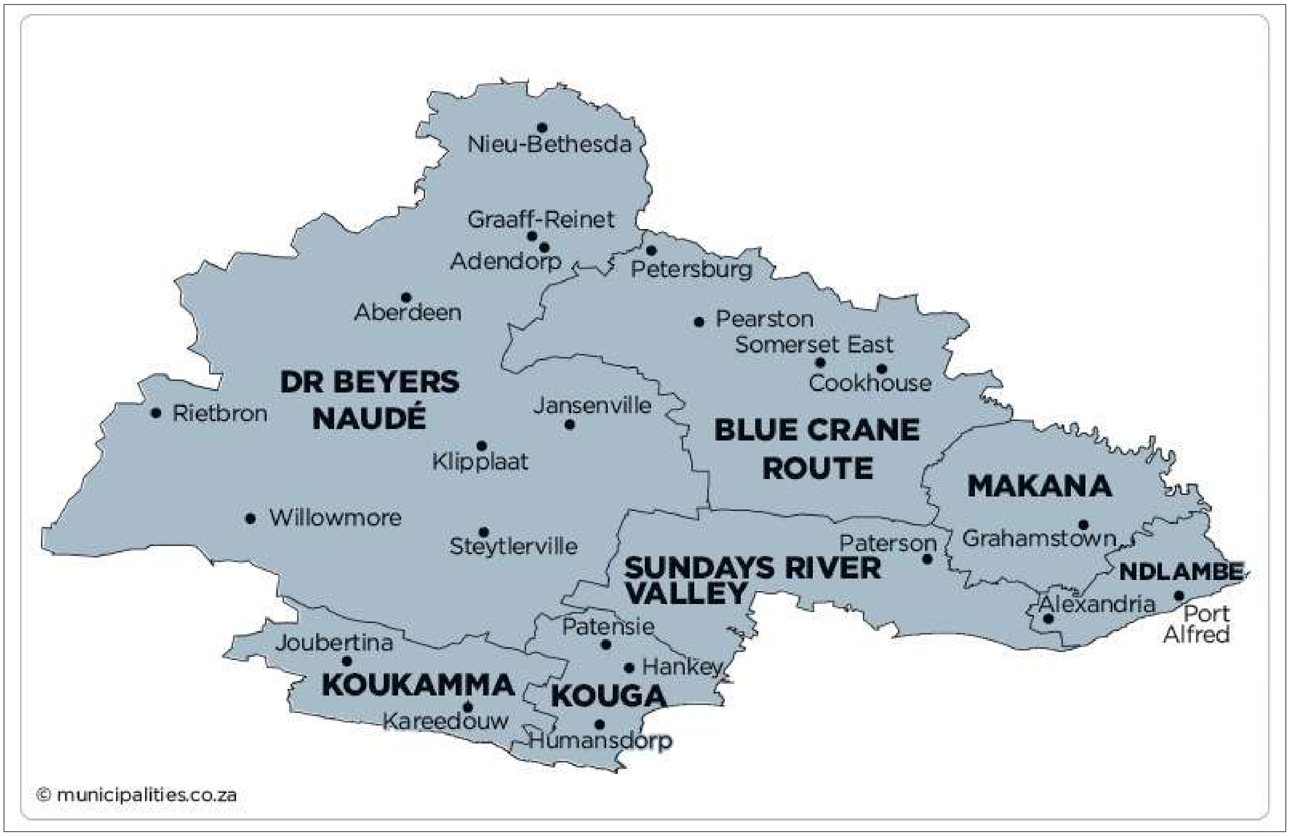

Figure 8.2: Local Municipalities of the Sarah Baartman DM (Source: Municipalities of South Africa)

Transport and communication are the biggest contributor of the LM's GDP at 22.8%, followed by the government (18.8%), finance and business services (12.2%), manufacturing (12%), agriculture (11.3%), wholesale and retail trade (10.2%), community services (9%), and construction (2%) sectors.

In 2016, the estimated population of the Blue Crane Route LM was approximately 36 063. Many residents are still dependent on government grants and the unemployment rate currently sits at 30.7%.

Areas surrounding the site are rural in nature and are predominantly dominated by agricultural land use with some tourist land use located in the surrounding areas such as conference venues, game farming and hunting. The entire proposed project site is located within the Cookhouse REDZ and the Gazetted Eastern Power Corridor. Some of the renewable energy Applications that have been approved or constructed within the Cookhouse REDZ includes the following:

- Amakhala Emoyeni Wind Farm (operating)
- Cookhouse Wind Farm (operating)
- Golden Valley Wind Farm (operating)
- Msenge Emoyeni Wind Farm (authorised)
- Izidluli Wind Farm (authorised)
- Nxuba Wind Farm (operating)
- Nojoli Wind Farm (operating)
- Waainek Wind Farm (operating)
- Highlands Wind Energy Facility (authorised)

Access to the project site is via the existing roads mainly consisting of national and regional roads. The proposed site is situated directly to the west of the N10 national road. The R335 is located to the west of the project site and the R400 is located to the south of the project site. An existing gravel road between the N10 and R335provides direct access to the project site and the development envelope.

8.3. Climatic Conditions

The climate of the broader project area is considered cold semi-arid to arid, and is referred to as the Nama-Karoo Biome (Lower Karoo Bioregion). Generally, the area does not receive much rainfall, although there is a peak in summer (March). The average rainfall is indicated at between 300 – 500mm per annum. Mean temperatures are higher on average in January at around 22.7°C and lowest on average in July at around 12.4 °C.

Altitude has a strong influence on most climatic variables. Generally, an increase in altitude corresponds to a decrease in temperature and an increase in rainfall. Mountains also have an orographic influence on rainfall. Escarpment zones usually experiencing increased rainfall and mist, depending on aspect, cause either an increase or decrease in mean daily insolation levels. The project site is located just south of the Great Escarpment and the climate is therefore strongly influenced by the presence of these mountains.

8.4. Biophysical Characteristics of the Study Area

8.4.1. Topography and Terrain

The study area occurs on land that ranges in elevation from approximately 465m (in the south-east) to 730m (at the top of the hills to the south of the proposed PV facility). The terrain surrounding the farm is predominantly flat with an even slope towards the north. The proposed development envelope itself is located at an average elevation of 541m above sea level.

The terrain morphology is described as lowlands (plains) with parallel hills, and even though the study area is predominantly flat, there are a number of prominent ridges to the south. The majority of the project area is characterised by a slope percentage between 0 and 5%, with some smaller patches within the project area characterised by a slope percentage up to 26%. The elevation of the project area is between 500 to 640 Metres Above Sea Level (MASL).

8.4.2. Geology, Soils and Agricultural Potential

Geological Setting of the Project Site

The project site is underlain by the Dwyka Group, Collingham Formation, Whitehill Formation, Prince Albert Formation, Rippon Formation, Fort Brown Formation (Ecca Group, Karoo Supergroup), Koonap Formation, Middleton Formation and Balfour Formation (Adelaide Subgroup, Beaufort Group, Karoo Supergroup), and Dolerite.

Soil Forms, Land Capability and Agricultural Potential of the Project Site

According to the land type database (Land Type Survey Staff, 1972 - 2006) the development falls within the Fc 176, Fc 340, Ag 29 and the Ia 81 land types (refer to **Figure 8.3**). The Fc land type consists of Glenrosa and/or Mispah soil forms with the possibility of other soils occurring throughout. Lime is rare or absent within this land type in upland soils but generally present in low-lying areas. The Ia land type consists of miscellaneous land classes with deep undifferentiated soil deposits. The Ag land type is characterised by freely drained Red or Yellow-Brown Apedal soils with red soils being dominant. These soils are characterised by a high base status and is likely to be less than 300mm deep.

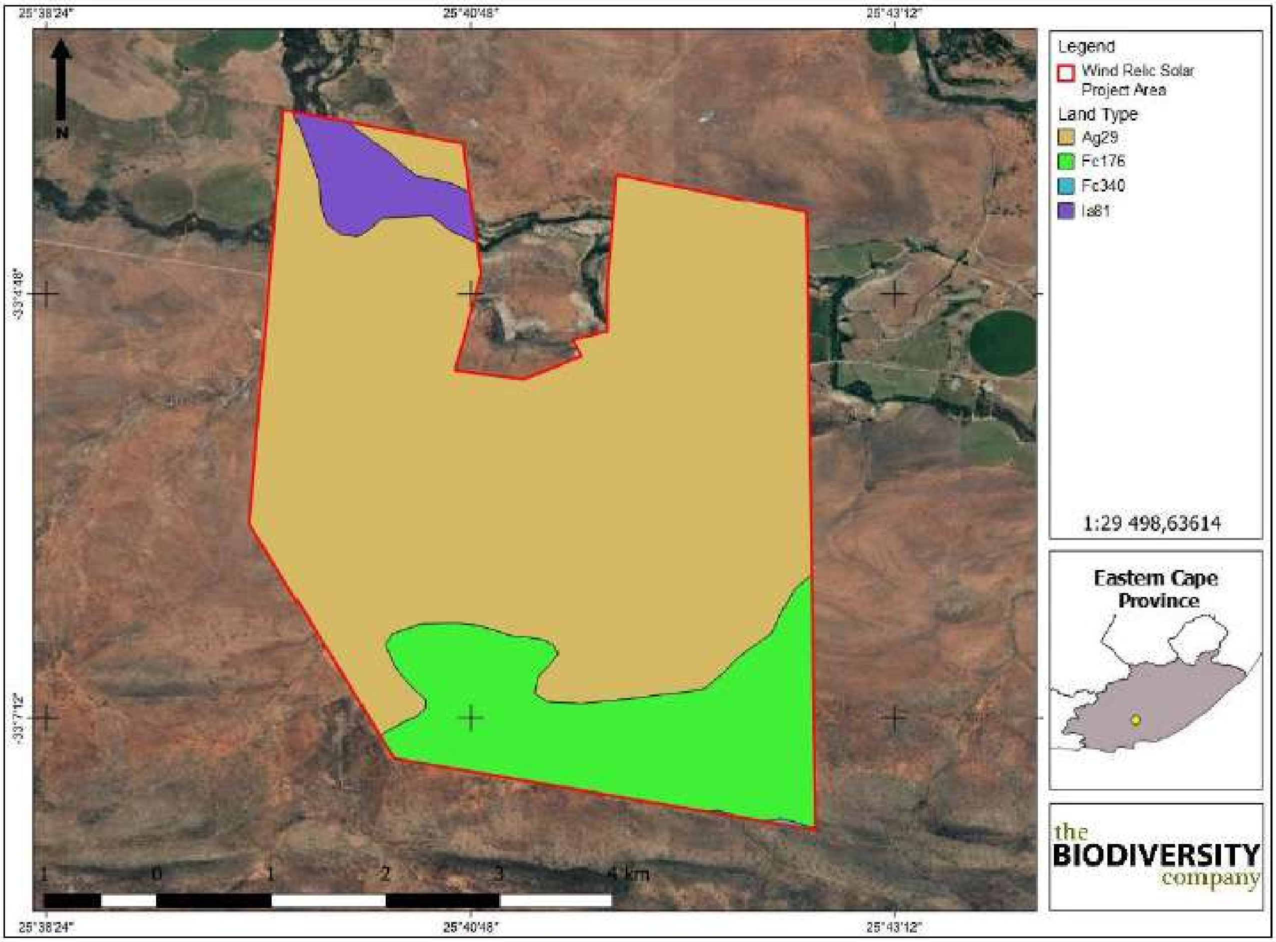

Figure 8.3: Land types present within the project area

Agricultural potential is determined by a combination of soil, terrain and climate features. Land capability classes reflect the most intensive long-term use of land under rain-fed conditions. The land capability is determined by the physical features of the landscape including the soils present. The land potential or agricultural potential is determined by combining the land capability results and the climate capability for the region. The land potential is detailed in Table 8.1 and illustrated in Figure 8.4.

Table 8.1: Land potential of the soils present within the project site

Land Potential	Percentage (%)	Description Of Land Potential Class	Sensitivity
6	43.2	Very restricted potential. Regular and/or severe limitations due to soil, slope, temperatures or rainfall. Non-arable.	Low
7	56.8	Low potential. Severe limitations due to soil, slope, temperatures or rainfall. Non-arable.	Low

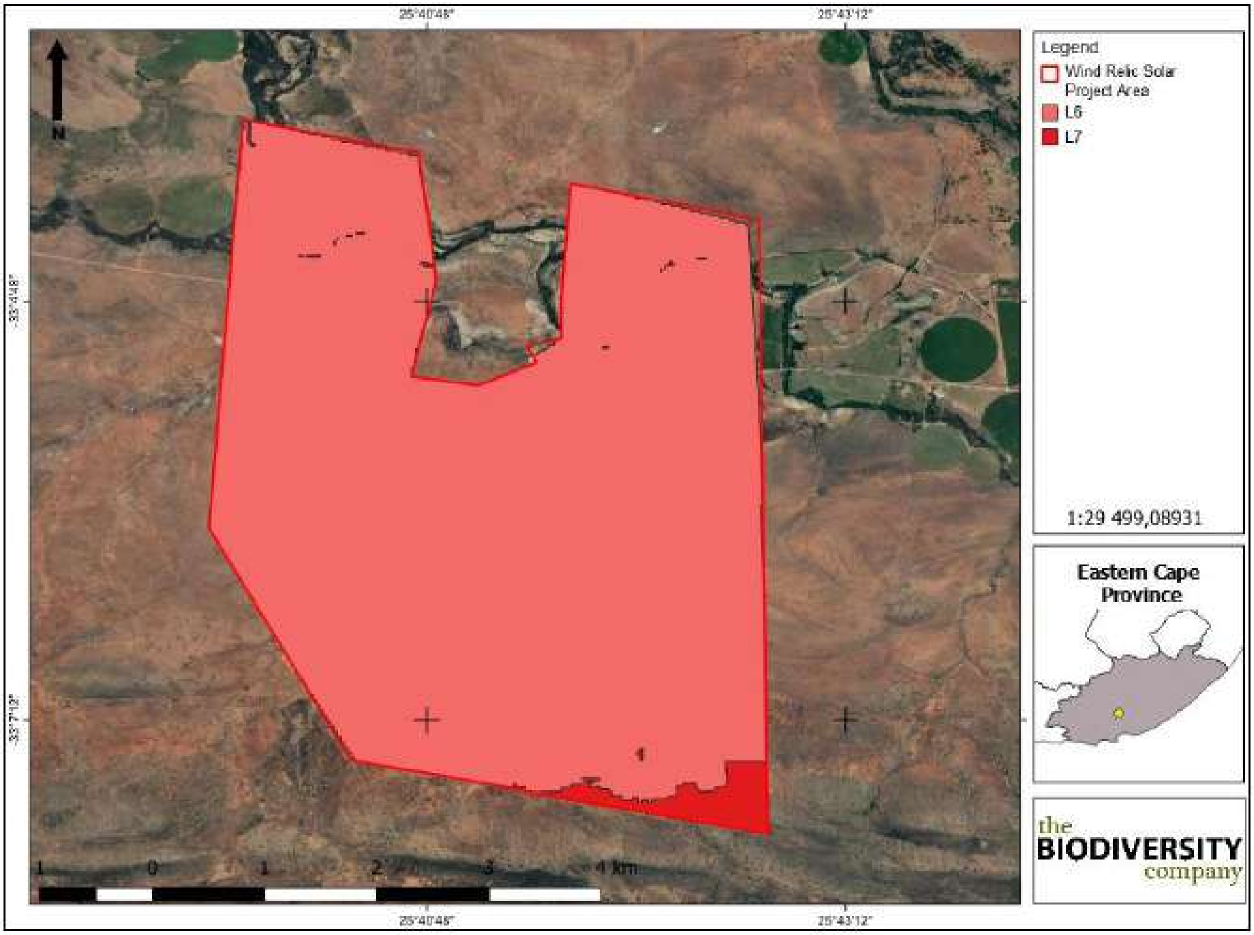

Figure 8.4: Land potential determined for the project area

8.4.3 Land Use

Three different land uses have been identified within the proposed project area, namely "Watercourses", "Roads" and "Grazing" (refer to Figure 8.5).

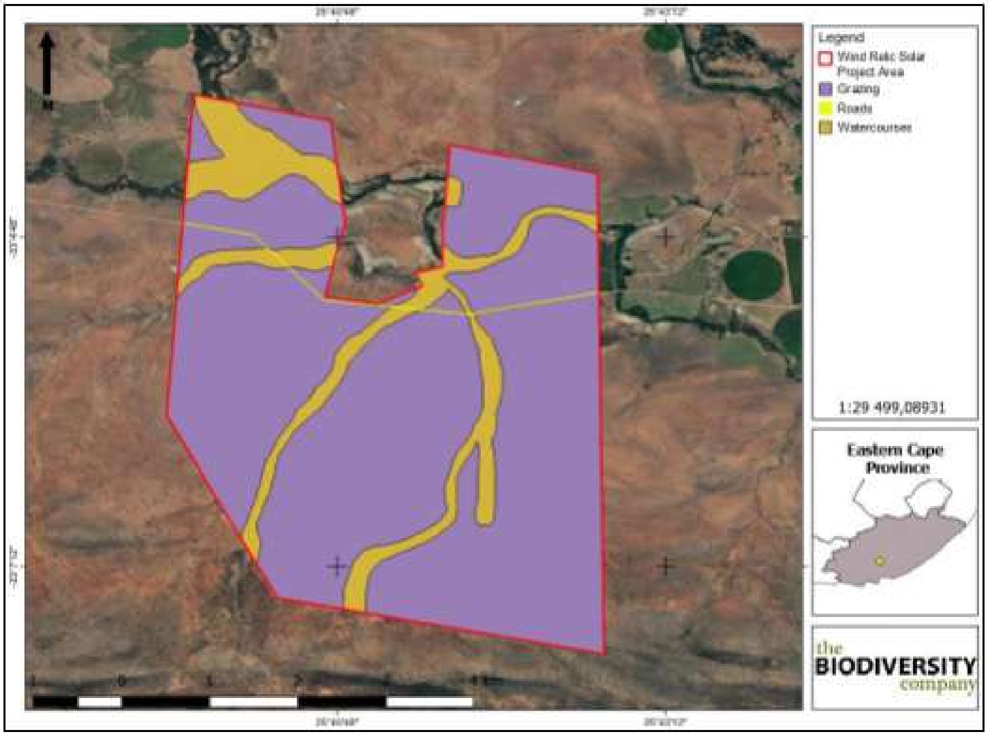

Figure 8.5: Different land uses within the proposed project area

8.4.4. Ecological Profile of the Broader Study Area and the Project Site

<u>i. Broad-Scale Vegetation Patterns</u>

At a very broad-scale, the site lies within the Maputaland-Pondoland-Albany Biodiversity Hotspot (CEPF 2010). This hotspot spans an area of nearly 275 000 km² and includes portions of South Africa, Swaziland and Mozambique. The hotspot is the second richest floristic region in southern Africa (after the Cape Floristic Region) and also the second richest floristic region in Africa for its size. An estimated 8 100 species occur within Maputaland-Pondoland-Albany, of which at least 1 900 (23%) are unique, or endemic, to the region. At a habitat level, one type of forest, three types of thicket, six types of bushveld and five types of grassland are endemic to the hotspot. The current study area lies within the Albany Centre of Endemism which is characterized by ecotones between the thicket, fynbos (from the Cape Floristic Region Hotspot) and the Succulent and Nama Karoo habitats. Albany Centre is also home to much of the thicket biome, which is thought to be the most species-rich formation of woody plants within South Africa. It is characterized by a unique suite of plant forms: evergreen shrubs (predominantly), tall succulents, a wealth of climbers, and very little grass. Thicket is most extensive in the southeast of the country, principally along the coastal parts of the Gouritz, Gamtoos, Sundays and Great Fish River valleys. This broad context outlines the baseline sensitivity for the area and highlights the diversity of habitats and ecosystems which characterise this area and the need for responsible development in line with long-term biodiversity maintenance.

The national vegetation map (Mucina & Rutherford 2006, SANBI 2018 update) for the study area is depicted in **Figure 8.6**. The Sun Garden development area is restricted to the Albany Broken Veld vegetation type, with some Kowie Thicket and Southern Karoo Riviere vegetation types along the grid connection route. The different vegetation types and communities present in the affected area are illustrated below. In practice, the upper parts of the site are transitional and have a significant thicket element, while the lower parts of the site consist of open plains dominated by low shrubs.

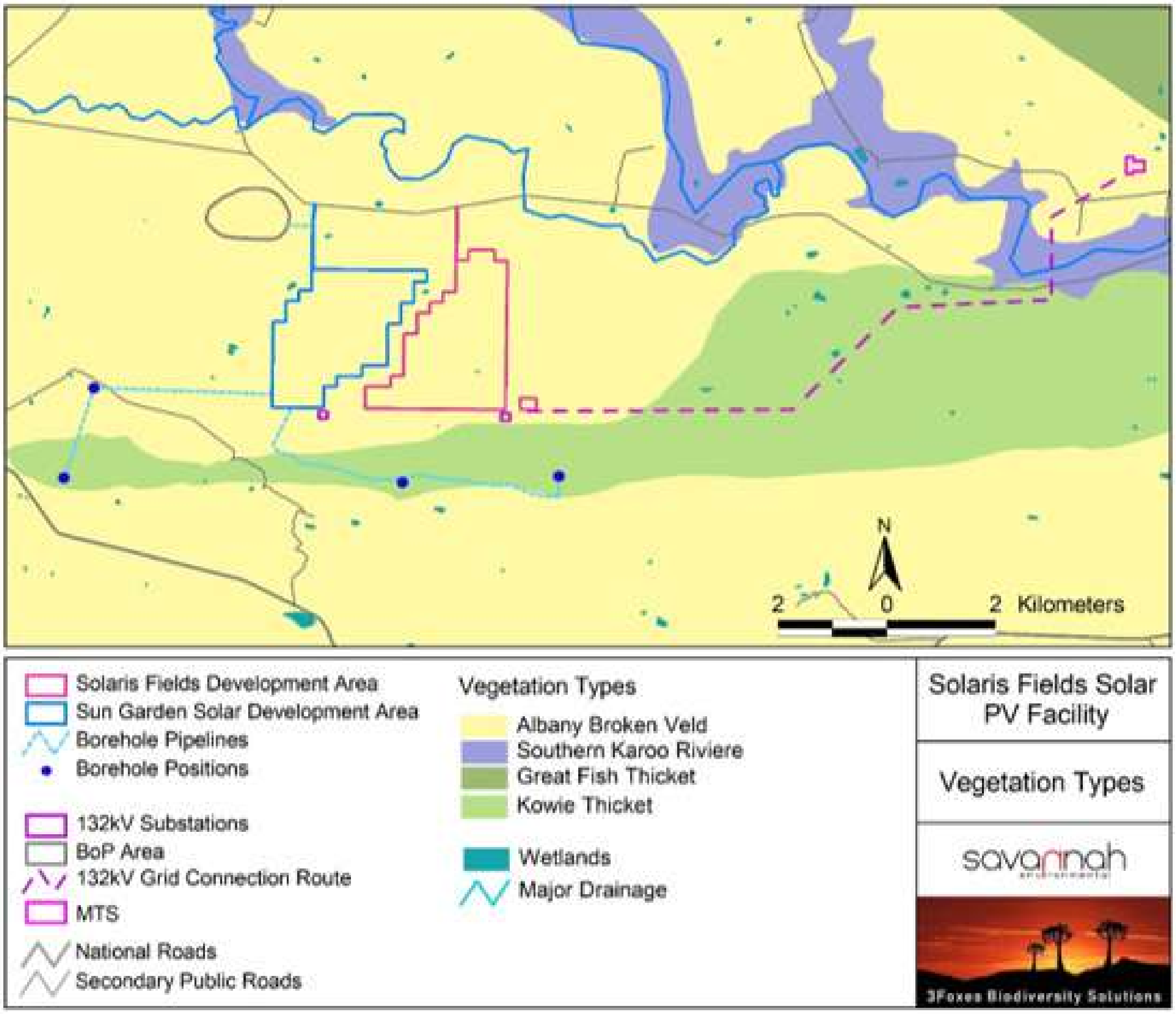

Figure 8.6: The 2018 update of the national vegetation map for the study area showing that the Sun Garden site falls entirely within the Albany Broken Veld vegetation type, with some Kowie Thicket and Southern Karoo Riviere along the grid connection route.

<u>Albany Broken Veld</u>

The whole of the Sun Garden PV development area consists of the Albany Broken Veld vegetation type. Albany Broken Veld is restricted to the Eastern Cape Province, from north of the Zuurberg Mountains and south of Middlewater, Redding and the area around the confluence of the Great and Little Fish Rivers and extending eastwards, north of the mountain ridges around Riebeeck East to the Carlisle Bridge area and south of these ridges in the upper Bushmans River Valley past Alicedale and up the New Years River Valley, including also some irregular linear patches east of Riebeeck East. Typical and characteristic species observed in the area include trees such as *Vachellia karroo*, *Euclea undulata*, *Pappea capensis*, *Schotia afra* var. *afra*, *Boscia oleoides* and *Cussonia spicata*. Common and dominant sharubs include *Grewia robusta*, *Lycium cinereum*, *Putterlickia pyracantha*, *Rhigozum obovatum*, *Rhus incisa* var. *effusa*, *Asparagus striatus*, *A. suaveolens*, *Becium burchellianum*, *Chrysocoma ciliata*, *Selago fruticosa*, *Eriocephalus ericoides* subsp. *ericoides*, *Felicia filifolia*, *F. muricata*, *Gnidia cuneata*, *Helichrysum dregeanum*, *Hermannia linearifolia*, *Indigofera sessilifolia*, *Pentzia incana* and *Rosenia humilis*. Succulents present include *Aloe ferox*, *Aloe striata*, *Cotyledon campanulata*, *Drosanthemum lique* and *Mestoklema tuberosum*. Forbs and herbs present include *Gazania krebsiana*, *Hermannia pulverata*, *Hibiscus pusillus*, *Bulbine frutescens* and *Drimia altissima*. Perennial and annual grasses present include *Aristida congesta*, *Eragrostis obtusa*, *Sporobolus fimbriatus*, *Tragus berteronianus*, *Cynodon incompletus*, *Digitaria eriantha*, *Ehrharta calycina*, *Eragrostis curvula*, *Setaria sphacelata* and *Tragus koelerioides*.

In practice the lower (northern) slopes of the site consist of open plains with few woody species present (**Figure 8.7**), while the upper slopes of the site (southern boundary) have a significantly higher woody species density and can be considered transitional with Kowie Thicket (**Figure 8.8**). There are also several small drainage lines and washes present which are characterised by the presence of woody species such as *Vachellia karroo* and *Searsia pallens*.

Figure 8.7. View over the open plains which characterise the central and northern parts of the Sun Garden PV site, with typical vegetation representative of the Albany Broken Veld vegetation type.

The open plains of the Sun Garden PV area consist of open plains with occasional scattered trees and shrubs. Dominant species include *Pentzia incana, Asparagus glaucus, Ruschia spinosa, Aloe striata, Aloe ferox, Rosenia humilis, Asparagus striatus, Chrysocoma ciliata, Nenax microphylla, Hermannia desertorum, Aristida adscensionis, Eragrostis lehmanniana, Eragrostis obtusa, Eragrostis curvula, Boophone disticha, Searsia rigida, Asparagus suaveolens, Pachypodium succulentum, Drimia anomala, Lycium cinereum, Barleria capensis, Ammocharis coranica, Sceletium tortuosum, Thesium hystrix, Blepharis mitrata, Tetragonia fruticosa, Aptosimum procumbens, Oropetium capense* and *Ocimum burchellianum*. Overall, the open plains community is considered to be low sensitivity and contains few features or species of concern.

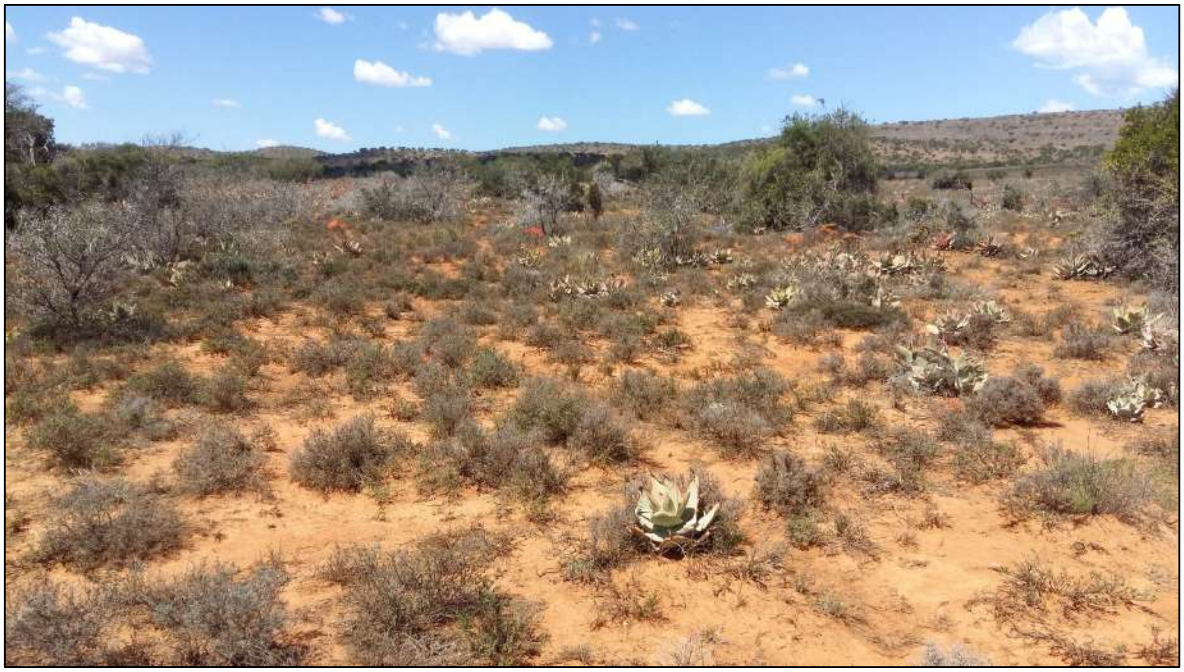

Figure 8.8 The Albany Broken Veld on the upper slopes of the Sun Garden PV site has a higher abundance of trees and woody species and there are areas with a high density of *Aloe striata*.

The upper slopes of the Sun Garden PV area have a higher density of trees and bush clumps, as well as some areas with a high density of *Aloe striata* (**Figure 8.9**). Trees and tall shrubs present include *Euclea undulata*, *Schotia afra*, *Searsia rigida*, *Azima tetracantha*, *Mystroxylon aethiopicum* subsp. *aethiopicum*, *Carissa bispinosa* and *Vachallia karroo*. The shrub and grass layer is dominated by *Pentzia incana*, *Drosanthemum lique*, *Cadaba aphylla*, *Asparagus striatus*, Asparagus sauveolens, *Lycium prunus-spinosa*, *Digitaria eriantha* and *Tragus koelerioides*. Due to the higher diversity and tree density, the upper slopes of the Sun Garden site is considered moderate sensitivity compared to the adjacent plains.

<u>*Kowie Thicket*</u>

Although there is no Kowie Thicket within the PV area, a significant proportion of the grid connection route to the MTS runs through this vegetation type. Kowie Thicket is restricted to the Eastern Cape Province, where it occurs in the river valleys of the Bushmans, Kariega, Kowie, Kleinemonde and Kap Rivers from near the Great Fish River Mouth to Kenton-on-Sea, extending inland up these valleys past Grahamstown to just past Riebeeck East and Alicedale to north of the Zuurberg at elevations of up 700m. Dominant and characteristic species observed on the hills near the site include *Euphorbia triangularis*, *Aloe speciosa*, *Schotia afra* var. *afra*, *Acacia natalitia*, *Cussonia spicata*, *Elaeodendron croceum*, *Maytenus undata*, *Pappea capensis*, *Ptaeroxylon obliquum*, *Sideroxylon inerme*, *Azima tetracantha*, *Gymnosporia polyacantha*, *Allophylus decipiens*, *Carissa bispinosa* subsp. *bispinosa*, *Clausena anisata*, *Ehretia rigida*, *Euclea undulata*, *Grewia occidentalis*, *Gymnosporia heterophylla*, *Mystroxylon aethiopicum*, *Olea europaea* subsp. *africana*, *Putterlickia pyracantha*, *Rhus longispina*, *R. lucida*, *Crassula cultrata*, *Portulacaria afra*, *Cotyledon orbiculata*, *C.velutina*, *C.tetragona*, *Kalanchoe rotundifolia*, *Mestoklema tuberosum*, *Pelargonium peltatum*, *Sarcostemma viminale*, *Plumbago auriculata*, *Asparagus aethiopicus*, *Jasminum angulare*, *Rhoicissus digitata*, *Cynodon dactylon*, *C.incompletus*, *Eragrostis curvula*, *Sporobolus fimbriatus*, *Themeda triandra*, *Eragrostis obtusa*, *Panicum maximum*, *Sansevieria aethiopica* and *S.hyacinthoides*. These areas are considered generally more sensitive than the adjacent Albanly Broken Veld.

Figure 8.9. The power line route to the MTS traverses these north-facing slopes mapped as Kowie Thicket, but rather represent a transitional area between Kowie Thicket and Albany Broken Veld.

<u>*Southern Karoo Riviere*</u>

Although there are no significant drainage features within or near the Sun Garden PV area, the power line route to the MTS traverses the Little Fish River, which is characterised by the presence of the Southern Karoo Riviere vegetation type. The Southern Karoo Riviere vegetation type is associated with the rivers of the central karoo such as the Buffels, Bloed, Dwyka, Gamka, Sout, Kariega and Sundays Rivers. About 12% has been transformed as a result of intensive agriculture and the construction of dams. Although it is classified as Least Threatened, it is associated with rivers and drainage lines and as such represents areas that are considered ecologically significant.

Figure 8.10. The Klein Fish River near the power line crossing point, representative of the Southern Karoo Riviere vegetation type. The river is lined by *Tamarix usneoides*, *Vachellia karoo* and *Searsia lancea*.

iii. Listed Plant Species

According to the SANBI POSA database, 300 species have been recorded from the broader study area, bounded by the N10 in the east and the R335 in the west and the R63 in the north and R400 in the south. Within this broad area, 277 records were returned, including three listed species as described below in Table 8.3. Of the three listed species, one is erroneous and does not occur in the Eastern Cape and another is not known from the study area and is not likely present. The third, Crassula decidua, is poorly known but has been recorded from Cookhouse, Somerset East and Cradock, where it appears to be associated with low karroid vegetation or in amongst succulent Euphorbia shrubs close to rivers. As this habitat is not present within the affected area, it is highly unlikely that it would be impacted by the development. The development area was well investigated in the field, and it transitional unlikely that there are any species of high conservation concern that are present and which were not observed. As such, the impact of the development on plant species of concern is expected to be low.

Table 8.3: List of plant species of conservation concern that are known to occur in the wider area around the site and their potential to be present within the site based on their recorded distribution and habitat requirements.

Family	Genus	Species	Status	Comment
Aizoaceae	*Drosanthemum*	*crassum*	NT	This species is restricted to the Western Cape and the record for the study area is likely due to taxonomic changes or misidentified specimens
Amaryllidaceae	*Crinum*	*campanulatum*	NT	Occurs in the Albany district, between Alexandria, Grahamstown, Bathurst and East London. As such, this species is highly unlikely to occur within the site. As it is associated with wetlands, there would also be minimal suitable habitat for this species within the site.
Crassulaceae	*Crassula*	*decidua*	NT	Occurs near Cookhouse, Somerset East and Cradock where it is associated with low karroid vegetation or in amongst succulent *Euphorbia* shrubs close to rivers.

iv. Critical Biodiversity Areas and Broad-Scale Processes

An extract of the 2019 Eastern Cape Biodiversity Plan for the study area is illustrated in Figure 8.11. This biodiversity assessment identifies CBAs which represent biodiversity priority areas which should be maintained in a natural to near natural state. The CBA maps indicate the most efficient selection and classification of land portions requiring safeguarding in order to maintain ecosystem functioning and meet national biodiversity objectives.

Although there are no CBAs within the Sun Garden site or along the power line route, the whole of the development area falls within an Ecological Support Area. Although the reasons layer that accompanies the Plan does not specify the exact reasons areas are selected as CBAs of ESAs, it does provide a list of attributes associated with each mapping unit. Within the ESA, the primary attribute common to these units is the presence of 2 vegetation types. As such, the ESA represents a transitional area with high topographical diversity and is designed as broad-scale corridor providing connectivity in an east-west direction and ultimately provides a linkage to the Addo Elephant National Park approximately 35km to the west of the site.

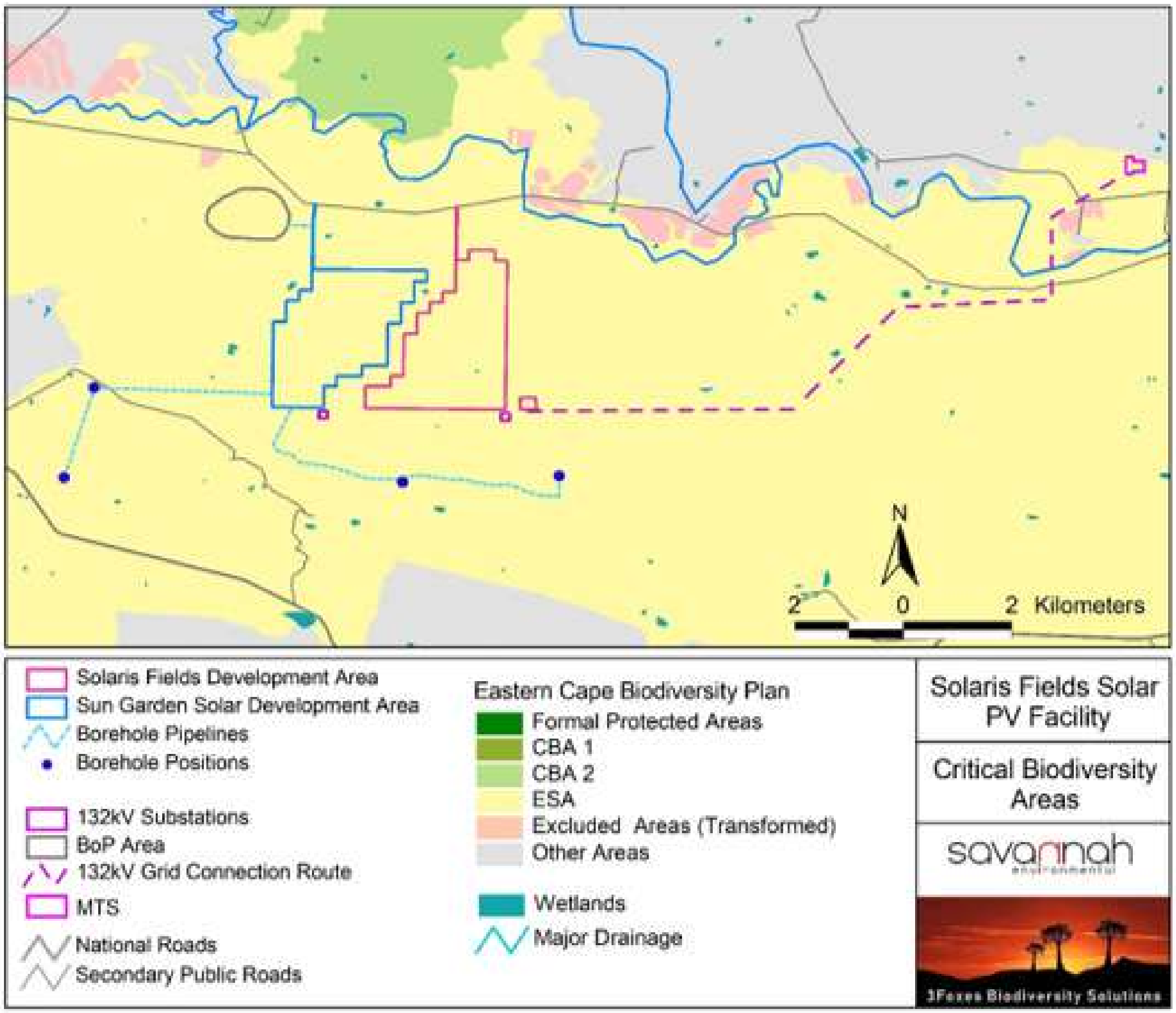

Figure 8.11: Extract of the Eastern Cape Biodiversity Plan for the study area, showing that the Sun Garden PV area and associated infrastructure falls within an extensive ESA

The ESA is however large and includes a significant extent both to the north and south of the site and although the PV facility at 2.8 km wide in a north-south direction would represent an obstacle for movement for some fauna, the overall function of the ESA is not likely to be compromised. The rugged terrain between the site and the R400 to the south of the site is seen as being of greater significance for biodiversity maintenance and ecological processes than the affected area as would be the corridors along the Klein Vis and Brak Rivers. The larger fauna of the area would easily move around the facility with the result that they would be little impacted by the presence of the PV facility, while it would be the middle-sized and small vertebrate species that would potentially be most affected by the presence of the PV facility. As such, specific measures to allow for the movement of such fauna through the area is recommended to reduce the potential impact of the development on faunal movement and habitat fragmentation. Recommended measures should include maintaining an intact grass or shrub layer within the facility as well as providing for gaps in the perimeter fencing that would allow for the smaller fauna of the area to pass in and out of the facility. This would not compromise the security of the facility as the gaps provided do not need to be large enough to allow humans to pass through. In addition, this would reduce some of the commonly associated negative ecological effects encountered with PV facilities which include outbreaks of rodents within the PV facility and which in turn tend to attract snakes into the facility area. Providing easier access into the facility area for the smaller predators of the area such as wild-cat and mongoose, would potentially allow for a more natural balance to be maintained.

In addition, the 2016 National Protected Areas Expansion Strategy (NPAES) does not include any focus areas near to the site and the closest expansion focus areas are around the Addo Elephant National Park, well south of the site.

iv. Ecological sensitivity of the site

The sensitivity map for the study area is depicted in **Figure 8.12**. The lower slopes of the PV area consist of open plains considered to be low sensitivity while the upper slopes of the PV area are steeper of have a higher woody component and are considered to be medium sensitivity. Along the power line route to the MTS, there are some high sensitivity drainage features, but these can easily be spanned by the power line and are not likely to be significantly impacted by the power line. The drainage feature which occurs along the south-eastern boundary of the PV area would be vulnerable to impact and it is recommended that a freshwater specialist should demarcate the boundary of this feature in the field before construction to ensure that the PV area does not encroach into this area unnecessarily. In terms of fauna, the PV area does not have any habitats present that would be of particularly high value and no specific impact of high magnitude on fauna are expected. However, given the size of the facility and the location within an ESA it is recommended that specific measures are put in place with regards to the design of the fence around the facility to facilitate the movement of smaller fauna in and out of the PV area. Similarly, no plant species of high concern were observed within the PV and impacts on plant SCC are likely to be low. Perhaps the greatest area of concern regarding the PV facility would be the location of the facility on a fairly steep slope with soils that appear to have high erodibility. The panels would generate a lot of runoff and combined with the high levels of disturbance that would occur after construction, the potential for erosion problems at the site are very high. Consequently, specific mitigation measures to reduce and manage erosion and runoff at the site are recommended.

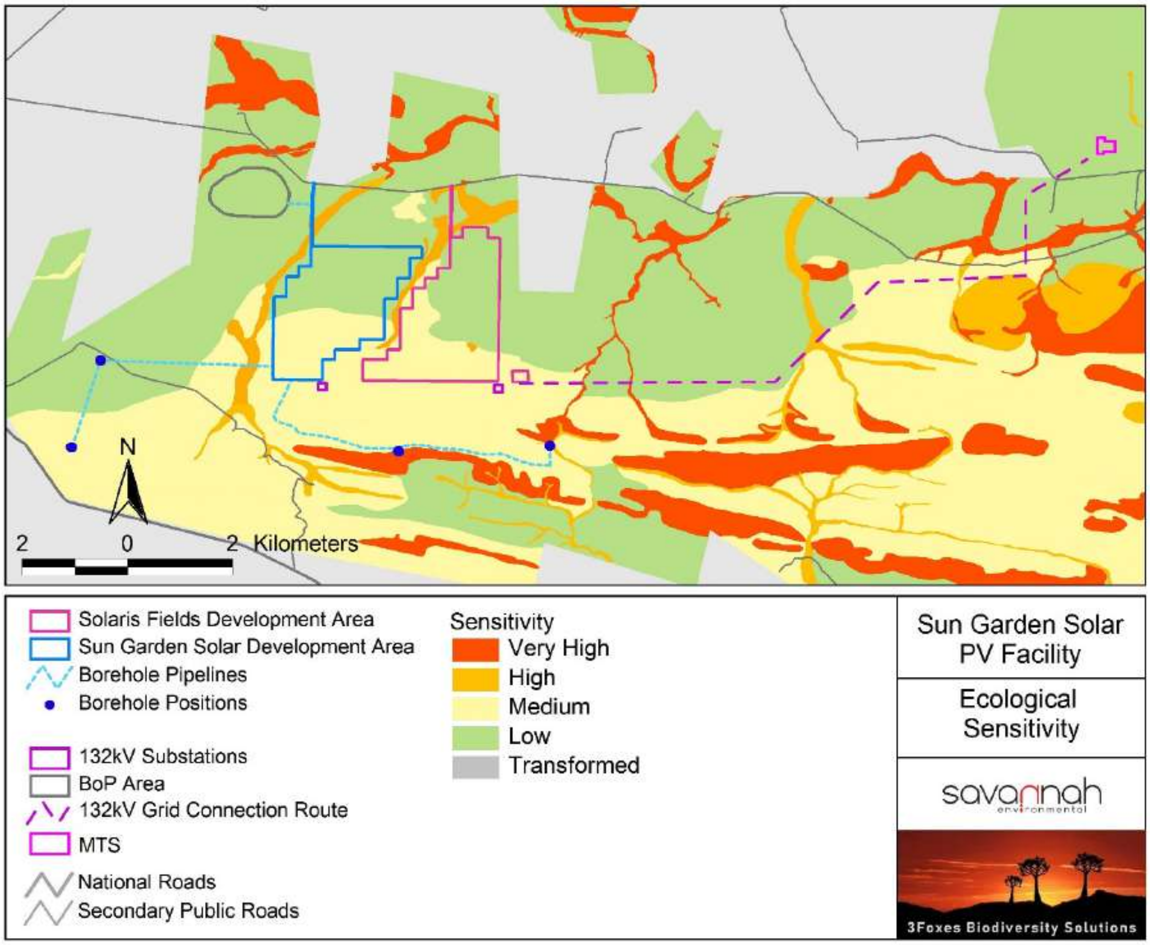

Figure 8.12. Ecological sensitivity map for the Sun Garden and surrounding area including the grid connection route to the MTS.

v. Aquatics and Surface Water Features

The proposed development occurs within the following Subquaternary (Quinary) catchments with the respective mainstem rivers all within the Southern Folded Mountains Ecoregion (**Figure 8.13**):

» Q80F Brak River
» P10C Bushmans River (small portion of the proposed Borehole water supply pipeline)

The development area contains short tributaries that link to these systems, consisting mostly of non-perennial rivers, with some containing narrow vegetated zones associated with increased runoff, but not typical of any riparian associated species. The proposed development area spans the South Fold Mountain and Drought Corridor Ecoregion, however the aquatic systems are more typical of those found in the Drought Corridor area, i.e., small drainage lines with little to no permanent aquatic features, some of which do not connect with any major or main stem systems.

Overall, these watercourses are largely in a natural state, when compared to other mainstem systems within the greater region (e.g. Great Fish River), which is considered Largely Modified. Current or existing impacts occur in localised areas within the development area and these include existing roads /tracks, evidence of grazing (livestock), bush encroachment (*Vachellia karroo*) and various farm dams (surface water impoundments).

