KHAUTA NORTH SOLAR FARM

PROPOSED DEVELOPMENT OF A 165 MW PHOTOVOLTAIC SOLAR FARM ON PORTION 0 OF THE FARM KOPJE ALLEEN NO. 81 AND PORTION 1 OF THE FARM KOPJE ALLEEN NO. 81, KHAUTA NORTH SOLAR PV FACILITY, NEAR RIEBEECKSTAD, MATJHABENG LOCAL MUNICIPALITY, FREE STATE PROVINCE

DRAFT ENVIRONMENTAL IMPACT REPORT

DFFE REF NO: 14/12/16/3/3/2/2221

MARCH 2023

APPLICANT:

KHAUTA NORTH SOLAR PV FACILITY RF (PTY) LTD

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COMPILED BY:

ENVIROWORKS

QUALITY AND REVISION RECORD

QUALITY APPROVAL

	CAPACITY	NAME	SIGNATURE
EAP	Environmental Consultant (EAPASA Reg: 2020/714, SACNASP Reg:119286, IAIAsa Reg 5602))	Michelle Boshoff	
Reviewer	Environmental Consultant and Project Manager (EAPASA Reg: 2019/1311)	Elana Mostert	

This report has been prepared in accordance with Enviroworks Quality Management System.

REVISION RECORD

REVISION NO.	OBJECTIVE	CHANGE	DATE	AUTHOR
1	Draft EIR Report	Internal Review	10 January 2023	Michelle Boshoff
2	Draft EIR Report	Public Review	02 March 2023	Michelle Boshoff
3	Draft EIR Report	DFFE Review	Pending	
4	Final EIR Report	Internal Review	Pending	
5	Final EIR Report	DFFE Review	Pending	

DISTRIBUTION

DISTRIBUTION LIST
Registered and Potential Registered and Affected Parties.
Department of Forestry, Fisheries and the Environment.
Khauta North Solar PV Facility RF (Pty) Ltd

REFERENCE

When used as a reference this report should be cited as: Enviroworks (2023) EIA Report for the 165MW Khauta North SP Facility, Matjhabeng Local Municipality, Free State Province.

DISCLAIMER

Even though every care is taken to ensure the accuracy of this report, environmental assessment studies are limited in scope, time and budget. Discussions are to some extent made on reasonable and informed assumptions built on bona fide information sources, as well as deductive reasoning. Since environmental impact studies deal with dynamic natural systems additional information may come to light at a later stage during the impact assessment phase. The author does not accept responsibility for conclusions made in good faith based on own databases or on the information provided. Although the author exercised due care and diligence in rendering services and preparing documents, he accepts no liability, and the client, by receiving this document, indemnifies the author against all actions, claims, demands, losses, liabilities, costs, damages, and expenses arising from or in connection with services rendered, directly or indirectly by the authors and by the use of this document. This report should therefore be viewed and acted upon with these limitations in mind.

PURPOSE OF THE REPORT AND INVITATION TO COMMENT

Khauta North Solar PV Facility RF (Pty) Ltd appointed Enviroworks as the independent environmental consultant (EAP) to undertake the Scoping and Environmental Impact Assessment (S&EIA) process for the 165MW Khauta North Solar PV Facility, Free State Province. The EIA process is being undertaken in accordance with the requirements of the 2014 EIA Regulations, as amended, promulgated in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA).

This EIA Report consists of twelve chapters, as follows:

- **Chapter 1** provides background to the 165MW Khauta North Solar PV Facility and the EIA process.
- **Chapter 2** provide an overview of the EIA methodology that was followed during this EIA.
- **Chapter 3** provides the site selection information.
- **Chapter 4** describes solar 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 165MW Khauta North Solar PV Facility within the project site.
- **Chapter 7** describes the project alternatives.
- **Chapter 8** describes the existing biophysical and socio-economic environment affected by the proposed facility.
- **Chapter 9** provides a description and assessment of the potential impacts as well as potential cumulative impacts associated with the proposed 165MW Khauta North Solar PV Facility and associated infrastructure.
- **Chapter 10** provides the recommendations for the various specialists relating to the 165MW Khauta North Solar PV Facility.
- **Chapter 11** presents the management and mitigations recommendations based on the findings of the EIA for the 165MW Khauta North Solar PV Facility.
- **Chapter 12** provides references used in the compilation of the Draft EIR

The EIA Report is available for review from Thursday, 02 March 2023 – Monday, 03 April 2023 on the Enviroworks website: https://enviroworks.co.za/p15/projects/public-participation.html.

Please submit your comments by 04 April 2023 to:
Michael Leach from Enviroworks Suite 1064, Private Bag X2, Century City, 7446 Tel: (051) 436 9675 Cell: 082 438 9744 Email: micheal@enviroworks.co.za

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

EXECUTIVE SUMMARY

The Proponent, Khauta North Solar PV Facility RF (Pty) Ltd, proposes to establish a commercial photovoltaic (PV) energy facility (hereafter referred to as Khauta North SPV Facility) and associated infrastructure with an output capacity of 165 megawatt (MW) in the Free State.

The project site is located across two farms (Portion 0 of the Farm Kopje Alleen No. 81 and Portion 1 of the Farm Kopje Alleen No. 81), located about 4km north-east of Riebeeckstad, within the Matjhabeng Local Municipality and within the Lejweleputswa District Municipality in the Free State Province (Refer to Figure 1).

The project is planned as part of a larger cluster of renewable energy projects (total of four) in the immediate surrounding areas and are to be known as the Khauta Cluster. Electricity will be evacuated from the facility via a new 132kV overhead line connecting into either:

- the existing Eskom Everest - Leander 1 132kV line via a loop-in- loop-out connection; or
- the Eskom Leander Main Transmission Substation directly; or
- the Eskom Everest Main Transmission Substation directly.

The grid connection will be assessed as part of separate Basic Assessment processes.

Each renewable energy facility from the Khauta Cluster (50MW Khauta e Nyane, 80MW Khauta West, 110MW Khauta South & 165MW Khauta North) will be constructed as a separate stand-alone project and therefore, separate Scoping and Environmental Impact Assessment (S&EIA) processes will be undertaken for each of the renewable energy facilities in the Khauta Cluster. Similarly, the grid connection solution will be subjected to a separate S&EIA or Basic Assessment (BA) process.

The need to expand and increase electricity generation capacity in the country is based on the Integrated Resource Plan of 2019 and informed by on-going strategic planning undertaken by the Department of Mineral Resources and Energy (DMRE). Through the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), the DMRE has been engaging with the sector in order to strengthen the role of Independent Power Producers (IPPs) in renewable energy development. Thus, in line with this strategic plan and from a regional perspective, the identified area within the Free State Province is considered favourable for the development of a commercial solar energy facility by virtue of prevailing climatic conditions, relief, the extent of the affected properties, the availability of a direct grid connection (i.e., a point of connection of the national grid) and the availability of land on which the development can take place. A original technically feasible project site 1[1], with an extent of ~515.49ha has been identified by Khauta North Solar PV Facility RF (Pty) Ltd as a technically suitable area for the development of the 165MW Khauta North SPV Facility. However, due to the

[1] The project site is the area with an extent of 515.49ha, within which the Khauta North Solar PV Facility RF (Pty) Ltd development footprint will be located.

recommendations of the specialist and the identification of no-go areas, the buildable area has been reduced to 273ha.

The project site comprises of two properties as listed in Table 1 below.

Table 1: General site information for the proposed 165MW Khauta North SPV Facility

Province	Free State	
District Municipality	Lejweleputswa District Municipality	
Local Municipality	Matjhabeng Local Municipality	
Ward Number (s)	Ward 10	
Nearest Town (s)	Riebeeckstad (~ 4km)	
Affected Properties:	**Parent Farm Number**	**Farm Portions**
	Farm 81 - Kopje Alleen	Portion 0
	Farm 81 - Kopje Alleen	Portion 1

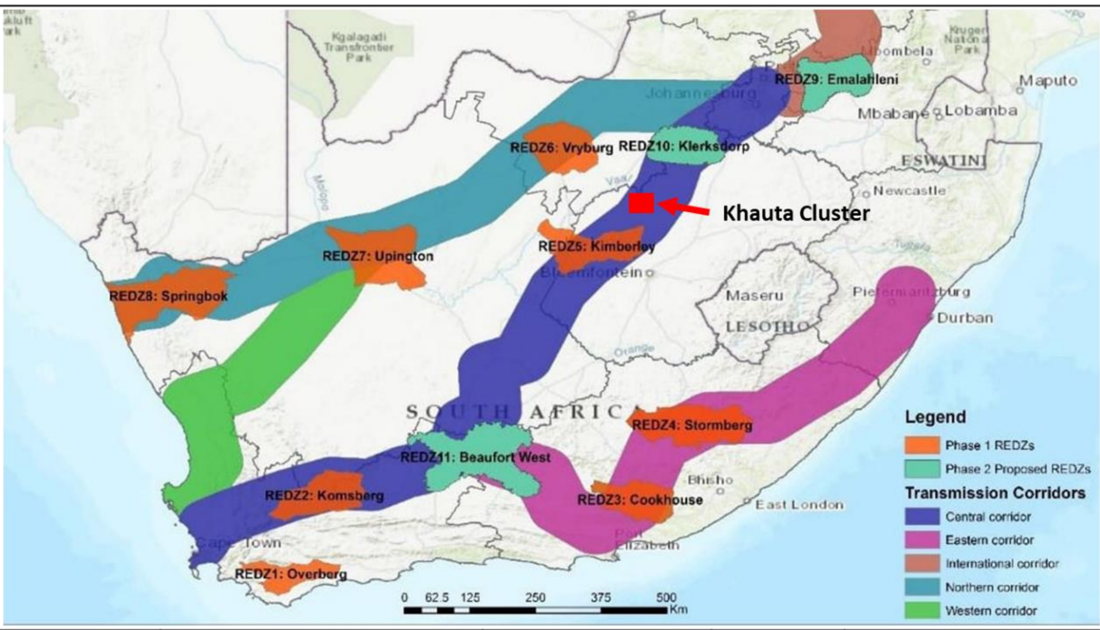
	PROJECT DETAILS	PLAN DETAILS	NOTES	TITLE: Location of Proposed Development
enviro works	Project Name: Khauta North SPV Facility Project No: 084(21) Client: Khauta North Solar PV Facility RF (Pty)Ltd Municipality: Matjhabeng	Plan No: 1 Revision: 1 Date: 2022-10-03 Drawn By: M. Boshoff Checked By: E. Mostert	1. All distances and areas are provisional and must be verified by cadastral survey.	PROPERTY DESCRIPTION: Kopje Alleen, Farm. No. 81, Portion 0 & Portion 1

Figure 1:Location of the proposed 165MW Khauta North SPV Facility

The full extent of the project site has been considered within the EIA process with the aim of determining the suitability from an environmental- and social perspective and identifying areas that should be avoided in development planning. Within this identified project site, a development area and a development footprint have been defined for assessment. The project site is larger than the area required for the development footprint of a 165MW Khauta North SPV Facility and therefore provides the opportunity for the optimal placement of infrastructure, ensuring avoidance of major identified environmental sensitivities or constraints identified through this EIA process.

The 165MW Khauta North SPV Facility is proposed in response to the identified objectives of 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 bid the 165MW Khauta North SPV Facility under the DMRE's REIPPP Programme or possibly a similar private procurement process with the aim of evacuating the generated power into the national grid. The Khauta Cluster falls within the Central Transmission Corridor that has been identified by the Government (**Figure 2**). The proposed facility will aid in the diversification and stabilisation of the country's electricity supply, in line with the objectives of the Integrated Resource Plan (IRP) published by the DMRE, with the 165MW Khauta North SPV Facility set to inject up to 165MW of electricity into the national grid. Similarly, the location of the new renewable electricity generation facility in the Free State Province is important in the context of the Just Energy Transition (JET). The 165MW Khauta North SPV Facility will provide valuable jobs and socio-economic benefits that are required in an area where coal fired generation will be phased out over the next 30 years in South Africa[2]. This project will be vitally important if the JET is to be successfully implemented and is a transition for everyone.

[2] Staff Writer, 6 July 2022, South Africa approves $8.5 billion plan to move away from coal, Businesstech, Website address: https://businesstech.co.za/news/energy/603460/south-africa-approves-8-5-billion-plan-to-move-away-from-coal/



	PROJECT DETAILS	PLAN DETAILS	NOTES	TITLE: LOCATION OF THE KHAUTA CLUSTER WITHIN THE TRANSMISSION CORRIDOR
enviro works	Project Name: 165MW Khauta North Project No: 084(22) Client: WKN Municipality: Matjhabeng	Plan No: 1 Revision: 1 Date: 2022-11-30 Drawn By: M. Boshoff Checked By: E. Mostert	1. All distances and areas are provisional and must be verified by cadastral survey.	PROPERTY DESCRIPTION: Portion 0 of the Farm Kopje Alleen No 81 Portion 1 of the Farm Kopje Alleen No 81

Figure 2: Location of the Khauta Cluster within the Central Transmission Corridors

Infrastructure associated with the 165MW Khauta North SPV Facility will include the following:

- PV modules and mounting structures (monofacial or bifacial) with fixed, single or double axis tracking mounting structures;
- Associated stormwater management infrastructure;
- Battery Energy Storage System (BESS);
- Site- and internal access roads (up to 6 m wide);
- Auxiliary buildings (offices, parking, etc.);
- Ablution facilities and associated infrastructure;
- Temporary laydown area during the construction phase (which will be a permanent laydown area for the BESS during the operational phase);
- On-site 33/132 kV substation (facility substation) (IPP Portion);
- Grid connection infrastructure including medium-voltage cabling between the project components and the facility substation (underground cabling will be used where practical);
- Perimeter fencing; and,
- Rainwater and/or groundwater storage tanks and associated water transfer infrastructure.

The proposed 165MW Khauta North SPV Facility development requires a development footprint of approximately 273 ha and is located within the broader area of approximately 515 ha of the two farm portions. Therefore, as part of the alternatives that will be assessed within the EIA process the final setting of the PV facility will be appropriately sited within the broader area such that any identified environmental sensitivities can be avoided.

1. ENVIRONMENTAL PERMITTING REQUIREMENTS

The 165MW Khauta North SPV Facility and its associated infrastructure trigger the need for the following environmental permit:

- An **Environmental Authorisation (EA)** from the National Department of Forestry, Fisheries, and the Environment (DFFE), in consultation with the Provincial Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA), in accordance with the requirements of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and Environmental Impact Assessment (EIA) Regulations (GNR 326), 2014, as amended.

Enviroworks has been appointed by Khauta North Solar PV Facility RF (Pty) Ltd as the Independent Environmental Assessment Practitioner (EAP) in accordance with NEMA and Regulations 21 to 24 of the 2014 EIA Regulations (GNR 326), as amended to undertake the required S&EIA in support of the application for Environmental Authorisation (EA) and the public participation process (PPP) for the project, in order to identify and assess all potential environmental impacts associated with the proposed 165MW Khauta North SPV Facility and recommend appropriate mitigation measures in an Environmental Management Programme (EMPr).

An EIA is an effective planning and decision-making tool that is used by the project developer as it allows for the identification and management of potential environmental impacts associated with a specific project and activity. It provides the opportunity for the developer to be fore warned of potential environmental issues, sensitive areas and allows for the resolution of issues reported on in the Scoping and EIA Reports as well as a dialogue with Interested and Affected Parties (I&APs). Comprehensive, independent environmental specialist studies are required in accordance with the EIA Regulations to provide the competent authority with sufficient information in order to make an informed decision on the proposed project. The EIA process being undertaken for the proposed 165MW Khauta North SPV Facility comprises two phases – i.e., (1) Scoping and (2) Impact Assessment - and involves the identification and assessment of environmental impacts through specialist studies, as well as public participation. The process followed in these two phases is as follows:

- The ***Scoping Phase*** includes the identification and description of potential impacts associated with the proposed project through a desktop study and consultation with I&APs and key stakeholders. This phase considers the broader project area in order to identify and delineate any environmental fatal flaws, no-go or sensitive areas, as well as project alternatives in order to determine which should be assessed in more detail in the EIA Phase. Following the public review period of the Scoping Report, this phase culminates in the submission of a final Scoping Report (this report) and Plan of Study for the EIA Phase to the competent authority for acceptance and approval to continue with the EIA Phase of the process.

- The ***EIA Phase*** involves a detailed assessment of potentially significant positive and negative impacts (direct, indirect, and cumulative) identified in the Scoping Phase. This phase considers a proposed development footprint and includes detailed specialist investigations (including field surveys), consideration of feasible alternatives and public consultation. Recommendations of practical and achievable mitigation and management measures are included in an Environmental Management Programme (EMPr) considering all phases of the project. Following the public review period of the EIA Report and EMPr, this phase culminates in the submission of a Final EIA Report and EMPr to the competent authority for review and decision-making.

2. EVALUATION OF THE 165MW KHAUTA NORTH SPV FACILITY

The EIA Report, together with the specialist studies contained within Appendices D-L provide a detailed assessment of the potential impacts on the two farm properties that may result from the development of the 165 MW Khauta North SPV Facility. Please note that 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.

The potential environmental impacts that were identified during the scoping phase and subsequent consultation with the Competent Authority (CA) associated with the proposed 165 MW Khauta North SPV Facility and which were assessed through the EIA process include the following:

- Impacts on soils and agricultural potential.
- Impacts on aquatic ecology.
- Impacts on avifaunal ecology.
- Impacts on the terrestrial ecology (flora and fauna).
- Impacts on the economy.
- Impacts on the heritage resources, including archaeology, palaeontology and the cultural landscape.
- Positive and negative social impacts.
- Visual impacts on the area imposed by the components of the facility.

Specialists' recommendations noted a number of significant and sensitive features/habitats throughout the original assessment area and the surrounding 500 m 'zone of influence'. Based on these findings and the subsequent initial recommendations of the Site Verification Report, the original proposed development area was significantly reduced in size and the design layouts of the Photovoltaic (PV) grid were revised by the applicant to adhere to the recommendations of the various specialists. The proposed development area is adequately kept away from any of the identified significant and sensitive features/habitats and species. The proposed development area discussed in this draft Environmental Impact Report (DEIR) report therefore constitutes this final acceptably reduced and revised area.

2.1 Impacts on soils and agricultural potential

The agricultural specialist[3] noted that the proposed development will not have an unacceptable negative impact on the agricultural production capability of the site. Instead, the development is an opportunity for a renewable energy facility to be integrated with agricultural production in a way that provides benefits to agriculture and leads to little loss of future agricultural production potential. The impact of the proposed development on the agricultural production capability of the site was assessed as being acceptable because of the above factors. Therefore, from an agricultural impact point of view, it was recommended that the development be approved.

Two potential negative agricultural impacts have been identified, that are direct impacts and lead to a decrease in agricultural potential through:

- Occupation of land - Agricultural land directly occupied by the development infrastructure will become unavailable for agricultural use, with consequent potential loss of agricultural productivity for the duration of the project lifetime.
- Soil degradation – This impact only occurs during the construction and decommissioning phases, but only becomes relevant once the land is returned to agricultural land use after decommissioning. Soil can be degraded by impacts in two different ways: erosion and topsoil loss. Erosion can occur as a result of the alteration of the land surface run-off characteristics, which can be caused by construction related land surface disturbance, vegetation removal, and the establishment of hard surface areas including roads. Loss of topsoil can result from poor topsoil management during construction related excavations. Soil degradation will reduce the ability of the soil to support vegetation growth. The site is not particularly susceptible to soil erosion, and it can be fairly easily and effectively prevented by standard best-practice soil degradation control measures, as will be recommended and included in the EMPr.

Two positive agricultural impacts have been identified, that are indirect impacts and lead to an increase in agricultural potential through:

- Increased financial security for farming operations - Reliable income will be generated by the farming enterprises through the lease of the land to the energy facility. This is likely to increase their cash flow and financial security and could improve farming operations and productivity through increased investment into farming.
- Improved security against stock theft and other crime due to the presence of security infrastructure and security personnel at the energy facility.

The extent to which any of these impacts is likely to actually affect levels of agricultural production is small and the significance of agricultural impacts is therefore low.

[3] Lanz, J. Site Sensitivity Verification and Agricultural Compliance Statement for Khauta North SPV Facility near Welkom, Free State Province, *e-mail:* johann@johannlanz.co.za

2.2 Impacts on aquatic ecology

Findings from the aquatic specialist[4] noted that from an aquatic ecological/biodiversity perspective, the important aquatic and semi-aquatic habitats of the watercourse, the two depression wetlands and Commandants Pan must be adequately preserved. When taking into account the significant visual impacts of the glare/shine on waterbirds as well as the significant collision and mortality risk to nocturnal avifaunal species, a minimum approximately 250 m Biodiversity Buffer distance was recommended to be implemented around the Commandants Pan and a minimum approximately 200 m buffer distance on both sides of the watercourse edges.

2.3 Impacts on the terrestrial ecology (flora and fauna)

Grasslands are highly threatened ecosystems and severely under protected. Therefore, any loss in this vegetation is not favourable. However, the specific footprint inhabits grassland previously disturbed by grazing pressure and agriculture which has resulted in most of the area being classified as Degraded in the Free State Biodiversity Spatial Plan. The footprint's contribution to the wider area's ecological functioning and species diversity is expected to be moderate due to the disturbance history of the area. Part of the footprint is mapped within ESAs, but this area has been recommended not to be classified as a ESA given the avoidance of wetlands and their buffers.

No threatened species or species of conservation concern (SCC) (or sensitive species as defined by the Screening Tool) (as identified by the Screening Tool) were observed within the development footprint during the site visit. However, suitable habitat for *Smaug giganteus* was recorded on the footprint. Preserving these areas of suitable habitat would result in fragmentation and colonising the area would be unlikely, it is recommended that suitable habitat areas outside of the development footprint be avoided. These areas are connected to areas of intact vegetation and thus, it would be more likely that these areas would be utilised or colonised.

To reduce the potential loss of grassland vegetation, it is expected that areas between the solar panels be kept as natural as possible, and a rehabilitation plan be compiled by Botanical/Rehabilitation specialist. This rehabilitation plan is expected to set rehabilitation targets and measures for areas disturbed outside of the footprint.

If all mitigation measures are implemented (especially the recommended buffer zones), the likelihood of significant ecological impacts occurring within the ecosystems, found within the development site, will be reduced to acceptable low-medium levels. The overall footprint of the proposed facility is not likely to generate a high-very high impact on broad scale ecological processes or landscape connectivity, on condition that all mitigation measures are followed. It is thus recommended that the proposed development application be approved from an Animal Species, Plant Species, and Terrestrial Biodiversity Theme perspective provided that all mitigation measures are implemented.

[4] Lamprecht A.J. H., Aquatic Ecological Assessment Report 165MW Khauta North Solar Photovoltaic (PV) Facility Development, Riebeeckstad, Free State Province, EcoFocus Consulting (Pty) Ltd, *e-mail*: ajhlamprecht@gmail.com

2.4 Impacts on the economy

The total impact on production/business sales once the project is fully operational is likely to equate to R 102.6 million (direct, indirect, and induced) per annum and will largely be spent in Free State and Gauteng. The total impact on GDP (direct, indirect, and induced) is likely to be R 62.3 million per year. It is anticipated that 20 South African based FTE employment positions will be created during the operational phase of the facility. The total impact on employment will be 54 FTE employment positions which will largely be experienced in the utilities sector and other value chains associated with solar farm operations.

2.5 Impacts on the heritage resources, including archaeology, palaeontology and the cultural landscape

The Heritage specialist[5] indicated that the topography of the farms are fairly level and covered in dense grassland vegetation. There were no significant landscape features such as rocky kopjes, outcrops, rivers or pans, in the proposed development footprint area that was placed in such a way as to avoid sensitive habitats. The current land use is grazing on the site. A few small earth dams also occur outside the application area. There was virtually no surface stone covering the area. Existing infrastructure comprised of farm roads, fencing and several isolated windmills. A farm house (labourers cottage) and a metal shed at the entrance to the farm will not be impacted by the proposed project. According to Almond (2022), `no fossil remains of any kind were recorded from the Permian bedrocks and Late Caenozoic superficial sediments that underly the study area, and that no palaeontological High Sensitivity or No-Go areas were identified'.

2.6 Positive and negative social impacts

The Social Impact Assessment (SIA) has found the surrounding community to generally be accepting of the proposed solar facility development, although there are at least two instances where surrounding landowners have raised objections relating to the cumulative impacts that the solar cluster, including Khauta North, will have on the area's sense of place.

A change in sense of place is anticipated to be the most significant impact experienced by surrounding and nearby landowners. Impacts to the sense of place will occur during both the construction and operational phases, but are expected to be greater during the operational phase given the duration of the impact (i.e. for the entire life time of the solar facility). The Free State Provincial Spatial Development Framework (PSDF) notes that the locating of renewable energy developments must avoid visual impacts on landscapes of significant symbolic, aesthetic, cultural or historic value and should blend in with the surrounding environment as far as possible. The landscape surrounding the proposed development does hold aesthetic value at a local scale, but not at a regional scale, thus sense of place impacts will be localised.

[5] Kaplan, J. Archaeological Heritage Impact Assessment Proposed Development of a 165MW Photovoltaic Solar Farm on Portion 0 of the Farm Kopje Alleen No. 81 and Portion 1 of the Farm Kopje Alleen No. 81, Khauta North Solar PV Facility near Riebeeckstad, Matjhabeng Local Municipality, Free State Province. ACRM. *e-mail:* jonathan@acrm.co.za

Negative impacts of an economic nature due to a change in sense of place are expected to be limited to the known game farms. The significance of a change in sense of place impact will thus vary between landowners based on whether it has economic implications (game farmers) or is only a nuisance. Where the impact is economic, animosity towards the solar facility may be created as well as fear/anxiety over future economic viability. Altering the sense of place will also reduce the likelihood of future tourism-related initiatives in the immediate area.

Disturbance to daily life, due to increased noise and activity in the area, will be temporal and chiefly associated with the construction phase. Through implementing mitigation measures, good planning and close working with the surrounding landowner, these impacts can be reduced to acceptable levels. A potential increase in crime, while also likely to be temporal, needs to be mitigated however possible, as it has the potential to have Very High negative consequences if impacts are realised. While an increase in crime is not entirely within the Applicant's control, they must work closely with farmers to reduce the potential for an increase.

Economic benefits to the surrounding area will be significant and benefits are expected to outweigh the negative economic impacts (van Jaarsveld, 2022). Economic benefits will extend across the construction and operational phases, with greater positive impacts expected during the construction phase. Positive economic impacts relate directly to positive social impacts. With a decline in the mining industry (Myburgh and Bastile, 2019), developing the solar facility will assist in offsetting job losses, albeit a small influence.

The proposed development can be considered to align with the reviewed planning documentation, as it is expected to have positive economic impacts which outweigh other impacts, without significantly compromising other sectors. It is noted that agricultural resources must be protected. While agriculture is a small contributor to the local municipality's economic output (1.1%) (Myburgh and Bastile, 2019) economic resources should still be protected. In this regard, a design that allows for agricultural activities to continue (e.g., grazing beneath panels) should be considered. A design with lower visual impacts should however take preference.

2.7 Visual impacts on the area imposed by the components of the facility

The highest visual impact within the short to medium distance zone will occur from the farmstead situated at kilometre two point four (km 2.4) towards the north as well as from the tourist accommodation situated two point eight kilometres towards the northeast of the proposed development. The visual impact from these vantage points will be moderate and permanent as observers will experience a change in the aesthetic value of the surrounding landscape.

It is advised that the eight metre (8 m) BESS be installed on site as the fifteen metre (15 m) BESS will have a higher visual impact on observers situated within the immediate vicinity. Furthermore, should the 15 m BESS be installed mitigation measures will need more time to be effective. If all mitigation measures are implemented on site as listed under Section 18.1 of this Visual Impact Assessment Report the proposed 165 MW Khauta SPV Facility will have a low visual impact on the surrounding observers and as such can be authorised from a visual perspective.

2.8 Assessment of Cumulative Impacts

In relation to the agricultural potential and quantifying the cumulative impact, the area of land taken out of agricultural production as a result of all this development plus the other 5 (total generation capacity of 450 MW) will amount to a total of approximately 1,125 hectares. This is calculated using the industry standards of 2.5 and 0.3 hectares per megawatt for solar and wind energy generation respectively, as per the Department of Environmental Affairs (DEA) Phase 1 Wind and Solar Strategic Environmental Assessment (SEA) (2015). As a proportion of the total area within a 30km radius (approximately 282,700 ha), this amounts to only 0.40% of the surface area. That is within an acceptable limit in terms of loss of land which is mostly only suitable for grazing, of which there is no particular scarcity in the country.

With regards to the cumulative aquatic impacts, it should be noted that the proposed development merely forms a small part of a significantly sized and extensive combined solar power generation facility cluster, which is envisaged and consequently being applied for throughout the local and broader landscape surrounding the proposed development area. This extensive combined cluster development and subsequent transformation in the same geographical area, which will highly likely take place, will therefore lead to substantial cumulative aquatic ecological impacts. The significant potential long-term aquatic ecological impacts identified for the proposed development, could therefore potentially add moderate cumulative impact to the existing and anticipated future negative impacts, associated with the envisaged significantly sized and extensive combined solar power generation facility cluster. It is however the opinion of the specialist, by application of the NEMA Mitigation Hierarchy, that all the identified potential cumulative aquatic ecological impacts associated with the proposed development, can be suitably reduced and mitigated to within acceptable residual levels, by implementation of the recommended mitigation measures. It is therefore not anticipated that the proposed development will add any significant residual cumulative aquatic ecological impacts to the surrounding environment, if all recommended mitigation measures as per this aquatic ecological report are adequately implemented and managed, for both the construction- and operational phases of the proposed development.

The following conclusions can be drawn regarding the cumulative impacts associated with the project:

- From an agricultural perspective the proposed development poses a low risk in terms of causing soil degradation because it can be fairly easily and effectively prevented by standard best practice soil degradation control measures, as recommended and included in the EMPr. If the risk for each individual development is low, then the cumulative risk is also low. The cumulative impact of loss of agricultural land use will not have an unacceptable negative impact on the agricultural production capability of the area. The proposed development is therefore acceptable in terms of cumulative impact, and it is therefore recommended that it is approved.
- Impacts relating to the aquatic ecology identified potential cumulative aquatic ecological impacts associated with the proposed development, that can be suitably reduced and mitigated to within acceptable residual levels, by implementation of the recommended mitigation measures. It is therefore not anticipated that the proposed development will add any significant residual cumulative aquatic

ecological impacts to the surrounding environment, if all recommended mitigation measures as per this aquatic ecological report are adequately implemented and managed, for both the construction- and operational phases of the proposed development.

- There will be no unacceptable risk to avifauna with the development of the 165MW Khauta North SPV Facility and other renewable energy projects within the surrounding area, provided the recommended mitigation measures are implemented. This is due to the limited footprint (that avoid ecological sensitive areas) expected to be associated with the renewable energy facilities proposed in authorised in the area.
- There will be no unacceptable loss or impact on ecological aspects (vegetation types, species and ecological processes) due to the development of the 165MW Khauta North SPV Facility and other renewable energy projects within the surrounding area, provided the recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.
- There will be no unacceptable loss of heritage resources associated with the development of the 165MW Khauta North SPV Facility. There will also be no unacceptable impacts to the cultural landscape as a result of the development of the facility provided that the recommended development buffers along major routes are adhered to. The cumulative impact is therefore acceptable.
- Cumulative visual impacts (i.e., within the medium to long distance zone) the proposed development will only be visible from one (1) of these vantage points inspected. It was determined that a moderate visual impact will occur from where the visual impact will be temporary as observers will only traverse through the area.
- With regards to the cumulative impacts relating to social and economic impacts it was noted that with the implementation of mitigation measures, other negative impacts are expected to be Low to Medium when factoring in the other solar facility developments. During construction phase the biggest impact will relate to the temporary increase on road traffic for the transportation of the equipment. The biggest positive cumulative impact will manifest during the Operational Phase, whereby the increased cumulative electricity generation capacity and addition to the National Grid system will have a Medium-High benefit.
- The overall cumulative impacts from an avifauna perspective indicated that the project are considered to be low and will not cause detrimental impacts to the avifauna species located within the development area.

3. ASSESSMENT OF THE ALTERNATIVES

In accordance with the requirements of Appendix 3 of the 2014 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 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.

The preferred project site (165MW Khauta North SPV Facility) was identified through an investigation of prospective sites and properties in the area within the Free State Province. The investigation involved the consideration of specific characteristics that play a role in the opportunities and limitations for the development of a Solar Energy Facility. The key drivers in siting the project were determined by:

- Access to the National Electricity Grid;
- Solar resource;
- Land availability;
- Geographical and topographical considerations; and,
- Access to the project site.

The overall aim of the facility layout (i.e., development footprint) is to maximise electricity production through exposure to the solar resource, while minimising infrastructure, operation, and maintenance costs, and social and environmental impacts.

3.1 Assessment of the type of renewable energy

Khauta North Solar PV Facility RF (Pty) Ltd is a renewable energy project developer and therefore only considered renewable energy activities in accordance with the need for such development within the IRP (refer to Chapters 6 for more detail). The development of a wind energy facility was also considered, but Class 3 winds (which are the standard requirement for the wind turbine to produce energy) with a speed of at least 23km/h is required to optimise wind turbine electricity generation. The windiest month (with the highest average wind speed) is November (14.4km/h) in Riebeeckstad. The calmest month (with the lowest average wind speed) is May (9km/h)[6]. These average wind speeds were too low to function a wind farm optimally and therefore wind generation was not further investigated as an alternative activity in this EIA Report. With the focus on solar energy, the assessment for alternatives were focussed on the alternative technologies to be implemented in the project.

3.2 Assessment of the No-go Alternative

The 'do-nothing' alternative is the option of not constructing and operating the 165MW Khauta North SPV Facility. Should this alternative be selected, there would be no environmental impacts or benefits as a result of construction and operation activities associated with a Solar Energy Facility. There will be no energy for the national grid, no job creation and the site will remain as is. The 'do-nothing' alternative will therefore likely result in minimising the cumulative impact on land, although it is expected that pressure to develop the site for renewable energy purposes will be actively pursued due to the same factors which make the site a viable option for renewable energy development. The 'do-nothing' alternative has been assessed as part of the EIA Phase (refer to Chapters 7 and 10 of this EIA Report). The 'do-nothing' alternative will do little to influence the

[6] *Web address*: https://www.weather-atlas.com/en/south-africa/riebeeckstad-climate

renewable energy targets set by government. Therefore, from a regional perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of benefits for the regional area.

3.3 Assessment of the Facility Layout

A number of ecologically / conservation significant and sensitive aquatic features/habitats and species, as well potential heritage sites were identified throughout the original assessment area and the surrounding 500 m 'zone of influence'. Based on these findings and the subsequent initial recommendations of the Site Verification Report and subsequent specialist assessments, the original proposed development area was significantly reduced in size and the design layouts of the Photovoltaic (PV) grid were revised by the applicant and the procedure is illustrated in Figure 3. This was done to ensure that the proposed development area is adequately kept away from any of the identified ecologically/conservation significant and sensitive aquatic features/habitats and -species. The proposed development area discussed in this report, therefore constitutes this final acceptably reduced and revised area.

As noted above, the indicative facility layout/development footprint assessed within this EIA Report (Figure 2) was designed by the project developer in order to respond to and avoid the sensitive environmental and social features located within the project site, which were identified by the specialists during the Scoping Phase of the EIA process. This approach ensured the application of the mitigation hierarchy (i.e., avoid, minimise, mitigate, and offset) to the proposed project, which ultimately ensures that the development is appropriate from an environmental perspective and is suitable for development within the project site.

Based on the findings as documented in this EIA report, it was concluded that this layout avoids areas of sensitivity and therefore no further optimisation is recommended. As such, the impact of this proposed Facility Layout is considered to be acceptable, and the layout is recommended for approval. Final micro-siting must however be undertaken prior to construction considering all mitigation measures recommended within this EIA Report and associated specialist studies.

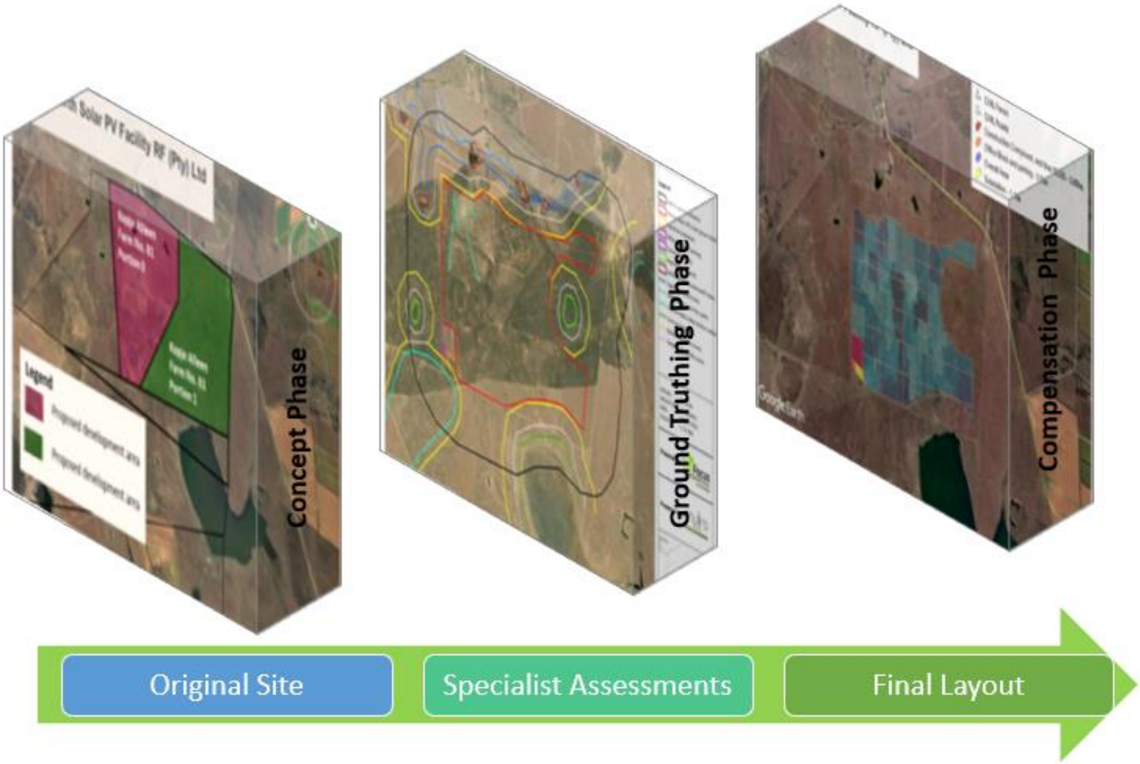


Figure 3: Environmental Screening and Assessment Process that informs the Final Layout

4. ENVIRONMENTAL COSTS VERSUS BENEFITS

This project forms part of the promulgated IRP 2010-2030 plan that identified electricity generation technology (specifically renewable energy – solar PV) to meet the expected demand growth up to 2030. This project aims to produce and distribute renewable energy generated electricity.

COSTS:

Environmental costs (including those to the natural-, 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 EIA Report and the EMPr are implemented and adhered to. No fatal flaws have been identified. These environmental costs could include:

- Loss of land for agriculture – The amount of agricultural land loss is well within the allowable development limits prescribed by the agricultural protocol. These limits reflect the national need to conserve valuable agricultural land and therefore to steer, particularly renewable energy developments, onto land with lower agricultural production potential. The proposed development offers positive impact on agriculture by way of improved financial security for farming operations, as well as security benefits against stock theft and other crime.
- Impacts on surrounding freshwater resources – the impacts on freshwater resources have been minimised through the avoidance of the sensitive features by the project infrastructure. The internal

access roads and MV Cabling will utilise the existing main access road to the north and all other infrastructure will remain within low-sensitive green developable area.

- Loss of biodiversity, flora and fauna due to the clearing of land for the construction and utilisation of land for the solar farm – The cost of loss of biodiversity has been minimised/avoided through avoiding placement of project components and infrastructure within the ecological features considered to be of very high sensitivity (No-Go areas).
- Impacts on avifauna – loss of bird's species due to construction activities and collision. The impact has been minimised through the avoidance of areas of very high sensitivity (No-Go areas) and is considered to be acceptable with implementation of mitigation measures.
- Impact to the cultural landscape - The 165MW Khauta SPV Facility is proposed within a landscape area with an overriding agricultural character. Whilst the proposed project will create a new large scale industrial node within the agricultural landscape, this is not entirely out of character with the broader region. However, it will be a significant local character change.
- Impact on heritage and palaeontological resources - According to Almond (2022), `no fossil remains of any kind were recorded from the Permian bedrocks and Late Caenozoic superficial sediments that underly the study area, and that no palaeontological High Sensitivity or No-Go areas were identified. No pre-colonial Stone Age, or historical archaeological heritage resources were recorded in the application area.
- Impact on the local economy – The economic impacts created by a capital injection (CAPEX) are once-off impacts that will only occur for the duration of construction. Thus, economic impacts associated with the construction phase are not sustainable economic impacts. Operational economic impacts, unlike capital expenditure economic impacts are sustainable and thus are calculated as an annual impact based on operational expenditure (OPEX) for a given year. The total impact on production/business sales once the project is fully operational is likely to equate to R 102.6 million (direct, indirect, and induced) per annum and will largely be spent in Free State and Gauteng. The total impact on GDP (direct, indirect, and induced) is likely to be R 62.3 million per year. It is anticipated that 20 South African based FTE employment positions will be created during the operational phase of the facility. The total impact on employment will be 54 FTE employment positions which will largely be experienced in the utilities sector and other value chains associated with solar farm operations.
- Impact on the visual surroundings - The highest visual impact within the short to medium distance zone will occur from the farmstead situated at kilometre two point four (km 2.4) towards the north as well as from the tourist accommodation situated two point eight kilometres towards the northeast of the proposed development. The visual impact from these vantage points will be moderate and permanent as observers will experience a change in the aesthetic value of the surrounding landscape. It is anticipated that with the implementation of the mitigation measures proposed in the Visual Impact Report, these could be limited to an acceptable level of disturbance.

BENEFITS:

It is anticipated that with the implementation of the recommended mitigation measures from all the specialists and overall project implementation, the 165MW Khauta North SPV Facility will provide the following benefits:

- The most notable advantage of solar energy is that it is a renewable energy, which is why it is considered inexhaustible and are considered a reliable long-term investment and a hedge against rising energy costs.
- Solar panels can use both direct and indirect sunlight. So even if it's cloudy, panels can still produce electricity. With the installation of the BESS at the 165MW Khauta North SPV Facility it is anticipated that the facility will bank excess solar production from sunny days to offset the times where the panels may not be producing. Through this option more consistent power supply is guaranteed.
- One of the biggest environmental advantages of solar energy (as current best electricity generation solution) entail the curbing and reducing the impacts on climate change. Solar is a renewable energy source with a fraction of the emissions of natural gas or coal (life-cycle carbon emissions are 95% lower than coal[7]). In fact, the small number of emissions required to manufacture a solar panel are offset within its first two years of production[8].
- The water requirement for a solar farm is negligible compared to the levels of water used by coal-based technologies. Water is normally required during the construction phase and then periodically during the operation phase whereby the panels must be cleaned from time to time.
- The project provides an opportunity for a new land use on the affected agricultural properties which would result in additional financial benefits to the directly affected landowners through compensation. It is important to note that the construction and operation of a solar facility can occur in concurrent with crop production.
- In terms of the location this project will contribute towards the National, Provincial and Local goals for the development of renewable energy as outlined in the respective Integrated Development Plans (IDPs) and IPP plan.
- The project serves to diversify the economy and electricity generation mix of South Africa through the addition of solar energy, in line with national policy[9] regarding energy generation.
- The project will result in important economic benefits at the local and regional scale through job creation, income, and other associated downstream economic development, supporting the Just Energy Transition[10] in the region. These will persist during the pre-construction, construction, operation and decommissioning phases of the project.

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[7] How Solar Energy Benefits the Environment, 2022. Solar Learning Center > The Pros and Cons of Solar Energy in 2022 > How Solar Energy Benefits the Environment. *Web Address*: https://www.solar.com/learn/benefits-of-solar-energy-to-the-environment/

[8] How Solar Energy Benefits the Environment, 2022. Solar Learning Center > The Pros and Cons of Solar Energy in 2022 > How Solar Energy Benefits the Environment. *Web Address*: https://www.solar.com/learn/benefits-of-solar-energy-to-the-environment/

[9] White Paper on the Renewable Energy Policy of the of the Republic of South Africa, 2003,November. GN Notice 513 of 2004.

[10] Project 90 by 2030, "Remaking our Energy Future: Towards a Just Energy Transition (JET) in South Africa," *Web Address*: https://90by2030.org.za/wp-content/uploads/2020/03/Remaking-our-Energy Future.pdf, 2019.

It is anticipated that the 165MW Khauta North SPV Facility will contribute to achieving goals for implementation of renewable energy and sustaining a 'green' economy within South Africa. 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, the benefits of the project are expected to partially offset the localised environmental costs of the solar farm, provided that the mitigation measures, as recommended by the specialists are adhered to.

5. OVERALL CONCLUSION (IMPACT STATEMENT)

The preferred activity entails the development of a renewable energy facility on site using solar as the preferred technology, due to the availability of a strong solar resource, available grid capacity, benign topography, and good access. A technically viable development footprint was amended by the developer to exclude environmental sensitivities identified in the scoping study and assessed as part of the EIA process. The assessment of the development footprint within the project site was undertaken by independent specialists and their findings have informed the results of this EIA Report.

In terms of the relevant policies 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 independent specialist findings from the EIA studies undertaken have indicated that there are no identified fatal flaws associated with the implementation of the development footprint within the project site subject to implementation of the recommended mitigation measures. The developer has amended the project development footprint in response to the identified sensitive environmental features and areas present within the project site. 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). The layout for the PV facility and associated infrastructure assessed within this EIA Report is located outside of the sensitive areas and features regarded to be No-Go for development and is therefore considered to be acceptable for implementation.

The impacts that are expected to remain after the **avoidance of the sensitive areas** by the facility **layout have been reduced** to acceptable levels through the recommendation of specific mitigation measures by the specialists. The minimisation of the significance of the impacts is in line with tier 2 of the mitigation hierarchy. Therefore, impacts can be mitigated to acceptable levels or enhanced through the implementation of the recommended mitigation or enhancement measures.

As noted in the cost-benefit analysis, the benefits of the 165MW Khauta North SPV Facility is 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/No-Go for development, the benefits of the project are expected to partially offset the localised environmental costs of the solar facility.

From a social perspective, both positive and negative impacts are expected. The implementation of 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 165MW Khauta North SPV Facility.

Based on the above it can be concluded that the development of the 165MW Khauta North SPV Facility will not result in unacceptable environmental impacts (subject to the implementation of the recommended mitigation measures).

6. OVERALL RECOMMENDATION

Considering the findings of the assessments (**Figure 4**), the independent specialist studies, the impacts identified by all, the revised development footprint, 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 165MW Khauta North SPV Facility is acceptable within the landscape and can reasonably be authorised subject to implementation of the refined optimised facility layout and the mitigation and enhancement measures recommended by the specialists.

The following key conditions would be required to be included within an authorisation issued for the 165MW Khauta North SPV Facility:

- All mitigation measures detailed within this EIA Report, as well as the specialist reports contained within Appendices D to L are to be implemented;
- The EMPr (for the facility and onsite substation) as contained within Appendix N of this EIA 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 165MW Khauta North SPV Facility is considered key in achieving the appropriate environmental management standards as detailed for this project.
- Following the final design of the 165MW Khauta North SPV Facility, a final layout must be submitted to DFFE for review and approval prior to commencing with construction. Micro-siting must take all recommended mitigation measures into consideration. No development is permitted within the identified No-Go areas as detailed in **Figure 59**.
- It is recommended that 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.
- A preconstruction walk-through of the final development footprint for protected species that would be affected and that can be translocated must be undertaken. The survey must also cover sensitive habitats and species that are required to be avoided. Permits from the relevant authorities, will be required to relocate and/or disturb listed species.

- Where practical, prevent birds from nesting in substation infrastructure through exclusion covers or spikes if required (this will need to be determined on a case-by-case basis).
- All other relevant environmental permits must be obtained prior to the construction of the facility.

A validity period of a minimum of 10 years of the Environmental Authorisation is requested, should the project obtain approval from DFFE.

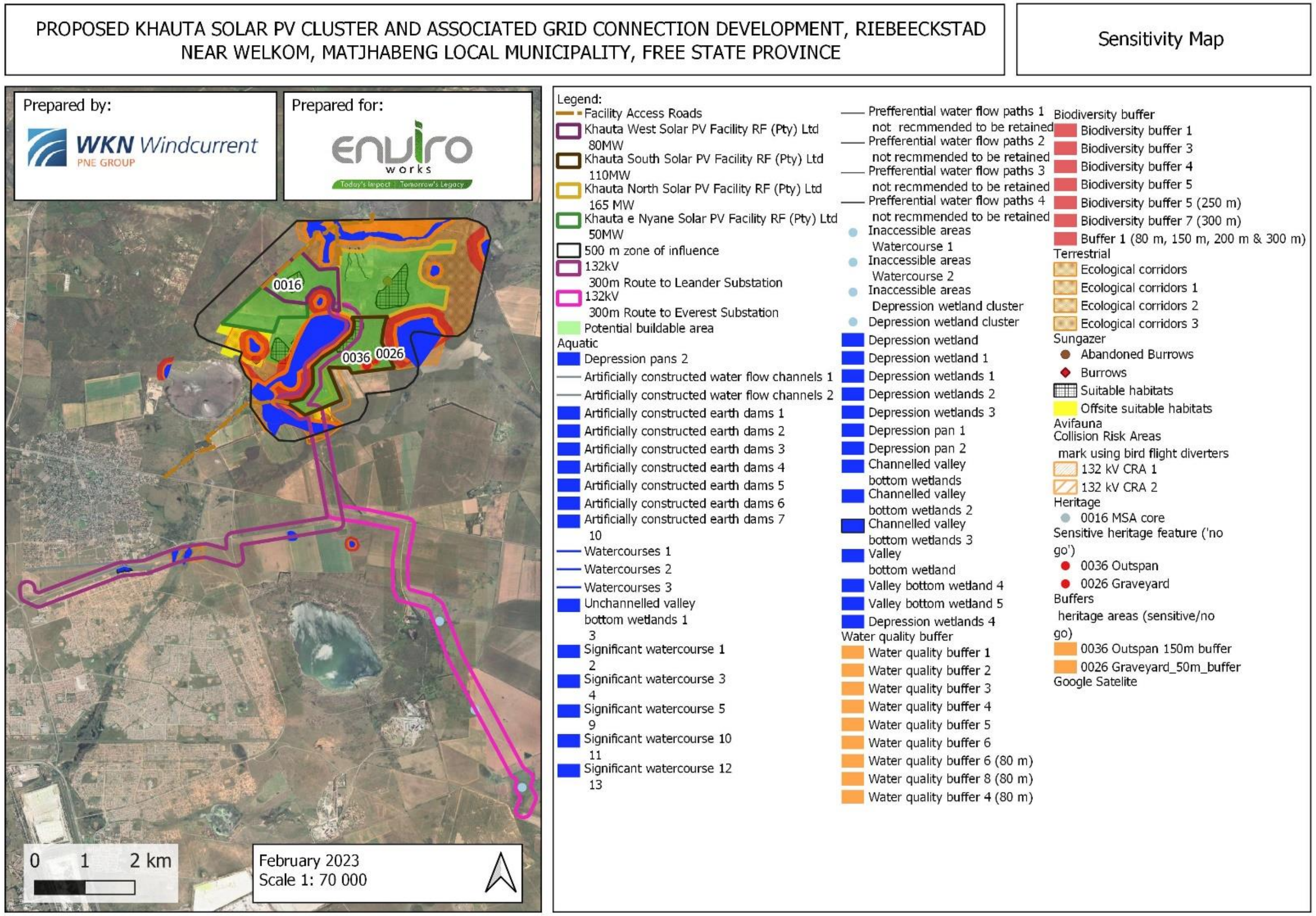

Figure 4: Overall Site Sensitivities for the Khauta Cluster SPV Facilities based on the Specialist Assessments (green area earmarked for potential buildable area)

Brief Description of the Biophysical Environment:

Vegetation - The development area lies in the *Grassland Biome* and the endemic vegetation is classified as *Highveld Alluvial Vegetatio*n. This vegetation type is considered *least threatened* and occurs throughout the Free Sate, North West and Gauteng Provinces at altitudes ranging between 1 000 m to 1 500 m. The *Highveld Alluvial* Vegetation consists of grasslands together with riparian thickets dominated by *Vachellia karroo* trees.