The National Wetland Inventory v5.2 spatial data (NWI), only indicated natural riverine systems and depressions/pans within the study area, as well as the high number of artificial farm dams (**Figure 8.14**). The presence of the pans and National Freshwater Ecosystems Priority Areas (NFEPA), resulted in portions of the study area, receiving a Very High Aquatic sensitivity rating (BoP and water supply pipelines) in the DFFE Screening Tool. Based on this, an Aquatic Biodiversity Assessment (this report) is required as part of the Basic Assessment process being undertaken for the project.

The only natural wetlands observed within or in close proximity to the development area, included several small depressions. This, inclusive of the proposed buffers (57m), will be avoided by the development footprint based on the information supplied in this report. No activities occur within 500m of these pan boundaries and only the road crossing the drainage lines will require a Water Use Authorisation, which has been initiated by the Applicant.

In terms of the National Freshwater Ecosystems Priority Areas (NFEPA) assessment, all the riverine (riparian not wetland) systems within the development area have been assigned a condition score of AB (Nel et al. 2011), indicating that they are largely intact and perform an ecological function. However, the development area systems are ephemeral and only carried water for short periods, thus the observed systems do not support any wide riparian zones and the vegetation associated with these watercourses were between 0.25m and 3m wide and contain mostly terrestrial species.

The only dense riparian vegetation was found along reaches of the Brak River, dominated by sedges and grasses (*Cynodon dactylon, Cyperus textilis, Phragmites australis*) on the river edge, while tall trees on the steep banks (*Searsia lancea, Combretum caffrum*), and thicket trees and shrubs on the upper slope of the banks included *Azima tetracantha, Buddleja saligna, Ehretia rigida, Gymnosporia heterophylla, Lycium* spp., *Olea europea* subsp. *africana, Vachellia karroo* and *Ziziphus mucronata*.

Climbers, including *Asparagus* spp. and *Cynanchum* spp., dwarf shrubs (*Felicia* spp.), and grasses (*Panicum deustum, P. maximum*) and succulents (*Drosanthemum hispidum, Malephora lutea*) occur in the open patches and disturbed margins of the riparian zones.

No aquatic Species of Conservation Concern (SCCs) were observed within the development area.

The National Freshwater Ecosystems Priority Areas (NFEPA) (Nel et al., 2011), also earmarked sub-quaternaries (**Figure 8.15**), based either on the presence of important biota (e.g. rare or endemic fish species) or conversely the degree of riverine degradation, i.e. the greater the catchment degradation the lower the priority to conserve the catchment. The important catchment areas are then classified as Freshwater Ecosystems Priority Areas (FEPAs).

None of the development area falls within any such area, with the exception of the water supply pipeline falling within a FEPA, while portions of the development area are located within an Ecological Support Area Type 1 (**Figure 8.16**) as per the Eastern Cape Biodiversity Conservation Plan (ECBCP, 2019).

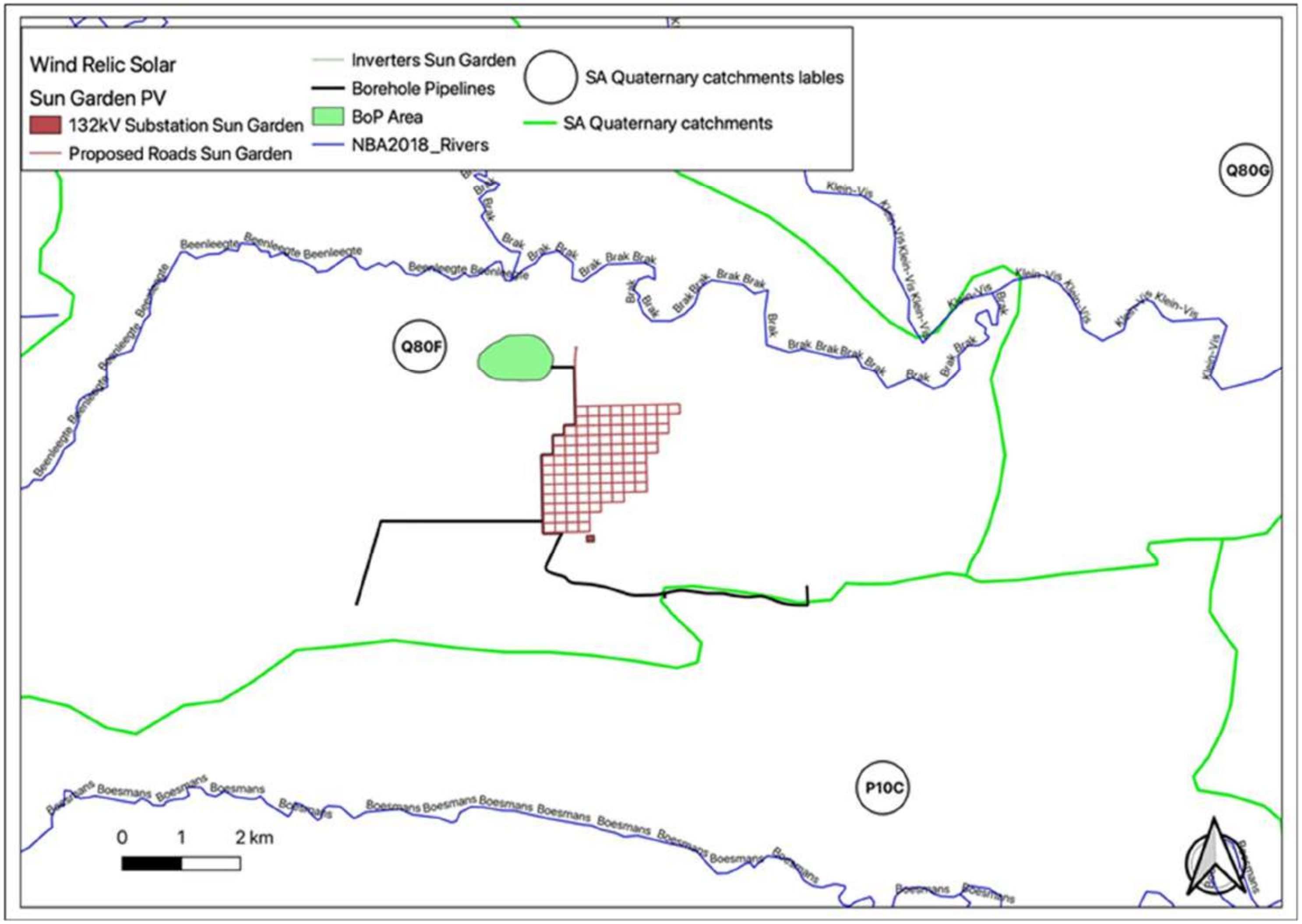

Figure 8.13: Project locality map indicating the various quaternary catchment boundaries (green line) in relation to the development area (Source DWS and NGI).

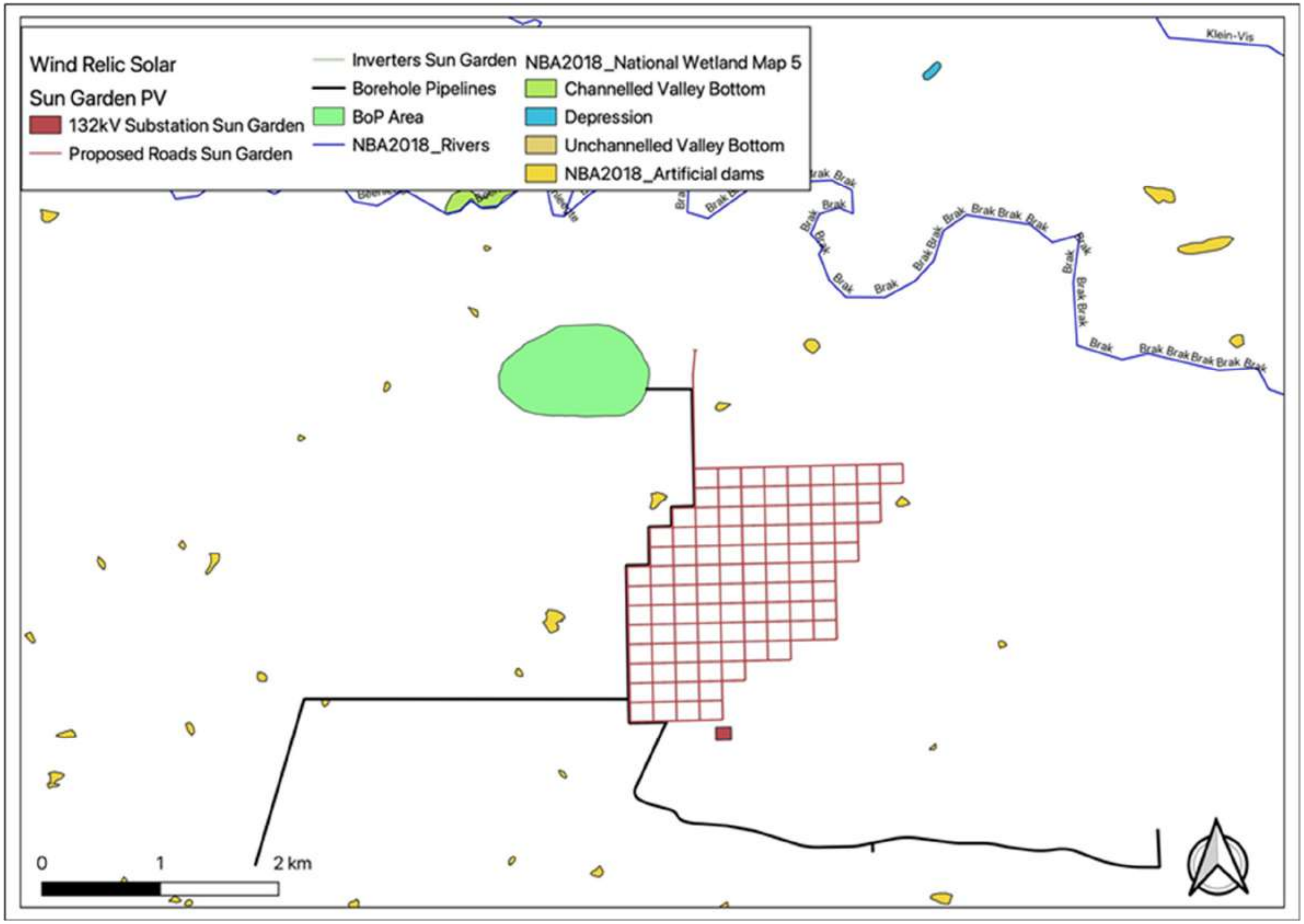

Figure 8.14: The various waterbodies identified in the National Wetland Inventory as shown in the National Spatial Biodiversity Spatial data

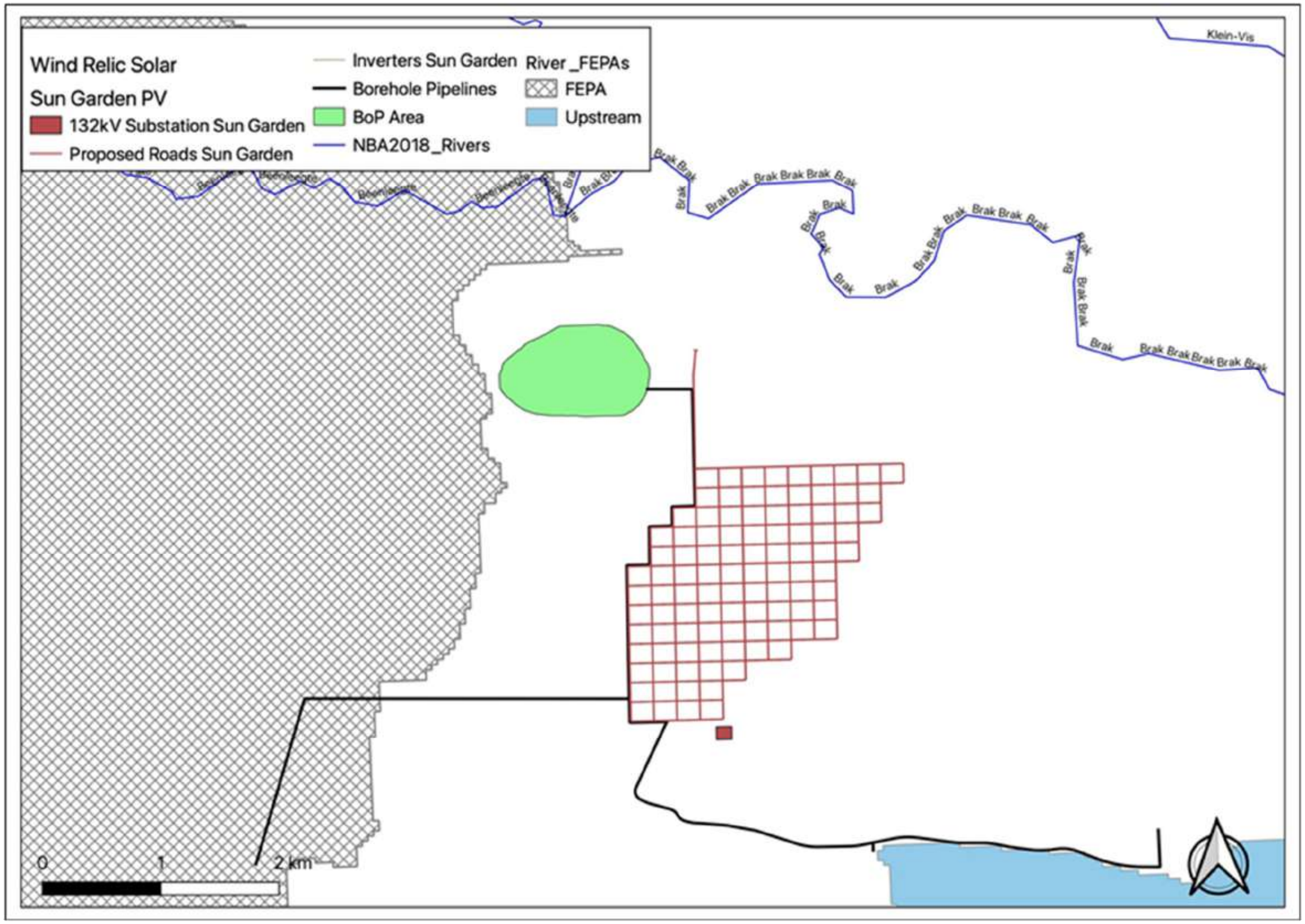

Figure 8.15: The respective sub quaternary catchments rated in terms of Freshwater Ecosystem Priority Areas (FEPAs) in relation to the development area.

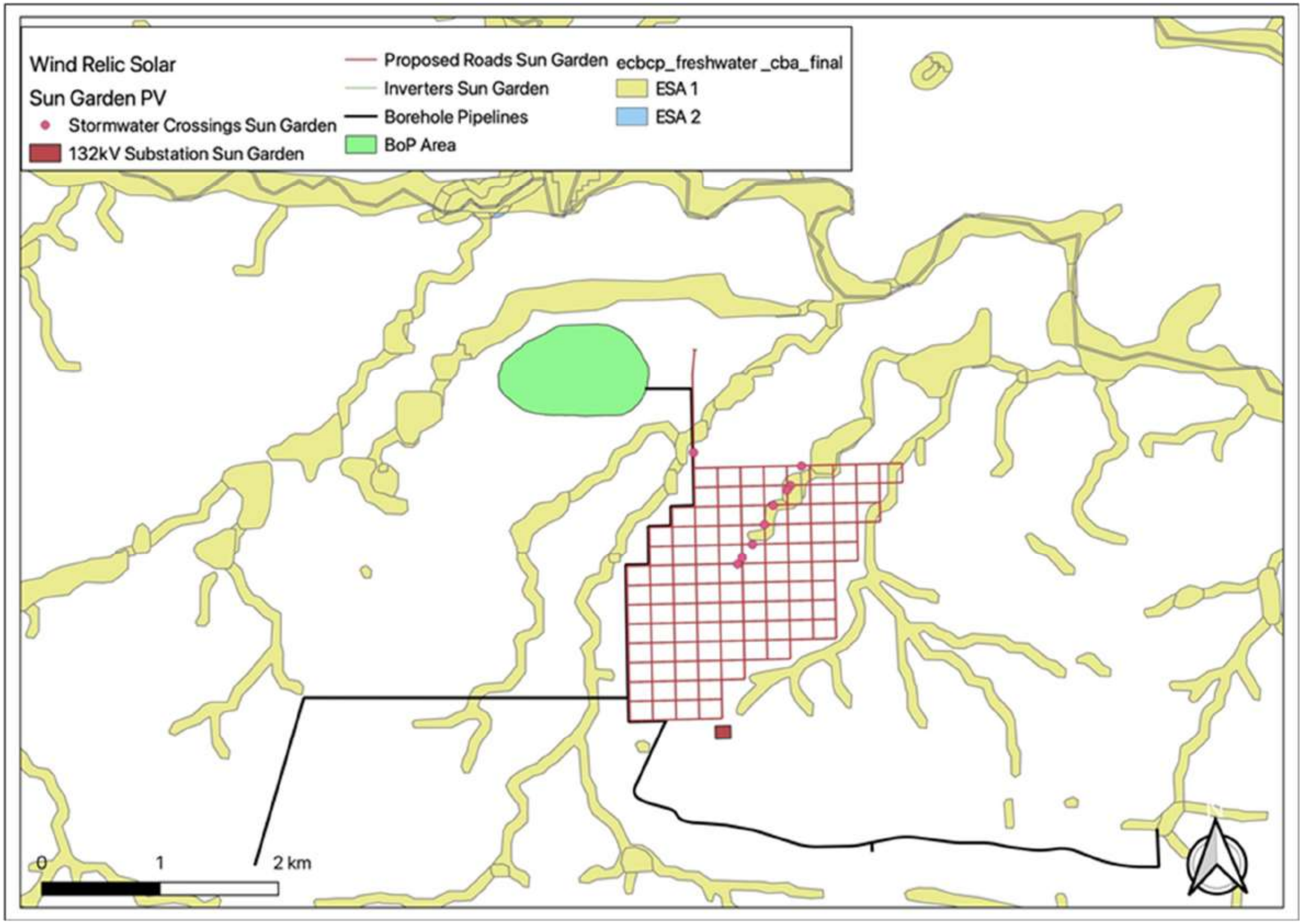

Figure 8.16: The results of the Eastern Cape Biodiversity Conservation Plan (ECBCP, 2019)

vi. Terrestrial Fauna Communities

Mammals

As many as 50 different naturally-occurring mammal species have been recorded from the vicinity of the Sun Garden site (Appendix 2). Common species observed during the site visit include Steenbok, Common Duiker, Kudu, Cape Porcupine, South African Ground Squirrel, Springhare, Aardvark, Grey Mongoose, Yellow Mongoose, Cape Hare, Bat-eared Fox, Vervet Monkey, Chacma Baboon, Suricate, Caracal and Black-backed Jackal. There is also some game farming in the area, with the result that there are also many introduced or farmed species present in the area, but as these populations are mostly maintained and managed by the landowners, they are not considered further here. Apart from the above common species, there are also several red-listed mammals which are confirmed present in the broader area or which may be present. These are detailed below in Table 2 and include Brown Hyena, Serval, White-tailed Rat, African Striped Weasel, Grey Rhebok, Black-footed Cat, Leopard and Mountain Reedbuck. Some of these species occur in the wider area at a low density and do not have well-established populations outside of conservation areas and larger game farms.

Reptiles

Based on the ADU database, thirty-three reptile species have been recorded from the area around the Sun Garden site. This is a relatively low total, suggesting that the area has not been very well sampled in the past. However, even when the sample area is expanded to adjacent quarter degree squares, no species of concern are picked up. Common species observed during the site visit or on previous projects in the immediate area include Thin-tailed Legless Skink, Southern Rock Agama, Common Ground Agama, Cape Girdled Lizard, Spotted Gecko, Leopard Tortoise, Angulate Tortoise, Red-lipped Snake, Rock Monitor and Puff Adder. The drainage lines with dense riparian vegetation and the rocky hills and especially those with large rocky outcrops are considered to represent the most important reptile habitat at the site. The typical open plains habitat that comprises the majority of the PV area is considered low sensitivity for reptiles. The only reptile of potential concern known from the area is the Albany Sundvold Lizard which is a narrow endemic that was previously listed as Near Threatened but as of 2017 has been assessed as being of Least Concern. This species has not been recorded from the vicinity of the Sun Garden site and based on the preferred habitat description, is not likely to occur within the site.

In terms of the likely impacts of the development on reptiles, habitat loss is not likely to be highly significant as the direct footprint of the development would be less than 350ha and this would not be highly significant in context of the affected habitats and the reptile community present. In addition, some reptiles such as some geckos and lizards increase within PV areas as they find the structures represent favourable habitat or provide shelter from aerial predators.

Figure 8.17: Some of the more common reptiles observed at the site include, from top left, the Rock Monitor, Spotted Grass Snake (Skaapsteker), Angulate Tortoise and Common Ground Agama

Amphibians

Amphibian diversity within the Sun Garden site is likely to be low. A total of 15 species are known from the broader area and according to the ADU database, includes no species of conservation concern. Species observed in the area include Raucous Toad, Bubbling Kassinia, Common Platanna, Bronze Caco and Common River Frog. The amphibian community can be broadly divided into those species strongly associated with water bodies such as River Frogs and Platanna and those species which are able to range more freely such as toads and Caco's which may breed in streams and ponds, but are more terrestrial in nature. Overall, impacts on amphibians are likely to be local in nature and it is not likely that the local population of any resident species would be compromised by the development.

vii. Bats

Habitats for bats

The broader study area is separated into two ecoregions; Albany Thicket, and Fynbos Shrubland. Within these ecoregions, the Sun Garden PV development footprint is comprised of Albany Broken Veld, Albany Valley Thicket and Saltaire Karroid Thicket. A gradient of increasing mean annual precipitation runs from the broader western study area (where Sun Garden is located) towards the east.

There is some suitable habitat for bats that can be used for roosting, foraging and commuting in the study area. This includes thicket and woodland habitats which provide a variety of clutter conditions and are known to be important for bats, particularly woodland (Cooper-Bohannon, et al., 2016; Gelderblom, et al., 1995). The study area is dominated by grassland habitat which supports relatively high bat species richness (Gelderblom, et al., 1995). Land use in the study area is primarily agricultural including grazing, stock farming and game farming and bats are known to be attracted to areas with livestock for foraging (Downs & Sanderson, 2010). Cultivated areas are found on the border and along the river system in the north of the development area. Cultivated areas are important foraging areas as some species forage over monoculture agricultural fields and prey on insect pests (Noer, et al., 2012; Taylor, et al., 2011). Farmsteads in the study areas contain lighting which at night will attract insects and in turn bats to hunt for prey.

Water sources are important for bats as a direct resource for drinking and because these areas tend to attract insects and promote the growth of vegetation (e.g. riparian vegetation). Therefore, besides providing drinking water, bats can also be attracted to water sources as potential foraging and roosting sites (Greif & Siemers, 2010; Sirami, et al., 2013). There is a river bordered by alluvial vegetation in the north of the site, reservoirs and farms dams in the study area that will be attractive to bats. Drainage lines will be equally important for foraging and commuting. Bats are known to use linear landscape features such as these, in addition to tree lines, for commuting routes to get to and from foraging sites, roost sites, to access water sources and because they provide protection to bats from predators, shelter from wind, and orientation cues (Verboom, 1998).

The suitability of habitat for bats is also dictated by the roosting potential. Habitats with roosting spaces are likely to be more favoured compared to areas where roosts are limited. The availability of roosting spaces is a critical factor for bats (Kunz & Lumsden, 2003) and a major determinant of whether bats will be present in a landscape, and the diversity of species that can be expected. Two bat roosts1 are found approximately 12 km east and 30km north of Sun Garden PV. Rocky crevices are also used as roosts by some species but these features are not significantly present on site. Other man-made infrastructure in the study areas may be used by bats as well [e.g. Cape serotine and Egyptian free-tailed bat, Monadjem et al. 2010)]. A number of free-tailed bats and plain-faced bats may roost in trees in woodland habitats, including in dead trees (Barclay, 1985; Fenton & Rautenbach, 1986; Monadjem et al., 2010). Evidence suggests that trees with larger trunks are preferentially selected by bats and therefore the destruction of older, larger trees could impact bats at the PV development.

<u>Bat Species</u>

The Sun Garden PV Facility falls within the actual or predicted distribution range of approximately 21 species of bat (refer to Table 1 in the bat assessment report included in Appendix F). However, the distributions of some bat species in South Africa, particularly rarer species, are poorly known so it is possible that more (or fewer) species may be present. Several echolocation calls that are characteristic of species in the Plain-faced bat family were recorded from static monitoring at the research site, although these calls were unable to be separated into distinct species. Since most of the species that these calls could belong to have a conservation status of Least Concern, these calls were grouped together and referred to as Unidentified plain-faced bat. However, some calls could potentially be from *Myotis tricolor*, although its presence has not been confirmed.

<u>viii. Avifauna</u>

The proposed development site falls wholly within a single pentad (3305_2540), with 110 species recorded in this pentad by SABAP2 to date, however only 5 cards have been submitted, with the number of cards providing an indication of the sampling effort. The SABAP2 data search area was therefore increased to include six pentads16 with 75 cards submitted. A total of 222 species of birds have been recorded by SABAP2 in the six pentads in and around the proposed development site.

The SEA for the Cookhouse Focus Area notes that the Focus Area (FA) is not located close to any recognised national IBAs, but that it does support a diverse avifauna. It identified at least 283 bird species that could regularly occur in the FA. This includes 19 red-listed species, six of which are endemic; Ludwig's Bustard, Blue Crane, Cape Vulture, Black Harrier, Melodious Lark and African Rock Pipit. The more natural vegetation within the proposed development site provides habitat for a variety of avifaunal species such as Ludwig's Bustard, Denham's Bustard, Southern Black Korhaan and Secretarybird while the irrigated agricultural areas and associated farm dams provide foraging and roosting opportunities for Blue Crane. The habitats present on the site and immediate surrounds are not unique to the site and are relatively widespread and contiguous in the area so any displacement from the immediate vicinity that may occur will unlikely incur a high energetic cost as suitable habitat is widely available nearby.

Species observed during the preconstruction monitoring undertake in the broader area include:

» Three Martial Eagle and three Verreaux's Eagle territories were confirmed in the broader area during the raptor surveys conducted for the WEFs. Breeding was confirmed in all three Martial Eagle ranges, with females seen incubating. The 'potential' Martial Eagle nest location identified in proximity to the proposed development site does not likely represent an active nesting site given the relatively low flight activity of this species recorded from Vantage Points (VPs) positioned near this location during the long-term monitoring conducted for the Redding wind farm. A fledged sub-adult recorded in this vicinity may rather represent the previous offspring of the breeding pair located further to the east of the site in the process of leaving the core territory as the next breeding cycle commences. Breeding was also confirmed and nest sites located at all three Verreaux's Eagle sites in 2019 (though only two of these sites were active in 2020, with the third occupied by a pair of Lanner Falcons). Other breeding locations identified included four Secretarybird nests, a Grey Crowned Crane nest and two Jackal Buzzard nests. However, none of the nests located are in proximity to the proposed solar PV development.
» The VP surveys closest to the proposed solar PV site recorded a relatively low number of flights, notable species observed include Blue Crane, Ludwig's Bustard, Southern Black Korhaan, Martial Eagle and Lanner Falcon.
» Ten species of particular interest were noted in this area during the drive transects: Blue Crane, Ludwig's Bustard, Denham's Bustard, Kori Bustard, Karoo Bustard, Southern Black Bustard, Secretarybird, Karoo Korhaan, Southern Black Korhaan, Caspian Tern, Martial Eagle, Black Harrier and Lanner Falcon.

The Site Ecological Importance determined for each Species of Conservation Concern (SCC) is low, based on consideration of biodiversity importance (BI) of the receiving environment (e.g. SCC and the habitat type present on the site) and its resilience to impacts (i.e. receptor resilience [RR]), as well as the conservation importance (CI) and the functional integrity (FI) of the receiving environment (refer to Appendix E for more details).

8.5. Heritage Resources

Heritage resources are unique and non-renewable. Various heritage resources were identified within the region.

8.5.1 Archaeological Resources

Archaeological stone age and iron age material are very sparse in the region. Several graded heritage sites of high local heritage significance have been identified in and around Cookhouse and Makhanda (Grahamstown), including palaeontological sites and rock art.

8.5.2 Heritage Resources

The area between and surrounding Makhanda (Grahamstown) and Somerset East is sparsely populated with several farmsteads and their associated structures located on the valley floors of this hilly and mountainous region. The farmsteads are connected through several farm roads and old historic ox-wagon routes that link the local communities to the busy towns of Makhanda (Grahamstown) and Somerset East. The area proposed for the Sun Garden Solar PV Facility has a low to high heritage significance. Many of the old farm buildings, stone houses and churches in the area contain architectural elements that are older than 60 years and fall with the general protection of the NHRA (25 of 1999).

Historically the region surrounding Makhanda (Grahamstown) and Somerset East has been occupied by pre-colonial farmers and herders as well as European settlers since the 1750s (Booth, 2013). Several structures, including forts, signalling towers, monuments and memorials found in this area, provide further evidence of the conflicts and wars fought between the British and Xhosa who occupied the region. The town of Grahamstown (now known as Makhanda) was established as a result of the frontier wars of 1812 (Marchsal, 2008). The Fish River, located to the east of Grahamstown (Makhanda), was historically the border between the Xhosa and the British (Booth, 2013).

This cultural significance of the area comprises of both tangible and intangible heritage. According to SAHRIS there are seventy (70) declared Provincial Heritage sites located around Makhanda (Grahamstown), consisting of historical structures and burial grounds, one (1) declared Provincial heritage site is located in Riebeeck East consisting of the Mooimeisiesfontein Farm, the well-known farm of Piet Retief, and fifteen (15) declared sites around Somerset East consisting of historical structures and buildings. Several graded heritage sites of high local heritage significance have also been identified in and around Cookhouse and Makhanda (Grahamstown). These sites include burial grounds and graves, monuments and memorials, stonewalling, as well as historical structures. These structures speak to the living heritage that is widespread on this cultural landscape. In terms of the tangible heritage, several historical structures (including old churches, farmsteads and stone houses) and burial grounds have been identified in the area.

Three Farmsteads (SF-01, SF-04, SF-05) (including outbuildings and stonewalling features and built environment structures.), three sites containing labourer houses (SF-02, SF-09, SF-10), a shed (SF-03), and the remains of three foundations of structures (SF-06, SF-07 and SF-08) were identified to the north of the Sun Garden Solar PV Facility. The historical structures and Farmsteads are situated adjacent or close to the existing roads that pass through the homesteads (**Figure 8.18**).

Several farmsteads, labourer cottages and remains of structures are located in the northern section of the Farm Britzkraal No 253.

A house with stone dressing was identified (GPS: S-33.076008 E25.666594) on Portion 9 of the farm Britzkraal No 253. The house is used as overnight accommodation for game hunters. Approximately 240m northwest of the house with stone dressing, an old shed was observed (GPS: -33.074144 25.665228). The remains of a brick structure (GPS: -33.085192 25.691033) are located approximately 140m north of the main far house. The walls, windows roof and doors of the structure have been removed, and the house has been abandoned. The ruins of an old stable were found located 70m north of the main farmhouse (GPS: -33.085744 25.690708). Only the foundations were still visible. Several labourers cottages were also identified on Portion 7, 8 and 9 of the farm Britzkraal No 253. Many of the labourer cottages have been abandoned and are in a dilapidated state. These structures are of low heritage significance.

The old Britzkraal farmhouse (GPS: -33.086325 25.690831) is located in the northern section of the farm. The walls, windows and doors of the house have been removed, and the house has been abandoned. Aerial Photograph (141_009_19421), dating to 1939, from the CDNGI Geospatial Portal (http://www.cdngiportal.co.za/cdngiportal/) shows several structures at the Britzkraal farmstead. The old Britzkraal farmhouse is an example of the local vernacular architecture of the region and of heritage significance. It was rated as IIIB with medium heritage significance.

The farmsteads and historical structures were considered as having a medium to low cultural significance and has been allocated a heritage grading of Medium heritage significance and heritage rating of IIIB and a Low Heritage significance and heritage rating of IIIC. These sites fall under the Protection of Section 34 of the NHRA.

None of the above are located close to the proposed PV facility (refer to **Figure 8.18**).

8.5.3. Palaeontology

The Sun Garden PV Facility is underlain by the Dwyka Group; the Fort Brown Formation of the Ecca Group (Karoo Supergroup), Adelaide Subgroup (Koonap and Middleton Formations, Beaufort Group, Karoo Supergroup) and the Witteberg Group of the Cape Supergroup, Karoo Dolerite, and Quaternary deposits. According to the PalaeoMap of SAHRIS the Palaeontological Sensitivity of the Dwyka Group is Low, the Collingham Formation, Rippon Formation, Fort Brown Formation of the Ecca Group is Moderate, while the Prince Albert Formation has a High and the Whitehill Formation of the Ecca has a Very High Palaeontological Sensitivity. The Adelaide Subgroup also has a Very High Palaeontological Sensitivity, Dolerite is igneous in origin and thus has an Insignificant Paleontological Sensitivity while that of Quaternary deposits is Low but locally High (Almond et al, 2013; SAHRIS website) (refer to **Figure 8.19**).

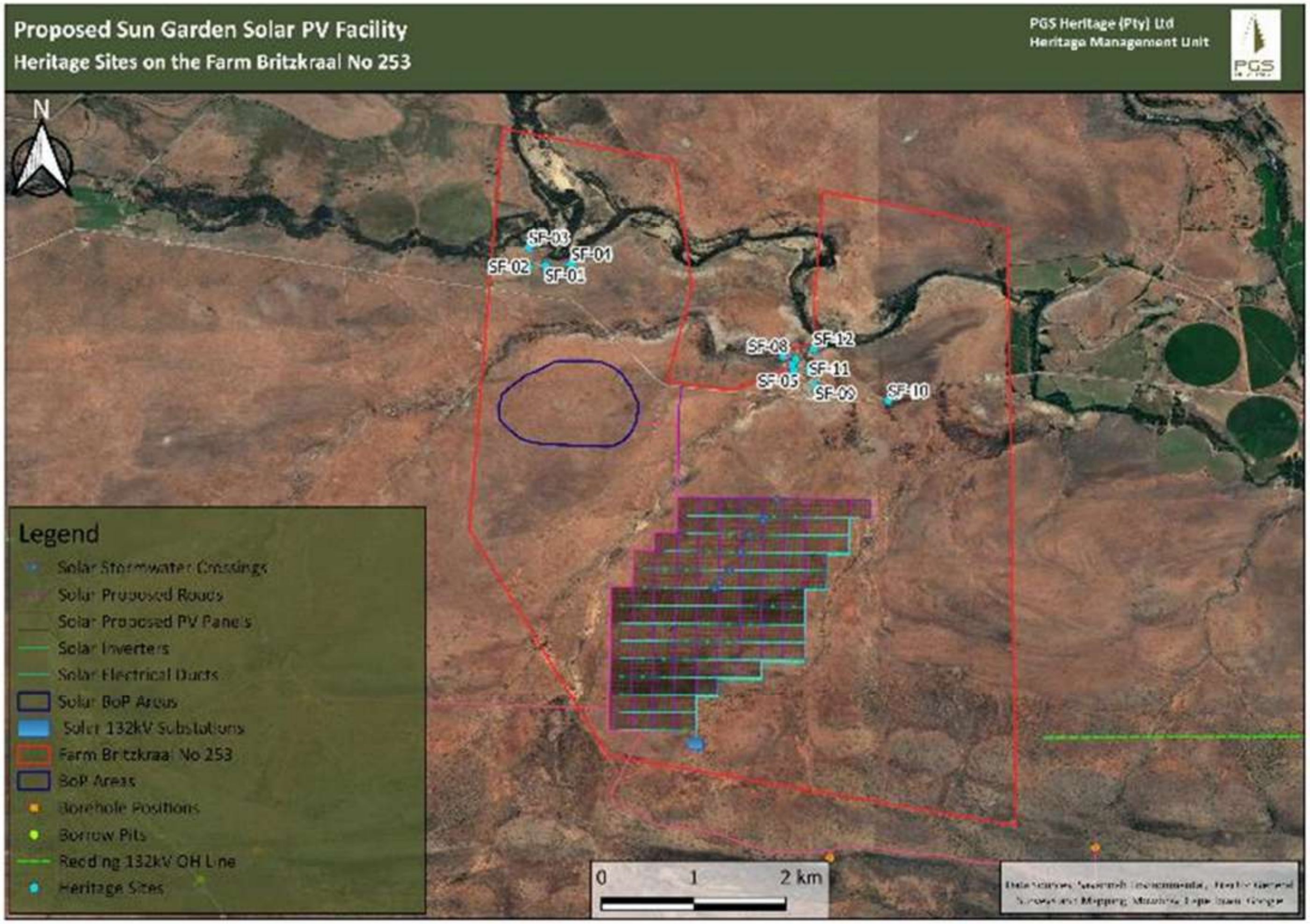

Figure 8.18: Map indicating the location of the identified heritage sites on the Farm Britzkraal No 253 in relation to the Sun Garden Solar PV Facility

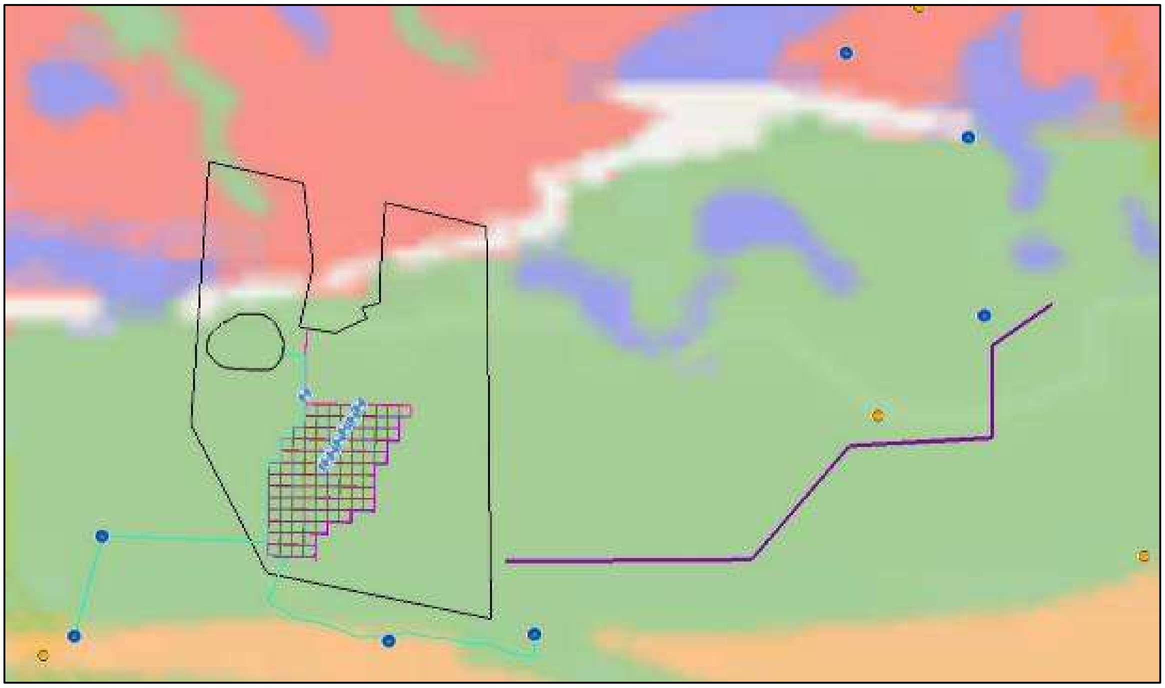

Figure 8.19: Overlay of the Sun Garden Solar PV Facility on the palaeosensitivity map from the SAHRIS database. This shows that most of the proposed development footprint falls in an area that is coloured blue and orange, which is rated as Low to High sensitivity.

A 3-day site-specific field survey of the development footprint was conducted on foot and by a motor vehicle on 20 November to 23 November 2020. No visible evidence of fossiliferous outcrops was found.

8.5.4. Cultural Landscape

According to Booth (2016), "*Cultural landscapes can be interpreted as complex and rich extended historical records conceptualised as organisations of space, time, meaning, and communication moulded through the cultural process.*" Because cultural landscapes can be associated with people of specific events, they represent the interface between the effect of human culture and identity has had on physical places, and the meanings these spaces have in human memory. At its core the cultural landscape represents both the 'natural' ecological processes and phenomena, as well as the changes emerging from the process of transformation of the landscape by communities who use, live and transform specific regions/areas, adapting it to their needs (Jansen & Franklin, 2021). These transformed spaces, along with cultural values, regional identities and traditions are what one generation inherits from the previous. As such when evaluating the significance of the cultural landscape it is important to understand and consider all its components including tangible and intangible aspects; as well as the natural and cultural processes that have transformed the area.

In 1992 the World Heritage Committee, defined cultural landscapes as "a representation of the combined worlds of nature and of man illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both external and internal" (UNESCO, 2020).

The proposed Sun Garden Solar PV Facility is situated in the Cookhouse REDZ and the Eastern Corridor of the Strategic Transmission Corridors specifically designated for large-scale wind and solar energy facilities. With the development ofwind and solar PV facilities within the REDZ zone it is expected that the "cultural landscape of an area will be changed to be dominated, or at least heavily altered, by renewable energy development" (Lavin, 2021). Several WEFs, power lines and substations has been developed in the broader region. These modern developments do constitute a transformation of the cultural landscape, through the addition of another layer of human intervention. According to Lavin (2021) the creating of an additional layer onto the CL of an area, within a REDZ is acceptable. However, the negative impact (the destruction of older archaeological or historical layers) of the CL should not be ignored.

These impacts can be mitigated in various ways. As such it should be noted that the addition of the Sun Garden Solar PV Facility to this area will create another layer to the exciting Cultural landscape. In this assessment, the aim is to ensure that other aspects of the CL are not destroyed or overridden as a result of this additional layer.

8.6. Visual Quality

The majority of the study area is sparsely populated (less than 10 people per km^2) and consists of a landscape of wide-open spaces and very little development. The relatively low rainfall has as a consequence that the region has not been transformed by dryland agriculture, with irrigated agriculture (crop circles) and dryland crop production primarily limited to areas along the Brak and Little Fish Rivers.

Besides the limited cultivation of crops, the study area is largely in a natural state, with mainly sheep and game farming as additional economic activities. Farm residences, or homesteads, dot the landscape at an irregular interval. These homesteads are generally located at great distances from each other (i.e. more than 3km apart).

There is an airfield (Henry's Flats Aerodrome) to the far north of the study area, approximately 5.5km north of the proposed PV facility (at the closest). The landowner has confirmed that this airfield is not in use. The airfield and the Jordaanskraal homestead are located on farms earmarked for the proposed Rippon Wind Farm. There is also another airfield (indicated on the SA 1:50 000 topographical maps) at the Glentana homestead (dairy farm) as well, but it appears to be under irrigation and not functioning as an airfield anymore[9].

The N10 national road provides motorised access to the region from the city of Port Elizabeth, the largest urban centre closest to the site (approximately 130km by road). Another 16km gravel road (the Beenleegte secondary road) provides the quickest access to the proposed development site from the N10. This road splits off from the N10 near the Rippon Substation.

There are no designated protected areas within the region and there are no other identified tourist attractions or destinations within the study area.

In spite of the rural and natural character of the study area, there are a large number of overhead power lines in close proximity to the development site. These include:

[9] Information received from neighbouring land owners and the project proponent indicates that neither of the airfields is operational.

» Golden Valley/Rippon 1 220kV
» Poseidon/Grassridge 1 and 2 400kV
» Poseidon/Dedisa 1 400kV
» Rippon/SATS 1 and 2 220kV
» Rippon/Doringkom 1 220kV

The entire proposed project site is located within the Cookhouse REDZ and the Gazetted Eastern Power Corridor. As stated previously, there are a number of proposed and operating wind farms in the areas around Cookhouse, Bedford and Golden Valley.

8.7 Traffic Conditions

Access to the project site is ample with the presence of existing roads mainly consisting of national and regional roads. The project site is situated directly adjacent, to the west, of the N10 national road, which provides access to the project site and development envelope (**Figure 8.20**).

N10 northbound Beenleegte Secondary gravel road

Figure 8.20: Main Routes providing direct access to the project site.

The R335 is located directly adjacent and to the west of the project site and the R400 is located to the south of the project site. The Beenleegte Secondary gravel road provides direct access to the project site and the development envelope. This route will be utilised for accessing the project site, development envelope and development footprint.

8.8 Socio-Economic Profile

i Profile of the Broader Area

The Blue Crane Route Local Municipality falls within the Sarah Baartman District Municipality and collectively account for 19% of the population, and 18% of the households in the district. The Blue Crane Route Local Municipality is the least populous local municipality in the district.

Population growth between 2008 and 2018 was 0,7% year-on-year for the Blue Crane Route Local Municipality which was stagnant when compared to the Sarah Baartman District (1%) but, slightly larger than the Eastern Cape (0,2%) over the same period.

Table 8.4: Overview of the population structures on a provincial, district and local level

Indicator	Eastern Cape	Sarah Baartman District	Blue Crane Route Local Municipality
Area (km^2)	168 966	58 243	11 069
Population	6 522 734	463 934	41 324
Number of Households	1 659 171	128 423	11 107
Population density (km^2)	38,6	8	3,7
Average household size	3,9	3,6	3,7
Annual population growth (2008-2018)	0,24%	1%	0,7%
Average monthly household income	R 9 139	R 10 758	R 8 705

Source: Quantec Standardised Regional (2020); Stats SA (2011) forecast to 2020

The disposable average monthly income of households in the Blue Crane Route Local Municipality was R 8 705 which was 19% lower than the average for Sarah Baartman District Municipality (R 10 758) and 5% lower than the average for the Eastern Cape. The number of households with no formal income in Blue Crane Route is 11 % which is similar to the average for the district at 12,7% but, lower than the provincial level of 15% (Table 8.6).

Table 8.6: Employment profile

Indicator	Eastern Cape	Sarah Baartman District	Blue Crane Route Local Municipality
Employed	1 228 511	152 437	11 557
Unemployment Rate	32,8%	19,1%	21,6%
Not Economically Active	1 986 792	110 127	10 644
Labour force participation rate	47,9%	63,1%	58,1%

Source: Quantec Standardised Regional (2020)

The review of the employment profile of Blue Crane Route indicates that just over a fifth of the economically active population within the municipality is formally unemployed. The unemployment rate and labour force participation rate in the Blue Crane Route Local Municipality were slightly worse than that of the Sarah Baartman District Municipality (Unemployment rate: 19,1%; Labour force participation rate: 63,1%).

The low population growth rate, relatively high unemployment rate and lower labour force participation relative to the district averages further suggests that the Blue Crane Route Local Municipality is subject to outward migration due to the limited number of employment opportunities available within the local municipality.

ii Profile of the Immediately Affected Area

It is recognised that many farms in the area practice a combination of crop, livestock and hunting activity. As such, most farms are involved in all three land uses as indicated previously. The dominant activity currently undertaken on farms that were surveyed was agriculture but, notable numbers of tourist activities occur on the farms. The following observations were made regarding land use:

» All of the farmers are commercial farmers.
» Goats and sheep were the most common animals found in the area (6 150 animals) followed by game (580 animals and then beef cattle (150 animals) across all respondents surveyed.
» The average size of property owned was 2 946 and ranged between 850 and 7 300ha.
» The majority of labourers live on the farms they work on with their family members.
» Livestock animals reared for sale and kept for the production of food products include goats, sheep, and cattle.
» All of the farms were the primary residence of the farm owner.
» Very few, if any, international tourists visit directly affected farms for tourism or hunting.
» Approximately 65 domestic tourists visited the area in a year. All being for hunting.
» Some of the farms have accommodation facilities for visitors.
» Farms receive visitors mostly between April and December.
» Some of the game farms earn income through the trading of live game.

The immediate area surrounding the proposed Sun Garden Solar PV Facility is very similar in terms of land use however there is no evidence of any tourism accommodation facilities offering overnight opportunities. In terms of the Blitzkraal Farm itself on which the largest footprint of the PV Facility will be developed, current economic activity can be described as follows:

» Agricultural activity is mainly focused on small-stock farming, this includes 120 Boer goats, 850 merino sheep and 150 dormer sheep. Limited cattle are kept on the property which consist of 11 Tuli cattle and 2 Jersey cattle.
» The total grazing area on the farm is approximately 2 700 ha.
» Only dryland agriculture is practised with no irrigation.
» There are around 5 residential houses on the property.
» Five families live permanently on the property, with a total of 4 permanent employees and 1 temporary employee all of whom reside on the property.
» Storage facilities comprise of 1 shearing shed and 5 storage facilities.
» The owners intend to diversify, or expand farming operations if feasible and farm upgrades are likely to be undertaken on the farm which include fencing upgrades, adding irrigation and facilities to intensify farming operations and increasing livestock numbers, maintenance and upgrades of the current facilities, etc.

» The development is expected to positively impact employment as there is a possibility that more jobs will be created as the farming operations intensify and expand and no job losses are projected.

CHAPTER 9: ASSESSMENT OF IMPACTS

This chapter serves to assess the significance of the positive and negative environmental impacts (direct, indirect, and cumulative) expected to be associated with the development of the Sun Garden PV Facility and associated infrastructure. This assessment has considered the construction of a solar facility with a contracted capacity of up to 400MW, within a development footprint of approximately 350ha. The development footprint includes the following infrastructure:

» Solar PV array comprising PV modules and mounting structures.
» Inverters and transformers.
» Cabling between the project components, lain underground where practical.
» A 132/33kV on-site collector substation to be connected to a proposed 400kV Main Transmission Substation (MTS) located to the north-east of the site via a new 132kV overhead power line (twin turn dual circuit line). The development of the proposed 400kV Main Transmission Substation will be assessed as part of the separate BA process in order to obtain Environmental Authorisation.
» Site offices and maintenance buildings, including workshop areas for maintenance and storage.
» Temporary laydown areas.
» Access roads to the site and between project components with a width of approximately 4,5m. The main access points will be 8m wide.
» Water supply pipelines from onsite boreholes.
» A temporary concrete batching plant.
» Staff accommodation (temporary).
» Operation and Maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitor's centre.

The full extent of the project site (~4 037ha) and development envelope (~500ha) was considered through the BA process. On-site sensitivities were identified through the review of existing information, desk-top evaluations and detailed field surveys. The identification of a development footprint for the solar facility within the project site was undertaken by the developer through consideration of the sensitive environmental features and areas and application of a mitigation hierarchy which aimed at avoidance as the first level of mitigation. The specialist assessments undertaken as part of this BA process have considered the entire project site and development envelope, as well as the proposed development footprint (refer to **Figure 9.1**) which was provided by the developer.

The sections which follow provide a summary of the specialist input for each field of study in terms of the impacts which are expected to occur, the significance of the impacts, the opportunity for mitigation of the impacts to an acceptable level and the appropriate mitigation measures recommended for the reduction of the impact significance. Note that impacts associated with decommissioning are expected to be similar to those associated with construction activities. Therefore, these impacts are not considered separately within this chapter. This section of the report must be read together with the detailed specialist studies contained in **Appendix D** to **L**.

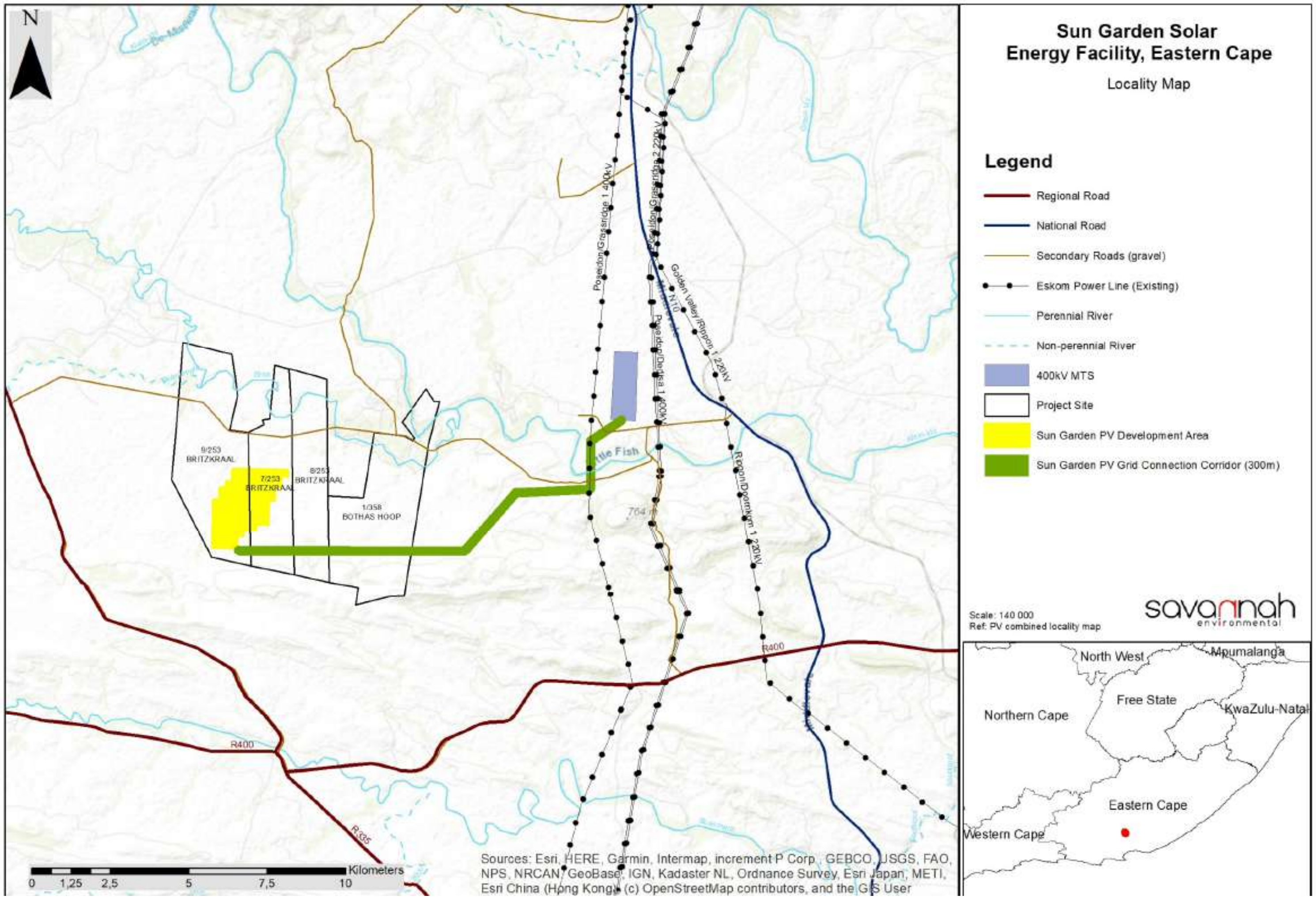

Figure 9.1: Map showing the proposed development footprint for the Sun Garden PV Facility and associated infrastructure within the larger area considered as part of this BA process (refer to **Appendix N** for A3 maps).

The development of the Sun Garden PV Facility will comprise the following phases:

» *Pre-Construction and Construction* – will include pre-construction surveys; site preparation; establishment of access roads; a temporary laydown area and facility infrastructure; construction of foundations involving excavations, the transportation of components/construction equipment to site, manoeuvring and operating vehicles for unloading and installation of equipment; laying cabling; and commissioning of new equipment and site rehabilitation. The construction phase for the facility is estimated at 30 months.

» *Operation* – will include the operation of the solar PV energy facility and the generation of electricity, which will be fed into the national grid via the authorised on-site substation via underground cables and connect to the national electricity grid. The operation phase of the facility is expected to be approximately 25 years (with maintenance).

» *Decommissioning* – depending on the economic viability of the SEF, the length of the operation phase may be extended beyond a 25-year period. At the end of the project's life, decommissioning will include site preparation, disassembling of the components of the PV facility its associated infrastructure, clearance of the relevant infrastructure at the PV panel area, and rehabilitation. Note that impacts associated with decommissioning are expected to be similar to those associated with construction activities; however, in certain instances decommissioning impacts have been considered separately.

9.1. Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 1: Content of basic assessment reports:

Requirement	Relevant Section
3(h)(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.	The impacts and risk associated with the development of the Sun Garden PV Facility, including the nature, significance, consequence, extent, duration and probability of the impacts and the degree to which the impact can be reversed and cause an irreplaceable loss of resources are included in sections 9.3.2, 9.4.2, 9.5.2, 9.6.2, 9.7.2, 9.8.2, 9.9.2, 9.10.2 and 9.11.2.
3(h)(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	The positive and negative impacts associated with the development of the Sun Garden PV Facility are included in sections 9.3.2, 9.4.2, 9.5.2, 9.6.2, 9.7.2, 9.8.2, 9.9.2, 9.10.2 and 9.11.2.
3(h)(viii) the possible mitigation measures that could be applied and the level of residual risk.	The mitigation measures that can be applied to the impacts associated with the Sun Garden PV Facility are included in sections 9.3.2, 9.4.2, 9.5.2, 9.6.2, 9.7.2, 9.8.2, 9.9.2, 9.10.2 and 9.11.2.
3(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 environmental impact	A description of all environmental impacts identified for the Sun Garden PV Facility during the BA process, and the extent to which the impact significance can be reduced through the implementation of the recommended mitigation measures provided by the specialists are

Requirement	Relevant Section
assessment 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,.	included in sections 9.3.2, 9.4.2, 9.5.2, 9.6.2, 9.7.2, 9.8.2, 9.9.2, 9.10.2 and 9.11.2.
3(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 avoided, managed or mitigated.	An assessment of each impact associated with the development of the Sun Garden PV Facility, including the nature and significance, the extent and duration, the probability, the reversibility, and the potential loss of irreplaceable resources, as well as the degree to which the significance of the impacts can be mitigated are included in sections 9.3.2, 9.4.2, 9.5.2, 9.6.2, 9.7.2, 9.8.2, 9.9.2, 9.10.2 and 9.11.2.
3(m) based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management outcomes for the development for inclusion in the EMPr.	Mitigation measures recommended by the various specialists for the reduction of the impact significance are included in sections 9.3.2, 9.4.2, 9.5.2, 9.6.2, 9.7.2, 9.8.2, 9.9.2, 9.10.2 and 9.11.2.

9.2. Quantification of Areas of Disturbance on the Site

The development footprint of the PV facility and associated infrastructure will be approximately 350ha. The 132kV twin turn dual circuit power line is approximately 12km in length. Only tower footprints along the power line will be cleared. Assuming a tower is placed every 250m and an area of 1ha is affected for each tower, a footprint of ~56ha is estimated. The Balance of Plant (BoP) area with an extent of 12ha will include the temporary laydown areas, temporary concrete batching plant, temporary staff accommodation and operation and maintenance buildings. The maximum area of disturbance is approximated to be 418ha in extent, some of which will be temporary and will be rehabilitated following construction.

It should be noted that the site currently has several existing access roads (farm tracks) which are used for farming activities. It is planned that where existing access roads are able to be utilised within the development footprint, these are widened and upgraded for the solar facility, essentially reducing the extent of disturbance resulting from access road construction.

Based on the above, it can be concluded that considering the 400MW facility, ~10% of the entire extent of the project site will be transformed and disturbed for the development footprint of the Sun Garden PV Facility.

9.3. Potential Impacts on Ecology (Ecology, Flora and Fauna)

The development of the Sun Garden PV Facility and associated infrastructure, is likely to result in a variety of impacts, associated largely with the disturbance, loss and transformation of intact vegetation and faunal habitat to PV arrays, roads and associated infrastructure. The following impacts are identified as the major impacts that are likely to be associated with the development and which are assessed for the Sun Garden PV Facility, for the preconstruction, construction and operation phases of the development. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix D** for more details).

9.3.1 *Description of Ecological Impacts*

Impacts on the ecology of the project site are expected to occur during the construction, operation and decommissioning phases of the Sun Garden PV Facility, as per the development footprint proposed by the developer. The following impacts are identified and assessed for the Sun Garden PV Facility project:

» Impacts on vegetation and listed or protected plant species: The development would require vegetation clearing for PV panels, access roads, buildings and other hard infrastructure. Apart from the direct loss of vegetation within the development footprint, listed and protected species may also be impacted. These impacts would occur during the construction phase of the development, with additional vegetation impacts during operation likely to be relatively low. This impact is therefore assessed for the construction phase only.

» Direct Faunal Impacts: Increased levels of noise, pollution, disturbance and human presence during construction will be detrimental to fauna. Sensitive and shy fauna are likely to move away from the area during the construction phase as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the construction activities and might be killed if proper management and monitoring is not in place. Traffic at the site during all phases of the project would pose a risk of collisions with fauna. Slower types such as tortoises, snakes and certain mammals would be most susceptible and the impact would be largely concentrated to the construction phase when vehicle activity was high. Some mammals and reptiles would be vulnerable to illegal collection or poaching during the construction phase as a result of the large number of construction personnel that are likely to be present. During the operation phase, impacts on fauna would be significantly reduced, but some persistent impacts on habitat loss and fragmentation would occur. Faunal impacts will therefore be assessed during the construction and operation phase of the facility.

» Increased Erosion Risk: The large amount of disturbance created during construction would leave the site highly vulnerable to erosion. The site is quite steep and along with friable soils, the disturbance created at construction will render the impacted areas highly vulnerable to erosion and measures to limit erosion will need to be implemented. This impact is likely to manifest during construction and would persist into the operation phase and should therefore be assessed for both phases.

»

» Alien Plant Invasion: The disturbance associated with the construction phase of the project will render the disturbed areas vulnerable to alien plant invasion. Some woody aliens are already present in the area and additional alien plant invasion following construction is highly likely and regular alien plant clearing activities would be required. Once the natural vegetation has returned to the disturbed areas, the site will be less vulnerable to alien plant invasion, however, the roadsides and turbine service areas are likely to remain foci of alien plant invasion for years. This impact would manifest during the operation phase, although some of the required measures to reduce this impact are required during construction.

»

» Impacts on CBAs and ESAs: The development is not located within any CBA areas but will result in some habitat loss and fragmentation within an ESA. In addition, the presence of the PV Facility and daily operational activities at the site is likely to result in some habitat fragmentation for fauna and a negative impact on the overall functioning of the ESA. This impact would persist for the life of the facility and is thus assessed for the operation phase of the PV facility.

9.3.2 Impact tables summarising the significance of impacts on ecology during construction, operation and decommissioning (with and without mitigation)

Construction Phase Impacts

Nature: Impacts on vegetation and protected plant species: Vegetation clearing for PV arrays, access roads, and other infrastructure will impact on vegetation and protected plant species.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long-term (3)	Long-term (3)
Magnitude	Moderate (5)	Moderate (4)
Probability	Definite (5)	Highly Probable (4)
Significance	**Medium (45)**	**32 (Medium)**
Status (positive or negative)	Negative	Negative
Reversibility	This impact is not highly reversible as it would take a long time for any cleared areas to return to their former state and rehabilitation of arid environments is difficult.	
Irreplaceable loss of resources?	There would be some potential loss of long-term productivity and diversity as it would take a long time (decades) for any cleared areas to return to their former state and rehabilitation of arid environments is difficult.	
Can impacts be mitigated?	**Yes**	
Mitigation: » Pre-construction walk-through of the facility's final layout in order to locate species of conservation concern that can be translocated as well as comply with the provincial permit conditions. » Search and rescue for identified species of concern before construction. » Vegetation clearing to commence only after walk-through has been conducted and necessary permits obtained. » 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. » Contractor's Environmental Officer (EO) to provide supervision and oversight of vegetation clearing activities within sensitive areas. » Demarcate all areas to be cleared with construction tape or other appropriate and effective means. However, caution should be exercised to avoid using material that might entangle fauna. » Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared. » All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the construction area. » Temporary laydown areas should be located within previously transformed areas or areas that have been identified as being of low sensitivity. These areas should be rehabilitated after use.		
Residual Impacts: Since vegetation clearing is an inevitable consequence of the development, this component of the development impact cannot be entirely mitigated and some residual habitat loss equivalent to the footprint of the development will remain.		

Nature: Impacts on fauna due to construction phase activities Disturbance, transformation and loss of habitat will have a negative effect on resident fauna during construction. Due to noise and operation of heavy machinery, faunal disturbance will extend well beyond the footprint and extend into adjacent areas. This will however be transient and restricted to the construction phase.

	Without mitigation	With mitigation
Extent	Local (2)	Local (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (6)	Moderate (5)
Probability	Highly Likely (4)	Probable (3)
Significance	**Medium (40)**	**27 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Noise and disturbance are largely reversible but habitat loss due to transformation of intact habitat is not considered easily reversible.	
Irreplaceable loss of resources?	It is not likely that there would be significant irreplaceable loss of resources in terms of fauna.	
Can impacts be mitigated?	**Yes**	

Mitigation:

» All personnel should undergo environmental induction with regards to fauna and, in particular, awareness about not harming or collecting species such as snakes, tortoises and owls, which are often persecuted out of superstition.
» Any fauna threatened by the construction activities should be removed to safety by an appropriately qualified environmental officer.
» All construction vehicles should adhere to a low speed limit (30km/h) to avoid collisions with susceptible species such as snakes and tortoises.
» All hazardous materials 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 as related to the nature of the spill.
» If trenches need to be dug for electrical cabling or other purpose, these should not be left open for extended periods of time as fauna may fall in and become trapped in them. Trenches which are standing open should have places where there are soil ramps allowing fauna to escape the trench.
» The illegal collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off of the construction site.
» No fuelwood collection should be allowed on-site.
» If any parts of the site such as construction camps must be lit at night, this should be done with low-UV type lights (such as most LEDs or HPS bulbs) as far as practically possible, which do not attract insects and which should be directed downwards.

Residual Impacts:

Noise and disturbance would be transient and largely reversible but habitat loss due to transformation of intact habitat would be permanent.

Nature: Increased Erosion Risk During Construction

During construction, the site will be highly vulnerable to soil erosion due to the disturbance created and likely low natural revegetation of disturbed areas.

	Without mitigation	With mitigation
Extent	Local (2)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (5)	Low (3)
Probability	Highly Likely (4)	Improbable (2)
Significance	**Medium (36)**	**12 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversibility would be high for mild erosion, but would become increasingly low with increasing severity of erosion.	

Irreplaceable loss of resources?	Large amounts of erosion would result in some irreplaceable loss of topsoil and ecosystem productivity, but with mitigation there would be no significant loss of resources.
Can impacts be mitigated?	Yes
Mitigation: » Erosion management at the site should take place according to the Erosion Management Plan and Rehabilitation Plan. » All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. » Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance must be undertaken, as per the Erosion Management and Rehabilitation Plans for the project. » All erosion problems observed must be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. » All cleared areas must be revegetated with indigenous perennial shrubs and succulents from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow.	
Residual Impacts: Some low-level erosion due to wind and water impacts is likely to occur despite erosion control measures. With the effective implementation of the recommended mitigation, the magnitude of this residual impact can however be reduced to a low level.	

Operation Phase Impacts

Nature: Impacts on fauna due to operational phase activities The operation and presence of the facility may lead to disturbance or persecution of fauna within or adjacent to the facility.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (3)	Long-term (3)
Magnitude	Medium Low (3)	Low (2)
Probability	Probable (4)	Probable (3)
Significance	**Low (28)**	**18 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Disturbance and habitat fragmentation are generally reversible impacts that would occur on a more or less persistent basis during the life of the PV facility, but cease thereafter.	
Irreplaceable loss of resources?	It is not likely that there would be significant irreplaceable loss of resources in terms of fauna.	
Can impacts be mitigated?	Yes	
Mitigation: » Any potentially dangerous fauna such as snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location. » If the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs), which do not attract insects. » All hazardous materials 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 as related to the nature of the spill. » All vehicles accessing the site should adhere to a low speed limit (30km/h max for heavy vehicles and 40km/h for light vehicles) to avoid collisions with susceptible species such as snakes and tortoises. » In terms of the boundary fence, no electrified strands should be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution from electric fences because they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks. Alternatively, the		

electrified strands should be placed on the inside of the fence and not the outside as is the case on the majority of already constructed PV plants. » The boundary fence should have access points for smaller fauna to enter and exit the PV area.
Residual Impacts: Some habitat loss, fragmentation and disturbance are unavoidable during the operation of the PV facility, but would be of a local nature

Nature: Increased Erosion Risk Following construction, the site will be highly vulnerable to soil erosion due to the disturbance created and likely low natural revegetation of disturbed areas.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Long-term (4)	Medium-term (4)
Magnitude	Moderate (5)	Low (3)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (33)**	**16 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversibility would be high for mild erosion, but would become increasingly low with increasing severity of erosion.	
Irreplaceable loss of resources?	Large amounts of erosion would result in some irreplaceable loss of topsoil and ecosystem productivity, but with mitigation there would be no significant loss of resources.	
Can impacts be mitigated?	Yes	
Mitigation: » Erosion management at the site should take place according to the Erosion Management Plan and Rehabilitation Plan. » All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. » It may be necessary to construct ponds to capture and process runoff from the site. If this is necessary, this should take place in consultation with a freshwater specialist. Any ponds constructed should not be lined with smooth plastic as fauna tend to fall into such ponds and are unable to escape due to the slippery sides of the pond. » Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance must be undertaken, as per the Erosion Management and Rehabilitation Plans for the project. » All erosion problems observed must be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. » All cleared areas must be revegetated with indigenous perennial shrubs and succulents from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow.		
Residual Impacts: Some low-level erosion due to wind and water impacts is likely to occur despite erosion control measures. With the effective implementation of the recommended mitigation, the magnitude of this residual impact can however be reduced to a low level.		

Nature: Alien plant invasion risk Following construction, the site will be highly vulnerable to alien plant invasion due to disturbance and the increased runoff created by the hard infrastructure. There is a risk that alien species would spread to adjacent drainage lines and other vulnerable areas.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)

Duration	Long-term (4)	Medium-term (3)
Magnitude	Moderate (4)	Low (2)
Probability	Probable (3)	Improbable (2)
Significance	**Low (27)**	**12 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversibility would be high for mild infestation, but would become increasingly low with extensive invasion.	
Irreplaceable loss of resources?	It is not likely that there would be significant irreplaceable loss of resources if this impact is managed.	
Can impacts be mitigated?	**Yes**	

Mitigation:

» Wherever excavation is necessary, topsoil should be set aside and replaced after construction to encourage natural regeneration of the local indigenous species.
» Due to the disturbance at the site as well as the increased runoff generated by the PV panels and hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented. Problem plant species are already present in the area and are likely to increase rapidly if not controlled.
» Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility must be undertaken as these are also likely to be prone to invasion problems.
» Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.

Residual Impacts:

Although some alien plant invasion is likely to occur at the site, with mitigation, there would be minimal residual impact.

Nature: Impact on CBAs, ESAs and broad-scale ecological processes

Transformation during construction and long-term presence of the facility will contribute to cumulative habitat loss within the affected ESA and may compromise the overall ecological functioning of the ESA and its long-term biodiversity value.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (5)	Low (4)
Probability	Highly Likely (4)	Likely (3)
Significance	**Medium (44)**	**Low (30)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» There should be an integrated management plan for the development area during operation, which is beneficial to fauna and flora.
» All disturbed areas that are not used such as excess road widths, should be rehabilitated with locally occurring shrubs and grasses after construction to reduce the overall footprint of the development.
» Noise and disturbance on the site should be kept to a minimum during operation and maintenance activities.
» There should be regular (at least every 50m) access points in the boundary fence of the facility to allow smaller fauna to enter the facility area. These should be constructed as boxed gaps in the fence of dimensions 20cm x 40cm and should be orientated in both directions. .

Residual Impacts:

Habitat loss within the ESAs cannot be fully mitigated with that some habitat loss and fragmentation would occur during operation, even with mitigation.

Decommissioning Phase Impacts

Nature: Impacts on fauna due to decommissioning phase activities Due to disturbance, noise and the operation of heavy machinery, faunal disturbance due to decommissioning will extend beyond the footprint and impact adjacent areas to some degree. This will however be transient and restricted to the period while machinery is operational. In the long term, decommissioning should restore the ecological functioning and at least some habitat value to the affected areas.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (4)	Low (2)
Probability	Highly probable (4)	Probable (3)
Significance	**Low (28)**	**15 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Noise and disturbance would be of relatively short duration and are considered reversible.	
Irreplaceable loss of resources?	It is not likely that there would be significant irreplaceable loss of resources in terms of fauna.	
Can impacts be mitigated?	Yes	
Mitigation: » Any potentially dangerous fauna such as snakes or fauna threatened by the decommissioning activities should be removed to a safe location prior to the commencement of decommissioning activities. » All hazardous materials 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 as related to the nature of the spill. » All vehicles accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises. » No excavated holes or trenches should be left open for extended periods as fauna may fall in and become trapped. » All above-ground infrastructure should be removed from the site. Below-ground infrastructure such as cabling can be left in place if it does not pose a risk, as removal of such cables may generate additional disturbance and impact, however, this should be in accordance with the facilities' decommissioning and recycling plan, and as per the agreements with the landowners concerned.		
Residual Impacts: Noise and disturbance during decommissioning would be unavoidable, but would be transient and ultimately the site would be restored to a near-natural state.		

Nature: Increased Erosion Risk due to Decommissioning Following decommissioning, the site will be highly vulnerable to soil erosion due to the disturbance created by the removal of infrastructure from the site.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Moderate (5)	Minor (3)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (33)**	**Low (14)**
Status (positive or negative)	Negative	Negative

Reversibility	Reversibility would be high for mild erosion, but would become increasingly low with increasing severity of erosion.
Irreplaceable loss of resources?	It is not likely that there would be significant irreplaceable loss of resources if this impact is managed.
Can impacts be mitigated?	Yes
Mitigation: » The site should be fully rehabilitated with locally-occurring shrubs and grasses. » Any roads that will not be rehabilitated should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. » There should be regular monitoring for erosion for at least 5 years after decommissioning by the applicant to ensure that no erosion problems develop as a result of the disturbance, and if they do, to immediately implement erosion control measures. » All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. » All disturbed and cleared areas should be revegetated with indigenous perennial shrubs and grasses from the local area.	
Residual Impacts: Some low-level erosion due to wind and water impacts are likely to occur following decommissioning despite erosion control measures. With the effective implementation of the recommended mitigation, the magnitude of this residual impact can however be reduced to a low level.	

Nature: Alien plant invasion risk following decommissioning Following decommissioning, the site will be highly vulnerable to alien plant invasion due to the large amount of disturbance generated by decommissioning. Disturbed areas, drainage lines and other wetter areas are likely to be particularly vulnerable.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (4)	Low (3)
Probability	Probable (4)	Improbable (2)
Significance	**Medium (36)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversibility would be high for mild infestation, but would become increasingly low with extensive invasion.	
Irreplaceable loss of resources?	It is not likely that there would be significant irreplaceable loss of resources if this impact is managed.	
Can impacts be mitigated?	Yes	
Mitigation: » Wherever excavation is necessary, topsoil should be set aside and replaced after construction to encourage natural regeneration of the local indigenous species. » Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented. Problem plant species are already present in the area and are likely to increase rapidly if not controlled. » Alien management at the site should take place according to the Alien Invasive Management Plan. This should make provision for alien monitoring and management for at least 5 years after decommissioning. » Regular alien clearing (annual) should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible		
Residual Impacts: Although some alien plant invasion is likely to occur at the site, with mitigation, there would be minimal residual impact.		

9.3.3 *Overall Result*

The Sun Garden PV Facility site falls largely within the Albany Broken Veld vegetation type and it is only the grid connection that traverses some Kowie Thicket and Southern Karoo Riviere vegetation types. The norther, lower slopes and plains of the site consist of low shrublands considered to be low sensitivity with few fauna or flora of concern likely to be present. The upper, southern slopes of the PV site are steeper or contain a higher proportion of woody species and are considered medium sensitivity. The drainage feature which occurs along the south-eastern boundary of the PV area would be vulnerable to impact and it is recommended that a freshwater specialist should demarcate the boundary of this feature in the field before construction to ensure that the PV area does not encroach into this area unnecessarily. Along the grid connection route to the MTS, there are some high sensitivity drainage features, but these can easily be spanned by the power line and are not likely to be significantly impacted by the power line. In terms of fauna, the PV area does not have any habitats present that would be of particularly high value and no specific impacts of high magnitude on fauna are expected. However, given the size of the facility (350ha) and the location within an ESA it is recommended that specific measures are put in place with regards to the design of the fence around the facility to facilitate the movement of smaller fauna in and out of the PV area.

There are no impacts associated with the Sun Garden PV Facility and associate infrastructure that cannot be mitigated to an acceptable level and as such, the assessed layout is considered acceptable. With the application of relatively simple mitigation and avoidance measures, the impact of the Sun Garden PV Facility on the local environment can be reduced to an acceptable magnitude. The contribution of the Sun Garden PV Facility to cumulative impact in the area would be low and is considered acceptable. Overall, there are no specific long-term impacts likely to be associated with the development of the Sun Garden PV Facility that cannot be reduced to a low significance. As such, there are no fatal flaws associated with the development and no terrestrial ecological considerations that should prevent it from proceeding.

9.4. Potential Impacts on Aquatic Ecology

The development of the Sun Garden PV Facility is likely to result in a variety of impacts from an aquatic perspective Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix G** for more details).

9.4.1 *Description of Impacts on Aquatic Ecology*

The aquatic ecology impacts identified to be associated with the Sun Garden PV Facility relate to fragmentation, changes in density of faunal and vegetation species, changes to the hydrological regime or hydroperiod, streamflow regulation, erosion control, and water quality changes.

The aquatic impacts that were identified and assessed include the following:

- » Loss of High Sensitivity systems, through physical disturbance
- » Impact on water courses (Low Sensitivity), through physical disturbance
- » Impact on all watercourse through the possible increase in surface water runoff on riparian form and function through hydrological changes
- » Increase in sedimentation and erosion

» Risks on the aquatic environment due to water quality impacts

9.4.2 *Impact tables summarising the significance of impacts on aquatic ecology during construction, operation and decommissioning (with and without mitigation)*

Nature: Loss of high sensitivity systems Loss of High Sensitivity systems, through physical disturbance, thus the proposed layout will need to avoid any of the wetland systems shown in during the construction phase.		
	Without mitigation	**With mitigation**
Extent	Regional (3)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	High (7)	Low (4)
Probability	Definite (5)	Very improbable (1)
Significance	**High (70)**	**Low (9)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » The most significant form of mitigation would be to select development options that avoided all aquatic features that were rated with a High sensitivity, which will be proposed by the layout based on information contained in this report. To date, sensitive areas have already been avoided as far as practically possible. Further the proposed grid connection can span these areas thus no new impacts are expected. Access to the gird connection should not cross any systems, resulting in additional new tracks to reach the pylons/towers. » All alien plant re-growth must be monitored and should these alien plants reoccur these plants should be re-eradicated. The scale of the development does however not warrant the use of a Landscape Architect and / or Landscape Contractor. » It is further recommended that a comprehensive rehabilitation / monitoring plan be implemented from the project onset i.e. during the detailed design phase prior to construction, to ensure a net benefit to the environment within all areas that will remain undisturbed.		
Residual Impacts: Possible impact on the remaining catchment due to changes in run-off characteristics in the development area.		

Nature: *Impact on watercourses through physical disturbance during the construction phase* The physical removal of narrow strips of woody riparian zones within watercourses, however this would be localised as the number of watercourses is of low sensitivity and located in areas with minimal vegetation (riparian) and/ or previously disturbed areas.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Minot (1)
Probability	Definite (5)	Probable (3)
Significance	**Medium (45)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		

» The most significant form of mitigation would be to select a development area, which contained no drainage lines. The proposed layout will be developed to avoid the important systems, thus requiring only crossings or footprints within areas rated as having a Low sensitivity to physical disturbance, although hydrological function (surface flows) would still remain. » Further the proposed grid connection can span these areas thus no new impacts are expected. Access to the grid connection should not cross any systems, resulting in additional new tracks to reach the pylons/towers. » Vegetation clearing should occur in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment. Suitable dust and erosion control mitigation measures should be included in the EMPr to mitigate these impacts.
Residual Impacts: Sizable portion of intact natural environment remain within the greater region.

Nature: - *Impact on all watercourse systems through the possible increase in surface water runoff that could alter the aquatic state and function through hydrological changes during the operation phase..* Increase in hard surface areas, and roads that require stormwater management will increase through the concentration of surface water flows that could result in localised changes to flows (volume) that would result in form and function changes within the aquatic systems, which are currently ephemeral, i.e. aquatic vegetation species composition changes, which then results in habitat change / loss.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Probable (3)
Significance	**Medium (45)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » A stormwater management plan is being developed, detailing the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems. The stormwater control systems must be inspected on an annual basis to ensure these are functional. Effective stormwater management must include effective stabilisation (gabions and Reno mattresses) of exposed soil and the re-vegetation of any disturbed riverbanks. » No runoff may be discharged or directed into the Pans, as these are not tolerant of excessive / regular volumes of water and would then change in nature and attributes, i.e. stormwater detention pond.		
Residual Impacts: Possible impact on the remaining catchment due to changes in run-off characteristics in the development area.		

Nature: *Increase in sedimentation and erosion within the development footprint during the operation phase.* An increase in hard surface areas, and or roads that require stormwater management increases runoff from a site through the concentration of surface water flows. These higher volume flows, with increased velocity can result in downstream erosion and sedimentation if not managed.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Probable (3)

Significance	**Medium (45)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » A stormwater management is being developed, detailing the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems. The stormwater control systems must be inspected on an annual basis to ensure these are functional. Effective stormwater management must include effective stabilisation (gabions and Reno mattresses) of exposed soil and the re-vegetation of any disturbed riverbanks. » No runoff may be discharged or directed into the Pans, as these are not tolerant of excessive / regular volumes of water and would then change in nature and attributes, i.e. stormwater detention pond.		
Residual Impacts: Possible impact on the remaining catchment due to changes in run-off characteristics in the development area.		

Nature: Impact on localised surface water quality During both preconstruction, construction and, to a limited degree, the operational activities, chemical pollutants (hydrocarbons from equipment and vehicles, cleaning fluids, cement powder, wet cement, shutter-oil, etc.) associated with site-clearing machinery and construction activities, as well as maintenance activities, could be washed downslope via the watercourses.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Probable (3)
Significance	**Medium (45)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Strict use and management of all hazardous materials used on site. » Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.) within demarcated / bunded areas » Containment of all contaminated water by means of careful run-off management on site. » Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility. These must be situated outside of any delineated watercourses and pans/depressions or the buffers shown. » Strict control of the behaviour of construction workers. » Appropriate waste management. » Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the Construction Environmental Management Plan (CEMP) for the project and strictly enforced.		
Residual Impacts: Residual impacts will be negligible after appropriate mitigation is implemented.		

While no specific impacts have been identified for the decommissioning phase, it is considered that the impacts expected for the construction phase, and the mitigation measures recommended will also be relevant to the decommissioning phase.

9.4.3 Overall Result

The proposed layout for the facility would not have a direct impact on the following:

» With the exception of the BoP area and pipeline any Very High sensitivity areas identified by the DFFE Screening Tool have been avoided by the development footprint;
» Watercourses will only be impacted upon by a limited number of water course crossings that will be mitigated by appropriate measures which include erosion protection etc.; and
» Mainstem riparian systems (outside of the development footprint) and Pans that do contain functioning aquatic environments that received a High sensitivity rating will also be avoided .

Therefore, based on the results of the Aquatic Impact Assessment, the significance of the remaining impacts assessed for the aquatic systems after mitigation would be Low. This includes the internal roads proposed that would need to cross some of these systems. Further the proposed grid connection can span these areas thus no new impacts are expected. Access to the gird connection should not cross any systems, resulting in additional new tracks to reach the pylons/towers.

Thus, based on the findings of this study no objection to the authorisation of any of the proposed activities is made at this point based on the current layout as provided by the developer.

As the proposed activities have the potential to create erosion, recommendations regarding the management of erosion must be implemented. It is further recommended that a comprehensive rehabilitation plan be implemented from the project onset, for all construction work to be located within watercourse areas (including buffers) to ensure a net benefit to the aquatic environment. This should from part of the suggested walk down as part of the final EMPr preparation during the pre-construction phase.

Furthermore, a Water Use License (or General Authorisation) for water uses identified in Section 21c and 21i of the National Water Act (Act 36 of 1998) would be required where activities are undertaken within 500m of watercourses and pans. No activities occur within 500m of the delineated pan boundaries and only the road crossing the drainage lines will require a Water Use Authorisation, which has been initiated by the Applicant.

9.5. Potential Impacts on Avifauna

The development of the Sun Garden PV Facility is likely to result in a variety of impacts from an avifaunal perspective. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix E** for more details).

9.5.1 Description of Avifaunal Impacts

The following key potential impacts on avifauna, arising from the proposed development have been identified for assessment:

» Construction Phase:
  * Direct Habitat Destruction – modification, removal and clearing of vegetation for development of infrastructure such as temporary laydown areas, site buildings, solar PV array footprint, access roads and servitudes;

    * Disturbance/Displacement – indirect habitat loss and/or reduced breeding success due to displacement by noise and activity associated with machinery and construction activity; and
    * Direct Mortality – fatalities of avifauna due to vehicle collision, entrapment, entanglement or collision with temporary infrastructure (e.g. fencing), entrapment in uncovered excavations and increased predation pressure.
- Operational Phase:
    * Disturbance/Displacement – indirect habitat loss, reduced breeding success, obstruction of movement corridors due to displacement by infrastructure and noise/activity associated with ongoing, routine operational tasks/maintenance activity; and
    * Direct Mortality – fatalities of avifauna due to vehicle collision, collision or entrapment with perimeter fencing, collision with solar PV arrays, collision with overhead powerlines, electrocution from electrical components and increased predation pressure.
- Decommissioning Phase:
    * Disturbance/Displacement – indirect habitat loss and/or reduced breeding success due to displacement by noise/activity associated with decommission activity; and
    * Direct Mortality due to vehicle collisions and increased predation pressure.

9.5.2 Impact tables summarising the significance of impacts on avifauna during construction, operation and decommissioning (with and without mitigation)

Construction Phase Impacts

Nature: Habitat destruction due to clearing of vegetation in the development footprint for the construction of infrastructure such as solar PV arrays, temporary laydown areas, site buildings, transmission line pylon bases, servitudes and access roads. This results in loss of area available to avifaunal species for foraging and breeding.

The removal and/or destruction and/or alteration of habitat during the construction phase is potentially the most significant impact associated with solar PV developments as the vegetation within the development footprint is cleared for the installation of the solar PV arrays. This results in the permanent exclusion of several species from the development footprint.

This impact is largely unavoidable, resulting in numerous birds being displaced from the projects site needing to find suitable available habitat elsewhere. The reduction in habitat has the potential to impact on the foraging and/or breeding success of certain species. Habitat loss may particularly affect larger terrestrial species such as korhaans and bustards as well as coursers and small passerine species. Raptors (e.g. Martial Eagle) may also be affected (though to a lesser degree) through the loss of potential foraging habitat.

The habitats present in the proposed development footprint for the solar PV arrays are not unique to the site and are relatively widespread and contiguous in the area. The loss of habitat associated with clearing will not likely have a significant negative impact on the long-term viability or persistence of avifaunal species populations in the area.

The proposed development site is considered to have a low ecological importance for potential SCC receptors of this impact and therefore the impact will not likely have a significant negative impact on these species.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Definite (5)	Definite (5)
Significance	**Medium (35)**	**Medium (35)**

Status (Positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impacts be mitigated	Partially	

Mitigation:

» A site specific environmental management programme (EMPr) must be implemented, which gives appropriate and detailed description of how construction activities must be conducted to reduce unnecessary destruction of habitat (e.g. no open fires outside of designated areas);
» All contractors are to adhere to the EMPr and should apply good environmental practice during construction;
» Existing roads and farm tracks should be used where possible;
» The minimum footprint areas of infrastructure should be used wherever possible, including road widths and lengths;
» No off-road driving should be permitted in areas not identified for clearing;
» An Environmental Site Officer (ESO) must form part of the on-site team to ensure that the EMPr is implemented and enforced and an Environmental Control Officer (ECO) must be appointed to oversee the implementation activities and monitor compliance for the duration of the construction phase; and
» Following construction, rehabilitation of areas disturbed by temporary laydown areas and facilities must be undertaken.

Residual Impacts:

Habitat cleared for the construction of permanent facilities will not be available for use by many avifaunal species during the operational lifespan of the development. No long-term residual impacts to SCCs are likely following decommission and rehabilitation given the low SEI of the site.

Nature: Disturbance or displacement of birds due to increased noise and activity levels associated with construction machinery and personnel resulting in an indirect loss of habitat available for foraging and breeding.

Indirect loss of habitat from disturbance during the construction phase is temporary in nature and is expected to result largely from the presence of heavy machinery and increased activity of construction personnel. This impact may extend beyond the immediate development footprint and result in the temporary exclusion of species from adjacent areas.

The habitats present in vicinity of the proposed development are not unique to the site and are relatively widespread and contiguous in the area so any displacement from the immediate vicinity that may occur will unlikely incur a high energetic cost as suitable habitat is widely available nearby. The proximity of nearby suitable habitat makes it likely that species will return to areas that have not been physically altered by the proposed development once construction activity ceases.

There are no known active nest locations in proximity to the proposed development site where breeding success is likely to be negatively impacted upon through disturbance or displacement.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Very Short-term (1)	Very Short-term (1)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (15)**	**Low (15)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	Unlikely	
Can impacts be mitigated?	Yes	

Mitigation:

» A site specific EMPr must be implemented, which gives appropriate and detailed description of how construction activities must be conducted; » All contractors are to adhere to the EMPr and should apply good environmental practice during construction; » Environmental Officer to oversee activities and ensure that the site specific EMPr is implemented and enforced; » Maximum use of existing access road and servitudes; » No off-road driving in undesignated areas; » Speed limits (30 km/h) should be strictly enforced on site to reduce unnecessary noise; » Construction camps should be lit with as little light as practically possible, with the lights directed downwards where appropriate; » The movement of construction personnel should be restricted to the construction areas on the project site; » No dogs or cats other than those of the landowners should be allowed on site; » The appointed Environmental Officer must be trained to identify the potential Red Data species as well as the signs that indicate possible breeding by these species; » The Environmental Officer must then, during audits/site visits, make a concerted effort to look out for such breeding activities of Red Data species, and such efforts may include the training of construction staff (e.g. in Toolbox talks) to identify Red Data species, followed by regular questioning of staff as to the regular whereabouts on site of these species; » If any of the Red Data species are confirmed to be breeding (e.g. if a nest site is found), construction activities within 500 m of the breeding site must cease, and an avifaunal specialist is to be contacted immediately for further assessment of the situation and instruction on how to proceed; » Prior to construction, an avifaunal specialist should conduct a site walkthrough, covering the final road and power line routes as well as temporary laydown areas and facilities, to identify any nests/breeding/roosting activity of sensitive species; » The results of which may inform the final construction schedule in close proximity to that specific area, including abbreviating construction time, scheduling activities around breeding activity, and lowering levels of associated noise.
Residual Impacts: None.

Nature: Avifaunal fatalities caused by construction activity including vehicle collision (i.e. roadkill), entrapment within security fencing or uncovered excavations and increased predation pressure through the increased attraction of crows, cats and dogs to the site.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Very short-term (1)	Very short-term (1)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Unlikely (12)
Significance	**Low (15)**	**Low (10)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Mitigation: » Maximum use of existing access road and servitudes; » No off-road driving in undesignated areas; » Speed limits (30 km/h) should be strictly enforced on site to reduce probability of vehicle collisions; » The movement of construction personnel should be restricted to the construction areas on the project site; » No dogs or cats other than those of the landowners should be allowed on site;		

» Any holes dug e.g. for foundations of pylons should not be left open for extended periods of time to prevent entrapment by ground dwelling avifauna or their young and only be dug when required and filled in soon thereafter; » Temporary fencing must be suitably constructed, e.g. if double layers of fencing are required for security purposes they should be positioned at least 2 m apart to reduce the probability of entrapment by larger bodied species that may find themselves between the two fences; » Roadkill is to be reported to the ECO and removed as soon as possible to reduce the attraction of the site to crows and other scavengers; » Organic waste is to be disposed of in an appropriate manner to reduce the attraction of the site to crows and other scavengers.
Residual Impacts: Without mitigation predatory species such as crows, cats or dogs may become established at the site increasing the residual threat to local SCCs such as ground dwelling birds (cranes, bustards, korhaans etc.) once construction activities have ceased. However, this can be effectively mitigated against.

Operation Phase Impacts

Nature: Disturbance or displacement of avifaunal SCCs due to ongoing routine daily operational tasks and maintenance activity. This can result in reduced areas available for foraging and breeding and reduce breeding success if e.g. helicopter assisted line surveys are frequently conducted near nesting locations during the breeding season. Facility may impede movement across the landscape by acting as a physical barrier or a distraction to certain species. Indirect loss of habitat from disturbance during the operational phase is associated with ongoing operational activity as well as more discrete periods of routine maintenance tasks. Many species (e.g. Blue Crane) are likely to become habituated to these activities and persist in the immediate surrounds of the proposed development. Maintenance tasks including aerial surveys of overhead powerlines (e.g. with helicopters) may pose a higher intensity of disturbance to avifaunal species than more general operational activity, however these events are temporally discrete in time and duration and the impact can be mitigated against should the need arise. For example, aerial surveys can be scheduled to occur outside of the breeding period of SCCs where possible should a Martial Eagle nest be constructed on transmission infrastructure. Utility scale solar energy facilities may form a physical barrier or distraction to movement of avifauna across the landscape, and this may alter migration routes and increase distances travelled and energy expenditure or block movement to important areas such as hunting and foraging areas. This potential impact is not yet well understood, is likely to be more significant as a cumulative impact with surrounding developments, is difficult to measure and assess, and therefore mitigation measures are difficult to identify. Mitigation measures have nevertheless been prescribed to reduce this impact.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Low (4)
Probability	Unlikely (2)	Improbable (1)
Significance	**Low (20)**	**Low (10)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Mitigation:		

» Aerial assessment or maintenance of the powerline (e.g. by helicopter) should not be conducted within 1 000 m of any located SCC nest (e.g. a newly constructed Martial Eagle nest on the transmission infrastructure) during the relevant breeding season where possible; » All vehicles should adhere to clearly defined and demarcated roads, no off-road driving should be allowed; » Speed limits (30 km/h) should be strictly enforced to reduce unnecessary noise; » The movement of personnel should be restricted to the servitudes and access roads on the project site; » No dogs or cats other than those of the landowners should be allowed on site; and » Any No-go areas identified should be adhered to.
Residual Impacts: None.

Nature: Avifaunal fatalities of SCCs resulting in collisions with solar PV arrays. Smaller passerine (songbird) species seem to account for the majority records of fatality due to collision with solar arrays19. This is not entirely unexpected as they are often the most abundant species, however larger ground dwelling birds such as francolin appear to be overly represented in the fatality records in relation to their abundance19. This may be due to an increased risk of collision mortality if panicked by a predator while feeding under the solar arrays. Bustards and korhaans are unlikely to enter the solar PV arrays due to operational activity. It is unlikely that collisions with infrastructure such as solar arrays will have a significant negative impact on local populations of avifaunal SCCs at the proposed development site.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Very Improbable (1)	Very Improbable (1)
Significance	**Low (7)**	**Low (7)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Lighting should be kept to a minimum to avoid attracting insects and birds, light sensors/switches should be utilised to keep lights off when not required; and » Lighting fixtures should be hooded and directed downward where possible, to minimize the skyward and horizontal illumination, lighting should be motion activated where possible.		
Residual Impacts: None.		