Heritage - The study has identified no impacts to archaeological heritage that will need to be mitigated prior to construction activities commencing. The cultural landscape, primarily agriculture (i.e., grazing), with farm fences, tracks, water storage, and windmills, being the main tangible evidence of the landscape, has low heritage significance.

Plant, Animal and Terrestrial Biodiversity - Areas classified as an ESA 1 or 2 have been classified based on the presence of wetland clusters (as per the Free State Biodiversity Plan, 2016[11]). The overall proposed development footprint is degraded but does have elements of the indigenous vegetation type and is likely to contribute to the over ecological functioning of the area. Based on the aforementioned site verification, the development footprint has been confirmed to be classified as “Low” for the Terrestrial Biodiversity Theme and “Low” for the Plant Species Theme, and “Medium” for the Animal Species Theme. The overall footprint of the proposed facility is not likely to generate a high-very high impact on broad scale ecological processes or landscape connectivity, on condition that all mitigation measures are followed.

Palaeontology - The area falls within the Permian bedrocks and Late Caenozoic superficial sediments. No pre-colonial Stone Age, or historical archaeological heritage resources were recorded in the application area. No evidence of any Late Iron Age archaeological heritage was encountered during the study, which appears to be absent from the area. And no evidence of any Anglo-Boer War battlefield sites (1899-1904), war graves or memorials were encountered during the study.

Groundwater - The aquifer beneath this site is classified as an intergranular fractured aquifer and the yield potential ranges between 0.1 - 0.5 ℓ/s. This is a minor aquifer and the depth to groundwater is approximately 38 m below ground level (DWS GRA2, 2005).

Watercourses - A significant first-order seasonal watercourse/tributary associated with the commencement portion of the Sandspruit, flows past the assessment area, directly adjacent north and continues in a westerly direction into the Sandspruit, approximately 400 m - 600 m to the north of the assessment area. Surface water runoff from the central and northern portions of the assessment area situated north of the highpoint/ridge apex, consequently mainly drains towards this watercourse.

Five artificially constructed earth dams are present within- and along the length of the seasonal watercourse/tributary associated, approximately 210 m to the north and east of the assessment area. The watercourse and associated earth dams, house locally distinct and important aquatic and semi-aquatic habitats,

[11] Collins, N., 2016. Free State Biodiversity Plan.

which are visibly utilised by various common and habitat-specific waterbirds, amphibian species and aquatic invertebrates for breeding, foraging and/or persistence purposes.

The Commandants Pan constitutes a well-known significantly sized naturally occurring depression pan, which is situated approximately 270 m south-east of the assessment area. The pan is seasonally/temporarily inundated and the inflow of the pan mainly originates from a significantly sized unchanneled valley-bottom wetland, situated approximately 550 m east of the assessment area.

A significantly sized naturally occurring unchanneled valley-bottom wetland, is located approximately 110m south-east of the assessment area. The localised topography flattens-out slightly in the vicinity of the subsequent unchanneled valley-bottom wetland, which results in this subsequent wetland being seasonally/temporarily inundated.

One naturally occurring depression wetland is present within the approximate 500 m zone of influence surrounding the assessment area. The wetland is situated approximately 216 m east of the assessment area, respectively.

During the EIA phase, these areas were assessed, and the development footprint has been selected with the aim to avoid these.

Agricultural Potential - The entire site was verified during the assessment as being of medium sensitivity for impacts on agricultural resources with a land capability value of 6 to 7. Parts of the site are allocated high agricultural sensitivity on the screening tool, because they were under crop production in the past. However, the high sensitivity was disputed because the lands have not been used for crop production for an extended period and so should no longer be classified as cropland or allocated high sensitivity because of it. The land was assessed as being of insufficient land capability for viable and sustainable future crop production. The cropping potential of the site is limited by the combination of fairly low rainfall and shallow soils limited by dense clay and poor drainage in the subsoil.

Environmental Impact Assessment Process:

The current assessment is being undertaken in terms of the **National Environmental Management Act** (Act No. 107 of 1998) (NEMA)[12]. This Act makes provision for the identification and assessment of activities that are potentially detrimental to the environment and which require authorisation from the Competent Authority (in this case, the national Department of Forestry, Fisheries and the Environment (DFFE) in respect of the proposed renewable energy facility and its related activities). In addition, but not limited to, the proposed project may also require a Water Use License by submitting a Water Use License Application (WULA) to the Department of Water and Sanitation (DWS) in terms of the National Water Act (Act No. 36 of 1998) (NWA) for the water uses as specified in Section 21 (a), (b), (c), (i) and (g) of the NWA. In addition to the above, a renewable energy facility

[12] The Minister of Water and Environmental Affairs promulgated new regulations in terms of Chapter 5 of the National Environmental Management Act (NEMA, Act 107 of 1998), viz, the Environmental Impact Assessment (EIA) Regulations 2014 (as amended in April 2017). These regulations came into effect on 08 December 2014 (amended on 07 April 2017) and replace the EIA regulations promulgated in 2006 and 2010.

requires approval from the National Department of Agriculture, Land Reform and Rural Development (DALRRD) if the facility is on agriculturally zoned land.

The proposed development entails a number of listed activities, which require a **Scoping & Environmental Impact Reporting (S&EIR) process**, which must be conducted by an independent Environmental Assessment Practitioner (EAP). King's Landing Trading 507 (Pty) Ltd t/a Enviroworks (hereafter referred to as Enviroworks) has been appointed to undertake this process.

The listed activities associated with the proposed development, as stipulation under the Environmental Impact Assessment (EIA) Regulations of 2014 (GN R.983, GN R.984 and GN R.985), as amended are listed in **Table 10** under Section 5.2.2 of this Draft EIA Report. The purpose of these regulations is to avoid negative impacts on the environment or where they cannot be avoided, ensure mitigation and management of the impacts to acceptable levels, while optimising positive environmental impacts.

Before any of the above-mentioned listed activities can be undertaken, Environmental Authorisation (EA) must be obtained from the DFFE.

Evaluation of the Proposed Project:

The potential environmental impacts identified, which are typically associated with solar energy projects, are associated with the construction and operational phases of the proposed project. The following potential environmental impacts has been assessed during the Environmental Impact Assessment phase of the (Scoping & EIR) process:

- An **Avifaunal Impact Assessment** has been conducted by a specialist to provide final recommendations on suitable aquatic avifaunal species and habitat buffer zones.
- A **Terrestrial Ecological Assessment** and **Aquatic Ecological Assessment** have been conducted to assess potential impacts on the ecology and biodiversity including the fauna, flora, and terrestrial biodiversity within the proposed development footprint.
- A **Soil and Agricultural Potential Assessment** has been conducted by a specialist to assess the potential of soil erosion and the loss of agricultural potential as well as other potential impacts in this specialist field.
- A **Heritage (including Archaeological & Paleontological) Impact Assessment** has been conducted by an Archaeologist to assess whether the construction of proposed project would have any impacts on significant artefacts.
- The **Visual Impact Assessment** of the PV facility has been assessed.
- A **Socio-Economic Impact Assessment** has been conducted to assess the potential impacts on the surrounding areas.
- A **Geotechnical Assessment** was done to assess the geotechnical requirements for the construction activities related to the project.

The outcome of this Draft EIR has not identified any fatal flaws associated with the proposed development of the 165MW Khauta North SPV Facility. Subject to the outcome of the Public Participation Process, it is Enviroworks' reasoned opinion that the project should proceed.

Public Participation:

A general public participation process (PPP) has been followed during the Scoping Phase and EIR Phase of the EIA for the proposed 165MW Khauta North SPV Facility. The aim and purpose of the PPP is to:

- Ensure all relevant Key stakeholders and Interested and Affected Parties (I&APs) have been identified and invited to engage in the scoping phase;
- Raise awareness, educate and increase understanding of stakeholders about the proposed project, the affected environment and the environmental process being undertaken;
- Create a platform for Key stakeholders and I&APs to freely communicate, issues or concerns and suggestions for enhancing potential benefits and/or to prevent or mitigate impacts;
- Accurately document all opinions, concerns and queries raised regarding the project; and,
- Ensure the issues and concerns of the stakeholders and I&APs related to the project are addressed in an adequate manner.

The Scoping & EIR process has been announced through a Background Information Document (BID) and the Draft Scoping Report (DSR), and advertisements that was published in the Beeld newspaper on Wednesday, **17 August 2022**, and the Vista local newspaper on Thursday, **18 August 2022**. Site notices were also placed at the corner of the R70 and R34 that turns onto the secondary road S173; adjacent to farm access roads near Portion 0 of Farm 81 (Kopje Alleen) and Portion 12 of Farm 74 (Nooitgedacht); the Riebeeckstad Library; as well as but not limited to, the Matjhabeng Local Municipality building in Welkom. All registered I&APs has been informed of the availability of the draft documentation for comment (as referred to above) when it is made available.

This Draft Scoping Report was made available for comments for 30 calendar days from **17 August 2022** until the **16 September 2022**. Written comments on this Draft Scoping Report were submitted to Enviroworks' Social Facilitation Specialist on or before 16 September 2022.

All registered I&APs have been and will be informed of the availability of the documentation for comment (as referred to above) when it is made available.

REPORT DETAILS

Table 2: Summary and Report Details of the Draft EIA Report.

TITLE	DRAFT EIR REPORT FOR KHAUTA NORTH SOLAR FARM
Purpose of this report:	This Draft EIR Report is available to all registered and potential Interested and Affected Parties (I&APs). This Draft EIR Report forms part of a series of reports and information sources that are being provided during the Scoping and Environmental Impact Reporting (Scoping & EIR) process for the proposed 165MW Khauta North photovoltaic (PV) Renewable Energy Facility in the Free State Province. This report forms part of the Scoping & EIR process. Registered I&APs will be given an opportunity to comment on the following reports as part of the Scoping & EIR process: • Draft Scoping Report; • Draft Environmental Impact Assessment Report; and • Draft Environmental Management Programme. In accordance with the EIA Regulations, 2014 (as amended), the objectives of the EIA process are to, through a consultative process: (a) determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context; (b) describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location; (c) identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment; (d) determine the-- (i) nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and (ii) degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources, and (cc) can be avoided, managed or mitigated; (e) identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment; (f) identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;

TITLE	DRAFT EIR REPORT FOR KHAUTA NORTH SOLAR FARM
	(g) identify suitable measures to avoid, manage or mitigate identified impacts; and (h)identify residual risks that need to be managed and monitored. The Draft EIR Report will be available to all stakeholders for a thirty (30) day review and comment period from **02 March 2023 – 03 April 2023**. An application has been submitted to the Department of Forestry, Fisheries and the Environment (DFFE) for the proposed Khauta North Solar Farm on **18 August 2022**.
Prepared for:	Khauta North Solar PV Facility RF (Pty) Ltd
Published by:	10 January 2023
Author:	Michelle Boshoff
DFFE Case Officer & Ref. No:	Mr Jay-Jay Mpelane Ref. No.: 2022-06-0040 (pre-application reference) DFFE Ref. No.:14/12/16/3/3/2/2221
Date:	18 August 2022

TECHNICAL DETAILS

The following technical details are included as a quick reference roadmap to the proposed project.

Table 3: Technical Details of the Propose 165MW Khauta North Solar PV Facility.

ADMINISTRATION		
Applicant Details	Applicant Name:	Khauta North Solar PV Facility RF (Pty) Ltd
	Company/ Trading name:	WKN Windcurrent SA (Pty) Ltd
	Company Registration Number:	2010/022616/07
SITE DETAILS		
Description of affected farm portion	Solar PV (SPV) Facility and Associated Infrastructure: • Portion 0 of Farm 81 (Kopje Alleen) in extent 254.31ha (Title Deed T3378/2013) situated in the Matjhabeng Local Municipality, Welkom Registration Division District, Free State Province; • Portion 1 of Farm 81 (Kopje Alleen) in extent 261.18ha both (Title Deed T3378/2013) situated in the Matjhabeng Local Municipality, Welkom Registration Division District, Free State Province;	
21 Digit Surveyor General codes	SPV Facility and Associated Infrastructure: • Portion 0 of Farm 81 (Kopje Alleen) - F02400000000008100000 • Portion 1 of Farm 81 (Kopje Alleen) - F02400000000008100001	
Title Deed	T3378/2013	
Photographs of the site	Refer to Section 3.1	
MAIN INFRASTRUCTURE DETAILS		
Type of technology	Solar Photovoltaic (SPV) Facility	
Structure orientation	They will either be fixed, or single axis to track sun east to west through the day, or dual axis, tracking sun through day, but also adjusting to the season (i.e., sun is more north in winter and more overhead in summer).	

Structure Height of Solar Panels	Approximately six metres (± 6m). The uppermost vertical point of the solar panel when tilted at an angle could reach a height of eight metres (± 8m).
Area of PV Array - Anticipated surface area to be covered by SPV Facility	Approximately 273 ha
Anticipated Laydown area	Area up to 3.9 ha (which will be a permanent laydown area for the BESS during the operational phase).
Anticipated Battery Energy Storage System (BESS) area	Area up to 3.9 ha
Structure height of BESS	Up to eight metres (± 8m).
Expected capacity of the facility (MW)	165 MW
Number of Inverters required	It is anticipated that 42 inverters will be placed adjacent to the roads.
Area to be occupied by inverter / transformer station / substations.	1.1ha will be reserved for the 132/33kV substation.
Capacity on on-site substation	132/33 kV substation
GRID CONNECTION DETAILS	
Own-Build Grid Connection - Power Lines and Substations	The proposed grid connection infrastructure includes underground medium-voltage cabling between the project components and the facility's on-site 33/132 kV collector substation. It is estimated that the maximum size of the facility's 33/132 kV collector substation will not exceed 1.1 ha. Please note that three additional SPV Facilities are proposed on the adjacent farms: namely, the 50 MW Khauta e Nyane SPV Facility, 80 MW Khauta West SPV Facility and 110 MW Khauta South SPV Facility and are concurrently being considered and assessed through separate Environmental Impact Assessment (EIA) processes. The proposed Khauta North SPV Facility substation will collect the power from the SPV cluster which will then be connected via a proposed 132 kV Overhead Powerline that will facilitate the connection to the Everest Main Transmission Substation (Alternative Option 1) or to the Leander Main Transmission Substation (Alternative Option 2) via a single or double circuit 132 kV Overhead Powerline. The proposed 132 kV Overhead Powerline connecting the facility's substation to the Main Transmission Substation will be assessed as part of a separate Application for Environmental Authorisation. It should further be noted that the above-mentioned proposed Power Lines and Substation falls within the Central Corridor geographical area referred to as "**strategic transmission**

	corridors" identified in Government Notice No. 113 published under Government Gazette No. 41445 of 16 February 2018 and Government Notice No. 1637 published under Government Gazette No. 45690 on 24 December 2021. These areas were chosen based on the findings of strategic environmental assessments: where development is prioritised in specific geographic locations which have an abundance of resources (such as sun), low environmental sensitivity, and where there is an increased need for socio-economic development, among other things.	
ADDITIONAL INFRASTRUCTURE DETAILS		
	Area occupied by Auxiliary Buildings	The buildings and facilities needed to service the Khauta North SPV Facility are a control room, a general office, an access control and security building, ablution facilities and kitchen area, a small workshop, and a store. The total area occupied is ± 0.5 ha
	External access road	The external main access road shall utilise the existing farm road on Portion 0 of Farm 81 (Kopje Alleen) leading to the Khauta North Solar PV Facility, accessed from the secondary road S173 that branches of the R34 and R70. The main access roads will not exceed 8 m in width. The total width including all stormwater management structures will not exceed 10 m in width. The majority of the access road will comprise the expansion of sections of the existing farm road.
Other proposed infrastructure	Internal roads (width & length)	A network of internal access roads (each with a width of up to 6 m) will be constructed to provide access to the solar PV modules, main control room, administration office, and various components of the facility. The anticipated length will be 20km
	Stormwater management infrastructure	Cut-off trenches and side drains along roads will be required to intercept the surface flow and redirect it away from the project infrastructure. Infiltration trenches and retention areas may be required to attenuate the surface flow and recharge groundwater on the project site.
	Proximity to grid connection	Approximately 13-15km (Leander MTS or Everest MTS)
	Height of fencing	Up to 3m for substation and again for entire site.
	Type of fencing	Typical for substations / solar projects.

CONTENT OF ENVIRONMENTAL IMPACT REPORT

The table below lists the minimal contents of a Environmental Impact Assessment Report in terms of Appendix 3 of the Environmental Impact Assessment Regulations of 2014 (Government Notice No. 982, as amended).

Table 4: General Requirements of a EIA Report as set out in Appendix 3.

REQUIREMENT	DETAILS
(a) details of - (i) the EAP who prepared the report; and (ii) the expertise of the EAP, including a curriculum vitae;	Appendix A
(b) the location of the activity, including – (i) the 21-digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name; (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	Section 3
(c) a plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is (i) a linear activity, a description, and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	Section 3
(d) a description of the scope of the proposed activity, including- (i) all listed and specified activities triggered and being applied for; and;	The listed and specified activities triggered are detailed in section 5.2.2 of this report.
(i) a description of the associated structures and infrastructure related to the development;	The description of the proposed activity is detailed in section 4 of this report.
(e) a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;	The legislative and policy context is included in section 5 of this report.
(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 development footprint within the approved site as contemplated in the accepted scoping report;	The need and desirability of the project are included in section 6 of this report.

REQUIREMENT	DETAILS
(g) a motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report;	
(h) a full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including: - (i) details of the development footprint alternatives considered;	The details of all alternatives considered are included in section 7.
(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	The details of the public participation to be undertaken are detailed in section 2.5 as well as the details of the public participation for the remainder of the environmental impact and reporting process are detailed in Appendix C of this report.
(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;	Issues and responses are included in Public Participation Report as Appendix C.
(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage, and cultural aspects;	Detailed site description and attributes are included in section 8 of this report.
(v) the impacts and risks identified for each alternative, 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;	A description of potential impacts identified by the EAP as well as participating specialists is included in section 9 of this report.
(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;	The methodology used for the determination and ranking of significance is included in section 9.3 of this report. Please also refer to the specific methodologies in the specialist reports attached in Appendixes D to L.
(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;	This EIR report identifies the potential positive and negative impacts associated with the proposed project. These are included in section 9 of this report.
(viii) the possible mitigation measures that could be applied and the level of residual risk;	The site-specific mitigation measures from the specialist studies and EAP will be identified and incorporated in the

REQUIREMENT	DETAILS
	draft Environmental Impact Report. This is included in section 9.5 and 10.2 of the report.
(ix) if no alternative development footprints for the activity were investigated, the motivation for not considering such; and;	Details regarding the criteria for the selection of the preferred site layout and technologies is included in section 7 of this report. Alternatives have been discussed in section 7 of this report.
(x) a concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report;	Please note that the proposed site (refer to section 7) and location (refer to section 7) and layout (i.e. the proposed development footprint) have been informed and developed based on the constraints and sensitivities identified through specialist site sensitivity verification assessments, undertaken during 2022, by various specialists that have been commissioned to outline the possible site sensitivities within the greater study area (i.e. identification of sensitive areas, No-Go areas and buffers for sensitive areas).
(i) a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity, including – (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and	Details of the process undertaken to identify, assess and rank the impacts of the proposed activity and associated structures and infrastructure is included in section 9.
(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;	Details of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided is included in section 9.
(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 can be reversed;	The assessment of each identified potentially significant impact and risk is included in section 9 and cumulative impacts are address in section 9.6.

REQUIREMENT	DETAILS
(vii) the degree to which the impact and risk can be mitigated;	
(k) where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;	The signed EAP declaration is appended to the EIA as Appendix A and a summary of the findings is included in the executive summary and section 10 of the report.
(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 development footprint on the approved site as contemplated in the accepted scoping report 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;	A summary of the findings and related maps are included in the executive summary and section 10 of the report.
(m) based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;	The recommendations and mitigation measures from specialists have been incorporated into the Draft EMPr and is attached as Appendix N to this report.
(n) the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;	The final proposed alternatives are included in section 10 of the report.
(o) 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;	Aspects which are conditional to the findings of the assessment either by the EAP or specialist are included as conditions of authorisation in section 10.3.
(p) a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Assumptions, uncertainties and gaps in knowledge is mentioned in section 1.5, 1.6 and 1.7 of the report.
(q) a reasoned opinion as to whether the proposed activity should or should not be authorised and if the opinion is that it should be authorised, any	The reasoned opinion as to whether the proposed activity should or should not be authorised is contained in section 10.

REQUIREMENT	DETAILS
conditions that should be made in respect of that authorisation;	
(r) where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised;	The proposed activity include operational aspects.
(s) an undertaking under oath or affirmation by the EAP in relation to – (i) the correctness of the information provided in the reports; (ii) the inclusion of comments and inputs from stakeholders and I&APs; (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	The signed EAP declaration of independence is appended to the EIA as Appendix A.
(t) where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	Deleted by GN 517 of 11 June 2021.
(u) an indication of any deviation from the approved scoping report, including the plan of study, including– (i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and (ii) motivation for the deviation;	The approved Scoping Report is attached as Appendix S in this report.
(v) any specific information that may be required by the competent authority; and	This will be addressed throughout the EIA process.
(w) any other matters required in terms of section 24(4)(a) and (b) of the Act.	This will be addressed throughout the EIA process.
(2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to an environmental impact assessment report the requirements as indicated in such notice will apply.	This is discussed in section 5.2.23.

GLOSSARY OF TERMS

Alien species: A plant or animal species introduced from elsewhere: neither endemic nor indigenous.

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.

Anthropogenic: Change induced by human intervention.

Applicant: means a person who has submitted an application for an environmental authorisation to the competent authority and has paid the prescribed fee.

Arable potential: Land with soil, slope and climate components where the production of cultivated crops is economical and practical.

Archaeological resources: This includes:

- material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artifacts, human and hominid remains and artificial features and structures;
- rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10 m of such representation;
- wrecks, being any vessel or aircraft, or any part thereof which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artifacts found or associated therewith, which is older than 60 years or which South African Heritage Recourses Act (SAHRA) considers to be worthy of conservation;
- features, structures and artifacts associated with military history which are older than 75 years and the site on which they are found.

Alluvial: Resulting from the action of rivers, whereby sedimentary deposits are laid down in river channels, floodplains, lakes, depressions etc.

Biodiversity: The variety of life in an area, including the number of different species, the genetic wealth within each species, and the natural areas where they are found.

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.

Commissioning: Commissioning commences once construction is completed.

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.

Cultural significance: This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

Cumulative Impact: In relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities.

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.

Development area: The development area is that identified area (located within the project site) where the Khauta SPV Facility is planned to be located.

Development footprint: The development footprint is the defined area (located within the development area) where the PV array and other associated infrastructure for the Khauta SPV Facility is planned to be constructed. This is the actual footprint of the facility, and the area which would be disturbed.

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.

'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.

Ecology: The study of the interrelationships between organisms and their environments.

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: All physical, chemical and biological factors and conditions that influence an object.

Environmental Impact Assessment: In relation to an application, to which Scoping and Environmental Impact Assessment must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of the application.

Environmental Impact Report: In-depth assessment of impacts associated with a proposed development. This forms the second phase of an Environmental Impact Assessment and follows on from the Scoping Report.

Environmental Management Programme: A legally binding working document, which stipulates environmental and socio-economic mitigation measures that must be implemented by several responsible parties throughout the duration of the proposed project.

Ephemeral: When referring to a stream or drainage line, it refers to the flow characteristics by which only periodic surface flows typically occur. Similarly when referring to a pan or depression, this would be characterised by only periods of time when surface water occurs within it, usually associated with the rainy season.

Heritage resources: This means any place or object of cultural significance. See also archaeological resources above.

Hydromorphic / hydric soil: Soil that, in its undrained condition, is saturated or flooded long enough during the growing season to develop anaerobic conditions favouring growth and regeneration of hydrophytic vegetation. These soils are found in and associated with wetlands.

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.

Kilovolt (kV): a unit of electric potential equal to a thousand volts (a volt being the standard unit of electric potential. It is defined as the amount of electrical potential between two points on a conductor carrying a current of one ampere while one watt of power is dissipated between the two points).

Local relief: The difference between the highest and lowest points in a landscape. For this study, it is based on 1:50 000 scale.

Loop-in-loop out: a closed electric or magnetic circuit through which a signal can circulate, as in a feedback control system.

Macro-geomorphological: Related to / on the scale of geomorphic provinces. A geomorphic province is a spatial entity with common geomorphic attributes.

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

Mitigation hierarchy: The mitigation hierarchy is regarded as a guideline 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.

Parabolic trough: Is a type of solar thermal energy collector. It is constructed as a long parabolic mirror (usually coated silver or polished aluminium) with a Dewar tube running its length at the focal point.

Precipitation: Any form of water, such as rain, snow, sleet, or hail that falls to the earth's surface.

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

Photovoltaic effect: Electricity can be generated using photovoltaic panels (semiconductors) which are comprised of individual photovoltaic cells that absorb solar energy to produce electricity. The absorbed solar radiation excites the electrons inside the cells and produces what is referred to as the Photovoltaic Effect.

Proponent: means a person intending to submit an application for environmental authorisation and is referred to as an applicant once such application for environmental authorisation has been submitted.

Red Data species: All those species included in the categories of endangered, vulnerable or rare, as defined by the International Union for the Conservation of Nature and Natural Resources.

Riparian: The area of land adjacent to a stream or river that is influenced by stream induced or related processes.

Scoping Report: A report that aim to identify the relevant policies, legislation, the need and desirability, proposed alternatives and associated preliminary risks and potential key issues associated with the proposed development. It forms part of the first phase of an Environmental Impact Assessment process.

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.

Soil compaction: Soil becoming dense by blows, vehicle passage or other types of loading. Wet soils compact easier than moist or dry soils.

ABBREVIATIONS

AIA	-	Archaeological Impact Assessment
Amsl	**-**	above mean sea level
BID	-	Background Information Document
BPEO	-	Best Practicable Environmental Option
CAR	-	Civil Aviation Regulations
CARA	-	Conservation of Agricultural Resources Act
CPA	-	Communal Property Association
CPV	-	Concentrating Photovoltaic
CSP	-	Concentrating Solar Power
DFFE	-	Department of Forestry, Fisheries and the Environment
DESTEA	-	Department of Small Business Development, Tourism and Environmental Affairs (Free State)
DOE	-	Department of Energy
DSR	-	Draft Scoping Report
DWS	-	Department of Water and Sanitation
EA	-	Environmental Authorisation
EAP	-	Environmental Assessment Practitioner
ECO	-	Environmental Control Officer
EIA	-	Environmental Impact Assessment
EIR	-	Environmental Impact Report
EMPr	-	Environmental Management Program
EO	-	Environmental Officer
EPC	-	Engineering Procurement Contractor
ESA	-	Early Stone Age
FSR	-	Final Scoping Report
GDP	-	Gross Domestic Product

GIS - Geographic Information System

GW - Gigawatt

Ha - Hectare

HIA - Heritage Impact Assessment

I&APs - Interested and Affected Parties

IDP - Integrated Development Plan

IEM - Integrated Environmental Management

IEC - International Electrotechnical Commission

IPP - Independent Power Producer

IRP - Integrated Resource Plan

IRR - Issues and Response Report

ISEP - Integrated Strategic Electricity Planning

kV - Kilo Volt

MW - Megawatt

MWp - Megawatt peak

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

NEMBA - National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)

NERSA - National Energy Regulator of South Africa

NIRP - National Integrated Resource Plan

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

NSBA - National Spatial Biodiversity Assessment

NWA - National Water Act, 1998 (Act No. 36 of 1998)

PHRA - Provincial Heritage Resources Agency

PM - Public Meeting

POC - Point of Connection

PPA - Power Purchase Agreement

PPP - Public Participation Process

PV	-	Photovoltaic
RE	**-**	Renewable Energy
REIPPP	-	Renewable Energy Independent Power Procurement Program
SADC	**-**	Southern African Development Community
SAHRA	**-**	South African Heritage Resources Agency
SANBI	**-**	South African National Biodiversity Institute
SDF	**-**	Spatial Development Framework
SKA	-	Square Kilometer Array
SPV	-	Solar Photovoltaic
SR	**-**	Scoping Report
STEP	-	Subtropical Thicket Ecosystem Plan
STC	-	Standard Test Conditions
W	-	Watt

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1 INTRODUCTION

1.1 INTRODUCTION AND BACKGROUND

Khauta North SPV Facility RF (Pty) Ltd is proposing the development of a commercial Solar Energy Facility and associated infrastructure on a site located across two farms (Portion 0 of the Farm Kopje Alleen No. 81 and Portion 1 of the Farm Kopje Alleen No. 81), located about 4km north-east of Riebeeckstad, within the Matjhabeng Local Municipality and within the Lejweleputswa District Municipality in the Free State Province. The facility will have a contracted capacity of up to 165MW and will be known as the 165MW Khauta North SPV Facility. The project is planned as part of a larger cluster of renewable energy projects (to be known as the Khauta Cluster), which include one 165MW Khauta North SPV Facility, one 110MW Khauta South SPV Facility, one 80MW Khauta West SPV Facility and a 50MW e Nyane SPV Facility. A separate EIA application and scoping/Basic Assessment (BA) Process will be undertaken for the associated grid connection infrastructure that will connect the Khauta Cluster projects to the Eskom grid.

Each renewable energy facility will be constructed as a separate stand-alone project and therefore, separate Scoping and Environmental Impact Assessment (S & EIA) processes will be undertaken for each of the four renewable energy facilities. Similarly, the grid connection solution will be subjected to a separate S&EIA/BA process.

It is the developer's intention to bid the 165MW Khauta North SPV Facility under the Department of Mineral Resources and Energy's (DMRE's) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme or a similar private programme, with the aim of evacuating the generated power into the national grid. The 165MW Khauta North SPV Facility is thus in response to the identified objectives of National and Provincial Government and Local and District Municipalities to develop renewable energy facilities for power generation purposes. The project site is strategically located within the Renewable Energy Development Zones (REDZ) corridor. REDZ are geographical areas where wind and solar PV development can occur (after following due process) in identified concentrated zones, creating priority areas for investment in the electricity grid and thereby increasing South Africa's green energy map by enabling higher levels of renewable power penetration. The location of the project in the Free State Province is important in the context of the Just Energy Transition (JET) programme. It is expected that the 165MW Khauta North SPV Facility will provide valuable jobs and socio-economic benefits not only in the immediate surroundings but also to the wider community, contributing to stabilising the electricity supply in the country. This is in line with the objectives of the Integrated Resource Plan (IRP), with the project set to inject up to 165MW electricity into the national grid.

From a regional perspective, the identified area within the Free State Province is considered favourable for the development of a commercial Solar PV Energy Facility by virtue of prevailing solar climatic conditions, the extent of the affected properties, the availability of a direct grid connection (i.e., a point of connection of the national grid) and the availability of land on which the development can take place.

1.2 REQUIREMENTS FOR AN ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

In terms of GNR 779 of 01 July 2016, the DFFE has been determined as the Competent Authority for all projects which relate to the IRP for Electricity 2010 – 2030, and any updates thereto. Through the decision-making process, the DFFE will be supported by the Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA) as the commenting authority.

Section 24 of South Africa's National Environmental Management Act (Act No. 107 of 1998) (NEMA) pertains to Environmental Authorisations (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 (CA). The 2014 Environmental Impact Assessment (EIA) Regulations, as amended (GNR 326), published under the NEMA, prescribe the process to be followed when applying for Environmental Authorisation (EA), while the Listing Notices (Listing Notice 1 (GNR 327), as amended, Listing Notice 2 (GNR 325), as amended, and Listing Notice 3 (GNR 324)), as amended contain those activities which may not commence without an EA from the CA.

As the development of the solar project has the potential to impact on the environment, an EA is required from the National DFFE subject to the completion of a full S&EIA process, as prescribed in Regulations 21 and 24 of the 2014 EIA Regulations (GNR 326), as amended. The requirement for EA subject to the completion of a full S&EIA process is triggered by the inclusion of, amongst others, Activity 1 of Listing Notice 1 (GNR 325), as amended, namely:

"***The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20MW or more***."

	PROJECT DETAILS	PLAN DETAILS	NOTES	TITLE:
			1. All distances and areas are provisional and must be verified by cadastral survey.	Location of Proposed Development
enviro works	**Project Name:** Khauta North SPV Facility **Project No:** 084(21) **Client:** Khauta North Solar PV Facility RF (Pty)Ltd **Municipality:** Matjhabeng	**Plan No:** 1 **Revision:** 1 **Date:** 2022-10-03 **Drawn By:** M. Boshoff **Checked By:** E. Mostert		PROPERTY DESCRIPTION: Kopje Alleen, Farm. No. 81, Portion 0 & Portion 1

Figure 5: Locality map of the project within which the 165MW Khauta SPV Facility will be developed.

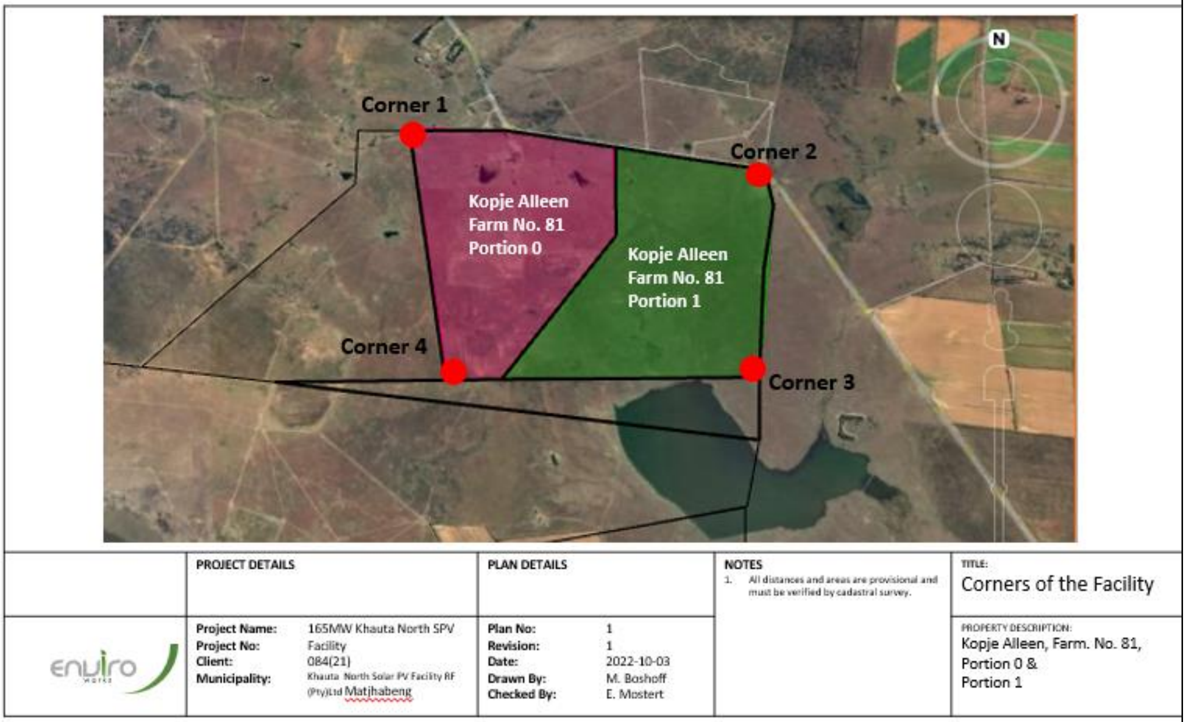
1.3 PROJECT OVERIEW

A larger technically feasible project site, with an extent of ~515.49ha has been identified by the applicant as a technically suitable area for the development of the 165MW Khauta North SPV facility. A development area of 273ha has been identified within the project site by the proponent for the development based on the outcome of the specialist assessments within the Scoping and EIA phases of the process as well as technical considerations. The project site comprises numerous properties as listed in Table 5 below.

Table 5: Detailed description of the 165MW Khauta North SPV Facility project site

Province	Free State		
District Municipality	Lejweleputswa District Municipality		
Local Municipality	Matjhabeng Local Municipality		
Ward Number	Ward 10		
Nearest Town	Riebeeckstad		
Affected Properties	Farm 81 - Kopje Alleen		Portion 0 (254.31ha) Portion 1 (261.18ha)
Current zoning	Agriculture		
Site Coordinates	27°52'59.55"S; and 26°52'12.76"E.		
Corner Coordinates of the project site		**Latitude**	**Longitude**
	Corner 1	27°52'13.99"S	26°51'40.531."E
	Corner 2	27°52'26.57"S	26°53'15.13."E
	Corner 3	27°53'25.79"S	26°53'2.67."E

	Corner 4	27°53'25.95"S	26°51'43.08."E



During the Scoping Phase and Environmental Impact Assessment Phase, the full extent and environmental sensitivities of the project site was considered by the specialist assessments. The aim was to determine the suitability of the site from an environmental and social perspective and identifying sensitive areas that should be avoided in the development planning. Based on the specialist assessments undertaken during the Scoping Phase and Environmental Impact Assessment Phase, areas of environmental sensitivity were identified within the project site.

In order to avoid these areas of potential sensitivity and to ensure that potential detrimental environmental impacts are minimised as far as possible, the developer identified a suitable development footprint of around 273ha in extent within the project site where the PV modules and other associated infrastructure for the 165MW Kuta North SPV Facility is planned to be constructed. Since the project site assessed during the Scoping Phase is larger than the area required for the development footprint, it provides the opportunity for the optimal placement of the infrastructure through ensuring avoidance of major identified environmental sensitivities.

1.4 DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER AND EXPERTISE TO CONDUCT THE S&EIA PROCESS

In accordance with Regulation 12 of the 2014 EIA Regulations (GNR 326), as amended, the applicant has appointed Enviroworks as the independent Environmental Consultant responsible for managing the Application for EA and supporting S & EIA process; inclusive of comprehensive, independent specialist studies. The application for EA and S & EIA process will be managed in accordance with the requirements of NEMA, the 2014 EIA Regulations (GNR 326), as amended, and all other relevant applicable legislation.

Neither Enviroworks, the Environmental Assessment Practitioners (EAPs) employed by the company nor any of the specialists responsible for undertaking studies for this project are subsidiaries or are affiliated to the applicant. Furthermore, Enviroworks does not have any interests in secondary developments that may arise out of the authorisation of the proposed facility.

Enviroworks has been extensively involved in large scale projects varying from Basic Assessments, Environmental Impact Assessments, and Section 24G Rectifications. Enviroworks is committed to providing cutting-edge, innovative, and excellent environmental management solutions and services, backed by a professional, brilliant team of environmental scientists and project managers.

Enviroworks has professional association with the following:

- International Association for Impact Assessment South Africa (IAIAsa);
- South African Council of Natural Scientific Professions (SACNASP);
- South African Green Industries Council (SAGIC AIS);
- Carbon Protocol of South Africa (CPSA);
- IAP2 Southern Africa (IAP2 SA) affiliate to the International Association for Public Participation(IAP2); and,
- Registered with EAPASA.

❖ **Michelle Boshoff**: the principal author of this EIA Report holds a MSc degree from the University of the North West and BSc. Honors degree from the University of the Free State, South Africa. She is a senior environmental assessment practitioner and specialise in environmental impact assessments, public participation, environmental management and environmental compliance. Michelle has over 20 years of professional experience in the environmental management sector where she has performed leading roles in government departments (as Assistant Director in EIA's at the Department of Economic Development, Tourism and Environmental Affairs (KZN DEDTEA) and later as Manager Environment at the Rio Tinto: Richards Bay Minerals operation in Richards Bay and has served on various forums such as the Environmental Policy Committee (EPC) at the Chamber of Mines, the South African Mining & Biodiversity Forum, uThungulu Coastal Management Forum, The Chamber of Industries uMhlathuze, The Tugela Forum and also served as Director of the Richards Bay Clean Air Association (RBCAA) from 2015 till 2018.

Michelle is a registered and active member of the following professional bodies:

- Environmental Assessment Practitioner Association South Africa (EAPASA): 2020/714
- South African Council for Natural Scientists (SACNASP): 119286
- International Association for Impact Assessment Association South Africa (IAIAsa): 5602
- Entomological Society of Southern Africa

❖ **Elana Mostert:** the principal reviewer of this EIA report has completed her MSc at the Stellenbosch University and her BSc Honors at the University of Pretoria. Elana provides technical input into project and is well versed in the environmental management field, specialising in environmental impact assessments, environmental auditing and monitoring., environmental permitting and environmental management plans. She has conducted numerous Basic Assessments for various developments. She has extensive experience in conducting ecological impact assessments and has also conducted ECO and auditing work.

Elana is registered with the following professional bodies:

- Environmental Assessment Practitioner Association South Africa (EAPASA): 2019/1311
- International Association for Impact Assessment Association South Africa (IAIAsa): 5631
- South African Association of Botanists: 649

❖ **Michael Leach:** the principal public participation consultant for this project. He completed his BSc at the Stellenbosch University. He has experience in public participation, stakeholder engagement, awareness creation processes and facilitation of various meetings (focus group, public meetings, workshops, etc.). He is responsible for project management of public participation processes for a wide range of environmental projects across South Africa.

Michael is registered with the following professional bodies:

- Environmental Assessment Practitioner Association South Africa (EAPASA): 2021/3872
- International Association for Impact Assessment Association South Africa (IAIAsa): 6051
- International Association for Public Participation: IAP2SA022

In order to adequately identify and assess potential environmental impacts associated with the proposed 165MW Khauta North SPV Facility, the following specialist sub-consultants have provided input into this EIA Report (Table 6):

Table 6: List of specialists involved in the EIA phase

Specialist	Company	Area of Expertise
Johan Lanz	Johan Lanz Soil Scientist	Agriculture
Rikus Lamprecht	EcoFocus	Aquatic
Mokgatla Molepo	Mora Ecological	Avifauna
Megan Smith	Enviroworks	Botanical/ Biodiversity
Pierre van Jaarsveld	Urban-Econ	Economic
Iain Paton	Quteniqua Geotechnical Services	Geotechnical
Jonathan Kaplan	ACRM	Heritage
Micheal Leach	Enviroworks	Socio Economic
Christoff du Plessis	Enviroworks	VIsual
Roy de Kock	BlueLeaf Environmental	External Reviewer
Bruce d'Hotman	CES Environmental and Social Advisory Services	Stormwater

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

1.5 ASSUMPTIONS AND LIMITATIONS

- All information provided by the applicant, engineering team, specialists and I&APs to the Environmental team was correct and valid at the time that it was provided;
- The information provided by the applicant, engineering team and specialists are accurate and unbiased;
- The need and desirability were based on strategic national, provincial and local plans and policies which reflect the interests of both statutory and public viewpoints;
- The EIA process is a project-level framework and is limited to assessing the environmental impacts associated with the project phases of the activity being applied for within the development footprint only;
- Strategic level decision making is achieved through co-operative governance with sustainable development principles underpinning all decision-making;
- The public will receive a fair and recurring opportunity to participate in the EIA process, through the provision of Public Participation timeframes stipulated in the Regulations;
- It is not always possible to involve all I&APs individually. However, every effort has been made to involve as many interested parties as possible; and,
- The scope of this investigation is limited to assessing the environmental impacts associated with the construction, operation and decommissioning of a Photovoltaic (PV) plant.
- Strategic level investigations undertaken by the applicant prior to the commencement of the EIA process, determined that the development site represents a potentially suitable and technically acceptable location for solar development.
- The proposed project development footprint as provided by the applicant is correct and will not be significantly deviated from.
- The development footprint (the area that will be affected during the operation phase) will include the footprint for the Solar Energy Facility and associated infrastructure (i.e., internal access roads, and grid connection infrastructure).
- Conclusions of the specialist studies undertaken, and this overall impact assessment assume that any potential impacts on the environment associated with the proposed development will be avoided, mitigated, or offset in accordance with the relevant recommendations made.
- This report and its investigations are project specific (i.e. solar), and consequently the environmental team did not evaluate any other power generation alternatives.
- With regards to water uses, the proposed development may require Water Use Authorisation in accordance with the following sections of the National Water Act (NWA) (Act No. 36 of 1998, as amended): Section 21(a) – Taking water from a water resource, Section 21(c) – Impeding or diverting the flow of water in a watercourse, Section 21(i) – Altering the bed, banks, course, or characteristics of a watercourse, and either Section 21(g) – Disposing of waste in manner that may detrimentally impact

a water resource, or Section 21(e) – Engaging in a controlled activity. The Water Use Application will be submitted to the Department of Water and Sanitation (DWS) via the Electronic Water Use Licence Application and Authorisation System (e-WULAAS) for the affected areas within the development area.

- The developer acknowledges that the DEIR does not include an impact assessment associated with water abstraction from the proposed development site or related infrastructure. Should the developer be appointed as a preferred bidder in the REIPPP process, further investigations in terms of water provision will be made and an application for a Water Use Authorisation for the above-mentioned identified water uses will be made by the applicant. The process of applying for a Water Use Licence (WUL) or General Authorisation (GA) registration will only be completed once a positive EA has been received. This is in line with the requirements of the DWS.

1.6 GAPS IN KNOWLEDGE

The EIA process is being undertaken prior to the availing of certain information which would be derived from the project design and feasibility studies. As such, technical aspects included herein derive from a range of sources including pre-feasibility engineering and through personal communication with the design team. Given that the EIA process is one of several investigations being done, milestones and key outputs for each of these may not always be available for interrogation into the EIA process. As such, the DFFE and other commenting and decision-making Authorities are required to generate their decision based on the information available to the study at the time, whilst measures can be adopted to manage any changes as conditions within decisions are made.

Enviroworks is an independent environmental consulting firm and as such, all processes and attributes of the EIA are addressed in a fair and unbiased fashion. It is believed that through the running of a transparent and participatory process, risk associated with assumptions, uncertainties and gaps in knowledge can be, and were, minimised.

1.7 UNCERTAINTIES

Given that an EIA involves prediction, uncertainty forms an integral part of the process. Two types of uncertainty are associated with the EIA process, namely process-related and prediction related. The FAO[13] cites types of uncertainty as discussed by De Jongh in Wathern. These are summarised as follow:

- **Uncertainty of prediction** is critical at the data collection phase as final certainty will only be resolved on implementation of the activity being applied for;
- **Uncertainty of values** depicts the approach assumed during the EIA process, while final certainty will be determined at the time decisions are made. Enhanced communications and widespread co-ordinations can lower uncertainty; and,
- **Uncertainty of related decisions**, relates to the decision-making aspect of the EIA process, which shall be appeased once monitoring of the project phase is undertaken.

[13] Dougherty, T.C. and Hall, A.W., 1995. *Environmental impact assessment of irrigation and drainage projects* (Vol. 53). Food & Agriculture Organisation.

The FAO 1995 further stresses the significance of widespread consultation towards minimising the risk of omitting significant impacts. The use of quantitative impact significance rating formulas can further limit the occurrence and scale of uncertainty.

2 THE EIA PHASE METHODOLOGY

The main aim of an Environmental Impact Assessment (EIA) is to obtain background environmental data, to assess potential impacts associated with a proposed project against the background data, assess the risks, propose mitigation measures so that decision makers can make an informed decision on the environmental effects of the proposed project on people and the environment, and to minimise the adverse effects of a project, within engineering and other constraints (i.e. following the mitigation hierarchy).

The main purpose of the EIA process is to identify issues surrounding the proposed project. Issues were identified through:

- Desktop assessment of the proposed area;
- Physical site inspections of the proposed area;
- Review of available literature;
- Professional judgment;
- Identifying impacts;
- Prediction and evaluation of economic, environmental and social impacts; and,
- A comprehensive Public Participation Process (PPP).

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 165MW Khauta North SPV Facility is a listed activity requiring EA. The application for EA is required to be supported by a full S&EIA process based on the contracted capacity of the facility being 165MW and Activity 1 of Listing Notice 2 (GNR 325) being triggered.

An EIA process refers to the process undertaken in accordance with the requirements of the 2014 EIA Regulations (GNR 326), as amended, which involves the identification and assessment of direct, indirect, and cumulative environmental impacts associated with a proposed project or activity. The EIA process comprises two main phases: i.e., (1) Scoping- and (2) EIA Phase and is illustrated in Figure 6. Public participation forms an important component of the process and is undertaken throughout both phases.

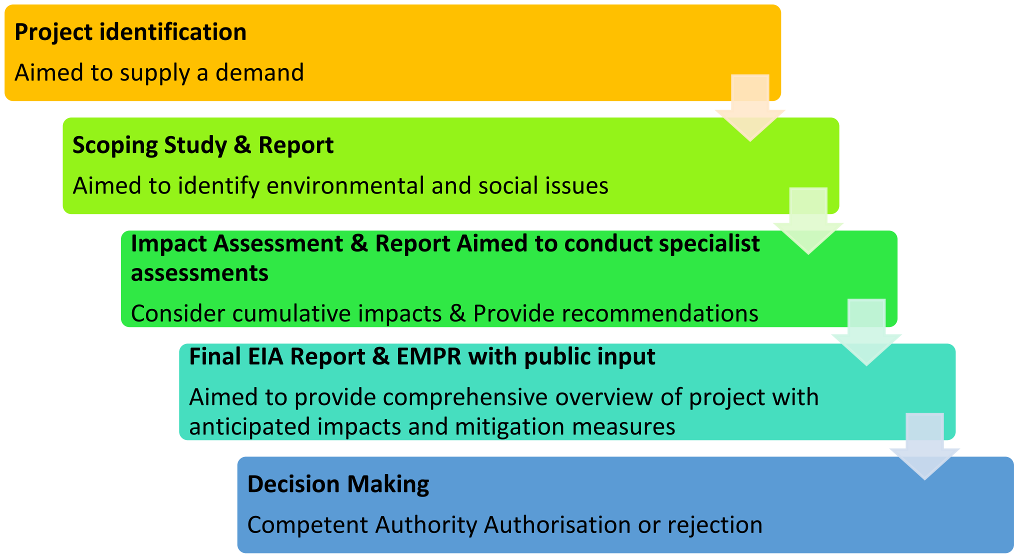


Figure 6: Illustration of the main phases in an Environmental Impact Assessment (EIA) Process

This EIA phase of the S&EIA process aimed at assessing potential issues associated with the proposed project identified through the Scoping Phase. This was achieved through an assessment of the proposed project involving detailed specialist studies, as well as a consultation process with the I&APs, including the decision-making authority, directly impacted landowners/occupiers, adjacent landowners/occupiers, relevant organs of state departments, ward councilors and other key stakeholders.

2.1 COMPETENT AUTHORITY

The Competent Authority in respect of this application will be DFFE, specifically because the listed activities (section 5.1.2) applied for includes an Energy Generation Facility, which is a national competency. The Department of Small Business Development, Tourism and Environmental Affairs (DESTEA) will be notified as a key stakeholder in a commenting capacity on the S&EIR process.

In terms of GNR 779 of 01 July 2016, the DFFE has been determined as the Competent Authority for all projects which relate to the IRP for Electricity 2010 – 2030, and any updates thereto. Through the decision-making process, the DFFE will be supported by DESTEA as the commenting authority.

2.2 APPLICATION FORM

An application for EA was completed by Enviroworks and was submitted to the DFFE on 18 August 2022 along with the Draft Scoping Report (DSR). The Scoping Report was accepted by the DFFE on 11 January 2023.

2.3 CONSULTATION WITH AUTHORITIES AND KEY STAKEHOLDERS

During the Scoping- and the EIA phase a number of I&APs, stakeholders and other regulating authorities were identified and have been requested to comment on the Draft Enviromental Impact Assessment (DEIR) in terms of Regulation 41 of the EIA Regulations of 2014, as amended.

2.4 IDENTIFICATION OF POTENTIAL ENVIRONMENTAL IMPACTS

Potential positive and negative direct and indirect environmental impacts associated with the proposed development were identified within the Scoping- and EIA phases and have been evaluated through desktop studies and site inspections and a site sensitivity verification assessment.

2.5 PUBLIC PARTICIPATION PROCESS (PPP)

The EIA Regulations, 2014 (GNR 326), as amended specify that a PPP must be conducted as an integral part of the EIA process. This chapter outlines the PPP that has been followed in terms of Regulations 39 to 44 during the Scoping- and EIA phase for the proposed 165MW Khauta North SPV Facility.

The aim and purpose of the PPP was to:

- Ensure all relevant key stakeholders and &APs have been identified and invited to engage in the Scoping/EIA phase;
- Raise awareness, educate and increase understanding of stakeholders about the proposed project, the affected environment and the environmental process being undertaken;
- Create a platform for key stakeholders and I&APs to freely communicate any issues or concerns and suggestions for enhancing potential benefits and/or to prevent or mitigate impacts;
- Accurately document all opinions, concerns and queries raised regarding the project;
- Ensure the issues and concerns of the stakeholders and I&APs related to the project are addressed in an adequate manner;
- A variety of mechanisms are provided to I&APs to correspond and submit their comments i.e., fax, post, email, telephone, text message (SMS and WhatsApp);
- An adequate review period is provided for I&APs to comment on the findings of the Scoping- and EIA Reports; and,
- The information presented during the PPP 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.

Regulation 40(2) of the EIA Regulations, 2014, as amended requires that PPP, contemplated in this regulation must provide access to all information that reasonably has or may have the potential to influence any decision with regard to an application unless access to that information is protected by law and must include consultation with—

(a) the competent authority;
(b) every State department that administers a law relating to a matter affecting the environment relevant to an application for an environmental authorisation;
(c) all organs of state which have jurisdiction in respect of the activity to which the application relates; and,
(d) all potential, or, where relevant, registered interested and affected parties.

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

During the **Scoping Phase**:

- Provide an opportunity to submit comments regarding the project;
- Assist in identifying reasonable and feasible alternatives, where required;
- 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;
- Comment on the findings of the Scoping Phase results; and,
- Identify issues of concern and suggestions for enhanced benefits.

During the **EIA Phase**:

- Contribute relevant local information and knowledge to the environmental assessment;
- Verify that issues have been considered in the environmental investigations as far as possible as identified within the Scoping Phase;
- Comment on the findings of the environmental assessments; and,
- Attend a Focus Group Meeting (if applicable) to be conducted for the project.

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.

2.5.1 PUBLIC PARTICIPATION PROCESS DURING EIA

A comprehensive PPP has been conducted in terms of Regulation 982 of NEMA EIA Regulations of 2014, as amended. The PPP was undertaken in a manner that ensures that all I&APs were adequately informed of the proposed development and to ensure that everyone had the opportunity to raise their concerns and/or comments.

2.5.1.1 PROCESS FOLLOWED

Subsequent to the approval of the Scoping Report, an EIA Report must be compiled and made available for I&AP comment for a 30-day period. Comments on the EIA Report has to be incorporated into a Final EIA Report that will be submitted to DFFE for a decision. The decision will be communicated to all registered I&APs within 14 days after Environmental Authorisation has been granted. I&APs will be afforded an opportunity to submit any appeals on the decision.

The proposed project was brought to the attention of the public by the following means:

- Fixing of a notice board at:
  - a place conspicuous to and accessible by the public on the proposed development site; and,
  - another public place.
- Witten notice by the following means:
  - a BID was given to the landowner and adjacent landowners;
  - a BID and soft copy of the report was provided to any organ of state having jurisdiction in respect of any aspect of the proposed development;
  - a soft copy of the report were submitted to DFFE; and,
  - Placing an advert in one local and national newspaper.

2.5.1.2 IDENTIFICATION OF INTERESTED AND AFFECTED PARTIES

I&APs have been identified primarily through responses received from the site notices and adverts placed for the project. Notifications were also sent to key stakeholders informing them of the application process and indicating how they could become involved in the project. The contact details of all identified I&APs were captured in a database. This database will be updated on an on-going basis throughout the EIA process.

2.5.1.3 ISSUES AND RESPONSE REPORT

Issues and concerns raised in the PPP have been compiled into an Issues and Responses Trail. This will be incorporated and submitted with the Final EIR.

2.5.1.4 ADVERTISING

In compliance with the EIA Regulations GN R982 (2014), as amended, notification of the commencement of the EIA process for the project was advertised in English in two newspapers namely, Beeld on 17 August 2022 and Vista on 18 August 2022. I&APs were requested to register their interest in the project and become involved in the EIA process. The primary aim of these advertisements was to ensure that the widest group of I&APs possible is informed and invited to provide input, questions and comments on the project. In addition to advertisements, two A3 size site notices were placed at the most accessible areas by the community notifying them of the EIA process for the project. Details of the public participation can be obtained in the Public Participation Report in Appendix C.

2.5.2 CONSULTATION WITH AUTHORITIES AND ORGANS OF STATE

In order to comply with this requirement, the proposal is to provide all relevant parties with access to digital copies of the Draft Scoping Report (DSR), Final Scoping Report (FSR), Draft Impact Assessment Report (DEIR), Draft Environmental Management Programme (DEMPr) and all specialist studies and plans. Such digital copies have been/will be provided to the Competent Authority, Organs of State and State Departments via digital platforms (email, website and direct download link). Where authorities such as DFFE and SAHRA, have online submission portals, these portals have been utilised for the submission of such reports. Where such authorities, state departments or organs of state do not have access to digital platforms, copies of the documentation will be provided to such parties upon request.

The following authorities and organs of state have been identified and consulted for this project:

- National Department of Forestry, Fisheries and the Environment (DFFE)
- Free State Province Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA)
- Lejweleputswa District Municipality
- Matjhabeng Local Municipality
- Department of Mineral Resources and Energy (DMRE)
- Eskom (Free State – Regional Office)
- National Department of Agriculture, Land Reform and Rural Development (DALRRD)
- National Department of Agriculture (DoA): Deputy Director General (Agricultural Production, Health and Food Safety, Natural Resources and Disaster Management)
- Provincial Roads Authority
- SANRAL
- South African National Heritage Resources Agency (SAHRA)
- Free State Heritage Resources Authority (FSHRA)
- Department of Water and Sanitation (DWS)
- South African Radio Astronomy Observatory (SARAO)
- SKA South Africa (Project Office)
- Speakers Office (Ward Councillor – Ward No. 10).
- Civil Aviation Authority (CAA)
- Air Traffic and Navigation Services (ATNS)

2.5.3 CONSULTATION WITH POTENTIAL I&APS:

All Interested & Affected Parties (I&APs) that were identified or registered as part of the process have been directly informed of the EIA process and review documents via registered post, telephone calls, WhatsApps and emails. They have been provided with access to digital copies of the Scoping Report via the following:

- The digital copy of the documentation that was available to download on the Enviroworks website (enviroworks.co.za) and direct download link;
- Attachments to e-mails; and,
- Hard copies of the documentation were provided via postal or courier services where they did not have access to the digital platforms provided.

2.5.4 GENERAL REQUIREMENTS

Section 39 - 41 of the EIA Regulations 2014, as amended details the PPP that must take place as part of an EIA process. The table (Table 7) below lists these requirements along with the proposed actions to comply with both Section 41 as well as Section 9.1 and Annexure 2 of EIA Regulations.

Table 7: General PPP requirements In terms of Regulation 41 of the EIA Regulations.

PUBLIC PARTICIPATION PROCESS REGULATED REQUIREMENT	PROPOSED ACTIONS
Regulation 39(1) If the proponent is not the owner or person in control of the land on which the activity is to be undertaken, the proponent must, before applying for an environmental authorisation in respect of such activity, obtain the written consent of the landowner or person in control of the land to undertake such activity on that land. (2) Subregulation (1) does not apply in respect of-. (a) linear activities;	A landowner consent for the development has been obtained in terms of this requirement and no deviation or additional actions in terms this regulation is required.
Regulation 41.(2) The person conducting a public participation process must take into account any relevant guidelines applicable to public participation as contemplated in section 24J of the Act and must give notice to all potential interested and affected parties of an application or proposed application which is subjected to public participation by -	
(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;	Site notices have will be placed at the boundary of the property and the main access point to the property. No deviation or additional actions in terms of the Regulations are required in this regard.
(b) giving written notice, in any of the manners provided for in section 47D of 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 or to any alternative site where the activity is to be undertaken;	The landowner has been requested to assist with identification and notification of all tenants and occupiers on the properties. No deviation or additional actions in terms of regulation are required in this regard.
(ii) owners, persons in control of, 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;	Owners of adjacent properties for the non-linear components will be notified of this environmental process and will be provided with access to digital copies of the documentation via the website and direct download link. Landowners will be informed that copies of the documentation can be provided via postal or courier services should they not have access to the digital platforms. Such owners will be requested to inform the occupiers of the land

PUBLIC PARTICIPATION PROCESS REGULATED REQUIREMENT	PROPOSED ACTIONS
	of this environmental process and the process to obtain copies of the relevant reports.
(iii) 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;	The ward councillor will be notified of this environmental process and will be provided with access to the digital copies of the documentation. The ward councillor will be informed that copies of the documentation can be provided via postal or courier services should they not have access to the digital platforms.
iv) the municipality which has jurisdiction in the area;	Relevant departments of the Local Municipality as well as the District Municipality will be provided with access to the digital copies of the documentation. Municipal officials will be informed that copies of the documentation can be provided via postal or courier services should they not have access to the digital platforms.
(v) any organ of state having jurisdiction in respect of any aspect of the activity; and	All organs of state that have jurisdiction in respect of the activity will be notified of this environmental process and will be provided with access to the digital copies of the documentation. Organs of State will be informed that copies of the documentation can be provided via postal or courier services should they not have access to the digital platforms.
(vi) any other party as required by the competent authority;	DFFE and DESTEA will be given an opportunity to comment on the DSR, DEIR and Draft EMPr. DFFE and DESTEA will be given an opportunity to comment on the DSR, DEIR and DEMPr. Should the Departments identify any additional I&APs/parties that need to provide comment, copies of the documentation and opportunity to comment will be provided to such parties.
(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;	An advert calling for registration and notifying potential I&APs of the availability of the DSR were published in the Beeld newspaper on Wednesday, 17 August 2022, and the Vista local newspaper on Thursday, 18 August 2022. There is currently no official Gazette that has been published specifically for the purpose of providing public notice of applications.
(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 which it is or will be undertaken: Provided that this paragraph need	Adverts has been placed in the Beeld a national newspapers, as the potential impacts may extend beyond the borders of the municipal area.

PUBLIC PARTICIPATION PROCESS REGULATED REQUIREMENT	PROPOSED ACTIONS
not be complied with if an advertisement has been placed in an official Gazette referred to in paragraph (c)(ii); and	
(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.	Notifications will include provision for alternative engagement in the event of illiteracy, disability or any other disadvantage. In such instances, Enviroworks will engage with such individuals in such a manner as agreed on with the competent authority.
3) A notice, notice board or advertisement referred to in sub-regulation (2) must - a. give details of the Application or proposed application which is subjected to Public Participation; and b. state - i. whether Basic Assessment or S&EIR procedures are being applied to the Application; ii. the nature and location of the activity to which the application relates; iii. where further information on the Application or proposed application can be obtained; and iv. the manner in which and the person to whom representations in respect of the application or proposed application may be made.	All notice boards will be placed in terms of this requirement and no deviation or additional actions in terms of regulation.
(4) A notice board referred to in sub-regulation (2) must- a. be of a size at least 60cm by 42cm; and, b. display the required information in lettering and in a format as may be determined by the Competent Authority.	All notice boards have complied with this requirement.
(5) Where Public Participation is conducted in terms of this Regulation for an Application or proposed Application, sub-regulation (2)(a), (b), (c) and (d) need not be complied with again during the additional Public Participation Process contemplated in regulations 19(1)(b) or 23(1)(b) or the Public Participation Process contemplated in Regulation 21(2)(d), on condition that -	This will be complied with if final reports are produced during the EIA process.

PUBLIC PARTICIPATION PROCESS REGULATED REQUIREMENT	PROPOSED ACTIONS
a. such process has been preceded by a Public Participation Process which included compliance with sub-regulation (2)(a), (b), (c) and (d); and, b. written notice is given to Registered Interested and Affected Parties regarding where the - i. revised Environmental Impact Assessment or, EMPr or Closure Plan, as contemplated in Regulation 19(1)(b); ii. revised Environmental Impact Report or EMPr as contemplated in Regulation 23(1)(b);or iii. Environmental Impact Report and EMPr as contemplated in Regulation 21(2)(d); may be obtained, the manner in which and the person to whom representations on these reports or plans may be made and the date on which such representations are due.	
6) When complying with this Regulation, the person conducting the Public Participation Process must ensure that - information containing all relevant facts in respect of the Application or proposed Application is made available to potential Interested and Affected Parties; and, a. b. participation by potential or Registered Interested and Affected Parties is facilitated in such a manner that all potential or Registered Interested and Affected Parties are provided with a reasonable opportunity to comment on the Application or proposed Application. (7) Where an Environmental Authorisation is required in terms of these Regulations and an Authorisation, Permit or Licence is required in terms of a specific environmental management Act, the Public Participation Process contemplated in this Chapter may be combined with any Public Participation Processes prescribed in terms of a	An Environmental Authorisation and WULA is required in terms of the NEMA and NWA. All reports will be submitted to relevant authorities and I&APs, that will be informed of such combination of processes that will be subject to public participation.

PUBLIC PARTICIPATION PROCESS REGULATED REQUIREMENT	PROPOSED ACTIONS
specific environmental management Act, on condition that all relevant Authorities agree to such combination of processes.	

2.5.5 SITE NOTICES

The site notices were placed in areas easily noticeable to the public on **17 August 2022**. Site notices were placed at the boundary of the site, main access points to the farm portions via farm roads branching off the R34 and R70, as well as at three (3) public locations. Please refer to the Public Participation Report for a detailed description.

2.5.6 NOTIFICATION OF STAKEHOLDERS AND I&APS

Stakeholders and I&APs were directly informed of the proposed project via the distribution of the BID and I&AP Comment Form and were requested to submit their comments to the Social Facilitation Specialist. Proof of the notification can be obtained in the Public Participation Report.

2.5.7 NOTIFICATION TO COMPETENT AUTHORITIES

The Competent Authority and a number of Organs of State were directly informed on the proposed project via a direct link to the DSR and were requested to submit comments to the Social Facilitation Specialist / Environmental Assessment Practitioner. The same process will be followed for the DEIR.

2.5.8 NOTIFICATION OF AVAILABILITY OF DRAFT SCOPING REPORT

All registered I&APs have been notified of the availability of the DSR for review and comment. This DSR was available for a 30-day review and comment period extending from **17 August 2022 – 16 September 2022.**

2.5.9 AVAILABILITY OF DRAFT SCOPING REPORT

The draft scoping report was available for a 30-day comment period extending from **17 August 2022** – **16 September 2022** and from **10 October 2022 till 10 November 2022**. Comments were received back from the Competent Authority on **28 October 2022** and the DSR was amended. Copies of the report were made available at the following locations:

- Enviroworks Website: www.enviroworks.co.za; and,
- Direct download link or attachment.

All notifications (including the site notice and advert) have made provisions for potential I&APs to contact Enviroworks, should they not have access to the digital platforms provided. In such instances, Enviroworks had arranged other suitable mechanisms for I&APs to be able to access the relevant information.

2.5.10 COMMENTS AND RESPONSES ON DRAFT SCOPING REPORT

All comments and/or issues raised by I&APs on the DSR was considered, responded to and included in the Final Scoping Report (FSR). The FSR was submitted to the Competent Authority on **21 November 2022**.

2.5.11 ACCEPTANCE OF THE SCOPING REPORT

The Final Scoping Report (FSR) and the Plan of Study for Environmental Impact Assessment (PoSEIA) dated November 2022 and received by the Department on 21 November 2022, was approved by the Competent Authority on **11 January 2023**.

2.5.12 RECORDING OF COMMENTS

Comments raised by I&APs to date have been included into a Comments and Responses (C&R) Report, which is included in Appendix C9 of this EIA 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.

Notes of all the telephonic discussions, virtual meetings, and face-to-face meetings conducted during the EIA process are included in Appendix C7 of the Final EIA Report.

2.6 PLAN OF STUDY FOR EIA

In terms of the EIA Regulations 2014, as amended a PoSEIA, was prepared and submitted as part of the Scoping Report.

2.7 DRAFT SCOPING REPORT

All public comments on the DSR have been captured in an IRR, and these were considered and included in the DSR. The DSR has been submitted to the DFFE, I&APs and other authorities. All registered I&APs have been notified of the availability of the DSR in order for them to note how their comments and issues were addressed. The DSR were submitted to the DFFE within 44 calendar days from submitting the Application for EA and DSR for consideration and approval to proceed with the EIA phase of the proposed project.

2.8 DRAFT EIA REPORT

The EIA process is required in order to get approval for the project from a competent authority. The EIA Report aim to assess the significant effects of the proposed project or development proposal on the environment. Furthermore, the report intends to provide sufficient information towards Regulators and I&APs to think about the likely effects on the environment at the earliest possible time and aim to avoid, reduce or offset those effects.

3 LOCATION AND PROPERTY DESCRIPTION

The activity entails the development of a solar PV facility and associated infrastructure (hereafter referred to as the Khauta North SPV Facility) on Portion 0 of the Farm Kopje Alleen No. 81 and Portion 1 of the Farm Kopje Alleen No. 81, situated north-east of Riebeeckstad near Welkom in the Matjhabeng Local Municipality in the Free State Province of South Africa.

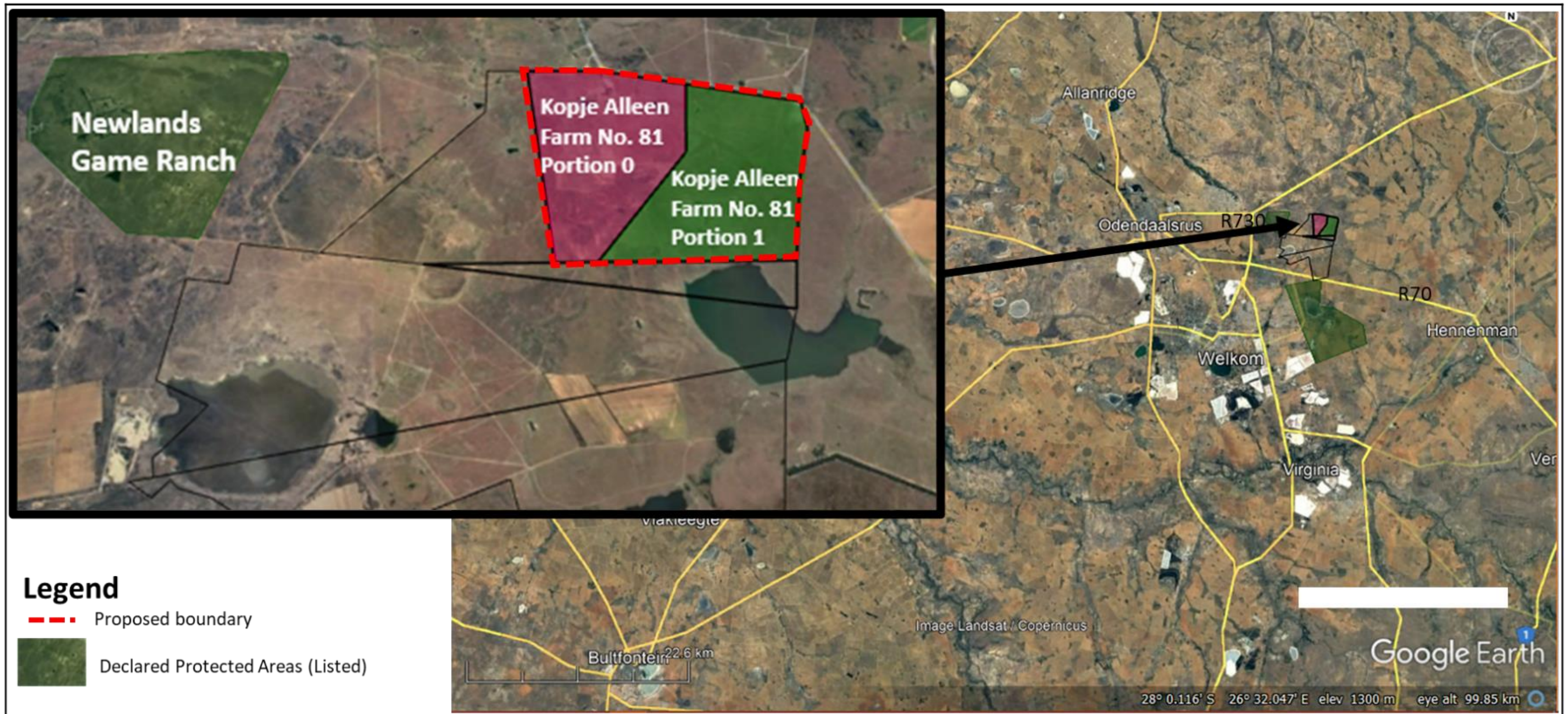
The proposed project entails the generation of up to a maximum export capacity of 165 Megawatt (MW) to be achieved through several arrays of PV panels. The total footprint of the SPV Facility including associated infrastructure will be approximately 273 hectares (ha) – refer to Table 8 for the general site information and **Figure 7** for the location of the proposed development. The property on which the facility is to be constructed will be leased by Khauta North SPV Facility RF (Pty) Ltd from the landowner for the life span of the project (minimum of 20 years).

Table 8: Detailed site information for the Proposed Khauta North SPV Facility.

Description of affected farm portion(s)	Solar PV (SPV) Facility and Associated Infrastructure: • Portion 0 of Farm 81 (Kopje Alleen) - 254.31 ha in extent • Portion 1 of Farm 81 (Kopje Alleen) - 261.18 ha in extent
21 Digit Surveyor General codes	SPV Facility and Associated Infrastructure: Portion 0 of Farm 81 (Kopje Alleen) - F02400000000008100000 Portion 1 of Farm 81 (Kopje Alleen) - F02400000000008100001
Title Deed	• T3378/2013 - Welkom Registration Division District, Free State Province
Photographs of the site	Refer to section 3.1
GPS Coordinates of the centre point of the Solar PV Facility	• 27°52'59.55"S; and, • 26°52'12.76"E.
Coordinate points for the proposed development site	Khauta North (165MW) • 27°53'26.08"S; 26°51'50.79"E • 27°53'24.49"S; 26°51'50.19"E • 27°53'21.88"S; 26°51'42.62"E • 27°52'48.12"S; 26°51'41.54"E • 27°52'46.90"S; 26°51'42.75"E • 27°52'36.88"S; 26°51'43.09"E • 27°52'37.86"S; 26°51'48.26"E • 27°52'38.09"S; 26°52'0.30"E • 27°52'34.27"S; 26°52'4.44"E • 27°52'35.07"S; 26°52'12.06"E • 27°52'37.32"S; 26°52'18.50"E • 27°52'37.33"S; 26°52'29.11"E

	• 27°52'35.11"S; 26°52'49.11"E • 27°52'31.25"S; 26°52'53.94"E • 27°52'30.63"S; 26°53'6.81"E • 27°52'38.80"S; 26°53'5.04"E • 27°52'39.41"S; 26°52'46.37"E • 27°52'45.37"S; 26°52'42.29"E • 27°52'53.95"S; 26°52'40.61"E • 27°52'59.05"S; 26°52'42.65"E • 27°53'3.93"S; 26°52'51.47"E • 27°53'4.52"S; 26°53'1.56"E • 27°53'20.29"S; 26°52'59.04"E • 27°53'17.03"S; 26°52'48.18"E • 27°53'18.17"S; 26°52'38.28"E • 27°53'20.74"S; 26°52'29.34"E • 27°53'25.65"S; 26°52'17.86"E

The site is situated in the Matjhabeng Local Municipality, a Category B municipality in the Lejweleputswa District in the Free State Province, and is located outside the urban area of Riebeeckstad, bordered by agricultural farmland. The project area is situated within Ward 10 of the Matjhabeng Local Municipality.



	PROJECT DETAILS	PLAN DETAILS	NOTES	TITLE:
			1. All distances and areas are provisional and must be verified by cadastral survey.	Location of Proposed Development
enviro works	**Project Name:** Khauta North SPV Facility **Project No:** 084(21) **Client:** Khauta North Solar PV Facility RF (Pty)Ltd **Municipality:** Matjhabeng	**Plan No:** 1 **Revision:** 1 **Date:** 2022-10-03 **Drawn By:** M. Boshoff **Checked By:** E. Mostert		PROPERTY DESCRIPTION: Kopje Alleen, Farm. No. 81, Portion 0 & Portion 1

Figure 7:Location of the proposed Khauta North SPV Facility

3.1 PHOTOGRAPHS OF THE STUDY AREA

Photographs of the centre point location of the proposed Khauta North SPV Facility on Portion 0 of the Farm Kopje Alleen No. 81.

Figure 8: Northern view

Figure 9: North-Eastern view

Figure 10: Eastern view

Figure 11: South eastern view

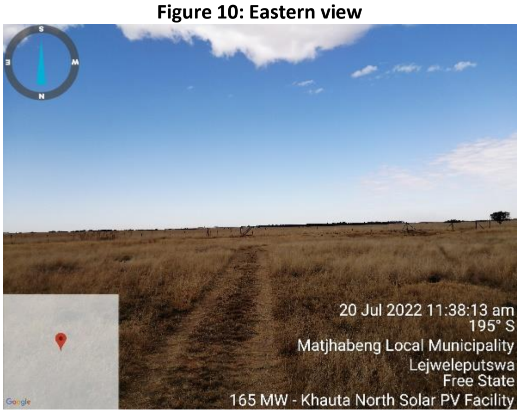


Figure 12: Southern view

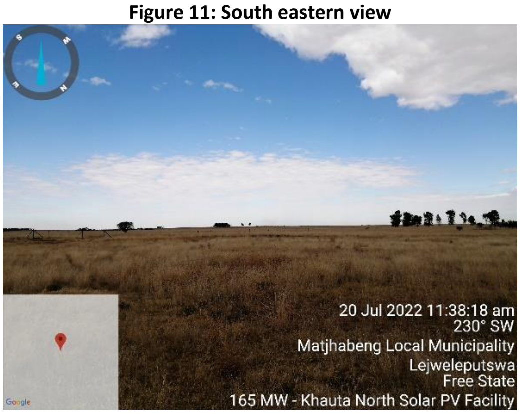


Figure 13: South Western view

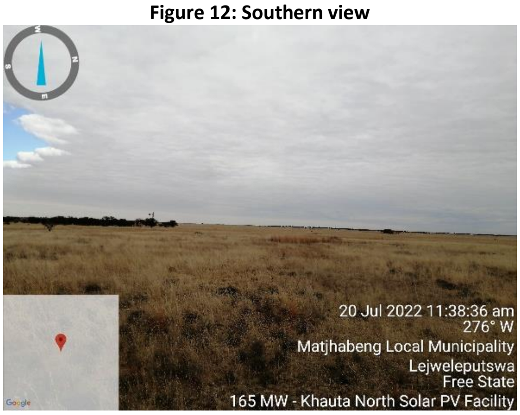


Figure 14: Western view

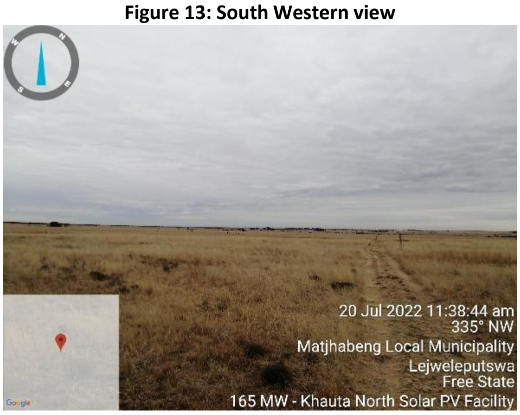


Figure 15: North-Western view

4 ACTIVITY DESCRIPTION

This section of the EIA Report summarises the 165MW Khauta North SPV Facility project proposal and provides a detailed description of all project components and activities throughout the construction, operation, and decommissioning phases of the project. Please refer to the location map as appended to Appendix O1. Detailed plans and layouts have been included in Appendix O2 in the draft EIAR for consideration and recommendations. Table 9 summarise the details of the planned infrastructure and more detail in the later sections of this chapter.

Table 9: Details or dimensions of typical infrastructure required for the 165MW Khauta North SPV Facility

Infrastructure	Footprint and dimensions
Number of panels	To be decided during final design
Panel height	Up to 8m
Technology	Use of fixed-tilt, single-axis tracking, and/or double-axis tracking PV technology. Monofacial or bifacial panels are both considered.
Contracted capacity	Up to 165MW
Area occupied by the solar array	273ha
Area occupied by the on-site facility substation (**IPP Portion**), office and parking	~ 1.6ha (1.1ha Substation + 0.5 ha office and parking)
Capacity of on-site facility substation (**IPP Portion**)	33kV/132kV
Underground cabling between the PV array and the onsite substation	Cabling will be installed underground where feasible at a depth of up to 1.5m to connect the PV panels to the on-site facility substation. Where not technically feasible to place cabling underground, this will be installed above-ground. The cabling will have a capacity of up to 33kV.
Laydown and Operations and Maintenance (O&M) hub	~ 300m x 300m, comprising: • Batching plant of up to 4ha • Construction compound (temporary) of approximately 4 ha. • O&M office of approximately 0.5ha (after construction).
Area occupied by laydown area	~75m x 120m
Access and internal roads	It is anticipated that existing access roads will be utilised to access the project site and development footprint. It is unlikely that current access roads will need to be upgraded as part of the proposed development. Internal roads of up to 8m in width will be required to access the PV facility and the on-site substation.
Grid connection	The grid connection infrastructure will include an approximately 13km 132kV overhead line from the on-site 132/33kV substation to the existing Eskom Leander Main Transmission Substation or a 15km

Infrastructure	Footprint and dimensions
	132kV overhead line from the on-site 132/33kV substation to the existing Eskom Everest Main Transmission Substation
Temporary infrastructure	The temporary infrastructure, including laydown areas, hardstand areas and a concrete batching plant, will be required during the construction phase. It is understood that all temporary infrastructure will be rehabilitated following the completion of the construction phase, where it is not required for the operation phase.

The components are described in more detail below.

4.1 PROJECT COMPONENTS AND INFRASTRUCTURE

The 165MW Khauta North SPV Facility will compose of the following infrastructure:

- PV modules and mounting structures (monofacial or bifacial) with fixed, single or double axis tracking mounting structures;
- Associated stormwater management infrastructure;
- Battery Energy Storage System (BESS);
- Site- and internal access roads (up to 6 m wide);
- Auxiliary buildings (Control room, general office, access control and security building, kitchen area with ablution facilities, small workshop, and a store);
- Ablution facilities and associated infrastructure;
- Temporary laydown area during the construction phase (which will be a permanent laydown area for the BESS during the operational phase);
- On-site 33/132kV substation (facility substation) and associated 33/132kV collector transmission line;
- Grid connection infrastructure including medium-voltage cabling between the project components and the facility substation (underground cabling will be used where practical);
- Perimeter fencing; and,
- Rainwater and/or groundwater storage tanks and associated water transfer infrastructure.

The main components and associated infrastructure are described in more detail in the following sections.

4.1.1 PHOTOVOLTAIC (PV) ARRAY

It is anticipated that the SPV modules will be connected in series and parallel to form an array of modules, thus increasing total available power output to the needed voltage and current for a particular application. A PV module will be composed of interconnected solar cells that are encapsulated between a glass cover and weatherproof backing. The modules will be typically framed in aluminium frames suitable for mounting.

The PV modules will be mounted on high-rise or elevated structures that are either fixed, at a defined angle, or mounted to a single or double axis tracker to optimise electricity yield. The technology alternatives for the PV modules at this stage are under consideration.

The Figure 16 below depicts the typical layout of a SPV Facility.

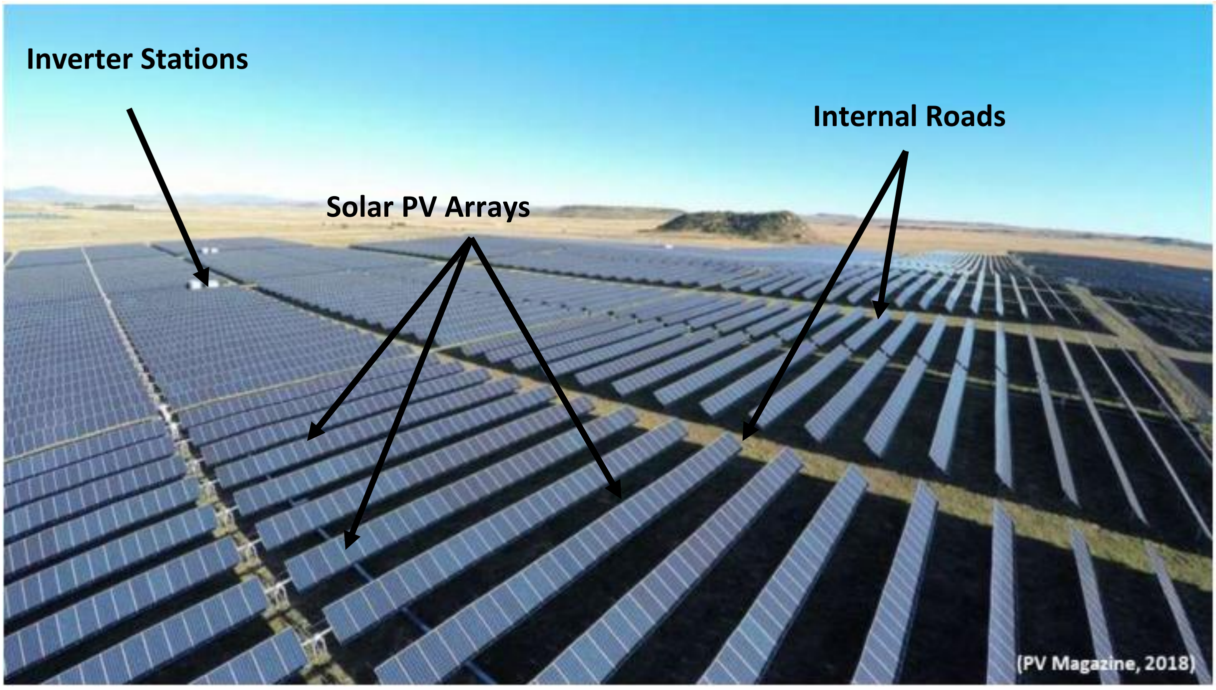


Figure 16: Typical layout of SPV Energy Facility

It is recommended that the solar panels are placed such that runoff can pass between each module, minimizing the concentration of runoff and allowing vegetation growth between and beneath the arrays (BVi, 2021).

4.1.2 MOUNTING STRUCTURES

Various options exist for mounting structure foundations, which include cast/pre-cast concrete foundations, driven/rammed piles, or ground/earth screws/augured piles. The foundation design will be governed by the supporting conditions and the applied loads: i.e., the site specific geotechnical and groundwater conditions, the PV module support structure and the selected PV technology (fixed or tracking). As the project is located in a seismic hazard zone, earthquake loading will be considered when determining the design loads (BVi, 2021). The construction- and operation phase impacts of these options is considered to be similar, however concrete is least preferred due the effort required at a decommissioning phase in order to remove the concrete from the soil, and therefore its impact on the environment.

The 165MW Khauta North SPV Facility will therefore aim to make the most use of either driven/rammed piles, or ground/earth screws mounting systems, and only in certain instances resort to concrete foundations should geotechnical studies necessitate this.

Preferred alternative:

The desktop geotechnical study indicates that piled foundations are likely to be suitable at this site. Additional soil improvement or soil replacement may be required, depending on the extent of the active clay in the soil profile (BVi, 2021).

4.1.3 GRID CONNECTION AND CABLING

The proposed 165MW Khauta North SPV Facility grid connection infrastructure will include underground medium-voltage cabling between the project components and the facility substation. It is envisaged that the electrical cables will be installed using trenches that are excavated adjacent to the internal roads. The depth of the cabling will typically be approximately 1000 mm below the ground but the exact depth should be established at the detailed design stage. The exact placement of the grid connection infrastructure will be available at the detailed design phase. A detailed layout map will be submitted to DFFE before construction commences, indicating the position of this infrastructure.

It is proposed that a 33/132 kV substation is constructed, hereafter referred to as the facility substation, which will include inverter-stations, transformers, switchgear and internal electrical reticulation. It is estimated that the maximum size of the facility substation will not exceed 1.1 hectare (ha). The generated electricity from the Khauta SPV Cluster shall then be transmitted to the Khauta North SPV Facility's collector substation with a 33/132 kV Overhead Power Line linking 80MW Khauta West- and 165 MW Khauta North- to 110MW Khauta South SPV Facility's substation[14]. Thereafter, the generated electricity is to be transmitted with a 132 kV Overhead Power Line[15] to connect to the Eskom grid at a suitable location. The location and installation of the 132 kV line is subject to a separate EIA process.

4.1.4 BATTERY STORAGE ENERGY SYSTEM

The need for a Battery Storage Energy System (BESS) originates from the fact that electricity is only produced by the solar field while the sun is shining, while the peak demand may not necessarily occur during daylight hours. Therefore, the storage of electricity in BESS and supply thereof during peak demand will mean that the facility is more efficient, reliable and electricity supply is more consistent. Currently, battery technology alternatives being considered are either solid state batteries or redox flow batteries.

The proposal for the 165MW Khauta North SPV Facility includes the installation of an area up to 4 ha BESS situated adjacent to the on-site facility substation and auxiliary buildings.

[14] The 50 MW Khauta West SPV Facility and 110 MW Khauta South SPV Facility are concurrently being considered and assessed as part of a separate Scoping and Environmental Impact Reporting (Scoping & EIR) process.
[15] The proposed 132 KV Overhead Powerline to connect to the Eskom grid at a suitable location will be assessed as part of a separate Application for Environmental Authorisation and Basic Assessment process.

4.1.5 AUXILIARY BUILDINGS

The proposed buildings and facilities needed to service the 165MW Khauta North SPV Facility are a control room, a general office, access control and security building, ablution facilities and kitchen area, a small workshop and a store. The total area occupied is approximately 0.5 ha.

4.1.6 EXTERNAL AND INTERNAL ACCESS ROADS

The proposed site is located in a rural area approximately 6km from Riebeeckstad and 20 km from Welkom. The main access road (external road), accessed from the secondary road S173 that branches of the R34 and R70, links to the existing farm road on Portion 0 of Farm 81 (Kopje Alleen), which shall provide access to the 165MW Khauta North SPV Facility and thereafter internal access to Khauta West- and the Khauta e Nyane SPV Facility within the development footprint.

The internal road layout is dependent on the PV module layout, however, it is anticipated that a network of gravel internal access roads (each with a width of up to 6m) will be required to access the PV modules for cleaning and maintenance that may be required during operational phase.

It is proposed that cut-off trenches and side drains along roads be constructed to intercept the surface flow and redirect it away from the project infrastructure. In addition, infiltration trenches and retention areas may be required to attenuate the surface flow and recharge groundwater on the project site (BVi, 2021). The exact placement of the stormwater infrastructure will be available at the detailed design phase. A detailed layout map will be submitted to DFFE before construction commences, indicating the details of this infrastructure.

4.1.7 FENCING OF THE SITE

It is planned that the site will be cordoned off and fenced during both the construction and operational phases. This is likely to entail the establishment of an electrified fence (up to 3m) which will remain in situ for the lifetime of the project (i.e. for the operational phase). For the construction phase, the construction area and construction site camp may also be cordoned off with temporary fencing.

4.1.8 WATER STORAGE AND CONSERVATION

The applicant will be installing water storage tanks up to 700m^3 on the site. It is planned that rainwater will be collected where practical to supplement the storage tanks. Water will predominantly be used for cleaning and ablution facilities.

4.2 EXTERNAL SERVICES

The following external services will be required for the construction and operation of 165MW Khauta North SPV Facility.

4.2.1 SOLID WASTE

It is anticipated that solid waste during the construction phase will mainly be in the form of construction material, excavated substrate and domestic solid waste. All domestic waste will be disposed of in scavenger proof bins and temporarily placed in a central location for removal by the contractor. Any other waste will be removed once construction is complete and disposed of at a registered waste facility. Excess excavation material will either be spoiled offsite at a registered facility or used for landscaping berms within the overall 165MW Khauta North SPV Facility footprint. It is proposed that the waste generated on site would be managed by reducing, reusing and recycling as far as possible. Khauta North SPV Facility RF (Pty) Ltd. will appoint an appropriately registered company that will provide the necessary general- and hazardous waste collection services during the construction- and operational phase.

4.2.2 SANITATION

It is expected that during the construction phase, chemical ablution facilities (chemical toilets and / or conservancy tank) will be utilised. These ablution facilities will be maintained, serviced and emptied by an appointed contractor, who will dispose of the effluent at a licensed facility offsite. Once construction is complete, the chemical ablution facilities will be removed from the study area*.

During the operational phase it is foreseen that a conservancy tank or similar will be installed at the Operations and Maintenance Building which will be regularly emptied by a registered service provider during the operational phase*.

**It is assumed that infrastructure for the bulk transportation of water, stormwater, sewage, effluent, process water, waste water, return water, industrial discharge or slimes will be less than 1000 meters in length; or, will have an internal diameter of less than 0.36 meters and have a peak throughout of 120 litres per second*.

4.2.3 WATER USAGE

The proposed development will require Water Use Authorisation in accordance with the following sections of the National Water Act (NWA) (Act No. 36 of 1998, as amended): Section 21(a) – Taking water from a water resource, Section 21(c) – Impeding or diverting the flow of water in a watercourse, Section 21(i) – Altering the bed, banks, course, or characteristics of a watercourse, and either Section 21(g) – Disposing of waste in manner that may detrimentally impact a water resource, or Section 21(e) – Engaging in a controlled activity. The Water Use Application will be submitted to the Department of Water and Sanitation (DWS) via the Electronic Water Use Licence Application and Authorisation System (e-WULAAS).

An application for a Water Use Authorisation for the above-mentioned identified water uses will be 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.

At this stage it is anticipated that water will be required for the construction of foundations, structures, and internal roads. During operation of the SPV facility, water will also be required for activities such as dust suppression, cleaning, ablutions, and maintenance activities. Concrete production and module cleaning represent the largest water requirements during the construction and operational phases respectively. *

Water required during the construction- and operation phases will be sourced from the following potential sources (in order of priority):

- The Local Municipality (LM) - Specific arrangements will be agreed on with the Matjhabeng Local Municipality in a Service Level Agreement (SLA). Preliminary, water will either be trucked in, or otherwise made available for collection at their Water Treatment Plant via a metered standpipe.
- Investigation into a third-party water supplier which may include a private services company.
- The investigation of drilling a borehole on site, which includes geohydrological testing and -assessment, a groundwater census and a Water Use License Application (WULA) in terms of section 21(a) of the National Water Act, 1998, for abstraction of water.

As noted above, possible sources of this water are to be investigated and the relevant authorities will be approached during the planning stage, once the Applicant has been confirmed as a preferred REIPPPP bidder and the EA.

It is assumed that infrastructure for the bulk transportation of water, stormwater, sewage, effluent, process water, waste water, return water, industrial discharge* ***or* *slimes will be less than 1000 meters in length; or will have an internal diameter of less than 0.36 meters* ***and*** *have a peak throughout of 120 litres per second*.

4.2.3.1 WATER USAGE DURING CONSTRUCTION

The following construction activities were identified for needing water:

- Construction of site roads;
- Construction of foundations;
- Substation construction;
- Establishment of the operation- and maintenance buildings;
- Ablution facilities; and,
- Dust suppression.

The water requirement during construction will be largely dependent on the foundation design and the source of water for concrete production. For the development of the 165 MW SPV Facility, the peak water demand during construction is approximately 169 kilolitres (kl) per day (worst case scenario). It should be noted that this is a theoretical amount obtained for a worst-case scenario (i.e., all the construction activities occur at the same time) with concrete manufactured on site for all foundations. It is estimated that approximately 124 Megaliters (Mℓ) of water will be required during a 24-month construction period. In addition, an above-ground water storage tank with the capacity to store 3-4 days (± 700 kl) of construction water will likely be required (BVi, 2021).

4.2.3.2 WATER USAGE DURING OPERATIONS

Water will be required for the operational phase for activities such as dust suppression (when and where required), general maintenance, and provisions for permanent staff and visitors. Cleaning of the SPV panels represents the largest water requirement during the operational phase. For the 165 MW SPV Facility, it is estimated that approximately 206 Mℓ of water will be required over a 25-year operation and maintenance period and averages a water demand of 8 Mℓ/year.

During the operation of the solar PV plant, the solar PV panels will need to be cleaned routinely as pollen, dust, dirt and bird droppings accumulate and reduce the amount of light reaching the cells. The degree of soiling will be site specific and related to environmental conditions such as dew and humidity, amount and frequency of rainfall as well as the air quality and size of particulate matter in the air. It is anticipated that due to the mining and agricultural activities near the site, the panels will require cleaning multiple times per year. As mentioned, water for cleaning the solar PV modules is the primary contributor to the operational water demand. Panels may be cleaned manually with a squeegee and water or mechanically with a tractor fitted with a cleaning boom. Alternative systems with automated mechanical systems that are integrated into the support structure are also available. The method to be selected will influence the amount of water required, averaging 1 – 3 ℓ/m^2 (BVi, 2021) (**Appendix T**).

De-ionised water is often recommended for cleaning to prevent the build-up of minerals on the panel surface. In order to reduce water use, anti-soiling coatings are available, which reduce the frequency and/or amount of water required to clean the panels. However, the potential water quality / environmental impact should be assessed before use.

4.2.3.3 STORM WATER AND DRAINAGE

The proposed site topography is conducive to the development of Solar PV, with no slopes greater than 5%. There are no major watercourses on or near the site, and the risk of a concentrated flood peak is low. Stormwater drainage will, however, be a concern due to the flat terrain and restricted permeability rates anticipated at this site (BVi, 2021).

The soils in this region are described as sandy clay loam and sandy loam, with a moderate stormwater runoff potential. These soils exhibit high erodibility, together with moderate infiltration rates and slightly restricted permeability. The existing grass cover slows the surface flow rate, prevents erosion and facilitates infiltration. Whereas the post-development condition of the site will have impermeable hardened surfaces, which will increase the surface runoff compared to the pre-development condition.

Erosion, including the loss of topsoil, can cause the support structure and solar panels to shift, reducing energy generation. Therefore, erosion control and regular inspections are required throughout the service life (BVi, 2021).

To avoid soil erosion, it is recommended that the clearing of vegetation be limited. Stormwater management and mitigation measures has been included in the Environmental Management Programme (EMPr) as part of this EIR.

4.2.4 ELECTRICITY

During the construction phase of the development, electricity will either be generated on site through a small solar system or through the use of generators or the existing Eskom supply on the farm will be utilised. This will depend on the Engineering, Procurement, and Construction (EPC) contractor appointed.

4.2.5 HAZARDOUS SUBSTANCES

Hazardous and general waste will be stored separately and temporarily on site. Any waste and excess material will be removed as needed during construction and disposed of at a registered waste facility. “Dangerous goods” that are likely to be associated with the project include fuel stored during the construction phase and/or hazardous chemical substances at the substation during the operational phase.

Dangerous goods required to be stored during construction or operations (e.g. limited quantities of fuel, oil, lubricants etc.) will be stored in compliance with relevant legislation (i.e. stored on covered and bunded areas / bin, and disposed of at a registered hazardous waste site). Hazardous waste will be appropriately stored and disposed of at a registered hazardous waste site.

During the construction phase, use of the following hazardous substances is anticipated:

- Cement powder associated with the batching plant;
- Petrol/diesel for trucks/ cranes/ bulldozers/generators;
- Limited amounts of lubricants and transformer oils;
- Defunct or damaged PV modules; and
- Defunct or damaged battery units.

The proposed BESS will contain hazardous substances/toxic chemicals and/or liquid electrolyte which pose a significant environmental risk if leaked. The design of the BESS has taken into account potential leaks and equipment will be suitably bunded and/or containerised and make provision for secondary containment to accommodate any spill as a result of normal operation and maintenance.

Temporary storage and disposal of hazardous waste will be done in compliance with relevant legislation and the EMPr.

4.3 CONSTRUCTION PHASE

4.3.1 CONSTRUCTION PROGRAMME

Construction will only be able to commence once the project receives an EA from the DFFE, preferred bidder allocation granted by DMRE or equivalent from a private buyer of the power, a generating license issued by NERSA, and a Power Purchase Agreement secured with Eskom or a buyer of the power. In addition to bidding into the REIPPPP, the developer is also considering options such as Private Power Purchase Agreements and Wheeling Agreements with Eskom to deliver the generated power to Private Offtakers. During the construction period it is expected that around 417 people will be employed from the surrounding area. It is not planned to have an on-site labour camp as it is expected that employees and contractors will be accommodated in the nearby towns such as Welkom, Odendaalsrus, Allanridge and Henneman and transported to and from site on a daily basis. Overnight on-site worker presence would be limited to security staff.

As noted previously (Section 4.2.1, 4.2.2 and 4.2.5) waste removal and sanitation will be undertaken by a sub-contractor, where possible. Waste containers, including containers for hazardous waste and tamper proof general waste bins, will be located at easily accessible locations on site when construction activities are undertaken.

During the construction period electricity will likely be generated through the use of generators. Water will be sourced from either boreholes / municipal / dam or a combination of all three (also refer to Section 4.2.3 above). Should water availability at the time of construction be limited, water will be transported to site via water tanks. Water will be used for sanitation and potable water on site as well as construction works.

The construction of the proposed 165MW Khauta North SPV Facility will be undertaken in a phased approach. It is anticipated that the construction duration will be between 12 – 18 months. Once the construction has been completed all the temporary site camps and works within the proposed construction laydown area will be removed from the site the BESS will be placed on the construction laydown area.

4.3.2 SURVEYING AND DEMARCATION OF SITE

- Prior to the commencement of road and foundation construction as well as the PV panel structures' erection, a number of enabling works need to be undertaken. These will include final Engineering design and a geotechnical assessment for the construction works to be undertaken on the site.
- This activity will also include the demarcation of the site and designating the various key construction areas, access roads, site works, site camps and additional areas associated with the construction phase.
- Final Layout Designs must be submitted to the Department for approval prior to commencement of construction.

4.3.3 CONSTRUCTION OF SITE CAMPS AND LAYDOWN AREAS

- A temporary site camp or construction compound and associated parking area will be set up on the site, comprising an area up to 3,9 Ha. The site camp will be used for the storing of materials and equipment such as PV modules, rack or tracker components, motors, gears, electrical devices, conduits for wires, transformers, switchgears, prefabricated structures etc., and will also serve as a gathering point for safety talks and will house office facilities for the staff involved in constructing the project.
- The site, including the parking part of the site will be graded and used as a construction staging/laydown area.
- Establishment of the laydown area will involve the removal of vegetation and the stripping and stockpiling of topsoil. This will be done in a systematic manner to reduce the risk of exposed ground being subjected erosion.
- The laydown area will be decommissioned, and all temporary facilities removed when construction is completed, although portions of the area may be retained to provide vehicle parking for maintenance personnel and equipment storage, including the BESS installation.
- The laydown area provision must be made for the following, but not limited to: safe working area, parking excavation and delivery vehicles.

4.3.4 CONSTRUCTION OF FOUNDATION FOR THE SOLAR PANELS

The excavation will be done manually and the PV array installation vertical support posts will be driven into the ground. Depending on the geological conditions, the applicant considers the use of alternative foundations (e.g., screw pile, helical pile, micropile or drilled post/piles).

4.3.5 ASSEMBLY AREAS

It is an area proposed for a safe and fast assembly of the racks. Necessary materials are laid out within the assembly area in order to streamline the assembly process. Once the rack is preassembled, a rough terrain vehicle will transport the rack to its final position to finish the process (including, but not limited towering connection and gear mounting).

4.3.6 SITE CLEARING

- Owing to the relatively open or expansive nature of the PV plant and hence the construction process, no specific service or haul roads are envisaged.
- The proposed site will be sufficiently cleared to allow access for the excavation equipment and the rough terrain vehicles that will deliver the site assembled PV rack or tracker structures to their positions.
- The proposed development footprint portion of the site will be cleared, grubbed and graded by means of the necessary cuts and fills in order to condition the terrain to the maximum slopes allowed for buildings, roads and racks.
- Given the flat nature of the site there is very little cut and fill envisaged.
- Vegetative ground cover reduces dust which influences the PV panel efficiency. The re-growth of the ground cover or rehabilitation is thus important to the PV plant. It thus makes sense to minimise the disruption of the existing vegetative ground cover, however in general the entire site will be trampled and vegetation rehabilitation measures will need to be implemented post-construction.