Nature: Fatalities of SCCs from collision with overhead powerlines. Cranes, bustards and korhaans are particularly susceptible to colliding with powerlines, unmarked earth wires when positioned above transmission cables pose an increased risk to cranes. If excessive fatalities of SCCs occurred this could potentially impact the population viability of species at the intermediate scale. Collisions with large (132 kV or above) power lines are a well-documented threat to birds in southern Africa 2021 while smaller lines pose a higher threat of electrocution but can still be responsible for collision. Collisions with overhead power lines occur when a flying bird does not see the cables, or is unable to take effective evasive action, and is killed by the impact or impact with the ground. Especially heavy-bodies birds such as bustards, cranes and waterbirds,

with limited manoeuvrability are susceptible to this impact. Many of the collision sensitive species are also considered threatened in southern Africa. A recent largescale study on avifaunal collisions with overhead powerlines in the eastern karoo of South Africa concluded that line-marking devices such as bird flight diverters (BFDs) line reduced collision rates for Blue Cranes by 92% (95% confidence interval [CI]: 77–97%) and all large birds by 51% (95% CI: 23–68%), but had no effect on bustards. The same study reported that five bustard species were in the top 10 list of most frequently found carcasses, and highlighted the relatively high collision rates of Ludwig's Bustards (0.68 birds/km/yr.). There is currently no widely accepted effective mitigation for reducing the collisions of bustards with overhead powerlines, however there is some indication that bustards collide more often with mid-span areas (89%) than they do nearer the supporting pylons (11%) suggesting that they see the pylons and take avoiding action. The staggering of pylons for novel transmission infrastructure between (rather than next to, i.e. in the mid-span) pylons of adjacent transmission lines may reduce bustard collisions by ~45%. The proposed overhead powerline corridor is mostly positioned alongside hills and slopes, away from the flatter areas generally preferred by bustards, this is likely to reduce the probability of collisions by these species simply due to the proposed position on the landscape. This follows the mitigation hierarchy philosophy through the avoidance of placing infrastructure in particularly sensitive areas.

The relatively short length of the proposed overhead powerline, combined with its position on the landscape and potential for running alongside other transmission infrastructure makes it unlikely that the development will have a significant negative impact on the long-term viability or persistence of avifaunal SCCs in the area following the implementation if mitigation measures.

	Without mitigation	**With mitigation**
Extent	Regional (3)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (52)**	**Medium (30)**
Status (positive or negative)	Negative	Negative
Reversibility	Unlikely	Unlikely
Irreplaceable loss of resources?	Potentially	Potentially
Can impacts be mitigated?	Yes	

Mitigation:

» Where practical, powerlines/cables on the project site should be underground;
» Where practical, grid connection infrastructure should follow existing servitudes such as existing powerlines, roads and fences;
» Pylon positions should be placed in a staggered manner in relation to adjacent parallel transmission lines to increase the overall visibility of transmission infrastructure to avifauna such as bustards;
» Appropriate bird flight diverters (BFDs) to be installed on all lengths of new overhead power lines;
» The operational monitoring programme for the overhead powerline route must be implemented to locate potential collision (and electrocution) fatalities; and
» Any fatalities located should be reported to Birdlife South Africa (BLSA) and the Endangered Wildlife Trust (EWT).

Residual Impacts:

Current mitigation measures, while effective, are not capable of completely preventing collisions and some residual impact will remain. It is unlikely that the proposed development will have a significantly negative impact on the long-term viability and persistence of SCCs in the area considering the relatively short length of overhead powerline proposed as well as the proposed position on the landscape, low SEI and potential for multiple powerlines running in parallel increasing overall visibility to avifauna..

Nature: Avifaunal fatalities caused by electrocution from energized infrastructure. Modern pylon designs generally installed greatly reduce the probability of this impact.

Electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed

components. With regard to the grid connection infrastructure, overhead power line infrastructure with a capacity of 132kV or more do not generally pose a risk of electrocution due to the large size of the clearances between the electrical infrastructure components. Electrocutions are therefore more likely for larger species whose wingspan is able to bridge the gap such as eagles or vultures. Mitigation measures nevertheless remain effective at reducing the potential risk of electrocution.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Small (0)
Probability	Low likelihood (2)	Improbable (1)
Significance	**Low (16)**	**Low (6)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » All new overhead powerline pylons must be of a design that minimizes electrocution risk by using adequately insulated 'bird friendly' structures, with sufficient clearances between live components to reduce the risk of electrocution for large species such as vultures and Martial Eagle.		
Residual Impacts: None.		

Decommissioning phase

The impacts of the decommissioning phase are similar to those of the construction phase, with the exception of a reduced impact of habitat destruction. Temporary disassembly and storage areas associated with the decommission phase are to be positioned on the same sites as those used for temporary laydown areas during the construction phase where possible to reduce the incidence of novel habitat destruction.

9.5.3 Overall Result

The impacts of solar PV facilities on avifauna are not well understood, particularly in the South African context. Nevertheless the low and very low classification of the site ecological importance for avifaunal SCCs as assessed reduces the overall risk of significant impacts to the local avifaunal community by the proposed development, despite any gaps that may exist in our current understanding of potential impacts.

As the Species Assessment Guideline states that in areas identified to be of low SEI development activities of medium to high impact are acceptable following the implementation of appropriate minimisation and restoration mitigation measures.

Based on the impact assessment conducted for the Sun Garden PV Facility (including cumulative impacts) it is the avifaunal specialist's informed opinion that the proposed development will not have a significant negative impact on the viability or persistence of SCC populations in the area following the implementation of mitigation measures. The proposed Sun Garden PV Facility is therefore acceptable and can be approved from an avifaunal perspective.

In addition to the mitigation measures outlined for each potential impact, the requirement for post-construction/operational phase monitoring is to be included in the Environmental Management Programme

(EMPr). This is necessary to determine the actual impacts of the proposed development, determine if additional mitigation is required and learn about impacts and improve future assessments.

Construction Phase monitoring is not considered to be necessary for this development as despite this period potentially being the most intense period in terms of disturbance and displacement of avifauna, no focal sites of particular concern (e.g. nearby SCC nests) have been identified in proximity to the proposed development site.

Post-construction monitoring should be started as soon as possible once the facility becomes operational. As the effects of the proposed development may change over time both activity and fatality monitoring should be conducted during the first two years of operation and then repeated every fifth year. Fatality monitoring is to be conducted both systematically and on a continuous ad-hoc basis. Systematic fatality monitoring must be conducted at least once per season and include an estimation of searcher efficiency and carcass persistence rates (determined experimentally), carcass searches, and appropriate data analyses to determine estimated mortality rates. This process is to be conducted under the direction of an avifaunal specialist. The duration and scope of post-construction monitoring should be informed by the outcomes of the previous year's monitoring, and should be reviewed annually, however a minimum of 20 % of the solar hardware is to be methodically searched for fatalities, with a search interval informed by carcass persistence trials. Systematic fatality surveys are to include the full length of the proposed overhead powerline. Ad-hoc fatality monitoring is to be conducted continuously throughout the lifespan of the project and all carcasses and feather spots found during routine operational activity by on-site personnel are to be recorded and made available for an avifaunal specialist for inclusion into subsequent reports.

The activity monitoring methods and data collection should replicate those employed during pre-construction monitoring as closely as possible in terms of effort and timing and should follow any additional recommendations of the latest best-practice guidelines available at the time.

9.6. Potential Impacts on Bats

Various potential impacts on bats have been identified to be associated with the development of the Sun Garden PV Facility. The potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix F** for more details).

9.6.1 Description of Bat Impacts

As a whole, very little evidence exists to suggest that solar energy facilities (PV) have a direct impact on bat fatalities (SABAA, 2021). Regardless, any potential alteration or disturbance/destruction of roosting habitats is important to consider in any impact assessment.

The Sun Garden development area itself presents few roosting features that could be significantly relevant for bats. An absence of rocky outcrops and cliffs provides very little roosting opportunity, while existing buildings in the broader area have not shown have any signs of occupation (guano or individuals).

A river bordered by alluvial vegetation is present in the north of the site with agricultural land at the north-east and north-western borders of the site boundary, which may potentially be important for bat foraging. This, together with the undisturbed vegetation is likely to be relevant for bats, either in terms of roosting or foraging activities. Nonetheless, due to the nature of the renewable energy technology under consideration, it is expected that the impacts to consider would include habitat destruction and disturbance.

Given the small extent of the project area, the absence of significant overlap of potentially sensitive roosting features with the current infrastructure layout (including associated infrastructures), and the species composition expected to occur on site, it is not foreseen for such impacts to be significant. Regardless, these impacts have been assessed and summarised in the impact tables below. Relevant impacts pertaining to the 132kV transmission line have already been assessed in the associated Redding Wind Farm bat impact assessment report (Arcus, 2021). The Sun Garden PV Facility and Redding Wind Farm will each have a 35m power line servitude running in parallel.

9.6.2 *Impact tables summarising the significance of impacts on bats during the construction, operation and decommissioning phases (with and without mitigation)*

Construction Phase Impacts

Nature: Habitat Destruction

PV facilities have the potential to impact bats directly through the destruction of foraging habitat during construction. Relevant activities include the construction of roads, Operation and Maintenance (O&M) buildings, sub-station(s), internal transmission lines and installation of solar panels. Construction activities could remove important vegetation and structures that bats use when commuting to foraging areas or within foraging areas. This impact will vary depending on the species involved; species that are clutter foragers are more likely to be affected than open air foragers if vegetation is removed. Reducing foraging habitats for bats is likely to have slight negative impacts. There is a river with alluvial vegetation running through the north of the site and agricultural land bordering the north-eastern and north-western boundaries of Sun Garden. Avoidance of these important features lowers the significance of this impact, with it unlikely that this impact will occur if mitigation measures are followed. Therefore, with mitigation the significance of this impact would be low and have a slight to no effect.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Minor (1)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (16)**	**Low (14)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

- All construction activities should be restricted to the immediate project footprint as far as possible.
- Avoid the construction of new roads by using existing roads as far as possible.
- Avoid excessive removal of existing vegetation as far possible and do not remove any vegetation outside of the project boundaries that have been assessed.
- Avoid the destruction of important vegetation and agricultural land in the north of the site as far as possible.

Residual Impacts:

Marginally less foraging habitat for bats in the project footprint.

Nature: Roost Disturbance during construction

PV facilities have the potential to impact bats directly through the disturbance of roosts during construction. Relevant activities include the construction of roads, Operation and Maintenance (O&M) buildings, sub-station(s), internal transmission lines and installation of solar panels. Excessive noise and dust during the construction phase could result in bats abandoning their roosts, depending on the proximity of construction activities to roosts. This impact will vary depending on the species involved; species that may roost in trees are likely to be impacted more (e.g. Cape serotine and Egyptian freetailed bats; Monadjem et al. 2010) because tree roosts are less buffered against noise and dust compared to roosts in buildings and rocky crevices. Roosts are limiting factors in the distribution of bats and their availability is a major determinant in whether bats would be present in a particular location. Reducing roosting opportunities for bats is likely to have negative impacts. There is a major bat roost approximately 30km north and a smaller roost 12km east of Sun Garden. Avoidance of known bat roosts and high potential areas (Large trees and rocky crevices) is critical for lowering the significance of this impact, with it unlikely that this impact will occur if mitigation measures are followed. Therefore, with mitigation the significance of this impact would be low and have a slight to no effect.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Very short-term (1)	Very short-term (1)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (12)**	**Low (10)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » All construction activities should be restricted to the immediate project footprint as far as possible. » Avoid the construction of new roads by using existing roads as far as possible. » Site Access should be strictly controlled, to avoid unnecessary disturbance. » Minimise lighting at night as far as possible. » Avoid operations outside of the project boundaries that have been assessed.		
Residual Impacts: Even with all mitigation measures being implemented, undiscovered roosts close to construction may be disturbed due to noise and dust.		

Nature*:* Roost Destruction during construction PV facilities have the potential to impact bats directly through the physical destruction of roosts during construction. Relevant activities include the construction of roads, O&M buildings, sub-station(s), grid connection transmission lines and installation of solar panels. Potential roosts that may be impacted by construction activities include trees, crevices in rocky outcrops and buildings. Roost destruction can impact bats either by removing potential roosting spaces which reduces available roosting sites or, if a roost is destroyed while bats are occupying the roost, this could result in bat mortality. Reducing roosting opportunities for bats or killing bats during the process of destroying roosts will have negative impacts and could be severe. There is a major bat roost approximately 30km north and a smaller roost 12km east of Sun Garden. Avoidance of known bat roosts and high potential areas (Large trees and rocky crevices) is critical for lowering the significance of this impact, with it unlikely that this impact will occur if mitigation measures are followed. Therefore, with mitigation the significance of this impact would be low and have a slight to no effect.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Permanent (5)	Permanent (5)

Magnitude	Low (4)	Minor (3)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (22)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	

Mitigation:

» All construction activities should be restricted to the immediate project footprint as far as possible.
» Avoid the construction of new roads by using existing roads as far as possible.
» Avoid excessive removal of existing vegetation as far possible and do not remove any vegetation outside of the project boundaries that have been assessed.
» Avoid the destruction of existing buildings as far as possible.

Residual Impacts:

Marginally less spaces for roosting bats and decrease in population if roosts are destroyed.

Operation Phase Impacts

Nature: Roost Disturbance during operation

PV facilities have the potential to impact bats directly through the disturbance of roosts during operation. Relevant factors such as maintenance activities and night-time lighting, particularly around existing or potential roosts, may result in the disturbance of roosting/foraging bats.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Minor (2)	Minor (1)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (14)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

» Site Access should be strictly controlled, to avoid unnecessary disturbance.
» Minimise lighting at night as far as possible.
» Maintain maintenance activities only around relevant PV infrastructures and avoid disturbance around undisturbed natural vegetation and existing buildings.

Residual Impacts:

Even with all mitigation measures being implemented, undiscovered roosts in the area may be disturbed due to noise, lighting and dust.

Decommissioning Phase Impacts

Nature: Roost Disturbance during decommissioning

PV facilities have the potential to impact bats directly through the disturbance of roosts during the decommissioning phase. Relevant activities include the increased traffic on roads and decommissioning of relevant PV infrastructures. Excessive noise and dust during this period could result in bats abandoning their roosts, depending on the proximity of activities to known/potential roosts. Roosts are limiting factors in the distribution of bats and their availability is a

major determinant in whether bats would be present in a particular location. With mitigation, the significance of this impact would be low and have a slight to no effect.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Very short-term (1)	Very short-term (1)
Magnitude	Minor (3)	Minor (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (12)**	**Low (10)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Maintain decommissioning activities around the immediate project footprint and avoid excess noise and traffic around existing buildings. » Avoid unnecessary destruction/disturbance of existing natural vegetation as far possible, by making use of existing roads. » Site Access should be strictly controlled, to avoid unnecessary disturbance. » Minimise lighting at night as far as possible.		
Residual Impacts: Even with all mitigation measures being implemented, undiscovered roosts close to decommissioning activities may be disturbed due to lighting, noise and dust.		

9.6.3 *Overall Result*

As per the findings presented in the specialist impact assessment (Appendix F), the specialist confirms that the classification of the project area (as low sensitivity to bats), as presented in the DFEE Screening Tool Report, is accurate and no further adjustments to this classification is necessary. It is believed, based on observations and available information, that the small extent of the project area and type of development under consideration is not expected to cause an irreplaceable loss to biodiversity, in terms of the bat community on site. No sensitive areas for avoidance have been identified on site, although several potentially sensitive features have been identified, as depicted in Figure 2. A few mitigation measures have subsequently been recommended to be followed – particularly pertaining to that of known and potential bat roosting structures/habitats, as described in Section 7. Should the above measures be adhered to, it is the opinion of the specialists that the proposed development can proceed and can be authorised from a bat perspective.

9.7. Assessment of Impacts on Land Use, Soil and Agricultural Potential

Based on the sensitivity of the Sun Garden PV Facility development envelope (see Chapter 8 and Appendix H) a compliance statement was undertaken and not a full impact assessment in accordance with the relevant specialist protocols published in GNR320 of 20 March 2020. Therefore an impact statement is provided from a land use, soils and agricultural perspective. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix H** – Soils Impact Assessment for more details).

9.7.1 Impact Statement and recommendations

All proposed activities are expected to be long term (> 15 years) and have been considered "permanent" on this basis, which renders the decommissioning phase irrelevant. All of the components associated with the Sun Garden project area are located on "Low" sensitivity land potential areas (Figure 9.1), including:

- » Construction and operation of the 132 kV substation;
- » Construction and operation of the Balance of Plant (BoP) area;
- » Construction and operation of the PV panels;
- » Construction and operation of the electrical ducts;
- » Construction and operation of the inverters;
- » Construction and operation of the stormwater crossings;
- » Construction and operation of the borehole pipelines; and
- » Construction and operation of the access roads.

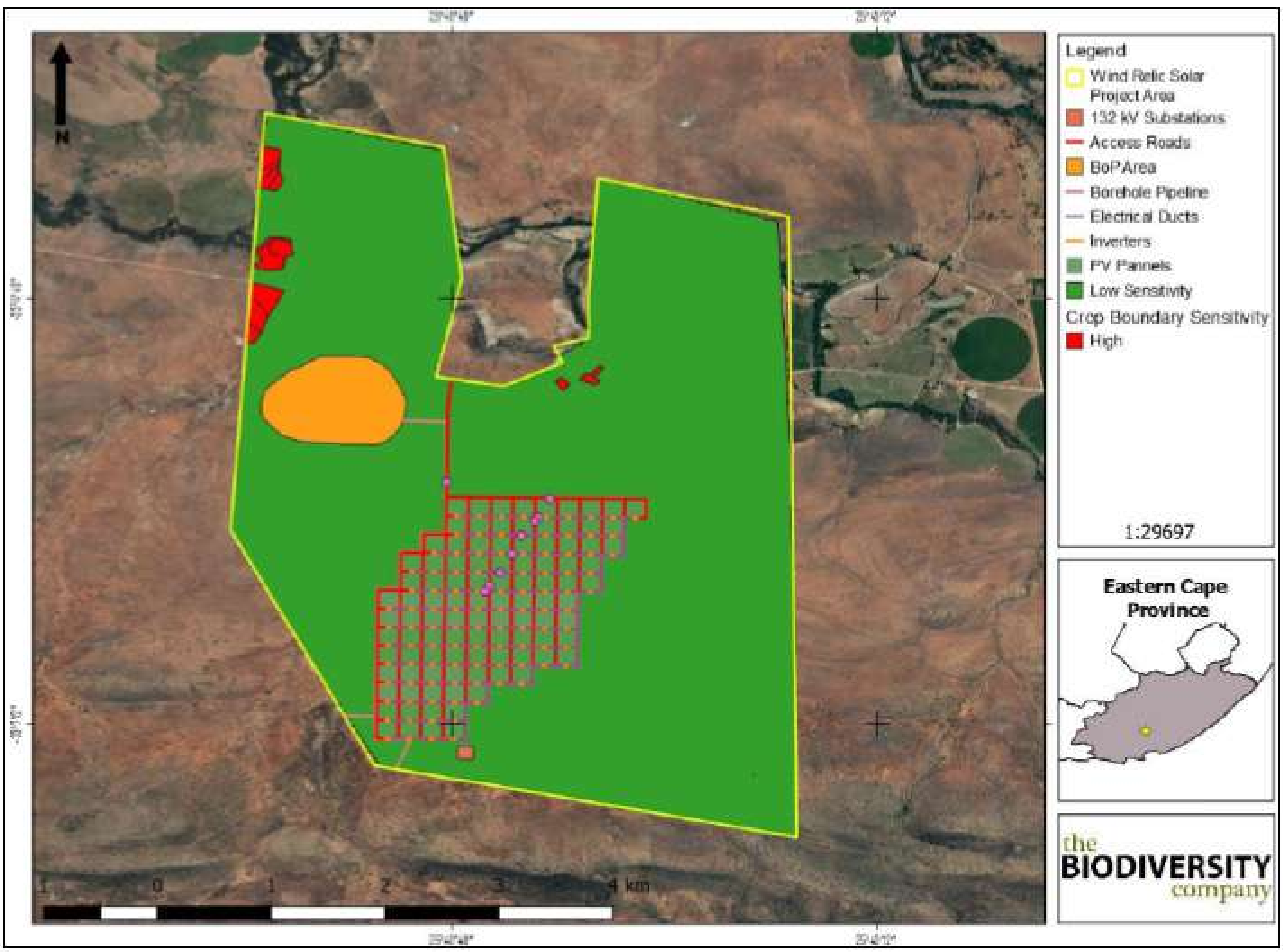

Figure 9.1: Proposed activities within project area

None of the proposed components are located within close proximity to any of the "High Sensitivity" crop boundaries (DEA, 2021). Therefore, the only sensitivity associated with soil resources proposed to be impeded upon by the PV facility has been deemed to be "Low".

Balance of Plant, PV Panels and 132 kV Substation

The impact statement of the BoP, PV panels and the on-site collector substation has been combined given the association with similar sensitivities (low sensitivities). It is the specialist's opinion that the construction and operation of the proposed these components will have an acceptable impact on the agricultural production capability of the area given the fact that only "Low" sensitivities are associated with these component's footprint areas.

Linear Activities (Access Roads, Stormwater Crossings and Pipeline)

The proposed access roads, stormwater crossings and pipelines are located within "Low" sensitivity land potential resources. It is the specialist's opinion that the proposed linear activities will have an acceptable impact on the agricultural production capability of the area given the fact that only "Low" sensitivities are associated with the footprint areas.

Recommendations and mitigations

General mitigations will ensure the conservation of all soil resources, regardless of the sensitivity of resources and the intensity of impacts.

» Only the proposed access roads are to be used to reduce any unnecessary compaction;
» Prevent any spills from occurring. Machines must be parked within hard park areas and must be checked daily for fluid leaks;
» Proper invasive plant control must be undertaken quarterly; and
» All excess soil (soil that are stripped and stockpiled to make way for foundations) must be stored, continuously rehabilitated to be used for rehabilitation of eroded areas.

» Restoration of Vegetation Cover

  Restoring vegetation cover is the first step to successful rehabilitation. Vegetation cover decreases flow velocities and minimises erosion.

» Ripping Compacted Areas

  All areas outside of the footprint areas that will be degraded (by means of vehicles, laydown yards etc.) must be ripped where compaction has taken place. According to the Department of Primary Industries and Regional Development (Agriculture and Food) (2017), ripping tines must penetrate to just below the compacted horizons (approximately 300 – 400 mm) with soil moisture being imminent to the success of ripping. Ripping must take place within 1-3 days after seeding, and also following a rain event to ensure a higher moisture content.

» Revegetate Degraded Areas

  Vegetation within the footprint areas will be cleared to accommodate the excavation activities coupled with the proposed footprint areas' foundations. This impact will degrade soil resources, ultimately decreasing the land capability of resources and increasing erosion. According to Russell (2009), areas characterised by a loss of soil resources should be revegetated by means of vegetation with vigorous growth, stolons or rhizomes that more or less resembles the natural vegetation in the area.

  It is recommended that all areas surrounding the development footprint areas that have been degraded by traffic, laydown yards etc. must be ripped and revegetated by means of indigenous grass species. Mixed stands or monocultures will work sufficiently for revegetation purposes. Mixed stands tend to blend in with indigenous vegetation species and are more natural. Monocultures however could achieve high productivity. In general, indigenous vegetation should always be preferred due to various reasons including the aesthetical presence thereof as well as the ability of the species to adapt to its surroundings.

Plant phase plants which are characterised by fast growing and rapid spreading conditions. Seed germination, seed density and seed size are key aspects to consider before implementing revegetation activities. The amount of seed should be limited to ensure that competition between plants are kept to a minimum. During the establishment of seed density, the percentage of seed germination should be taken into consideration. *E curvula* is one of the species recommended due to the ease of which it germinates. This species is also easily sown by means of hand propagation and hydro seeding.

The following species are recommended for rehabilitation purposes;

- *Eragrostis teff;*
- *Cynodon species* (Indigenous and altered types);
- *Chloris gayana;*
- *Panicum maximum;*
- *Digitaria eriantha;*
- *Anthephora pubescens;* and
- *Cenchrus ciliaris.*

9.7.2 Overall Result

It is the specialist's opinion that the baseline findings do not concur with the land capabilities identified by means of the DAFF (2017) desktop findings in regard to land capability sensitivities. Even though the land capability, in theory, is similar to that portrayed by (DEA, 2021), the climatic conditions have been deemed to be extremely poor. These poor climatic conditions have resulted in a land potential level characterised by "Low" sensitivity throughout the project area. No "High" land capability sensitivities were identified within proximity to any of the proposed activities. Considering the lack of sensitivity and the measures put in place in regard to stormwater management and erosion control, it is the specialist's opinion that all activities will have an acceptable impact on agricultural productivity. Furthermore, no measures in regard to moving components in their micro-setting were required to avoid or minimise fragmentation and disturbances of agricultural activities.

Various soil forms were identified within the Sun Garden project area, namely Swartland, Glenrosa, Mispah and Oakleaf. These soil forms were determined to be associated with three different land capabilities, namely LCIII, LCIV and LCVI. These land capability classes were then further refined to land potential levels by comparing land capability of climatic capabilities of the project area. Two land potential levels were then calculated, namely L6 and L7.

These land potential levels were used to determine the sensitivities of soil resources. Together with sensitive agricultural fields determined by means of the DFFE screening tool, only "Low" sensitivities were determined with a scattered patches of "High" sensitivity crop fields. It is worth noting that no development is expected to have an impact on these areas. Considering the low sensitivities associated with land potential resources, it is the specialist's opinion that the proposed activities will have an acceptable impact on soil resources and that the proposed activities should proceed as have been planned.

9.8. Assessment of Impacts on Heritage Resources

The region between and surrounding Makhanda (previously known as Grahamstown) and Somerset East is sparsely populated with several farmsteads and their associated structures located on the valley floors of this hilly and mountainous region. The farmsteads are connected through several farm roads and old historic ox-wagon routes that link the local communities to the busy towns of Makhanda and Somerset East.

Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix I**).

9.8.1 Description of the Heritage Impacts

The main impacts expected to occur on the heritage resources associated with the development of the Sun Garden PV Facility will be during the construction phase. No major impacts are expected during the operation or decommissioning phase.

Heritage resources
During the survey no heritage sites (historical structures, burial grounds or graves) were identified within the proposed development footprint.

Palaeontology
According to the PalaeoMap of SAHRIS the Palaeontological Sensitivity of the study area is of low to very high sensitivity. The impact significance before mitigation on the Paleontological resources will be moderate negative before mitigation. Only the study site will be affected by the proposed development. The possibility of the impact occurring is very likely. The expected duration of the impact is assessed as potentially permanent. Implementation of the recommended mitigation measures will reduce this impact rating to an acceptable low negative impact.

Cultural Landscape
According to the VIA (de Plessis, 2021), an impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light. The greater environment has a rural, undeveloped character and a natural appearance. These generally undeveloped landscapes are considered to have a high visual quality, except where urban development represents existing visual disturbances.

The anticipated visual impact of the proposed PV facility on the regional visual quality, and by implication, on the sense of place, is difficult to quantify, but is generally expected to be of low significance. This is due to the relatively low viewer incidence within close proximity to the proposed development site.

9.8.2 Impact tables summarising the significance of impacts on heritage during construction, operation and decommissioning (with and without mitigation)

Nature: *Impact to palaeontological resources* The excavations and site clearance of the Sun Garden PV facility will involve extensive excavations into the superficial sediment cover as well as into the underlying bedrock. These excavations will change the existing topography and may destroy and seal-in fossils at or below the ground surface. These fossils will then be unavailable for research. Impacts on Palaeontological Heritage are likely to happen only within the construction phase. No impacts are expected to occur during the operation phase.

	Without mitigation	With mitigation
Extent	Development area (1)	Development area (1)
Duration	Permanent (5)	Medium-term (3)
Magnitude	High (8)	Minor (2)
Probability	Highly Probable (4)	Improbable (1)
Significance	**Medium (-56)**	**Low (+6)**
Status (positive or negative)	Negative	Neutral
Reversibility	Irreversible	
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	

Mitigation:

<u>Chance Find Procedure:</u>

» If a chance find is made the person responsible for the find must immediately stop working and all work must cease in the immediate vicinity of the find.
» The person who made the find must immediately report the find to his/her direct supervisor which in turn must report the find to his/her manager and the Environmental Officer (EO) (if appointed) or site manager . The EO must report the find to the relevant Heritage Agency (South African Heritage Research Agency, SAHRA). (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). The information to the Heritage Agency must include photographs of the find, from various angles, as well as the GPS co-ordinates.
» A preliminary report must be submitted to the Heritage Agency within 24 hours of the find and must include the following: 1) date of the find; 2) a description of the discovery and a 3) description of the fossil and its context (depth and position of the fossil), GPS co-ordinates.
» Photographs (the more the better) of the discovery must be of high quality, in focus, accompanied by a scale. It is also important to have photographs of the vertical section (side) where the fossil was found.

Upon receipt of the preliminary report, the Heritage Agency will inform the EO (or site manager) whether a rescue excavation or rescue collection by a palaeontologist is necessary.

» The site must be secured to protect it from any further damage. No attempt should be made to remove material from their environment. The exposed finds must be stabilised and covered by a plastic sheet or sand bags. The Heritage agency will also be able to advise on the most suitable method of protection of the find.
» In the event that the fossil cannot be stabilised the fossil may be collected with extreme care by the EO (or site manager). Fossils finds must be stored in tissue paper and in an appropriate box while due care must be taken to remove all fossil material from the rescue site.
» Once Heritage Agency has issued the written authorisation, the developer may continue with the development.

Residual Impacts:

Loss of fossil heritage.

Nature: *<u>Impact on Cultural Landscape</u>*

Impact on historic cultural landscape elements by all phases of development.

	Without mitigation	With mitigation
Extent	Broader Regional Area **(5)**	Regional **(3)**
Duration	Permanent **(5)**	Permanent **(5)**
Magnitude	Moderate **(6)**	Low **(4)**
Probability	Definite **(5)**	Definite **(5)**
Significance	High **(80)**	High **(60)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
The irreplaceable loss of resources?	Yes	Yes

Can impacts be mitigated?	Yes

Mitigation:

» Mitigation measures as proposed in the HIA for the proposed Sun Garden PV Facility development that reduces negative impacts on the land use patterns and living heritage will reduce the impact of this facility on the overall load.

» The mitigation measures proposed for heritage resources will reduce the negative cumulative impact on the CL and should be implemented as recommended.

» According to the Visual impact assessment (VIA) of LOGIS by Du Plessis (2021) no mitigation of the impact on the sense of place of the region or the CL is possible as the structures will be visible regardless. However, the following general mitigation measures are proposed:

Planning:

» Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/servitude.

Operations:

» Maintain the general appearance of the facility as a whole.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use.
» Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.

» General mitigation measures for renewable energy development in areas of CL significance as proposed by Jansen and Franklin, (2021) as well as Lavin (2021) is recommended:

Ecological:

» Species and ecosystem loss should be prevented by limiting fragmentation in the landscape, and should therefore adhere to the following general recommendations:
» Remaining areas of endemic and endangered natural vegetation should be conserved.
» High and Very High Sensitivity Ecological areas (crest lines and drainage lines), should be protected from development.
» Areas of habitat are found among the rocky outcrops and contribute to the character, as well as biodiversity of the area. Care should be taken that habitats are not needlessly destroyed.
» Careful planning should incorporate areas for stormwater runoff where the base of the structure disturbed the natural soil. Local rocks found on the site could be used to slow stormwater (instead of concrete, or standard edge treatments), and prevent erosion that would be an unfortunate consequence that would alter the character of the site. By using rocks from site, it helps to sensitively keep to the character.
» The principle of 'tread lightly' must be applied for any activity (and associated development requirements e.g. toilets for the construction process) should be emphasised.

Aesthetic:

» Encourage mitigation measures (for instance use of vegetation) to 'embed' or disguise the proposed structures within the surrounding tourism and agricultural landscape at ground level, road edges etc;
» The continuation of the traditional use of material could be enhanced with the use of the rocks on the site as building material. This would also help to embed structures into the landscape that does not have to be standard containers that clutter the landscape.
» Using material found on the site adds to the sense of place and reduces transportation costs of bringing materials to site.
» Where additional infrastructure (i.e. roads) is needed, the upgrade of existing roads to accommodate the development should be the first consideration. The local material such as the rocks found within the area could be applied to address stormwater runoff from the road to prevent erosion.

- » Infrastructure improvement, including new roads and upgrades to the road network, should be appropriate to the rural context (scale, material etc.).
- » The layout of the turbines should have an emphasis on place-making, i.e. landscape-related heritage considerations, as opposed to standard infrastructure driven requirements;
- » Prevent the construction of new buildings/structures on visually sensitive, steep, elevated or exposed slopes, ridgelines and hillcrests. Retain the integrity of the distinctive landscape character;
- » Scale and massing should be sensitive to the surrounding landscape, although this is challenging with regard to the development of WEFs.
- » Avoid visual clutter in the landscape by intrusive signage, and the intrusion of commercial corporate development along roads
- » Avoid development of infrastructure (such as buildingsand power lines), on crests or ridgelines due to the impact on the visual sensitivity of skylines.
- » Retain view-lines and vistas focused on prominent natural features such as mountain peaks or hills, as these are important place-making and orientating elements for experiencing the cultural landscape.

<u>Historic</u>:

- » The integrity of the historic farm werfs should be maintained and protected.
- » Names of routes and watercourses that refer to traditional use during the time of the hunter-gatherers and herders, as well as the colonial era, should be celebrated.
- » Traditional planting patterns should be protected by ensuring that existing trees are not needlessly destroyed, as these signify traces of cultural intervention in a harsh environment. These planting patterns include the trees planted around the werfs.
- » In some cases, remnant planting patterns (even single trees) uphold the historic character of an area. Interpretation of these landscape features as historic remnants should occur.
- » Mountain slopes have been used for traditional practices for many years, and care should be taken that any significant cultural sites, such as burials and veldkos/medicinal plant resources, are not disturbed.
- » Where the historic function of a building/site is still intact, the function has heritage value and should be protected. Please take note of the items listed below:
- » Surviving examples (wagon routes, outspans, and commonage), where they are owned in some public or communal way (or by a body responsible for acting in the public interest) and where they are found to be actively operating in a communal way, will have cultural and heritage value and should be enhanced and retained.
- » The new roads should display minimum scale designs where possible.
- » Maintain traditional movement patterns across rural landscapes or to places of socio-historical value. (a) Avoid privatization or the creation of barriers to traditional access routes. (b) Retain old roadways, which have been replaced by newer roads, for use as recreation trails.
- » Respect existing patterns, typologies and traditions of settlement-making by promoting the continuity of heritage features. These include: (a) indigenous; (b) colonial; and (c) current living heritage in the form of tangible and intangible associations to place.
- » Respect traditional werf settlement patterns by considering the entire werf as the component of significance. This includes the backdrop of the natural landscape against which it is sited, as well as its spatial structure. Any development that impacts the inherent character of the werf component should be discouraged.

<u>Social</u>:

- » Care should be taken that existing functions such as outspan areas (see criteria for these under historic) are not lost in the development stages, as it fulfils an important function within the cultural landscape.
- » The local community around the development should benefit from job opportunities created by the proposed development.

<u>Economic</u>:

- » Sheep or game farming should be allowed to continue in the area and between the panels where feasible.
- » Care should be taken to reduce visual impact from surrounding tourism areas, by following the recommendations included in the VIA.

Residual Impacts:
Considering the nature of the sites identified in the present study, the residual risk will be moderate.

9.8.3 *Overall Result*

Analysis of the various components of the HIA indicates a mitigated low negative impact on heritage resources and are expanded on below.

» Historical structures: No historical structures of heritage significance were identified.
» Burial Grounds and graves: No burial grounds or graves were identified.
» Palaeontology: An assessment of the possible impacts of the proposed project on palaeontological resources has shown that unmitigated impacts consist of a medium negative impact mostly confined to the construction phase of the project. By implementing the mitigation measures as listed in this report these impacts can be managed to a neutral.
» Cultural landscape: An assessment of the possible impacts of the proposed project on the overall cultural landscape has shown that unmitigated impacts consist of a high negative impact mostly confined to the construction and operation phase of the project. Impacts on cultural landscape are expected to be high. It must be considered that the addition of the infrastructure of the Sun Garden PV Facility will constitute an additional layer to the cultural landscape and must be considered as such within a gazetted REDZ area. Through the implementation of the economically feasible recommendations as set out in the Heritage impact Assessment (**Appendix I**) and contained in this report it will be possible to preserve older layers of the cultural landscape and in some cases even enhance them through consideration such as the use of older name places in the naming of infrastructure and enhancing local heritage through the incorporation of such structures in project conservation initiatives to name a few.

The assessment of the possible impacts on the archaeological, historical and palaeontological resources has shown a Low impact from the Sun Garden PV Facility project after mitigation measures. It is further considered that the project can have a potential positive influence on such resources in the region when the proposed conservation initiative from the project considers such resources as part of a larger development strategy.

The assessment of the cultural landscape indicated that the project will have a significant Moderate to High impact on the cultural landscape. The general mitigation measures for renewable energy development in areas of cultural landscape significance as proposed by Jansen and Franklin, (2021) as well as Lavin (2021) will still result in a marginal reduction of impact.

It must further be considered that the addition of the infrastructure of the Sun Garden PV Facility will constitute an additional layer to the CL and must be considered as such within a gazetted REDZ area. Through the implementation of the economically feasible recommendations as set out in the cultural landscape assessment and contained in this report it will be possible to preserve older layers of the cultural landscape and in some cases even enhance them through consideration such as the use of older name places in the naming of infrastructure and enhancing local heritage through the incorporation of such structures in project conservation initiatives to name a few.

Analysis of the findings of the SEIA for this project further reveals that the economic benefit for the region and the overall energy needs such project addresses outweighs the need for conservation of cultural resources at all costs. The economic benefit for the region and the overall energy needs such a project address to outweigh the need for the exclusion of the Sun Garden PV facility to conserve cultural resources at all costs. Especially where a project is situated within a gazetted REDZ area.

The overall impact of the Sun Garden PV facility, on the heritage resources identified during this report, is considered as acceptable after the recommendations have been implemented and therefore, impacts can be mitigated to acceptable levels allowing for the development to be authorised.

9.9. Assessment of Visual Impacts

Negative impacts on visual receptors will occur during the undertaking of construction activities and the operation of the Sun Garden PV Facility. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix J**).

9.9.1 Description of Visual Impacts

The combined results of the visual exposure, viewer incidence/perception and visual distance of the proposed PV facility are displayed on Figure 9.2. Here the weighted impact and the likely areas of impact have been indicated as a visual impact index. Values have been assigned for each potential visual impact per data category and merged to calculate the visual impact index.

The criteria (previously discussed in this report) which inform the visual impact index are:

- Visibility or visual exposure of the structures
- Observer proximity or visual distance from the structures
- The presence of sensitive visual receptors
- The perceived negative perception or objections to the structures (if applicable)
- The visual absorption capacity of the vegetation cover or built structures (if applicable)

An area with short distance visual exposure to the proposed infrastructure, a high viewer incidence and a potentially negative perception (i.e. a sensitive visual receptor) would therefore have a higher value (greater impact) on the index. This helps in focussing the attention to the critical areas of potential impact and determining the potential magnitude of the visual impact.

The index indicates that potentially sensitive visual receptors within a 1km radius of the PV facility may experience a very high visual impact. The magnitude of visual impact on sensitive visual receptors subsequently subsides with distance to; high within a 1–3km radius (where/if sensitive receptors are present) and moderate within a 3–6km radius (where/if sensitive receptors are present). Receptors beyond 6km are expected to have a low potential visual impact.

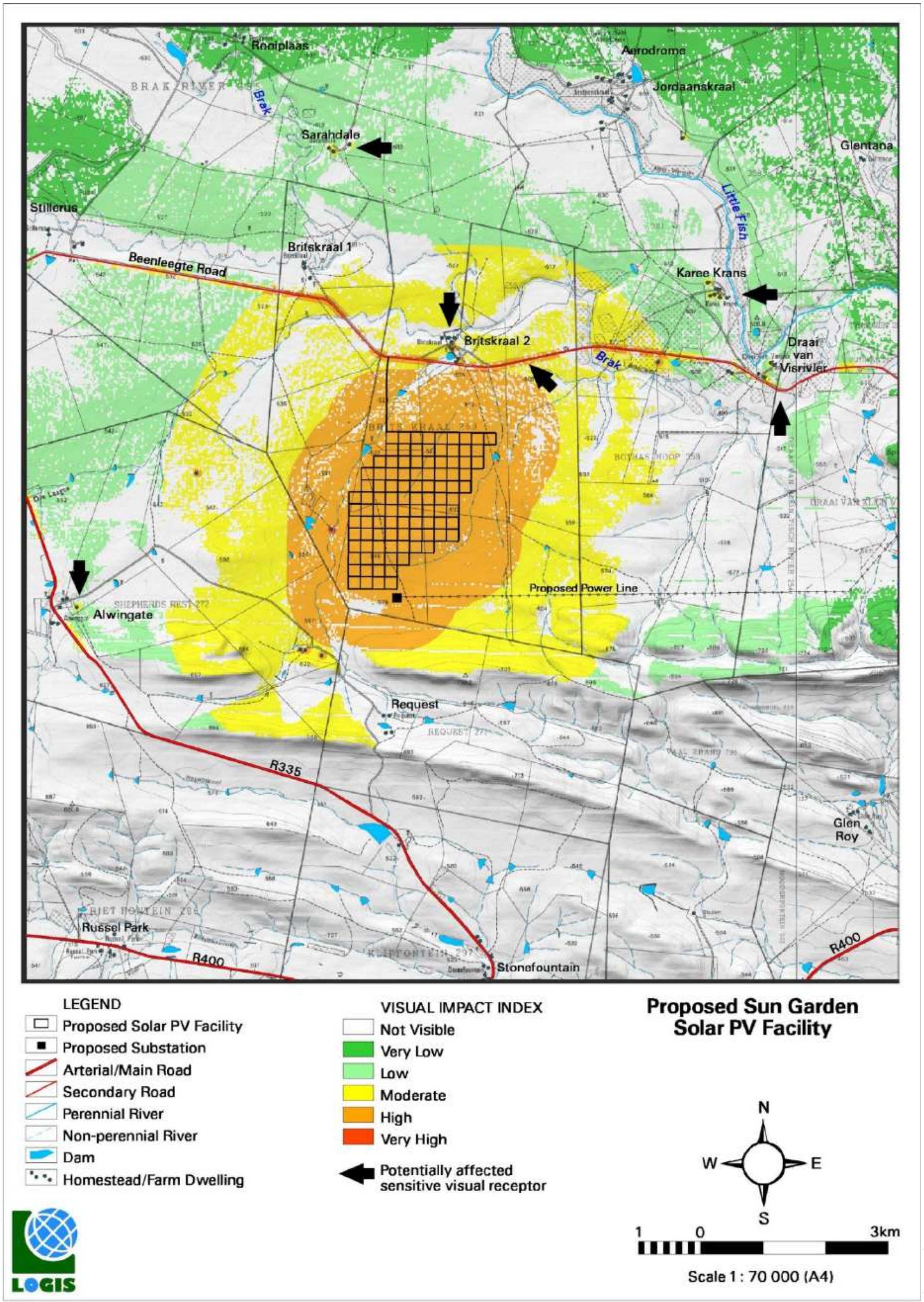

Figure 9.1: Visual impact index and potentially affected sensitive visual receptors

Magnitude of the potential visual impact

The PV facility is not expected to have visual impacts of very high magnitude, due to the fact that there are no residences/homesteads or public roads within a 1km radius of the proposed PV facility.

The facility may have a visual impact of high magnitude on the following observers:

Residents of/or visitors to:

- Britskraal (2)

Observers travelling along the Beenleegte secondary road north of the proposed facility

The facility may have a visual impact of moderate magnitude on the residents of/or visitors to:

- Alwingate
- Sarahdale
- Jordaanskraal
- Kareekrans
- Draai van Visrivier

9.9.2 *Impact table summarising the significance of visual impacts during construction and operation (with and without mitigation)*

Construction Phase Impacts

Nature: Potential visual impact of construction activities on sensitive visual receptors in close proximity to the proposed PV facility and ancillary infrastructure. During construction, there may be a noticeable increase in heavy vehicles utilising the roads to the development site that may cause, at the very least, a visual nuisance to other road users and landowners in the area. Construction activities may potentially result in a moderate (significance rating = 40), temporary visual impact, that may be mitigated to low (significance rating = 24)		
	Without mitigation	**With mitigation**
Extent	Local **(2)**	Local **(2)**
Duration	Short term **(2)**	Short term **(2)**
Magnitude	Moderate **(6)**	Low **(4)**
Probability	Highly Probable **(4)**	Probable **(3)**
Significance	Moderate **(40)**	Low **(24)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: Planning: » Retain and maintain natural vegetation immediately adjacent to the development footprint. Construction: » 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) wherever possible. » Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads. » Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities. » Reduce and control construction dust using approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent). » Restrict construction activities to daylight hours whenever possible in order to reduce lighting impacts. » Rehabilitate all disturbed areas immediately after the completion of construction works.
Residual Impacts: None, provided rehabilitation works are carried out as specified..

Operation Phase Impacts

Nature: Visual impact on observers travelling along the roads and residents at homesteads within a 1km radius of the PV facility structures

The PV facility is expected to have a moderate visual impact (significance rating = 36) on observers travelling along the Beenleegte secondary road. There are no homesteads within a 1km radius of the proposed PV facility structures.

Mitigation of this impact is possible and both specific measures as well as general "best practice" measures are recommended in order to reduce/mitigate the potential visual impact. The table below illustrates this impact assessment.

	Without mitigation	**With mitigation**
Extent	Local **(2)**	Local **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	High **(8)**	Moderate **(6)**
Probability	Probable **(3)**	Probable **(3)**
Significance	Moderate **(42)**	Moderate **(36)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

Planning:

» Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint.
» Consult adjacent landowners (if present) in order to inform them of the development and to identify any (valid) visual impact concerns.

Operations:

» Maintain the general appearance of the facility as a whole.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use.
» Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.

Residual Impacts:

The visual impact will be removed after decommissioning, provided the PV facility infrastructure is removed. Failing this, the visual impact will remain.

Nature: Visual impact on observers travelling along the roads and residents at homesteads within a 1 – 3km radius of the PV facility structures

The operational PV facility could have a low visual impact (significance rating = 22) on observers located between a 1 – 3km radius of the PV facility structures, both before and after the implementation of mitigation measures. The only homestead within this zone is the Britskraal (2) residence, located on the property earmarked for the proposed development.

	Without mitigation	With mitigation
Extent	Regional **(3)**	Regional **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Low **(4)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	Low **(22)**	Low **(22)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, however best practice management measures can be implemented.	

Mitigation:

Planning:

» Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint.

Operations:

» Maintain the general appearance of the facility as a whole.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use.
» Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.

Residual Impacts:

The visual impact will be removed after decommissioning, provided the PV facility infrastructure is removed. Failing this, the visual impact will remain

Nature: Potential visual impact of operational, safety and security lighting of the facility at night on observers in close proximity to the proposed PV facility.

Lighting impacts relate to the effects of glare and sky glow. The source of glare light is unshielded luminaries which emit light in all directions and which are visible over long distances.

Sky glow is the condition where the night sky is illuminated when light reflects off particles in the atmosphere such as moisture, dust or smog. The sky glow intensifies with the increase in the amount of light sources. Each new light source, especially upwardly directed lighting, contribute to the increase in sky glow. It is possible that the PV facility may contribute to the effect of sky glow within the environment which is currently undeveloped.

Mitigation of direct lighting impacts and sky glow entails the pro-active design, planning and specification of lighting for the facility. The correct specification and placement of lighting and light fixtures for the PV facility and the ancillary infrastructure (e.g. workshop and storage facilities) will go far to contain rather than spread the light.