4.3.7 CONSTRUCTION OF INTERNAL ROADS

- Sufficient space will be allowed at the access point to ensure that the vehicles do not stack up on the road while being processed through security.
- The road alignment and layout will take into account the safety precautions necessary for any road crossings.
- The access and internal roads shall be constructed as all-weather type road with wide, open side drains forming part of the drainage system.
- The road layout will be designed in order to ensure ease of access to every rack or tracker structure and the horizontal geometry will be designed to enable the turning of trucks.
- During the operational phase access around the site is generally only required for security and routine inspection. Access for cleaning operations or maintenance is very infrequent, thus generally the internal service roads need only be gravel tracks.
- The topsoil removed would be stored in accordance with best practice methods, and later used for site restoration. Soils needed for backfill would be stored temporarily adjacent to the excavations until needed.

Any remaining excavated material would be recycled to a local site needing clean fill material, or stockpiled for future use.

4.3.8 PV PANELS ERECTION AND CONNECTION TO BESS

The construction phase also involves the installation of the solar PV panels and the structural and electrical infrastructure to make the plant operational. The majority of the work will entail the preparation of the soil and improvement of the existing access roads.

For array installation, typically vertical support posts will be driven into the ground. Depending on the results of the geotechnical report, different foundation methods, such as screw pile, helical pile, micro-pile or drilled post/pile will be implemented. The posts will hold the support structures (tables) on which PV arrays would be mounted. The PV modules will be secured to the tables via brackets.

Thereafter trenches will be dug for the underground AC and DC cabling and the foundations of the inverter enclosures and transformers will be prepared. It is expected that while the cables are being laid and combiner boxes are being installed, the PV tables will be erected. This process will also include a wire harness that will be connected to the PV modules and the electrical collection systems. Underground cables and overhead circuits will be connecting the Power Conversion Stations (PCS) to the on-site AC electrical infrastructure and ultimately the project's on-site substation. This process also involves the installation and connection to the BESS facility.

4.3.9 LABOUR AND WORKFORCE

It is anticipated that construction personnel and labour would originate from neighbouring towns such as Riebeeckstad, Welkom and Virginia and will be employed during the various stages of the construction phase. This is aimed at temporary job creation in a manner similar to the goals of the extended public works projects that use labour intensive methods where applicable and practical.

4.3.10 TRAFFIC ON AND OFF SITE

- Access to the site shall be gained via farm roads off the R70, R34 and secondary road S173 onto the existing gravel road turning off into the site. This will be the entry point for all workers, construction equipment and PV components for the duration of the construction phase. The impact of the construction trip generation will mostly be temporary and restricted to the construction phase.
- During construction of the internal site roads and PV foundations, there would be an increase in truck traffic on the road leading to and from the project site. Increased dust is possible, although water trucks will continually dampen the roads and excavation areas in order to control dust.

4.3.11 TRANSPORT OF COMPONENTS AND EQUIPMENT TO AND WITHIN THE SITE

The components for the solar PV facility and onsite substation will be transported via appropriate National and Provincial roads, and the dedicated access/haul road to the site. Where required, flatbed trucks will be utilised to transport big equipment such as bulk PV panels and substation transformer) and may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989) by virtue of the dimensional limitations.

It is expected that 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.

4.3.12 CONSTRUCTION OF ANCILLARY INFRASTRUCTURE

The site offices and maintenance buildings, including workshop areas for maintenance and storage will be required and this will require the clearing of vegetation, levelling, and the excavation of foundations prior to construction.

4.3.13 CONSTRUCTION COMPLETION

It is expected that once all the construction, erection, and commissioning are completed and the project is in the start-up phase, all temporary works will be removed, and any disturbed areas shall be rehabilitated and restored to the original state.

As discussed previously, the grid connection infrastructure will include a on-site 132/33kV substation and a new 132kV overhead line connecting either into the existing Leander Main Transmission Substation, or the existing Everest Main Transmission Substation.

. Photos were borrowed from other solar PV developments and does not represent the activity on the site (**Figure 17**).

Figure 17: Illustration of the construction process in solar farms (construction progress indicated from 1 to 4)

4.4 OPERATIONAL PHASE

The project duration is expected to be 20-30 years. During this period the key activities and employment on the site will relate to security and maintenance of the project. Once the solar energy facility is operational, there shall very minimal human and vehicle activity required on site. Approximately 15 to 30 full-time employment opportunities will be available during the operation of the 165MW Khauta North SPV Facility.

Waste removal and sanitation will be undertaken by a sub-contractor, where possible. Waste containers, including containers for hazardous waste, will be located at easily accessible locations positions on site.

Either borehole / municipal / dam or a combination of all three will be used to provide water. Should water availability at the time of operation be limited, water will be transported to site via water tanks. Water will be used for sanitation and potable water on site as well as cleaning of the panels. Scheduled maintenance work will be carried out several times each year throughout the operational phase.

The internal site roads will be used for periodic maintenance, panel working and safety checks (including panel cleaning).

A large notice board or signage board will be located at the entrance to the site. This signage will provide essential safety information such as emergency contacts and telephone numbers. Safety signs, such as speed limits and safety information, would also be installed throughout the Project Site. These signs will be maintained throughout the operational life of the solar farm.

As an example, but not limited to, the following activities could occur in the operational phase:

- Checking and verifying of the electricity production;
- Maintaining vegetation height and alien invasive species management;
- Maintaining and monitoring a weather station;
- Routine inspection of all BESS equipment and systems;
- Periodic maintenance;
- Cleaning of PV modules; and,
- Security operations.

The traffic generated by the PV plant during operation phase once the plant is generating electricity is projected to be minimal.

4.5 DECOMMISSIONING PHASE OR UPGRADE

After the 20-30 years of operation, the PV plant will either be upgraded if a new license is granted, or the plant will be decommissioned. It is anticipated that the land use will be returned to grazing and agricultural use once the site has been rehabilitated. Upgrading the PV power plant will consist of replacing old PV modules with new modules, increasing the total peak power of the plant (a process called “Repowering”) or increasing the power of the plant by adding new elements such as trackers, PV modules or transformers.

If the plant is to be decommissioned then the site should be returned to as close as possible to its original state. Other than the concrete, all of the components of a PV plant have an intrinsic value either for re-use or recycling.

The decommissioning process will consist of the following steps:

- The PV facility would be disconnected from the Eskom grid;
- The inverters and PV modules would be disconnected and disassembled;
- Concrete foundations (if used) would be removed and the structures would be dismantled;
- Wastewater storage conservancy tank would be responsibly removed and the area would be rehabilitated;
- The underground cables would be unearthed and removed and buildings would be demolished and removed;
- The fencing would be dismantled and removed;
- The roads can be retained should the landowner choose to retain them, alternatively the roads will be removed and the compaction will be reversed;
- Most of the wires, steel and PV modules are recyclable and would be recycled to a reasonable extent. The Silicon and Aluminium in PV modules can be removed and reused in the production of new modules; and,
- Any rubble and non-recyclable materials will be disposed of at a registered landfill facility.

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

- Removal of all structures and rubble;
- Breaking up compaction where required, loosening of the soil and the redistribution of topsoil;
- Restoration of the surface to the original contours and application of hydro seeding/seeding and/or direct planting (as required);
- Removal of all cables;
- Rehabilitation may include top soiling, raking, and/or re-seeding (whichever is appropriate); and,
- A final site walkthrough will be conducted to remove debris and/or waste generated within the site during the decommissioning process.
- Monitoring periodically to ensure rehabilitation measures successful and established.

5 LEGISLATIVE AND POLICY FRAMEWORK

Environmental decision making with regards to solar PV plants is based on numerous policy and legislative documents. These documents inform decisions on project level environmental authorisations issued by DFFE as well as comments from local and district authorities. Moreover, it is significant to note that they also inform strategic decision making reflected in the Integrated Development Plans (IDPs) and Spatial Development Frameworks (SDFs). Therefore, to ensure streamlining of environmental authorisations it is imperative for the proposed activity to align with the principles and objectives of key national, provincial and local development policies and legislation.

The legislation that is relevant to this study is briefly outlined below. These environmental requirements are not intended to be definitive or exhaustive but serve to highlight key environmental legislation and responsibilities only.

5.1 STRATEGIC ELECTRICITY PLANNING IN SOUTH AFRICA

By the end of September 2022, the year 2022 had had more load shedding than all previous years combined. Level 6 load shedding was reimposed starting on 7 December 2022 when over 20,000MW of was taken offline due to a high number of power station breakdowns[16]. The South African government-owned national power utility and primary power generator, Eskom, and various parliamentarians attributed these rolling-blackouts to insufficient generation capacity[17]. Hence the need to expand electricity generation capacity in South Africa is based on national policy and informed by on-going strategic planning undertaken by DMRE. The hierarchy of policy and planning documentation that support the development of renewable energy projects such as the 165MW Khauta North SPV Facility is illustrated in **Figure 18**. These policies are discussed in more detail in the following sections, along with the provincial and local policies or plans that have relevance to the development of the proposed project.

The South African energy industry is evolving rapidly, with regular changes to legislation and industry role players with a key focus on supporting renewable energy projects. 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 PV 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 PV project and the related statutory environmental assessment process. Please refer to **Figure 18**.

[16] Information obtained from Wikipedia on 11 December 2022: Web address: https://en.wikipedia.org/wiki/South_African_energy_crisis#:~:text=By%20the%20end%20of%20September,number%20of%20power%20station%20breakdowns.

[17] Information obtained from article on web on 11 December 2022: What is Load Shedding Archived 9 April 2008 at the Wayback Machine: Web address: https://web.archive.org/web/20080409233818/http://www.eskom.co.za/live/content.php?Item_ID=5608

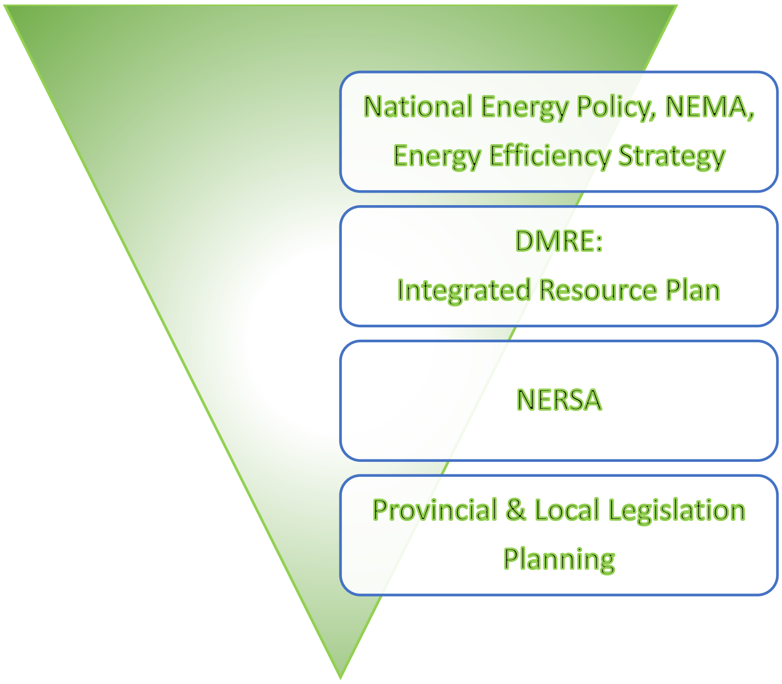


Figure 18: Regulatory Hierarchy of Electricity and Planning Documents

At a National Level the key regulatory agencies include the following key role players as noted in **Figure 19**:

Department of Mineral Resources and Energy (DMRE)	• DMRE is responsible for policy relating to all energy forms and for compiling and approving the Integrated Resource Plan (IRP) for electricity. Furthermore, the Department 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 (Act No. 28 of 2002) (MPRDA) in terms of Section 53 of the Act. 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 project site and development 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)	• DFFE is responsible for environmental policy and is the controlling authority in terms of NEMA and the EIA Regulations, 2014 (GN R326) as amended. DFFE is the Competent Authority for this project (as per GN R779 of 01 July 2016), and is charged with granting the EA for the project under consideration.
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 road maintenance of all national road routes.
Department of Water and Sanitation (DWS)	• DWS responsible for effective and efficient water resource management to ensure sustainable economic and social development. This Department is also responsible for evaluating and issuing licenses pertaining to water use (i.e., Water Use License (WUL) and General Authorisation (GA)).
The Department of Agriculture, Rural Development and Land Reform (DARDLR)	• DARDLR is the custodian of South Africa's agricultural resources and is primarily responsible for the formulation and implementation of policies governing the agriculture sector.

Figure 19: National Level Key Regulatory Agencies

5.2 NATIONAL LEGISLATION

5.2.1 THE CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA (ACT 108 OF 1996)

Administering Authority: *National Government*

The Constitution of the Republic of South Africa (Act 108 of 1996) states that everyone has a right to a non-threatening environment and that reasonable measures are applied to protect the environment. This includes preventing pollution and promoting conservation and environmentally sustainable development, while promoting justifiable social and economic development.

The Constitution and Bill of Rights contains a number of provisions, which are relevant to securing the protection of the environment.

Section 24 states that "*everyone has the right to an environment that is not harmful to their health or well-being; and 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 the use of natural resources while promoting justifiable economic and social development*."

NEMA (discussed below) is the enabling legislation to ensure this primary right is achieved.

5.2.2 NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NEMA) (ACT NO. 107 OF 1998)

Administering Authority: *National Department of Forestry, Fisheries and the Environment (DFFE)*
Free State Province Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA)

NEMA provides for co-operative governance by establishing principles and procedures for decision-makers on matters affecting the environment. An important function of the Act is to serve as an enabling Act for the promulgation of legislation to effectively address integrated environmental management. Some of the principles in the Act are accountability; affordability; cradle to grave management; equity; integration; open information; polluter pays; subsidiary; waste avoidance and minimisation; co-operative governance; sustainable development; and environmental protection and justice.

An EIA is an effective planning and decision-making tool for the project developer as it allows for the identification and management of potential environmental impacts. It provides the opportunity for the developer to be forewarned of potential environmental issues and allows for the resolution of the issues reported on in the Scoping and EIA reports as well as dialogue with interested and affected parties (I&APs).

The EIA process comprises of two (2) phases (i.e., Scoping and EIA) (refer to **Figure 20**) and involves the identification and assessment of potential environmental impacts through the undertaking of independent specialist studies, as well as public participation. The processes followed in these two phases is as follows:

- The **Scoping Phase** includes the identification of potential issues associated with the project through a desktop study (considering existing information), limited field work and consultation with I&APs and key stakeholders. This phase considers the project site in order to identify and delineate any environmental fatal flaws, No-Go and / or sensitive areas. Following a public review period of the Scoping report, this phase culminates in the submission of a final Scoping Report and Plan of Study for the EIA to the Competent Authority for consideration and acceptance. The Scoping Report was accepted, and the Plan of Study for the EIA Phase approved by the DFFE on 11 January 2023.

- The **EIA Phase** involves a detailed assessment of the potentially significant positive and negative impacts (direct, indirect, and cumulative) identified in the Scoping Phase. This phase considers a proposed development footprint within the project site and includes detailed specialist investigations as well as public consultation. Following a public review period of the EIA Report, this phase culminates in the submission of a final EIA Report and an EMPr, including recommendations of practical and achievable mitigation and management measures, to the Competent Authority for final review and decision-making.

The mandate for a Scoping & EIR process lays with the NEMA and the EIA Regulations 2014, as amended (GNR 982), and the three (3) Listing Notices (GNR 983, 984 & 985), as amended promulgated in terms of Section 24 of NEMA.

Further to the above, the EIA Regulations in Government Notice No. R. 982, as amended make reference to a schedule of listed activities, which may not commence prior to authorisation. These contemplated listed activities are identified in Government Notices No. R. 983, No. R. 984 and No. R. 985 of 2014, as amended.

The relationship of the listed activities and the EIA processes is as follows:

- All listed activities identified under Government Notices No. R. 983, and No. R. 985 of (Listing Notice 1 and 3), as amended, require a Basic Assessment Process to be undertaken as part of the application for authorisation; and
- All listed activities identified under Government Notices No. R. 984 (Listing Notice 2), as amended require Scoping and Environmental Impact Reporting processes to be undertaken as part of the application for authorisation.

With respect to the proposed 165MW Khauta North SPV Facility the following table summarises the listed activities (**Table 10**), which the proposed development is likely to trigger, for which this EIA for Environmental Authorisation has been prepared.

Table 10: Listed Activities Likely to be Triggered by the Khauta North SPV Facility.

GNR 983 (as amended)Activity No(s):	**Provide the relevant Basic Assessment Activity(ies) as set out in Listing Notice 1 of the EIA Regulations, 2014, as amended**	**Describe the portion of the proposed project to which the applicable listed activity relates.**
Activity No.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 proposal includes medium voltage (MV) cabling of up to 33/132 Kilovolts (kV) and an onsite substation with a capacity of up to 132 kV.
Activity No.12(ii)(a)(c):	The development of— (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs— (a) within a watercourse; in front of a development setback; or if no development setback exists, (b) within 32 metres of a watercourse, measured from the edge of a watercourse.	The proposed Khauta North SPV Facility could trigger this activity, should access road development and/or expansion and supporting services infrastructure have a cumulative footprint exceeding 100 square meters within a watercourse or within 32m of a watercourse. The use of existing infrastructure and footprints will be preferred. Development will be placed in low-sensitive developable area.
Activity No. 19(i).	The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a (i) watercourse;	Possible infilling and levelling of three small preferential water flow paths/drainage lines present within the central-northern portion of the Khauta North SPV Facility. Possible infilling or deposition of material into or from a watercourse and supporting services infrastructure, however, the use of existing infrastructure and footprints (existing farm roads) will be preferred. Development will be placed in low-sensitive developable area.
Activity No.24 (ii):	The development of a road— (ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;	The construction of a road from the main access road (existing farm road) to Khauta North SPV Facility could be wider than 8m with turning circles, with the inclusion of side drains and gavel embankments and will thus exceed the threshold of this activity.

Activity No. 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 proposed Khauta North SPV Facility development is considered to be commercial use and the total footprint size will exceed 1 hectare (ha), on land that was used for agriculture/game farming. The total development footprint is 273ha.
Activity No. 56 (i)(ii)	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre— (i) where the existing reserve is wider than 13,5 meters; or (ii) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas.	The proposed main access road (existing farm road) to Khauta North SPV Facility may potentially be lengthened by more than 1km in order to reach Khauta North SPV Facility. This will occur outside and urban area. Existing farm roads within the project site may require widening, and access roads will be widened by more than 6 metres.
GNR 984 **(as amended)** Activity No(s):	Provide the relevant **Scoping and EIA Activity(ies**) as set out in **Listing Notice 2** of the EIA Regulations, 2014 as amended	Describe the portion of the proposed project to which the applicable listed activity relates.
Activity No. 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 proposed Khauta North SPV Facility will have a generation capacity of up to 165 megawatts (MW).
Activity No. 15:	The clearance of an area of 20 hectares or more of indigenous vegetation.	The proposed 165MW Khauta North SPV Facility will require the clearance of an area in excess of 20ha and as such exceeds the threshold of this activity. In order to accommodate the BESS and to remove potential fire hazards, approximately 4 ha of natural vegetation will be cleared. The total development footprint is 273ha.
Activity No(s): GNR 985 **(as amended)**	Provide the relevant **Basic Assessment Activity(ies)** as set out in **Listing Notice 3** of the EIA Regulations, 2014 as amended	Describe the portion of the proposed project to which the applicable listed activity relates.
Activity No. 2 (ff).	The development of reservoirs, excluding dams, with a capacity of more than 250 cubic metres. b. Free State Outside urban areas: (ff) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other	Above-ground water storage tank with a capacity to store 3-4 days (± 700 m^3) of construction water will likely be required.

	protected area identified in terms of NEMPAA or from the core area of a biosphere reserve;	
Activity No. 4 (i)(ee)(gg).	The development of a road wider than 4 metres with a reserve less than 13,5 metres. b. Free State (i) Outside urban areas: (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve, excluding disturbed areas;	Access roads will be between 4m to 8m in width and 1km in length. The total length of the internal roads will be approximately 20km.
Activity No. 10(gg).	The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres. b. Free State Outside urban areas: (gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve, excluding disturbed areas.	“Dangerous goods” that are likely to be associated with the project include fuel stored during the construction phase and/or hazardous chemical substances at the substation during the operational phase. Threshold of 80 m^3 expected to be exceeded.
Activity No. 12 (ii)(iv).	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. b. Free State (ii) Within critical biodiversity areas identified in bioregional plans;	This activity may be applicable pending the final design considerations for the layout of project infrastructure and main access road.

	(iv) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland.	
Activity No. 14(i)(ff)(hh).	The development of— infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; b. Free State (i) Outside urban areas: (ff) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; (hh) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland;	A road of approximately 70m x road width of 6-8m will need to be constructed to cross a watercourse.
Activity No. 18(ii)(ee)(gg)(hh)	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre. b. Free State (ii) Outside urban areas: (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve, excluding disturbed areas; (hh) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland;	Existing roads will be used and where required the roads may be widened by more than 4m (not exceeding 8m) to provide for safe access to the site.

***NOTE:** Basic Assessment as well as a full Environmental Impact Assessment are triggered by the proposed development activities and as such, the Environmental Process will follow a Scoping and Environmental Impact Reporting process (**Figure 20**).*

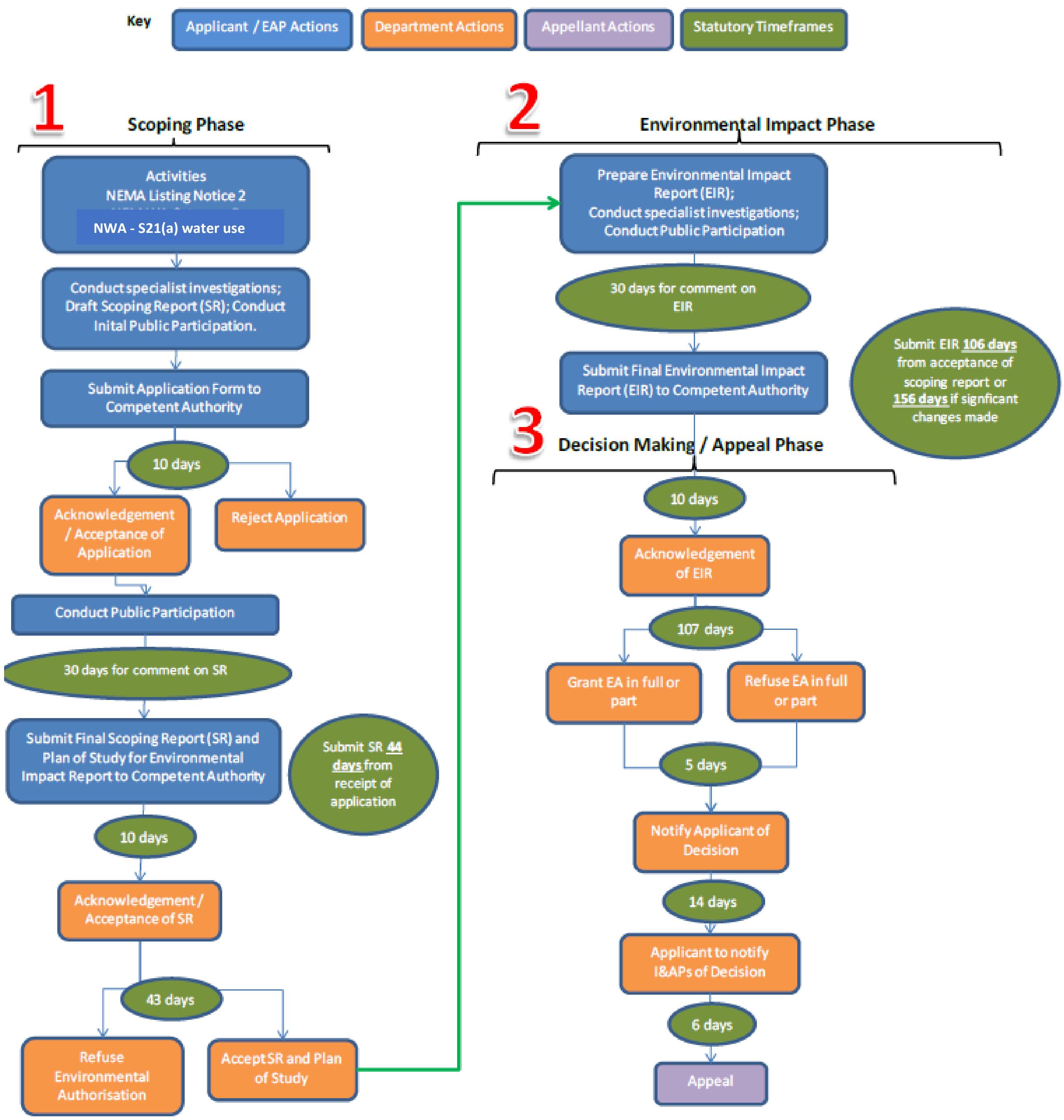


Figure 20: Outline of the Scoping and EIA Process in terms of the EIA Regulations 2014, as amended.

It must be noted that the potential listed activities in **Table 10** are all to be considered at the scoping phase, but certain of the activities listed may no longer be relevant or additional activities may be relevant after the outcome of the specialist studies. In this case, the activities forming part of the application may be amended.

The EIA will be undertaken in accordance with the EIA Regulations 2014, as amended, published in the Government Gazette in terms of Section 24 (5) of NEMA as well as relevant regulations, legislation and guidelines mentioned above.

5.2.3 NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT (NEMBA) (ACT NO. 10 OF 2004)

Administering Authority:	National Department of Forestry, Fisheries and the Environment (DFFE)

The National Environmental Management Biodiversity Act (NEMBA) provides for listing of threatened or protected ecosystems, in one of four categories: **critically endangered** (CR), **endangered** (EN), **vulnerable** (VU) or **protected**. The purpose of listing threatened ecosystems is primarily to reduce the rate of ecosystem and species extinction and to preserve witness sites of exceptionally high conservation value. This includes preventing further degradation and loss of structure, function and composition of threatened ecosystems.

In terms of the EIA Regulations 2014, as amended a Basic Assessment is required for the transformation or removal of indigenous vegetation in a critically endangered or endangered ecosystem if more than 300 square metres are transformed.

The development footprint falls within the Highveld Alluvial Vegetation unit, classified as Least Threatened (SANBI, 2006-2019)[18]. The Endangered vegetation unit (the Vaal-Vet Sandy Grassland unit) is located approximately 1 km east from the project site.

5.2.4 NATIONAL ENVIRONMENTAL MANAGEMENT: PROTECTED AREAS ACT (NEMPAA) (ACT NO. 57 OF 2003)

Administering Authority:	National Department of Forestry, Fisheries and the Environment (DFFE)

The National Environmental Management: Protected Areas (NEMPAA) intends to provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes. It furthermore provides for the establishment of a national register of all national, provincial and local protected areas.

The 165MW Khauta North SPV Facility is located within 10 kilometres from nature reserves designated as protected areas in terms of NEMPAA. Buffers around protected areas are drawn at distances as defined in

[18] National list of ecosystems that are threatened and in need of protection, (G 34809, GN 1002) of 9 December 2011

Listing Notice 3 of the EIA Regulations, 2014 (as amended). The activities likely to be triggered in Listing Notice 3 are applied for and included in **Table 10**– *section 5.2.2.*

5.2.5 NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT (NEMWA) (ACT NO. 59 OF 2008)

Administering Authority:	Hazardous Waste:	DFFE
	General Waste:	DESTEA

The National Environmental Management: Waste Act (NEMWA) came into effect on 1 July 2009. Section 19 of the NEMWA provides for listed waste management activities and states in Section 19(1) that the Minister may publish a list of waste management activities that have or are likely to have a detrimental effect on the environment. Such a list was published in GN 921 of 29 November 2013, as amended identifying those waste management activities that require a Waste Management Licence in terms of the Act. Activities are defined within Category A, Category B and Category C.

Some key definitions from this Act include:

"Disposal" – the burial, deposit, discharge, abandoning, dumping, placing or release of any waste into, or onto, any land.

"General waste" means waste that does not pose an immediate hazard or threat to health or to the environment, and includes –

- domestic waste;
- building and demolition waste;
- business waste: and
- inert waste;

"Hazardous waste" – any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment.

"Storage" – the accumulation of waste in a manner that does not constitute treatment or disposal of that waste.

"Waste" – any substance, whether or not that substance can be reduced, re-used, recycled and recovered –

That is surplus, unwanted, rejected, discarded, abandoned or disposed of;

Which the generator has no further use of for (he purposes of production;

That must be treated or disposed of; or

That is identified as a waste by the Minister by notice in the Gazette, and includes waste generated by the mining, medical or other sector, but –

A by-product is not considered waste; and

Any portion of waste, once re-used, recycled and recovered, ceases to be waste.

No authorisation will be required in terms of activities defined within Category A and Category B.

The National Norms and Standards (activities listed in Category C) must be adhere to with regards to waste management during construction and operation:

National norms and standards for the storage of waste (GN. R 926 of 2013);
Waste Classification and Management Regulations (GN. R 634 of 2013);
National Norms and Standards for the Assessment of Waste for Landfill Disposal (GN. R 635 of 2013); and
National Norms and Standards for the Disposal of Waste to Landfill (GN. R 636 of 2013 of 2013).

5.2.6 NATIONAL FORESTS ACT (ACT NO. 84 OF 1998)

Administering Authority:	National Department of Forestry, Fisheries and the Environment (DFFE)

The National Forests Act provides for the protection of forests as well as specific tree species, quoting directly from the Act: "*no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a licence or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated*".

A terrestrial biodiversity survey has been undertaken the during the EIA phase and is discussed in more detail in section 8 of this report.

5.2.7 FENCING ACT (ACT NO. 31 OF 1963)

Any person erecting a boundary fence may clean any bush along the line of the fence up to 1.5 metres on each side thereof and remove any tree standing in the immediate line of the fence. However, this provision must be read in conjunction with the environmental legal provisions relevant to the protection of flora.

5.2.8 CONSERVATION OF AGRICULTURAL RESOURCES ACT (CARA) (ACT NO. 43 OF 1983)

Administering Authority:	National Department of Agriculture, Land Reform and Rural Development (DALRRD) National Department of Agriculture (DoA)

The mandate of the Conservation and Agricultural Resources Act (CARA) is to conserve "natural agricultural resources" (the soil, the water sources and the vegetation, excluding weeds and invader plants) through production potential of land, by the combating and prevention of erosion and weakening or destruction of the water sources, and by the protection of the vegetation and the combating of weeds and invader plants.

Section 6 of the Act concerns the control measures which the following may be applicable to IPPs (subsections (2) (f), (g) and (o)):

- the regulating of the flow pattern of run-off water;
- the utilization and protection of the vegetation; and,
- the construction, maintenance, alteration or removal of soil conservation works or other structures on land.

Regulation 8 regulating the flow pattern of run-off water states that no land user shall in any manner whatsoever divert any run-off water from a water course on his farm unit to any other water course, except on authority of a written permission by the executive officer. No land user shall effect an obstruction that will disturb the natural flow pattern of run-off water on his farm unit or permit the creation of such obstruction unless the provision for the collection, passing through and flowing away of run-off water through, around or along that obstruction is sufficient to ensure that it will not be a cause for excessive soil loss due to erosion through the action of water or the deterioration of the natural agricultural resources.

The use of agricultural land for energy generation will need to be well motivated to the Department of Agriculture, since according to the Department, good productive agricultural land is in short supply in South Africa. The Department of Agriculture's Guideline Document excludes areas of high agricultural potential from being developed for wind generation energy purposes (and it is presumed that the same will apply for solar energy developments).

An agricultural assessment (as required by the Screening Report) has been undertaken to determine the agricultural potential of the site in support of the following:

- *Application for the change in land use to the Deputy Director General (Agricultural Production, Health and Food Safety, Natural Resources and Disaster Management)*
- *Consent for the long-term lease in terms of the Subdivision of Agricultural Land Act (Act 70 of 1970) (SALA)*

5.2.9 NATIONAL HERITAGE RESOURCES ACT (NHRA) (ACT NO. 25 OF 1999)

Administering Authority:	South African National Heritage Resources Agency (SAHRA) Free State Heritage Resources Authority (FSHRA)

The protection and management of South Africa's heritage resources are controlled by the National Heritage Resources Act (NHRA). The South African National Heritage Resources Agency (SAHRA) and the provincial heritage resources agency in the Free State Province (FSHRA), is registered as a Stakeholder for this environmental process.

In terms of Section 38 of the NHRA, the Heritage Resources Agency will comment on the detailed Heritage Impact Assessment (HIA) where certain categories of development are proposed. Section 38(8) also makes provision for the assessment of heritage impacts as part of an EIA process.

The NHRA requires relevant authorities to be notified regarding this proposed development, as the following activities are relevant:

- the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
- any development or other activity which will change the character of a site exceeding 5 000 m² in extent;
- the re-zoning of a site exceeding 10 000m² in extent.

Furthermore, in terms of Section 34(1), no person may alter or demolish any structure or part of a structure, which is older than 60 years without a permit issued by the SAHRA, or the responsible resources authority.

Nor may anyone destroy, damage, alter, exhume, or remove from its original position, or otherwise disturb, any grave or burial ground older than 60 years, which is situated outside a formal cemetery administered by a local authority, without a permit issued by the SAHRA, or a provincial heritage authority, in terms of Section 36(3).

In terms of Section 35(4), no person may destroy, damage, excavate, alter or remove from its original position, or collect, any archaeological material or object, without a permit issued by the SAHRA, or the responsible resources authority.

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 proposed development, 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 South African Heritage Resources Agency (SAHRA) Permit Regulations (GNR 668).

An Archaeological Heritage and Paleontological Impact Assessment (as required by the Screening Report) has been undertaken during the EIA phase. These assessment reports will be submitted to SAHRA and FSHRA simultaneously with this draft EIR for input and guidance on further requirements.

5.2.10 NATIONAL WATER ACT (NWA) (ACT NO. 36 OF 1998)

Administering Authority: Department of Water and Sanitation (DWS)

The National Water Act (Act No. 36 of 1998) (NWA) administered by the DWS aims to manage and protect the national water resources to achieve sustainable use of water for the benefit of all water users. 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 (DWS) or the relevant Catchment Management Agency (CMA)). 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 11** below list the water use activities that may be triggered by the proposed development and associated infrastructure.

Table 11: Listed activities triggered by the NWA (Act No. 36 of 1998)

Notice No.	Activity No.	Description of Water Use
NWA (No. 36 of 1998)	Section 21 (a)	*Taking water from a water resource.* **The proposed project may require abstraction of groundwater for use during the construction period and then for cleaning of the panels and domestic use during the operational phase.**
NWA (No. 36 of 1998)	Section 21 (b)	*Storing water.* **The Applicant plans to install an above-ground water storage tank with a capacity to store 3-4 days (± 700 m^3) of construction water.**
NWA (No. 36 of 1998)	Section 21 (c)	*Impeding or diverting the flow of water in a watercourse.* **The site considered for the establishment of the 165MW Khauta North SPV Facility is associated with the presence of freshwater/drainage features. Activities pertaining to the establishment, including roads, of the Solar Energy Facility might encroach on freshwater/drainage features which may lead to an impediment and diversion of the flow in the watercourses. The proposed site is located within 100m of drainage line or river and within 500m of a wetland.**
NWA (No. 36 of 1998)	Section 21 (g)	*Disposing of waste in a manner which may detrimentally impact on a water resource.*

Notice No.	Activity No.	Description of Water Use
		The applicant is considering to install conservancy tanks as the preferred sewerage system on-site during construction and operation of the project.
NWA (No. 36 of 1998)	Section 21 (i)	*Altering the bed, banks, course or characteristics of a watercourse.* **The site considered for the establishment of the 165MW Khauta North SPV Facility is associated with the presence of freshwater/drainage features. Activities (including the construction of roads) pertaining to the establishment of the Solar Energy Facility might encroach on freshwater/drainage features which may lead to the altering of the characteristics of the watercourses. The site is located within 100m of drainage line or river and within 500m of a wetland.**

In the event that the flow of water in the freshwater/drainage features is affected and the bed, banks or course characteristics are altered, then a water use authorisation would be required. This will need to be in accordance with the requirements of the Regulations Regarding the Procedural Requirements for Water Use License Applications and Appeals (GNR 267), or a GA registered in accordance with the requirements of the Revision of General Authorisation. The process of applying for a WUL or GA registration will only be completed once a positive EA has been received and the project selected as Preferred Bidder under the REIPPPP or similar programme. This is in line with the requirements of the Department of Water and Sanitation (DWS).

5.2.11 MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT (MPRDA) (ACT NO. 28 OF 2002)

Administering Authority: Department of Mineral Resources and Energy (DMRE)

This act makes provisions for equitable access to and sustainable development of South Africa's mineral and petroleum resources.

Section 53 (1) stipulates that Subject to subsection (2), any person who intends to use the surface of any land in any way which may be contrary to any object of this Act or which is likely to impede any such object must apply to the Minister for approval in the prescribed manner.

A Section 53 application has been submitted to DMRE for approval of the sterilisation of mineral resources in terms of the proposed change in land-use which will prevent the extraction of mineral resources during the life of the project.

5.2.12 THE HAZARDOUS SUBSTANCES ACT (HSA) (ACT NO. 15 OF 1973)

The Hazardous Substances Act (HSA) was promulgated to provide for the control of substances which may cause injury, ill-health or death. Substances are defined as hazardous if their inherent nature is: toxic, corrosive, irritant; strongly sensitising, flammable and pressure generating (under certain circumstances) which may injure cause ill-health, or death in humans. HSA is administered by the Department of Health in consultation with other departments.

The HSA also provides for matters concerning the division of such substances or products into four groups in relation to the degree of danger, the prohibition and control of the importation, manufacture, sale, use, operation, application and disposal of such substances.

- Group 1 substances include all hazardous substances (as defined above);
- Group 2 substances include mixtures of Group 1 substances;
- Group 3 substances include substances found in certain electronic products (i.e. product with an electronic circuit); and
- Group 4 substances include all radioactive substances.

Noted with regards to the proposed BESS and storage of dangerous goods during the Project Life Cycle.

5.2.13 ASTRONOMY GEOGRAPHIC ADVANTAGE ACT (ACT NO. 21 OF 2007)

Administering Authority:	South African Radio Astronomy Observatory (SARAO) Square Kilometre Array (SKA) South Africa

The purpose of the Act is to preserve the geographic advantage areas that attract investment in astronomy. The entire Northern Cape Province, excluding the Tsantsabane Municipality, has been declared an astronomy advantage area. The Northern Cape optical and radio telescope sites were declared core astronomy advantage areas. The Act allowed for the declaration of the Southern Africa Large Telescope (SALT), Meerkat and Square Kilometre Array (SKA) as astronomy and related scientific endeavours that has to be protected.

The closest SKA station has been identified as Rem-Opt-11, at approximately 262 km from the proposed solar PV facility. Based on the distance to the nearest SKA station, the facility is considered to poses a low risk of detrimental impact on the SKA. The SKA Project Office and SARAO is registered as stakeholders in this environmental process and will be given the opportunity to provide comments and/or input during the Public Participation Process.

5.2.14 NATIONAL ENERGY ACT (ACT NO. 34 OF 2008)

Administering Authority: Department of Mineral Resources and Energy (DMRE)

The National Energy Act, 2008 (Act No. 34 of 2008) was promulgated in 2008. One of the objectives of the Act was to promote diversity of supply of energy and its sources. In this regard, the preamble makes direct reference to renewable resources, including solar and wind.

5.2.15 MUNICIPAL SYSTEMS ACT (MSA) (ACT NO. 32 OF 2000)

Administering Authority: Matjhabeng Local Municipality
Lejweleputswa District Municipality

The Municipal Systems Act (MSA) concerns itself with the internal systems and administration of municipalities. The Act requires that the Constitution and other national level acts (e.g. NEMA) be incorporated into strategic planning at a municipal level. The Competent Authority (CA) responsible for administrating the MSA is dependent on the municipality in which the activity is taking place.

Development at a local level is the primary focus as the act separates the responsibility of a service authority with that of a service provider; sets out the roles of officials and councillors and provides for a range of requirements; including IDPs, performance management and tariff setting.

The Act accordingly regulates municipal service delivery and provides a comprehensive range of service delivery mechanisms through which municipalities may provide municipal services. It explains the process to be applied and the criteria to be considered in reviewing and selecting municipal service delivery mechanisms. Under the Act, every municipal council must adopt a single, inclusive and strategic plan (i.e., IDP) for the development of the municipality which amongst others:

- links, integrates and co-ordinates plans and takes into account proposals for the development of the municipality; and,
- aligns the resources and capacity of the municipality with the implementation of the plan.

At a municipal level, these plans may call for the implementation of renewable energy projects and should be referenced in applications to motivate for relevant environmental authorisations.

IPPs will consult with the various relevant municipal authorities and development plans as applicable to the proposed 165MW Khauta North SPV Facility. The Matjhabeng Local Municipality and Lejweleputswa District Municipality are registered as a key stakeholder in this environmental process and are referenced in the application for environmental authorisation.

5.2.16 NATIONAL INFRASTRUCTURE PLAN

The South African Government adopted a National Infrastructure Plan in 2012. The aim of the plan is to transform the economic landscape while simultaneously creating significant numbers of new jobs and strengthening the delivery of basic services.

As part of the National Infrastructure Plan, Cabinet established the Presidential Infrastructure Coordinating Committee (PICC). The Committee identified and developed 18 strategic integrated projects (SIPS). The SIPs cover social and economic infrastructure across all nine provinces (with an emphasis on lagging regions). The proposed project is aligned to at least three SIP's

The three energy SIPS are SIP 8, 9 and 10 as described below:

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).
- Support bio-fuel production facilities.

SIP 9: Electricity generation to support socio-economic development

- Accelerate the construction of new electricity generation capacity in accordance with the IRP 2010 to meet the needs of the economy and address historical imbalances.
- Monitor implementation of major projects such as new power stations: Medupi, Kusile and Ingula.

SIP 10: Electricity transmission and distribution for all

- Expand the transmission and distribution network to address historical imbalances, provide access to electricity for all and support economic development.
- Align the 10-year transmission plan, the services backlog, the national broadband roll-out and the freight rail line development to leverage off regulatory approvals, supply chain and project development capacity.

5.2.17 WHITE PAPER ON THE ENERGY POLICY OF THE REPUBLIC OF SOUTH AFRICA

Investment in renewable energy initiatives, such as the proposed 165MW Khauta North SPV Facility, is supported by the White Paper on Energy Policy for South Africa (December 1998). In this regard, the document notes:

- "Government policy is based on an understanding that renewables are energy sources in their own right, are not limited to small-scale and remote applications, and have significant medium and long-term commercial potential".
- "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 renewable energy policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and wind and that renewable applications are in fact the least cost energy service in many cases; more so when social and environmental costs are taken into account.

5.2.18 WHITE PAPER ON RENEWABLE ENERGY

The White Paper on Renewable Energy (November 2003) (further referred to as the White Paper) supplements the White Paper on Energy Policy, which recognizes that the medium and long-term potential of renewable energy is significant. This Paper sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa.

The White Paper notes that while South Africa is well endowed with renewable energy resources that have the potential to become sustainable alternatives to fossil fuels, these have thus far remained largely untapped. As signatory to the Kyoto Protocol , Government is determined to make good the country's commitment to reducing greenhouse gas emissions (GHG). To this purpose, Government has committed itself to the development of a framework in which a national renewable energy framework can be established and operate.

Apart from the reduction of greenhouse gas emissions, the promotion of renewable energy sources is aimed at ensuring energy security through the diversification of supply (in this regard, also refer to the objectives of the National Energy Act).

The long-term goal is the establishment of a renewable energy industry producing modern energy carriers that will offer in future years a sustainable, fully non-subsidised alternative to fossil fuels.

5.2.19 INTEGRATED ENERGY PLAN (2016)

The Integrated Energy Plan (IEP) notes that a diversified energy mix with a reduced reliance on a single or a few primary energy sources should be pursued. In terms of renewable energy, wind and solar are identified as the key options.

With reference to the Renewable Energy Independent Power Producer (REIPP) Procurement Programme, the IEP notes:

- The REIPP Procurement Programme should be extended, and new capacity should be allocated through additional bidding windows in order ensure the ongoing deployment of renewable energy technologies.
- Experience and insights gained from the current procurement process should be used to streamline and simplify the process.

The implementation of REIPP projects in subsequent cycles of the programme should be aligned with the spatial priorities of provincial and local government structures in the regions that are selected for implementation, in line with the SDPs. This will ensure that there is long-term, sustainable infrastructure investment in the areas where REIPP projects are located. Such infrastructure includes bulk infrastructure and associated social infrastructure (e.g., education and health systems). This alignment will further assist in supporting the sustainable development objectives of provincial and local government by benefiting local communities.

5.2.20 INTEGRATED RESOURCE PLAN

In terms of renewable energy four bidding rounds have been completed for renewable energy projects under the REIPP Procurement Programme. The most dominant technology in the Integrated Resource Plan (IRP) 2019 is renewable energy from wind and solar PV technologies, with wind being identified as the stronger of the two technologies. There is a consistent annual allocation of 1 600MW for wind technology commencing in the year 2022 up to 2030. The solar PV allocation of 1 000MWs per year is incremental over the period up to 2030, with no allocation in the years 2024 (being the year the Koeberg nuclear extension is expected to be commissioned) and the years 2026 and 2027 (presumably since 2 000MW of gas is expected in the year 2027). The IRP 2019 states that although there are annual build limits, in the long run such limits will be reviewed to take into account demand and supply requirements.

5.2.21 NATIONAL DEVELOPMENT PLAN

The National Development Plan (NDP) contains a plan aimed at eliminating poverty and reducing inequality by 2030 making this one of the guiding objectives of the NDP over the next 20 years. The NDP identifies 9 key challenges and associated remedial plans. Managing the transition towards a low carbon national economy is identified as one of the 9 key national challenges. Expansion and acceleration of commercial renewable energy is identified as a key intervention strategy.

5.2.22 THE NEW GROWTH PATH FRAMEWORK

The aim of the New Economic Growth Path Framework is to enhance growth, employment creation and equity. Central to the New Growth Path is a massive investment in infrastructure as a critical driver of jobs across the economy. In this regard, the framework identifies investments in five key areas namely: energy, transport, communication, water and housing.

The New Growth Path also identifies five other priority areas as part of the programme, through a series of partnerships between the State and the private sector. The Green Economy as one of the five priority areas to create jobs, including expansions in construction and the production of technologies for solar, wind and biofuels. In this regard, clean manufacturing and environmental services are projected to create 300 000 jobs over the next decade.

5.2.23 DFFE SCREENING TOOL AND PROTOCOLS

Administering Authority:	National Department of Forestry, Fisheries and the Environment (DFFE)

The DFFE Screening Tool (**Appendix P**) was generated for the proposed 165MW Khauta North SPV Facility and used to determine various theme sensitivities (**Table 12**), in terms of sections 24(5)(a) and (h) and 44 of the NEMA, within the development footprint. Based on protocols (as stipulated in Government Notices no. 43110 and no. 42946), the level (Low, Medium, High, or Very high) of these sensitivities needs to be confirmed or disputed by a site verification.

Following the site verification, a Compliance Statement or a Full Impact Assessment by a specialist was compiled based on the sensitivity level of each theme. Where the protocols were not followed i.e. a Compliance Statement or Full Impact Assessment was not done, valid and detailed reasons, based on the site verification, was outlined.

In addition to the theme sensitivities, the required specialist studies were also identified by the DFFE Screening Tool. The need for a specialist study is dependent on whether the sensitivity of the respective theme has been confirmed or disputed with a site verification. Where a specialist study has not been conducted as suggested by the DFFE Screening Tool, a motivation to exclude the study has been outlined with reference to the site verification.

The environmental sensitivities as well as the level of study required by the DFFE Screening Tool protocols, are summarised in the **Table 12** *below.*

Table 12: Sensitivity of the Environmental Themes and Studies that has been undertaken in terms of these Sensitivities

ENVIRONMENTAL THEME	SENSITIVITY	MINIMUM REQUIRED INVESTIGATION	DISCUSSION / COMPLIANCE
Agriculture Theme	High	Agricultural Compliance Statement	An Agricultural Compliance Statement has been submitted as part of the EIA process, based on the site verification by the Specialist. Please refer to **Appendix D**.
Animal Species Theme	Low	Terrestrial Animal Species Compliance Statement	A Terrestrial Animal Species Compliance Statement has been submitted as part of the EIA process. Please refer to **Appendix G.**
Aquatic Biodiversity Theme	Low	Aquatic Biodiversity Compliance Statement	An Aquatic Biodiversity Assessment has been submitted as part of the EIA process. Please refer to **Appendix E.**
Archaeological and Cultural Heritage Theme	Low	Archaeological Heritage Impact Assessment	An Archaeological Heritage Impact Assessment has been undertaken as part of the EIA process. Please refer to **Appendix I**.
Avian Theme	Low	Avifaunal Impact Assessment	Although assigned a low sensitivity for SPV developments, an Avifaunal Impact Assessment has been undertaken as part of the EIA phase, due to the surrounding water resources and potential flight collision risks in terms of the proposed 32/44 kV and 33/132kV transmission lines. Please refer to **Appendix F**.
Civil Aviation (Solar PV) Theme	Low	No investigation required.	No significant impacts on the civil aviation installation are expected in low sensitivity areas. It is unlikely for further assessment and mitigation measures to be required.

ENVIRONMENTAL THEME	SENSITIVITY	MINIMUM REQUIRED INVESTIGATION	DISCUSSION / COMPLIANCE
Defence Theme	Low	No investigation required.	No negative impacts on the defence installation are expected in low sensitivity areas. It is unlikely for further assessment and mitigation measures to be required.
Landscape (Solar) Theme	Very High	Specialist assessment	A Visual Impact Assessment has been undertaken as part of the EIA process. Please refer to **Appendix K**.
Palaeontology Theme	High	Specialist assessment	Forms part of the Archaeological Heritage Impact Assessment that have been undertaken as part of the EIA process. Please refer to **Appendix I**.
Plant Species Theme	Low	Terrestrial Plant Species Compliance Statement	A Terrestrial Plant Species Impact Assessment has been undertaken as part of the EIA process. Please refer to **Appendix G.**
RFI Theme	Low	Compliance Statement	Not to be undertaken – The SKA declared area is approximately 262 km southwest of the project site. Considering the distance, the project is unlikely to have any impact on the SKA. The South African SKA Project Office and SARAO have been registered as a key stakeholder on this environmental process and has been given the opportunity to provide comments and input in terms of the Astronomy Geographic Advantage Act and potential impact to SKA.
Terrestrial Biodiversity Theme	Very High	Terrestrial Biodiversity Specialist Assessment	A Terrestrial Biodiversity Specialist Assessment has been undertaken as part of the EIA process. Please refer to **Appendix G.**
Geotechnical Assessment	To be confirmed	Specialist assessment	A Geotechnical Desktop Assessment was undertaken as part of the preliminary engineering study (**referrer to Appendix L**). Detailed investigations will be done at detailed design stage.
Socio-Economic Assessment	Medium	Specialist assessment	A Socio-Economic Assessment has been undertaken as part of the EIA process. Please refer to **Appendix H** and **Appendix J**.

5.3 PROVINCIAL LEGISLATION

This section deals with provincially promulgated or provincially applicable legislation associated with the proposed 165MW Khauta North SPV Facility. The main regulatory agencies in the Free State include the following key role players as indicated in **Figure 21**:

Provincial Government of the Free State - Department of Ecomomic and Small Business Development, Tourism and Environmental Affairs (DESTEA)	• DESTEA is the commenting authority for the EIA process for the project and is responsible for issuing of biodiversity and conservation-related permits.
Free State Department of Public Works & Infrastructure	• This Department provides coordination of planning, design, construction and maintenance of social and economic infrastructure.
Free State Provincial Heritage Resource Authority	• This Department identifies, conserves and manages heritage resources throughout the Free State Province.

Figure 21: Provincial regulatory agencies in the Free State

5.3.1 FREE STATE SPATIAL DEVELOPMENT FRAMEWORK (2014)

The Free State Provincial Spatial Development Framework (PSDF) (2007) is a provincial spatial plan and strategic planning policy which addresses and adheres to all relevant policies and legislation. The PSDF aims to address the key challenges facing the Free State of needing to implement a 'developmental state' while ensuring global obligations to social, economic and environmental sustainability are achieved. The Free State PSDF supplements the Free State Growth Development Strategy (FSGDS). Together they provide a crucial tool for guiding the use of the provinces resources in a way that is ensures the provinces development needs and priorities are met while remaining sustainable.

Agriculture is a key economic driver within the Free Sate and areas of high agricultural potential need to be protected from non-agricultural activities and used appropriately. Where agricultural land is to be used for other activities, such as mining, the activities must result in meaningful benefit. With regards to industrial activities, the PSDF aims to any ensure that any use or the provinces resources results in meaningful and lasting benefits for the people of the province and the environment.

Renewable energy is noted as a key focus in the PDSF, with the goal of renewable energy sources, including solar, comprising 25% of the province's energy generation capacity by 2020.

5.3.2 FREE STATE PROVINCIAL SPATIAL BIODIVERSITY PLAN

The Free State Provincial Spatial Biodiversity Plan (2018) provides a map of the terrestrial Critical Biodiversity Areas only (Please refer to the Terrestrial Specialist Report, **Appendix G**). The inclusion of the aquatic component was limited to the Freshwater Ecosystem Priority Areas (FEPA) catchments (included in the cost layer and for the identification of Ecological Support Areas (ESAs)) and wetland clusters (included in the ESAs only).

In terms of the preliminary layout plan for the solar PV facility, all watercourses surrounding the development footprint, was considered to be ecologically significant and have been delineated and buffers have been assigned as no-go areas. This is especially significant for ESA 1 and 2 areas on the site to preserve the National Freshwater Ecosystem Priority Areas (NFEPA) wetland clusters and to prevent sedimentation (i.e., reduction of water quality) into the wetlands. By retaining these as no-go areas it is anticipated that the functionality of the ESAs will be retained.

In addition to the above-mentioned, the plant species assessment take into consideration any identified species listed and categorised as per the Red Data Species List; Protected Species List of the National Forests Act (Act No. 84 of 1998), Invasive Species List of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004), Alien and Invasive Species Regulations, 2014 as well as the Provincially Protected species of the Free State's Nature Conservation Ordinance (No 8 of 1969).

5.4 LOCAL AUTHORITIES

5.4.1 LEJWELEPUTSWA DISTRICT MUNICIPALITY: INTEGRATED DEVELOPMENT PLAN (IDP) 2017-2022

One of the strategic objectives noted in the Lejweleputswa District Municipality IDP is the reduction of greenhouse emissions in the district, through the development of solar power plants. The solar energy projects at Dealesville and Boshof have been identified as projects to be expanded into a solar energy hub for the southwestern part of the Lejweleputswa district.

The district has seen retrenchments in the mining industry, particularly affecting the mining towns of Virginia, Welkom, Odendaalsrus and Allanridge. Welkom is an economic node within the district and is expected to remain so despite a decline in the gold mining industry of the Welkom area. Welkom serves as a main service centre within the district, providing specialised services including a hospital, institutions, regional government representation, regional banking institutions, specialised commercial and industries. It is anticipated that the solar development will add value to the economic growth in the area directly via electricity supply and indirectly by enabling businesses (who are dependent on electricity) to grow.

5.4.2 MATJHABENG LOCAL MUNICIPALITY: INTEGRATED DEVELOPMENT PLAN FOR THE FINANCIAL YEAR 2017 – 2022.

It is noted that the Matjhabeng area has a well-established bulk electrical network. Eskom serves the mines and townships in the municipal area and thus there is sufficient bulk infrastructure available to serve the whole area. The municipality however faces the challenge of aging electrical infrastructure. Several proposed projects for the upgrading of electrical infrastructure are included in the IDP. It is noted that Matjhabeng Municipality are endeavouring to reduce their carbon footprint and move to towards green economy.

Based on the Matjhabeng Local Municipality SDF (2013), there are no development proposals for the project area. Long-term urban development (proposed roads) is planned to the west of Road R34. At a municipal level, the IPP will need to consult with the various relevant municipal authorities and development plans as applicable to the specific project design and location.

5.5 GUIDELINES, POLICIES AND AUTHORITATIVE REPORTS

5.5.1 EIA GUIDELINE FOR RENEWABLE ENERGY PROJECTS

The Minister of Environmental Affairs published the Environmental Impact Assessment Guideline for Renewable Energy in terms of section 24J of the NEMA on 16 October 2016.

In pursuit of promoting the country's Renewable Energy development imperatives, the Government has been actively encouraging the role of Independent Power Producers (IPPs) to feed into the national grid. Through its REIPPPP, the DoE has been engaging with the sector in order to strengthen the role of IPPs in renewable energy development. Launched during 2011, the IPPs Procurement Programme is designed so as to contribute towards a target of 3 725MW, and towards socio-economic and environmentally sustainable development, as well as to further stimulate the renewable industry in South Africa.

The table below (**Table 13**) indicates the potential impacts associated with the full range of solar energy project development, together with the applicable and relevant legislation. It is stipulated that these are (under normal circumstances) the main impacts, but other impacts maybe relevant depending on project specifics.

Table 13 Potential environmental impacts of solar energy projects

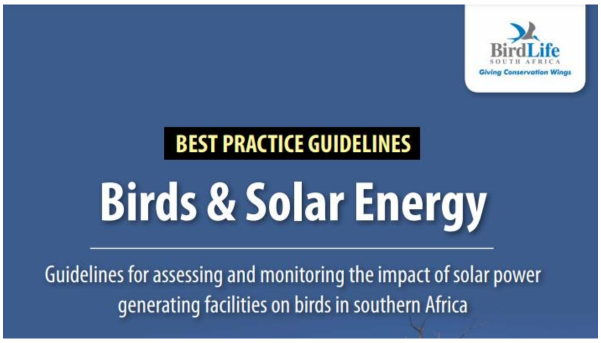
Impact Description	Relevant Legislation
Visual Impact	NEMA
Land Use Transformation (fuel growth and production)	NEMA, NEMPAA, NHRA
Impacts on Cultural Heritage	NEMA, NHRA
Impacts on Biodiversity	NEMA, NEMBA, NEMPAA, NFA
Impacts on Water Resources	NEMA, NEMICMA, NWA, WSA
Hazardous Waste Generation	NEMA, NEMWA, HSA
Electromagnetic Interference	NEMA
Aircraft Interference	NEMA, MSA
Loss of Agricultural Land	SALA
Sterilization of Mineral Resources	MPRDA

Assuming an IPP project triggers the need for a Scoping & EIR process under the EIA Regulations 2014, as amended, included in the assessment process is the preparation of an environmental management programme (EMPr). Project-specific measures designed to mitigate negative impacts and enhance positive impacts should be informed by good industry practice and are to be included in the EMPr.

Potential measures for solar energy projects include but are not limited to:.

- *Conduct pre-disturbance surveys as appropriate to assess the presence of sensitive areas, fauna, flora and sensitive habitats;*
- *Plan visual impact reduction measures such as natural (vegetation and topography) and engineered (berms, fences, and shades, etc.) screens and buffers;*
- *Utilise existing roads and servitudes as much as possible to minimise project footprint;*
- *Site projects to avoid construction too near to pristine natural areas and communities;*
- *Locate developments away from important habitat for faunal species, particularly species which are threatened or have restricted ranges, and are collision-prone or vulnerable to disturbance, displacement and/or habitat loss;*
- *Fence sites as appropriate to ensure safe restricted access;*
- *Ensure dust abatement measures are in place during- and post-construction;*
- *Develop and implement a storm water management plan;*
- *Develop and implement a waste management plan; and,*
- *Re-vegetation with appropriate indigenous species to prevent dust and erosion, as well as establishment of alien species.*

5.5.2 BEST PARACTICE GUIDELINES BIRDS & SOLAR ENERGY (2017)



The Best Practice Guidelines for Birds and Solar Energy[19] (2017) proposed by the Birds and Renewable Energy Specialist Group (BARESG) (convened by BirdLife South Africa and the Endangered Wildlife Trust) contain guidelines for assessing and monitoring the impact of solar generation facilities on birds in Southern Africa. The guidelines recognise the impact that solar energy may have on birds, through for example the alteration of habitat, the displacement of populations from preferred habitat, and collision and burn mortality associated with elements of solar hardware and ancillary infrastructure; and the fact that the nature and implications of these effects are poorly understood.

The guidelines are aimed at Environmental Assessment Practitioners (EAPs), avifaunal specialists, developers and regulators and propose a tiered assessment process, including:

(i) Preliminary avifaunal assessment – an initial assessment of the likely avifauna in the area and possible impacts, preferably informed by a brief site visit and by collation of available data; also including the design of a site-specific survey and monitoring project should this be deemed necessary.

[19] Jenkins AR, Ralston-Paton S & Smit-Robinson HA, 2017 BirdLife South Africa. 2017. Birds & Solar Energy: Guidelines for assessing and monitoring the impact of solar power generating facilities on birds in Southern Africa.

(ii) Data collection – further accumulation and consolidation of the relevant avian data, possibly including the execution of baseline data collection work (as specified by the preliminary assessment), intended to inform the avian impact study.

(iii) Impact assessment – a full assessment of the likely impacts and available mitigation options, based on the results of systematic and quantified monitoring if this was deemed a requisite at preliminary assessment.

(iv) Monitoring – repetition of baseline data collection, plus the collection of mortality data. This helps to develop a complete before and after picture of impacts, and to determine if proposed mitigation measures are implemented and are effective or require further refinement. Monitoring may only be necessary for projects with the potential for significant negative impacts on birds (i.e., large area affected and / or vulnerable species present).

In terms of the guidelines the quantity and quality of baseline data required to inform the assessment process at each site should be set in terms of the size of the site and the predicted impacts of the solar technology in question, the anticipated sensitivity of the local avifauna (for example, the diversity and relative abundance of priority species present, proximity to important flyways, wetlands or other focal sites) and the amount of existing data available for the area.

Data collection could vary from a single, short field visit (Regime 1, for e.g. at a small or medium sized site with low avifaunal sensitivity), to a series of multi-day survey periods, including the collection of various forms of data describing avian abundance, distribution and movement and spread over 12 months (Regime 3, for e.g. at a large developments located in a sensitive habitat, or which otherwise may have significant impacts on avifauna). **Figure 22** & Table **14: Recommended avian assessment** regimes in relation to proposed solar energy technology project size and known impact risks.**Table 14** is taken from the best practise guidelines and provides a summary of the recommended assessment regimes in relation to proposed solar energy technology, project size, and likely risk).

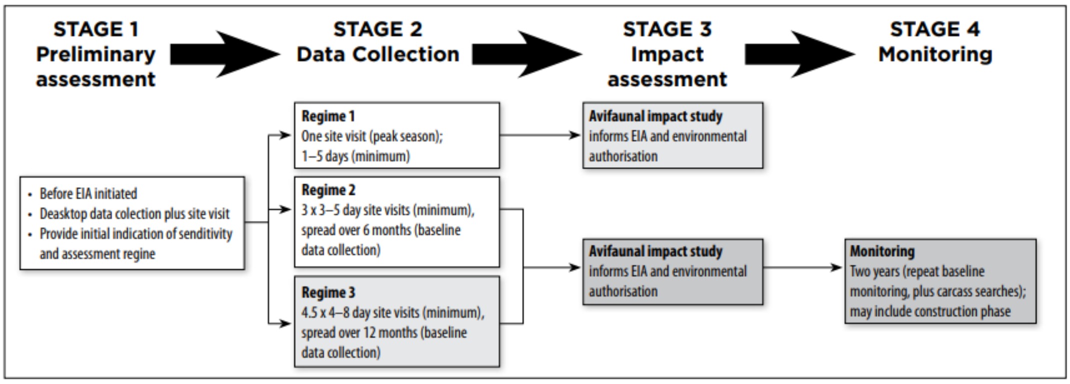


Figure 22: Recommended multi-tier process for assessing impacts of solar energy developments in South Africa.

Table 14: Recommended avian assessment regimes in relation to proposed solar energy technology project size and known impact risks.

Regime 1: One site visit (peak season); minimum 1-5 days.
Regime 2: Pre- and post-construction; minimum 2-3 x 3-5 days over 6 months (including peak season); carcass searches.
Regime 3: Pre- and post-construction; minimum 4-5 x 4-8 days over 12 months, carcass searches.

Type of technology[1]	Size[2]	Avifaunal Sensitivity[3]		
		Low	Medium	High
All except CSP power tower	Small (<30 ha)	Regime 1	Regime 1	Regime 2
	Medium (30-150 ha)	Regime 1	Regime 2	Regime 2
	Large (>150 ha)	Regime 2[4]	Regime 2	Regime 3
CSP power tower	All	Regime 3		

[1] Different technologies may carry different intrinsic levels of risk, which should be taken into account in impact significance ratings

[2] For multi-phased projects, the aggregate footprint of all the phases should be used. At 3ha per MW, Small = < 10 MW, Medium = 10-50 MW, Large = > 50MW.

[3] The avifaunal sensitivity is based on the number of priority species present, or potentially present, the regional, national or global importance of the affected area for these species (both individually and collectively), and the perceived susceptibility of these species (both individually and collectively) to the anticipated impacts of development. For example, an area would be considered to be of high avifaunal sensitivity if one or more of the following is found (or suspected to occur) within the broader impact zone: 1) avifaunal habitat (e.g. a wetlands, nesting or roost sites) of regional or national significance, 2) a population of a priority species that is of regional or national significance, and/or 3) a bird movement corridor that is of regional or national significance, and 4) a protected area and/or Important Bird and Biodiversity Area. An area would be considered to be of medium avifaunal sensitivity if it does not qualify as high avifaunal sensitivity, but one or more of the following is found (or suspected to occur) within the broader impact zone 1) avifaunal habitat (e.g. a wetland, nesting or roost sites) of local significance, 2) a locally significant population of a priority species, 3) a locally significant bird movement corridor. An area would be considered to be of low avifaunal sensitivity if it is does not meet any of the above criteria.

[4] Regime 1 may be applied to some large sites, but only in instances where there is abundant existing data to support the assessment of low sensitivity.

Bird distribution patterns fluctuate widely in response to environmental conditions (e.g., local rainfall patterns, nomadism, migration patterns, seasonality), meaning that a composition noted at a particular moment in time will differ during another time period at the same locality. For this reason, the PV transects are counted 4 times in Spring and then again 4 times in Autumn. The spring survey has already been conducted and the findings have been used to inform the avifauna impact report completed for the EIA phase.

5.5.3 INTERNATIONAL FINANCE CORPORATION (IFC) ENVIRONMENTAL HEALTH AND SAFETY (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 proposed project:

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

The General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines, however no Industry Sector EHS Guidelines have been developed for PV solar power to date. 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

5.5.4 IFC's PROJECT DEVELOPERS'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 IFC's Performance Standards (IFC PS).

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

- Construction phase impacts (i.e., OHS, temporary air emissions from 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).
- Water usage (i.e., the cumulative water use requirements).
- Land matters (i.e., land acquisition procedures and the avoidance or proper mitigation of involuntary land acquisition / resettlement).
- Landscape and visual impacts (i.e., the visibility of the solar panels within the wider landscape and associated impacts on landscape designations, character types and surrounding communities).
- Ecology and natural resources (i.e., habitat loss / fragmentation, impacts on designated areas and disturbance or displacement of protected or vulnerable species).

- Cultural heritage (i.e., impacts on the setting of designated sites or direct impacts on below-ground archaeological deposits as a result of ground disturbance during construction).
- Transport and access (i.e., impacts of transportation of materials and personnel).
- Drainage / flooding (i.e., flood risk associated with the site).
- Consultation and disclosure (i.e., consulting with key authorities, statutory bodies, affected communities and other relevant stakeholders as early as possible).
- Environmental and Social Management Plan (ESMP) (i.e., compile an ESMP to ensure that mitigation measures for relevant impacts are identified and incorporated into project construction procedures and contracts).

5.5.5 SUSTAINABILITY IMPERATIVE

The following guideline documents were considered amongst others:

- DEAT (2005) Guideline 3: General Guide to Environmental Impact assessment Regulations 2005, Integrated Environmental Management Guideline Series, Department of Environmental Affairs and Tourism (DEAT), Pretoria.
- DEAT (2005) Guideline 4: Public Participation, in support of the EIA Regulations 2005,
- Integrated Environmental Management Guideline Series, Department of Environmental Affairs and Tourism (DEAT), Pretoria.
- DEAT (2006) Guideline 5: Assessment of Alternatives and Impacts in support of the Environmental Impact Assessment Regulations 2005, Integrated Environmental Management Guideline Series, Department of Environmental Affairs and Tourism (DEAT), Pretoria.
- Integrated Environmental Management (IEM) Guidelines.

Changes to these guidelines following the amendments to NEMA and the EIA Regulations have been considered.

The general approach to this EIA study has been guided by the principles of Integrated Environmental Management (IEM) and the **EIA Guideline for Renewable Energy Projects (DEA, 2013)** to assist project planning, financing, permitting, and implementation for both developers and regulators, in order to promote efficient, effective, and expedited authorisation processes. Therefore, IEM is a procedure for ensuring that environmental considerations are fully integrated into all stages of the development process. This philosophy aims to achieve a desirable balance between conservation and development (DEAT, 1992). The IEM guidelines intends to encourage a pro-active approach to sourcing, collating and presenting information in a manner that can be interpreted at all levels.

Further to the above guidelines, other best practice guideline documents from other provinces and also international sources have been used in the scoping process and has also been used in the EIA phase. Among these guidelines are those developed by the Western Cape Department of Environmental Affairs and Development Planning (DEA&DP)[20], which include:

Guideline for Determining the Scope of Specialist Involvement in EIA Processes;
Guideline for the Review of Specialist Input into the EIA Process;
Guideline for Involving Biodiversity Specialists in EIA Processes;
Guideline for Involving Heritage Specialists in EIA Processes;
Guideline for Involving Visual and Aesthetic Specialists in EIA Processes;
Guideline for Involving Economists in EIA Processes;
Guideline for Involving Hydro Geologists in EIA Processes;
Guideline for Environmental Management Plans;
Guideline for Involving Social Assessment Specialists in EIA Processes; and,
Guideline on Need and Desirability.

International Guidelines used include:

Guidelines for Landscape and Visual Impact Assessment (The Landscape Institute and the Institute of Environmental Management and Assessment, 2002).

The EAP and the specialists involved with the proposed Solar Energy Facility have and shall ensure these guidelines are used and implemented where applicable and appropriate.

5.6 POLICY ON RENEWABLE ENERGY

The White Paper on Renewable Energy 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*'.[21]

The Government's overall vision for the role of renewable energy in its energy economy is:

- An energy economy in which modern renewable energy increases its share of energy consumed and provides affordable access to energy throughout South Africa, thus contributing to sustainable development and environmental conservation.

The purpose of this White Paper is to set out government's principles, goals and objectives for renewable energy. It furthermore commits government to a number of enabling actions to ensure that renewable energy becomes a significant part of its energy portfolio over the next ten years.

[20] The Western Cape Provincial guidelines were considered in the absence of Free State Province Guidelines.
[21] The Department of Minerals and Energy. White Paper on Renewable Energy. November 2003.

With an increasing demand in energy predicted and growing environmental concerns about fossil fuel-based energy systems, the development of large-scale renewable energy supply schemes is strategically important for increasing the diversity of domestic energy supplies and avoiding energy imports while minimising the environmental impacts.

6 PROJECT NEED AND DESIRABILITY

Appendix 3 of the 2014 EIA Regulations (GNR 326), as amended requires that an EIA Report includes a motivation for the need and desirability of the proposed development, including the need and desirability of the activity in the context of the preferred location. The Department of Environmental Affairs' updated Need and Desirability Guideline Document (2017) were referenced to provide the following estimation of the activity in relation to the broader societal needs. The concept of need and desirability can be explained in terms of its two components, where need refers to *time,* and *desirability* refers to *place* (i.e. is this the right time and is it the right place for locating the type of land-use/activity being proposed?).

The overall need for alternative, so-called 'green energy', is in light of the known environmental burdens associated with the impact of coal power generation through which most of our country's electricity is currently being generated. Associated aspects such as air pollution, water use and carbon tax are discussed in order to further explain the need and desirability for 'green energy' projects in general. This section provides an overview need and desirability of the proposed Khauta North SPV Facility. This is expanded upon in the relevant specialists' (most notably the socio-economic specialist) impact assessments.

6.1 NEED AND DESIRABILITY FROM AN INTERNATIONAL PERSPECTIVE

From an international perspective, the need and desirability of the 165MW Khauta North SPV Facility, can be described through the project's alignment with internationally recognised and adopted agreements, protocols, and conventions. South Africa, as a country, is a 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 global socio-economic challenges such as poverty, hunger, health, education, climate change, gender equality, water, sanitation, energy, urbanisation, environment, and social justice. The SDGs consist of 17 global goals set by the United Nations. The 17 SDGs are characterised by 169 targets, and 304 indicators.

7 AFFORDABLE AND CLEAN ENERGY

Goal 7[22] of the SDGs 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 (**Table 15**):

Table 15: List of Targets under Goal 7 of the Sustainable Development Goals of the United Nations Development Program.

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.

[22] United Nation's Development Programme's (UNDP's) Sustainable Development Goals. Website: https://southafrica.un.org/en/sdgs/7

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.

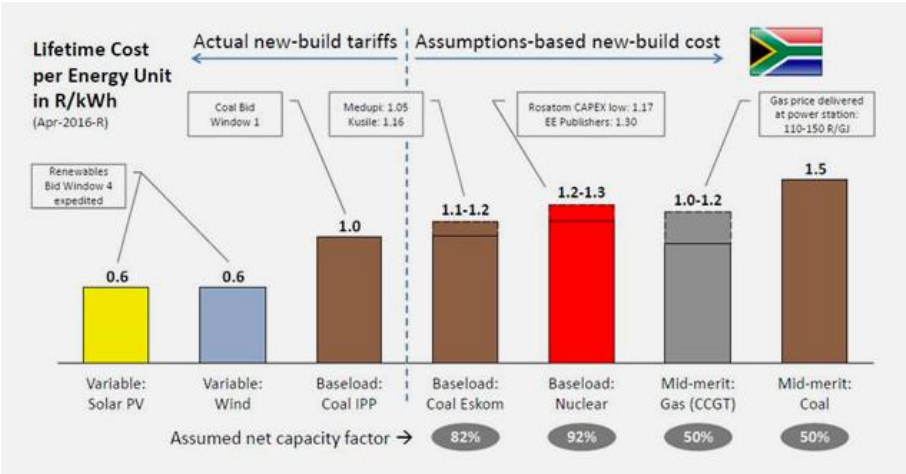


Figure 23: Comparative analysis based on IPP announcements

The proposed 165MW Khauta SPV Facility would contribute positively towards Goal 7 (and specifically 7.2.1) of the SDGs through the following:

- By generating up to 165MW (contracted capacity) of affordable and clean energy.
- Solar power technology is currently regarded as the best available technology and one of the cleanest electricity generation technologies, as it does not result in the release of emissions during its operation.

- A study[23] published by the CSIR on 14 October 2016 ("Cost of new power generators in South Africa Comparative analysis based on recent Independent Power Producer (IPP) announcements", Dr Tobias Bischof-Niemz and Ruan Fourie) which took into consideration the results of the cost prices bid successfully under the Department of Mineral Resources and Energy's Renewable Energy (RE) IPP and Coal Baseload IPP Procurement Programmes, found that solar PV and wind were up to 40% cheaper than new baseload coal (i.e. R0.62/kWh for PV and wind vs R1.03 for coal). Please refer to **Figure 23.**
- 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 for the development of the 165MW Khauta North SPV Facility from an international perspective. The protocol calls for the overall reduction of South Africa's GHG emissions through actively cutting down on using fossil fuels (especially coal-based fuels), or by utilising more renewable resources such as solar, wind or hydroelectricity. The development of the 165MW Khauta North SPV 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 GHGs.

6.2 NEED AND DESIRABILITY FROM A NATIONAL PERSPECTIVE

The current situation in South Africa is that Eskom's fleet of coal-fired power stations is on average over 40 years old, and its performance is deteriorating due to age and maintenance issues. This has resulted in constant power cuts across the country over the recent years. The construction of two of Eskom's biggest power stations, namely, Medupi and Kusile, was delayed and has been set back by numerous design flaws, which has further exacerbated the issue of power outages in South Africa.

In order to address the issue of load shedding, government is focused on two overriding objectives: first, to improve the performance of Eskom's existing power stations; and second, to add as much new generation capacity to the grid as possible, as quickly as possible as noted in the DMRE's IRP for Electricity[24].

In addition to this 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[25]), resulting in a large carbon footprint. Taking into consideration the need to ensure adequate supply of electricity and meet

[23] Bischof-Niemz, T. & Fourie, R. 2016 Cost of new power generators in South Africa Comparative analysis based on recent Independent Power Producer (IPP) announcements. Web Address: https://energyandmines.com/2016/10/renewables-40-cheaper-than-coal-south-africas-csir-study/#post/0
[24] 2019 Integrated Resource Plan (IRP) for Electricity. Web Address: https://www.energy.gov.za/IRP/2019/IRP-2019.pdf
[25] Stats SA, 2016. Web Address: http://www.statssa.gov.za/publications/Report-41-01-02/Report-41-01-022016.pdf

international obligations in terms of addressing climate change, Government has identified the need to diversify the energy mix within the country.

The 165MW Khauta North SPV Facility is proposed in specific response to the above, including to the National Government initiatives and the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). The REIPPPPP was initiated in order to give effect to the requirements of the IRP with regards to renewable energy targets. As a result, the need and desirability of the 165MW Khauta North SPV Facility from a national perspective can largely be linked from the project's alignment with national government key transmission corridors, policies, plans, and programmes which have relevance to energy planning and production (as discussed in detail in Chapter 5). The following key plans have been developed by National Government to consider South Africa's current energy production, projected future demands, and provides the necessary framework within which energy generation projects can be developed:

- Integrated Energy Plan (IEP); and,
- Integrated Resource Plan (IRP).

These plans form the basis of South Africa's energy generation sector and dictate national priorities for energy production. It is our understanding that the above-mentioned energy plans have been extensively researched and are updated on an on-going 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.

The IEP is intended to provide an overview of South Africa's future energy landscape and guide future energy infrastructure investments and policy development. The Plan[26] considers the three pillars of sustainable development, and **Figure 24** list the eight key energy planning objectives.

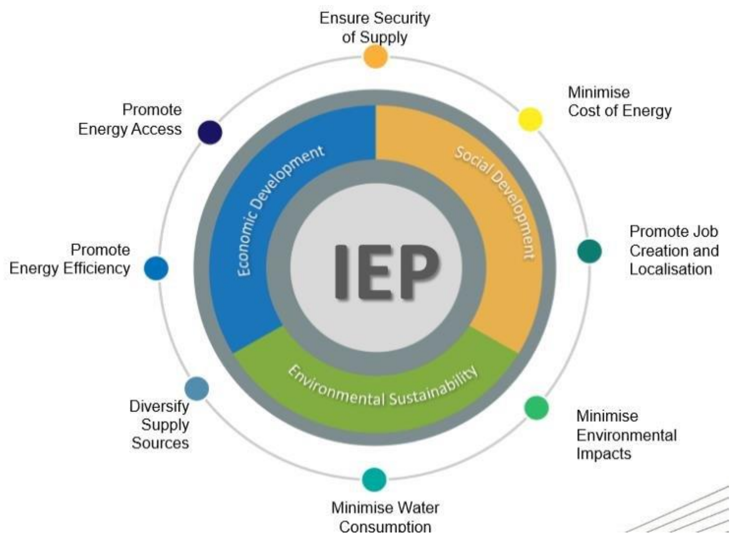


Figure 24: Eight Key Energy Objectives as listed in the IEP, 2016

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 statements regarding solar energy's contribution to the diversified energy mix:

[26] Akom, K. & Shongwe, Thokozani & Joseph, M.K. (2021). South Africa's integrated energy planning framework, 2015-2050. Journal of Energy in Southern Africa. 32. 68-82. 10.17159/2413-3051/2021/v32i1a8517.

- 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.
- Several interventions which could enhance the future solar energy landscape are recommended as follows: − Large scale CSP projects with proven thermal storage technologies and hybridisation / industrial steam application projects should be incentivised in the short to medium term. In the long term, the existing incentives could be extended to promote locally developed CSP technology storage solutions and large-scale solar fuel projects.
- 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.

A number of IPP Procurement Programmes have been initiated to secure electricity generated from a range of resources from the private sector (i.e., from Independent Power Producers, or IPPs). Under these Programmes, IPPs are invited to submit proposals for the finance, construction, operation, and maintenance of electricity generation facilities for the purpose of entering into an Implementation Agreement with the DMRE and a Power Purchase Agreement (PPA) with Eskom as the buyer. Provision has been made for new additional capacities in the IRP 2019 (refer to **Figure 25**).

	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 25: Anticipated additional capacities proposed in the IRP 2019

The IRP2010 contained capacity allocations for electricity generated from renewable technologies, and it is against these allocations that the then Minister of Energy issued Ministerial Determinations for renewable energy, which included the technologies of solar PV, wind, solar CSP, landfill gas, biomass, biogas and hydro.

In terms of solar the following provision has been made for the following new additional capacity by 2030: 6,000MW[27] of solar 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 principles, 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[28] 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 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 165MW Khauta North SPV Facility can be regarded as a mechanism for securing additional power generation capacity for input to the national grid, reducing the reliance for electricity on Eskom.

As the 165MW Khauta North SPV Facility will make use of renewable energy technology and would aim to contribute positively towards reducing South Africa's GHG emissions. It is envisioned that the facility will comply with all applicable legislation and permitting requirements. In addition, by making use of solar technology, the facility would have reduced water requirements when compared with some other generation technologies in alignment with one of the vision 2030 themes of the then-Department of Water and Sanitation's (now the Department of Human Settlements, Water and Sanitation) National Water Resource Strategy 2 (2013) (i.e., transitioning to a low carbon economy through stimulating renewable energy and retrofitting buildings).

[27] IRP 2019 Web address: 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

[28] South African Economic Reconstruction and Recovery Plan 2020. Web Address: https://www.gov.za/sites/default/files/gcis_document/202010/south-african-economic-reconstruction-and-recovery-plan.pdf

6.3 FEASIBILITY CONSIDERATION

The commercial feasibility for the proposed 165 MW Khauta North SPV Facility to be built on private land near Welkom, has been informed by its contextual location, and economic, social and environmental impacts and influence. The project has gathered sufficient information including specialist assessments in the EIA phase.

6.3.1 SOLAR RESOURCE AND ENERGY PRODUCTION

The economic viability of a solar PV facility is directly dependent on the annual solar irradiation at the site. From a regional site selection perspective, this region is considered to be preferred for solar energy development by virtue of its annual solar irradiation values. The Global Horizontal Irradiation (GHI) for the area derived from the World Bank Group's Global Solar Atlas is approximately 2 128 kWh/m^2/annum. Please refer to **Figure 27**.

6.3.2 SOLAR FARM & GRID CONNECTION

Ease of access into the Eskom electricity grid is vital to the viability of a solar PV facility. Projects which are in close proximity to a connection point and/or demand centre are favourable, and reduce the losses associated with power transmission. The proximity of the site to the existing 132 kV power line (±5 km from the site) connecting to the Eskom grid with a line-in line-out configuration is deemed most appropriate. Alternatively connecting to the Everest Substation (±12 km) or Leander Substations (±11 km) with a new powerline. Both options allow for a feasible connection point. The solar PV site is also located within the strategic transmission corridor (central corridor)[29] important for the planning of electricity transmission and distribution infrastructure, which allows for the fast tracking of applications for environmental authorisation for electricity transmission and distribution expansion. See **Figure 26**.

[29] Government Notice No. 113 in Government Gazette No. 41445

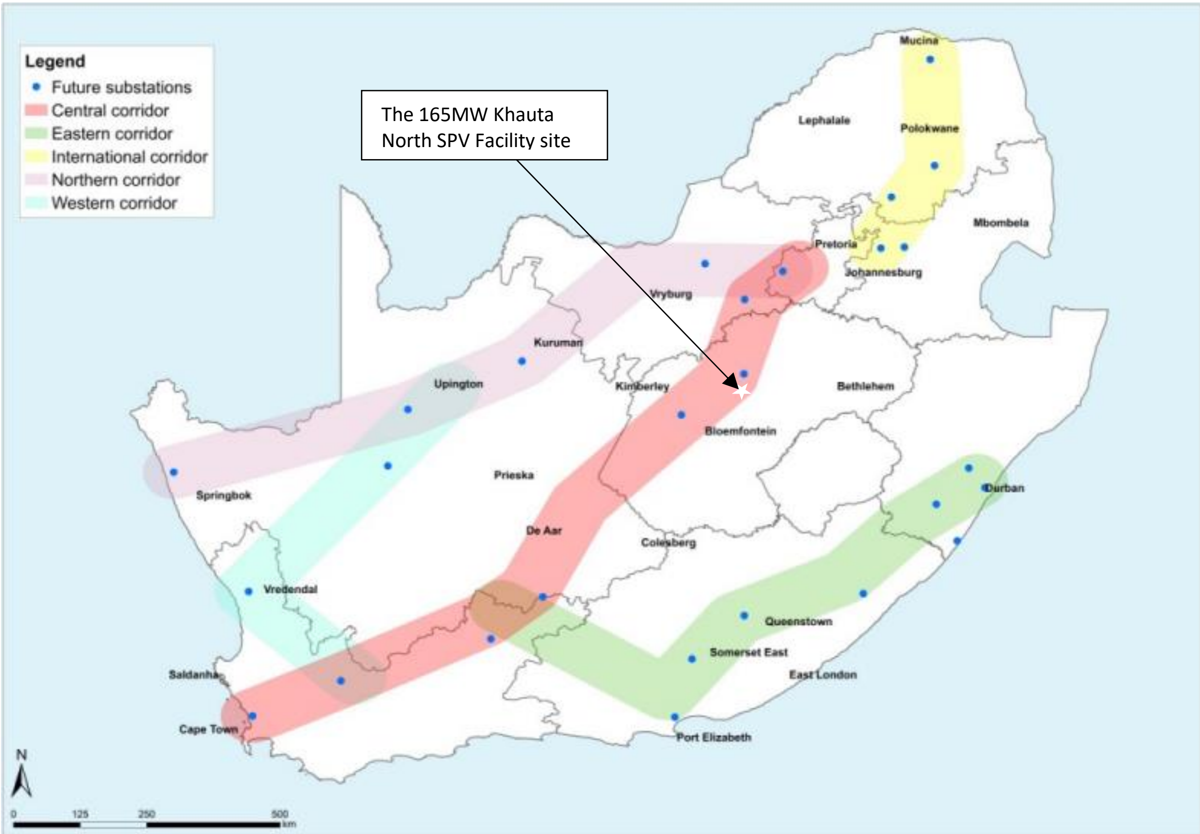


Figure 26: Preliminary Power Corridors based on the Eskom Strategic Grid Plan Study 2040

6.3.3 SOCIO-ECONOMIC IMPACT

Power generation is one of the rare growth opportunities for the Free State Province due to the high solar irradiation levels and the solar PV facility's strategic location in terms of the Strategic Transmission Corridors (8.1 Central Corridor) compiled in terms of section 24(3) of NEMA. This setup creates growth opportunities for the area, and the establishment of a renewable energy project is considered important to diversify and complement the economic development of the region.

6.3.4 EMPLOYMENT & SKILLS TRANSFER

The benefits of renewable energy facilities to local regions are not confined to the initial investment in the project. They also provide a reliable and on-going income for landowners and municipality, creating direct employment opportunities for locals, as well as flow-on employment for local businesses through provision of products and services to the project and its employees. Since inception of the REIPPPP in 2011, that has attracted R200bn in total investment and nearly R50 billion in foreign direct investment and approximately 31 207 job years for South African citizens have been created by 2019[30].

The 165MW Khauta North SPV Facility will have a positive impact on local employment. During the estimated 18-month construction phase, job opportunities will involve about 5 000 man-months and approximately 15-20

[30] Mew, T. 2019. An Economic and Social Review of the Preferred Bidders Under the Small Projects IPP Procurement Programme: A Cross-Case Synthesis. Thesis published under the Department of Mechanical Engineering: Energy Research Centre, University of Cape Town. Web Address: https://open.uct.ac.za/bitstream/handle/11427/30981/thesis_ebe_2019_mew_timothy.pdf?sequence=1&isAllowed=y

full time individuals during the operation. The majority employment will be provided by the local labour market. Due to the fact that there is limited local skilled labour in the field of renewable energy, the employment structure will likely consist of local and outside capacity. To guarantee successful operations over the lifetime of the investment, 165MW Khauta North SPV Facility will likely use the skills of outside labour to cross-train local specialists. This cross training and skills development will take place especially in the area of technical maintenance and administration.

6.3.5 SUSTAINABLE GROWTH AND DEVELOPMENT

The benefits of renewable energy facilities, such as the proposed 165MW Khauta North SPV Facility, to national, provincial, and local development goals are as follow:

- The proposed project shall benefit several key areas from broader international policy to local development goals;
- Assist South Africa in meeting international GHG emission reduction targets as set under the Kyoto Protocol;
- Support goals and objectives of South African national policy on climate change and renewable energy provisions, such as the IRP of 2010/2018;
- Support the mandate of the National Energy Regulator of South Africa (NERSA) and the Department of Energy (DoE) IPP procurement programme which aims to capacitate clean energy generation through feed-in mechanisms;
- Give mobility to the Free State Province's SDF's principles of promoting land use, of being a developmental state, aligning environmental management priorities and sustainable economic growth under the Free State Growth and Development Strategy;
- Meeting the needs of the Matjhabeng Local Municipality's IDP, namely those of developing a positive contribution to national policies and strategies and promoting human resources through training and implementation of new technological aids. The need for infrastructure development is further mentioned as an objective hereof;
- The local community shall benefit from long-term economic incentives including both short- and long-term job creation; and,
  - As a consequence to these economic incentives, positive social repercussions shall include skills development.

According to a study by Finland's LUT University, solar PV consumes between 2% and 15% of the water that coal and nuclear power plants use to produce just 1 MWh of output[31]. 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 (sun) for

[31] PV Magazine, 12 December 2019: Web Address: https://www.pv-magazine.com/2019/12/12/100-renewables-means-95-less-water-consumption-for-conventional-power-generation/#:~:text=According%20to%20a%20new%20study,from%200.1%25%20to%2014%25.

renewable energy facilities is free, while compared to the continual purchase of fossil fuel for conventional power stations.

In terms of 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 irradiation or wind for power generation is a non-consumptive use of a natural resource which produces zero emissions during its operation. The uptake of renewable energy currently 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 GHG emissions.

6.4 SITE SELECTION CRITERIA

A range of criteria has been considered, which affected the suitability of the area for the 165MW Khauta North SPV Facility and which could potentially constrain or guide the development. The criteria included technical, environmental, and land use considerations. The following is a comprehensive list of the criteria considered:

- **Location characteristics**
    - Available land;
    - Access to site;
    - Grid connection; and,
    - Environmental constraints or opportunities.
- **Technical Considerations**
    - Sufficient solar resource;
    - Capacity of the local electrical distribution network; and,
    - Proximity to ESKOM substation.
- **Environmental Considerations**
    - Proximity to provincial or nationally significant parks or wetlands;
    - Proximity to natural areas and sensitive environments; and,
    - Any other sensitive provincial or municipal designations.
- **Land Use Considerations**
    - Available access to the land and suitable ground conditions;
    - Other nearby land uses in the area; and,
    - Proximity to residential properties, communities, and towns.
- **Planning Considerations**
    - Municipality official plans and zoning by-law regulations; and,
    - Provincial Policy Statement and regional planning ordinances.

The identification of the affected properties for the development of 165MW Khauta North SPV Facility was based on the following characteristics.

Site Extent

An area of approximately 273ha is required for the facility of up to 165MW of export capacity. The proposed site, which is approximately 515 ha in extent, will therefore be sufficient for the development of the proposed facility, and should allow for the avoidance of any identified environmental and/or technical constraints in terms of the final design of the facility.

Land availability and site access

The land is currently leased/owned by farmers. Access to the proposed area is gained by existing access to the properties via farm roads off the R70, R34 and secondary road S173, approximately 3 – 4 km from Riebeeckstad and 10 – 20 km from Welkom. The site is therefore appropriately located for transport of components and equipment as well as labour traveling to and from the site.

Climatic Conditions

The economic viability of a PV solar farm is directly dependent on the annual direct solar irradiation values. The site has been indicated as an area of high irradiation, which indicates that the regional location of the project is appropriate for a solar energy facility (Solar GIS, 2021). The irradiation level is an important factor in a highly competitive bidding environment under REIPPPP.

Gradient

A relatively flat surface area is preferred for the installation of PV panels. The slope of the proposed site is considered to be acceptable from a development perspective, which reduces the need for extensive earthworks and associated levelling activities, thereby minimising environmental impacts.

Grid Connection

The proposed site is situated adjacent to a 132kV power line. The electricity generated by the facility is expected to be fed into the power line using a loop-in-loop-out connection (Alternative option 1). However, the proponent will need to apply for a cost estimate letter from Eskom to determine the best option in detail, based on the existing infrastructure.

Environmental Sensitivity

Establishment of a PV solar facility requires a large amount of land, which may result in adverse impacts on the environment. No fatal flaws in terms of the environment were identified by the Spatial Development Framework (SDF), desktop assessments, detailed Site Sensitivity Verification and impact assessments undertaken during the EIA phase. No rivers or wetlands are present on the proposed development site as the majority of the area has been previously disturbed. Appropriate buffers have been applied to surrounding watercourses in close proximity to the proposed facility.

Enviroworks undertook a site investigation and site sensitivity verification with specialists, in May 2022, to identify sensitive areas and No-Go areas and to provide buffers for sensitive areas to determine the potential buildable area for the proposed 165 MW SPV facility. The findings and recommendations of the site sensitivity verifications are presented in **Appendix E, F, G, & I**. The potential buildable area has been assessed in greater detail during the EIA Phase through the site-specific specialist impact assessment studies. The specialists' findings have been included in the draft EIR, which will be made available to I&APs for review.

7 CONSIDERATION OF PROJECT ALTERNATIVES

In accordance with the requirements of Appendix 3 of the 2014 EIA Regulations (GNR 326), as amended, reasonable and feasible alternatives, including but not limited to site and technology alternatives, as well as the "do-nothing" alternative should be considered. All identified, feasible and reasonable alternatives are required to be identified in terms of social, biophysical, economic and technical factors. Several other renewable energy facilities are planned within the broader study area, supporting the suitability of the area for renewable energy projects.

In terms of the EIA Regulations 2014, as amended the definition of "alternatives" in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to:

- the property on which or location where it is proposed to undertake the activity;
- the type of activity to be undertaken;
- the design or layout of the activity;
- the technology to be used in the activity; and,
- the operational aspects of the activity.

The other critical aspects in the definition of project alternatives are terms such as 'reasonable', 'practicable', 'feasible' or 'viable'. Given the understanding, there are essentially two types of alternatives, the incrementally different (modifications) alternatives to the project; and the fundamentally (totally) different alternatives to the project:

- Incrementally different (modifications) alternatives to the project; and,
- Fundamentally (totally) different alternatives to the project.

7.1 CONSIDERATION OF FUNDAMENTALLY DIFFERENT ALTERNATIVES

Fundamentally different alternatives are usually assessed at a strategic level and EIA practitioners recognise the limitations of project specific EIAs to address fundamentally different alternatives. Electricity generating alternatives have been addressed as part of the National Integrated Resource Plan (NIRP) published by the National Energy Regulator of South Africa (NERSA) and the Integrated Strategic Electricity Plan (ISEP) undertaken by Eskom. Environmental aspects are considered and integrated into the NIRP and ISEP using the strategic environmental assessment approach, focusing on environmental life-cycle assessments, water-related issues and climate change considerations.

Fundamentally different renewable energy options that were initially considered included the following energy generation through:

- Hydro generation;
- Wind generation; and,

- Solar generation.

Fundamental Alternative 1: Hydro generation was rejected as the site is not located close to a prominent and sufficient water resource to generate hydro-electricity. This option was thus not further investigated.

Fundamental Alternative 2: Electricity generation through wind turbines was investigated. The recommended wind speed for a commercial wind turbine is around 144km/h to 259km/h. The average wind speed in the Welkom and project area is 11km/h to 14.5km/h[32]. Hence, due to the local climatic conditions, a wind energy facility was not considered suitable as the area does not have the required wind resources. This alternative was therefore regarded as not feasible and has not been evaluated further in this report.

Fundamental Alternative 3: Electricity from solar generation was investigated as the site is located a relatively high solar irradiation area (**Figure 27**) with the shortest day with 10 hours and 22 min sunlight and the longest day with 13 hours and 55min sunlight.

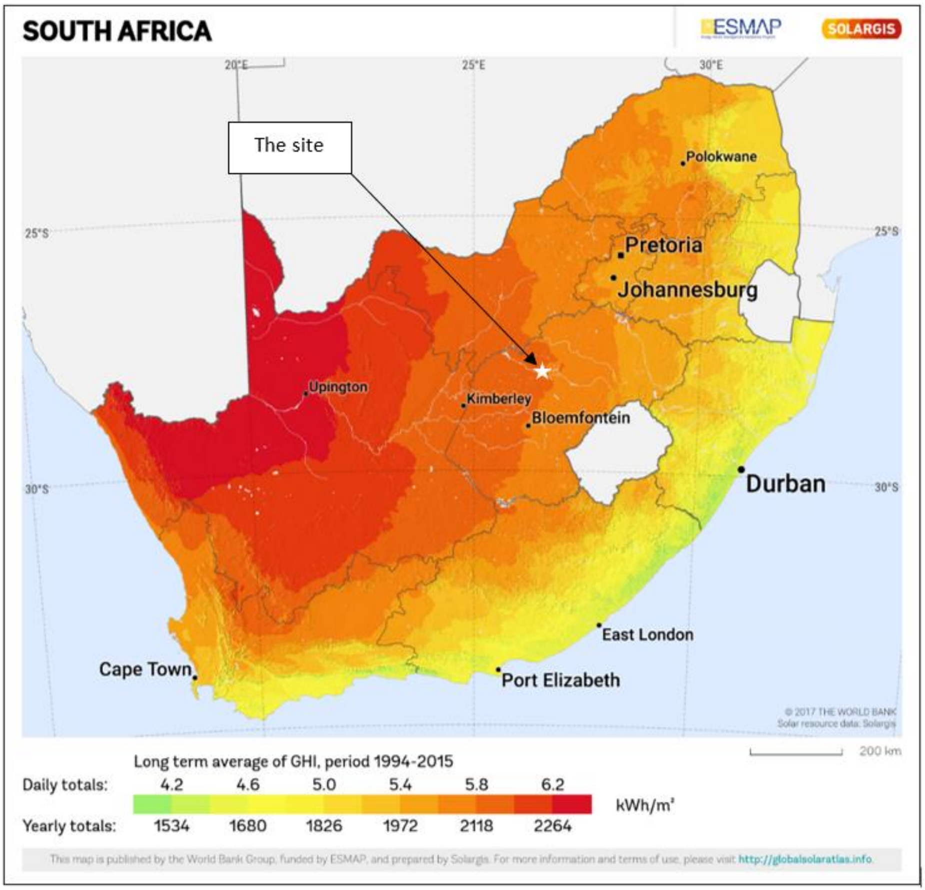


Figure 27: Global Horizontal Irradiation Values for South Africa (SOLAR GIS, 2021).

For this reason, the option of a solar facility was perused. In this instance, 'the project' refers to the 165MW Khauta North SPV Facility, a Solar Energy Facility with capacity of up to 165MW and associated infrastructure

[32] Weather Park: Web Address: https://weatherspark.com/y/92853/Average-Weather-in-Welkom-South-Africa-Year-Round

proposed to be developed by an Independent Power Producer (IPP) and intended to form part of the DMRE's REIPPP Programme, or another similar programme.

7.2 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 properties 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; and,
- 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 165MW Khauta North SPV Facility. Where no alternative is being considered, a motivation has been provided as required by the EIA Regulations 2014, as amended.

7.2.1 PROPERTY OF LOCATION ALTERNATIVES

Due to the nature of the development, the location of the project is largely dependent on technical factors such as solar irradiation, climatic conditions, topography of the site and available grid connection.

A preliminary cluster area of ~980 ha was identified by the Proponent as being technically feasible.

Various specialist studies have been commissioned to outline the site sensitivity verification (SSV) within the greater study area (~980 ha). The objective of the various specialist studies were to provide the following for their respective fields:

- A brief description of the site with high-level feedback on the proposed development footprint;
- Identify Sensitive areas;
- Identify No-Go areas;
- Provide buffers for sensitive areas; and,
- Provide overall spatial files and maps that outline the sensitive areas, No-Go areas and possible buildable area for development.

Of the preliminary ~980 ha of the cluster area that was assessed (via the SSV process, that was preceded by a desktop assessment), ~ 690 ha has been identified as suitable for development, considering the findings of the specialists listed in the table below (**Table 16**). The outcome of this SSV Report (**Appendix T**) was used to inform the Proponent in developing the project scope of works and site layout plan for the proposed development footprint[33] of the Khauta North SPV Facility. Therefore, no site alternatives will be further assessed.

Table 16: Proposed specialists were involved during the site sensitivity verification

SITE SENSITIVITY VERIFICATION SPECIALIST	SPECIALIST
Avifaunal	Mokgatla Molepo (Pri.Nat.Sc.) from Moira Ecological Services (Pty) Ltd
Agricultural	Dr Johann Lanz (Pri.Nat.Sc.)
Terrestrial & Aquatic Ecological	Rikus Lamprecht (Pri.Nat.Sc.) from EcoFocus Consulting (Pty) Ltd
Economic Desktop Assessment	Petrus J van Jaarsveld (ESSA #0116)
Heritage and Archaeological	Jonathan Kaplan from Agency for Cultural Resource Management (ACRM)
Palaeontological	Dr John Almond from Natura Viva CC
Terrestrial Biodiversity, Plant- and Animal Species	Mr Roy de Kock M.Sc (Pri.Nat.Sc.) from Blue Leaf Environmental (Pty) Ltd Megan Smith M.Sc Biological Sciences (EAPASA: Registered EAP) from Enviroworks
Social	Michael Leach (EAPASA Reg: 2021/3872) from Enviroworks
Visual	Christoff Du Plessis from Enviroworks (BSc, AIS 1013)
Geo-Technical Desktop Assessment	BVi Consulting Engineers Western Cape (Pty) Ltd

The development site identified for the 165MW Khauta North SPV Facility is located close to Riebeeckstad. The preferred project site was identified through an investigation of prospective sites and properties in the area within the Free State Province. The investigation involved the consideration of specific characteristics that play a role in the opportunities and limitations for the development of a Solar Energy Facility. These are discussed in the sections below.

Solar resource: Solar resource is the first main driver of site selection and property viability when considering the development of Solar PV facilities. 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 Horizon Irradiation (GHI) for the study area is in the region of approximately 2118 kWh/m^2 /annum (refer to **Figure 27**). The northern Free State Province is considered to have high solar generation potential and therefore enables the development of solar energy projects and the successful operation thereof.

[33] The development footprint is the defined area (located within the development area) where the PV panel array and other associated infrastructure for Khauta North Solar PV Facility is planned to be constructed. This is the actual footprint of the facility, and the area which would be disturbed.

Access to the National Electricity Grid – A key factor in the siting of any generation project is a viable grid connection. The grid connection infrastructure for the facility will include a new on-site substation connecting into either the existing Leander Main Transmission Substation via a new approximately 13km 132kV line or the existing Everest Main Transmission Substation via a new approximately 15km 132kV line. This proposed grid connection has been confirmed with Eskom as a feasible option through a Cost Estimate Letter ("CEL"). The grid connection solution will be subjected to a separate BA process.

Land Availability: In order to develop the 165MW Khauta North SPV Facility with a contracted capacity of up to 165MW, sufficient space is required. The preferred project site was identified within the Free State Province and in the Welkom / Riebeeckstad area following the confirmation of a feasible solar resource through available data. 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 considered in the Scoping- and EIA phase of the process has an extent of 515.49ha, which was considered by the developer as sufficient for the development of the 165MW Khauta North SPV Facility. A development footprint of 273ha within the project site for the placement of infrastructure has been identified considering environmental constraints and sensitivities identified within the project site through the Scoping Evaluation and is being assessed as part of this EIA Report.

Land Use, Geographical and Topographical Considerations: The character of the greater area surrounding the project site can be described as agricultural lands that were used for grazing. Settlement occurs in the form of isolated homesteads throughout the study area that are generally related to agricultural uses. The closest town include Riebeeckstad. Based on the location of the project site (within an area where supporting transmission and distribution infrastructure is readily available to enable the evacuation of the generated power) and the suitable topography, the site was identified as being technically preferred for the planned development.