	Without mitigation	With mitigation
Extent	Local **(2)**	Local **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	High **(8)**	Moderate **(6)**
Probability	Probable **(3)**	Improbable **(2)**
Significance	Moderate **(42)**	Low **(24)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**

Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

Planning & operation:

» Shield the sources of light by physical barriers (walls, vegetation, or the structure itself).
» Limit mounting heights of lighting fixtures, or alternatively use foot-lights or bollard level lights.
» Make use of minimum lumen or wattage in fixtures.
» Make use of down-lighters, or shielded 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.

Residual Impacts:

The visual impact will be removed after decommissioning, provided the PV facility and ancillary infrastructure is removed. Failing this, the visual impact will remain

Nature: Potential visual impact of solar glint and glare as a visual distraction and possible air/road travel hazard.

Glint and glare occur when the sun reflects of surfaces with specular (mirror-like) properties. Examples of these include glass windows, water bodies and potentially some solar energy generation technologies (e.g. parabolic troughs and CSP heliostats). Glint is generally of shorter duration and is described as "a momentary flash of bright light", whilst glare is the reflection of bright light for a longer duration.

The visual impact of glint and glare relates to the potential it has to negatively affect sensitive visual receptors in relative close proximity to the source (e.g. residents of neighbouring properties), or aviation safety risk for pilots (especially where the source interferes with the approach angle to the runway). The Federal Aviation Administration (FAA) of the United States of America have researched glare as a hazard for aviation pilots on final approach and may prescribe specific glint and glare studies for solar energy facilities in close proximity to aerodromes (airports, airfields, military airbases, etc.). It is generally possible to mitigate the potential glint and glare impacts through the design and careful placement of the infrastructure.

PV panels are designed to generate electricity by absorbing the rays of the sun and are therefore constructed of dark-coloured materials, and are covered by anti-reflective coatings. Indications are that as little as 2% of the incoming sunlight is reflected from the surface of modern PV panels (i.e. such as those proposed for the Sun Garden PV Facility) especially where the incidence angle (angle of incoming light) is smaller i.e. the panel is facing the sun directly. This is particularly true for tracker arrays that are designed to track the sun and keep the incidence angle as low as possible.

The proposed PV facility is not located near any operational airports or airfields (as indicated by surrounding land owners and the project proponent) and is very remote in terms of exposure to other potentially sensitive visual receptors. There are no major (national or arterial) roads in close proximity to the PV facility, and the closest road, the Beenleegte secondary road, is located more than 1km away. The intensity of the light reflected from the solar panels decrease with increasing distance, and is therefore not expected to influence motorists travelling along this road. As such, the potential visual impact related to solar glint and glare is expected to be of low significance (significance rating = 20).

	Without mitigation	**With mitigation**
Extent	Local **(2)**	N.A.
Duration	Long term **(4)**	N.A.
Magnitude	Low **(4)**	N.A.
Probability	Improbable **(2)**	N.A.
Significance	Low **(20)**	N.A.

Status (positive or negative)	Negative	N.A.
Reversibility	Reversible **(1)**	N.A.
Irreplaceable loss of resources?	No	N.A.
Can impacts be mitigated?	N/A	
Mitigation: N/A		
Residual Impacts: N/A		

Nature: Visual impact of ancillary infrastructure On-site ancillary infrastructure associated with the PV facility includes a 132kV power line, substation, inverters, 33kV cabling between the PV arrays, meteorological measurement station, internal access roads, workshop, office buildings, etc. No dedicated viewshed analyses have been generated for the ancillary infrastructure, as the range of visual exposure will fall within that of the PV arrays. The anticipated visual impact resulting from this infrastructure is likely to be of low significance both before and after mitigation.		
	Without mitigation	**With mitigation**
Extent	Local **(2)**	Local **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Low **(4)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	Low **(20)**	Low **(20)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	
Mitigation: Planning: » Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/power line servitude. Operations: » Maintain the general appearance of the infrastructure. Decommissioning: » Remove infrastructure not required for the post-decommissioning use. » Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.		
Residual Impacts: The visual impact will be removed after decommissioning, provided the ancillary infrastructure is removed. Failing this, the visual impact will remain.		

Nature: Visual impact on the sense of place Sense of place refers to a unique experience of an environment by a user, based on his or her cognitive experience of the place. Visual criteria, specifically the visual character of an area (informed by a combination of aspects such as topography, level of development, vegetation, noteworthy features, cultural / historical features, etc.), plays a significant role.

An impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light.

The greater environment has a rural, undeveloped character and a natural appearance. These generally undeveloped landscapes are considered to have a high visual quality, except where urban development represents existing visual disturbances.

The anticipated visual impact of the proposed PV facility on the regional visual quality, and by implication, on the sense of place, is difficult to quantify, but is generally expected to be of low significance. This is due to the relatively low viewer incidence within close proximity to the proposed development site.

	Without mitigation	**With mitigation**
Extent	Regional **(3)**	Regional **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Low **(4)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	Low **(22)**	Low **(22)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	

Mitigation:

Planning:

» Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/servitude.

Operations:

» Maintain the general appearance of the facility as a whole.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use.
» Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.

Residual Impacts:

The visual impact will be removed after decommissioning, provided the PV facility infrastructure is removed. Failing this, the visual impact will remain.

Decommissioning Phase Impacts

The visual impact will be removed after decommissioning, provided the solar facility infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.

9.9.3 Overall Result

The findings of the Visual Impact Assessment undertaken for the proposed 400MW PV facility is that the visual environment surrounding the site, especially within a 1 - 3km radius, may be visually impacted during the anticipated operational lifespan of the facility (i.e. a minimum of 20 years).

This impact is applicable to the individual Sun Garden PV Facility and to the potential cumulative visual impact of the facility in relation to the proposed Solaris Fields PV Facility (and the proposed WEFs), where the combined frequency of visual impact is expected be greater. The potential area of cumulative visual exposure is however still deemed to be within acceptable limits, considering the PV facilities' close proximity to each other.

The following is a summary of impacts remaining, assuming mitigation as recommended, is exercised:

» During construction, there may be a noticeable increase in heavy vehicles utilising the roads to the development site that may cause, at the very least, a visual nuisance to other road users and landowners in the area. Construction activities may potentially result in a moderate, temporary visual impact that may be mitigated to low.
» There are no homesteads within a 1km radius of the proposed PV facility. The PV facility is expected to have a moderate visual impact on observers traveling along the Beenleegte secondary road at a distance of just over 1km from the operational PV structures.
» The PV Facility is expected to have a low visual impact within the region (1 – 3km radius of the PV facility), both before and after the implementation of mitigation measures.
» The anticipated impact of lighting at the PV facility is likely to be of moderate significance, and may be mitigated to low.
» The potential visual impact related to solar glint and glare is expected to be of low significance.
» The anticipated visual impact resulting from the construction of on-site ancillary infrastructure is likely to be of low significance both before and after mitigation.
» The anticipated visual impact of the proposed PV facility on the regional visual quality, and by implication, on the sense of place, is difficult to quantify, but is generally expected to be of low significance. This is due to the relatively low viewer incidence within close proximity to the proposed development.
» The anticipated cumulative visual impact of two proposed PV facilities is expected to be of moderate significance, which is considered to be acceptable from a visual perspective. This is mainly due to the relatively low viewer incidence within close proximity to the proposed development sites.

The anticipated visual impacts listed above (i.e. post mitigation impacts) range from moderate to low significance. Anticipated visual impacts on sensitive visual receptors (if and where present) in close proximity to the proposed facility are not considered to be fatal flaws for the proposed PV facility.

Considering all factors, it is recommended that the development of the facility as proposed be supported; subject to the implementation of the recommended mitigation measures and management programme recommended within the visual impact assessment (Appendix J).

9.10. Assessment of Socio-economic Impacts

Potential social and socio-economic impacts and the relative significance of the impacts associated with the development of the Sun Garden PV Facility are summarised below (refer to **Appendix K**).

9.10.1 Description of Socio-economic Impacts

Impacts are expected to occur with the development of the Sun Garden PV Facility during the construction, operation and decommissioning phases. Both positive and negative impacts are identified and assessed.

Positive impacts during construction includes:
» Temporary stimulation of the national and local economy
» Temporary increase employment in the national and local economies
» Contribution to skills development in the country and local economy
» Temporary increase in household earnings

» Temporary increase in government revenue

Negative impacts during construction includes:
» Negative changes to the sense of place
» Temporary increase in social conflicts associated with the influx of people
» Impact on economic and social infrastructure
» Impact on property and land value in the immediately affected area during construction

Positive impacts during operation includes:
» Sustainable increase in production and GDP nationally and locally
» Creation of sustainable employment positions nationally and locally
» Skills development of permanently employed workers
» Improved standards of living for benefiting households
» Sustainable increase in national and local government revenue
» Local economic and social development benefits derived from the project's operations
» Sustainable rental revenue for farms where the solar facility is located
» Sustainable increase in electricity available for the local region and South Africa

Negative impacts during operation includes:
» Negative changes to the sense of place

9.10.2 Impact tables summarising the significance of socio-economic impacts during construction, operation and decommissioning (with and without mitigation measures)

Construction Phase Impacts

Nature: *Temporary increase in the GDP and production of the national and local economies during construction.*
The proposed Sun Garden PV Facility will cost R 3,6 billion (2020 prices) to establish. This will equate to a total impact of R 9,2 billion (direct, indirect, and induced) on production/new business sales in the country. The localised expenditure on the project will stimulate the local and national economies albeit for a temporary period of 30 months during construction.

As indicated in Table 5.1 it is estimated that the project will increase the GDP directly in the country by R 1,1 billion in 2020 prices, which will translate into a total impact of R 1,8 billion (direct, indirect, and induced) of Gross Domestic Product (GDP) (see Table 5.1). These effects will take place for the duration of construction.

The greatest effects on production and GDP stimulated during construction activities will be created through the multiplier effects, specifically through a combination of production and consumption induced effects. The former refers to the impact generated along with backwards linkages when the project creates demand for goods and services required for construction and subsequently stimulates the business sales of the suppliers of inputs that are required to produce these goods and services. The latter refers to the effects of household spending which is derived from an increase in salaries and wages directly and indirectly stimulated by the project's expenditure.

Sectors and industries that will experience the greatest stimulus from this expenditure include:

» Basic metals, structural metal products and other fabricated metal products industries
» Trade
» Insurance
» Transport services

» Electrical machinery and apparatus		
	Without enhancement	**With enhancement**
Extent	National (4)	National (4)
Duration	Short term (2)	Short term (2)
Magnitude	Medium (6)	High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	**48 (Medium)**	**56 (High)**
Status (positive or negative)	Benefit is terminated with the end of construction	Positive
Reversibility	Positive	
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	Yes (enhanced)	

Enhancement:

- » The developer should encourage the EPC contractor to increase the local procurement practices and promote the employment of people from local communities, as far as feasible, to maximise the benefits to the local economies.
- » The developer should engage with local authorities and business organisations to investigate the possibility of procuring construction materials, goods and products from local suppliers were feasible.

Residual Impacts:

None foreseen at this stage

Nature: <u>Temporary increase in employment in local and national economies</u>

The construction of the facility will create 3 116 Full Time Equivalent (FTE) employment positions over the course of the development based in South Africa (see Table 5.1). Approximately 20% of the employment positions involve skilled Black South African construction workers, with the remaining being managers, professional engineers, and supervisors. Based on estimates by Sun Garden (Pty) Ltd), it is anticipated that 60% of the FTE positions will be filled by people from local communities.

The construction sector of the Blue Crane Route Municipality is relatively small employing only 653 people in 2018 (Quantec, 2018). The area, however, is fairly close to the Nelson Mandela Bay Metro which has a significantly larger construction sector that employs approximately 19 951 people (Quantec, 2018). Given the size of the construction sector within these municipalities, it is anticipated that there will be sufficient local labour to satisfy the demand for 1 047 South African based construction workers. Furthermore, if most of the local staff comes from the Blue Crane Route Municipality it will have a positive effect on local unemployment particularly since the area experiences an unemployment rate above the provincial average.

Beyond the direct employment opportunities that will be created by the project during the construction phase, the development will also have a positive spin-off effect on the employment situation in other sectors of the national and local economies. Through the procurement of local goods (i.e., consumption induced effects) the project will support an estimated total of 1 348 FTE employment positions (indirect). Most of these positions will be in sectors such as construction, business services and trade.

The expenditure on the project outside of the local economies will also have a positive effect on employment creation, albeit for a temporary period of 30 months. Through the production and consumption induced impacts the project is envisioned to create an estimated additional 721 FTE employment (induced) positions. Given that a significant portion of the multiplier effects will be generated through backward linkages, more than half of these FTE employment positions will be created along the supply chain and amongst industries providing inputs to the businesses in the supply chain.

Based on these figures the total contribution of the development towards employment creation in South Africa is estimated at 3 116 FTE employment positions. Throughout the construction phase, it is recommended that the developer encourage the EPC contractor to fill as many local positions as possible using labour from within Blue Crane Route Municipality rather than from outside of the municipal boundaries.

	Without enhancement	**With enhancement**
Extent	Regional (3)	Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	High (8)	Very High (9)
Probability	Highly probable (4)	Highly probable (4)
Significance	**52 (Medium)**	**56 (Medium)**
Status (positive or negative)	Benefit is terminated with the end of construction	Positive
Reversibility	Positive	
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	Yes (enhanced)	

Enhancement:

» Coordinate with the local municipality and relevant labour unions to inform the local labour force about the project that is planned to be established and the jobs that can potentially be applied for.
» Establish a local skills desk (in Somerset East, Riebeek East and Cookhouse) to determine the potential skills that could be sourced in the area
» Recruit local labour as far as feasible
» Employ labour-intensive methods in construction where feasible
» Sub-contract to local construction companies particularly SMMEs and BBBEE compliant enterprises where possible
» Use local suppliers where feasible and arrange with the local SMMEs to provide transport, catering, and other services to the construction crews.

Residual Impacts:

Experience gained in the construction of solar PV facilities.

Nature: *Contribution to skills development in the country and in the local economy*

The construction of the proposed Sun Garden PV Facility is likely to have a positive impact on the skills development in South Africa. During the solar panel installation period which is included as part of the construction phase and is planned to be conducted in the Eastern Cape, it is likely that foreign technical experts will be involved. This will present an opportunity for skills and knowledge transfer between these technical experts and local manufacturers.

It is also expected that the construction staff involved in the project will gain knowledge and experience in respect of the development of solar energy facilities. This will be highly beneficial given South Africa's target of generating 40 GW of solar energy by 2050 (DST, DOE, 2014). More skilled local construction staff would most likely also lower the cost of future solar projects in the province. Since it is estimated that 60% of the construction workers will be from local communities, these workers will probably be able to utilise these new skills over the long run, in other developments proposed in the local area.

In addition to the direct effects of the project on skills development in the country and the local economy, the project could contribute to the development of the local research and development (R&D) and manufacturing industries associated with solar technology. This could be achieved through partnerships with Rhodes University (situated in the Blue Crane Route Local Municipality) or the Nelson Mandela University (NMU) in Port Elizabeth. Partnerships of this nature could further enhance the development of new skills and expertise.

	Without enhancement	**With enhancement**
Extent	Regional (3)	Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Moderate (6)

Probability	Probable (3)	Highly Probable (4)
Significance	**33 (Medium)**	**44 (Medium)**
Status (positive or negative)	No	Positive
Reversibility	No	
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	Yes (enhanced)	

Enhancement:
- Facilitate knowledge and skills transfer between foreign technical experts and South African professionals during the pre-establishment and construction phases.
- Set up apprenticeship programmes to build onto existing skill levels or develop new skills amongst construction workers, especially those from local communities.
- Facilitate broader skills development programme as part of socio-economic development commitments.

Residual Impacts:
- South Africa's human capital development.
- Improved labour productivity and employability of construction workers for similar projects.
- Possible development of local skills and expertise in R&D and manufacturing industries related to solar technology through partnerships with Rhodes University and NMU.

Nature: *Temporary improvement of the standard of living of the positively affected households.*

The proposed solar energy facility will create an estimated total of 3 116 South African based FTE employment positions during construction generating R 1,2 billion of revenue for the affected households locally and around the country through direct, indirect, and induced effects. Of this figure R 475 million will be paid out in the form of salaries and wages to those individuals directly employed during the construction phase. The remaining R 748 million in households' earnings will be generated through indirect and induced effects resulting from project expenditure. Given the average household size in the Blue Crane Route Local Municipality and Eastern Cape is 3,7 and 3,9 respectively, a total of between 5 169 and 5 448 people are likely to benefit from the employment positions created and the income derived through these 1 047 FTE employment positions.

Although temporary, this increase in household earnings will have a positive effect on the standard of living for these households. This is especially applicable to the households benefitting from the project that resides in the Blue Crane Route Municipality and broader Eastern Cape.

	Without enhancement	**With enhancement**
Extent	Regional (3)	Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	High (8)
Probability	Probable (3)	Highly Probable (4)
Significance	**33 (Medium)**	**52 (Medium)**
Status (positive or negative)	Positive	Positive
Reversibility	Benefit is terminated with the end of construction	
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	Yes (enhanced)	

Enhancement:
- Recruit local labour as far as feasible to increase the benefits to the local households.
- Employ labour-intensive methods in construction where feasible.
- Sub-contract to local construction companies where possible.
- Use local suppliers where feasible and arrange with local SMMEs and BBBEE compliant enterprises to provide transport, catering, and other services to the construction crews.

Residual Impacts:
- Possible increase of households' saving accounts.
- Improved standard of living of the affected households.

Nature: _Temporary increase in government revenue_ The investment in the Sun Garden PV Facility will generate revenue for the government during the construction period through a combination of personal income tax, VAT, companies' tax etc. Additional government revenue will also be earned through corporate income tax, however since the gross operating surplus of the EPC contractor employed to construct the facility is not known, an estimate of the overall corporate income tax value is not possible at this stage. Government earnings will be distributed by the national government to cover public spending which includes amongst others the provision and maintenance of transport infrastructure, health, and education services as well as other public goods.		
	Without enhancement	**With enhancement**
Extent	National (4)	National (4)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	**40 (Medium)**	**40 (Medium)**
Status (positive or negative)	Positive	Positive
Reversibility	Benefit is terminated with the end of construction	
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: » None suggested		
Residual Impacts: None envisioned		

Nature: _Impact on the sense of place of the region_

The area proposed for the Solar Energy Facility development as well as its surrounds does not currently have any large-scale industries or high-rise buildings, however, the proposed development site of the PV facility is in close proximity to the N10 National Road. Noise and light intrusion during the night in the area is notable. Visitors and inhabitants to directly affected farms would already be familiar with recently constructed WEFs in the broader municipal area, these being the Cookhouse Wind Farm, Amakhala Emoyeni Wind Farm, Nojoli Wind Farm, Golden Valley Wind Farm and Nxuba Wind Farm. Given the above-described agricultural characteristics, the area can be defined as being largely rural.

During the construction of the proposed solar energy facility, there are likely to be noise and dust impacts caused by the movement of vehicles as well as construction activities on site. These impacts are anticipated to occur primarily during the day with illumination from the site being experienced during the night. The presence of this noise is likely to alter the way the surrounding environment is experienced by households in the area. As construction activities progress and the footprint of the facility grows, the visual impact will also become more apparent, and the sense of place experienced by households residing within the visually affected area will be altered further.

It is anticipated that residents residing on the farms on which solar PVs are proposed to be established will experience the greatest disruption in their sense of place during the construction period. Individuals who live on the surrounding farms will, over the course of the construction phase of the project, be subjected to either visual or noise disruptions that are currently not present in the area.

The anticipated visual impact of the proposed PV facility on the regional visual quality, and by implication, on the sense of place, is difficult to quantify but is generally expected to be of low significance. This is due to the relatively low viewer incidence within close proximity to the proposed development site (LOGIS, 2021b).

As stated, the sense of place of local residents is likely to begin to be altered once the construction of the proposed facility begins. Visual impacts will, however, remain for the entire operation of the development (This is discussed in more detail in Section 6.1.2). This means that although the effect on the sense of place could be relatively small considering the population to be affected, the duration of the impact increases it significantly. It is advisable that all efforts be made to address the factors that will affect an individual's sense of places such as visual effects and noise pollution to make them less intrusive.

Engagements undertaken by Urban-Econ with the neighbouring property owners that fall within the impact area revealed that they have not expressed any resistance to the development from a visual perspective. There are also very few visitors and no tourists that stay on the adjacent properties who will experience the diminishing value in the sense of place.

	Without mitigation	**With mitigation**
Extent	Local **(1)**	Local **(1)**
Duration	Short term **(2)**	Short term **(2)**
Magnitude	Low **(4)**	Low **(4)**
Probability	Probable **(3)**	Probable **(3)**
Significance	Low **(21)**	Low **(21)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	

Mitigation:

Planning:

» Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/servitude.

Operations:

» Maintain the general appearance of the facility.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use.
» Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.

Residual Impacts:

The visual impact will be removed after decommissioning, provided the PV facility infrastructure is removed. Failing this, the visual impact will remain

Nature: *Temporary increase in social conflicts associated with the influx of construction workers and job seekers to the area*

Neither the Blue Crane Route nor the surrounding municipalities are sufficiently diversified to supply the entire workforce for the construction of the proposed solar energy facility, particularly in terms of skilled positions. A significant number of the unskilled and semi-skilled workers required during the construction phase will however be sourced locally. It is estimated that up to 60% of jobs that will be created during the construction phase could be filled by labour coming from the local municipalities and the nearby communities located outside of its boundaries. In addition, given the scale and extent of the development, the project is likely to attract job seekers from other parts of the country, particularly from within the Eastern Cape. This would be in addition to the migrant workers contracted to work on the project.

The migration of people to the area could result in social conflicts between the local population and the migrant work force as the local population could perceive these migrant workers as "stealing" their employment opportunities. Likewise, the influx of people into the area, could potentially lead to a temporary increase in the level of crime, illicit activity and possibly a deterioration of the health of the local community through the spread of infectious diseases. Semi-skilled and unskilled construction workers could also choose to remain in the area following the completion of

the construction phase. Without any form of income these individuals run the risk of exacerbating the level of poverty within Blue Crane Route. Aside from the broader community issues the increase in the number of people in the area is likely to have an adverse effect on crime levels, incidents of trespassing, development of informal trading and littering. There is also potentially a likelihood of increased stock theft. The influx of job seekers and the potential social conflicts that can arise with in-migration of temporary workers to an area is difficult to mitigate. Appropriate awareness campaigns and strict adherence to recruiting practices could, however, reduce the extent of the adverse effect. Addressing the challenges related to potential social impacts is best done in partnership with all stakeholders in the area, specifically the affected and adjacent property owners, local communities, ward communities and municipalities. This would promote transparency; information sharing and help build good relationships between all affected parties. In addition, all opportunities that would include the community in the project should be explored and where possible implemented. Employment opportunities, including the provision of ancillary services, are particularly relevant in this incidence as the creation of employment opportunities for locals could eliminate the potential alienation between the community and the project as well as migrant workers. The developer has indicated that staff accommodation would be constructed to accommodate the staff who will be constructing the solar energy facility. Accommodation will allow the staff the remain separate from the broader community which may decrease social conflicts associated with the influx of the workers.		
	Without mitigation	**With mitigation**
Extent	Regional (3)	Regional (3)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Improbable (2)
Significance	**36 (Medium)**	**18 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversibility within a short period	
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: » Set up a recruitment office in the nearby towns (i.e., Cookhouse, Riebeek East, Somerset East) and adhere to strict labour recruitment practices that would reduce the desire of potential job seekers to loiter around the properties in the hope of finding temporary employment » Employ locals as far as feasible through the creation of a local skills database » Establish a management forum comprising key stakeholders to monitor and identify potential problems that may arise due to the influx of job seekers to the area » Ensure that any damages or losses to nearby affected farms that can be linked to the conduct of construction workers are adequately reimbursed » Assign a dedicated person to deal with complaints and concerns of affected parties » The construction of on-site accommodation will likely mitigate some social conflicts from taking place. The developer should, however, organise appropriate transport for the workers from the site to the nearest towns in order to access services or to buy goods. This will reduce the amount of time the staff spend walking to or from the site.		
Residual Impacts: » Contribution towards social conflicts in the area by construction workers and job seekers who decide to stay in the area after construction is complete and who are unable to find a sustainable income.		

Nature: *<u>Added pressure on economic and social infrastructure during construction as a result of increase in local traffic and in migration of construction workers</u>* The proposed solar energy facility will create and estimated 3 116 FTE employment positions for the duration of the project. Given that these workers will require services there is likely to be an increase in the demand for social services, access to water and electricity. According to the Blue Crane Route Local Municipality's IDP (2020) there are six (6) clinics, one (1) hospital, and one (1) mobile clinic in the municipal area. There is also a clinic situated in Riebeek East. Given the proximity of the development site to Cookhouse and Somerset East, it is most likely that the health facilities in the area will experience additional demand for medical services brought about by the influx of works and job seekers. Access to water can sometimes be a significant concern in the area, although in general there the area is supplied with water. The supply of electricity can sometimes be erratic as well. If a construction camp is established to accommodate workers there will be a need for additional water and electrical connections for both the camp as well as the site office. These connections will, however, be minimal and it is unlikely to alter the demand significantly. The effects of the project on road infrastructure should also be considered as it is highly likely that the development will lead to an increase in traffic volumes on surrounding roads. This could lead to a significant deterioration of local road conditions, specifically the N10 National Route, R355 and R400 regional road, the latter of which is already in a poor state of repair. The deterioration of these roads could place additional financial burdens on the municipality through additional maintenance costs. Additional traffic volumes are also likely to impact the condition of secondary roads used to access surrounding farms. The deterioration of secondary roads could add additional operating costs to farmers in the area due to delays in deliveries and damage to vehicles. Based on the above discussion it is expected that the basic service provision, health facilities and road infrastructure will be under additional strain during the construction period. Given that the project is anticipated to attract additional people to the area the significance of the impact is considered to be low. These impacts can however be mitigated if the developer engages with the local municipalities and plans accordingly. It is not expected that there will be significant impact on housing and accommodation as the developer has indicated that staff accommodation will be constructed to accommodate the workers for the duration of the construction phase of the project.		
	Without mitigation	**With mitigation**
Extent	Regional (3)	Regional (3)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Highly probable (4)	Probable (3)
Significance	**36 (Medium)**	**21 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible within a short period	
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Provide adequate signage along the N10, R355 & R400 to warn motorists of the construction activities taking place on the site. » Engage with local authorities and inform them of the development as well as discuss with them their ability to meet the additional demands on social and basic services created by the in migration of workers. » Where feasible, assist the municipality in ensuring that the quality of the local social and economic infrastructure does not deteriorate through the use of social responsibility allocations.		
Residual Impacts: Further eroding of economic infrastructure and social services in the region which may not be suited to a large number of people utilising them at one time.		

Operation Phase Impacts

Nature: *Sustainable increase in production and GDP nationally and locally* The proposed facility will require an annual operational expenditure of R 334 million over 25 years. The total impact on production in the country as a result of the project's operations will equate to R 120,6 million per annum in 2020 prices for the 25 years. Aside from the utilities sector, industries that will experience the greatest stimulus from the project will include electrical machinery and apparatus, insurance, trade, transport service and chemical production industry. It is estimated that the project will generate R 150,4 million of value add per year over the 25-year period (comprising gross operating surplus before taxes and labour) and taxes. Through indirect and induced effects, an additional R 67,4 million of GDP will be generated per annum, which means that the total impact of the project on the national GDP will equate to R 334,4 million per annum in 2020 prices. The production and consumption induced multiplier effects of the project are considered to be relatively small compared to conventional electricity generating industries. This is because the energy source used to produce electricity by the proposed solar energy facility is free, unlike conventional power stations where raw inputs (i.e., coal) and the transport therefore comprise a significant portion of operating expenditure. It is for this reason that such a facility is a highly attractive business venture. In addition to the positive production and GDP impacts arising from expenditure related to the operation of the PV facility, the local economy is anticipated to be positively stimulated by expenditure related to the developer's intended socio-economic development contributions in the immediate area. The contribution to the Blue Crane Route Municipality although small relative to the combined size of the municipality's economy will nevertheless be positive and more importantly, a sustainable contribution.		
	Without enhancement	**With enhancement**
Extent	National (4)	National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (5)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	**52 (Medium)**	**56 (Medium)**
Status (positive or negative)	Positive	Positive
Reversibility	Benefits are sustained only over project's lifespan	
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	Yes (enhanced)	
Enhancement: » The operator of the solar energy facility should be encouraged to, as far as possible, procure materials, goods and products required for the operation and maintenance of the facility from local suppliers to increase the positive impact in the local economy.		
Residual Impacts: None foreseen at this stage		

Nature: *Creation of sustainable employment positions nationally and locally* The proposed facility will create an estimated 50 permanent employment positions across the operational phase of the development which, will be retained for approximately 25 years. Of these, an estimated 50 will be South African based positions. It is envisaged that 75% of the skilled and low skilled staff will be employed from within the local area with the remaining staff being sourced from other parts of the Eastern Cape and the country. This means that approximately 7,5 out of 10 positions are expected to be filled by local labour, which is a small but positive contribution towards addressing the high unemployment rates observed in both the Blue Crane Route and the Eastern Cape. Aside from the direct employment opportunities, the facility will support an estimated 13 FTE employment positions created through the production and consumption indirect and induced effects. Due to the spatial allocation of

procurement spending and direct employment created, most of the indirect and induced positions will also be created within the local area. The trade, agriculture and community and personal services sectors will benefit the most from these new employment opportunities. In addition to the planned employment creation during operation and maintenance of the PV facility, the developer intends to make a positive contribution to employment opportunities in other non-solar related industries.		
	Without enhancement	**With enhancement**
Extent	Mostly local or regional (4)	Mostly local or regional (4)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (4)	Moderate (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	**48 (Medium)**	**48 (Medium)**
Status (positive or negative)	Positive	Positive
Reversibility	Benefits are sustained only over project's lifespan	
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	Yes (enhanced)	
Enhancement: » Where possible, local labour should be considered for employment so as to increase the positive impact on the local economy » As far as possible, local small and medium enterprises should be approached to investigate the opportunities for supply inputs required for the maintenance and operation of the facility.		
Residual Impacts: Experience in operating and maintaining a solar energy facility.		

Nature: Skills development of permanently employed workers South Africa has a number of large-scale solar energy facilities with a large proportion located in the Eastern Cape and the Blue Crane Route. It is thus assumed that the skills base to operate and maintain such facilities should be readily available in the province. It is, however, likely that highly skilled personnel would need to be recruited from outside of the Blue Crane Route Municipality as the economy would not be diversified enough to attract such specialists. These employees would include skilled "mechatronics" engineers (specialised in both electrical and mechanical engineering) likely to be recruited from the Nelson Mandela Bay Metro. Maintenance will be carried out throughout the lifetime of the solar PV facility. A maintenance schedule usually involves an initial inspection after commissioning, semi-annual inspection, an annual inspection and two- and five-year inspections but this varies according to the turbine. Typical activities during maintenance include changing of oil, replacement of brake linings and cleaning of components.		
	Without enhancement	**With enhancement**
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Definite (5)
Significance	**44 (Medium)**	**55 (Medium)**
Status (positive or negative)	Positive	Positive
Reversibility	No	
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	Yes (enhanced)	
Enhancement: » The developer should consider establishing vocational training programmes for the local labour force to promote the development of skills required by the solar energy facility and thus provide for the opportunities for these people to be employed in other similar facilities elsewhere in the future.		
Residual Impacts:		

Human capital development of the affected workers

Nature: *<u>Improved standard of living for benefitting households</u>* The creation of an estimated 50 FTE employment positions throughout the country will generate R 92,0 million of personal income (2020 prices), which will be sustained for the entire duration of the project's lifespan. Given the average household size in affected local municipalities and nationally, this increase in household earnings will support up to 185 people. The sustainable income generated as a result of the project's operation will positively affect the standard of living of all benefitting households. This is specifically applicable to the Blue Crane Route Municipality, as the average income per employee at the facility would far exceed the average household income within these municipalities.		
	Without enhancement	**With enhancement**
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (5)	Moderate (6)
Probability	Probable (4)	Probable (4)
Significance	**48 (Medium)**	**52 (Medium)**
Status (positive or negative)	Positive	Positive
Reversibility	Benefits are sustainable only over project's lifespan	
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	Yes (enhanced)	
Enhancement: » Where possible, the local labour supply should be considered for employment opportunities to increase the positive impact on the area's economy » As far as feasible, local small and medium enterprises should be approached to investigate the opportunities for supply inputs required for the maintenance and operation of the facility.		
Residual Impacts: None foreseen at this stage		

Nature: *<u>Sustainable increase in national and local government revenue</u>* The proposed facility will, through property taxes and salaries and wages payments, contribute towards both local and national government revenue. At a local level, the project will contribute to local government through payments for utilities used in the operation of the facility. It will also increase its revenue through an increase in property taxes compared to the current level. Given that the Blue Crane Route Municipality has a relatively small economy and considering the low rates base derived by the municipality (Blue Crane Route, 2020), any additional income would greatly benefit the municipality. On a national level, the revenue derived by the project during its operations, as well as the payment of salaries and wages to permanent employees will contribute to the national fiscus. Although it is impossible to trace exactly how such revenue is allocated, any additional revenue generated means that national governments can increase its spending on public goods and services.		
	Without enhancement	**With enhancement**
Extent	National (4)	National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	**48 (Medium)**	**48 (Medium)**
Status (positive or negative)	Positive	Positive

Reversibility	Benefits are sustained only over project's lifespan	
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: » None suggested		
Residual Impacts: None foreseen at this stage		

Nature: *Local economic and social development benefits derived from the project's operations* The proposed Sun Garden PV Facility will make a notable contribution to poverty and social and community development in the area. The developer has pledged that 2.5% of the gross annual revenue will be dedicated to socio-economic and economic development initiatives for the duration of operation of the solar facility. Thus, this revenue share of the project can subsequently be utilised for local social and economic development projects. Since the community has not yet been selected, it is not possible to quantify the number of households that will be direct beneficiaries of the project at this stage. Furthermore, the social and economic development plan will prioritise numerous local welfare projects and community development initiatives that will be directed at uplifting local people and improving their standards of living. The developer has indicated that of the 2.5% of revenue that will be directed at socio-economic and economic development initiatives, 0.5% will be allocated to the Just Energy Transition, will the remaining 2% will be for normal SED projects and initiatives. Given the electricity generation potential of this project the annual SED contribution of the developer is expected to amount to R19,05 million.		
	Without enhancement	**With enhancement**
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly probable (4)	Definite (5)
Significance	**52 (Medium)**	**65 (High)**
Status (positive or negative)	Positive	Positive
Reversibility	Benefits could stretch beyond project's lifespan	
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	Yes (enhanced)	
Enhancement: » A social development and economic development programme should be devised by the developer and implemented throughout the project's lifespan. » The plan should be developed in consultation with local authorities and local communities to identify community projects that would result in the greatest social benefits. » These plans should be reviewed on an annual basis and, where necessary, updated. » When identifying enterprise development initiatives, the focus should be on creating sustainable and self-sufficient enterprises. » In devising the programmes to be implemented, the developer should take into account the local Integrated Development Plans and Local Economic Development Strategy (Blue Crane Route, 2020).		
Residual Impacts: None foreseen at this stage		

Nature: *Sustainable rental revenue for farms where the solar facility is located* It is anticipated that farms where the solar PVs are located on will enter into a rental agreement with the developer, in the case of this project it will include the owners of Blitzkraal Farm. The owners will likely thus receive rental revenue

as a result of hosting the solar PVs on their property. The revenue that the owners of the properties receive will have a positive impact on the local economies especially if spent in the local area. This revenue is also likely to assist local property owners in dealing with economic shocks to their current business activities such as drought or unfavourable economic conditions that currently prevail. The revenue generated from the rental of land for the solar PVs will additionally assist farmers in investing in new technologies to improve the efficiencies of their current agricultural practices and allow farmers to better compete in the open market. While these impacts are notably only for those farms who have solar PVs located on their properties, the impact of additional revenue is likely to be very significant to those impacted. The owners, with the additional rental revenue are intending to explore options to diversify their farming activity and move into more intensive forms of agricultural activity, producing niche products for the regional market. Their intention is to retain all existing labour on the farm, and hopefully increase employment numbers when the need arises.		
	Without enhancement	**With enhancement**
Extent	Site (1)	Site (1)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Definite (5)	Definite (5)
Significance	**35 (Medium)**	**35 (Medium)**
Status (positive or negative)	Positive	Positive
Reversibility	Benefits could stretch beyond project's lifespan	
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: » None suggested		
Residual Impacts: None foreseen at this stage		

Nature: <u>*Sustainable increase in electricity available for the local region and South Africa*</u> The development of the solar PV facility will lead to a sustainable increase in the supply of electricity for the country. For this specific project, the generated electricity will be supplied to private off-takers, this making available additional Eskom supplied power to existing or new customers. It was noted in section 3 that lack of electricity and load shedding has had a notable impact on the economy of the country and is one of the reasons stated by foreign investors for the lack of investment in the country. With an improved supply of power to industry, there is likely to be an improvement in the economy as a whole. It should be noted that while this solar PV facility alone is unlikely to make a large impact in the shortages of electricity in the country, the cumulative impact of all the proposed solar PV facility products in the region will be substantial. The combined energy production for the solar PVs planned for the area will be approximately 400MW which begins to reflect a notable positive injection into the energy generation capacity from the region.		
	Without enhancement	**With enhancement**
Extent	National (4)	National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Definite (5)	Definite (5)
Significance	**50 (Medium)**	**50 (Medium)**
Status (positive or negative)	Positive	Positive
Reversibility	Benefits during projects lifespan only	
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: » None suggested		

Residual Impacts:
None foreseen at this stage

Nature: _Impact on the sense of place experienced by the local community as a result of visual effects that appear during the operation phase_ The effects on the community's sense of place will initially be felt during the construction period and will continue into the operational phase. However, the literature review carried out in Section 6.1.2 highlighted that solar farm impact on the local communities' sense of place is generally considerably greater during the pre-construction stage than during operations. Given the proximity of the PV development site to the N10, noise and visual disturbances are already common in the area, as a result the sense of place changes are not anticipated to be significant. Given that the immediate area that is expected to experience visual impacts does not contain any tourism accommodation or hospitality facilities, the change in sense of place is not expected to result in any material change to economic activity and revenue currently derived by directly and indirectly affected properties.		
	Without mitigation	**With mitigation**
Extent	Regional **(3)**	Regional **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Low **(4)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	Low **(22)**	Low **(22)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	
Mitigation: Planning: » Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/servitude. Operations: » Maintain the general appearance of the facility. Decommissioning: » Remove infrastructure not required for the post-decommissioning use. » Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.		
Residual Impacts: The visual impact will be removed after decommissioning, provided the PV facility infrastructure is removed. Failing this, the visual impact will remain.		

Decommissioning Phase Impacts

Upon the expiry of the Sun Garden PV Facility lifespan, the facility would need to be disbanded, although the facility would likely be upgraded in order to maintain and prolong the lifespan of the facility.

If the facility is decommissioned, the land will be rehabilitated in order to return it to pre-project conditions. This also means that all impacts whether positive or negative, which take place during the operational phase will cease to exist. At the same time spending on the disassembly of the components and rehabilitation of land will increase the demand for construction services and other industries, thus stimulating economic activity in the local area, albeit over a temporary period.

Socio-economic impacts stimulated during the decommissioning phase are expected to be similar to those that took place during the construction phase. They will also be temporary in nature, but most likely will take a much shorter time than the construction phase. They will also be associated with some expenditure, although it will be considerably less than the investment required during the development phase. Besides the positive impacts on production, employment, household income and government revenue that could ensue from the project, some negative impacts could also occur. These would largely be related to a slight increase in noise in the area surrounding the site, increase in traffic congestion on the N10, R355 and R400 and concerns over local safety and security due to a greater number of people accessing the area.

All of the positive impacts can be enhanced to increase the benefits to the local communities, while the negative impacts could be mitigated. The impacts though are expected to be of low significance due to the very short duration and, therefore, of lower magnitude. Enhancement and mitigation measures proposed for the construction phase impacts would also apply to the decommissioning phase. Overall, the impact that would ensue during the decommissioning phase will mostly be of low significance and should not affect the decision regarding the proposed development.

9.10.3 Overall Result

The review of the proposed Sun Garden PV Facility is associated with both positive and negative socio-economic impacts. In order to assess whether the project is beneficial, the additions to the environment brought about by the project need to be evaluated. The additional benefits of the intervention are the difference between the reference case position (i.e., the no-go option) and the position if the intervention is implemented. It involves the evaluation of the net effect and trade-offs associated with the proposed intervention.

The assessment of the proposed facility, and its net effect from a socio-economic perspective, indicates that the project would generate greater socio-economic benefits during both the construction and operational phases than the potential losses that could occur as a result of its establishment. Stimulation of production, employment, government revenue, skills development, and household income as a result of the investment in the project and its subsequent operations will outweigh possible production, employment and household income losses that could be experienced by local businesses affected by changes in the areas aesthetic and visual resources. It should be noted though that the positive and negative impacts will be distributed mostly amongst different receptors but will not result in inequality. Adherence to the proposed mitigation measures, however, would ensure that the offset of impacts is more balanced and that it also takes into account communities and businesses that will be negatively affected.

The positive effects generated by the project will not offset many of the negative impacts. These include impacts on the sense of place and property and business values that could occur during both construction and operation, the effect on social and economic infrastructure, and crime and social conflicts in the area that could be created during only the construction phase. These impacts though will only affect local communities either temporarily or over the long term. These impacts are not highly significant and can be traded off for the net positive impact created by the project in terms of production, employment, government revenue, community benefits and households' earnings. This means that when compared with the no-go option, the proposed project is associated with greater socio-economic benefits.

Recommendations

Based on the information presented in the SEIA report, it is concluded that the net positive impacts associated with the development and operation of the proposed solar energy facility are expected to outweigh the net negative effects. The project is also envisaged to have a positive stimulus on the local economy and employment creation, leading to the economy's diversification and a small reduction in the unemployment rate. The project should therefore be considered for development. It should, however, be acknowledged that any negative impacts would be largely borne by the farms in the immediate vicinity and households residing on them, whilst the positive impacts will be largely concentrated in the local and national economies. Due to this imbalance, it is recommended that the mitigation measures suggested being strictly adhered to. Application of these mitigation measures will ensure that the negative impacts on the nearby farms and businesses are minimised and that the distribution of the potential benefits of the project are more balanced.

9.11. Assessment of Impacts on Traffic

Potential impacts on the traffic components of the affected area and the relative significance of the impacts associated with the development of the Sun Garden PV Facility are summarised below (refer to **Appendix L**).

9.11.1 Description of Traffic Impacts

The potential transport related impacts are described below.

- » Construction Phase
  - ∗ Construction related traffic
  - ∗ The construction traffic would also lead to noise and dust pollution.
  - ∗ This phase also includes the construction of roads, excavations, trenching and ancillary construction works that will temporarily generate the most traffic.
- » Operational Phase
  - ∗ During operation, it is expected that staff and security will visit the facility. Approximately twenty (20) full-time employees will be stationed on site. The traffic generated during this phase will be minimal and will not have an impact on the surrounding road network.
- » Decommissioning Phase
  - ∗ This phase will result in the same impact as the Construction Phase as similar trips are expected.

9.11.2 Impact tables summarising the significance of impacts on traffic during the construction and operation phases (with and without mitigation)

Construction Phase Impacts

Nature: Traffic congestion due to an increase in traffic caused by the transportation of equipment, material and staff to site. The number of heavy vehicles per 7MW installation is estimated to range between 200 and 300 trips depending on the site conditions and requirements. For the 400MW, the total trips can therefore be estimated to be between 8 572 and 12 858 heavy vehicle trips, which will generally be made over a 12-month construction period. Choosing the worst-case scenario of 12 858 heavy vehicles over a 12-month period travelling on an average of 22 working days per month, the resulting daily number of vehicle trips is 49.

Considering that the number of vehicle trips during peak hour traffic in a rural environment can roughly be estimated at around 20-40% of the average daily traffic, the resulting vehicle trips for the construction phase are approximately 10 - 20 trips. If the panels are imported instead of manufactured within South Africa, the respective shipping company will be able to indicate how the panels can be packed (for example using 2MW packages and 40ft containers). These can then be stored at the port and repacked onto flatbed trucks. It is assumed that during the peak of the construction period, 200 employees will be active on site. It is difficult to accurately estimate the construction traffic for the transportation of materials as it depends on the type of vehicles, tempo of the construction, source/location of construction material etc. However, it is assumed that at the peak of construction, approximately 150 construction vehicle trips will access the site per day. The impact on the surrounding road network and the general traffic is therefore deemed nominal as the 288 trips will be distributed across a 9-hour working day. The majority of the trips will occur outside the peak hours. The significance of the transport impact without mitigation measures during the construction phase can be rated as medium. However, considering that this is temporary and short term in nature, the impact can be mitigated to an acceptable level.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Definite (5)	Probable (3)
Significance	**Medium (50)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	Completely reversible	Completely reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Stagger component delivery to the site. » Stagger the construction period. » The use of mobile batching plants and quarries in close proximity to the project site would decrease the impact on the surrounding road network. » Staff and general trips should occur outside of peak traffic periods. » Regular maintenance of gravel roads by the contractor during the construction phase.		
Residual Impacts: The proposed mitigation measures for the construction traffic will result in a reduction of the impact on the surrounding road network. Traffic will return to normal levels after construction is completed		

Nature: Dust pollution due to traffic in the construction phase Construction traffic on roads will generate dust. Air quality will be affected by dust pollution		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (36)**	**Low (21)**

Status (positive or negative)	Negative	Negative
Reversibility	Completely reversible	Completely reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Dust Suppression of gravel roads during the construction phase, as required. » Regular maintenance of gravel roads by the contractor during the construction phase.		
Residual Impacts: Dust pollution during the construction phase cannot be completely mitigated but mitigation measures will significantly reduce the impact. Dust pollution is limited to the construction period.		

Nature: Noise pollution due to traffic in the construction phase Construction traffic on roads will generate noise i.e. noise pollution due to increased traffic.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (40)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	Completely reversible	Completely reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Stagger component delivery to the site. » Reduce the construction period. » The use of mobile batching plants and quarries in close proximity to the project site would decrease the impact on the surrounding road network. » Staff and general trips should occur outside of peak traffic periods.		
Residual Impacts: Noise pollution during the construction phase cannot be completely mitigated but mitigation measures will significantly reduce the impact. Noise pollution is limited to the construction period.		

9.11.3 Overall Result

The potential traffic and transport related impacts for the construction, operation and decommissioning phases of the proposed Sun Garden PV Facility were identified and assessed. The main impact on the external road network will be during the construction phase. This phase is temporary in comparison to the operational period. The number of abnormal loads vehicles was estimated and to be found to be able to be accommodated by the road network. During operation, it is expected that maintenance and security staff will periodically visit the facility. It is assumed that approximately twenty (20) full-time employees will be stationed on site. The traffic generated during this phase will be minimal and will not have an impact on the surrounding road network.

The traffic generated during the construction phase, although significant, will be temporary and impacts are considered to be negative and of medium significance before and of low significance after mitigation. The traffic generated during the decommissioning phase will be less than the construction phase traffic and the impact on the surrounding road network will also be considered negative and of medium significance before and of low significance after mitigation.

The access road and access point to the proposed site have been assessed and were found to be acceptable from a traffic engineering perspective.

The development is supported from a transport perspective provided that the recommendations and mitigations contained in this report are adhered to.

The potential impacts associated with proposed Sun Garden PV Facility and associated infrastructure are acceptable from a transport perspective and it is therefore recommended that the proposed facility be authorised.