Site access: Access to the project site can be gained through the presence of existing gravel roads. It is assumed that if components are imported to South Africa, it will be via the Port of Richard's Bay, which is located in KwaZulu-Natal. A detailed transportation plan and schedule for the transport of components, main assembly cranes and other large pieces of equipment will be compiled during the detailed design phase prior to the commencement of the construction activities.

Based on the above considerations, the 165MW Khauta North Solar 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. As a result, no property/location alternatives are proposed as part of this S&EIA process.

7.2.2 DESIGN AND LAYOUT ALTERNATIVES

The proposed Khauta North SPV Facility is expected to have a development footprint of approximately 273ha (**Figure 5**), within the total extent of the 515 ha of Portion 0 of the Farm Kopje Alleen No. 81 and Portion 1 of the Farm Kopje Alleen No. 81.

The site layout plan (buildable area) for the 165 MW Khauta North SPV Facility (**Figure 58**) was informed and developed to avoid identified sensitive areas and buffers around sensitive areas. The potential impacts of the project have been identified by the EAP and participating specialists, the significance thereof assessed in the Environmental Impact Report.

The overall aim of the project and the facility layout (i.e., development footprint) is to maximise electricity production through exposure to the solar resource, while minimising infrastructure, operation, and maintenance costs, and social and environmental impacts in the area.

Following the confirmation of the 165MW Khauta North Solar Facility preferred project site as being technically feasible for the development for a Solar Energy Facility, the developer commenced with the scoping assessment of the site to evaluate the main constraints, opportunities, environmental sensitivities and to determine whether or not there are any fatal flaws or significant No-Go areas within the site that might compromise or limit the proposed development.

The scoping process included specialist investigations of the project site based on desktop studies and where possible, field assessments. The purpose of this phase of the project was to identify sensitive and No-Go areas, as well as to determine appropriate buffers to be considered within the development of the project layout. The sensitivity spatial data was compiled by the specialist team during the Scoping Phase and the information was provided to the applicant. 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 EIA Phase.

Through integration of the specialist sensitivity data obtained, based on field-survey and desktop studies, as well as consideration of technical aspects, the developer designed the layout to avoid areas and features of high environmental sensitivity. Where avoidance was not possible, appropriate mitigation and management measures (in this instance the development of technical mitigation solutions as well as recommendations from the various environmental specialists) have been proposed for implementation during the construction and operation of the proposed Solar Energy Facility. This has resulted in the consideration of a reduced development footprint of 273ha as part of the EIA process which is designated to be environmentally appropriate as far as possible.

An overall environmental sensitivity map (**Figure 4**) has been provided in order to illustrate the sensitive environmental features located within the project site which needs to be considered and, in some instances completely avoided by the development footprint.

With reference to the BESS design, two (2) height alternatives are proposed for the Battery Energy Storage System. Design Alternative 1 was assessed at a maximum height of eight meters (8 m) and Design Alternative 2 was assessed at a maximum height of fifteen meters (15 m). These are assessed in section 9.5.8 of the report.

7.2.3 ACTIVITY ALTERNATIVES

Khauta North SPV Facility RF (Pty) Ltd is a renewable energy project developer and as such is only considering renewable energy activities in accordance with the need for such development within the IRP. Considering the available renewable energy resources within the area and the current significant restrictions placed on other natural resources such as water, it is considered that solar energy (**Alternative 1**) is the preferred option for the development of a renewable energy facility within the identified project site. No other activity alternatives are being considered within this S&EIA process.

7.2.4 TECHNOLOGY ALTERNATIVES

7.2.4.1 RENEWABLE ENERGY TECHNOLOGY ALTERNATIVES

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. Solar energy is considered to be the most suitable renewable energy technology for this area, based on the site location, ambient conditions and energy resource availability.

The S&EIA process considered the development of a SPV facility would be the most appropriate land use for the particular site. Proposed activity alternatives that have been assessed during the EIA phase included the following:

- Solar photovoltaic (PV) facility – Solar energy is considered to be the most suitable renewable energy resource for this specific site, based on the locality of the site, ambient conditions and the availability of energy resources, which in this case would be solar irradiation (indicated as an area of high irradiation – 2093 kWh/m^2/annum) (**Figure 27**). Solar PV technology is also preferred when compared to Concentrated Solar Power technology (discussed below) because of the lower visual profile.

- Concentrated solar power (CSP) facility - A CSP has a high visual impact and requires large volumes of water; this is a major constraint for this type of technology considering the water challenges and limitation experienced not only in the country but also the local area. While the irradiation values are high enough to generate sufficient solar power, the water constraints render this alternative not feasible. It must also be noted that the IRP no longer includes the use of CSP as part of the energy mix of the county. Therefore, this alternative will not be considered further in this report.

When considering PV as a technology choice, several types of panels are available, including inter alia:

- Bifacial PV panels;
- Monofacial PV panels;
- Fixed mounted PV systems (static / fixed-tilt panels); and,
- Single-axis tracking or double-axis tracking systems (with solar panels that rotate around a defined axis to follow the sun's movement).

The primary difference between PV technologies available relate to the extent of the facility, as well as the height of the facility (visual impacts), however the potential for environmental impacts remains similar in magnitude. Fixed mounted PV systems are able to occupy a smaller extent and have a lower height when compared to tracking PV systems, which require both a larger extent of land, and are taller in height. However, both options are considered to be acceptable for implementation from an environmental perspective.

The PV panels are designed to operate continuously for more than 20 years, mostly unattended and with low maintenance. The impacts associated with the construction, operation, and decommissioning of the facility are anticipated to be the same irrespective of the PV panel type selected for implementation. Once environmental constraining factors have been determined through the S&EIA process Khauta North SPV Facility RF (Pty) Ltd will consider various solar panel options. The preferred option will be informed by efficiency as well as environmental impact and constraints (such as sensitive biophysical features). The PV panels proposed, will comprise solar panels which once installed, will stand no more than 8m above ground level. The solar panels will include centralised inverter stations, or string inverters mounted above ground.

Khauta North SPV Facility RF (Pty) Ltd therefore confirms PV solar energy technology as the preferred technology alternative for the development of the project. No further technology alternatives are considered within this EIA Report.

7.2.4.2 SOLAR PV TECHNOLOGIES

Very few technological options exist as far as PV technologies are concerned; those that are available are usually differentiated by climatic conditions that prevail. The impacts of the different PV technologies on the environment are very similar. The construction, operation and decommissioning activities associated with the facility will all be the same, irrespective of the chosen technology. Both technology alternatives are considered reasonable and relevant to this application, based on the current technology available and potential engineered simplification of solar tracking systems in the coming years. As technological advances within PV technologies are frequent the Applicant may apply for either of the two technology alternatives and no preferred option is specified by the Applicant.

The Fixed and Tracking PV panel technologies are both considered for the proposed Khauta North SPV Facility. The different solar PV panel technologies are briefly discussed in the following sub-headings:

- Fixed / mounted PV panels; and,
- Tracking PV panels (these solar panels rotate to follow the sun's movement/trajectory).

It is important to note that while both types are detailed and assessed in this report, no specific technology is proposed as that preferred for authorisation, as both are expected to have similar impacts due to their design and functions being closely related. Therefore, the assessment proposes both technologies for authorisation (i.e. PV panels of Fixed / mounted PV- or Tracking PV panels), to allow the proponent to determine the precise technology when the project is implemented, on the understanding that further investigation into the specific technologies available at the time of being awarded preferred bidder status will allow for one of two to be selected and ultimately developed.

7.2.4.2.1 FIXED MOUNTED PV SYSTEM

In a fixed mounted PV System (**Figure 28**), the PV panels are installed at a pre-determined angle from which they will not move during the lifetime of the plant's operation. The limitations imposed on this system due to its static placement are countered by the fact that the PV panels are able to absorb incident radiation reflected from surrounding objects. In addition, the misalignment of the angle of the PV panels have been shown to only marginally affect the efficiency of energy collection. There are advantages which are gained from fixed mounted systems, and includes the following:

- The maintenance and installation costs of a fixed mounted PV system are lower than that of a tracking system, which is mechanically more complex given that these PV mountings include moving panels;
- Fixed mounted PV systems are an established technology with a proven track record in terms of reliable functioning. In addition, replacement parts are able to be sourced more economically and with greater ease than with alternative systems; and,
- Fixed mounted systems are robustly designed and able to withstand greater exposure to winds than tracking systems.

A typical fixed structure will have two rows of twenty (20) modules (2 strings). The modules are placed in portrait arrangement. The foundation technology is usually a direct-driven (rammed) installation, with a ramming depth subject to the soil characteristics, or reinforced concrete strip footings.

Figure 28: Example of fixed mounted PV System

The design of the fittings for fixing the modules to the rack structures will enable thermal expansion of the metal without transferring mechanical loads that could affect the integrity of the modules. The structure will probably have anti-theft bolts.

7.2.4.2.2 SINGLE / DUAL AXIS TRACKING SYSTEM

In a dual axis tracking system, PV panels are fixed to mountings which track the sun's trajectory. There are various tracking systems namely a single axis tracker or a dual axis tracker. A 'single axis tracker' will track the sun from east to west, while a 'dual axis tracker' will in addition be equipped to account for the seasonal waning of the sun. These systems utilise moving parts and complex technology, including solar irradiation sensors to optimise the exposure of PV panels to sunlight. Tracking systems are a new technology and, as such, are more complex to operate in South Africa. This is due to:

- A high degree of maintenance is required due to the nature of the machinery used in the system, which consists of numerous components and moving parts. A qualified technician is required to carry out regular servicing of these tracking systems, which are normally located in remote areas;
- The cost of the system is necessarily higher than a fixed mounted system due to the maintenance required for this system and given that separate mountings need to be placed apart from one another to allow for their tracking movement; and,
- A power source is needed to mechanically drive the tracking system and this would offset a certain portion of the net energy produced by the plant.

However, the additional improvements in capacity factor and efficiency may make a tracking system attractive despite these challenges. This can only be determined with a financial model during the more detailed design phase of the project.

7.2.4.3 BATTERY ENERGY STORAGE SYSTEM TECHNOLOGY ALTERNATIVES

As technological advances within battery energy storage systems (BESS) are frequent the Applicant may apply for "Solid State Batteries" (**Figure 29**) and/or "Flow Batteries" as the two technology alternatives for the BESS and, no preferred option is specified by the Applicant. Both have been assessed as alternative technology options in the EIA phase. Due to uncertainty regarding the preferred technology type, which may only be determined with a financial model during the more detailed design phase of the project and/or during the construction tender process, the Applicant may apply for both technology types. It is therefore deemed necessary that all technology risk types be assessed during the EIAs phase and mitigated in terms of the Environmental Management Programme (EMPr). The two BESS technology types considered are briefly described below.

- Lithium-Ion technology (e.g. Lithium Ferrophosphate (LFP), Nickel Manganese Cobalt Oxide (NMC) or similar technology and chemistries); and ,
- Redox-flow technology (e.g. vanadium flow battery, or similar technology and chemistries).

Both technologies include batteries housed within containers which are fully enclosed and self-contained. It is envisioned that the batteries will arrive on site – pre-assembled. It is important to note that while both types are detailed and assessed in this report, no specific technology is proposed as that preferred for authorisation, as both are expected to have similar impacts due to their design and functions being closely related. Therefore, the assessment proposes both technologies for authorisation (i.e. a BESS of either Lithium-Ion or Redox-flow type), to allow the proponent to determine the precise technology when the project is implemented, on the understanding that further investigation into the specific technologies available at the time of being awarded preferred bidder status will allow for one of two to be selected and ultimately developed.

7.2.4.3.1 Solid State Batteries (Lithium-Ion technology)

Solid state battery electrolytes, such as lithium-ion (Li-ion), zinc hybrid cathode, sodium ion, flow (e.g. zinc iron or zinc bromine), sodium sulphur (NaS), zinc air and lead acid batteries, can be used for grid applications. Compared to other battery options, Li-ion batteries are highly efficient, have a high energy density and are lightweight. As a result of the declining costs, Li-ion technology now accounts for more than 90% of battery storage additions globally (IRENA, 2019).

These energy storage units come in a range of containerised systems with size categories from 500 kWh to 4 MW. The total footprint area required for the containerised systems to accommodate the 165 MW project with this type of battery is approximately 3.8 ha.

Solid state batteries consist of multiple battery cells that collectively form modules. Each cell contains an anode, cathode and a solid electrolyte. Modules are usually assembled within shipping containers and delivered to the site. Multiple containers will be required. The container unit dimensions are approximately 17 m long, 3.5 m wide, and 4 m high. Containers will be placed on a raised concrete plinth (300 mm) and may be stacked on top of each other to a maximum height of approximately 8 m. Additional instrumentation, including inverters and temperature control equipment, may be positioned between the battery containers. Refer to **Figure 29**.

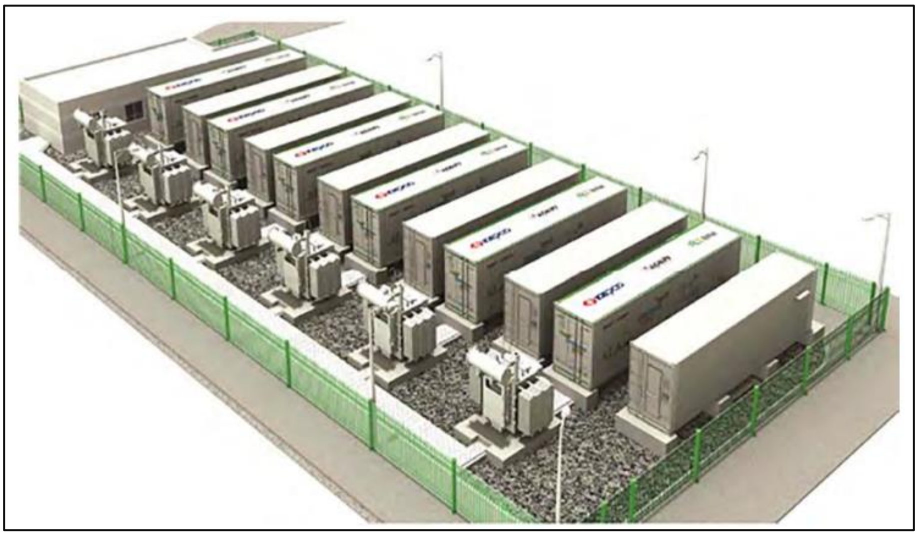


Figure 29: Typical illustration of a Battery Energy Storage System Technology

Considering the nature of the project, a solid-state technology type is envisaged for the proposed technology. The technology includes batteries housed within containers which are fully enclosed and self-contained. Therefore, the assessment proposes all solid-state technologies for authorisation to allow the precise technology to be selected when the project is implemented, on the understanding that further investigation into the specific technologies available at the time of being awarded preferred bidder status will allow for one of two to be selected and ultimately developed.

A lithium-ion (Li-ion) battery is a rechargeable electrochemical battery operating on a wide array of chemistries where lithium ions are transferred between the electrodes during the charge and discharge reactions (Parsons, 2017[34]).

A Li-ion cell is comprised of three main components; cathode and anodes electrodes, and an electrolyte that allows lithium ions to move from the negative electrode to the positive electrode during discharge and back when charging (**Figure 30**) (Parsons, 2017). While charging, lithium ions flow from the positive metal oxide electrode to the negative graphite electrode which is reversed during discharge (i.e. ion flow is in the opposite direction).

[34] Parsons 2017. South Africa Energy Storage Technology and Market Assessment. Objective 8 Deliverable Final Report. TDA-IE201511210, 2015-11032A

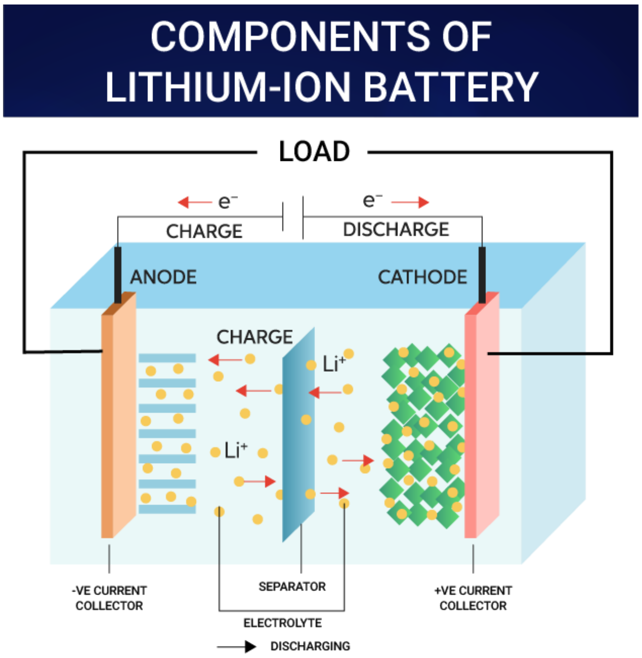


Figure 30: An example of a LI-ION Cell and its components[35]

Li-ion battery cells contain two reactive materials which are capable of electron transfer chemical reactions (commonly a lithium source cathode and a graphite anode). A Li-ion battery comprises one or more power generating blocks called cells. A battery has the following main components: cathode (positive electrode), anode (negative electrode), electrolyte, separator, positive terminal (positive current collector) and negative terminal (negative current collector). The anode and cathode store the lithium and the electrolyte carries positively charged lithium ions from the anode to the cathode and vice versa through the separator. The movement of the lithium ions creates free electrons in the anode which creates a charge at the positive terminal. The electrical current then flows from the current collector through a device being powered to the negative terminal. The separator blocks the flow of electrons inside the battery.

While the battery is discharging and providing an electric current, the anode releases lithium ions to the cathode, generating a flow of electrons from one side to the other. When plugging in the device, the opposite happens: Lithium ions are released by the cathode and received by the anode.

Li-ion batteries initially got popular in consumer electronics industry because of their rechargeable quality. Today, they have become a standard for any device that needs a rechargeable battery. With their high energy density feature, they are revolutionizing the electrical vehicles as well. Li-ion batteries can work under different conditions that include very low as well as very high temperature, high as well as low drain, and for shock and vibration tolerant environments. First, Li-ion batteries are capable of packing huge amounts of power. They have one of the highest energy densities among different battery types, in the range of 100 – 200 Watt-hour / kg[36].

[35] Example of a LI-ION Cell and its components (Source: https://esmito.com/blog/lithium-ion-batteries.html)
[36] Estimo, 2021. Lithium-Ion Batteries: Revolutionizing the Electric Vehicle Industry, Sept 10, 2021. Source: https://esmito.com/blog/lithium-ion-batteries.html

Li-ion batteries utilise both lithium and a heavy metal (commonly cobalt or manganese) in the reactions required for energy storage, resulting in environmental impacts during the preconstruction phases of the technology (i.e. supply chain impacts). Lithium can however be recycled, adding the future potential use of this battery technology, however the recycling process is difficult and expensive.

The high round-trip efficiency (the fraction of energy put into the storage that can be retrieved), high power and energy density of this technology provide a significant advantage where a small footprint and available space are an issue. A significant disadvantage to Li-ion has been the high initial cost, as well as the limited cycle lives produced by earlier (historical) chemistries used in the battery (Parsons, 2017). Regardless, recent technological advances and large-scale manufacturing have reduced the price drastically and increased performance, with the result that Li-ion batteries are expected to be an important BESS through to 2030 in both small- and large-scale applications.

7.2.4.3.2 Flow Batteries

Flow-battery technologies provide alternative means for power smoothing through on-site battery storage. For this technology, energy is stored as an electrolyte in the flow cells. Options include Sodium polysulfide/bromine (PSB) flow batteries, Vanadium Redox (VRB) flow batteries, and Zinc-Bromine (ZNBR) flow batteries which would be contained in small bunded areas. The footprint of a Redox Flow Battery (RFB) system is approximately 150 m x 100 m, with a height of 8 m. For this technology, energy is stored as an electrolyte in the flow cells. The system consists of two electrolyte storage tanks that are contained within a 2.5 m high berm wall, which prevents leakage of the electrolyte chemical into the surrounding environment.

With a simple flow battery, it is straightforward to increase the energy storage capacity by increasing the quantity of electrolyte stored in the tanks. The electrochemical cells can be electrically connected in series or parallel, so determining the power of the flow battery system. They store and release energy through a reversible electrochemical reaction between two electrolytes (chemical reactants), which are separated by a membrane through which charging, and discharging occurs. These batteries provide an energy output greater than or equal to lead acid batteries, and their storage capacity is dependent upon the size of the electrolyte tanks while the power output is dependent on the size of the reaction stack (Parsons, 2017).

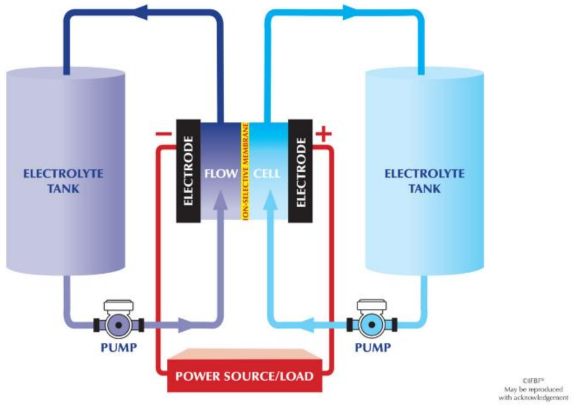


Figure 31: An example of a Flow Battery and its component[37]

Flow batteries (**Figure 31**) are a technology of battery which requires mechanical systems (pumps, pipes, and tanks) and are therefore inherently more complex than a solid-state battery (for example, lithium-ion, lead or advanced lead acid batteries discussed above). The greatest advantage these batteries exhibit is their scalability and their longer duration discharge cycles which are more cost efficient when compared to solid-state batteries (Parsons, 2017). The most successful and widespread of these batteries use vanadium and zinc-bromine chemistries.

Redox Flow Batteries (RFB) are a class of electrochemical energy storage technology which entail a chemical reduction and oxidation reaction that stores energy in liquid electrolyte solution flowing through a battery of electrochemical cells during charge and discharge. They are therefore a subset (or one variant) of flow batteries and essentially work by two separate containers of dissolved chemical components, separated by a membrane, which facilitate ion exchange (and thus the resulting flow of electric current) across the membrane when an electrical load is applied to the system. These batteries may act as a fuel cell, where spent electrolyte solution is exchanged once no longer effective, or rechargeable, where regeneration may be achieved by applying a source of electricity to the electrolyte). The energy capacity of this battery is a function of the volume of the electrolyte solution, allowing for a high degree of scalability.

7.2.5 ACCESS ROUTE ALTERNATIVES

Recommendations from the specialists advised that sensitive areas be avoided and advise that the internal access roads and MV Cabling must be utilise the existing main access road to the north and all other infrastructure will remain within low-sensitive green developable area. No other roads have been assessed.

7.3 THE "NO-GO" ALTERNATIVE

The assessment of alternatives must at all times include the No-Go option as a baseline against which all other alternatives must be measured. The option of not implementing the activity or excluding sensitive areas from development have been assessed to the same level of detail as the other feasible and reasonable alternatives.

[37] An example of a Flow Battery and its component (Source: https://flowbatteryforum.com/what-is-a-flow-battery/)

The No-Go option focussed on the existing rights on the property, including the approved PV facility, and this includes all the duty of care and other legal responsibilities that apply to the owner of the property.

7.3.1 "DO-NOTHING" ALTERNATIVE

The 'do-nothing' alternative is the option of not constructing and operating the 165MW Khauta North SPV Facility. Should this alternative be selected, there would be no environmental impacts or benefits as a result of construction and operation activities associated with a Solar Energy Facility. There will be no energy for the national grid, no job creation and the site will remain as is. The 'do-nothing' alternative may result in the continuation of electricity shortages in the country, forcing people to source alternative energy sources for cooking such as wood due to a lack of access to sustainable energy supply. Uncontrolled wood harvesting could lead to habitat fragmentation. As these practices are not monitored, it is difficult to determine the overall cumulative impact of illegal wood harvesting.

In addition to the above, environmental pollution and the emission of CO_2 from the combustion of fossil fuels through the implementation of conventional power plants remain a threat to the environment. The use of fossil fuels is reportedly responsible for ~70% of GHG 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 currently 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 solar energy projects are able to meet all economic, social and environmental sustainability criteria through the appropriate placement of these facilities.

In terms of establishing a Solar Facility, the 'do-nothing' alternative may likely result in minimising the cumulative environmental impact on the farms, although it is expected that pressure to develop the site for renewable energy purposes will be actively pursued due to the same factors which make the site a viable option for renewable energy development. The 'do-nothing' alternative has been assessed as part of the EIA Phase (refer to section 9 in this EIA Report).

Should the 'do-nothing' alternative be selected to reject the whole proposed 165MW Khauta North Solar PV Facility, it is anticipated that there will be impacts at a local and broader scale. From a local perspective, the identified site, which is zoned for agricultural purposes, would not be impacted on from an environmental perspective, and could be utilised for future agricultural activities. However, at a broader scale, the potential benefits of additional capacity to the electricity grid and those associated with the introduction of renewable energy would not be realised. Although the proposed facility is only proposed to contribute 165MW to the grid capacity, it would assist in meeting the growing electricity demand through the country and would also assist in augmenting government's renewable energy goals.

Based on the current need in the country for cleaner and more reliable power supply, this option is not recommended.

7.3.2 EXCLUDING SENSITIVE AREAS ALTERNATIVE

The 'excluding sensitive areas' alternative identifies environmental sensitive areas on the proposed properties and exclude them from the development footprint.

Some sensitive environmental areas have been identified on the proposed farms, and these are clearly indicated in the final layout map as No-Go areas (**Figure 58**). Conservation and preservation management recommendations have been included in the EMPr.

8 DESCRIPTION OF THE ENVIRONMENTAL ATTRIBUTES

This section of the EIA Report provides a description of the local environment that may be affected by the proposed Khauta North SPV Facility. This information is provided in order to assist the reader in understanding the proposed effects of the proposed project on the environment. Aspects of the biophysical, social, and economical environment that could directly be 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 and aims to provide context within which the scoping is being conducted.

8.1 REGIONAL SETTING

The proposed 165MW Khauta North SPV Facility is located approximately 7km north east of Riebeeckstad near Welkom in the Matjhabeng Local Municipality, Free State Province.

The Free State Province is high-lying, with almost all land being 1,000 metres above sea level. The Drakensberg and Maluti Mountains foothills raise the terrain to over 2,000 m in the east. The Free State lies in the heart of the Karoo Sequence of rocks, containing shales, mudstones, sandstones and the Drakensberg Basalt forming the youngest capping rocks. Mineral deposits are plentiful, with gold and diamonds being of particular importance, mostly found in the north and west of the province.

Agriculture dominates the Free State landscape, with cultivated land covering 32,000 square kilometres, and natural veld and grazing a further 87,000 square kilometres of the province. The Free State is also rich in mineral wealth, with gold representing 20% of the world's total gold production. Mining is the province's major employer.

The Free State Province comprises of five District Municipalities, namely Fezile Dabi, Lejweleputswa, Thabo Mofutsanyana, Mangaung, and Xariep (refer to **Figure 32**) – which contain eighteen local municipalities collectively, with the project being located within the Lejweleputswa District Municipality.

Figure 32: District Municipalities in the Free State Province (Source: By Htonl - Own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=15096694)

The Lejweleputswa District Municipality (DC18) is bordered by the other four district municipalities. According to Stats SA the population is 657 019 with the majority speaking Sotho. The Matjhabeng Local Municipality has a total population of 406 461 people, of which 87,7% are black African. The coloured population makes up 2,1%, and 9,6% are white.

Of the people aged 20 and older, 38,8% have some form of secondary schooling and only 28,1% have matric. In the municipality, 4,6% of people have no schooling and 14% have some form of primary schooling. A total of 99 650 people is employed while 13 290 are discouraged work-seekers. According to Census 2011, 58 524 people are unemployed; making the unemployment rate stand at 37% (Refer to **Figure 33**).

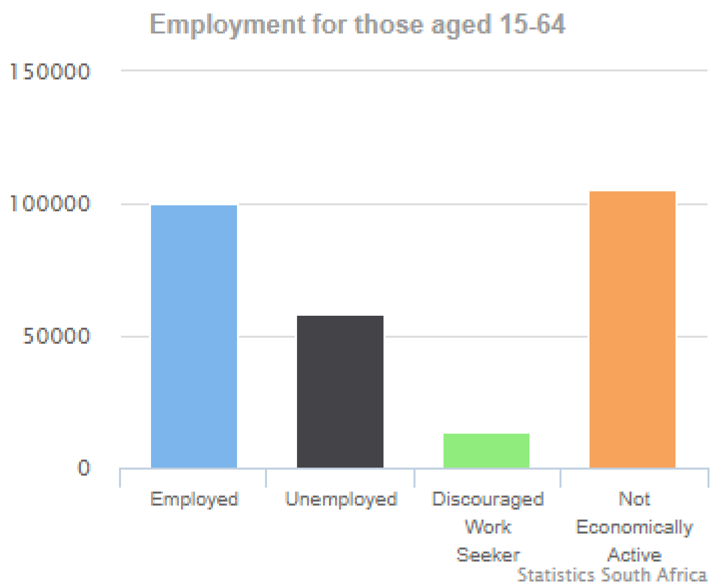


Figure 33: Employment statistics for Matjhabeng Local Municipality (Source: Stats SA 2011)

The municipality services Welkom, Virginia, Odendaalsrus and Allanridge. The municipality experiences high unemployment which was exacerbated by the Covid-19 pandemic[38]. As of 2021, about 150,000 adults are unemployed. Some 10 gold mines closed their shafts, and suppliers of these mines closed shop. Crime has increased in its towns and townships, especially in Meloding, Virginia, Thabong and Welkom. The reported crimes include theft and vandalism of municipal property and infrastructure, besides illegal mining by zama zamas, costly cable theft, theft of fencing material and vandalism of cemeteries.

8.2 CLIMATE

8.2.1 TEMPERATURE

Riebeeckstad is in the Southern Hemisphere. Summer begins here at the end of December and ends in March. The months of summer are December, January, February, March. The maximum average monthly temperature is approximately 23.3°C in the summer months while the minimum average monthly temperature is

[38] Seleka, Ntwaagae (5 September 2021). "Matjhabeng municipality: Rampant looting, illegal mining and theft could wipe out ailing entity". news24.com. News24. Retrieved 16 September 2021.

approximately 9.7°C during the winter. January is the hottest month of the year. Maximum daily temperatures can reach up to 29.7°C in the summer months and dip to as low as 2.4°C during the winter. Please refer to **Figure 34** and **Table 17**.

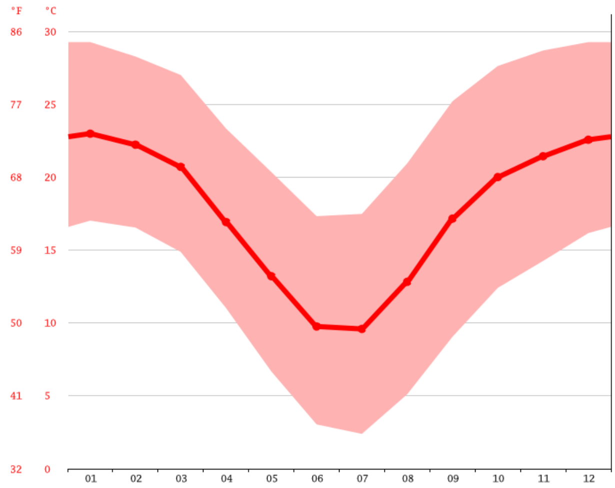


Figure 34: Average temperature in Riebeeckstad during the 12 months of the year.

Table 17: Data: 1991 - 2021 Min. Temperature °C (°F), Max. Temperature °C (°F), Precipitation / Rainfall mm (in), Humidity, Rainy days. Data: 1999 - 2019: avg. Sun hours. (Source: Climate-Data.org)

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature °C (°F)	23 °C (73.4) °F	22.2 °C (72) °F	20.7 °C (69.3) °F	16.9 °C (62.5) °F	13.2 °C (55.8) °F	9.8 °C (49.6) °F	9.6 °C (49.3) °F	12.8 °C (55.1) °F	17.2 °C (62.9) °F	20 °C (68) °F	21.4 °C (70.6) °F	22.6 °C (72.6) °F
Min. Temperature °C (°F)	17 °C (62.6) °F	16.5 °C (61.8) °F	14.9 °C (58.8) °F	11 °C (51.8) °F	6.7 °C (44) °F	3 °C (37.5) °F	2.4 °C (36.3) °F	5.1 °C (41.2) °F	9.1 °C (48.3) °F	12.4 °C (54.3) °F	14.3 °C (57.7) °F	16.2 °C (61.1) °F
Max. Temperature °C (°F)	29.3 °C (84.7) °F	28.3 °C (82.9) °F	27 °C (80.6) °F	23.3 °C (74) °F	20.3 °C (68.6) °F	17.3 °C (63.2) °F	17.5 °C (63.5) °F	20.9 °C (69.7) °F	25.2 °C (77.4) °F	27.6 °C (81.7) °F	28.7 °C (83.6) °F	29.3 °C (84.7) °F
Precipitation / Rainfall mm (in)	97 (3)	77 (3)	72 (2)	48 (1)	20 (0)	12 (0)	7 (0)	16 (0)	15 (0)	53 (2)	66 (2)	94 (3)
Humidity(%)	52%	55%	54%	56%	53%	52%	45%	37%	31%	36%	40%	48%
Rainy days (d)	10	9	7	6	3	1	1	2	2	5	7	9
avg. Sun hours (hours)	11.2	10.8	10.0	9.3	9.1	8.8	9.2	9.6	10.3	10.9	11.4	11.5

8.2.2 RAINFALL

The rainfall of the region peaks during the summer months and the Mean Annual Precipitation (MAP) of the area is approximately 577 mm[39]. Precipitation is the lowest in July, with an average of 7 mm | 0.3 inch. Most of the precipitation here falls in January, averaging 97 mm (**Figure 35** & **Figure 36**).

[39] Climate data. Source: https://en.climate-data.org/africa/south-africa/free-state/riebeeckstad-27308/

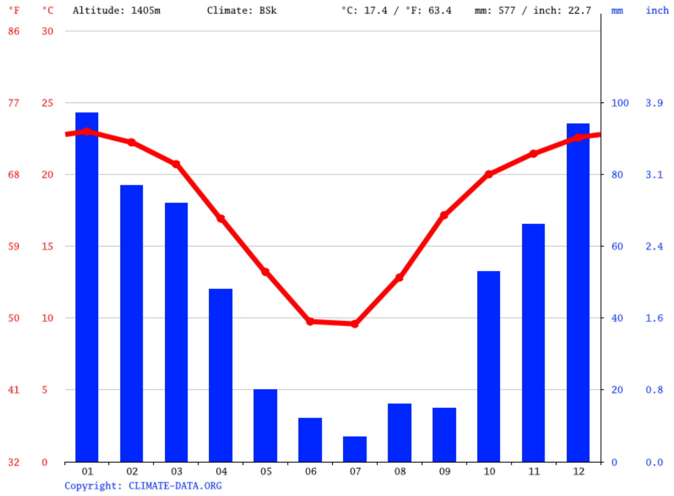


Figure 35: Average rainfall data for a 12-month period in Riebeeckstad

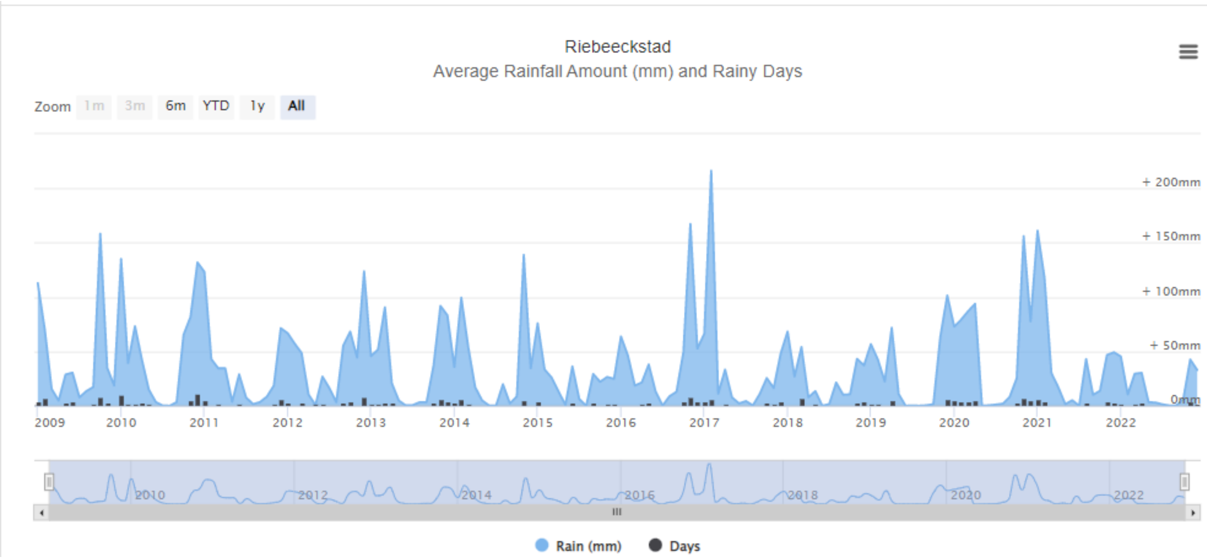


Figure 36: Yearly rainfall and rain days averages (Source: worldweatheronline.com)

8.2.3 HOURS OF SUNSHINE

In Riebeeckstad, the month that is graced with the most daily hours of sunshine is December with an average of 11.48 hours of sunshine. In total, there are 356.02 hours of sunshine throughout December months.

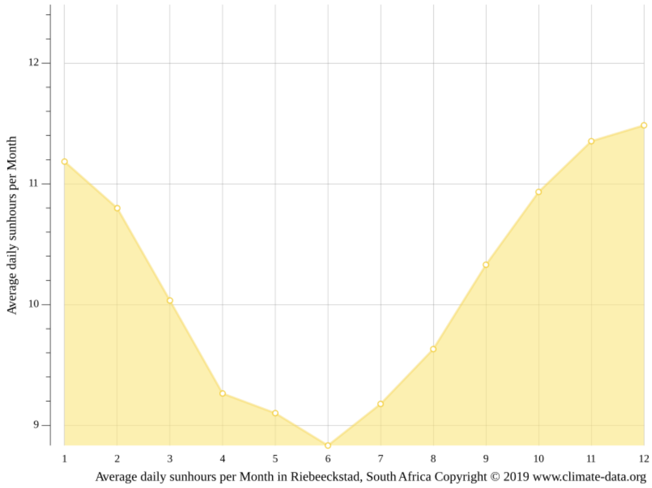


Figure 37: Average daily sun hours per month in Riebeeckstad

In Riebeeckstad, the sun shines for an average of 3713.58 hours per year. That comes out to 122.12 hours of sunshine each month[40]. Please refer to **Figure 37**.

8.2.4 WIND

The windiest month (with the highest average wind speed) is November (14.4km/h) in Riebeeckstad. The calmest month (with the lowest average wind speed) is May (9km/h). These average wind speeds are too low to function a wind farm optimally in this region. **Figure 38** illustrate the annual wind speed and wind gust averages for the past 13 years.

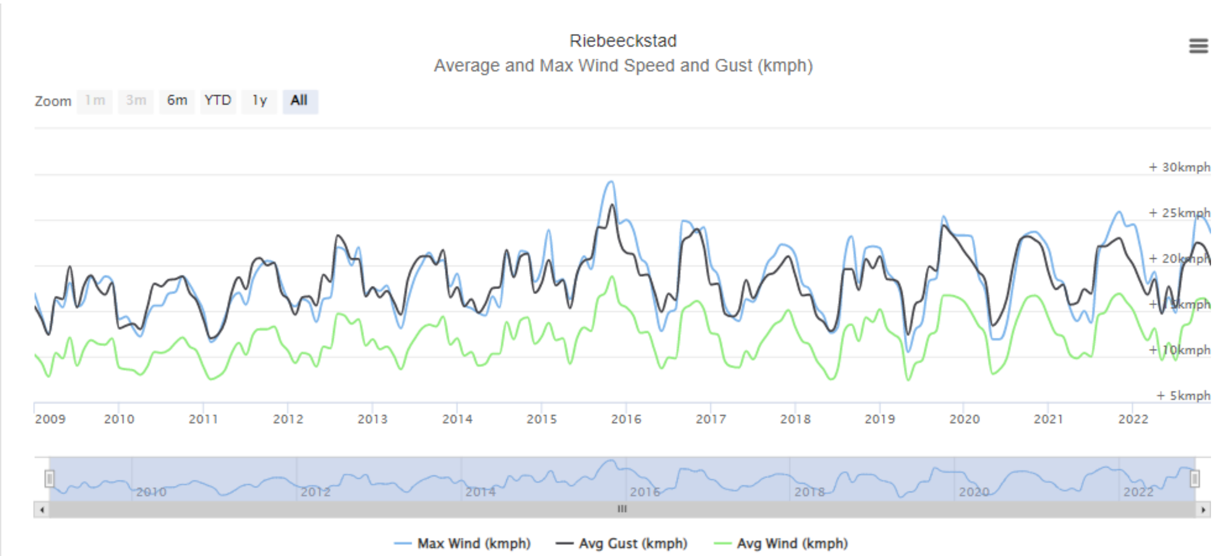


Figure 38: Annual wind speed and wind gust averages (Source: worldweatheronline.com)

[40] 2019. Climate-data.org

8.2.5 CLIMATE CHANGE

Climate change projections for the region indicate high-range warming with temperature increases from 2.5 – 3.3°C as well as more very hot days (> 35°C) in the next 30 years[41]. It is anticipated that there will be an increase in annual rainfall by as much as 100 mm/year, together with more extreme convective rainfall events and the associated increases in lightning strikes. Along with 1998 and 2010, 2014, 2015 and 2016 are widely recognised as the warmest years on record. The regional distribution of temperature increases is not uniform, however, and some regions have experienced greater change than others.

There is strong evidence that the average land-surface temperature has increased across Africa over the last century (**Figure 39**), and that this warming has been particularly marked since the 1970s with the decade of the 2000s being the warmest (**Figure 40**)[42].

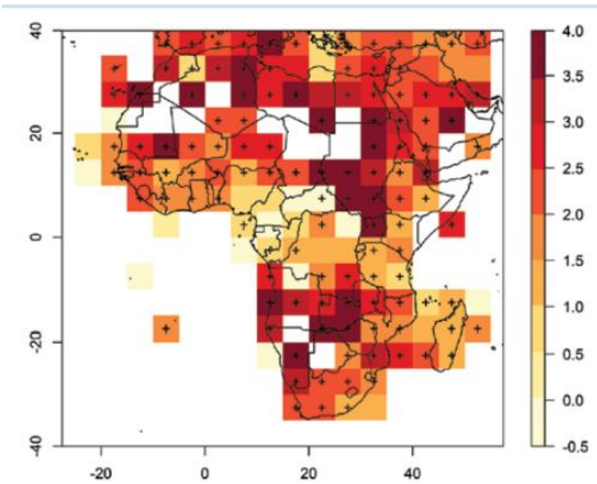


Figure 39: Observed trends in annual average near-surface temperature (°C per decade) over Africa for the period 1961-2014 based on CRUTEM4v data. Crosses indicate grid boxes where the trend is statistically significant. White areas indicate incomplete or missing data.

[41] Stocker, T., Qin, D., Plattner, G., Tignor, M., Allen, S., Boschung, J., Nauels, A., Xia, Y., Bex, B. & Midgley, B. 2013b, "IPCC, 2013: Climate Change 2013: The physical science basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change", Cambridge Univ. Press, Cambridge

[42] Davis-Reddy, C.L. and Vincent, K. 2017: Climate Risk and Vulnerability: A Handbook for Southern Africa (2nd Ed), CSIR, Pretoria, South Africa.

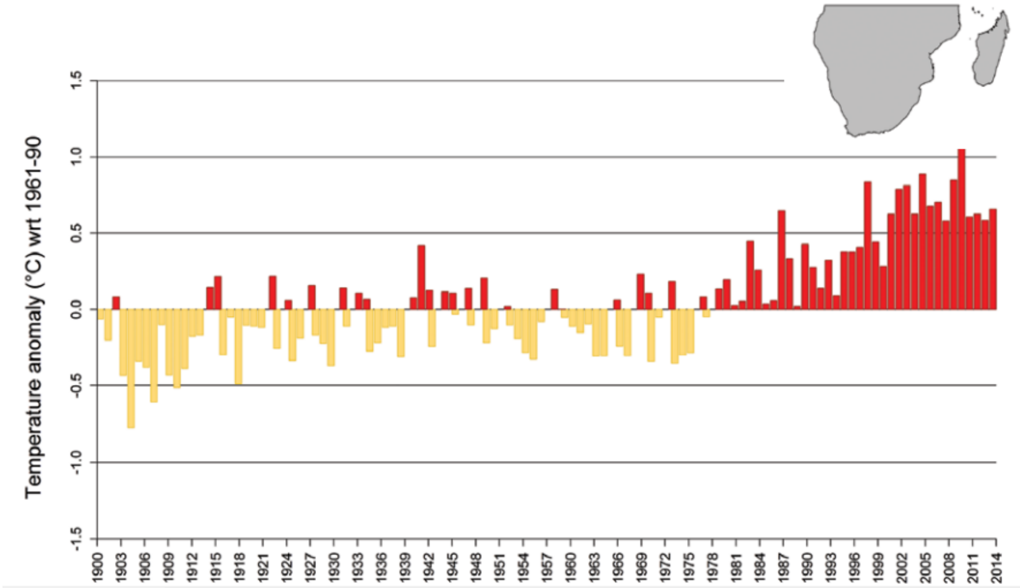


Figure 40: Mean annual temperature anomaly (°C) over southern Africa from 1901 to 2014 with respect to the long-term average climatology 1961-1990; based on the gridded CRUTEMv4 data set. Red represents a positive anomaly and yellow a negative temperature anomaly.

8.3 BIOPHYSICAL CHARACTERISTICS OF THE PROJECT SITE

The following section provides an overview and description of the biophysical characteristics of the study area and has been informed by specialist studies (**Appendix D - L**) undertaken for this EIA Report.

8.3.1 TOPOGRAPHY

Topographically the study area is relatively flat and occurs between 1 380 and 1 400 meters above sea level (Mucina et al., 2006). Refer to **Figure 41**. The site is on very flat land with very low slope gradients[43].

[43] Lanz, J. 2022. Site sensitivity verification and agricultural compliance statement for Khauta North SPV Facility near Welkom, Free State Province. Specialist Report dated 8 September 2022.

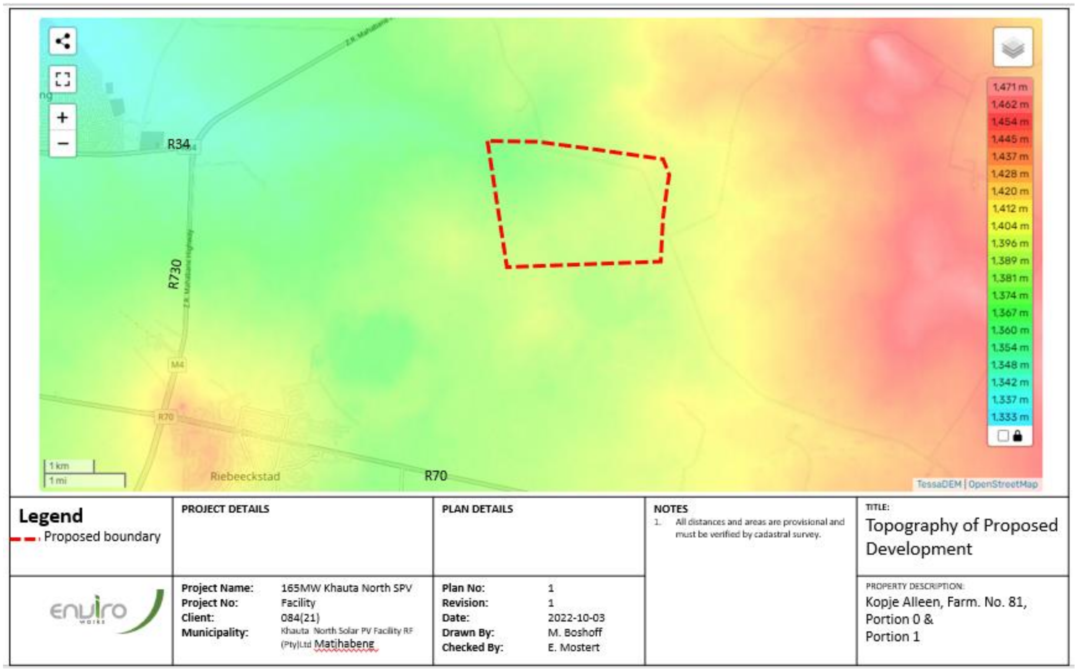


Figure 41: General topography of the project site.

8.3.2 GEOLOGY AND SOILS

According to Mucina & Rutherford (2006), the assessment area (**Figure 42**) is mainly covered by deep sandy to clayey alluvial soils developed over quaternary alluvial sediments. Both alluvial and residual soil layers are expected to comprise high clay contents and highly expansive clay minerals.

Findings by Dr Johann Lanz (2022), indicated that the geology is Ecca sandstone, shale and mudstone. The entire site falls within one land type, Db1. The land type soil data as well as the soil data from investigated auger samples across the site is given in the Agricultural Specialist Assessment Report in Appendix D. The land type across the site has a high proportion of shallow, clay-rich soils predominantly of the Sterkspruit and Valsrivier soil forms that are unsuitable for crop production. The on-site soil investigation (**Figure 42**) confirmed the dominance of these shallow, clay-rich soils across the site. Although there are pockets of better soil on the site, these are too small and occur between unsuitable soils, and are therefore not viable for cropping. The cropping potential is constrained by the shallow depth above the limiting, dense clay horizon in the subsoil. In the relatively low rainfall of the site (491 to 500 mm per annum), the shallow soils have too little potential root volume and moisture reservoir to support viable cropping. This land is therefore only suitable for grazing. The long-term grazing capacity of the site is 7 hectares per large stock unit.

Based on the expected presence of deep alluvial and residual soils overlying the bedrock, driven piling systems should be considered as founding solutions for the proposed solar panels. Piling systems would have to be designed to resist heave action of expansive clays. Where shallow bedrock is encountered, founding of the solar PV support structures may take place by means of pad foundations (BVi, 2021).

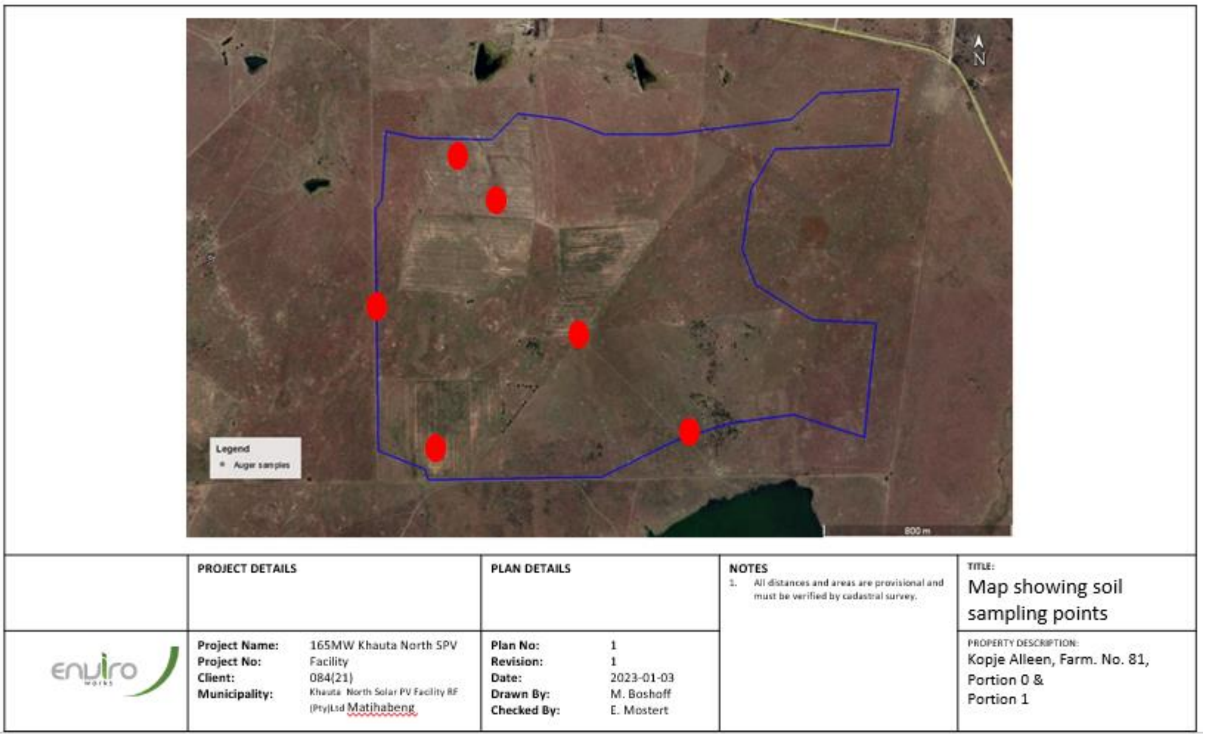


Figure 42: Location of the soil sampling points.