9.12. Assessment of the 'Do Nothing' Alternative

The 'do-nothing' alternative (i.e. no-go alternative) is the option of not constructing the Sun Garden PV Facility. Should this alternative be selected, there would be no environmental impacts on the site or to the surrounding local area due to the construction and operation activities of a PV facility. All baseline information provided in this report relates to the current situation on site and in the surrounding area, and can be considered the no-go alternative. Impacts are limited to the status quo. All negative impacts, specifically related to the development of the PV facility, discussed in this report will not materialise. In addition, positive impacts identified to be associated with the project will be foregone. These are described below.

a) Land use and agriculture

The land capability of the project site indicates that the entire site is considered to be of low sensitivity. Based on the land capability and the land use suitability in terms of agriculture this includes grazing, veld, pastures and afforestation. The proposed development footprint of the Sun Garden PV Facility would allow the on-going current grazing and farming activities to continue on areas of the affected properties that will not house solar PV infrastructure. The development footprint of the Sun Garden PV Facility is ~10% of the total extent of the project site. Therefore the current land-use will be retained, while also generating renewable energy from the solar irradiation. As detailed in the SEIA (**Appendix K**), the affected landowners have indicated that the potential revenue received from rental income derived from the PV facility could be utilised to invest in solutions to mitigate challenges currently facing the agricultural industry in the surrounding area (i.e., droughts, feed prices etc). In addition, the owners are exploring options to diversify their farming activity and move into more intensive forms of agricultural activity, producing niche products for the regional market. Their intention is to retain all existing labour on the farm, and hopefully increase employment numbers when the need arises. The impact on agricultural activities as a result of the project is, therefore, expected to be low.

The implementation of the 'do-nothing' alternative would leave the land-use restricted to the current livestock grazing and limitations experienced in terms of land capability, losing out on the above-mentioned opportunities. Therefore, from a land-use perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of a viable and compatible land use. Use of the identified site for the development of the proposed solar energy facility is considered to be a preferred land use as the benefits will outweigh the impacts.

b) Socio-economic impact

Social: The impacts of pursuing the no-go alternative are both positive and negative as follows:

- The benefits would be that there is no disruption from an influx of jobseekers into the area, nuisance impacts (noise and dust during construction), visual impacts and safety and security impacts. The impact is therefore neutral.
- There would also be an opportunity lost in terms of job creation, skills development and associated economic business opportunities for the local economy, as well as a loss of the opportunity to generate energy from a renewable resource without creating detrimental effects on the environment.

Foregoing the proposed development would not necessarily compromise the development of renewable energy facilities in South Africa. However, the socio-economic benefits for local communities at this location and within the surrounding area would be forfeited. The area has experienced social challenges which has resulted in the need for socio-economic upliftment.

Therefore, from a socio-economic perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of socio-economic benefits, when considering the current socio-economic conditions of the area.

New Business: Some of the positive spin off effects that are to ensue from the project expenditure will be localised in the communities located near the site, such as the towns of Cookhouse, Riebeek East and Somerset East. The local services sector and specifically the trade, transportation, catering and accommodation, renting services, personal services and business services are expected to benefit the most from the project activities during the construction phase. New business sales that will be stimulated as a result of the establishment of the solar facility, albeit for a temporary period, will be lost with the implementation of the 'do nothing' alternative. Therefore from a business perspective, the 'do-nothing' alternative is not preferred as there is a loss of new business opportunities.

Employment: The development of the Sun Garden PV Facility within the Blue Crane Route Local Municipality will aid in a reduction of the unemployment rate, however if the solar facility is not developed then the unemployment rate will not be positively influenced by the proposed development. The upliftment and socio-economic benefits for individuals within local communities would be forfeited with the implementation of the 'do nothing' alternative. Therefore, from an employment perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of employment opportunities.

Skills development: The establishment of the Sun Garden PV Facility will offer numerous opportunities for skills transfer and development. This is relevant for both on-site activities and manufacturing activities. Various renewable energy facilities are proposed to be developed in the area and in the Eastern Cape Province, which means that the transfer of skills from foreign experts to the local engineers and construction workers will take place, similar to what has taken place where other renewable energy facilities have been constructed and operated within the Province. The skills training and transfer benefits for individuals within local communities would be forfeited with the implementation of the 'do nothing' alternative.

Municipal goals: The opportunity to contribute to the innovative energy sourcing methods as identified by the Blue Crane Route Local Municipality as per a draft policy which sets out the criteria which will enable the evaluation of renewable energy generation infrastructure to be developed in a manner that will limit the potential negative impacts thereof will not be met should the Sun Garden PV Facility not be constructed with the implementation of the 'do nothing' alternative.

The no-go alternative will therefore result in the above economic benefits not being realised and a subsequent loss of income and opportunities to local people. From this perspective the no-go alternative is not preferred.

c) Regional scale impact

At a broader scale, the benefits of additional capacity to the electricity grid and those associated with the introduction of renewable energy would not be realised. Although the Sun Garden PV Facility is only proposed to contribute a contracted capacity of up to 400MW to the grid capacity, this would assist in meeting the electricity demand for the relevant private off-takers and would also assist in meeting the government's goal for renewable energy and the energy mix. The generation of electricity from renewable energy resources offers a range of potential socio-economic and environmental benefits for South Africa. These benefits include:

» Increased energy security;
» Resource saving (i.e. fossil fuels and water);
» Exploitation of South Africa's significant renewable energy resource;
» Pollution reduction;
» Climate friendly development;
» Support for international agreements;
» Employment creation;
» Acceptability to society; and
» Support to a new industry sector.

At present, South Africa is some way off from fully exploiting the diverse gains from renewable energy and from achieving a considerable market share in the renewable energy industry. South Africa's electricity supply remains heavily dominated by coal-based power generation, with the country's significant renewable energy potential largely untapped to date.

The Integrated Resource Plan (IRP) (2019) provides for the development of 6 000MW of capacity from large scale solar energy facilities by 2030. The IRP essentially drives the assortment of energy to be implemented for South Africa which is known as the energy mix of the country, considering various generation technologies.

9.12.1 Conclusion

The no-go is the continuation of the existing land use, i.e. maintain the status quo. As detailed in the sections above, there would be no environmental impacts on the site or to the surrounding local area due to the construction and operation activities of a solar facility with the implementation of this alternative. All negative impacts, specifically related to the development of the solar facility, discussed in this report will not materialise.

The 'do-nothing' alternative will do little to influence the renewable energy targets set by government. However, as the project site experiences ample solar resource and optimal grid connection opportunities are available, not developing the Sun Garden PV Facility would see such an opportunity being lost. As current land use activities can continue on the site once the project is operational, the loss of the land to this project during the operation phase (less than 2% of the larger project site) is not considered significant. In addition, the Eastern Cape Province will not benefit from additional generated power being evacuated directly into the Province's grid. Therefore, from a regional perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of benefits for the regional area.

From the specialist studies undertaken, no environmental fatal flaws were identified to be associated with the Sun Garden PV Facility. Visual impacts remain high, but this is not considered as a fatal flaw by the specialist. All impacts associated with the project can be mitigated to acceptable levels. If the solar facility is not developed the following positive impacts will not be realised:

» Job creation from the construction and operation phases.
» Economic benefit to participating landowners due to the revenue that will be gained from leasing the land to the developer.
» Meeting of energy generation mix in a most economic and rapid manner.
» Provision of clean, renewable energy in an area where it is optimally available.

As detailed above, the 'do-nothing' alternative will result in a number of lost opportunities. The 'do nothing' alternative is therefore not preferred and not proposed to be implemented for the development of the Sun Garden PV Facility.

CHAPTER 10: ASSESSMENT OF POTENTIAL CUMULATIVE IMPACTS

As identified and assessed in Chapter 9, a solar PV development may have effects (positive and negative) on natural resources, the social environment and on the people living in a project area. The preceding impact assessment chapter has reported on the assessment of the impacts associated with the Sun Garden PV Facility largely in isolation (from other similar developments).

The Sun Garden PV Facility falls within the Cookhouse REDZs which has been identified by the DFFE as an area highly suitable for commercial scale wind and solar developments given a range of factors considered. Therefore, DFFE envisages dealing with multiple renewable energy applications and cumulative issues within a REDZ area. The REDZ are of strategic importance for large scale wind and solar photovoltaic development, in terms of Strategic Integrated Project (SIP) 8. These zones are considered to be areas where significant negative impacts on the environment are limited and socio-economic benefits to the country can be enhanced. Multiple renewable energy projects (wind) within the area have been successfully bid under the DMRE's REIPPP programme and are already operational. The Sun Garden PV Facility will contribute to the cumulative impact associated with renewable energy developments experienced within the area.

This chapter assesses the potential for the impacts associated with the project to become more significant when considered in combination with the other operating or proposed renewable energy projects within the area.

10.1. Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 1: Content of basic assessment reports:

Requirement	Relevant Section
3(j)(i) an assessment of each identified potentially significant impact and risk, including cumulative impacts.	The cumulative impacts associated with the development of the Sun Garden PV Facility are included and assessed within this chapter.

10.2 Approach taken to Assess Cumulative Impacts

The cumulative impacts that have the potential to be compounded through the development of the solar PV facility and its associated infrastructure in proximity to other similar developments include impacts such as those listed below. The role of the cumulative assessment is to confirm if such impacts are relevant to the Sun Garden PV Facility within the project site being considered for the development. This assessment considers whether the cumulative impact will result in:

- » Unacceptable loss of threatened or protected vegetation types or species through clearing, resulting in an impact on the conservation status of such flora or ecological functioning;
- » Unacceptable loss to sensitive aquatic features;
- » Unacceptable risk to avifauna through habitat loss, avoidance and displacement;
- » Unacceptable risk to bats through loss of habitat or infringement on roosting or breeding areas;

- Unacceptable loss of high agricultural potential areas presenting a risk to food security and increased soil erosion;
- Complete or whole-scale change in sense of place and character of an area and unacceptable visual intrusion;
- Unacceptable loss of heritage resources;
- Unacceptable negative socio-economic impact; and
- Unacceptable impact to the traffic network.

Further to the above, positive cumulative impacts are also expected and will be associated with socio-economic aspects and benefits.

Figure 10.1 indicates the location of the Sun Garden PV Facility in relation to all other operating and proposed renewable energy facilities located within the surrounding area of the project site. These projects were identified using the DFFE Renewable Energy Database and current knowledge of projects operating and being proposed in the area. For the assessment of cumulative impacts, developments within 30km radius from the Sun Garden PV Facility were considered. (**Figure 10.2**). This is in line with the DFFE's requirements.

In the case of the Sun Garden PV Facility, there are several wind farms located within a 30km radius of the project site and one other solar facility. These are listed in Table 10.1 and illustrated in **Figure 10.1**. At the time of writing this BA report some facilities were still in process of obtaining Environmental Authorisation and other facilities already operational. The potential for cumulative impacts is summarised in the sections which follow and have been considered within the specialist studies (refer to **Appendices D – L**).

Table 10.1: Renewable energy developments located within the broader area (within a 30km radius) of the Sun Garden PV Facility project site

Project Name	Location from the Sun Garden PV Facility project site	Project Status
Cookhouse WEF	33km to the north-east	Operational
Amakhala Emoyeni WEF	16km to the north-east	Operational
Nxuba WEF	32km to the north-east,	Operational
Nojoli WEF	27km to the north-east	Operational
Golden Valley Phase 1	11km to the north-east	Operational
Golden Valley Phase 2	11km to the north-east	Authorised
Msengi Emoyeni WEF	35km to the north-east	Authorised
Izidluli Emoyeni WEF	35km to the north-east	Authorised
Highlands WEF (x3 facilities)	40km to the north-west	Authorised
Aeoulus WEF	4km to the south	In process
Hamlett WEF	8km to the north	In process
Ripponn WEF	3km to the north	In process
Redding WEF	2km to the east	In process
Solaris Fields PV Facility	Immediately adjacent to the east	In process

It should be noted that not all the renewable energy developments presently under consideration by various renewable energy developers will be built for operation. Not all proposed developments will be granted the relevant permits by the relevant authorities (DFFE, DMRE, NERSA and Eskom) and this is because of the following reasons:

» There may be limitations to the capacity of the existing or future Eskom grid;
» Not all applications will receive a positive environmental authorisation;
» There are stringent requirements to be met by applicants in terms of the REIPPP Programme and a highly competitive process that only selects the best projects;
» Not all proposed projects will be viable because of lower renewable resources on some sites;
» Not all proposed projects will be able to reduce the associated negative impacts to acceptable levels or be able to mitigate the impacts to acceptable levels (fatally flawed);
» Not all proposed facilities will eventually be granted a generation license by NERSA and sign a Power Purchase Agreement with Eskom; and
» Not all developers will be successful in securing financial support to advance their projects further.

As there is uncertainty whether all the above-mentioned projects will be implemented, it is also difficult to quantitatively assess the potential cumulative impacts. The cumulative impacts of other known facilities in the broader area and the Sun Garden PV Facility are therefore qualitatively assessed in this Chapter.

It is important to explore the potential for cumulative impacts on a quantitative basis as this will lead to a better understanding of these impacts and the potential for mitigation that may be required. The scale at which the cumulative impacts are assessed is important. For example, the significance of the cumulative impact on the regional or national economy will be influenced by renewable energy developments throughout South Africa, while the significance of the cumulative impact on visual amenity may only be influenced by renewable energy developments that are in closer proximity to each other, e.g., up to 30km to 50km apart. For practical purposes a sub-regional scale of 30km has been selected for this cumulative impact evaluation.

In the sections below a summary of the potential for a cumulative impact resulting from several renewable energy developments within a 30km radius of the Sun Garden PV Facility are explored (refer also to the specialist reports contained in **Appendix D** to **L**). Impacts are assessed accordingly in terms of the proposed project in isolation and the impact considering other projects within the area or the cumulative impact with and without mitigation, as was deemed relevant by the specialist. The approach taken by the various specialists in assessing cumulative impacts is informed by the scale at which the impact is likely to occur.

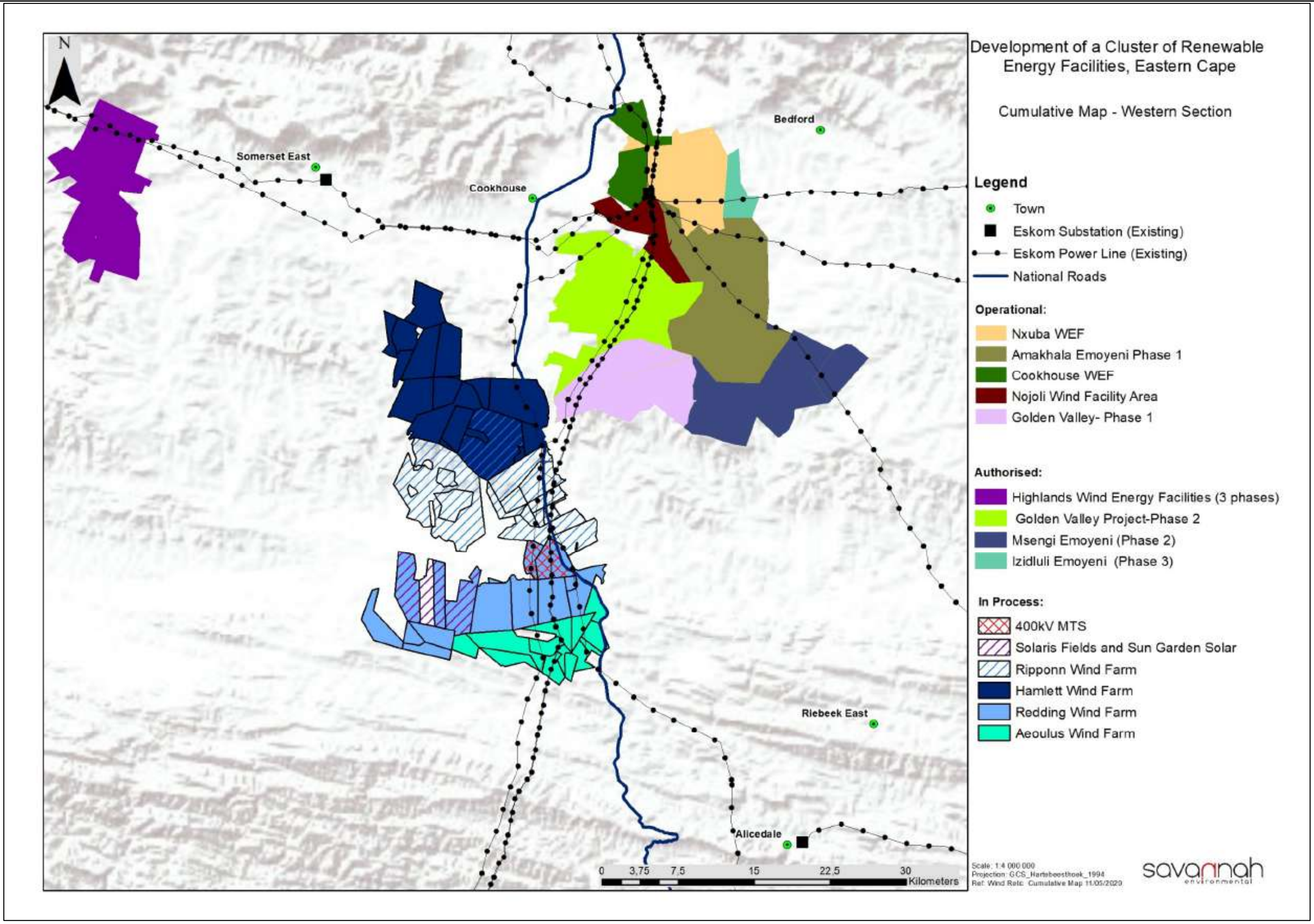

Figure 11.1: Renewable energy projects located within the surrounding area of the Sun Garden PV Facility project site that are considered as part of the cumulative impact assessment

10.3 Cumulative Impacts on Ecological Processes

From an ecological perspective the development will contribute to cumulative impacts on habitat loss and fragmentation in the area and potentially the ability to meet future conservation targets. In addition, the presence of the PV Facility and daily operational activities at the site may deter certain species from the area, resulting in a loss in broad-scale landscape connectivity.

In terms of existing impacts in the area, there is a cluster of wind farms east of Cookhouse, with an approximate footprint of 600ha. In addition, there are also numerous approved but not built facilities which generally lie adjacent to the existing operational facilities. The exception is the Highlands Wind Energy Facility which lies to the west of Somerset East and is already authorised. The planned facilities would have a footprint of approximately 500ha. Apart from the above facilities, the current suite of projects would include the adjacent Redding WEF as well as an additional 4 planned projects (3 wind farms and an MTS). The total footprint of these facilities would be approximately 100 ha each for the wind farms and 40ha for the MTS. Thus, in terms of total impact, all built and planned projects would amount to approximately 2200 ha in extent. The majority of these projects are located within the Bedford Dry Grassland and Great Fish Thicket vegetation types. The current PV development is however restricted largely to Albany Broken Veld, which is not currently heavily impacted by renewable energy development. It is only the adjacent planned Aeoulus WEF and Redding WEF that occur in a broadly similar environment to the current PV projects. These two projects would have a cumulative footprint of approximately 200ha, while the current Sun Garden and Sun Garden PV projects would have a combined footprint of approximately 700ha. Overall, while there would be some local impact on landscape connectivity habitat loss, the contribution of the Sun Garden PV Facility at 350ha is considered acceptable.

Nature: Cumulative ecological impacts due to renewable energy development in the area Renewable (wind & solar) energy development in the wider area around the site will generate cumulative impacts on habitat loss and fragmentation for fauna and flora.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (3)	Moderate (5)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Medium (33)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Low
Irreplaceable loss of resources?	No	Yes
Can impacts be mitigated?	**Yes**	
Mitigation: » The facility should have access points for fauna as detailed in order to promote the movement of fauna through the facility and reduce the impact of the development on habitat fragmentation. » Promote sustainable land use practices in the area and especially in areas adjacent to the facility to improve the quality of the habitat for fauna and flora. » Ensure that alien species of flora are managed to ensure that they do not have a broadly negative impact.		

10.4 Cumulative Impacts on Aquatic Ecology

In terms of aquatic ecology cumulative impacts are expected to occur. The cumulative impact assessment considers the combined impact of the surrounding renewable energy facilities on the natural environment. Although the current state of the surrounding landscape is largely natural the cumulative impact would be negligible, coupled to the fact that the aquatic systems are largely ephemeral.

Nature: Cumulative impacts on Aquatic Ecology

In the assessment of this project, a number of projects have been assessed by the report author within a 35km radius and or other sites were accessed during the course of travelling between the various projects. Of these potential projects, this report author has been involved in the initial EIA aquatic assessments or has managed / assisted with the WUL process and or Plant & Animal Search & Rescue for several of these projects.

All of the projects have indicated that their intention with regard to mitigation, i.e. selecting the best possible sites to minimise the local and regional impacts, or improving the drainage or hydrological conditions within these rivers, and therefore the cumulative impact could be seen as a net benefit. However, the worse-case scenario has been assessed below, i.e. only the minimum of mitigation be implemented by the other projects such as stormwater management, and that flows within these systems are sporadic.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Definite (5)
Significance	**Low (27)**	**Medium (35)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

» Improve the current stormwater and energy dissipation features not currently found along the tracks and roads within the region by local landowners / public works entities where possible.
» Install properly sized culverts with erosion protection measures at the present road / track crossings where already installed by local landowners / public works entities.

10.5 Cumulative Impacts on Avifauna

The proposed development site falls within the Cookhouse Renewable Energy Development Zone (REDZ) and within the Eastern Corridor of the Strategic Transmission Corridors, an area that is therefore the focus of multiple proposed renewable energy developments. The proposed development of a complex of four WEFs (up to 170 wind turbine generators) in the vicinity are of particular relevance. The Sun Garden PV Facility lies adjacent to the proposed Redding WEF (64 turbines).

In addition to these, the following operational or approved WEFs are located within approximately 50km:

» Cookhouse (66 turbines);
» Nojoli (44 turbines);
» Nxuba (47 turbines);
» Golden Valley (48 turbines);
» Amakhala Emoyeni (56 turbines); and

» Highlands (49 turbines).

The Solaris Fields Solar PV Facility is proposed for development directly adjacent to the Sun Garden PV Facility. The Solaris Fields Solar PV Facility is of similar design and capacity to the Sun Garden PV Facility and is likely to have the same individual contribution to potential impacts as the proposed development assessed above.

Nature: The contribution of the proposed development to the cumulative post-mitigation impact of multiple developments in an area and their combined impacts on the regional populations of avifaunal SCCs over the long-term.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Regional (3)	Regional (5)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (33)**	**Medium (39)**
Status (positive or negative)	Negative	Negative
Reversibility	Possible	Possible
Irreplaceable loss of resources?	Unlikely	Unlikely
Can impacts be mitigated?	Yes	
Mitigation: » Implement the mitigation measures listed within the Avifaunal Impact Assessment (Appendix E).		

10.6 Cumulative Impacts on Bats

The construction and operation of several infrastructures over the broader region (causing the same impacts) may potentially lead to an increase in the magnitude of the impacts associated with such developments. This may ultimately impact the bat biodiversity within the region more negatively that of a single development in isolation. The Sun Garden PV facility is proposed directly adjacent another PV facility, as well as in the immediate vicinity of several proposed wind energy facilities. Potential habitat destruction and disturbance impacts across all facilities, collectively, may potentially pose a risk to bat biodiversity in the area.

Nature: Cumulative impacts on bats		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (2)	Regional (4)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Low (4)	Moderate (7)
Probability	Improbable (2)	Probable (3)
Significance	**Low (18)**	**Medium (42)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Low
Irreplaceable loss of resources?	No	Yes
Can impacts be mitigated?	Yes	
Mitigation: » Maintain all construction, operation and decommissioning activities around the immediate project footprint only, and avoid excess noise and traffic around existing buildings.		

» Avoid destruction of existing buildings on site. » Avoid destruction of natural vegetation, as far as possible. » Use of existing roads should be maximised. Off-road driving should be avoided. » Site Access should be strictly controlled, to avoid unnecessary disturbance. » Minimise lighting at night as far as possible.

10.7 Cumulative Impacts on Land Use, Soil and Agricultural Potential

Cumulative impacts within the project area and its surroundings have been determined to be low. The general condition of the soil resources is predominantly natural. Aside from isolated areas of erosion, limited developments and accompanied anthropogenic activities, no significant degradation of the area is notable. Additionally, considering the low sensitivity of the soil resources in the area, it is the specialist's opinion that no significant impacts are expected in the foreseeable future.

Nature: Loss of land capability and agricultural potential		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Low (2)	Low (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (18)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Mitigation is possible, but very little will be relevant given the fact that very few impacts on a "Low" sensitivity soil resource is anticipated.		

10.8 Cumulative Impacts on Heritage (including archaeology, palaeontology and cultural landscape)

Increased development in the greater Study Area will have a number of cumulative impacts on heritage resources. In this instance the cumulative impacts that could result from a combination of the proposed and current projects as well as other actual or proposed future developments in the broader area. As no heritage structures or graves were recorded within the development footprint for the Sun Garden PV Facility, only impacts on palaeontology and cultural landscape are considered. The cumulative impacts considered below assumes that mitigation measures have been applied.

Nature: Cumulative heritage impacts on palaeontological resources Cumulative impacts on fossil remains preserved at or beneath the ground surface.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Low (1)	High (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	High (8)	High (8)
Probability	Highly Probable (4)	Improbable (2)
Significance	**Medium (-56)**	**Low (28)**
Status (positive or negative)	Negative	Negative

Reversibility	Irreversible	Low
Can impacts be mitigated?	Yes	

Mitigation:

Chance Find Procedure:

» If a chance find is made the person responsible for the find must immediately stop working and all work must cease in the immediate vicinity of the find.
» The person who made the find must immediately report the find to his/her direct supervisor which in turn must report the find to his/her manager and the Environmental Officer (EO) (if appointed) or site manager. The EO must report the find to the relevant Heritage Agency (South African Heritage Research Agency, SAHRA). (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). The information to the Heritage Agency must include photographs of the find, from various angles, as well as the GPS co-ordinates.
» A preliminary report must be submitted to the Heritage Agency within 24 hours of the find and must include the following: 1) date of the find; 2) a description of the discovery and a 3) description of the fossil and its context (depth and position of the fossil), GPS co-ordinates.
» Photographs (the more the better) of the discovery must be of high quality, in focus, accompanied by a scale. It is also important to have photographs of the vertical section (side) where the fossil was found.

Upon receipt of the preliminary report, the Heritage Agency will inform the EO (or site manager) whether a rescue excavation or rescue collection by a palaeontologist is necessary.

» The site must be secured to protect it from any further damage. No attempt should be made to remove material from their environment. The exposed finds must be stabilised and covered by a plastic sheet or sand bags. The Heritage agency will also be able to advise on the most suitable method of protection of the find.
» In the event that the fossil cannot be stabilised the fossil may be collected with extreme care by the EO (or site manager). Fossils finds must be stored in tissue paper and in an appropriate box while due care must be taken to remove all fossil material from the rescue site.
» Once Heritage Agency has issued the written authorisation, the developer may continue with the development.

Nature: *Cumulative impacts on cultural heritage*

The potential cumulative visual impact of renewable energy facilities on the cultural landscape

There are currently several applications being made for the development of WEFs renewable energy facilities in the area surrounding the Sun Garden PV facility development site. The study area may ultimately encompass the Redding WEF, two solar energy facilities (Sun Garden and Solaris Fields PV Facilities) and the larger region the Hamlett, Rippon and Aeoulus WEFs, as well as the existing Cookhouse, Golden Valley, Nxuba, Nojoli and Amakhala Emoyeni WEFs. According to the VIA, the significance of the visual impacts on the sense of place within the region (i.e. beyond a 20km radius of the development and within the greater region) is expected to be of low significance (du Plessis, 2021).

However, according to the VIA (du Plessis, 2021) the cumulative visual impact of the proposed Sun Garden PV facility, the study area may ultimately encompass the Redding WEF, two solar energy facilities (Sun Garden and Solaris Fields PV Facilities) and the larger region the Hamlett, Rippon and Aeoulus WEFs, as well as the existing Cookhouse, Golden Valley, Nxuba, Nojoli and Amakhala Emoyeni WEFs.

The construction and operation of all of these renewable energy facilities is expected to increase the cumulative visual impact of industrial type infrastructure within the region.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Regional **(3)**	Broader Regional Area **(4)**
Duration	Permanent **(5)**	Long term **(4)**

Magnitude	Low **(4)**	Very high **(10)**
Probability	Definite **(5)**	Highly probable **(4)**
Significance	**High (60)**	**High (72)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Can impacts be mitigated?	Yes	

Mitigation:

» Mitigation measures as proposed in the HIA for the proposed Sun Garden PV Facility development that reduces negative impacts on the land use patterns and living heritage will reduce the impact of this facility on the overall load.

» The mitigation measures proposed for heritage resources will reduce the negative cumulative impact on the CL and should be implemented as recommended.

According to the Visual impact assessment (VIA) of LOGIS by Du Plessis (2021) no mitigation of the impact on the sense of place of the region or the CL is possible as the structures will be visible regardless. However, the following general mitigation measures are proposed:

Planning:

» Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/servitude.

Operations:

» Maintain the general appearance of the facility as a whole.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use.
» Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.

General mitigation measures for renewable energy development in areas of CL significance as proposed by Jansen and Franklin, (2021) as well as Lavin (2021) is recommended:

Ecological:

» Species and ecosystem loss should be prevented by limiting fragmentation in the landscape, and should therefore adhere to the following general recommendations:
» Remaining areas of endemic and endangered natural vegetation should be conserved.
» High and Very High Sensitivity Ecological areas (crest lines and drainage lines), should be protected from development.
» Areas of habitat are found among the rocky outcrops and contribute to the character, as well as biodiversity of the area. Care should be taken that habitats are not needlessly destroyed.
» Careful planning should incorporate areas for stormwater runoff where the base of the structure disturbed the natural soil. Local rocks found on the site could be used to slow stormwater (instead of concrete, or standard edge treatments), and prevent erosion that would be an unfortunate consequence that would alter the character of the site. By using rocks from site, it helps to sensitively keep to the character.
» The principle of 'tread lightly' must be applied for any activity (and associated development requirements e.g. toilets for the construction process) should be emphasised.

Aesthetic:

» Encourage mitigation measures (for instance use of vegetation) to 'embed' or disguise the proposed structures within the surrounding tourism and agricultural landscape at ground level, road edges etc;
» The continuation of the traditional use of material could be enhanced with the use of the rocks on the site as building material. This would also help to embed structures into the landscape that does not have to be standard containers that clutter the landscape.

- Using material found on the site adds to the sense of place and reduces transportation costs of bringing materials to site.
- Where additional infrastructure (i.e. roads) is needed, the upgrade of existing roads to accommodate the development should be the first consideration. The local material such as the rocks found within the area could be applied to address stormwater runoff from the road to prevent erosion.
- Infrastructure improvement, including new roads and upgrades to the road network, should be appropriate to the rural context (scale, material etc.).
- The layout of the turbines should have an emphasis on place-making, i.e. landscape-related heritage considerations, as opposed to standard infrastructure driven requirements;
- Prevent the construction of new buildings/structures on visually sensitive, steep, elevated or exposed slopes, ridgelines and hillcrests. Retain the integrity of the distinctive landscape character;
- Scale and massing should be sensitive to the surrounding landscape, although this is challenging with regard to the development of WEFs.
- Avoid visual clutter in the landscape by intrusive signage, and the intrusion of commercial corporate development along roads
- Avoid development of infrastructure (such as buildings and power lines), on crests or ridgelines due to the impact on the visual sensitivity of skylines.
- Retain view-lines and vistas focused on prominent natural features such as mountain peaks or hills, as these are important place-making and orientating elements for experiencing the cultural landscape.

<u>Historic</u>:

- The integrity of the historic farm werfs should be maintained and protected.
- Names of routes and watercourses that refer to traditional use during the time of the hunter-gatherers and herders, as well as the colonial era, should be celebrated.
- Traditional planting patterns should be protected by ensuring that existing trees are not needlessly destroyed, as these signify traces of cultural intervention in a harsh environment. These planting patterns include the trees planted around the werfs.
- In some cases, remnant planting patterns (even single trees) uphold the historic character of an area. Interpretation of these landscape features as historic remnants should occur.
- Mountain slopes have been used for traditional practices for many years, and care should be taken that any significant cultural sites, such as burials and veldkos/medicinal plant resources, are not disturbed.
- Where the historic function of a building/site is still intact, the function has heritage value and should be protected. Please take note of the items listed below:
- Surviving examples (wagon routes, outspans, and commonage), where they are owned in some public or communal way (or by a body responsible for acting in the public interest) and where they are found to be actively operating in a communal way, will have cultural and heritage value and should be enhanced and retained.
- The new roads should display minimum scale designs where possible.
- Maintain traditional movement patterns across rural landscapes or to places of socio-historical value. (a) Avoid privatization or the creation of barriers to traditional access routes. (b) Retain old roadways, which have been replaced by newer roads, for use as recreation trails.
- Respect existing patterns, typologies and traditions of settlement-making by promoting the continuity of heritage features. These include: (a) indigenous; (b) colonial; and (c) current living heritage in the form of tangible and intangible associations to place.
- Respect traditional werf settlement patterns by considering the entire werf as the component of significance. This includes the backdrop of the natural landscape against which it is sited, as well as its spatial structure. Any development that impacts the inherent character of the werf component should be discouraged.

<u>Social</u>:

- Care should be taken that existing functions such as outspan areas (see criteria for these under historic) are not lost in the development stages, as it fulfils an important function within the cultural landscape.
- The local community around the development should benefit from job opportunities created by the proposed development.

Economic:

» Sheep or game farming should be allowed to continue in the area and between the panels where feasible.
» Care should be taken to reduce visual impact from surrounding tourism areas, by following the recommendations included in the VIA.

10.9 Cumulative Visual Impacts

The study area may ultimately encompass the Redding WEF, two solar energy facilities (Sun Garden and Solaris Fields PV Facilities) and the larger region the Hamlett, Rippon and Aeoulus WEFs, as well as the existing Cookhouse, Nxuba, Nojoli, Golden Valley and Amakhala Emoyeni WEFs.

The construction and operation of all of these renewable energy facilities is expected to increase the cumulative visual impact of industrial type infrastructure within the region. Details of these applications are indicated in the table below and are displayed on Figure 10.2.

On the other hand, the location of these renewable energy facilities within the Cookhouse REDZ will contribute to the consolidation of infrastructure to this locality and avoid a potentially scattered proliferation of renewable energy generation infrastructure throughout the region

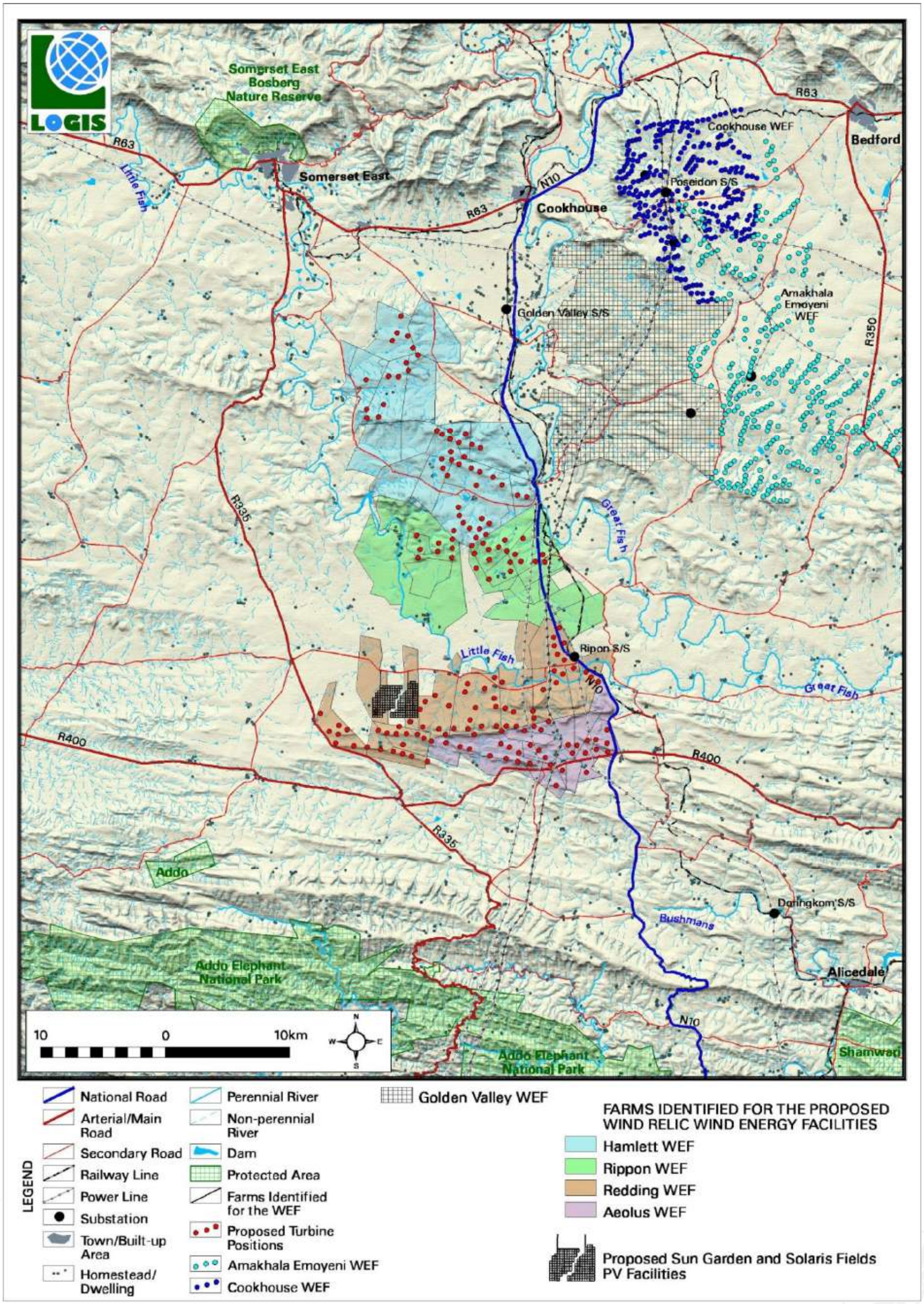

Figure 10.2: Renewable energy applications and existing WEFs within the region

Nature: Potential cumulative visual impacts		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (2)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	High (8)
Probability	Probable (3)	Probable (3)
Significance	**Moderate (36)**	**Moderate (45)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	
Generic best practise mitigation/management measures: Planning: » Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint. Operations: » Maintain the general appearance of the facility as a whole. Decommissioning: » Remove infrastructure not required for the post-decommissioning use. » Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.		

10.10 Cumulative Socio-Economic Impacts

From a socio-economic perspective cumulative impact have been identified for both the construction and operation phases, and within each phase positive and negative impacts have been identified.

During the construction phase the following cumulative impacts are relevant:
» Temporary stimulation of the national and local economy
» Temporary increase employment in the national and local economies
» Contribution to skills development in the country and local economy
» Temporary increase in household earnings
» Temporary increase in government revenue
» Negative changes to the sense of place
» Temporary increase in social conflicts associated with the influx of people
» Impact on economic and social infrastructure

During the construction phase the following cumulative impacts are relevant:
» Sustainable increase in production and GDP nationally and locally
» Creation of sustainable employment positions nationally and locally
» Skills development of permanently employed workers
» Improved standards of living for benefiting households
» Local economic and social development benefits
» Sustainable rental revenue for farms where wind farms are located
» Sustainable increase in electricity available for the local region and South Africa
» Negative changes to the sense of place

Socio-economic cumulative impacts during the construction phase

Nature: *Temporary increase in the GDP and production of the national and local economies during construction* It is highly likely that if the projects are approved by government the demand for goods and services required for the construction of similar facilities would grow especially if they were constructed simultaneously. This could provide sufficient economies of scale and thus open opportunities for the establishment of new industries in the country and new businesses in the local area, specifically in the sectors that are not well represented in the economy. This would have a significant positive impact on the regional economies and a notable impact on the national economy.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	National (4)	National (4)
Duration	Short term (2)	Medium-term (3)
Magnitude	Very High (9)	Very High (9)
Probability	Highly probable (4)	Highly probable (4)
Significance	**60 (High)**	**64 (High)**
Reversibility	Benefit is terminated with the end of construction	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: » None beyond enhancement at an individual project level		
Residual Impacts: » None foreseen at this stage		

Nature: *Temporary increase employment in the national and local economies* With the number of renewable energy facilities (including PV sites) that are proposed for the region, it is highly likely that if authorities approve the projects the number of people employed from the local area would be significant. It would likely result in a significant temporary reduction in the unemployment rate in the area and increase the number of employed in the area during the construction phase of the development. This would be particularly significant if all proposed developments were constructed simultaneously.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Regional (3)	Regional (3)
Duration	Short term (2)	Medium-term (3)
Magnitude	Very High (9)	Very High (9)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (56)**	**High (60)**
Reversibility	Benefit is terminated with the end of construction	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: » None beyond enhancement at an individual project level		
Residual Impacts: » None foreseen at this stage		

Nature: *Temporary increase employment in the national and local economies* The potential construction of numerous renewable energy projects will have a notable impact on the skills development in the region especially in the field of renewable energy. This will have a positive impact on an area that has notably been lacking skills development and employment opportunities.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Regional (3)	Regional (3)
Duration	Short term (2)	Medium-term (3)
Magnitude	High (8)	Very High (9)
Probability	Highly Probable (4)	Highly probable (4)
Significance	**Medium (52)**	**High (60)**
Reversibility	No	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: » None beyond enhancement at an individual project level		
Residual Impacts: » South Africa's human capital development. » Improved labour productivity and employability of construction workers for similar projects.		

Nature: *Temporary improvement of the standard of living of the positively affected households* The living standards in the region will likely increase for the affected households as earnings increase in the region. If construction of all proposed projects occurs simultaneously then it is likely that the cumulative impact will be notable for the region. The injection of earnings at a household level will have induced and indirect impacts on the local and regional economy as spending increases. In addition to the planned employment creation during operation and maintenance of the solar facility, the developer intends to make a positive contribution to employment opportunities in other non-solar related industries. As part of the 2,0% SED revenue commitment of the developer, up to 2% of this could potentially be channelled towards both short- and long-term job opportunities on an annual basis. Projects bid through the government IPP programme are also required to implement a similar SED programme.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Regional (3)	Regional (3)
Duration	Short term (2)	Medium-term (3)
Magnitude	High (8)	Very High (9)
Probability	Highly Probable (4)	Highly probable (4)
Significance	**Medium (52)**	**High (60)**
Reversibility	Benefit is terminated with the end of construction	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: » None beyond enhancement at an individual project level		
Residual Impacts: » Possible increase of households' saving accounts » Improved standard of living of the affected households		

Nature: *<u>Temporary improvement of the standard of living of the positively affected households</u>* The development of the proposed projects will likely increase government revenue through VAT, companies' tax, PAYE and income tax and property taxes. The impact of increased revenues for the local economies will be notable. At a national level this will result in lower government debt and servicing costs as revenue increases.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	National (4)	National (3)
Duration	Short-term (2)	Medium-term (3)
Magnitude	Low (4)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (40)**	**Medium (48)**
Reversibility	Benefit is terminated with the end of construction	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: » None beyond enhancement at an individual project level		
Residual Impacts: » None envisaged		

Nature: *<u>Impact on the sense of place experienced by the local community as a result of visual and noise effects that appear during the construction phase</u>* The development of the proposed renewable energy facilities may have a notable impact on the change to the sense of place of the area. The broader area is currently perceived by residents and visitors as rural and "wild". This perception may change with the construction of the proposed renewable energy structures, particularly those closer to wildlife and hunting orientated properties and accommodation facilities. This could be particularly evident if construction occurs simultaneously.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Site & immediate surrounding area (2)	Regional (3)
Duration	Short term (2)	Medium-term (3)
Magnitude	Moderate (6)	High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (40)**	**Medium (56)**
Reversibility	Possible to reverse but only with decommissioning	
Status (positive or negative)	Negative	Negative
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation: » None beyond mitigation at an individual project level		
Residual Impacts: » Altered characteristics of the environment » Change in the perception of tourists of the local environment		

Nature: *<u>Temporary increase in social conflicts associated with the influx of construction workers and job seekers to the area</u>*

The number of projects planned for the area may entice job seekers from outside the region to move to the area in search of employment. The increase in job seekers to an area with already low levels of employment may lead to increased conflicts in the area. Such conflicts will need to be managed by engaging the communities, local authorities, and local labour unions. Managing expectations of the community is important to avoiding such conflicts at a project-by-project level. The simultaneous construction of all the planned projects in the region will drastically increase the number of workers present in the area. This will be mitigated somewhat by the presence of staff accommodation for some developments but the presence of additional workers in the area may be a cause for conflict for local community members. It is thus vitally important that local community members are employed for the development of projects in the region.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Regional (3)	Regional (3)
Duration	Short-term (2)	Medium-term (3)
Magnitude	Low (4)	Low (4)
Probability	Improbable (2)	Probable (3)
Significance	**Low (18)**	**Medium (30)**
Reversibility	Reversibility within a short period	
Status (positive or negative)	Negative	Negative
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	No	
Mitigation: » None beyond mitigation at an individual project level		
Residual Impacts: » Contribution towards social conflicts in the area by construction workers and job seekers who decide to stay in the area after construction is complete and who are unable to find a sustainable income		

Nature: *<u>Added pressure on economic and social infrastructure during construction as a result of increase in local traffic and in migration of construction workers</u>* The number of projects planned for the area will increase the number of workers and job seekers in the area. This may drastically increase pressure on economic infrastructure and social services for the area. Despite the provision of accommodation at some facilities, the additional staff may cause strain on the already delicate social and economic infrastructure in the area. It is thus important to employ local community members to reduce the influx of people to the area. This should be managed at a project-by-project level.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Regional (3)	Regional (3)
Duration	Short-term (2)	Medium-term (3)
Magnitude	Minor (2)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (18)**	**Medium (30)**
Reversibility	Reversible within a short period	
Status (positive or negative)	Negative	Negative
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation: » None beyond mitigation at an individual project level		
Residual Impacts: » Contribution towards social conflicts in the area by construction workers and job seekers who decide to stay in the area after construction is complete and who are unable to find a sustainable income		

Socio-economic cumulative impacts during the operation phase

<table>
<tr><td colspan="3">Nature: <u>Sustainable increase in production and GDP nationally and locally</u>
If other renewable energy facilities that have been proposed are approved in the Eastern Cape, together with the Sun Garden PV Facility project, sufficient economies of scale could be created to establish new businesses in the local economies. These businesses could then supply the goods and services required for the operation and maintenance of the facility that cannot currently be procured in the area. This would contribute to the local economies' growth and development. Additional impacts would be the improved energy supply in the country as well as the reduced carbon emissions associated with generation of electricity.</td></tr>
<tr><td></td><td>Overall impact of the proposed project considered in isolation</td><td>Cumulative impact of the project and other projects in the area</td></tr>
<tr><td>Extent</td><td>National (4)</td><td>National (4)</td></tr>
<tr><td>Duration</td><td>Long-term (4)</td><td>Long-term (4)</td></tr>
<tr><td>Magnitude</td><td>Moderate (6)</td><td>High (8)</td></tr>
<tr><td>Probability</td><td>Highly probable (4)</td><td>Highly probable (4)</td></tr>
<tr><td>Significance</td><td>Medium (56)</td><td>High (64)</td></tr>
<tr><td>Reversibility</td><td colspan="2">Benefits are sustained only over project's lifespan</td></tr>
<tr><td>Status (positive or negative)</td><td>Positive</td><td>Positive</td></tr>
<tr><td>Irreplaceable loss of resources?</td><td>No</td><td>No</td></tr>
<tr><td>Can impacts be enhanced?</td><td colspan="2">No</td></tr>
<tr><td colspan="3">Enhancement:
» None beyond mitigation at an individual project level</td></tr>
<tr><td colspan="3">Residual Impacts:
» None foreseen at this stage</td></tr>
</table>

<table>
<tr><td colspan="3">Nature: <u>Creation of sustainable employment positions nationally and locally</u>
The development of the proposed projects will create a notable number of sustainable employment positions for the region. The development of the Sun Garden PV Facility will create 50 direct employment positions alone. The development of other renewable projects will be notable in the region as they will likely create a similar number of sustainable positions for the duration of the operation of the facilities.</td></tr>
<tr><td></td><td>Overall impact of the proposed project considered in isolation</td><td>Cumulative impact of the project and other projects in the area</td></tr>
<tr><td>Extent</td><td>National (4)</td><td>National (4)</td></tr>
<tr><td>Duration</td><td>Long-term (4)</td><td>Long-term (4)</td></tr>
<tr><td>Magnitude</td><td>Moderate (6)</td><td>High (8)</td></tr>
<tr><td>Probability</td><td>Highly probable (4)</td><td>Highly probable (4)</td></tr>
<tr><td>Significance</td><td>Medium (56)</td><td>High (64)</td></tr>
<tr><td>Reversibility</td><td colspan="2">Benefits are sustained only over project's lifespan</td></tr>
<tr><td>Status (positive or negative)</td><td>Positive</td><td>Positive</td></tr>
<tr><td>Irreplaceable loss of resources?</td><td>No</td><td>No</td></tr>
<tr><td>Can impacts be enhanced?</td><td colspan="2">No</td></tr>
<tr><td colspan="3">Enhancement:
» None beyond mitigation at an individual project level</td></tr>
<tr><td colspan="3">Residual Impacts:
» None foreseen at this stage</td></tr>
</table>

Nature: *<u>Skills development of permanently employed workers</u>*

As per the statement above, the development of the proposed projects is likely to further develop the skills of those employed by the renewable energy projects in the region. This will further increase the skills base in the area. As part of the developer's intended SED contributions to the immediate area, both on-project, and non-solar energy skills development initiatives will be funded for each PV facility development. The non-solar energy skills to be developed should be relevant and required in the region and should seek to provide value to the community and the environment.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Regional (3)	Regional (3)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Definite (5)	Definite (5)
Significance	**Medium (55)**	**High (65)**
Reversibility	No	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: » None beyond mitigation at an individual project level		
Residual Impacts: » None foreseen at this stage		

Nature: *Improved standard of living for benefitting households* Those workers who are employed by the renewable energy facilities are likely to experience improved standards of living. This will be fairly notable in the region which has low levels employment, high levels of poverty and limited access to resources. It is likely that the development of the proposed renewable energy facilities will support between 3,7 and 3,9 members per household.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long-term (4)
Magnitude	Moderate (6)	High (8)
Probability	Probable (4)	Probable (4)
Significance	**Medium (52)**	**High (60)**
Reversibility	Benefits are sustainable only over project's lifespan	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: » None beyond mitigation at an individual project level		
Residual Impacts: » None foreseen at this stage		

Nature: *Local economic and social development benefits* The benefits of the economic and socio-economic development initiatives that are to be developed as a result of the establishment and operation of the renewable energy facilities will be very notable in the region. The cumulative financial resources provided by the renewable energy projects will assist in reducing the levels of poverty in the Blue Crane Route Local Municipality and surrounds as a result of multiple socio-economic development projects that

would be run concurrently in the area. This will lead to improved standards of living for the members of the community that benefit from these programmes. Additionally, it is possible that improvements in access to services will be felt by the local communities such as access to healthcare and municipal services. Local infrastructure will also be improved through the social and economic programmes planned which will be a benefit to the local economy and community. Finally, local SMEs and organisations will greatly benefit for the economic support provided by the established socio-economic and economic development plans.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long-term (4)
Magnitude	Moderate (6)	High (8)
Probability	Definite (5)	Definite (5)
Significance	**High (65)**	**High (75)**
Reversibility	Benefits could stretch beyond project's lifespan	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: » None beyond mitigation at an individual project level		
Residual Impacts: » None foreseen at this stage		

Nature: *Sustainable rental revenue for farms where wind farms are located* As with the development of the Sun Garden PV Facility, there will likely be increased household incomes for households who have renewable energy infrastructure situated on their properties. This increased infrastructure may potentially lead to improved buying power in the local economy and an ability to improve their current farming practices. This in itself will lead to increase in employment on the participating properties and may further increase the employment rate in the area.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Site (1)	Local (2)
Duration	Long term (4)	Long-term (4)
Magnitude	Minor (2)	Low (4)
Probability	Definite (5)	Definite (5)
Significance	**Medium (35)**	**Medium (50)**
Reversibility	Benefits could stretch beyond project's lifespan	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: » None beyond mitigation at an individual project level		
Residual Impacts: » None foreseen at this stage		

Nature: *Sustainable increase in national and local government revenue*

While the development of a single solar PV facility is unlikely to dramatically improve the levels of electricity provision in the country, the development of the proposed renewable energy projects will provide a notable injection of electricity supply to a system that is under significant pressure. The increased levels of electricity provision throughout the country will be welcomed by industry as well as the wider society and will be a boon to an economy under stress.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	National (4)	National (4)
Duration	Long term (4)	Long-term (4)
Magnitude	Minor (2)	Low (4)
Probability	Definite (5)	Definite (5)
Significance	**Medium (50)**	**High (60)**
Reversibility	Benefits during projects lifespan only	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: » None beyond mitigation at an individual project level		
Residual Impacts: » None foreseen at this stage		

Nature: <u>*Impact on the sense of place experienced by the local community as a result of visual effects that appear during the operation phase of the renewable energy facilities*</u> The effects on the broader community's sense of place will initially be felt during the construction period and will continue into the operational phase of the various renewable energy facilities and infrastructure. This change in sense of place may be fairly notable in an area that has limited development in terms of pre-existing renewable energy facilities, however this is not the case for many residents and travellers within the N10 corridor as a result of the various WEFs recently built within the Cookhouse REDZ. There may be an overall increase in negative perceptions of the area due to the presence of other solar farms and WEFs in the surrounding area and may distress select members of the community and visitors to the area seeking a more rural and wildlife orientated perspective. It is however anticipated that these negative impacts will predominantly be experienced by select visitors to wildlife orientated and hunting reserves within viewshed to the proposed WEFs.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Site & immediate surrounding area (2)	Regional (3)
Duration	Long term (4)	Long-term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (48)**	**Medium (52)**
Reversibility	Possible to reverse but only with decommissioning	
Status (positive or negative)	Negative	Negative
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation: » None beyond mitigation at an individual project level		
Residual Impacts: » None foreseen at this stage		

10.11 Cumulative Traffic Impacts

To assess the cumulative impact, it was assumed that all proposed and authorized renewable energy projects within 50km be constructed at the same time. This is a precautionary approach, as in reality these projects would be subject to a highly competitive bidding process. Only a handful of projects would be selected to enter into a power purchase agreement with Eskom, and construction is likely to be staggered depending on project-specific issues.