8.3.3 LAND-USE

The proposed development is located on old historically cultivated agricultural lands, approximately 4 km from the urban edge of Riebeeckstad. All the lands across the project area are currently used only for grazing. These lands are likely to have been cropped with economic viability in the past, but they have been abandoned as cropland because they were found to be too marginal for viable crop production as the agricultural economy became more challenging, particularly in terms of high input costs (Dr Johann Lanz, 2022).

There are several mining operations surrounding Welkom, which lie to the south and the east of the proposed solar PV development. The nearest mine shaft is located 7 km from the SPV Cluster.

8.3.4 AGRICULTURAL POTENTIAL

The assessment area consisted of a mosaic of mainly natural undisturbed terrestrial grassland and to a lesser extent, old historically cultivated agricultural lands, which was last cultivated approximately seven (7) years ago.

The majority of the proposed site is classified on the Screening Tool as less than high (medium) sensitivity for impacts on agricultural resources (refer to **Figure 43**). The 2016 Land Capability Evaluation (Department of Agriculture, Forestry and Fisheries) identified the farm portion as having low-moderate soil capability for long term agricultural use. This was verified in the agricultural assessment by the specialists as the area being of medium sensitivity for impacts on agricultural resources with a land capability value of 6 to 7. Parts of the site are allocated high agricultural sensitivity on the Screening Tool, because they were under crop production in the past. However, the high sensitivity was disputed because the lands have not been used for crop production for an extended period and so should no longer be classified as cropland or allocated high sensitivity because of it.

Figure 43: The proposed development footprint overlayed on agricultural sensitivity, as given by the DFFE Screening Tool (Yellow = Medium; Red = high).

The specialist findings by Dr Johann Lanz (2022) indicated that the land was assessed as being of insufficient land capability for viable and sustainable future crop production. The cropping potential of the site is limited by the combination of fairly low rainfall and shallow soils limited by dense clay and poor drainage in the subsoil.

The cropping potential of the soils across the site is constrained. The land type across the site has a high proportion of shallow, clay-rich soils of the Sterkspruit and Valsrivier soil forms that are unsuitable for crop production. The on-site soil investigation confirmed the dominance of these shallow, clay-rich soils across the site. Although there are pockets of better soil on the site, these are too small and occur between unsuitable soils, and are therefore not viable for cropping. The cropping potential is constrained by the shallow depth above the limiting, dense clay horizon in the subsoil. In the relatively low rainfall of the site (491 to 500 mm per annum), the shallow soils have too little potential root volume and moisture reservoir to support viable cropping. This land is therefore only suitable for grazing.

Because of the lack of cropping potential, a high agricultural sensitivity or a land capability of more than 7 is not therefore justified for this site. The high agricultural sensitivity attributed to parts of the site by the screening tool as a result of cropping status is therefore disputed by this assessment.

This site sensitivity verification verifies the entire site as being of medium agricultural sensitivity with a land capability value of 6 to 7. The land capability value is in keeping with the soil and climate limitations that make the site too marginal for crop production.

The allowable development limit for non-cropland with a land capability value of less than 8 (as this site has been confirmed to be in the site sensitivity verification report (**Appendix T**)), is 2.5 ha per MW. The proposed agricultural footprint of the facilities is approximately 273 hectares, and the generation capacity is 165 MW. This is well within the 2.5 ha per MW limit. The conclusion of this assessment is that the proposed development will not have an unacceptable negative impact on the agricultural production capability of the site.

8.3.5 SURFACE WATER

The proposed development area and surrounding 500 m 'zone of influence' fall within the Middle Vaal Water Management Area (WMA 9). And most of the development footprint falls within the associated C25B quaternary surface water catchment- and drainage area.

A local but extensive linear topographic highpoint/ridge apex traverses the proposed development area, which roughly lies in a south-west to north-east direction. This highpoint/ridge apex acts as the main natural linear surface water runoff- and drainage separator, between the C25B quaternary surface water catchment- and drainage area situated north of- and the C42J quaternary surface water catchment- and drainage area situated south of the highpoint/ridge apex, respectively. Surface water runoff from the local area consequently mainly drains either in a northerly- or southerly direction, depending on which side of the highpoint/ridge apex the area is situated. The majority of the proposed development area drains towards the north, while merely the small south-eastern portion drains towards the south.

8.3.5.1 WATERCOURSE BASELINE INFORMATION

During the site visit by the aquatic specialist (EcoFocus Consulting (Pty) Ltd in January, February and April 2022 it was noted that a significant second-order seasonal watercourse known as the Sandspruit, flows past the proposed development area, approximately 700 m to the north and continues in a westerly direction. It then eventually discharges into the Vaal River. The Sandspruit is deemed the only significant watercourse associated with the proposed development area. Surface water runoff from the central and northern portions of the assessment area situated north of the highpoint/ridge apex, consequently, mainly drains towards this watercourse.

8.3.5.2 SIGNIFICANT WATERCOURSE

A significant first-order seasonal watercourse/tributary (**Figure 44**) associated with the commencement portion of the Sandspruit, flows past the proposed development area, approximately 200 m to the north and continues in a westerly direction. Surface water runoff from the majority of the proposed development area which is situated north of the highpoint/ridge apex (see discussion earlier above), consequently mainly drains towards this watercourse. This watercourse discharges into the Sandspruit, approximately 700 m to the north-west of the proposed development area.

Although four (4) earth dams have been artificially constructed within the watercourse, the watercourse and associated earth dams still house locally distinct and important aquatic and semiaquatic habitats, which are mainly dominated by hydrophytic grass- and -graminoid species.

The Present Ecological State (PES) of the watercourse is classified as Class C as it is moderately modified. Moderate loss and transformation of natural habitat and biota have occurred, mainly as a result of the artificial construction of the four (4) earth dams within the portion of the watercourse situated to the north of the proposed development area. Significant anthropogenic impeding and modification of the original flow regime of the watercourse has therefore taken place.

The watercourse and associated earth dams however still house locally distinct and important aquatic and semi-aquatic habitats, which are mainly dominated by hydrophytic grass- and -graminoid species. These locally distinct and important aquatic and semi-aquatic habitats are also visibly utilised by various common and habitat-specific waterbirds, amphibian species and aquatic invertebrates as refuge and for breeding, foraging and/or persistence purposes. The presence of the avifauna is discussed in more detail in the avifauna section. The basic ecosystem functionality has therefore remained predominantly unchanged.

Figure 44: Two images illustrating the presence of second-order seasonal watercourse 200m north of the proposed site.

The Ecological Importance and Sensitivity (EIS) of the watercourse is classified as Class C (moderate) as it is viewed as being ecologically important and sensitive on provincial scale. The watercourse discharges into the Sandspruit, approximately 700 m to the north-west of the proposed development area and therefore forms an important part of the local and broader quaternary surface water catchment- and drainage area, towards the west.

It is therefore recommended that the watercourse as well as a portion of the surrounding natural undisturbed terrestrial grassland, must be adequately buffered out. No current or future development is allowed to take place within this buffered zone.

Due to the locally distinct and important nature of the aquatic and semi-aquatic habitats of the watercourse and associated earth dams, the local area is furthermore viewed as being of moderate to high conservational significance/value for habitat preservation and ecological functionality persistence in support of the surrounding aquatic ecosystem and the associated habitat-specific waterbirds, amphibian species and aquatic invertebrates. The presence of the Critical Biodiversity Area one (CBA 1), further substantiates the ecological importance of this area.

From an aquatic ecological/biodiversity perspective, the important aquatic and semi-aquatic habitats therefore also need to be adequately preserved. When taking into account the significant visual impacts of the glare/shine on waterbirds as well as the significant collision and mortality risk to nocturnal avifaunal species, a minimum approximately 200 m Biodiversity Buffer distance is therefore recommended to be implemented on both sides of the watercourse edges.

8.3.5.3 PREFERENTIAL WATER FLOW PATHS

Three small preferential water flow paths/drainage lines are present within the north-western corner of the proposed development area (**Figure 45**). These flow paths/drainage lines traverse a number of old historically cultivated agricultural lands and merely assist with channelling surface water runoff from a very small portion of the proposed development area, towards the significant watercourse to the north.

Figure 45: Photo of the small preferential water flow within the north-western corner of the site.

Due to the lack of continuous water flow through the local area, these flow paths/drainage lines do not possess any ecologically/conservationally significant semi-aquatic habitat. They rather house a similar terrestrial grassland vegetation composition and -structure relative to the surrounding landscape, with merely slight variations in species representation. These flow paths/drainage lines therefore merely play a minor assisting role in the local catchment and drainage and are not viewed as being of any conservational significance/value, from a hydrological or aquatic ecological/biodiversity perspective.

8.3.5.4 WETLANDS

A wetland is found where the land is wet enough (i.e., saturated or flooded) for long enough to be unfavourable to most plants but are favourable to plants adapted to anaerobic soil conditions. As soil becomes increasingly wet, the water starts to fill the space between the soil particles. Many wetlands are land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil (from the South African National Water Act; Act No. 36 of 1998).

Wetlands can be identified by three basic indicators[44] namely vegetation, hydrology and soils. All three characteristics must be present during some portion of the growing season for an area to be a jurisdictional wetland.

An aquatic ecosystem is an ecosystem that is permanently or periodically inundated by flowing or standing water, or which has soils that are permanently or periodically saturated within 0.5 m of the soil surface. Based on these definitions, for the purpose of the Classification System, wetlands are considered to be a type of aquatic ecosystem because it is the presence of water at some stage (either permanently or periodically, sometimes rather ephemerally) that distinguishes a wetland ecosystem from a terrestrial ecosystem.

[44]The Wetlands Initiative, Web address: http://www.wetlands-initiative.org/what-is-a-wetland. Accessed 4 Feb 2023.

The amount of water present in a wetland can vary greatly. Some wetlands are permanently flooded, while others are only seasonally flooded but retain saturated soils throughout much of the unflooded period. Still other wetlands may rarely flood, but saturated soil conditions still are present long enough to support wetland-adapted plants and for hydric soil characteristics to develop. Hydric soils develop when chemical changes take place in the soil due to the low-oxygen conditions associated with prolonged saturation.

Different plant communities may be found in different types of wetlands, with each species adapted to the local hydrology (the quantity, distribution, and movement of water throughout a given area). Wetland plants are often referred to as hydrophytes because they are specially adapted to grow in saturated soils. Many bird, insect, and other wildlife species are completely dependent on wetlands for critical stages in their life cycles, while many other species make use of wetlands for feeding, resting, or other life activities. Wetlands fulfil important ecological functions such as flood prevention, groundwater recharge, erosion control, habitat and food for various species.

There are many different types of wetlands[45], each determined by its hydrology, water chemistry, soils, and the plant species found there (**Figure 46**). Wetlands may be characterized as dominated by trees, shrubs, or herbaceous vegetation. They may be fed by precipitation, runoff, or groundwater, with water chemistry ranging from very acidic to alkaline.

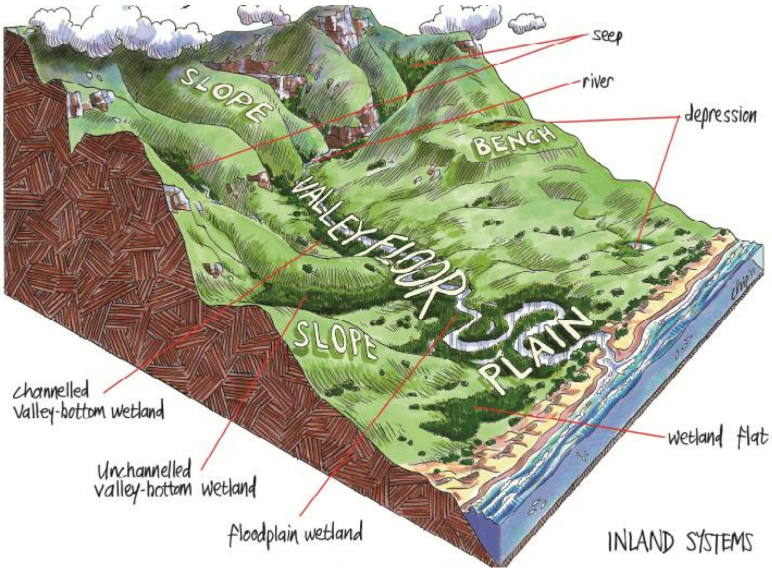


Figure 46: Illustration of hydrogeomorphic (HGM) types of wetlands (Source Ollis, D. Snaddon, K., Job, N. & Mbona , N. 2013)

The types of wetlands that occur in the project site area are discussed in more detail below.

[45] Ollis, D. Snaddon, K., Job, N. & Mbona , N. 2013 Classification systems for wetlands and other aquatic ecosystems in South Africa: User manual: Inland systems. SANBI Biodiversity Series 22. South African National Biodiversity Institute, Pretoria. Web address: http://biodiversityadvisor.sanbi.org/wp-content/uploads/2016/07/Classification-system-for-wetlands-other-aquatic-ecosystems.pdf. Accessed 4 Feb 2022.

8.3.5.4.1 DEPRESSION WETLANDS

Two naturally occurring depression wetlands (**Figure 47**) are present, approximately 200 m east and 350 m west of the proposed development area, respectively. Both of these wetlands are situated north of the highpoint/ridge apex and their surrounding landscapes therefore mainly slope towards the north. The small portion to the west of the westerly located wetland however rather drains towards the east, in the direction of this wetland.

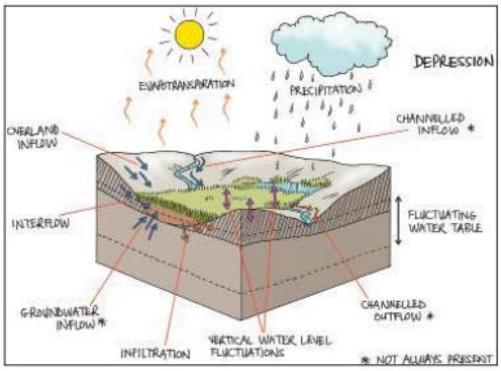


Figure 47: Illustration of depression wetland (Source: Ollis et al. 2013)

The wetlands are seasonally/temporarily inundated and no distinct surface water flow paths into or out of the wetlands are evident, as they rather constitute slight surface depressions within the local landscape. The westerly located wetland (**Figure 48**) therefore merely collects rainwater as well as general surface water runoff from a very limited upstream area to its south and west, but which is still situated to the north of the highpoint/ridge apex. Surface water flow towards this wetland will not be directly impacted by the proposed development as the area rather drains away from the wetland, towards the north. The easterly located wetland however collects rainwater as well as general surface water runoff from a more extensive upstream area to its south, which consists of a significant portion of undeveloped land and a small portion of the proposed development area, but which is still situated to the north of the highpoint/ridge apex.

Figure 48: Photo of the naturally occurring depression wetland, which is situated 350m west of the proposed development site.

The broader area to the west and north-west of the proposed development area along with the most northerly portion of the westerly located wetland, are classified as a Critical Biodiversity Area one (CBA 1), according to the Free State Provincial Spatial Biodiversity Plan 2018 (Collins, 2018).

The wetlands house locally distinct and important semi-aquatic habitats within their basins and around their edges, which are mainly dominated by the hydrophytic grass species *Echinochloa holubii*, *Diplachne fusca*, *Eragrostis plana*, *Themeda triandra*, *Paspalum spp*. and *Setaria spp*. as well as the hydrophytic graminoid species *Cyperus spp*.

The locally distinct and important semi-aquatic habitats of the wetlands are also likely utilised by various common and habitat-specific waterbirds, amphibian species and aquatic invertebrates as refuge and for breeding, foraging and/or persistence purposes. It is therefore highly likely that the semi-aquatic habitats of the identified wetlands and local surrounding terrestrial grassland landscapes are utilised by individuals and/or pairs of Marsh owls (*Asio capensis*) and Grass owls (*Tyto capensis*) as refuge and for breeding, foraging and/or persistence purposes. The latter species is nationally classified as a Vulnerable Red Data Listed bird species, due to extensive habitat degradation and loss.

The Present Ecological State (PES) of the wetlands is classified as Class A as they are unmodified, natural and pristine. The wetlands house locally distinct and important semi-aquatic habitats within their basins and around their edges, which are mainly dominated by hydrophytic grass- and graminoid species. These locally distinct and important semi-aquatic habitats are also likely utilised by various common and habitat-specific waterbirds, amphibian species and aquatic invertebrates as refuge and for breeding, foraging and/or persistence purposes. The ecosystem functionality has therefore remained unchanged.

The Ecological Importance and Sensitivity (EIS) of the wetlands is classified as Class C (moderate) as they are viewed as being ecologically important and sensitive on local and possibly provincial scale.

It is therefore recommended that the depression wetlands as well as portions of the surrounding natural undisturbed terrestrial grasslands, must be adequately buffered out. No current or future development is allowed to take place within these buffered zones. A minimum approximately 80 m Water Quality Buffer distance is therefore recommended to be implemented around the wetlands.

8.3.5.4.2 UNCHANNELED VALLEY-BOTTOM WETLAND

A significantly sized, broad naturally occurring unchanneled valley-bottom wetland is present, approximately 80 m south-west of the proposed development area. This wetland is situated to the south of the highpoint/ridge apex and its surrounding landscape therefore mainly slopes towards the south.

Surface water runoff from a substantial portion of the landscape to the south of the highpoint/ridge apex, consequently, mainly channels and drains flow through this wetland, towards the lower lying southwest. Surface water flow towards this wetland will not be directly impacted by the proposed development as the wetland and proposed development area are topographically separated by the presence of the highpoint/ridge apex.

Due to the sloping topography of the area along with a lack of continuous water flow through the local area, this wetland does not possess any ecologically/conservationally significant semi-aquatic habitat. It rather houses a similar terrestrial grassland vegetation composition and -structure, relative to the surrounding landscape, with merely slight variations in species representation. The wetland is therefore not expected to be specifically utilised by any habitat-specific waterbirds, amphibian species and/or aquatic invertebrates as refuge or for breeding, foraging and/or persistence purposes.

The wetland is mainly dominated by the terrestrial grass species *Eragrostis chloromelas*, *Themeda triandra*, *Cynodon dactylon* and *Sporobolus spp*. The grass species *Eragrostis curvula*, *E gummiflua*, *E superba*, *E plana*, *Panicum spp*., *Paspalum spp*. and *Setaria spp*. as well as the hydrophytic graminoid species *Cyperus spp*., were also found to be present, but to a lesser extent (**Figure 49**).

Figure 49: Photo of the unchanneled valley-bottom wetland situated 80m south-west of the proposed development site.

The wetland gradually flows into a subsequent significantly sized naturally occurring unchanneled valley-bottom wetland, located further downstream to the south-west. The outflow of this subsequent wetland further flows into an artificially constructed earth dam which in turn, finally discharges into a significantly sized depression pan, located approximately 2.4 km south-west of the proposed development area.

It is therefore evident that this unchanneled valley-bottom wetland situated approximately 80 m to the south-west of the proposed development area, forms an important part of the hydrological and aquatic ecological connectivity of the local and broader quaternary surface water catchment- and drainage area, towards the west.

The PES of the wetland is classified as Class B as it is largely natural. A small change in natural habitats and biota may have taken place, mainly as a result of continual livestock grazing activities. The ecosystem functionality has however remained essentially unchanged. Due to the lack of continuous water flow through the local area, this wetland does not possess any ecologically/conservationally significant semi-aquatic habitat. It rather houses a similar terrestrial grassland vegetation composition and -structure, relative to the surrounding landscape with merely slight variations in species representation. The wetland is therefore not expected to be specifically utilised by any habitat-specific waterbirds, amphibian species and/or aquatic invertebrates as refuge or for breeding, foraging and/or persistence purposes.

The EIS of the wetland is classified as Class C (moderate) as it is viewed as being ecologically important and sensitive on a local scale. Due to it forming an important part of the hydrological and aquatic ecological connectivity associated with the local and broader quaternary surface water catchment- and drainage area, the local area is viewed as being of moderate conservational significance/value for habitat preservation and ecological functionality persistence, in support of the surrounding aquatic ecosystem.

It is therefore recommended that the unchanneled valley-bottom wetland as well as a portion of the surrounding natural undisturbed terrestrial grassland, must be adequately buffered out. No current or future development is allowed to take place within this buffered zone.

8.3.5.4.3 DEPRESSION PAN

The Commandants Pan constitutes a well-known significantly sized naturally occurring depression pan, which is situated approximately 270 m south of the proposed development area. The pan is seasonally/temporarily inundated, and its main inflow originates from a significantly sized unchanneled valley-bottom wetland, situated approximately 550 m east of the proposed development area as well as an associated watercourse. A broad surface water outflow is also evident on the southern side of the pan. This outflow constitutes a watercourse and water drainage plain/valley-bottom wetland, which gradually flows in a south-westerly direction and eventually flows into a second smaller depression pan, located approximately 2.5 km south-west of the proposed development area. This second pan in turn, discharges into an artificially constructed earth dam, located approximately 2.3 km south-west of the proposed development area, which finally discharges into a significantly sized depression pan, located approximately 2.4 km south-west of the proposed development area.

The pan also collects rainwater as well as general surface water runoff from a limited upstream area to its north, but which is still situated to the south of the highpoint/ridge apex as well as from a substantial area, situated to its west. Surface water flow towards this pan will merely be very slightly impacted by the proposed development as the pan and proposed development area are mostly topographically separated by the presence of the highpoint/ridge apex. Merely the small south eastern portion of the proposed development area drains towards the south, in the direction of the pan.

It is therefore evident that all these aquatic features along with their associated in- and outflows, form an important part of the hydrological and aquatic ecological connectivity of the local and broader quaternary surface water catchment- and drainage area, towards the west.

The pan (**Figure 50**) houses a locally distinct and important semi-aquatic habitat within its basin and around its edges, which is mainly dominated by the hydrophytic grass species *Themeda triandra*, *Eragrostis curvula*, *E. plana*, *Paspalum spp*. and *Setaria spp*. as well as the hydrophytic graminoid species *Cyperus spp*. The more terrestrial grass species *Panicum spp*., *Aristida spp*., *Digitaria eriantha*, *E. gummiflua*, *E. superba*, *Cymbopogon pospischilii* and *Elionurus muticus* were also found to be present throughout the semi-aquatic habitat of the pan, but to a lesser extent.

The locally distinct and important semi-aquatic habitat of the pan is also visibly utilised by various common and habitat-specific waterbirds, amphibian species and aquatic invertebrates as refuge and for breeding, foraging and/or persistence purposes.

Figure 50: Photo of the naturally occurring Commadants Pan, situated 270 m south of the proposed development site.

The PES of the Commandants Pan is classified as Class A as it is unmodified, natural and pristine. The pan houses a locally distinct and important semi-aquatic habitat within its basin and around its edges, which is mainly dominated by hydrophytic grass- and graminoid species.

This locally distinct and important semi-aquatic habitat is also visibly utilised by various common and habitat-specific waterbirds, amphibian species and aquatic invertebrates as refuge and for breeding, foraging and/or persistence purposes, although the focus of the site assessment was not on avifauna. The ecosystem functionality has therefore remained unchanged.

The EIS of the Commandants Pan is classified as Class C (moderate) as it is viewed as being ecologically important and sensitive on local and possibly provincial scale. Due to it forming an important part of the hydrological and aquatic ecological connectivity associated with the local and broader quaternary surface water catchment- and drainage area, the local area is viewed as being of moderate conservational significance/value for habitat preservation and ecological functionality persistence, in support of the surrounding aquatic ecosystem.

It is therefore recommended that the Commandants Pan as well as a portion of the surrounding natural undisturbed terrestrial grassland, must be adequately buffered out. No current or future development is allowed to take place within this buffered zone. A minimum of approximately 80 m Water Quality Buffer distance and a minimum approximately 250 m Biodiversity Buffer is therefore recommended to be implemented around the Commandants Pan.

8.3.5.5 AQUATIC ECOLOGICAL SITE SENSITIVITY MAP

Based on the aquatic assessment and subsequent recommendations of the aquatic specialist an aquatic site sensitivity map was compiled to delineate the identified significant watercourse, preferential water flow paths/drainage lines, two depression wetlands, unchanneled valley-bottom wetland and the Commandants Pan, which are present throughout the proposed development area and surrounding 500 m ‘zone of influence’.

The recommended buffer zones to be implemented around the various aquatic features, are also illustrated below. The development footprint was adjusted to take the buffer zones into consideration and the layout was amended accordingly. Please see **Figure 51.**

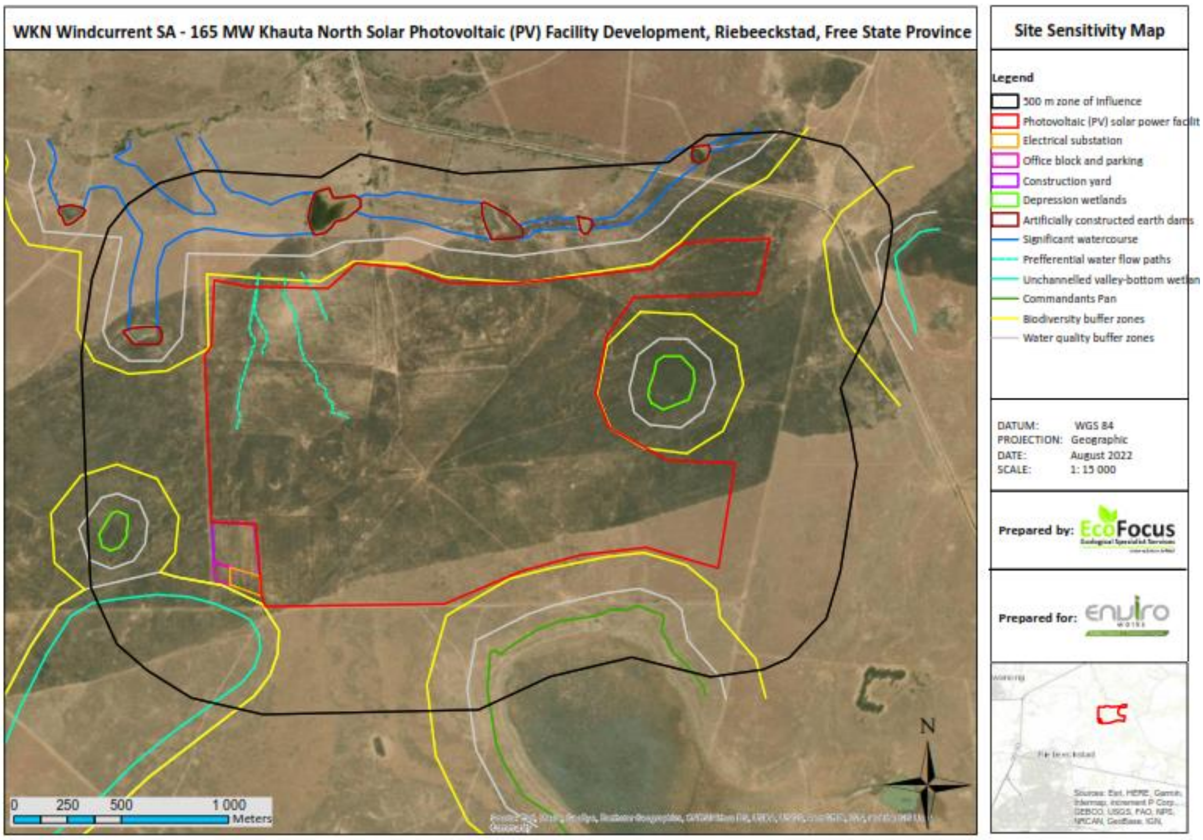


Figure 51: Aquatic site sensitivity map with the wetlands delineated and recommended buffer zones with proposed developent layout.

Five artificially constructed earth dams are present within- and along the length of the seasonal watercourse/tributary associated, approximately 210 m to the north and east of the assessment area. The watercourse and associated earth dams, house locally distinct and important aquatic and semi-aquatic habitats, which are visibly utilised by various common and habitat-specific waterbirds, amphibian species and aquatic invertebrates for breeding, foraging and/or persistence purposes.

Three small preferential water flow paths/drainage lines are present within the central-northern portion of the development footprint (see figure below). These flow paths/drainage lines traverse some old historically cultivated agricultural lands and merely assist with channeling surface water runoff from a very small portion of the assessment area, towards the significant watercourse to the north. A Water Use License Application (WULA) shall be submitted to the Department of Water and Sanitation (DWS), to request authorisation for the proposed development through the flow paths/drainage lines, in accordance with the National Water Act (Act 36 of 1998).

The Commandants Pan constitutes a well-known significantly sized naturally occurring depression pan, which is situated approximately 270 m south-east of the assessment area. The pan is seasonally/temporarily inundated, and the inflow of the pan mainly originates from a significantly sized unchanneled valley-bottom wetland, situated approximately 550 m east of the assessment area.

A significantly sized naturally occurring unchanneled valley-bottom wetland, is located approximately 110m south-east of the assessment area. The localised topography flattens-out slightly in the vicinity of the subsequent unchanneled valley-bottom wetland, which results in this subsequent wetland being seasonally/temporarily inundated.

One naturally occurring depression wetland is situated approximately 216 m east of the assessment area, respectively.

The layout and designed of the facility (see **Figure 51**) have been informed with the input of registered terrestrial, biodiversity and aquatic specialists. Recommendations were incorporated into the layout design in an attempt to maintain the hydrological and ecological functionality and -integrity of the watercourses and semi-aquatic fauna in the area and to prevent any significant increase in sediment inputs and contamination. The following buffer zones[46] were incorporated into the layout design of the facility, comprising:

- A minimum **water quality buffer** of 80 m from the edge of watercourse and associated earth dams and depression wetland.
- a minimum **water quality buffer** of 80 m around the edge of the unchanneled valley-bottom wetland and the Commandants Pan
- A minimum **biodiversity buffer** of 200 m from the edge of all watercourse and associated earth dams.
- A minimum **biodiversity buffer** of 250 m around the Commandants Pan and depression wetland.

Watercourses, preferential water flow paths/drainage lines were assessed within the boundaries of the farms to ensure the proposed development footprint does not impact on the water courses.

8.3.6 GROUND WATER

The operational phase of the proposed solar facility will require significant volumes of raw and potable water to maintain the processes. Water for the operational processes associated with the proposed solar facility, will either be sourced from the local municipality (if adequate capacity is available) or be extracted from a borehole. Significant volumes of groundwater will therefore in all probability continually be extracted from the borehole, which could potentially lead to over extraction from the aquifer over time, if not adequately managed.

The aquifer beneath this site is classified as an intergranular fractured aquifer and the yield potential ranges between 0.1 - 0.5 ℓ/s. This is a minor aquifer and the depth to groundwater is approximately 37 m below ground level[47] (DWS GRA2, 2005).

[46] A Practical Field Procedure for the Identification and Delineation of Wetlands and Riparian Areas (DWAF, 2005).
[47] Product developed as part of Groundwater Resource Assessment Phase 2 (GRA2, 2005), and modelled as 1 km x1 km raster. Waterlevel Grid (mbgl)

Groundwater resource maps show that the aquifer is moderately vulnerable. Aquifer vulnerability indicates the tendency for contamination to reach the groundwater system after introduction to a location above the uppermost aquifer. As such, this aquifer is susceptible to contamination from pollutants that are continually discharged or leached.

In general terms, the groundwater in the vicinity of the project can be said to be slightly saline, with a marginally salty taste. The electrical conductivity, which provides a measure of the groundwater quality ranges from 70 – 150 mS/m.

8.3.7 AVIFAUNA

The site assessment revealed that the solar panels will be located on old farmlands that consist of overgrown vegetation. It was anticipated that bird species may be present within and around the proposed site as the area has several surrounding pans that attract a variety of waterfowl, including migrants.

8.3.7.1 SABAP2 DATA

A site assessment and information from the Second South African Bird Atlas Project 2 (SABAP2) was used in the avifauna assessment. The site of the proposed 165MW Khauta Solar PV development and associated infrastructure is located in pentad 2750_2650. The pentad occupies approximately 7,700 Ha, whereas the total EIA footprint is approximately 273 Ha. Please refer to **Figure 52**.

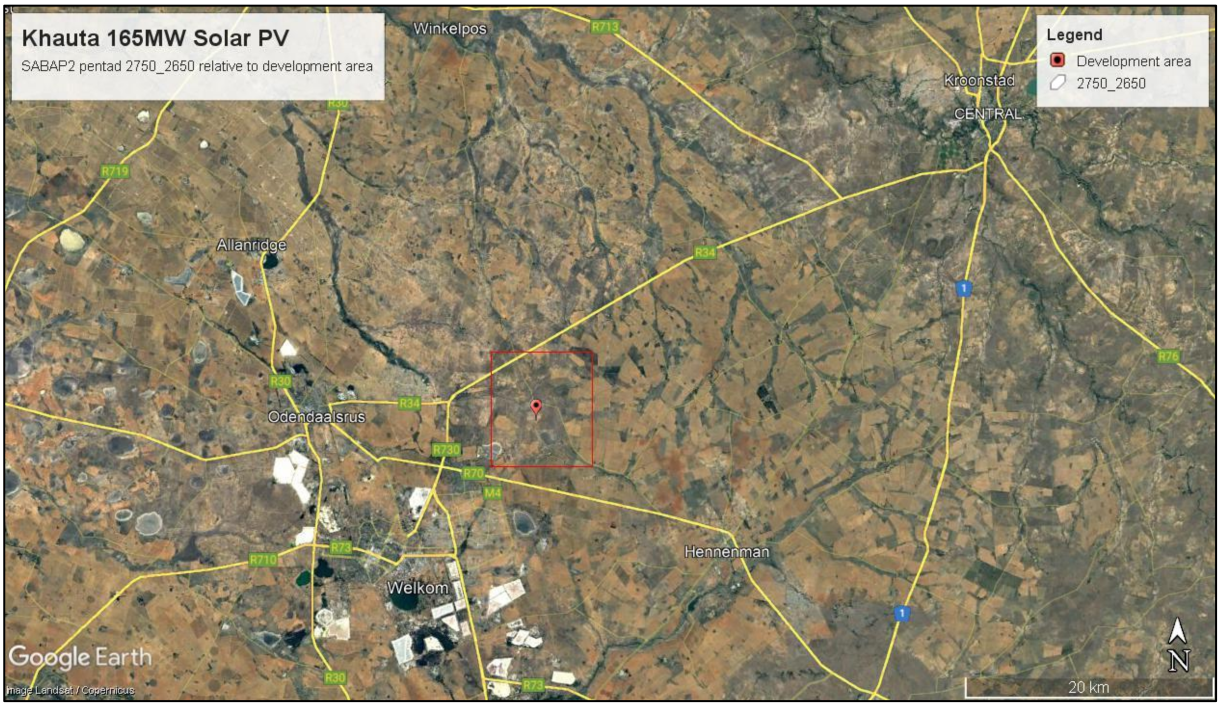


Figure 52: Location and extent of SABAP2 2750_2650 pentad relative to the 165MW Khauta Solar PV development site.

According to the SABAP2 species list in **Table 18**Table 18: List of avifaunal species encountered on site during structured surveys or recorded during SABAP2 assessments for the wider pentads., it is estimated that a total of 98 bird species could occur in the broader area. A total of 72 birds species were observed during the assessments. Of the 72 recorded bird species, 43 bird species have been previously observed during the second bird atlas project. A total of 29 bird species were not previously present during the second bird atlas project. This may be attributed the seasonal movement patterns of birds. There are many long-distance migrant species that will only be recorded during early to mid-summer and also some regional migrants and nomadic species that are more likely to occur in winter. One of the 29 newly observed species include the endemic Karoo Korkhaan. The vulnerable Secretarybird was encountered on site during assessments and during the second bird atlas project. Both the Karoo Korkhaan and the Secretarybird were only encountered once throughout the assessment.

Table 18: List of avifaunal species encountered on site during structured surveys or recorded during SABAP2 assessments for the wider pentads.

No.	Species	Observed during assessments
1	Acacia Pied Barbet	1
2	African Pipit	1
3	African Sacred Ibis	0
4	African Stonechat	0
5	Amur Falcon	0
6	Ant-eating Chat	1
7	Ashy Tit	0
8	Barn Swallow	0
9	Black-chested Prinia	1
10	Black-headed Heron	0
11	Blacksmith Lapwing	0
12	Black-throated Canary	1
13	Black-winged Kite	0
14	Black-winged Pratincole	0
15	Black-winged Stilt	0
16	Blue Korhaan	0
17	Bokmakierie	1
18	Brown-crowned Tchagra	1
19	Cape Longclaw	0
20	Cape Sparrow	1
21	Cape Turtle Dove	0
22	Cape Wagtail	1
23	Cardinal Woodpecker	1
24	Chestnut-vented Warbler	1
25	Cloud Cisticola	0
26	Common Buzzard	0
27	Common Cuckoo	0
28	Common Ostrich	0
29	Common Scimitarbill	0
30	Common Waxbill	0
31	Crowned Lapwing	1
32	Diederik Cuckoo	1
33	Eastern Clapper Lark	0
34	Egyptian Goose	0
35	Fiscal Flycatcher	1

No.	Species	Observed during assessments
36	Greater Striped Swallow	1
37	Grey Heron	0
38	Hadada Ibis	1
39	Helmeted Guineafowl	1
40	House Sparrow	0
41	Kalahari Scrub Robin	1
42	Laughing Dove	1
43	Lesser Grey Shrike	0
44	Lesser Kestrel	0
45	Levaillant's Cisticola	0
46	Long-billed Crombec	0
47	Long-tailed Paradise Whydah	0
48	Long-tailed Widowbird	1
49	Marsh Owl	1
50	Namaqua Dove	1
51	Neddicky	0
52	Northern Black Korhaan	0
53	Orange River White-eye	1
54	Pale Chanting Goshawk	0
55	Pink-billed Lark	1
56	Pin-tailed Whydah	0
57	Pririt Batis	0
58	Quailfinch	1
59	Red-backed Shrike	0
60	Red-billed Firefinch	0
61	Red-billed Quelea	1
62	Red-billed Teal	0
63	Red-eyed Dove	0
64	Red-faced Mousebird	0
65	Red-headed Finch	1
66	Red-knobbed Coot	0
67	Reed Cormorant	1
68	Rock Dove	0
69	Rock Kestrel	0
70	Rufous-naped Lark	1
71	Sabota Lark	0
72	Scaly-feathered Weaver	0
73	Secretarybird	1
74	South African Cliff Swallow	0
75	Southern Fiscal	1
76	Southern Grey-headed Sparrow	1
77	Southern Masked Weaver	0
78	Southern Red Bishop	0
79	Speckled Pigeon	1
80	Spike-heeled Lark	1

No.	Species	Observed during assessments
81	Spotted Eagle-Owl	0
82	Spur-winged Goose	1
83	Swainson's Spurfowl	0
84	Violet-eared Waxbill	1
85	Wattled Starling	1
86	Western Barn Owl	0
87	Western Cattle Egret	0
88	Whiskered Tern	0
89	White-backed Mousebird	0
90	White-browed Sparrow-Weaver	1
91	White-faced Whistling Duck	1
92	White-winged Widowbird	0
93	Willow Warbler	0
94	Yellow Canary	1
95	Yellow-bellied Eremomela	0
96	Yellow-billed Duck	0
97	Yellow-crowned Bishop	1
98	Zitting Cisticola	1

8.3.7.2 GENERAL SPECIES DESCRIPTION

The overall avifaunal species occurring at the proposed development site are dominantly represented by bishops, cisticolas, doves, larks, mousebirds, sparrows, swallows and widowbirds. None of the priority bird species were encountered during the fixed-point surveys.

8.3.7.3 SPECIES OF CONSERVATION IMPORTANCE

Of the 98 listed avifaunal species encountered on site during structured surveys or recorded during SABAP2 assessments for the wider pentads, none were classified as Red Data Species. Of the observed aquatic species, none are of conservation concern.

8.3.7.4 ENDEMIC SPECIES

South Africa has a rich diversity of nationally and regionally endemic species that are found nowhere else on earth and, therefore, warrant consideration for assessment of sensitivity to potential developments. The Karoo Korhaan (*Eupodotis vigorsii*) was heard patch calling 300 m on the grassland habitat. The Karoo Korkhaan has been confirmed to be of Least Concern as it has wide distributional ranges and reportedly healthy populations. Therefore, the Karoo Korkhaan should not present any substantial threats as a result of development of this site.

8.3.7.5 IMPORTANT HABITATS

During the assessment it was noted that the waterbodies present an important habitat for birds. Birds are highly mobile in nature and have wide geographical distributions that vary seasonally and annually. As a precaution, it is advised that sensitive habitats (such as the wetland 500m from the development area) be preserved.

The surrounding wetlands and local surrounding terrestrial grassland landscapes provide very suitable habitat for Marsh owls (*Asio capensis*) and Grass owls (*Tyto capensis*). Marsh owl individuals were in fact encountered within various other local wetlands surrounding the proposed development area. It is therefore highly likely that the semi-aquatic habitats of the identified wetlands and local surrounding terrestrial grassland landscapes are utilised by individuals and/or pairs of one or both of these owl species as refuge and for breeding, foraging and/or persistence purposes. Both of these owl species are considered to be very habitat-specific and therefore range limited. The latter species is nationally classified as a Vulnerable Red Data Listed bird species, due to extensive habitat degradation and loss.

8.3.7.6 SPECIES RICHNESS, EVENNESS & ABUNDANCE

The overall species richness of the site is considered low (3,459) (**Table 19**). Species evenness reflected that the site was moderately even as a value of 0 indicates complete unevenness and a value of 1 indicates complete evenness. A diversity index score of below 1.5 is considered poor, between 1.5 and 2.5 is moderate, between 2.5 and 3.5 is high, and greater than 3.5 is extreme. The site can be concluded to have a moderately low diversity.

Table 19: Avifaunal species richness, evenness and diversity recorded during vehicle drive and walked transects.

Margalef's richness	Evenness	Shannon D	Simpson D
d	J'	H'(loge)	1-Lambda'
3,459	0,5961	1,755	0,719

In summary it was concluded that the general area of which the proposed 165 MW Khauta North SPV Facility site occurs does not have a high number of avian species. The majority of the observed avian population is of least conservation concern. The site assessments and SABAP2 datasets suggested the area of the proposed development to be less sensitive.

8.3.8 FAUNA AND FLORA

The properties are currently being used for cattle and game farming. However, grazing intensity is expected to be low based on the high diversity of indigenous plants.

The old lands were verified to be rehabilitated grassland that are less than 10 years old. Although these areas are not considered “natural vegetation” as per NEMA, these areas are similar in species composition to Habitat Unit 1 and are expected to function in a similar manner. Therefore, old lands are considered to be successfully rehabilitating and are likely to support a variety of faunal and floral species and contributed to the overall ecological significance of the area. No threatened or protected species were recorded within these old lands.

8.3.8.1 LAND COVER

The proposed development is located on natural grasslands, approximately 4 km from the urban edge of Riebeeckstad. All the lands across the project area are now used only for grazing. There are several mining operations surrounding Welkom, which lie to the south and the east of the proposed solar PV development.

The nearest mine shaft is located approximately 7 km from the Khauta SPV Cluster. A land cover map of the proposed development footprint and surrounds is presented in **Figure 53**.

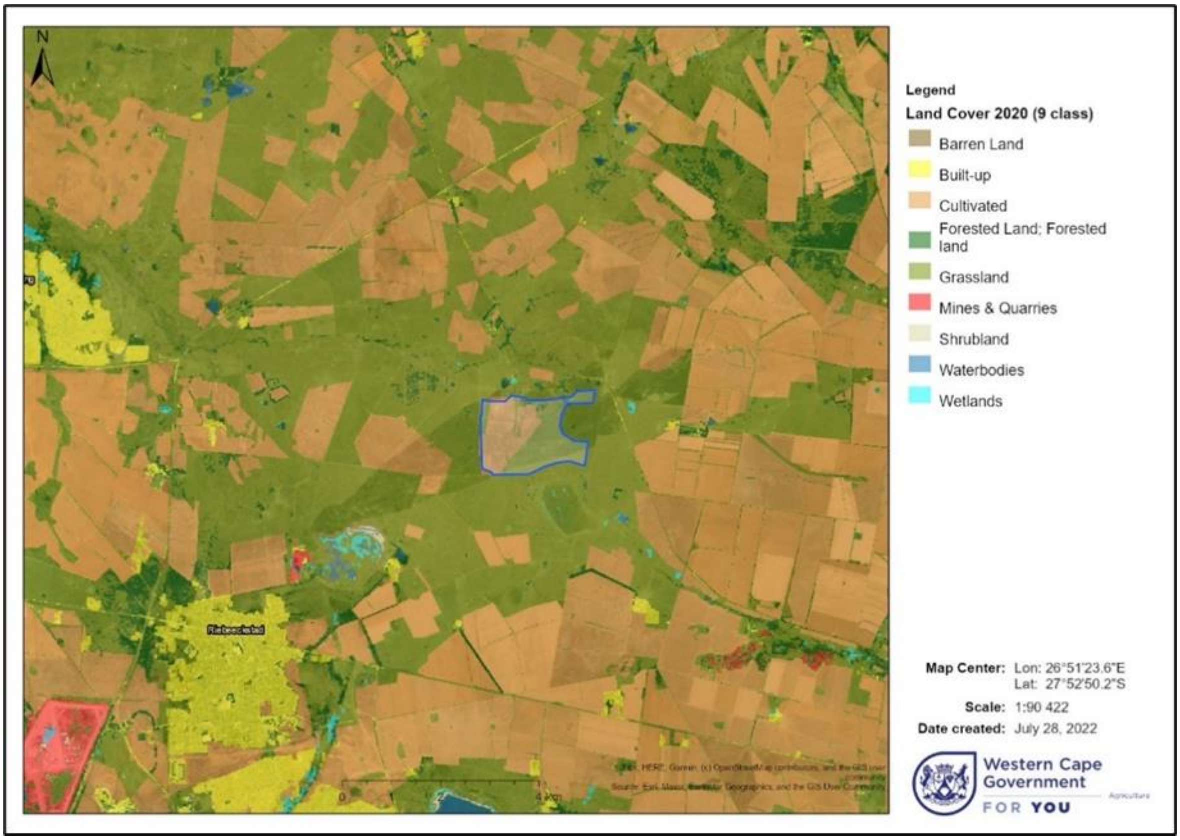


Figure 53: Landcover map for the proposed development footprint (demarcated in blue).

8.3.8.2 VEGETATION DESCRIPTION

The proposed development site (demarcated in blue) consists of Highveld Alluvial Vegetation (**Figure 54**). Highveld Alluvial Vegetation can be found throughout South Africa in the Free State, Gauteng, North West and outside of South African in Lesotho and Swaziland. The vegetation type is often found along alluvial drainage lines and floodplains in the Grassland and Savanna Biome.

The vegetation within the Highveld Alluvial Vegetation is characterised by flat topography supporting riparian thickets mostly dominated by *Vachellia karroo*, accompanied by seasonally flooded grassland and disturbed herblands often dominated by alien plants (Mucina and Rutherford, 2006). **Table 20** below presents the key indicator species of this vegetation type.

Although the Highveld Alluvial Vegetation is classified as Least Concern, more than a quarter of the vegetation type has been transformed or lost as a result of cultivation, dam building, and the invasion of alien invasive plant species. Only 10% of the vegetation type is formally conserved.

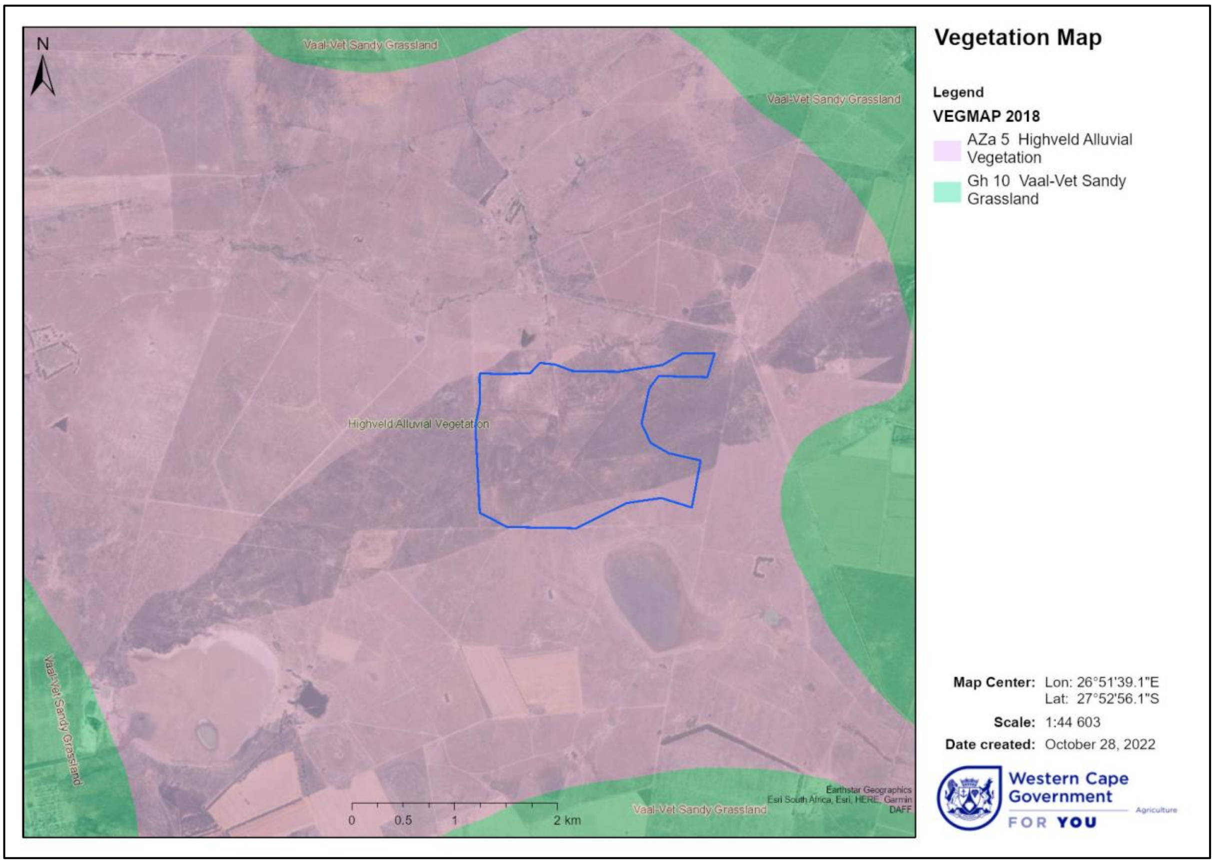


Figure 54: Vegetation types within the proposed development site (demarcated in blue).