The construction and decommissioning phases are the only significant traffic generators for renewable energy projects. The duration of these phases is short term (i.e. the impact of the generated traffic on the surrounding road network is temporary and renewable energy facilities, when operational, do not add any significant traffic to the road network). Even if all renewable energy projects within the area are constructed at the same time, the roads authority will consider all applications for abnormal loads and work with all project companies to ensure that loads on the public roads are staggered and staged to ensure that the impact will be acceptable.

Potential cumulative impacts relate to traffic congestion/delays on the surrounding road network and noise and dust pollution.

Nature: Cumulative traffic impacts Traffic congestion and the associated noise and dust pollution		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (2)	Regional (3)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	High (8)
Probability	Probable (3)	Improbable (2)
Significance	**Low (21)**	**Low (26)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible, with slight increase in operational traffic
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Stagger component delivery to the site. » Dust suppression » Reduce the construction period » The use of mobile batching plants near the site would decrease the impact on the surrounding road network. » Staff and general trips should occur outside of peak traffic periods.		

10.12 Conclusion regarding Cumulative Impacts

Cumulative impacts are expected to occur with the development of the Sun Garden PV Facility throughout all phases of the project life cycle and within all areas of study considered as part of this BA report. The main aim for the assessment of cumulative impacts considering the Sun Garden PV Facility is to test and determine whether the development will be acceptable within the landscape proposed for the development, and whether the loss, from an environmental and social perspective, will be acceptable without whole-scale change.

The following conclusions can be drawn regarding the cumulative impacts associated with the project:

- There will be no unacceptable loss or impact on ecological aspects (vegetation types, species and ecological processes) due to the development of the Sun Garden PV Facility and other renewable energy facilities within the surrounding area, provided recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.
- There will be no significant loss of sensitive and significant aquatic features, provided recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.
- There will be no unacceptable risk to avifauna with the development of the Sun Garden PV Facility and other renewable energy projects within the surrounding area, provided recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.
- There will be no unacceptable risk to bats in terms of mortality with the development of the Sun Garden PV Facility and other renewable energy projects within the surrounding area, provided recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.
- There will be no unacceptable loss of land capability due to the development of the Sun Garden PV Facility and other renewable energy projects within the surrounding areas, provided recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.
- Change to the sense of place and character of the area is expected with the development of renewable energy facilities. However, the change is not considered to be a fatal flaw.
- There will be no unacceptable loss of heritage resources associated with the development of the Sun Garden PV Facility and other wind farms within the surrounding areas. The cumulative impact is therefore acceptable.
- No unacceptable socio-economic impacts are expected to occur. The cumulative impact is therefore acceptable.
- No unacceptable impacts to the traffic network are expected to occur with the development of the Sun Garden PV Facility and other renewable energy projects within the surrounding areas. The cumulative impact is therefore acceptable.

Positive cumulative impacts are expected to occur from a socio-economic perspective. These impacts will range from a medium to high significance depending on the impact being considered.

All cumulative impacts associated with the Sun Garden PV Facility will be of a medium or low significance, with impacts of a high significance associated with positive socio-economic cumulative impacts and cultural landscape impacts. A summary of the cumulative impacts is included in **Table 10.3**.

Table 10.3: Summary of the cumulative impact significance for the Sun Garden PV Facility within the project site

Specialist assessment	Overall significance of impact of the proposed project considered in isolation	Cumulative significance of impact of the project and other projects in the area
Ecology	Low	Medium
Aquatic Ecology	Low	Medium
Avifauna	Low	Medium
Bats	Low	Medium

Specialist assessment	Overall significance of impact of the proposed project considered in isolation	Cumulative significance of impact of the project and other projects in the area
Land use, soil and agricultural potential	Low	Low
Heritage (archaeology, palaeontology and cultural landscape)	Medium (palaeontology) High (cultural landscape)	Low (palaeontology) High (cultural landscape)
Noise	Low	Low
Visual	Medium	Medium
Socio-Economic	*Positive impacts:* High or Medium (depending on the impact being considered) *Negative impacts:* Medium or Low (depending on the impact being considered)	*Positive impacts:* High or Medium (depending on the impact being considered) *Negative impacts:* Medium or Low (depending on the impact being considered)
Traffic	Low	Low

The location of the Sun Garden PV Facility project site and the surrounding renewable energy projects being considered as part of this cumulative impact assessment within a REDZ is considered to assist with the concentration of the negative impacts within an area, as well as the focussing of positive impacts and benefits. The REDZ are considered to be areas within which significant negative impacts on the natural environment are limited and socio-economic benefits are enhanced. Therefore, the development of renewable energy facilities within a REDZ reduces the negative impacts in areas located outside of the REDZ and concentrates the positive impacts within the REDZ thereby creating a positive contribution to the communities present. This supports and contributes the need and desirability of the Sun Garden PV Facility within the project site.

Based on the specialist cumulative assessment and findings, the development of the Sun Garden PV Facility and its contribution to the overall impact of all renewable energy facilities to be developed within a 30km radius, it can be concluded that the Sun Garden PV Facility cumulative impacts will be of a medium to low significance, with impacts of a high significance mainly relating to positive socio-economic impacts and impacts on the cultural landscape. It was concluded that the development of the Sun Garden PV Facility will not result in unacceptable, high cumulative impacts and will not result in a whole-scale change of the environment.

CHAPTER 11: CONCLUSIONS AND RECOMMENDATIONS

Sun Garden (Pty) Ltd is proposing the development of a commercial solar PV facility and associated infrastructure on a site located approximately 46km south-east of Somerset East, 40km south-west of Cookhouse and 37km north-west of Riebeek East within the Blue Crane Route Local Municipality and the Sarah Baartman District Municipality in the Eastern Cape Province. The entire extent of the site falls within the Cookhouse Renewable Energy Development Zone (REDZ) and within the Eastern Corridor of the Strategic Transmission Corridors.

A preferred project site with an extent of ~4 037ha has been identified by Sun Garden (Pty) Ltd as a technically suitable area for the development of the Sun Garden PV Facility. The project site consists of four (4) affected properties which make up the project site (**Figure 1.2** and **Table 1.1**). The affected properties include:

» Portion 9 of the farm Britzkraal No 253, Division of Somerset East
» Portion 8 (a Portion of Portion 7) of the farm Britzkraal No 253, Division of Somerset East
» Portion 7 of the farm Britzkraal No 253, Division of Somerset East
» Portion 1 of farm Bothas Hoop 358, Division of Somerset East

A development envelope for the placement of the solar facility infrastructure (i.e. development footprint) has been identified within the project site and assessed as part of the BA process. The development envelope is ~500ha in extent and the much smaller development footprint of ~350ha will be placed and sited within the development envelope. The development footprint will contain the following infrastructure to enable the solar facility to generate up to 400MW:

» Solar PV array comprising PV modules and mounting structures.
» Inverters and transformers.
» Cabling between the project components, lain underground where practical.
» A 132/33kV on-site collector substation to be connected to a proposed 400kV Main Transmission Substation (MTS) located to the north-east of the site via a new 132kV overhead power line (twin turn dual circuit line). The development of the proposed 400kV Main Transmission Substation will be assessed as part of the separate BA process in order to obtain Environmental Authorisation.
» Site offices and maintenance buildings, including workshop areas for maintenance and storage.
» Temporary laydown areas.
» Access roads to the site and between project components with a width of approximately 4,5m. The main access points will be 8m wide.
» Water supply pipelines from onsite boreholes.
» A temporary concrete batching plant.
» Staff accommodation (temporary).
» Operation and Maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitor's centre.

Sun Garden (Pty) Ltd has confirmed that the project site is particularly suitable for solar energy development from a technical perspective due to the strength of the prevailing solar resources, access to the electricity grid, compatibility with the current land use and land availability.

A summary of the recommendations and conclusions for the proposed project is provided in this Chapter.

11.1. Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 1: Content of basic assessment reports:

Requirement	Relevant Section
3(k) where applicable, a summary of the findings and impact management measures identified in 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	A summary of the findings of the specialist studies undertaken for the Sun Garden PV Facility has been included in section 11.2.
3(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.	An environmental impact statement containing the key findings of the environmental impacts of the Sun Garden PV Facility has been included as **section 11.5**. An Environmental Sensitivity and Layout map of the Sun Garden PV Facility has been included as **Figure 11.1** which overlays the development footprint (as assessed within the BA) of the PV facility with the environmental sensitive features located within the project site. A summary of the positive and negative impacts associated with the Sun Garden PV Facility has been included in section 11.2.
3(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.	All conditions required to be included in the Environmental Authorisation of the Sun Garden PV Facility has been included in section 11.6.
3(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.	A reasoned opinion as to whether the Sun Garden PV Facility should be authorised has been included in section 11.5.

11.2 Evaluation of the Sun Garden PV Facility

The preceding chapters of this report together with the specialist studies contained within **Appendices D-L** provide a detailed assessment of the potential impacts that may result from the development of the Sun Garden PV Facility. This chapter concludes the environmental assessment of the solar PV facility by providing a summary of the results and conclusions of the assessment of both the project site and development footprint for the Sun Garden PV Facility. In so doing, it draws on the information gathered as part of the BA process, the knowledge gained by the environmental specialists and the EAP and presents a combined and informed opinion of the environmental impacts associated with the project.

No environmental fatal flaws or unacceptable impacts were identified in the detailed specialist studies conducted, provided that the recommended mitigation measures are implemented. These measures include, amongst others, the avoidance of sensitive features within the development footprint as specified by the specialists.

The potential environmental impacts associated with the Sun Garden PV Facility identified and assessed through the BA process include:

» Impacts on ecology, flora, and fauna.
» Impacts on aquatic ecology.
» Impacts on avifauna.
» Impacts on bats.
» Impacts on land use, soils, and agricultural potential.
» Impacts on heritage resources, including archaeology, palaeontology, and the cultural landscape.
» Visual impacts on the area imposed by the components of the facility.
» Positive and negative socio- economic impacts.
» Traffic impacts, including increased pressure on the existing road network.

11.2.1 Impacts on Ecology

The Sun Garden PV Facility site falls largely within the Albany Broken Veld vegetation type and it is only the grid connection that traverses some Kowie Thicket and Southern Karoo Riviere vegetation types. The norther, lower slopes and plains of the site consist of low shrublands considered to be low sensitivity with few fauna or flora of concern likely to be present. The upper, southern slopes of the PV site are steeper or contain a higher proportion of woody species and are considered medium sensitivity. The drainage feature which occurs along the south-eastern boundary of the PV area would be vulnerable to impact and it is recommended that a freshwater specialist should demarcate the boundary of this feature in the field before construction to ensure that the PV area does not encroach into this area unnecessarily. Along the grid connection route to the MTS, there are some high sensitivity drainage features, but these can easily be spanned by the power line and are not likely to be significantly impacted by the power line. In terms of fauna, the PV area does not have any habitats present that would be of particularly high value and no specific impacts of high magnitude on fauna are expected. However, given the size of the facility (350ha) and the location within an ESA it is recommended that specific measures are put in place with regards to the design of the fence around the facility to facilitate the movement of smaller fauna in and out of the PV area.

There are no impacts associated with the Sun Garden PV Facility and associate infrastructure that cannot be mitigated to an acceptable level and as such, the assessed layout is considered acceptable. With the application of relatively simple mitigation and avoidance measures, the impact of the Sun Garden PV Facility on the local environment can be reduced to an acceptable magnitude. The contribution of the Sun Garden PV Facility to cumulative impact in the area would be low and is considered acceptable. Overall, there are no specific long-term impacts likely to be associated with the development of the Sun Garden PV Facility that cannot be reduced to a low significance. As such, there are no fatal flaws associated with the development and no terrestrial ecological considerations that should prevent it from proceeding.

11.2.2 Impacts on Aquatic Ecology

The proposed layout for the facility would not have a direct impact on the following:
» Watercourses will only be impacted upon by a limited number of water course crossings that will be mitigated by appropriate measures which include erosion protection etc.; and

» Mainstem riparian systems (outside of the development footprint) and Pans that do contain functioning aquatic environments that received a High sensitivity rating will also be avoided.

Therefore, based on the results of the Aquatic Impact Assessment, the significance of the remaining impacts assessed for the aquatic systems after mitigation would be Low. This includes the internal roads proposed that would need to cross some of these systems. Further the proposed grid connection can span these areas thus no new impacts are expected. Access to the gird connection should not crosse any systems, resulting in additional new tracks to reach the pylons/towers.

Thus, based on the findings of this study no objection to the authorisation of any of the proposed activities is made at this point based on the current layout as provided by the developer.

As the proposed activities have the potential to create erosion, recommendations regarding the management of erosion must be implemented. It is further recommended that a comprehensive rehabilitation plan be implemented from the project onset, for all construction work to be located within watercourse areas (including buffers) to ensure a net benefit to the aquatic environment. This should from part of the suggested walk down as part of the final EMPr preparation during the pre-construction phase.

Furthermore, a Water Use License (or General Authorisation) for water uses identified in Section 21c and 21i of the National Water Act (Act 36 of 1998) would be required where activities are undertaken within 500m of watercourses and pans. No activities occur within 500m of the delineated pan boundaries and only the road crossing the drainage lines will require a Water Use Authorisation, which has been initiated by the Applicant.

11.2.3 Impacts on Avifauna

The impacts of solar PV facilities on avifauna are not well understood, particularly in the South African context. Nevertheless, the low and very low classification of the site ecological importance for avifaunal SCCs as assessed reduces the overall risk of significant impacts to the local avifaunal community by the proposed development, despite any gaps that may exist in our current understanding of potential impacts.

As the Species Assessment Guideline states that in areas identified to be of low SEI development activities of medium to high impact are acceptable following the implementation of appropriate minimisation and restoration mitigation measures.

Based on the impact assessment conducted for the Sun Garden PV Facility (including cumulative impacts) it is the avifaunal specialist's informed opinion that the proposed development will not have a significant negative impact on the viability or persistence of SCC populations in the area following the implementation of mitigation measures. The proposed Sun Garden PV Facility is therefore acceptable and can be approved from an avifaunal perspective.

In addition to the mitigation measures outlined for each potential impact, the requirement for post-construction/operational phase monitoring is to be included in the Environmental Management Programme (EMPr). This is necessary to determine the actual impacts of the proposed development, determine if additional mitigation is required and learn about impacts and improve future assessments.

Construction Phase monitoring is not considered to be necessary for this development as despite this period potentially being the most intense period in terms of disturbance and displacement of avifauna, no focal sites of particular concern (e.g. nearby SCC nests) have been identified in proximity to the proposed development site.

Post-construction monitoring should be started as soon as possible once the facility becomes operational. As the effects of the proposed development may change over time both activity and fatality monitoring should be conducted during the first two years of operation and then repeated every fifth year. Fatality monitoring is to be conducted both systematically and on a continuous ad-hoc basis. Systematic fatality monitoring must be conducted at least once per season and include an estimation of searcher efficiency and carcass persistence rates (determined experimentally), carcass searches, and appropriate data analyses to determine estimated mortality rates. This process is to be conducted under the direction of an avifaunal specialist. The duration and scope of post-construction monitoring should be informed by the outcomes of the previous year's monitoring, and should be reviewed annually, however a minimum of 20 % of the solar hardware is to be methodically searched for fatalities, with a search interval informed by carcass persistence trials. Systematic fatality surveys are to include the full length of the proposed overhead powerline. Ad-hoc fatality monitoring is to be conducted continuously throughout the lifespan of the project and all carcasses and feather spots found during routine operational activity by on-site personnel are to be recorded and made available for an avifaunal specialist for inclusion into subsequent reports.

The activity monitoring methods and data collection should replicate those employed during pre-construction monitoring as closely as possible in terms of effort and timing and should follow any additional recommendations of the latest best-practice guidelines available at the time.

11.2.4 Impacts on Bats

As per the findings presented in the specialist impact assessment (Appendix F), the specialist confirms that the classification of the project area (as low sensitivity to bats), as presented in the DFEE Screening Tool Report, is accurate and no further adjustments to this classification is necessary. It is believed, based on observations and available information, that the small extent of the project area and type of development under consideration is not expected to cause an irreplaceable loss to biodiversity, in terms of the bat community on site. No sensitive areas for avoidance have been identified on site, although several potentially sensitive features have been identified, as depicted in Figure 2. A few mitigation measures have subsequently been recommended to be followed – particularly pertaining to that of known and potential bat roosting structures/habitats, as described in Section 7. Should the above measures be adhered to, it is the opinion of the specialists that the proposed development can proceed and can be authorised from a bat perspective.

11.2.5 Impacts on Land Use, Soil and Agricultural Potential

It is the specialist's opinion that the baseline findings do not concur with the land capabilities identified by means of the DAFF (2017) desktop findings in regard to land capability sensitivities. Even though the land a\capability, in theory, is similar to that portrayed by (DEA, 2021), the climatic conditions have been deemed to be extremely poor. These poor climatic conditions have resulted in a land potential level characterised by "Low" sensitivity throughout the project area. No "High" land capability sensitivities were identified within proximity to any of the proposed activities. Considering the lack of sensitivity and the measures put in place in regard to stormwater management and erosion control, it is the specialist's opinion that all activities will have an acceptable impact on agricultural productivity. Furthermore, no measures in regard to moving components in their micro-setting were required to avoid or minimise fragmentation and disturbances of agricultural activities.

Various soil forms were identified within the Sun Garden project area, namely Swartland, Glenrosa, Mispah and Oakleaf. These soil forms were determined to be associated with three different land capabilities, namely LCIII, LCIV and LCVI. These land capability classes were then further refined to land potential levels by comparing land capability of climatic capabilities of the project area. Two land potential levels were then calculated, namely L6 and L7.

These land potential levels were used to determine the sensitivities of soil resources. Together with sensitive agricultural fields determined by means of the DFFE screening tool, only "Low" sensitivities were determined with a scattered patches of "High" sensitivity crop fields. It is worth noting that no development is expected to have an impact on these areas. Considering the low sensitivities associated with land potential resources, it is the specialist's opinion that the proposed activities will have an acceptable impact on soil resources and that the proposed activities should proceed as have been planned.

11.2.6 Impacts on Heritage Resources (archaeology, palaeontology and cultural landscape)

Analysis of the various components of the HIA indicates a mitigated low negative impact on heritage resources and are expanded on below.

» Historical structures: No historical structures of heritage significance were identified.
» Burial Grounds and graves: No burial grounds or graves were identified.
» Palaeontology: An assessment of the possible impacts of the proposed project on palaeontological resources has shown that unmitigated impacts consist of a medium negative impact mostly confined to the construction phase of the project. By implementing the mitigation measures as listed in this report these impacts can be managed to a neutral.
» Cultural landscape: An assessment of the possible impacts of the proposed project on the overall cultural landscape has shown that unmitigated impacts consist of a high negative impact mostly confined to the construction and operation phase of the project. Impacts on cultural landscape are expected to be high. It must be considered that the addition of the infrastructure of the Sun Garden PV Facility will constitute an additional layer to the cultural landscape and must be considered as such within a gazetted REDZ area. Through the implementation of the economically feasible recommendations as set out in the Heritage impact Assessment and contained in this report it will be possible to preserve older layers of the cultural landscape and in some cases even enhance them through consideration such as the use of older name places in the naming of infrastructure and enhancing local heritage through the incorporation of such structures in project conservation initiatives to name a few.

The assessment of the possible impacts on the archaeological, historical and palaeontological resources has shown a Low impact from the Sun Garden PV Facility project after mitigation measures. It is further considered that the project can have a potential positive influence on such resources in the region when the proposed conservation initiative from the project considers such resources as part of a larger development strategy.

The assessment of the cultural landscape indicated that the project will have a significant Moderate to High impact on the cultural landscape. The general mitigation measures for renewable energy development in areas of cultural landscape significance as proposed by Jansen and Franklin, (2021) as well as Lavin (2021) will still result in a marginal reduction of impact.

It must further be considered that the addition of the infrastructure of the Sun Garden PV Facility will constitute an additional layer to the CL and must be considered as such within a gazetted REDZ area. Through the implementation of the economically feasible recommendations as set out in the cultural landscape assessment and contained in this report it will be possible to preserve older layers of the cultural landscape and in some cases even enhance them through consideration such as the use of older name places in the naming of infrastructure and enhancing local heritage through the incorporation of such structures in project conservation initiatives to name a few.

Analysis of the findings of the SEIA for this project further reveals that the economic benefit for the region and the overall energy needs such project addresses outweighs the need for conservation of cultural resources at all costs. The economic benefit for the region and the overall energy needs such a project address to outweigh the need for the exclusion of the Sun Garden PV Facility to conserve cultural resources at all costs. Especially where a project is situated within a gazetted REDZ area.

The overall impact of the Sun Garden PV Facility, on the heritage resources identified during this report, is considered as acceptable after the recommendations have been implemented and therefore, impacts can be mitigated to acceptable levels allowing for the development to be authorised.

11.2.7 Visual Impacts

The findings of the Visual Impact Assessment undertaken for the proposed 400MW PV facility is that the visual environment surrounding the site, especially within a 1 - 3km radius, may be visually impacted during the anticipated operational lifespan of the facility (i.e. a minimum of 20 years).

This impact is applicable to the individual Sun Garden PV Facility and to the potential cumulative visual impact of the facility in relation to the proposed Solaris Fields PV Facility (and the proposed WEFs), where the combined frequency of visual impact is expected be greater. The potential area of cumulative visual exposure is however still deemed to be within acceptable limits, considering the PV facilities' close proximity to each other.

The following is a summary of impacts remaining, assuming mitigation as recommended, is exercised:

- During construction, there may be a noticeable increase in heavy vehicles utilising the roads to the development site that may cause, at the very least, a visual nuisance to other road users and landowners in the area. Construction activities may potentially result in a moderate, temporary visual impact that may be mitigated to low.
- There are no homesteads within a 1km radius of the proposed PV facility. The PV facility is expected to have a moderate visual impact on observers traveling along the Beenleegte secondary road at a distance of just over 1km from the operational PV structures.
- The PV Facility is expected to have a low visual impact within the region (1 – 3km radius of the PV facility), both before and after the implementation of mitigation measures.
- The anticipated impact of lighting at the PV facility is likely to be of moderate significance, and may be mitigated to low.
- The potential visual impact related to solar glint and glare is expected to be of low significance.

- The anticipated visual impact resulting from the construction of on-site ancillary infrastructure is likely to be of low significance both before and after mitigation.
- The anticipated visual impact of the proposed PV facility on the regional visual quality, and by implication, on the sense of place, is difficult to quantify, but is generally expected to be of low significance. This is due to the relatively low viewer incidence within close proximity to the proposed development.
- The anticipated cumulative visual impact of two proposed PV facilities is expected to be of moderate significance, which is considered to be acceptable from a visual perspective. This is mainly due to the relatively low viewer incidence within close proximity to the proposed development sites.

The anticipated visual impacts listed above (i.e. post mitigation impacts) range from moderate to low significance. Anticipated visual impacts on sensitive visual receptors (if and where present) in close proximity to the proposed facility are not considered to be fatal flaws for the proposed PV facility.

Considering all factors, it is recommended that the development of the facility as proposed be supported; subject to the implementation of the recommended mitigation measures and management programme recommended within the visual impact assessment (Appendix J).

11.2.8 Socio-economic Impacts

Impacts are expected to occur with the development of the Sun Garden PV Facility during the construction, operation and decommissioning phases. Both positive and negative impacts are identified and assessed.

Positive impacts during construction includes:

- Temporary stimulation of the national and local economy
- Temporary increase employment in the national and local economies
- Contribution to skills development in the country and local economy
- Temporary increase in household earnings
- Temporary increase in government revenue

Negative impacts during construction includes:

- Negative changes to the sense of place
- Negative impact on the local tourism, game industry and associated industries during construction
- Temporary increase in social conflicts associated with the influx of people
- Impact on economic and social infrastructure
- Impact on property and land value in the immediately affected area during construction

Positive impacts during operation includes:

- Sustainable increase in production and GDP nationally and locally
- Creation of sustainable employment positions nationally and locally
- Skills development of permanently employed workers
- Improved standards of living for benefiting households
- Sustainable increase in national and local government revenue
- Local economic and social development benefits derived from the project's operations
- Sustainable rental revenue for farms where the solar facility is located
- Sustainable increase in electricity available for the local region and South Africa

Negative impacts during operation includes:

» Negative changes to the sense of place
» Negative impact on local tourism, game farming and associated industries

Net effect and trade off analysis

The review of the proposed Sun Garden PV Facility is associated with both positive and negative socio-economic impacts. In order to assess whether the project is beneficial, the additions to the environment brought about by the project need to be evaluated. The additional benefits of the intervention are the difference between the reference case position (i.e., the no-go option) and the position if the intervention is implemented. It involves the evaluation of the net effect and trade-offs associated with the proposed intervention.

The assessment of the proposed facility, and its net effect from a socio-economic perspective, indicates that the project would generate greater socio-economic benefits during both the construction and operational phases than the potential losses that could occur as a result of its establishment. Stimulation of production, employment, government revenue, skills development, and household income as a result of the investment in the project and its subsequent operations will outweigh possible production, employment and household income losses that could be experienced by local businesses affected by changes in the areas aesthetic and visual resources. It should be noted though that the positive and negative impacts will be distributed mostly amongst different receptors but will not result in inequality. Adherence to the proposed mitigation measures, however, would ensure that the offset of impacts is more balanced and that it also takes into account communities and businesses that will be negatively affected.

The positive effects generated by the project will not offset many of the negative impacts. These include impacts on the sense of place and property and business values that could occur during both construction and operation, the effect on social and economic infrastructure, and crime and social conflicts in the area that could be created during only the construction phase. These impacts though will only affect local communities either temporarily or over the long term. These impacts are not highly significant and can be traded off for the net positive impact created by the project in terms of production, employment, government revenue, community benefits and households' earnings. This means that when compared with the no-go option, the proposed project is associated with greater socio-economic benefits.

Recommendations

Based on the information presented in the SEIA report, it is concluded that the net positive impacts associated with the development and operation of the proposed solar energy facility are expected to outweigh the net negative effects. The project is also envisaged to have a positive stimulus on the local economy and employment creation, leading to the economy's diversification and a small reduction in the unemployment rate. The project should therefore be considered for development. It should, however, be acknowledged that any negative impacts would be largely borne by the farms in the immediate vicinity and households residing on them, whilst the positive impacts will be largely concentrated in the local and national economies. Due to this imbalance, it is recommended that the mitigation measures suggested being strictly adhered to. Application of these mitigation measures will ensure that the negative impacts on the nearby farms and businesses are minimised and that the distribution of the potential benefits of the project are more balanced.

11.2.9 Impacts on Traffic

The potential traffic and transport related impacts for the construction, operation and decommissioning phases of the proposed Sun Garden PV Facility were identified and assessed. The main impact on the external road network will be during the construction phase. This phase is temporary in comparison to the operational period. The number of abnormal loads vehicles was estimated and to be found to be able to be accommodated by the road network. During operation, it is expected that maintenance and security staff will periodically visit the facility. It is assumed that approximately twenty (20) full-time employees will be stationed on site. The traffic generated during this phase will be minimal and will not have an impact on the surrounding road network.

The traffic generated during the construction phase, although significant, will be temporary and impacts are considered to be negative and of medium significance before and of low significance after mitigation. The traffic generated during the decommissioning phase will be less than the construction phase traffic and the impact on the surrounding road network will also be considered negative and of medium significance before and of low significance after mitigation.

The access road and access point to the proposed site have been assessed and were found to be acceptable from a traffic engineering perspective.

The development is supported from a transport perspective provided that the recommendations and mitigations contained in this report are adhered to.

The potential impacts associated with proposed Sun Garden PV Facility and associated infrastructure are acceptable from a transport perspective and it is therefore recommended that the proposed facility be authorised.

11.2.10 Assessment of Cumulative Impacts

Cumulative impacts and benefits on various environmental and social receptors will occur to varying degrees with the development of several renewable energy facilities in South Africa. The degree of significance of these cumulative impacts is difficult to predict without detailed studies based on more comprehensive data/information on each of the receptors and the site-specific developments. The alignment of renewable energy developments with South Africa's National Energy Response Plan and the global drive to move away from the use of non-renewable energy resources and to reduce greenhouse gas emissions is undoubtedly positive. The economic benefits of renewable energy developments at a local, regional and national level have the potential to be significant.

The Sun Garden PV Facility falls within the Cookhouse REDZ which has been identified by the DFFE as an area highly suitable for commercial wind and solar development given a range of factors considered. Therefore, DFFE envisages dealing with multiple renewable energy applications and cumulative issues within a REDZ area. The REDZs are of strategic importance for large scale wind and solar photovoltaic development, in terms of Strategic Integrated Project (SIP) 8. These zones are considered to be areas where significant negative impacts on the environment are limited and socio-economic benefits to the country can be enhanced. Multiple projects within the area have been successfully bid under the DMRE's REIPPP programme and are currently operational. The Sun Garden PV Facility will contribute to the cumulative impact experienced within the area. The cumulative impacts associated with the Sun Garden PV Facility have been assessed to be acceptable, with no unacceptable loss or risk expected (refer to **Table 11.1** and Chapter 10).

Table 11.1: Summary of the cumulative impact significance for the Sun Garden PV Facility

Specialist assessment	**Overall significance of impact of the proposed project considered in isolation**	**Cumulative significance of impact of the project and other projects in the area**
Ecology	Low	Medium
Aquatic Ecology	Low	Medium
Avifauna	Low	Medium
Bats	Low	Medium
Land use, soil and agricultural potential	Low	Low
Heritage (archaeology, palaeontology and cultural landscape)	Medium (palaeontology) High (cultural landscape)	Low (palaeontology) High (cultural landscape)
Noise	Low	Low
Visual	Medium	Medium
Socio-Economic	*Positive impacts:* High or Medium (depending on the impact being considered) *Negative impacts:* Medium or Low (depending on the impact being considered)	*Positive impacts:* High or Medium (depending on the impact being considered) *Negative impacts:* Medium or Low (depending on the impact being considered)
Traffic	Low	Low

Based on the specialist cumulative assessment and findings, the development of the Sun Garden PV Facility and its contribution to the overall impact of all renewable energy facilities to be developed within a 30km radius, it can be concluded that the Sun Garden PV Facility cumulative impacts will be of a medium to low significance, with impacts of a high significance mainly relating to positive socio-economic impacts and impacts on the cultural landscape. It was concluded that the development of the Sun Garden PV Facility will not result in unacceptable, high cumulative impacts and will not result in a whole-scale change of the environment.

11.3. Environmental Sensitivity Analysis

As part of the specialist investigations undertaken within the project development area, specific environmental features and areas were identified. The environmental features identified within and directly adjacent to the development area and development footprint are illustrated in Figure 11.1. The following points provide a description of the sensitivities identified within the development area:

» **Ecological features:**
The lower slopes of the PV area consist of open plains considered to be low sensitivity while the upper slopes of the PV area are steeper of have a higher woody component and are considered to be medium sensitivity. Along the power line route to the MTS, there are some high sensitivity drainage features, but these can easily be spanned by the power line and are not likely to be significantly impacted by the power line. The drainage feature which occurs along the south-eastern boundary of

the PV area would be vulnerable to impact and it is recommended that a freshwater specialist should demarcate the boundary of this feature in the field before construction to ensure that the PV area does not encroach into this area unnecessarily. In terms of fauna, the PV area does not have any habitats present that would be of particularly high value and no specific impact of high magnitude on fauna are expected. However, given the size of the facility and the location within an ESA it is recommended that specific measures are put in place with regards to the design of the fence around the facility to facilitate the movement of smaller fauna in and out of the PV area. Similarly, no plant species of high concern were observed within the PV and impacts on plant SCC are likely to be low. Perhaps the greatest area of concern regarding the PV facility would be the location of parts of the facility on fairly steep slopes (>5%) with soils that appear to have high erodibility. The panels would generate a lot of runoff and combined with the high levels of disturbance that would occur after construction, the potential for erosion problems at the site are very high. Consequently, specific mitigation measures to reduce and manage erosion and runoff at the site are recommended.

» **Aquatic Ecology:**
The only natural wetlands observed within or in close proximity to the development area, included seven depressions. These, inclusive of the proposed buffers (57m), will be avoided by the development footprint based on the information supplied in this report. No activities occur within 500m of these pan boundaries and only the road crossing the drainage lines will require a Water Use Authorisation, which has been initiated by the Applicant. Currently it is anticipated that all the applications will fall within a General Authorisation.

» **Avifauna:**
The Site Ecological Importance has been determined for each Species of Conservation Concern (SCC) has been determined to be Low. Therefore, development activities of medium to high impact are acceptable following the implementation of appropriate minimisation and restoration mitigation measures. The proposed overhead powerline corridor is mostly positioned alongside hills and slopes, away from the flatter areas generally preferred by bustards, this is likely to reduce the probability of collisions by these species simply due to the proposed position on the landscape. No no-go areas have been identified and no buffers have been recommended.

» **Bats:**
The site as a whole yield very few sensitive features relevant for the local bat community occurring in the area. No known bat roosts occur on site, although two larger roosts are located approximately 12.5km south-east and 30km north of the proposed facility. No no-go areas have been identified and no buffers have been recommended.

» **Soils:**
All of the components associated with the Sun Garden project area are located on "Low" sensitivity land potential areas. No no-go areas have been identified and no buffers have been recommended.

» **Heritage Resources:**
During the survey of the Sun Garden PV Facility no heritage sites of significance were identified. According to the PalaeoMap of SAHRIS the Palaeontological Sensitivity of the site ranges from Low to Very High. No visible evidence of fossiliferous outcrops was found during the field assessment. No no-go areas have been identified and no buffers have been recommended for the PV facility. Buffers of 500m (heritage buffer) and 1000m (cultural landscape buffer) have been recommended for heritage

resources identified within the Redding Wind Farm site (across which the power line is proposed) in the vicinity of the power line. Where the development encroaches into these buffers, the specialist recommended that the heritage resource be fully recorded prior to construction being undertaken.

» **Visual:**
The relatively constrained dimensions of the PV facility would amount to a fairly limited area of potential visual exposure. The visual exposure would largely be contained within a 6km radius of the proposed development site, with the predominant exposure to the north. There are no homesteads or public roads within 1km of the facility where the facility may be highly visible. Sensitive receptors within the 1km to 3km zone include the Britskraal homestead and sections of the Beenleegte secondary road. A number of sensitive receptors (4 homesteads) are located within the 3-6km zone. All but 1 of these are located within farms earmarked for the Redding Wind Farm. No no-go areas have been identified and no buffers have been recommended.

» **Socio-economic:**
» Sensitive receptors from a socio-economic perspective are similar to those identified from a visual perspective, as detailed above. Most of the farms in the area are involved in a combination of crop, livestock and hunting activity. The dominant activity currently undertaken on farms that were surveyed was agriculture but, notable numbers of tourist activities occur on the farms. The immediate area surrounding the proposed Sun Garden PV Facility is very similar in terms of land use however there is no evidence of any tourism accommodation facilities offering overnight opportunities. No no-go areas have been identified and no buffers have been recommended.

» **Traffic:**
The proposed main access road to the site is an existing gravel road between the N10 and R335. The proposed access road will link to the internal road network of the facility. The proposed access road and the access point to the development is deemed suitable from a traffic engineering perspective. No no-go areas have been identified and no buffers have been recommended.

Based on an analysis of the identified sensitivities for the project development area, no optimisation of the layout is required. The layout as presented within Figure 11.1 is therefore considered to be the most appropriate from an environmental perspective.

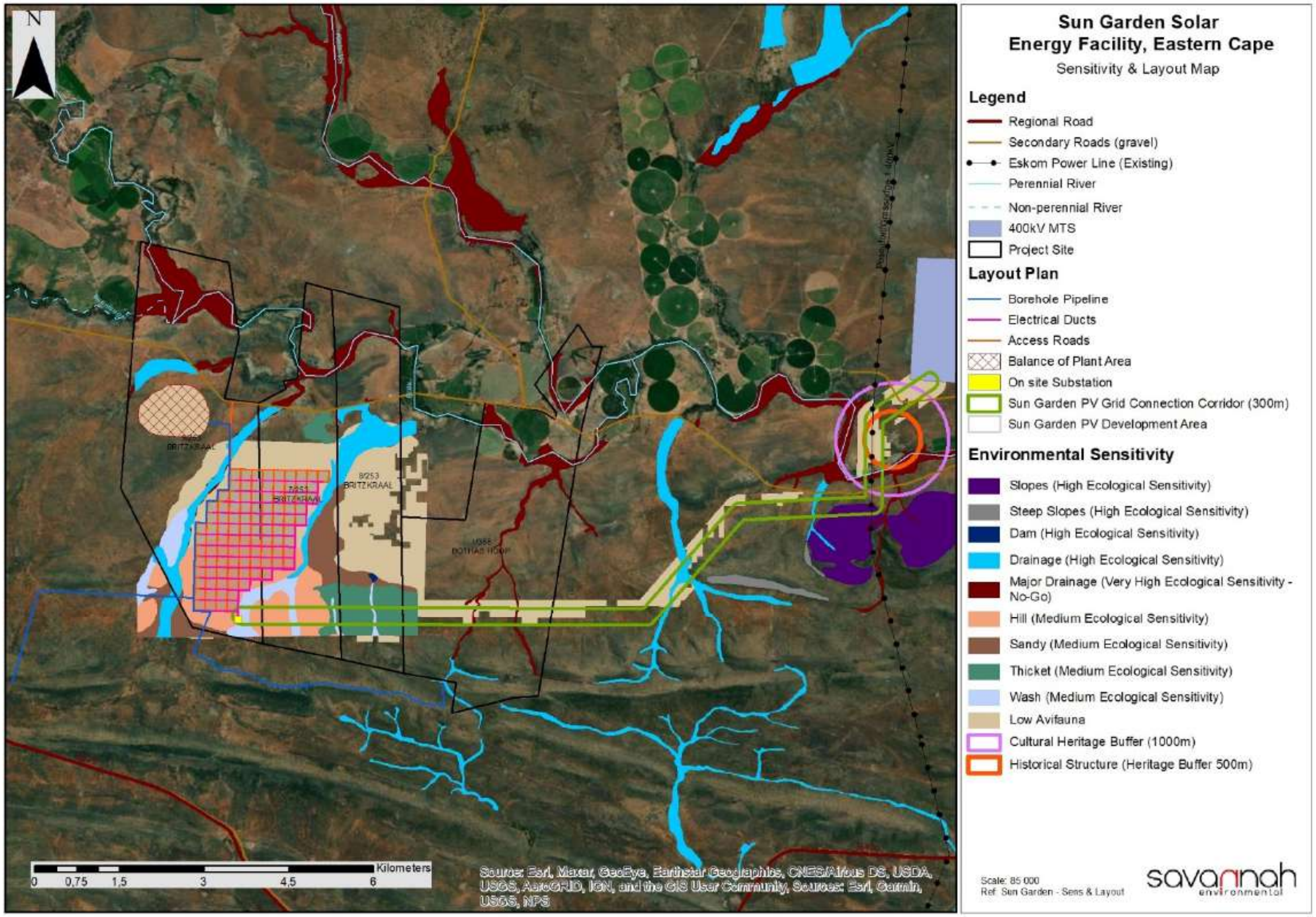

Figure 11.1: The development footprint (~350ha) of the Sun Garden PV Facility, as assessed within this BA Report, overlain on the identified environmental sensitive features (**Appendix N**)

11.4. Environmental Costs versus Benefits of the Project

Environmental costs (including those to the natural environment, economic and social environment) can be anticipated at a local and site-specific level and are considered acceptable provided the mitigation measures as outlined in the BA report and the EMPr are implemented and adhered to. No fatal flaws have been identified. These environmental costs could include:

» A loss of biodiversity, flora and fauna due to the clearing of land for the construction and utilisation of land for the PV facility. The cost of loss of biodiversity has been minimised/avoided through the limited placement of project components and infrastructure within the fine-scale vegetation types considered to be of high sensitivity
» An increase in traffic - The Sun Garden PV Facility construction will create an increase in traffic. This impact will however be short-term in extent and is not considered to be significant.
» Visual impacts associated with the PV facility. The Sun Garden PV Facility will be visible and mainly of a high significance within 6km of the facility. No mitigation of this impact is possible (i.e. the structures will be visible in the landscape), but general mitigation and management are required as best practise to minimise secondary visual impacts which may arise from mismanagement of the site.
» Heritage impacts associated with the PV facility. The Sun Garden PV Facility will have an impact on the Cultural Landscape within the area. Technically feasible recommendations made in the CLA will result in a marginal reduction of impact.
» Loss of land for agriculture. The development will remove areas available for agricultural activities. However, based on the low sensitivity of the soils within the development footprint of the PV Facility, this will not be significant.
» Impacts on birds and bats. The development will result in a loss of habitat. The impact is however considered to be acceptable without any impact of high significance.
» Impacts on the social environment. Socio-economic impacts include impacts on the sense of place and property and business values that could occur during both construction and operation, the effect on social and economic infrastructure, and crime and social conflicts in the area that could be created during only the construction phase. These impacts though will only affect local communities either temporarily or over the long term. These impacts are not highly significant and can be traded off for the net positive impact created by the project in terms of production, employment, government revenue, community benefits and households' earnings.

Benefits of the Sun Garden PV Facility include the following:
» The project will result in important economic benefits at the local and regional scale through job creation, income and other associated downstream economic development. These will persist during the preconstruction, construction, operation and decommissioning phases of the project.
» The project provides an opportunity for a new land use on the affected properties which is considered as a more efficient use of the land and provides an opportunity for financial benefits to the current land use.
» The project contributes towards the Provincial and Local goals for the development of renewable energy as outlined in the respective IDPs.
» The project serves to diversify the economy and electricity generation mix of South Africa through the addition of solar energy.

- The water requirement for a solar facility is negligible compared to the levels of water used by coal-based technologies. This generation technology is therefore supported in dry climatic areas.
- South Africa's per capita greenhouse gas emissions are amongst the highest in the world due to the reliance on fossil fuels. The Sun Garden PV Facility will contribute to achieving goals for implementation of renewable energy and sustaining a 'green' economy within South Africa.

The benefits of the Sun Garden PV Facility are expected to occur at a national, regional, and local level. As the costs to the environment at a site-specific level have been largely limited through the appropriate placement of infrastructure on the project site within lower sensitive areas through the avoidance of features and areas considered to be sensitive, the benefits of the project are expected to partially offset the localised environmental costs of the PV facility.

11.5. Overall Conclusion (Impact Statement)

The preferred activity was determined by the developer to be the development of a renewable energy facility on site using solar irradiation as the preferred technology, due to the availability of a suitable solar resource. Independent specialists appointed to undertake the assessment of potential impacts associated with the project assessed a larger area in order to inform the best location for the solar facility infrastructure. The Specialists considered desktop data, results from field work, existing literature and the National Web-based Environmental Screening Tool to inform the identification of sensitivities. A proposed layout was designed after provision of sensitivity data by the specialists with the aim of avoiding sensitive areas identified.

Based on the specialist investigations of the larger area, a technically viable development footprint was proposed by the developer and assessed as part of the BA process. The findings of the assessment of the development footprint undertaken by independent specialists have informed the results of this BA report. The specialist findings have indicated that there are no identified fatal flaws associated with the implementation of the project within the project site.

From a review of the relevant policy and planning framework, it was concluded that the project is well aligned with the policy framework, and a clear need for the project is seen from a policy perspective at a local, provincial and National level. The project development area is located outside of any protected area and outside of any Critical Biodiversity Areas (CBAs) as defined in the Provincial Conservation Plan. When considering biodiversity and socio-economic benefits and impacts on the affected and surrounding areas, the following is concluded from the specialist studies undertaken within this BA process.

From a biodiversity perspective, the site is not located within a protected area. The site is located within an extensive ESA. However, overall, there are no specific long-term impacts likely to be associated with the development of the Sun Garden PV Facility that cannot be reduced to a low significance. There are no fatal flaws associated with the development and no terrestrial ecological considerations that should prevent it from proceeding. No sensitivities were identified from a bat and avifauna perspective, and the layout proposed ensures that all aquatic sensitivities identified through the BA process are avoided and recommended buffer areas are honoured. This approach is in line with the application of the mitigation hierarchy, where all the sensitive areas which could be impacted by the development have been avoided (i.e. tier 1 of the mitigation hierarchy). Where impacts could not be avoided, appropriate mitigation has been proposed to minimise impacts. It follows therefore that the project does not adversely impact on the ecological integrity of the area.

In addition, consideration must also be given to the positive and negative socio-economic impact. Impacts on cultural landscape are expected to be high. It must be considered that the addition of the infrastructure of the Sun Garden PV Facility will constitute an additional layer to the cultural landscape and must be considered as such within a gazetted REDZ area. Through the implementation of the economically feasible recommendations as set out in the Heritage impact Assessment and contained in this report it will be possible to preserve older layers of the cultural landscape and in some cases even enhance them through consideration such as the use of older name places in the naming of infrastructure and enhancing local heritage through the incorporation of such structures in project conservation initiatives to name a few.

The Socio-economic Impact Assessment has identified short-term (construction related) impact indicators and operational related socio-economic impact indicators. The assessment of the proposed facility, and its net effect from a socio-economic perspective, indicates that the project would generate greater socio-economic benefits during both the construction and operational phases than the potential losses that could occur as a result of its establishment.

As detailed in the cost-benefit analysis, the benefits of the Sun Garden PV Facility are expected to occur at a national, regional and local level. As the costs to the environment at a site-specific level have been largely limited through the appropriate placement of infrastructure on the project site within lower sensitive areas through the avoidance of features and areas considered to be sensitive, the benefits of the project are expected to partially offset the localised environmental costs of the PV facility. From an economic perspective, both positive and negative impacts are expected.

Based on the conclusions of the specialist studies undertaken, it can be concluded that the development of the Sun Garden PV Facility based on the current layout as provided by the developer will not result in unacceptable environmental impacts (subject to the implementation of the recommended mitigation measures).

11.6. Overall Recommendation

Considering the findings of the independent specialist studies, the impacts identified, the development footprint proposed by the developer within the development envelope, the avoidance of the sensitive environmental features within the project site, as well as the potential to further minimise the impacts to acceptable levels through mitigation, it is the reasoned opinion of the EAP that the Sun Garden PV Facility is acceptable within the landscape and can reasonably be authorised. The proposed layout as provided by the developer (**Figure 11.1**) is considered to be the most appropriate from an environmental perspective as it avoids identified sensitivities and recommended buffer areas.

The following infrastructure would be included within an authorisation issued for the project:

» Solar PV array comprising PV modules and mounting structures.
» Inverters and transformers.

- Cabling between the project components, lain underground where practical.
- A 132/33kV on-site collector substation to be connected to a proposed 400kV Main Transmission Substation (MTS) located to the north-east of the site via a new 132kV overhead power line (twin turn dual circuit line). The development of the proposed 400kV Main Transmission Substation will be assessed as part of the separate BA process in order to obtain Environmental Authorisation.
- Site offices and maintenance buildings, including workshop areas for maintenance and storage.
- Temporary laydown areas.
- Access roads to the site and between project components with a width of approximately 4,5m. The main access points will be 8m wide.
- Water supply pipelines from onsite boreholes.
- A temporary concrete batching plant.
- Staff accommodation (temporary).
- Operation and Maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitor's centre.

The following key conditions would be required to be included within an authorisation issued for the Sun Garden PV Facility:

- All mitigation measures detailed within this BA report, as well as the specialist reports contained within **Appendices D to L** are to be implemented.
- The EMPr as contained within **Appendix M** of this BA report should form part of the contract with the Contractors appointed to construct and maintain the solar facility in order to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of the Sun Garden PV Facility is considered key in achieving the appropriate environmental management standards as detailed for this project.
- Following the final design of the Sun Garden PV Facility, a revised layout must be submitted to DFFE for review and approval prior to commencing with construction. No development is permitted within the identified no-go areas as detailed in **Figure 11.1.**
- A pre-construction walk-through of the final layout, including roads and underground cables, should be undertaken before construction commences and adjusted where required to reduce impacts on species of conservation concern and habitats of concern.
- The permitter fence of the facility must have access points for smaller fauna at least every 50m of fence. These should be a minimum of 40cm x 20cm in size and should be orientated both vertically and horizontally.
- The facility must have a detailed runoff and erosion management plan that takes account of the vulnerability of the area to erosion damage. This should be developed with input from a specialist with specific experience in this regard.
- Implement a chance finds procedure for the rescuing of any fossils or heritage resources discovered during construction.
- If any archaeological material or human burials are uncovered during construction activities, work in the immediate area should be halted, the find reported to the heritage authorities and inspected by an archaeologist. Such heritage is the property of the State and may require excavation and curation in an approved institution.
- Maintain vegetation cover (i.e. either natural or cultivated) immediately adjacent to the actual development footprint, both during construction and operation of the proposed facility.

» Monitor all rehabilitated areas for one year following decommissioning and implement remedial actions as and when required.

A validity period of 15 years of the Environmental Authorisation is requested, should the project obtain approval from DFFE.

CHAPTER 12: REFERENCES

Terrestrial Ecology

Alexander, G. & Marais, J. 2007. A Guide to the Reptiles of Southern Africa. Struik Nature, Cape Town.

Branch W.R. 1998. Field guide to snakes and other reptiles of southern Africa. Struik, Cape Town.

Bates, M.F., Branch, W.R., Bauer, A.M., Burger, M., Marais, J., Alexander, G.J. & de Villiers, M. S. 2013. Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland. Strelitzia 32. SANBI, Pretoria.

Department of Environmental Affairs and Tourism, 2007. National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004): Publication of lists of Critically Endangered, Endangered, Vulnerable and Protected Species. Government Gazette, Republic of South Africa.

Du Preez, L. & Carruthers, V. 2009. A Complete Guide to the Frogs of Southern Africa. Struik Nature., Cape Town.

Minter LR, Burger M, Harrison JA, Braack HH, Bishop PJ & Kloepfer D (eds). 2004. Atlas and Red Data book of the frogs of South Africa, Lesotho and Swaziland. SI/MAB Series no. 9. Smithsonian Institution, Washington, D.C.

Mucina L. & Rutherford M.C. (eds) 2006. The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

Nel, J.L., Murray, K.M., Maherry, A.M., Petersen, C.P., Roux, D.J., Driver, A., Hill, L., Van Deventer, H., Funke, N., Swartz, E.R., Smith-Adao, L.B., Mbona, N., Downsborough, L. and Nienaber, S. (2011). Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. K5/1801.

Skinner, J.D. & Chimimba, C.T. 2005. The mammals of the Southern African Subregion. Cambridge University Press, Cambridge

Avifauna

Dean, WRJ. 2000. Factors affecting bird diversity patterns in the Karoo, South Africa. South African Journal of Science. 96. 609-616.

Department of Environmental Affairs, 2015. Strategic Environmental Assessment for wind and solar photovoltaic energy in South Africa. CSIR Report Number: CSIR/CAS/EMS/ER/2015/0001/B. Stellenbosch. https://egis.environment.gov.za/redz

Guisan, A., Weiss, S.B. and Weiss, A.D. 1999. GLM versus CCA spatial modelling of plant species distribution. Plant Ecology 143: 107-122.

IUCN Red List of Threatened Species 2020 (IUCN) https://www.iucnredlist.org/

Jenkins, A.R., Ralston-Paton, S., and Smit-Robinson, H.A. 2017. Birds & Solar Energy Best Practice Guidelines. Guidelines for Assessing and Monitoring the Impact of Solar Power Generating Facilities on Birds in Southern Africa. BirdLife South Africa.

http://sabap2.birdmap.africa/

https://screening.environment.gov.za/

Low, A. B. & Rebelo, A. G. 1996. Vegetation of South Africa, Lesotho and Swaziland. Department of Environmental Affairs and Tourism, Pretoria.

Marnewick MD, Retief EF, Theron NT, Wright DR, Anderson TA. 2015. Important Bird and Biodiversity Areas of South Africa. Johannesburg: BirdLife South Africa.

Mucina, L. and Rutherford, M.C. (eds) 2006. The vegetation of South Africa, Lesotho and Swaziland, in Strelitzia 19. South African National Biodiversity Institute, Pretoria.

Parker, D. M. 2019. The elephant in the 'room': determinants of songbird assemblages in the Thicket Biome, South Africa, Emu - Austral Ornithology, 119:2, 157-165.

Riley, S.J., De Gloria, S.D. and Elliot, R. 1999. A Terrain Ruggedness Index that Quantifies Topographic Heterogeneity. Intermountain Journal of sciences, 5: 23-27.

Shaw, J.M, Jenkins, A.R., Smallie, J.J & Ryan, P.G. 2010. Modelling power-line collision risk for the Blue Crane Anthropoids paradiseus in South Africa. Ibis 152: 590-599

Shaw, J.M., Reid, T.A., Gibbons, B.K., Pretorius, M., Jenkins, A.R., Visage, R., Michael, M.D., Ryan, P.G. 2021. A large-scale experiment demonstrates that line marking reduces power line collision mortality for large terrestrial birds, but not bustards, in the Karoo, South Africa, Ornithological Applications, Volume 123, Issue 1, 1 February 2021, duaa067,

Simmons, R.E., Pallett, J. & Brown, C.J. In prep.

South African National Biodiversity Institute (SANBI). 2020. Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental impact assessments in South Africa. South African National Biodiversity Institute, Pretoria. Version 1.2020.

Taylor, M.R., Peacock, F., and Wanless, R.M. 2015. Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland.

Taylor, P.B., Navarro, R.A., Wren-Sargent, M., Harrison, J.A. & Kieswetter, S.L. 1999. Coordinated waterbird Counts in South Africa, 1992-1997. Avian Demography Unit, Cape Town.

van Rooyen, C.S. 2004. The Management of Wildlife Interactions with over-headlines. In The fundamentals and practice of Over-head Line Maintenance (132kV and above), pp217-245. Eskom Technology, Services International, Johannesburg.

Young, D.J., Harrison, J.A, Navarro, R.A., Anderson, M.A., & Colahan, B.D. (Eds). 2003. Big birds on farms: Mazda CAR Report 1993-2001. Avian Demography Unit: Cape Town.

Bats

ACR. (2020). African Chiroptera Report 2020.

Arcus. (2021). Bat Impact Assessment for the Proposed Redding Wind Farm, Eastern Cape Province.

Barclay, R. (1985). Foraging Behaviour of the African Insectivorous Bat, Scotophilus leucogaster. Biotropica 17, 65-70.

Cooper-Bohannon, R., Rebelo, H., Jones, G., Cotterill, F., Monadjem, A., Schoeman, M., Park, K. (2016). Predicting bat distributions and diversity hotspots in southern Africa. Hystrix 27, 47-57.

Downs, N., & Sanderson, L. (2010). Do bats forage over cattle dung or over cattle? Acta Chiropterologica 12, 349-358.

Fenton, M., & Rautenbach, I. (1986). A comparison of the roosting and foraging behaviour of three species of African insectivorous bats (Rhinolophidae, Vespertilionidae and Molossidae). Canadian Journal of Zoology 64, 2860-2867.

Gelderblom, C., Bronner, G., Lombard, A., & Taylor, P. (1995). Patterns of distribution and current protection status of the Carnivora, Chiroptera and Insectivora in South Africa.

Greif, S., & Siemers, B. (2010). Innate recognition of water bodies in echolocating bats. Nature Communications 1, 107.

Kunz, T., & Lumsden, L. (2003). Ecology of Cavity and Foliage Roosting Bats. In T. Kunz, & M. Fenton, Bat Ecology (pp. 3-89). Chicago: The Univ. Chicago Press.

Monadjem, A., Taylor, P., Cotterill, F., & Schoeman, M. (2010). Bats of Southern and Central Africa: A Biogeographic and Taxonomic Synthesis. Johannesburg: Wits University Press.

Noer, C., Dabelsteen, T., Bohmann, K., & Monadjem, A. (2012). Molossid bats in an African agroecosystem select sugarcane fields as foraging habitat. African Zoology 47, 1-11.

SABAA. (2021, 10 18). Bats and Solar Power. Retrieved from The South African Bat Assessment Association: http://www.sabaa.org.za/pages/4_batsandsolar.html

Schnitzler, H., & Kalko, E. (2001). Echolocation by insect-eating bats. BioScience 51, 557-568.

Sirami, C., Jacobs, D., & Cumming, G. (2013). Artificial wetlands and surrounding habitats provide important foraging habitat for bats in agricultural landscapes in the Western Cape, South Africa. Biological Conservation 164, 30-38.

Taylor, P., Mkhari, D., Mukwevho, T., Monadjem, A., Schoeman, M., Schoeman, C., & Steyn, J. (2011). Bats as potential biocontrol agents in an agricultural landscape, Levubu Valley: Diet, activity and species composition of bats in macadamia orchards and neighbouring natural habitats. South African Avocado Growers Association Yearbook 34.

Verboom, B. (1998). The use of edge habitats by commuting and foraging bats. Wageningen: IBN-DLO.

Aquatic

Agenda 21 – Action plan for sustainable development of the Department of Environmental Affairs and Tourism (DEAT) 1998.

Agricultural Resources Act, 1983 (Act No. 43 of 1983).

Alexander, G. And Marais, J. 2010. A Guide to Reptiles of Southern Africa. Struik Nature, Cape Town. Animal Demography Unit, Department Of Zoology, University Of Cape Town. 2012. Summary Data Of The Frogs Of South Africa, Lesotho And Swaziland. Downloaded From: Http://Adu.Org.Za/Frog_Atlas.Php; Accessed On 2/02/2013.

Branch, W.R. 1998. Terrestrial reptiles and amphibians. In: A Field Guide to the Eastern Cape Coast, R. A. Lubke, F. W. Gess and M. N. Bruton (eds.), Grahamstown Centre for the Wildlife Soc. S. Afr., 251 264.

Davies, B. and Day J., (1998). Vanishing Waters. University of Cape Town Press.

Department of Water Affairs and Forestry - DWAF (2005). A practical field procedure for identification and delineation of wetland and riparian areas Edition 1. Department of Water Affairs and Forestry , Pretoria.

Department of Water Affairs and Forestry - DWAF (2008). Manual for the assessment of a Wetland Index of Habitat Integrity for South African floodplain and channelled valley bottom wetland types by M. Rountree (ed); C.P. Todd, C. J. Kleynhans, A. L. Batchelor, M. D. Louw, D. Kotze, D. Walters, S. Schroeder, P. Illgner, M. Uys. and G.C. Marneweck. Report no. N/0000/00/WEI/0407. Resource Quality Services, Department of Water Affairs and Forestry, Pretoria, South Africa.

Driver A., Sink, K.J., Nel, J.N., Holness, S., Van Niekerk, L., Daniels, F., Jonas, Z., Majiedt, P.A., Harris, L. & Maze, K. 2012. National Biodiversity Assessment 2011: An assessment of South Africa's biodiversity and ecosystems. Synthesis Report. South African National Biodiversity Institute and Department of Environmental Affairs, Pretoria.

Du Preez, L. And Carruthers, V. 2009. A Complete Guide To Frogs Of Southern Africa. Struik Nature, Cape Town

ECBCP (2019) Eastern Cape Biodiversity Conservation Plan Handbook. Department of Economic Development and Environmental Affairs (King Williams Town). Compiled by G. Hawley, P. Desmet and D. Berliner.

Ewart-Smith J.L., Ollis D.J., Day J.A. and Malan H.L. (2006). National Wetland Inventory: Development of a Wetland Classification System for South Africa. WRC Report No. KV 174/06. Water Research Commission, Pretoria.

IUCN (2019). Red List of Threatened Species. IUCN Species Survival Commission, Cambridge Available: http://www.iucnredlist.org/

Kleynhans C.J., Thirion C. and Moolman J. (2005). A Level 1 Ecoregion Classification System for South Africa, Lesotho and Swaziland. Report No. N/0000/00/REQ0104. Resource Quality Services, Department of Water Affairs and Forestry, Pretoria.

Kotze D.C., Marneweck G.C., Batchelor A.L., Lindley D.S. and Collins N. (2008). WET-EcoServices A technique for rapidly assessing ecosystem services supplied by wetlands. WRC Report No: TT 339/08.

Macfarlane, D.M. & Bredin, I.P. 2017. Buffer Zone Guidelines for Rivers, Wetlands and Estuaries Buffer Zone Guidelines for Rivers, Wetlands and Estuaries. WRC Report No TT 715/1/17 Water Research Commission, Pretoria.

Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), as amended.

Minter, L. Burger, M. A. Harrison, J. Braack, H. Bishop, P. & Kloepfer, D. (2004). Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland. Smithsonian Institute.

Mitsch, J.G. and Gosselink, G. (2000). Wetlands 3rd End, Wiley, NewYork, 2000, 920 pg.

Mucina, L., & Rutherford, M.C., 2006. The Vegetation of South Africa, Lesotho and Swaziland, Strelitzia 19, South Africa.

National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended.

National Water Act, 1998 (Act No. 36 of 1998), as amended

Nel, J., Maree, G., Roux, D., Moolman, J., Kleynhans, N., Silberbauer, M. and Driver, A. 2004. South African National Spatial Biodiversity Assessment 2004: Technical Report. Volume 2: River Component. CSIR Report Number ENV-S-I-2004-063. Council for Scientific and Industrial Research, Stellenbosch.

Nel, J.L., Murray, K.M., Maherry, A.M., Petersen, C.P., Roux, D.J., Driver, A., Hill, L., Van Deventer, H., Funke, N., Swartz, E.R., Smith-Adao, L.B., Mbona, N., Downsborough, L. and Nienaber, S. (2011). Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. K5/1801.

Ollis, D.J., Snaddon, C.D., Job, N.M. & Mbona, N. 2013. Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland Systems. SANBI Biodiversity Series 22. South African National Biodiversity Institute, Pretoria.

Parsons R. (2004). Surface Water – Groundwater Interaction in a Southern African Context. WRC Report TT 218/03, Pretoria.

Ramsar Convention, (1971) including the Wetland Conservation Programme (DEAT) and the National Wetland Rehabilitation Initiative (DEAT, 2000).

Rowntree, K., Wadesone, R. and O'Keeffe, J. 2000. The development of a geomorphological classification system for the longitudinal zonation of South African rivers. South African Geographical Journal 82(3): 163-172.

South African Bird Atlasing Project 2 (SABAP2). 2017. Animal Demographic Unit. Available online: http://sabap2.adu.org.za/

Stuart, C and Stuart, T. 2007. A field guide to the mammals of Southern Africa. Struik Nature, Cape Town.

van Deventer H., Smith-Adao, L. Petersen C., Mbona N., Skowno A., Nel, J.L. (2018) Review of available data for a South African Inventory of Inland Aquatic Ecosystems (SAIIAE). Water SA 44 (2) 184-199.

Woodhall, Steve (2005). Field Guide to Butterflies of South Africa. Cape Town, South Africa: Struik. ISBN 978-1-86872-724-7.

Soil, Land Use, Land Capability and Agricultural Potential

Department of Primary Industries and Regional Development. 2017. Deep ripping for soil compaction. https://www.agric.wa.gov.au/soil-compaction/deep-ripping-soil-compaction.

Land Type Survey Staff. 1972 - 2006. Land Types of South Africa: Digital Map (1:250 000 Scale) and Soil Inventory Databases. Pretoria: ARC-Institute for Soil, Climate, and Water.

Mucina, L., & Rutherford, M. C. 2006. The Vegetation of South Africa, Lesotho, and Swaziland. Strelitzia 19. Pretoria: National Biodiversity Institute.

Russell, W. 2009. WET-RehabMethods. National guidelines and methods for wetland rehabilitation.

SASA, S. A. 1999. Identification & management of the SOILS of the South African sugar industry. Mount Edgecombe: South African Sugar Association Experiment Station.

Smith, B. 2006. The Farming Handbook. Netherlands & South Africa: University of KwaZulu-Natal Press & CTA.

Soil Classification Working Group. 1991. Soil Classification A Taxonomic system for South Africa. Pretoria: The Department of Agricultural Development.

Soil Classification Working Group. 2018. Soil Classification A Taxonomic system for South Africa. Pretoria: The Department of Agricultural Development.

The Biodiversity Company. 2021. Agricultural Compliance Statement for the proposed 400MTS

Van Zijl, G.M. & Botha, J.O. 2016. In pursuit of a South African national soil database: potential and pitfalls of combining different soil datasets.

Van Zijl, G.M. 2018. Digital soil mapping approaches to address real world problems in southern Africa.

Heritage (including archaeology, palaeontology and cultural landscape)

BERGH, J.S. (ed.). 1999: Geskiedenis Atlas van Suid-Afrika: Die Vier Noordelike Provinsies. J.L. van Schaik. Pretoria.

BROQUET, C.A.M. 1992. The sedimentary record of the Cape Supergroup: a review. In: De Wit, M.J. & Ransome, I.G. (Eds.) Inversion tectonics of the Cape Fold Belt, Karoo and Cretaceous Basins of Southern Africa, pp. 159-183. Balkema, Rotterdam.

CHISHOLM, H. 1911. "Algoa Bay". Encyclopædia Britannica. (11th ed.). Cambridge: Cambridge University Press. p. 655.

COETZEE, C. 1994. Forts of the Eastern Cape: Securing a frontier 1799-1878. University of Fort Hare: King Williams Town.

COLLINS, B. & WILKINS, J. and AMES, C. 2017. Revisiting the holocene occupations at Grassridge Rockshelter, Eastern Cape, South Africa. South African Archaeological Bulletin 72 (206): 162–170.

CORY, G. 1920. Grahamatown, in Souvenir in Commemoration of the Centenary of the 1820 Settlers of Albany April 1820-April 1920. East London Daily Dispatch

DEACON, H.J. 1976. Where Hunters Gathered: A Study of Holocene Stone Age people in the Eastern Cape. South African Archaeological Society Monograph Series, No. 1.

ENCYCLOPAEDIA BRITANNICA. 2006. Port Elizabeth. Internet: https://www.britannica.com/place/Port-Elizabeth-South-Africa#accordion-article-history. Accessed: 22 January 2020

ERASMUS. 2014. On Route in South Africa. Jonathan Ball Publishers.3rd Edition. Johannesburg

GESS, W. H. R. 1969. Excavation of a pleistocene bone deposit at Aloes near Port Elizabeth. The South African Archaeological Bulletin, 24(93): 31-32.

HALL, S. L. 1985. The Prehistory of Grahamstown and its Environs. In Daniel, J.B. McI; Holleman, W.; Jacot Guillardmod, A. Grahamstown and its Environs. Grahamstown, Albany Museum.

HALL, S. & BINNEMAN, J. F. 1987. Later Stone Age Burial Variability in the Cape: A Social Interpretation. South African Archaeological Society 42(146): 140–152.

HALL, S AND WEBLEY, L. 1998. Chapter 27: Archaeology and Early History, in Lubke, R and De Moor, I. Field Guide to the Eastern and Southern Cape Coasts. Cape Town: University of Cape Town Press.

HUFFMAN, T. 2007. Handbook to the Iron Age of Pre-Colonial Farming Societies in South Africa. Pietermaritzburg: University of KwaZulu-Natal Press.

LEIN, R. G. 2000. The Earlier Stone Age of Southern Africa. The South African Archaeological Bulletin, 27(172): 107-122.

KORSMAN, S.A. & MEYER, A. 1999. Die Steentydperk en rotskuns. In Bergh, J.S. (red.). Geskiedenisatlas van Suid-Afrika. Die vier noordelike provinsies. Pretoria: J.L.van Schaik.

MAZEL, A. D. 1992. Early pottery from the eastern part of southern Africa. The South African Archaeological Bulletin, 47(155): 3-7.

MITCHELL, P. 2002. The Archaeology of Southern Africa. Cape Town: Cambridge University Press.

MUCINA, L. & RUTHERFORD, M. C. 2006. Vegetation Map of South Africa, Lesotho and Swaziland. Pretoria: SANBI.

MYLES, P. B. 2017. Maritime Clusters and the Ocean Economy: An Integrated Approach to Managing Coastal and Marine Space. Oxon: Routledge

OPPERMAN, H., 1982. Some research results of excavations in the Colwinton Rock Shelter, north-eastern Cape. The South African Archaeological Bulletin, 37(136): 51-56.

OPPERMAN, H. 1987. The Later Stone Age of the Drakensberg Range and its foothills. Oxford: British Archaeological Reports International Series 339.

OPPERMAN, H. 1996. Strathalan Cave B, north-eastern Cape Province, south Africa: Evidence for human behaviour 29,000-26,000 years ago. Quaternary International, 33: 45-53

PEIRES, J. B. 1982. The House of Phalo: A History of the Xhosa People in the Days of Their Independence. Los Angeles: University of California Press

PINTO, H., ARCHER, W., WITELSON, D., REGENSBERG, R., EDWARDS BAKER, S., MOKHACHANE, R., RALIMPE, J., NDABA, N., MOKHANTSO, L., LECHEKO, P. & CHALLIS, S. 2018. The Matatiele Archaeology and Rock Art (MARA) Program Excavations: The Archaeology of Mafusing 1 Rock Shelter, Eastern Cape, South Africa. Journal of African Archaeology, 16(2): 145-167.

RASMUSSEN, R. K. 1978. Migrant Kingdom: Mzilikazi's Ndebele in South Africa. London: Rex Collings

REDGRAVE, J.J. 1947. Port Elizabeth in bygone days. Cape Town: Rustica Press.

RIGHTMIRE, G. P. & DEACON, H.J. 1991. Comparative studies of Late Pleistocene human remains from Klasies River Mouth, South Africa, Journal of Human Evolution, 20(2): 131-156

SHAW, I. & JAMESON, R. 2002. A Dictionary of Archaeology. UK: Blackwell Publishers Ltd

THEAL, G. M. 2010. History of South Africa Since September 1795. Cambridge: Cambridge University Press

WADLEY. L. 2007. The Middle Stone Age and Later Stone Age. In Bonner, P. & Esterhuysen, A. & Jenkins, T. A Search for Origins: Science, History and South Africa's 'Cradle of Humankind'. Johannesburg: Wits University Press. Pg 122 -135.

WEBSTER, L.J. 1978. Visit to Table Hill Farm and Hilton. Annals of the Grahamstown Historical Society, 2(3): 71-79.

WESSELS, A. 2010. The Anglo-Boer War 1889-1902: White Man's War, Black Man's War, Traumatic War. Bloemfontein: African Sun Media.

<u>Unpublished</u>

ANDERSON, G. 2009. Heritage survey of the proposed Waainek Wind Farm, Grahamstown, Eastern Cape. Prepared for Coastal and Environmental Services.

BEATER, J. 2014. Proposed New 15ml Concrete Reservoir, Lenasia South. Heritage Impact Assessment. Prepared for Johannesburg Water.

BINNEMAN, & REICHERT, K. 2015. An archaeological walkthrough survey of the final optimised layout of the authorised Nxuba Wind Farm near Cookhouse, Blue Crane Route Local Municipality, Sarah Baartman District Municipality, Eastern Cape Province. Prepared for Savannah Environmental (Pty) Ltd.

BINNEMAN, J. 2013. A Phase 1 Archaeological Impact Assessment of the proposed new substation and 132kv power line and the Nojoli Wind Farm near Cookhouse, Blue Crane Route Local Municipality, Cacadu District, Eastern Cape Province. Prepared for Savannah Environmental (Pty) Ltd.

BINNEMAN, J. 2013. An archaeological walkthrough survey of the turbine footprint for the proposed Phase 1 Amakhala Emoyeni Wind Energy Facility, Cookhouse District, Blue Crane Route Municipality, Eastern Cape Province.

BINNEMAN, J. 2014. An archaeological walkthrough survey of the final layout of the proposed Nojoli Wind Energy Facility near Cookhouse, Blue Crane Route Local Municipality, Bedford District, Eastern Cape Province. Prepared for Savannah Environmental (Pty) Ltd.

BINNEMAN, J. AND BOOTH, C. 2009. A Phase 1 archaeological heritage impact assessment for the proposed subdivision and rezoning of Erf 8517, Grahamstown, Makana Municipality, Cacadu District Municipality, for the purposes of constructing residential and town housing, and business centre. Prepared for Conservation Support Services.

BOOTH, C. 2011A. A Phase 1 Archaeological Impact Assessment for the proposed Cookhouse Ii Wind Energy Facility, Blue Crane Route Local Municipality, Eastern Cape Province. Prepared for Savannah Environmental (Pty).

BOOTH, C. 2011B. Phase 1 archaeological impact assessment for the Golf Course Development On Portions 1 and 2 of the Farm Willow Glen and Portion 6 of Belmont Farm, Grahamstown, Makana Municipality, Cacadu District Municipality, Eastern Cape Province. Prepared for Coastal and Environmental Services.

BOOTH, C. 2012. An Archaeological Desktop Study for the Proposed Elliot Wind Energy Facility on a site west of Elliot, Sakhisizwe Local Municipality. Prepared for Savannah Environmental.

BOOTH, C. 2013. A phase 1 archaeological impact assessment (AIA) for the proposed N2 national route (N2-13) between Grahamstown and the Fish River Bridge as well as six borrow pits and three quarries, Eastern Cape Province. Prepared for Coastal and Environmental Services (CES).

BUTLER, E. 2021. Palaeontological Impact Assessment for the proposed development of a cluster of renewable energy facilities between Somerset East and Grahamstown in the Eastern Cape. Prepared for Savannah Environmental (Pty) Ltd.

DU PLESSIS, L. 2021. Visual Impact Assessment. Proposed Sun Garden Solar PV Facility, Eastern Cape Province. Prepared for Savannah Environmental (Pty) Ltd.

GAIGHER, S. 2010. Heritage Impact Assessment for the Proposed Upgrading of the Storm Water Drainage Network for the Town of Somerset East, Eastern Cape Province.

HALKETT, D. & WEBLEY, L. & ORTON, J.& PINTO, H. 2010. Heritage impact assessment of the propose Amakhala-Emoyeni wind energy facility, Cookhouse District, Eastern Cape. Prepared for Savannah Environmental (Pty).

HALKETT, D. & WEBLEY, L. 2010. Heritage Scoping Assessment of a proposed Wind Energy Facility to be situated on farms in the Cookhouse District, Eastern Cape. Prepared for Savannah Environmental (Pty).

HALL, S. 1990. Hunter-gatherer-fishers of the Fish River Basin: A Contribution to the Holocene Prehistory of the Eastern Cape. Unpublished PhD thesis. Stellenbosch: University of Stellenbosch.

JANSEN, L. & FRANKLIN, M. 2021. Cultural Landscape Assessment, including heritage design indicators, proposed development of the Pienaarspoort 1 and 2 Wind Energy Facility (WEF), on the Farms Bruwelsfontein 249 portion 0, Drinkwaterskloof 251 (REF), and Melkbosch Kraal 250 portion 1 near Touwsrivier, Western Cape. Prepared for Savannah Environmental (Pty).

KEELY, M. & BROUGHTON, E. 2021. Socio-Economic Impact Assessment Report for the proposed Sun Garden Solar Pv Facility and Associated Infrastructure in the Eastern Cape. Prepared for Savannah Environmental (Pty).

LAVIN, J. 2021. Cultural Landscape Assessment As Part Of The Heritage Impact Assessment Process In Renewable Energy Development Zones. Letter for Savannah Environmental (Pty).

LESLIE-BROOKER, M. 1987. An Archaeological Study of the Uniondale Rockshelter, Albany District, Eastern Cape. Master of Arts thesis: University of Stellenbosh

LOTTER, M. G. 2016. The archaeology of the lower Sundays River Valley, Eastern Cape Province, South Africa: an assessment of Earlier Stone Age alluvial terrace sites. PHD Thesis. Johannesburg: University of the Witwatersrand.

MARSHAL, R. 2008. A social and cultural history of Grahamstown, 1812 to c1845. Unpublished MA Thesis. Grahamstown: Rhodes University

NEL, J. & DE KAMPER, G. 2008. Heritage resources scoping survey & preliminary assessment Transnet Freight Line EIA, Eastern Cape and Northern Cape. Prepared for Environmental Resource Management in Southern Africa.

NILSSEN, P. 2011. Proposed development of the Plan 8 Grahamstown Wind Energy Project: including Farms Gilead 361, Peynes Kraal 362 and Tower Hill 363, Grahamstown, Makana Municipality, Eastern Cape Province. Prepared for Coastal & Environmental Services.

SMUTS. K. & LAVIN, J. 2017. Heritage impact assessment for the proposed Spitskop Wef 132kv Power Lines. Prepared for Terramanzi Group (Pty) Ltd.

STEELE, J. 2001. First-millennium agriculturist ceramics of the Eastern Cape, South Africa: an investigation into some ways in which artefacts acquire meaning. MA Thesis. Pretoria: University of South Africa.

VAN RYNEVELD, K. 2011. Cultural heritage impact assessment upgrade of the National Route 10 Section 3(N10/3) from Baviaans River to Rietvlei (Vrischgewaagd), between Cookhouse and Cradock, Eastern Cape, South Africa. Prepared for MPM Environmental Consultants.

VAN RYNEVELD, K. 2016. Phase 1 Archaeological & Cultural Heritage Impact Assessment – Proposed Hempel Quarry, Crusher and Stockpile Area, Farm No 604, near Grahamstown, Makana Local Municipality, Eastern Cape. Prepared for Terreco Environmental.

VAN SCHALKWYK, J. 2011. Heritage impact assessment for the proposed Eskom 400kv Electricity Transmission Line, Neptune To Poseidon Substations, East London To Cookhouse, Eastern Cape.

VAN SCHALKWYK, L. 2008. Heritage impact assessment of four borrow pits, Ndlambe and Makana Municipalities, Greater Cacadu Region, Eastern Cape Province, South Africa. Prepared for BKS (Pty) Ltd.

WEBLEY, L & WAY-JONES, M. F. 2007. Phase 1 heritage impact assessment on erven 1,44,7586 and 4979, Rhodes University, Grahamstown, Eastern Cape. Prepared for Rhodes University.

Digital sources

CDNGI GEOSPATIAL PORTAL. 2021. Aerial Photo (141_009_19421). Internet: http://cdngiportal.co.za/photocentres/OTHER_SCALES_PAN/141/141_009_19421.jpg Assessed: 05/10/2021

MILITARYHISTORYSA. 2017. An overview of the East Cape Frontier Wars. Internet: https://militaryhistorysa.wordpress.com/2017/04/02/1-an-overview-of-the-east-cape-frontier-wars/ Accessed: 2 March 2020

NATIONAL SCREENING TOOL. 2017. Environmental screening tool. Internet: https://screening.environment.gov.za/screeningtool/#/pages/welcome Accessed: 1 October 2020.

RIEBEECK EAST. 2013. History of Riebeeck East - South Africa. Internet: http://www.riebeeckeast.co.za/history.html. Accessed: 28 February 2020

REID, J. 1847. Plan of the Eastern Frontier Cape of Good Hope and the adjacent country of the Kaffir Tribes included between the Great Fish and Kei Rivers. Internet: http://catalog.afriterra.org/viewMap.cmd?number=1001 Accessed: 29 August 2021

SA HISTORY. 2019. Riebeek East. Internet: https://www.sahistory.org.za/place/riebeek-east. Accessed: 28 February 2020.

UNESCO. 2020. Cultural Landscapes. Internet: https://whc.unesco.org/en/culturallandscape/#1 Accessed: 15 October 2020.

WILY, W. H. & FADEN, W. 1818. Military Sketch of that part of the Colony of the Cape of Good Hope. Internet: http://catalog.afriterra.org/viewMap.cmd?number=622 Accessed: 29 August 2021

Visual

Blue Oak Energy, 2016. https://www.blueoakenergy.com/blog/glint-and-glare-studies-for-commercial-and-industrial-solar-

Chief Directorate National Geo-Spatial Information, varying dates. 1:50 000 Topographical Maps and Data.

CSIR, 2017. Delineation of the first draft focus areas for Phase 2 of the Wind and Solar PV Strategic Environmental Assessment.

CSIR, 2015. The Strategic Environmental Assessment for wind and solar photovoltaic energy in South Africa.

DFFE, 2018. National Land-cover Database 2018 (NLC2018).

DFFE, 2021. South African Protected Areas Database (SAPAD_OR_2021_Q1).

DFFE, 2021. South African Renewable Energy EIA Application Database (REEA_OR_2021_Q1).

DEA&DP, 2011. Provincial Government of the Western Cape. Guideline on Generic Terms of Reference for EAPS and Project Schedules.

Department of Environmental Affairs and Tourism (DEA&T), 2001. Environmental Potential Atlas (ENPAT) for the Eastern Cape Province.

FAA, 2015. Evaluation of Glare as a Hazard for General Aviation Pilots on Final Approach.

Forge Solar PV Planning and Glare Analysis, 2019. Guidance and information on using Forge Solar analysis tools.

JAXA, 2021. Earth Observation Research Centre. ALOS Global Digital Surface Model (AW3D30).

Meister Consultants Group, 2014.
http://solaroutreach.org/wp-content/uploads/2014/06/Solar-PV-and-Glare-_Final.pdf

National Botanical Institute (NBI), 2004. Vegetation Map of South Africa, Lesotho and Swaziland (Unpublished Beta Version 3.0)

Oberholzer, B. (2005). Guideline for involving visual and aesthetic specialists in EIA processes: Edition 1.

Pager Power Urban and Renewables, 2020. Solar Photovoltaic and Building Development – Glint and Glare Guidance.

The Environmental Impact Assessment Amendment Regulations. In Government Gazette Nr. 33306, 18 June 2010.

Socio-economic

Adrian, T. & Natalucci, F. 2020. COVID-19 Crisis Poses Threat to Financial Stability. [Online]. Available: https://blogs.imf.org/2020/04/14/covid-19-crisis-poses-threat-to-financial-stability/

Blue Crane Route Local Municipality. 2008. Blue Crane Route Municipality Local Economic Development Plan (LED). Somerset East: Blue Crane Route Local Municipality

Blue Crane Route Local Municipality. 2020. Blue Crane Route Municipality Integrated Development Plan (IDP). Somerset East: Blue Crane Route Local Municipality

Department of Economic Development, Environmental Affairs and Tourism. 2019. Eastern Cape Environmental Management Bill. King Williams Town: DEDEAT

Department of Economic Development, Environmental Affairs and Tourism. 2009. Eastern Cape Tourism Master Plan. King Williams Town: DEDEAT

Department of Energy. (2016). Integrated Energy Plan. Government Gazette.

Department of Minerals and Energy, 1998. White Paper on the Energy Policy of the Republic of South Africa, Republic of South Africa.

Department of Minerals and Energy, 2003. White Paper on Renewable Energy.

Department of Science and Technology and Department of Energy. 2014. Solar Energy Technology Roadmap (SETRM).

Duvenage, A. 2020. What the Moody's downgrade means for SA. [Online]. Available: https://city-press.news24.com/Business/what-the-moodys-downgrade-means-for-sa-20200330

e-SEK. 2020. Making sense of COVID-19's impact on South African businesses [Online]. Available: https://www.itweb.co.za/content/wbrpOMgYbkEvDLZn

Folger, J. 2018. Basic Valuation Concepts. [Online]. Available: https://www.investopedia.com/articles/realestate/12/real-estate-valuation.asp

Goldberg, A. 2015. The economic impact of load shedding: The case of South African retailers. Pretoria: Gordon Institute of Business Science - University of Pretoria.

Google Earth Pro. 2021

Kovaleski, D. 2019. Study shows high investor confidence in renewable energy. [Online]. Available: https://dailyenergyinsider.com/news/20058-study-shows-high-investor-confidence-in-renewable-energy/

LOGIS, 2021. Proposed Solaris Fields Solar PV Facility, Eastern Cape Province: Visual Impact Assessment

LOGIS, 2021b. Proposed Sunbird Solar PV Facility, Eastern Cape Province: Visual Impact Assessment

McGregor, S. 2020. Impact of the Moody's Downgrade. [Online]. Available: https://www.allangray.co.za/latest-insights/markets-and-economy/impact-of-moodys-downgrade/

McSweeney, R. & Timperley, J. 2018. The Carbon Brief Profile: South Africa. [Online]. Available: https://www.carbonbrief.org/the-carbon-brief-profile-south-africa

Michel, AH Buchecker, M., and Backhaus, N. 2015. Using Renewable Energy as a Tool to Achieve Tourism Sustainability in Mediterranean Islands [Online]

Available at: https://bioone.org/journalArticle/Download?fullDOI=10.1659%2FMRD-JOURNAL-D-14-00111.1

National Department of Economic Development (DED). 2011. New Growth Path: Framework. Cape Town: Department of Economic Development.

National Department of Energy (DOE). 20003. White Paper on the Renewable Energy Policy of RSA 2003

National Department of Energy (DOE). 2019. Integrated Resource Plan (IRP2019). Pretoria: Department of Energy.

National Department of Energy (DOE). 2019. The South African Energy Sector Report 2019. Pretoria: Department of Energy.

National Energy Regulator of South Africa (NERSA). 2020. National Electricity Industry Regulation: A different focus on the electricity supply industry challenges and possible solutions. Pretoria: National Energy Regulator of South Africa

National Planning Commission (NPC). 2012. National Development Plan 2030. Pretoria: National Planning Commission.

National Treasury. 2021. BUDGET 2021: BUDGET REVIEW. Available [Online]: *FullBR.pdf (treasury.gov.za)

Quantec. 2020. Standardised Regional Economic Data, 2018 release. Pretoria: Quantec

Quantec. 2020. Standardised Regional Socio-Economic Data, 2018 release. Pretoria: Quantec

REN21. 2019. The Renewables 2019 Global Status Report (GSR 2019). [Online]. Available: http://www.ren21.net/gsr-2019/pages/foreword/foreword/

Republic of South Africa, 1996. Constitution of the Republic of South Africa, 1996. Pretoria: Republic of South Africa

Roddisa, P., Carver, S., Dallimer, M., Norman, P., Ziv, G. (2018). The role of community acceptance in planning outcomes for onshore wind and solar farms: An energy justice analysis.[Online].https://reader.elsevier.com/reader/sd/pii/S0306261918308043?token=7F87964D1FA72DB53DEA47A0A9B9810257217C8E0FC05ACF7913B0BA2A411DED1B3D8D35DB2E7394DE9F13A636778E7E

Santander. 2020. South Africa: Foreign investment. [Online]. Available: https://santandertrade.com/en/portal/establish-overseas/south-africa/foreign-investment

Sarah Baartman District Municipality. 2013. Sarah Baartman District Spatial Development Framework (SDF). Port Elizabeth: Sarah Baartman District

Sarah Baartman District Municipality. 2019. Sarah Baartman District Integrated Development Plan (IDP). Port Elizabeth: Sarah Baartman District

Sinding, S.W. 2009. Population, poverty and economic development. [Online]. Available: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2781831/

Statistics South Africa (StatsSA). 2011. Census 2011. Pretoria: Statistics South Africa

Statistics South Africa (StatsSA). 2019. Economic Growth – December 3. Pretoria: Statistics South Africa

Statistics South Africa (StatsSA). 2020. Economic Growth – June 30. Pretoria: Statistics South Africa

Swart, P. & Goncalves, S. 2020. Downgrade of South Africa's credit rating further into junk. [Online]. Available: https://www.cliffedekkerhofmeyr.com/en/news/publications/2020/finance/finance-alert-11-may-downgrade-of-south-africas-credit-rating-further-into-junk.html

The Eastern Cape Department of Economic Development and Environmental Affairs (DEDEA). 2011. The Eastern Cape Industrial Development Strategy. Bhisho: Department of Economic Development, and Environmental Affairs

The Eastern Cape Department of Economic Development and Environmental Affairs (DEDEA). 2012. The Eastern Cape Sustainable Energy Strategy. Bhisho: Department of Economic Development, and Environmental Affairs

The Eastern Cape Department of Economic Development, Environmental Affairs and Tourism (DEDEAT). 2016. Eastern Cape Provincial Economic Strategy (PEDS). Bhisho: Department of Economic Development, Environmental Affairs and Tourism

The South African Chamber of Commerce and Industry (SACCI) 2021a. Business Confidence Index May 2021. Johannesburg: The South African Chamber of Commerce and Industry. Online [Available]: https://sacci.org.za/wp-content/uploads/2021/07/BCI-MAY-2021.pdf

The South African Chamber of Commerce and Industry (SACCI) 2021b. Business Confidence Index September 2021. Johannesburg: The South African Chamber of Commerce and Industry. Online [Available]: https://sacci.org.za/wp-content/uploads/2021/10/BCI-SEP-2021.pdf

South African Reserve Bank (SARB). 2021. Monetary Policy Review – October 2021. Online [Available]: https://www.resbank.co.za/content/dam/sarb/publications/monetary-policy-review/2021/MPR%20October%202021.pdf

van Wyk, C. 2020. SA's "big bazooka" stimulus package explained. [Online]. Available: https://www.investec.com/en_za/focus/economy/sas-big-bazooka-stimulus-package-explained.html

Quantec (2012). Standardised Regional Data, 2011 release.

SA Green Fund. (2015). Retrieved October 2020, from https://www.sagreenfund.org.za/wordpress/wp-content/uploads/2015/04/Green-Economy-Accord.pdf

StatsSA (2012). Census 2011. Statistics South Africa (StatsSA), Pretoria.

StatsSA (2007). Census of Commercial Agriculture, 2007 – Eastern Cape. Statistics South Africa (StatsSA), Pretoria.

The Republic of South Africa. 1998. National Environmental Management Act (NEMA), Act 107 of 1998. Republic of South Africa: Pretoria.

The Republic of South Africa. 2014. Environmental Impact Assessment Regulations, 2014. Department of Environmental Affairs: Pretoria.

Traffic

Google Earth Pro
Road Traffic Act, 1996 (Act No. 93 of 1996)
National Road Traffic Regulations, 2000
SANS 10280/NRS 041-1:2008 - Overhead Power Lines for Conditions Prevailing in South Africa
The Technical Recommendation for Highways (TRH11)