Table 20: Key indicator floral species associated with the Highveld Alluvial Vegetation type

Grass species	Forb species	Tree/Shrub species
Riparian thickets		
• *Setaria verticillata* • *Panicum maximum*	• *Pollichia campestris*	• *Vachellia karroo* • *Salix mucronata subsp.* • *mucronata* • *S. mucronata subsp. woodii* • *Ziziphus mucronata* • *Celtis africana* • *Rhus lancea* *Gymnosporia buxifolia* • *Rhus pyroides* • *Diospyros lycioides* • *Ehretia rigida* • *Grewia flava* • *Asparagus laricinus suaveolens* • *Clematis brachiate*

Grass species	Forb species	Tree/Shrub species
		• *Lycium hirsutum*
	Flooded grasslands & herblands	
• *Agrostis lachnantha* • *Andropogon eucomus* • *Chloris virgata* • *Cynodon dactylon* • *Eragrostis plana* • *Hemarthria altissima* • *Imperata cylindrical* • *Ischaemum fasciculatum* • *Miscanthus junceus* • *Paspalum distichum* • *Andropogon appendiculatus* • *Brachiaria marlothii* • *Cyperus denudatus* • *C. longus* • *Echinochloa holubii* • *Eragrostis obtuse* • *E. porosa* • *Fimbristylis ferruginea* • *Panicum coloratum* • *Pycreus mundii* • *Sporobolus africanus* • *S. fimbriatus* • *Themeda triandra* • *Urochloa panicoides*	• *Persicaria lapathifolia* • *Alternanthera sessilis* • *Barleria acrostegia* • *Corchorus asplenifolius* • *Equisetum ramosissimum* • *Galium capense* • *Hibiscus pusillus* • *Lobelia angolensis* • *Nidorella resedifolia* • *Persicaria amphibia* • *P. hystricula* • *Pseudognaphalium oligandrum* • *Pulicaria scabra* • *Rorippa fluviatilis var. fluviatilis* • *Senecio inornatus* • *Stachys hyssopoides* • *Vahlia capensis* • *Crinum bulbispermum* • *Haplocarpa lyrata*	• *Gomphocarpus fruticosus* • *Felicia muricata* • *Salsola rabieana*

With specific reference to the 165 MW facility development footprint, it was confirmed that the area predominantly inhabits areas of natural grassland and old lands. Please refer to **Figure 55**.

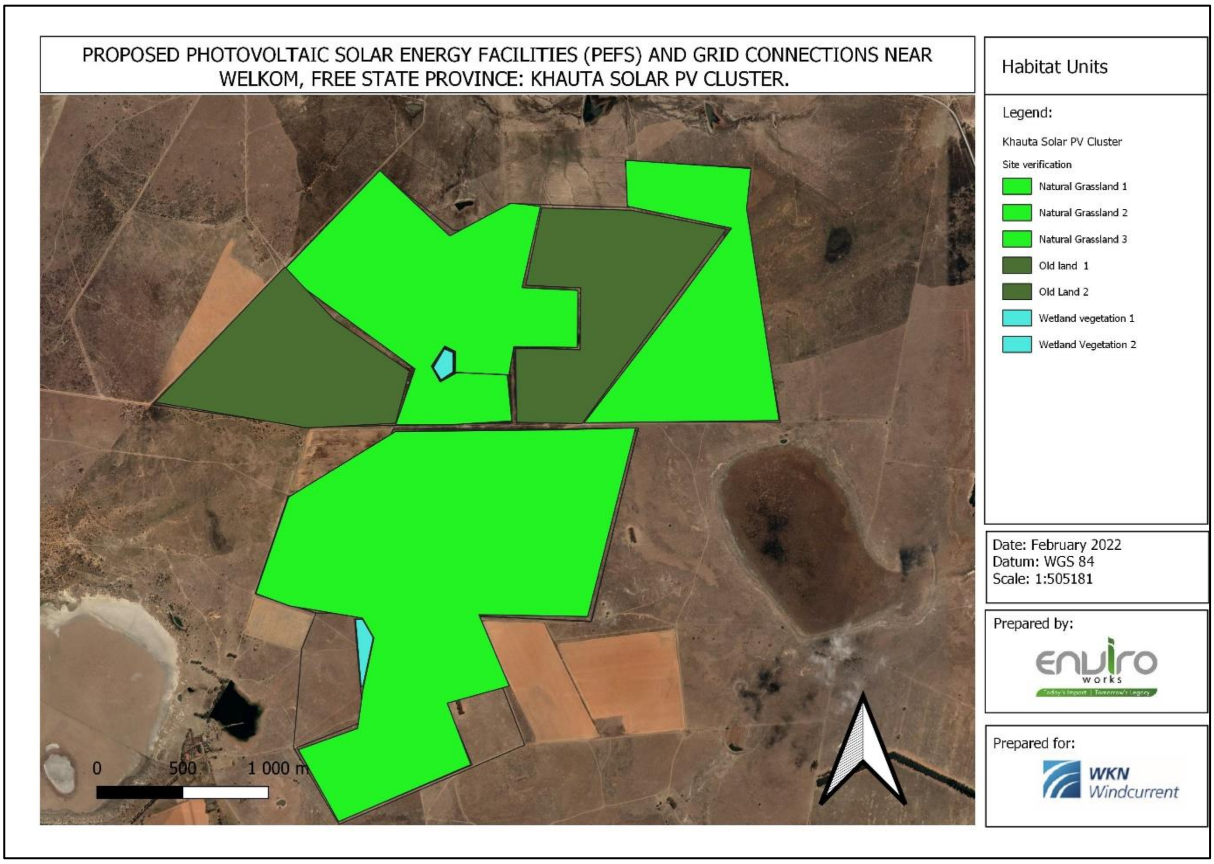


Figure 55: Habitat Units within the Solar Photovoltaic (PV) total area under consideration.

8.3.8.2.1 OLD LANDS

The old lands were verified to be rehabilitating or "secondary" grassland that are less than 10 years old. These areas are not considered "natural vegetation" as per NEMA. These old lands have undergone significant transformation in the last 10 years due to crop cultivation (**Figure 56**).

It is well known that secondary grasslands are usually very slow to recover to the same species diversity and composition as natural grasslands and thus, secondary grasslands usually have considerably lower floral diversity than primary grasslands (Muller et al., 2021; Nerlekar and Veldman, 2020).

These old lands were dominated by grass species such as *Melinis repens, Setaria sphacelate, Eragrostis curvula, Digitaria sp., Pentaschistis airoides, Bromus diandrus*, *Molinia caerulea*, *Chloris gayana* and other herbaceous species such as *Selago densiflora.* This composition is different to that of the Natural Grassland which is mostly dominated by *Themeda triandra.* Although some of the ecological functioning (such effects can include lower primary and secondary production, lower decomposition, lower seed dispersal capabilities, and higher invertebrate herbivory (Leidinger et al., 2017)[48] of the natural grasslands may have been lost, the

[48] Leidinger, J., Gossner, M., Weisser, W., Koch, C., Rosadio Cayllahua, Z., Podgaiski, L., Duarte, M., Araújo, A., Overbeck, G., Gerhard E. Overbeck, J., Kollmann, J., Meyer, S., 2017. Historical and recent land use affects ecosystem functions in subtropical grasslands in Brazil. Ecosphere.

old lands are still likely to support a variety of faunal and floral species and contribute to the overall ecological significance of the area. No threatened or protected species were recorded within these old lands.

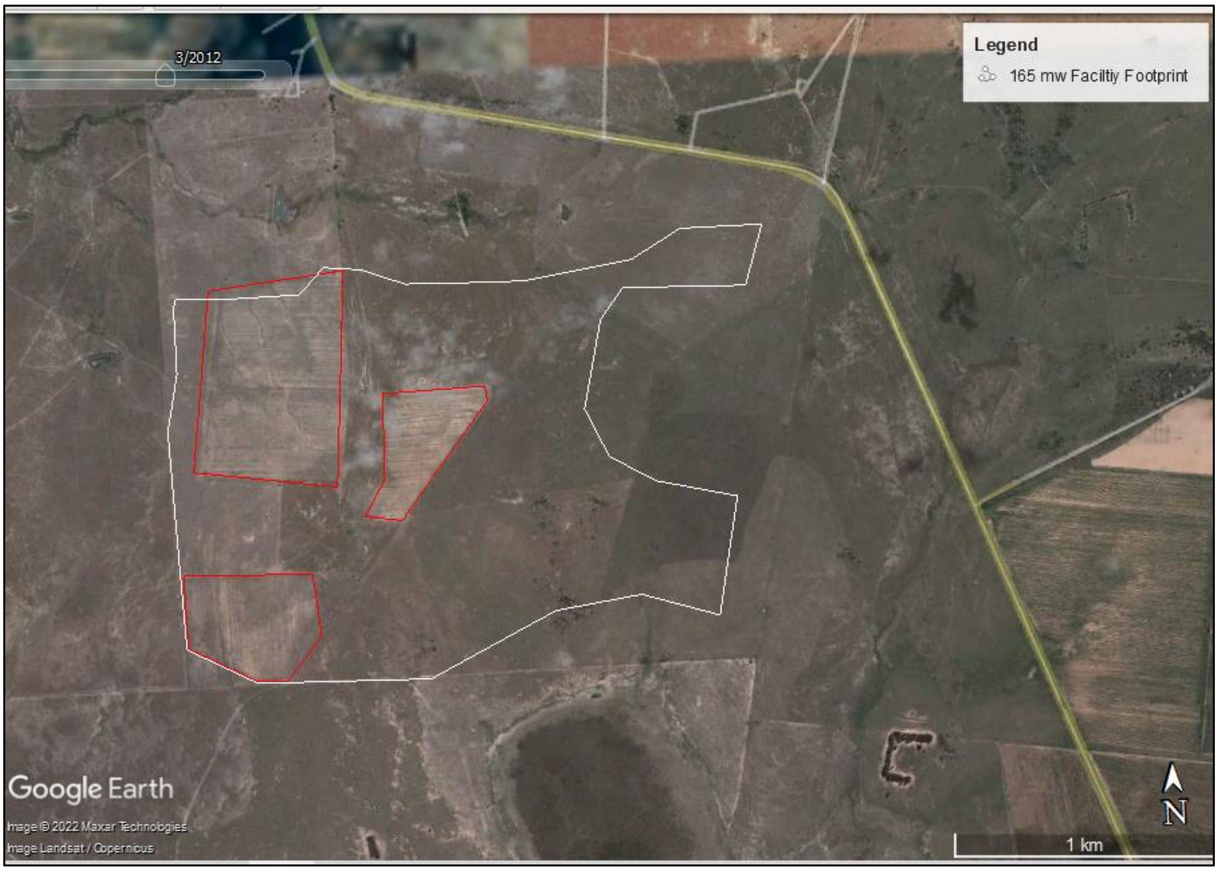


Figure 56: Satellite imagery of the proposed 165 MW development footprint taken in 2012 illustrating the areas that have been transformed via cultivation (demarcated in red)

8.3.8.2.2 NATURAL GRASSLANDS

These areas were dominated by indigenous species such as *Themeda triandra, Cymbopogon sp., Panicum coloratum, Cynodon* sp.. Although the development footprint is mapped within the Highveld Alluvial Vegetation type, the vegetation found on site was likely more botanically representative of Western Free State Clay Grassland or Central Free State Grassland (both classified as Least Threatened) due to the areas clay-rich soils (confirmed the Aquatic Biodiversity Specialist and Agricultural Specialist) and the dominance of *Themeda triandra* and *Cymbopogon* sp., and the low abundance of trees. Please refer to the Animal Species, Plant Species and Terrestrial Biodiversity Impact Assessment Report (**Appendix G**) for a full list of species that were identified within the footprint.

Although classified as Least Threatened, grasslands are highly threatened ecosystems and severely under protected (Cadman et al., 2013). It is one of the most at-risk of South Africa's biomes: more than 40% of it has already been irreversibly modified, 60% of remaining grassland is considered to be threatened and less than 3% of it is under formal protection. Grassland is also considered to face the greatest risk of significant change due to climate change. Therefore, any loss in this vegetation is not favourable (Cadman et al., 2013).

8.3.8.3 SPECIES OF CONSERVATION CONCERN

8.3.8.3.1 PLANT SPECIES

None of the expected species of special concern were observed during the site visit. It is possible that the development footprint could provide habitat to some of the species of conservation concern. However, this is very unlikely given the previous disturbance history of the area.

8.3.8.3.2 ANIMAL SPECIES

None of the expected species of special concern were observed during the site visit. However, suitable habitat for the *Smaug giganteus* (Sungazer also known as giant girdled lizard) was confirmed on the development footprint. An old burrow was confirmed on the footprint, but this burrow is no longer in use. Only when signs of burrowing are evident can the habitat suitability be known for certain. It should be noted that not all suitable habitat is always occupied by the species.

Typically, it would be recommended that areas delineated suitable habitat for the Sungazer would not be developed. Should this recommendation be fulfilled for this development, it will result in an island of potential habitat (i.e., fragmentation). The probability of the area being inhabited by the Sungazer after development is expected to be low. Therefore, avoiding an “island” of suitable habitat would not retain the function of the suitable habitat as colonisation of these areas by *S. giganteus* is unlikely.

To have effective suitable habitat for the species, it is recommended that potential suitable Sungazer habitat outside of the development footprint (**Figure 57**) be set aside and avoided. It should be noted that the suitable habitat outside of the development footprint were not mapped previously in the Free State Biodiversity Spatial Plan. Areas outside of the development are connected to intact vegetation and the likelihood of these areas of suitable habitat being utilised by the Sungazer is expected to be high, as borrows were found in these areas.

A variety of fauna were recorded on site including *Danus chrysippusa, Amietia delalandii* and *Hystrix* sp. Given that there is potential habitat surrounding the development footprint, any faunal species that inhabits the development footprint, will likely be able to find refuge in the surrounding areas.

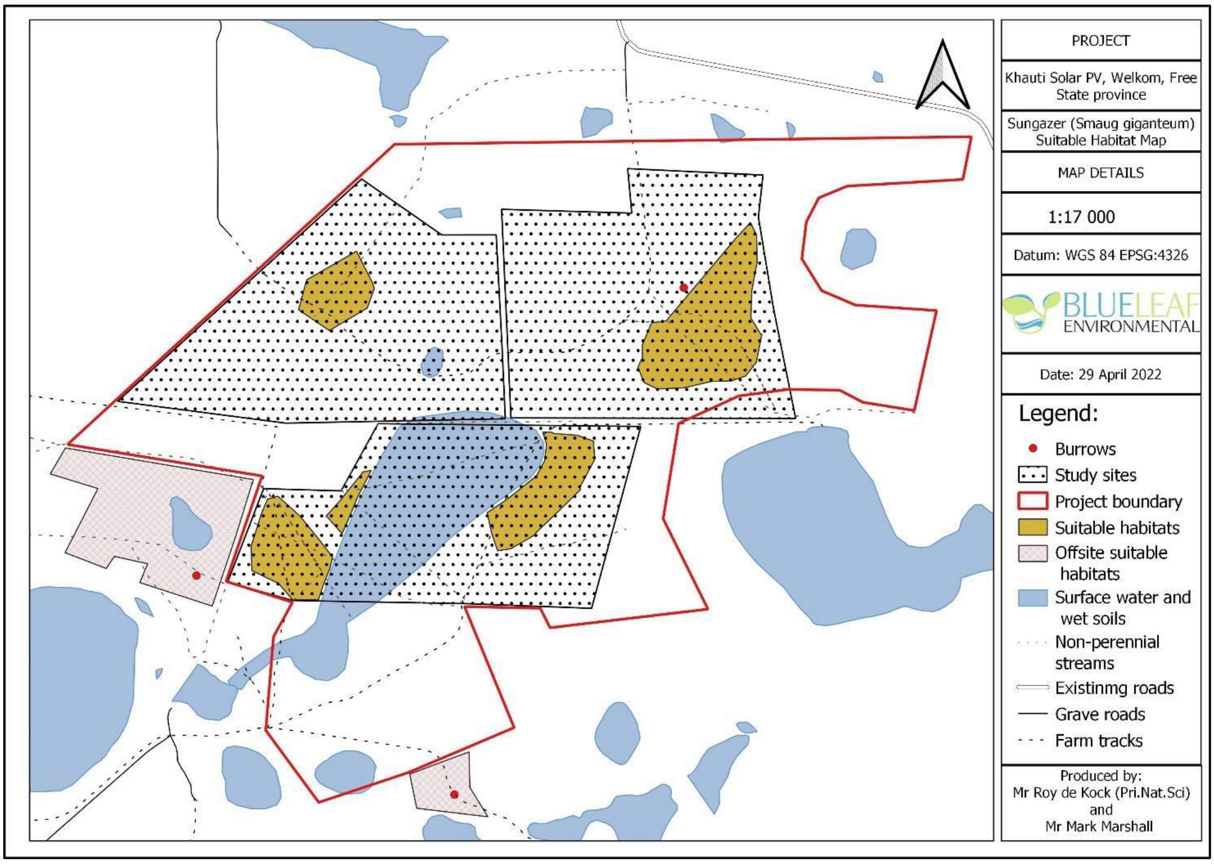


Figure 57: Sungazer habitat and location map within and surrounding the Khauta Solar PV Study Site (Blue Leaf Environmental, 2022)

8.3.8.4 SENSITIVE AREAS

Critical Biodiversity Areas (CBAs) are areas of high biodiversity and ecological value. These areas are required to meet biodiversity targets for species, ecosystems or ecological processes and infrastructure. CBAs that are likely to be in a natural condition are classified as Category 1 CBAs and those that are potentially degraded or represent secondary vegetation are classified as Category 2 CBAs. Only low-impact, biodiversity-sensitive land uses are considered appropriate within CBAs (Pool-Stanvliet et al., 2017[49]). These areas are also to be managed for biodiversity conservation purposes, restored where required and incorporated into the Protected Area network.

Ecological Support Areas (ESAs) are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of CBAs and delivering ecosystem services. Ecological Support Areas (ESAs) are supporting zones which must be safeguarded to prevent degradation of CBAs and formal protected areas.

The proposed development footprint is predominantly situated in an Ecological Support Area (ESA) and some portion of the proposed footprint is in Degraded Areas (**Figure 58**).

[49] Pool-Stanvliet, R., Duffell-Canham, A., Smart, R., 2017. The Western Cape Biodiversity Spatial Plan Handbook. CapeNature., Stellenbosch.

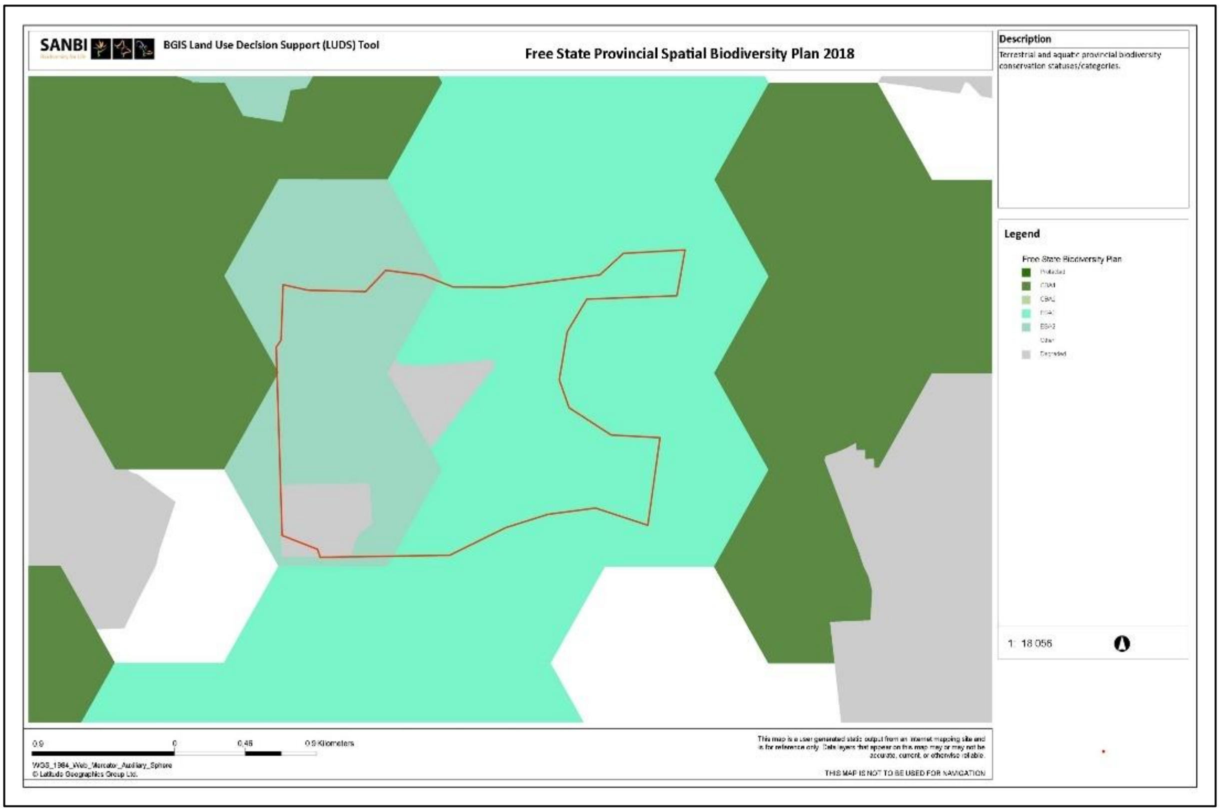


Figure 58: Sensitivity of the proposed site (demarcated in red) where dark green = CBA 1, faded green = ESA 2, Blue/green = ESA 1, grey = degraded.

Since the proposed development footprint is situated in sensitive areas identified by the Free State Biodiversity Spatial Plan, the development footprint is considered to hold conservation importance within these sensitive areas. The ESA has been classified due to the presence and functioning of watercourses. Therefore, by avoiding the watercourses and their buffers (as delineated by the Aquatic Biodiversity Verification Report; EcoFocus, 2022, **Appendix E**), the functioning of the ESA will be preserved.

All delineated watercourses, considered to be ecologically significant in the Aquatic Biodiversity Assessment Report, and their buffer areas were identified as No-Go areas, especially in all areas delineated as ESA. Given that the ESA has been delineated to preserve the NFEPA wetland clusters, any areas that would prevent sedimentation (i.e., reduction of water quality) into the wetlands must be preserved. This will retain the functionality of the ESA. It was further recommended that all wetlands remain connected via an ecological corridor to ensure the movement of animals and seed dispersal of plants between ESAs.

The CBA has been classified as being important suitable habitat for the threatened species, *Smaug giganteus*. Therefore, areas that are of suitable habitat for the aforementioned species was included in the CBA delineation. These areas must be avoided, and there for the “No-Go areas” were incorporated into the design of the solar farm as denoted in **Figure 59**.

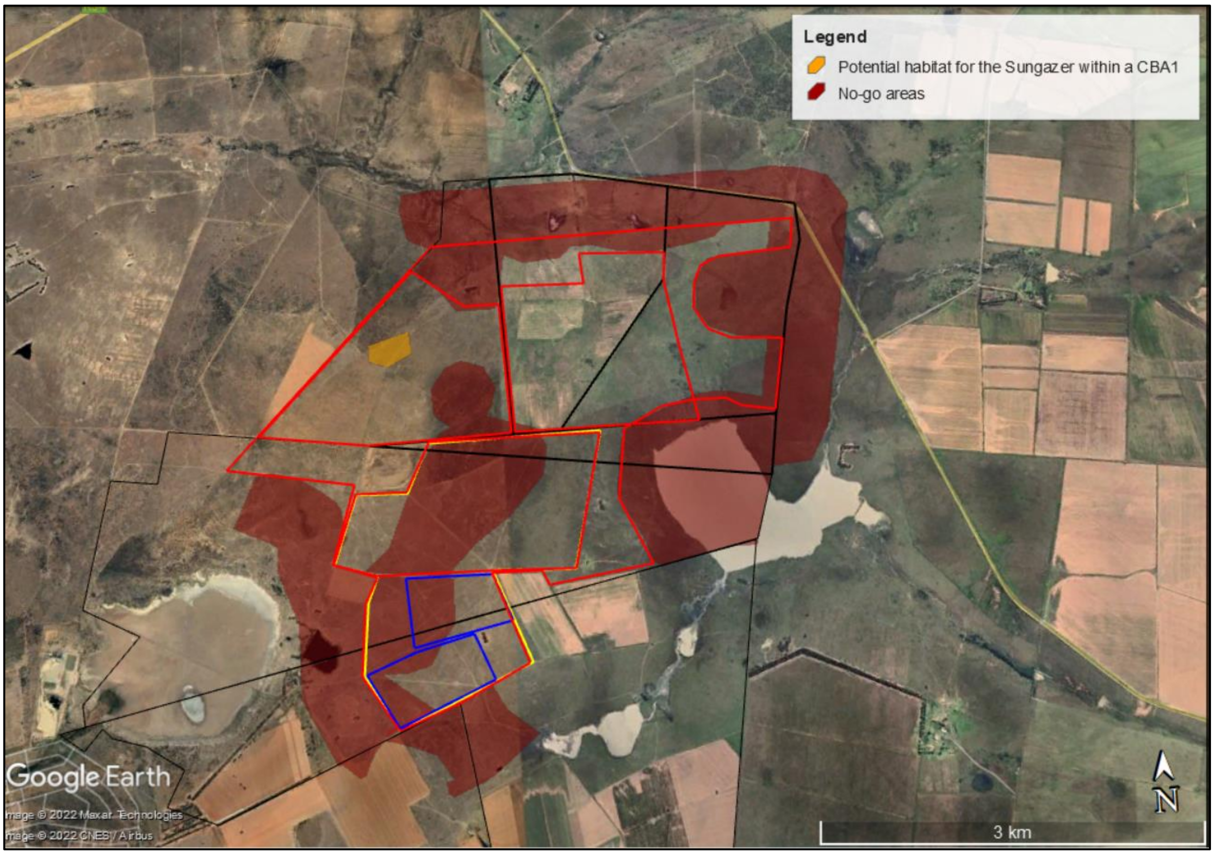


Figure 59: Recommended No-Go areas (demarcated in red) within the solar PV farm development footprints.

The potential habitat for Sungazers (orange) can only be confirmed as suitable if sungazers or active borrows are found. None have been observed during the site visit, but the current habitat is regarded as suitable and therefore their potential presence cannot be excluded (as per the recommendations by the specialist). The mitigation measures as stipulated by the specialist and EMPR must be implemented.

8.3.8.5 PRESENT ECOLOGICAL STATE, ECOLOGICAL IMPORTANCE AND SENSITIVITY

The proposed solar farm will transform the existing surface vegetation inside the development footprint. The development will cause indigenous vegetation loss and disrupt minimal ecological functioning across the development footprint. Although almost half of the development footprint was confirmed to be old agricultural land, the footprint still sustains important ecological function even if some of the floral diversity has been lost.

The PES Score of the proposed solar farm development footprint is B. The overall footprint currently consists of natural grassland. In these areas, species diversity is likely to be significantly high, and the contribution to overall ecological functioning of the area is expected to be high. Therefore, the area is likely to contribute to the overall ecosystem functioning of the total solar farm footprint.

The EIS of the development footprint is B (High) given that the areas are still likely to contribute to the overall ecological functioning of the area. Species composition and diversity has likely not been altered but is expected to currently inhabit mostly non-threatened species that are common to the wider area. It was also confirmed that part of the development footprint is included in a CBA.

8.3.9 SITE SENSITIVITY VERIFICATION

The DFFE National Screening Tool Classified the proposed development area as "Very High" sensitivity for the Terrestrial Biodiversity theme and "Low" sensitivity for the Plant Species theme, and "High" for the Animal Species Theme.

Specific areas within the proposed development site have been classified as CBAs. These areas have been confirmed on the footprint due to suitable habitat for the Sungazer. Therefore, these areas are of conservation value.

With reference to the vegetation description, the vegetation and soil is more associated with grassland vegetation especially that of the Central Free State Grassland and Western Free State Clay Grassland (both vegetation types are classified as Least Threatened). In terms of vegetation condition, much of the habitat units or ecosystems within the development footprint are homogenous overall and do not contain any species of special concern. The footprint is considered to be of ecological importance as it is expected to contribute to the overall ecosystem functioning of the wider area.

The overall proposed development footprint is degraded but does have elements of the indigenous vegetation type and is likely to contribute to the over ecological functioning of the area. Based on the aforementioned site verification, the development footprint has been confirmed to be classified as "Low" for the Terrestrial Biodiversity Theme and "Low" for the Plant Species Theme, and "Medium" for the Animal Species Theme.

8.3.10 CONSERVATION AREAS, PROTECTED AREAS AND IMPORTANT BIRD AREAS

8.3.10.1 PROTECTED AREAS

The South African Protected Areas Database (SAPAD) are GIS inventories of all Protected (PA) areas in South Africa (DFFFE, 2021). The database also includes data on privately owned protected areas. The surrounding protected areas (**Figure 60**) in proximity to the proposed development footprint are :

Newlands Game Ranch (Nature Reserve) - 2.7 km to the west;

Thabong Game Ranch (Nature Reserve) - 6.4 km to the south;

Goliatskraal Private Nature Reserve - 16 km to the north-east; and

De Rust Private Nature Reserve - 11.2 km to the north.

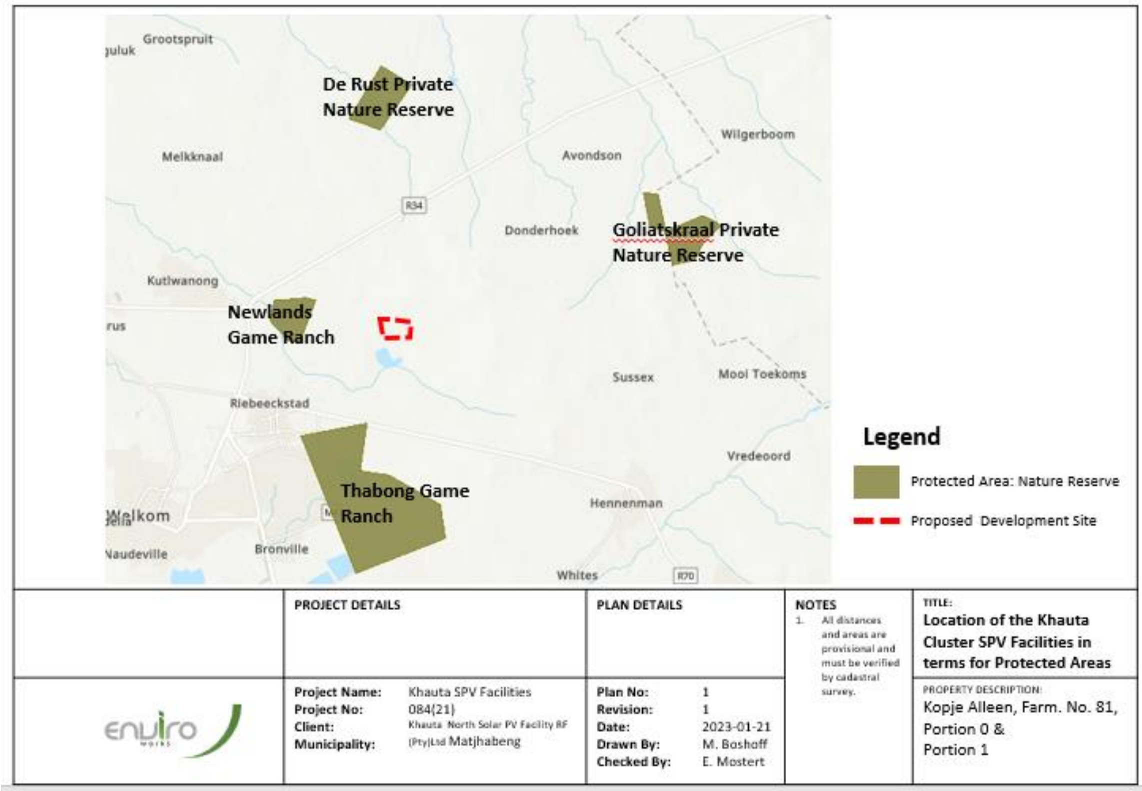


Figure 60: Surrounding Protected Areas in proximity to the proposed development

Of the four declared reserves, only three (Newlands Game Ranch, Goliatskraal Private Nature Reserve and De Rust Private Nature Reserve) are managed in terms of protection of species with limited development.

Thabong Game Ranch has seen development encroachment within the reserve boundaries and land uses currently taking place within the reserve include residential-, commercial-, agriculture- and mining developments (**Figure 61**). During 2012 the Doringpan lake has dried-up (Google Earth Imagery dated 3 July 2012).

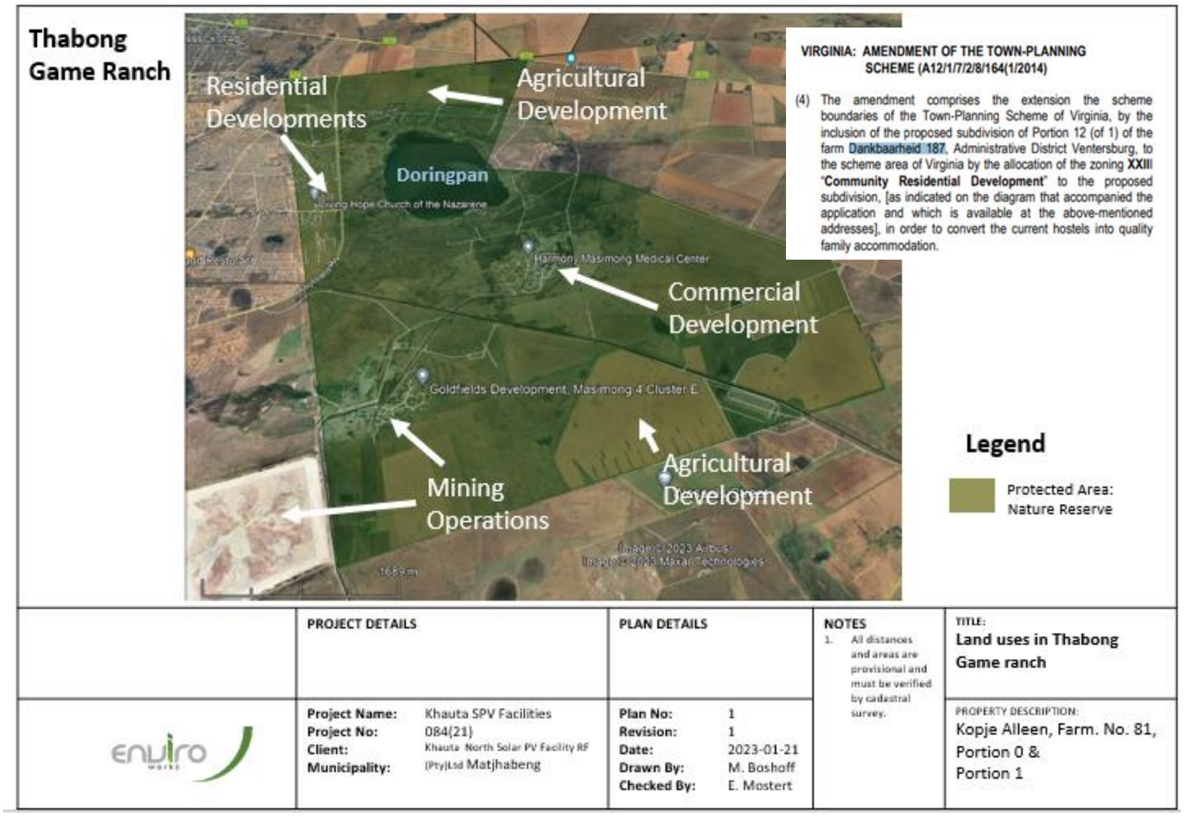


Figure 61: Development encroachment within the Thabong Game Ranch

8.3.10.2 IMPORTANT BIRD AREAS

Important Bird and Biodiversity Areas (IBAs), as defined by BirdLife International, constitute a global network of over 13 500 sites, of which 112 sites are found in South Africa. IBAs are sites of global significance for bird conservation, identified nationally through multi-stakeholder processes using globally standardised, quantitative and scientifically agreed criteria. Essentially, these are the most important sites for conserving[50].

There are currently no IBA's located within the proposed development site or within a 5km radius of the site.

8.3.11 HERITAGE & PALEONTOLOGICAL RESOURCES

Based on the published 1: 250 000 geological map 2726 Kroonstad (Schutter 1993) the combined project area is almost entirely underlain by Middle to Late Permian basinal mudrocks of the Volksrust Formation (Ecca Group) that are of Low to (at most) Medium Palaeosensitivty.

Based on the SAHRA sensitivity map the area is of high sensitivity, concurring with the DFFE Screening Tool indicating the area as very highly sensitive because of the potential of finding trace fossils. The level of assessment entailed a desktop study as well as a field assessment out on foot on 12 April 2022.

[50] Birdlife South Africa: Source: https://www.birdlife.org.za/what-we-do/important-bird-and-biodiversity-areas/

8.3.11.1 ARCHAEOLOGY

No pre-colonial Stone Age, or historical archaeological resources were recorded in the proposed development area for the proposed 165MW Khauta North Solar PV Facility.

8.3.11.2 LATE IRON AGE

No evidence of any Late Iron Age archaeological heritage was noted during the field assessment, which appears to be absent from the study area.

According to the distribution map for Iron Age settlements on the Southern Highveld as published in Maggs (1976), the Khauta SPV Cluster area is located to the west of the known distribution of Late Iron Age sites. It is therefore unlikely for any such sites to be located within the study area, or its immediate surroundings.

8.3.11.3 ANGLO BOER WAR

No evidence of any Anglo-Boer War battlefield sites (1899-1904), war graves or memorials were encountered during the study.

According to Mr Louis Venter of the War Museum in Bloemfontein (email correspondence dated May 2022), there are no references to any Anglo Boer War skirmishes in the area.

8.3.11.4 BUILT ENVIROMENT

A farmhouse/labourer cottage (**Figure 62**), and a large metal shed (**Figure 63**) at the entrance to the farm Kopje Alleen No. 81 is located outside the proposed development footprint and will not be impacted by proposed construction activities.

Figure 62: Farmhouse/labourer cottage on Portion 0 of Farm 81 Kopje Alleen

Figure 63: Metal shed on Portion 0 of Farm 81 Kopje Alleen

8.3.11.5 PALAEONTOLOGY

With the possible exception of some shallow drainage lines, bedrock exposure in this area of very low relief is likely to be minimal due to pervasive soil and vegetation cover. Most of the area is already disturbed by agriculture.

According to consulting palaeontologist, Dr John Almond (2022), `no fossil remains of any kind were recorded from the Permian bedrocks and Late Caenozoic superficial sediments that underly the study area', during a site visit conducted in May 2022, and that `no palaeontological High Sensitivity or No-Go areas were identified'.

Almond (2022) concludes `that the site is in practice of "Low to Very Low Palaeosensitivty".

8.3.12 LANDSCAPE (SOLAR) / VISUAL RESOURCES

Landscape character is defined by the U.K Institute of Environmental Management and Assessment (IEMA) as the "*distinct and recognizable pattern of elements that occurs consistently in a particular type of landscape, and how this is perceived by people. It reflects particular combinations of geology, landform, soil, vegetation, land use and human settlement"* (GLVIA, 2013). According to DEA&DP Guideline Section 9.2, information describing the current state of the affected environment, as well as trends in the area, is required for visual input into the EIA process. The receiving environment was determined using the 2013-2014 South African National Land-Cover data as provided by the National Department of Environmental Affairs (DEA) and field observation conducted on 17 August 2022.

According to the DFFE Screening Tool Report compiled for the proposed solar PV facility, the landscape (solar) theme sensitivity is Very High (**Figure 64**), due to the proximity of nearby nature reserves and koppies, however, the greatest portion of area is classified as having a Medium landscape (solar) theme sensitivity.

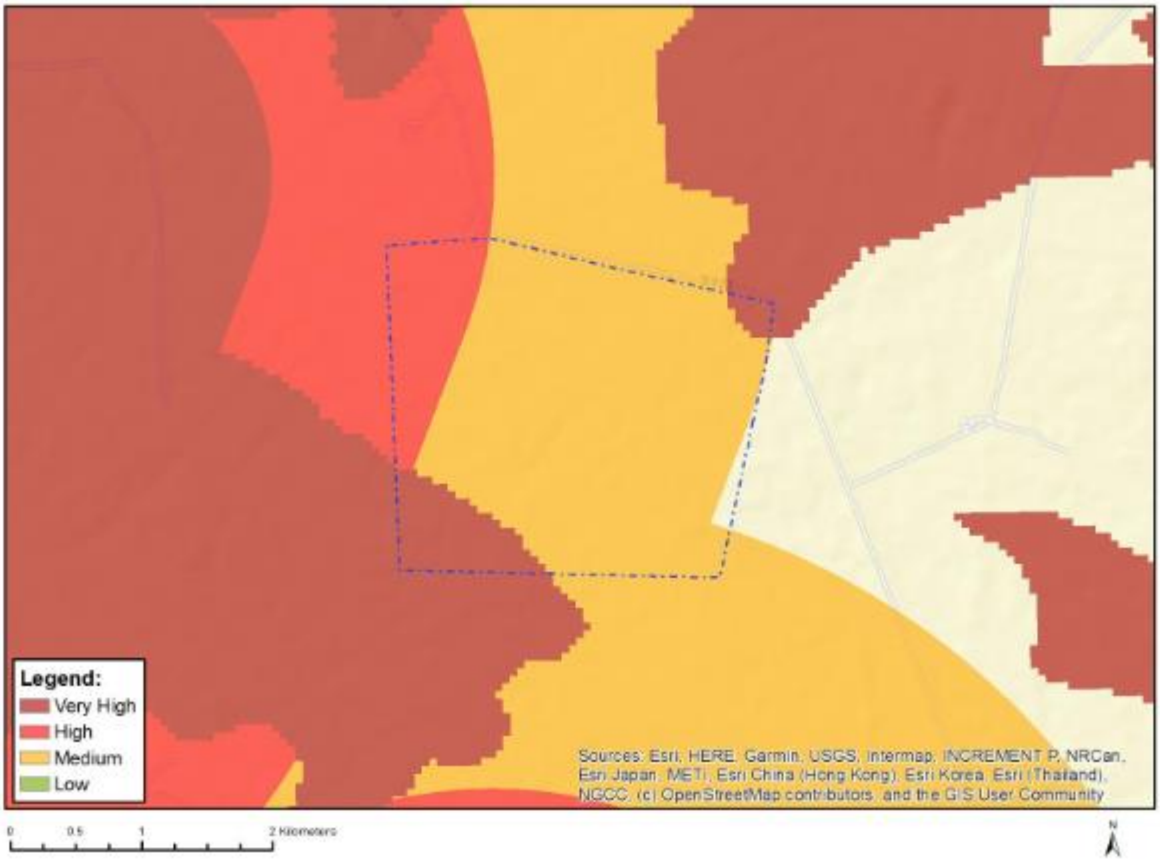


Figure 64: Map of relative landscape (Solar) Theme Sensitivity

8.3.12.1 SENSE OF PLACE

The term sense of place captures the identity of places we recognize. It embraces natural and cultural features, the distinctive sights, sounds and experiences to the people residing in or nearby that place. Places with a strong sense of place have a clear identity and character that is recognisable by inhabitants and visitors alike.

Sense of place differs from place attachment by considering the social geographical context of place bonds and the sensing of place, such as aesthetic and a feeling of dwelling. 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.

Welkom is regarded as South Africa’s youngest city and was established in 1947 amid the discovery of goldfields within the region. The discovery of gold brought rapid growth to the area escalating Welkom to the second largest town within the Free State Province just in a few years’ time.

Welkom is in decay and most economic indicators will illustrate that it is the worst-performing urban area in South Africa. At its peak the mining sector employed roughly 184 600 people; however, in 2010 almost 150 000 of those jobs have been lost. The vast majority of the region's manufacturing sector was linked to mining; however, with the decline of the mining industry 71 % of this sector has been lost (Vegter, 2019[51]).

Given the short history of Welkom and the decline of the mining sector the town was not able to accumulate any significant heritage status and as such in today's terms is considered as an area of low scenic, cultural and historical significance. As per **Figure 65** (Landcover Map) the area consists of Urban Residential Areas, Urban Built-up Environments, Cultivated Commercial Farming, Woodlands, Plantations and Mining Areas.

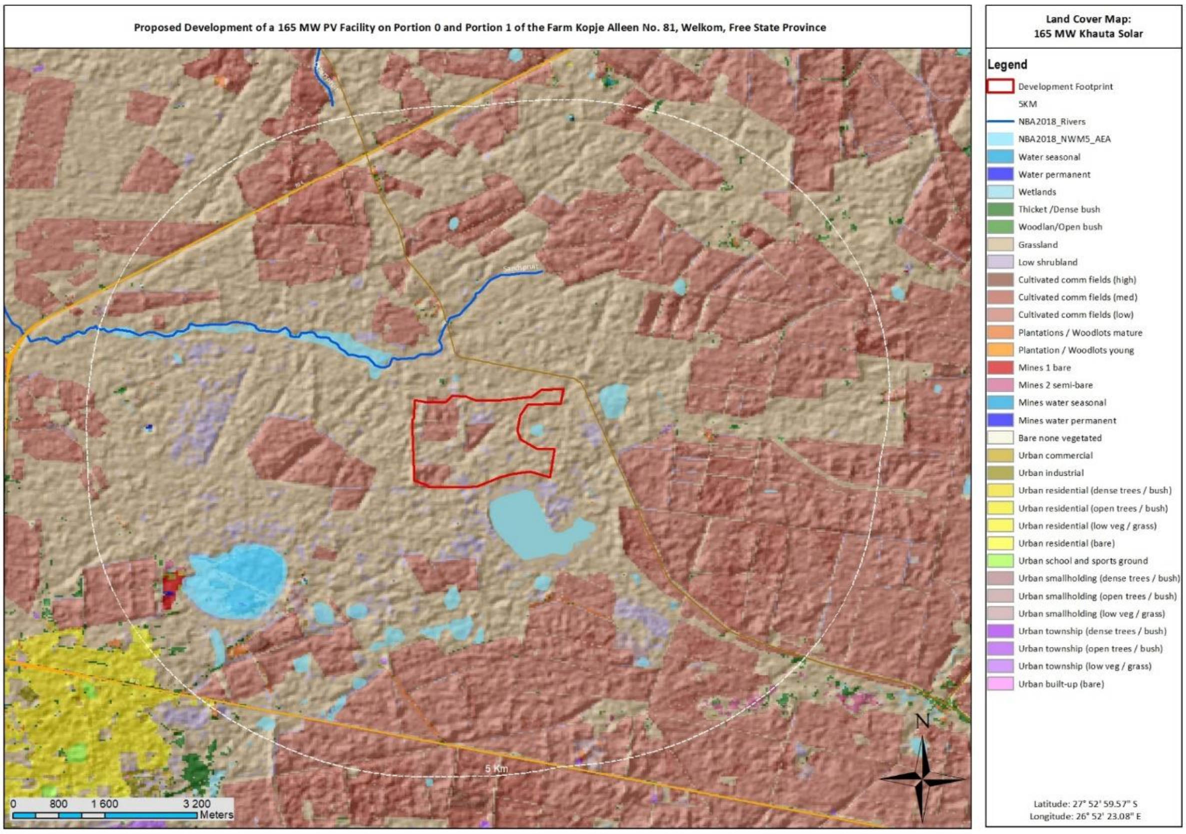


Figure 65: Land cover map of the proposed development area.

8.3.13 GEOTECHNICAL CHARACTERISTICS

The site was broadly mapped according to the expected geotechnical characteristics, including soil type and thickness, slope gradients, surface water bodies, natural drainage lines, and areas with shallow groundwater or drainage problems such as marshes. The proposed site is located in two distinct terrains and are mapped below in **Figure 66**. Terrain 1 forms the central and southern portions of the site, and was characterised by low slope gradients with potentially slightly to moderately compressible and collapsible transported soils (aeolian/colluvial) and potentially active residual soil underlain by bedrock siltstone or sandstone, possibly within a shallow depth

[51] Vegter, I. 2019. Welkom to a world where mining dies. The history of Welkom, once a booming gold rush town, mirrors what will happen elsewhere if urgent policy changes are not made to halt the decline of the mining industry. The Star [web: https://irr.org.za/media/welkom-to-a-world-where-mining-dies-the-star (Date of Access: 15 September 2022)].

range (i.e. estimated 1.5-3m of surface). Terrain 1 was deemed to have a high development potential. Terrain 2 lies in the northern portion of the site, and was characterised by natural drainage lines and/or surface water bodies with potentially problematic geotechnical conditions and low development potential.

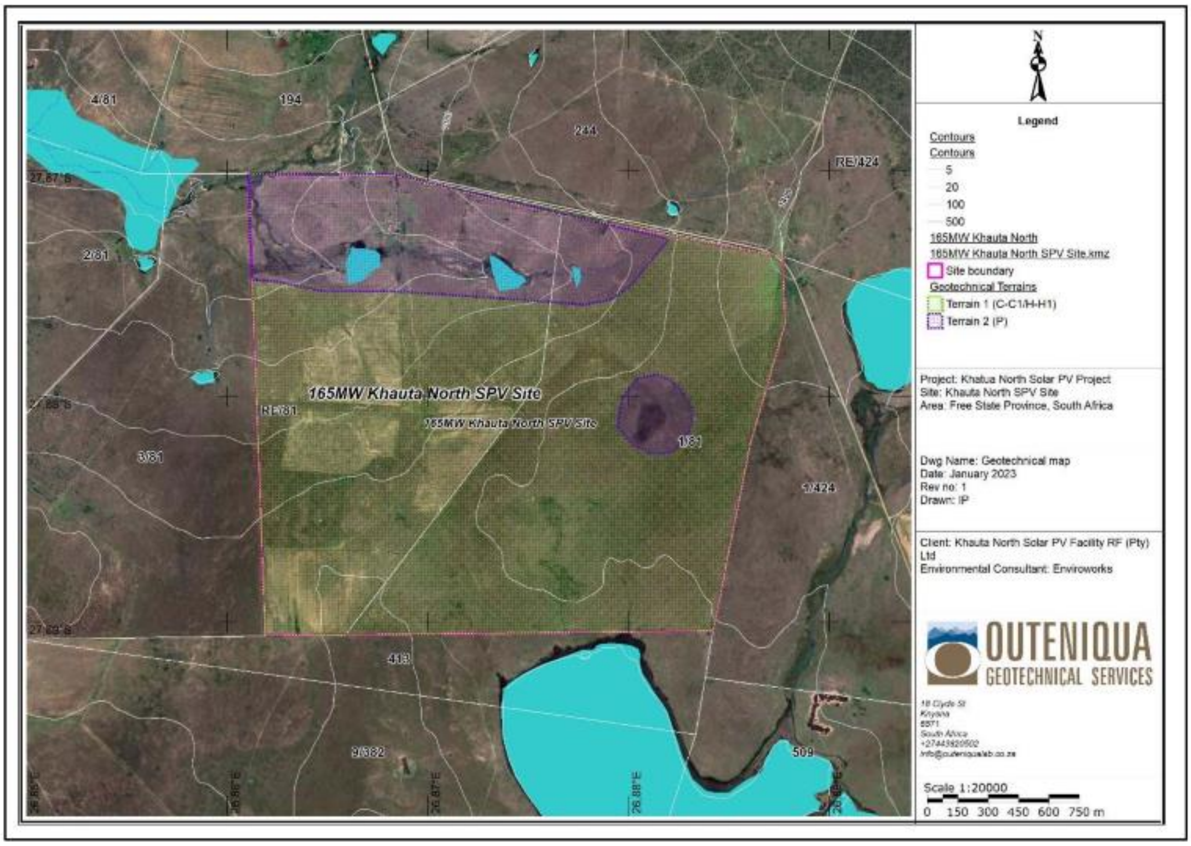


Figure 66: Geotechnical map of the proposed site

8.3.13.1.1 FOUNDATIONS FOR STRUCTURES

The proposed PV array structures would be supported on lightweight steel frame structures attached to the ground either on shallow pad foundations or driven or pre-bored steel piles, generally emplaced at a typical depth of 1.0-3.0m, depending on the underlying soil profile and geotechnical characteristics of the profile, which would have to be investigated during on-site testing.

8.3.13.1.2 SLOPE STABILITY AND EROSION

The slope gradient on the site was low and therefore natural slope stability problems were not considered to be a significant risk. No severe erosion scars were apparent during the investigation and erosion was not considered to be a significant problem, although localised erosion was expected around the edges of drainage lines and surface water bodies identified in Terrain 2.

8.3.13.1.3 SITE CLASSIFICATION

In accordance with SANS 10400-H Section 4.2, the applicable geotechnical site classifications are shown in Table 21.

Table 21: SANS 10400-H Site Classification

Terrain Unit	Geotechnical Constraint	Expected Movement (mm)	Site Classification
1	Potentially compressible and/or collapsible soil	<10	C-C1
	Potentially active soil	<15	H-H1
2	Shallow groundwater or marshy ground conditions		P

8.4 SOCIO-ECONOMIC CONTEXT OF THE AREA

The proposed development is situated in the Matjhabeng Local Municipality. The Matjhabeng Local Municipality is a Category B municipality situated in the Lejweleputswa District in the Free State Province (**Figure 67**). The project area is located in Ward 10 of the Matjhabeng Local Municipality.

The main economic sectors include mining and manufacturing.

8.4.1 PROVINCIAL OVERVIEW

The 165MW Khauta North SPV Facility is located in the Free State Province. The Free State Province (FSP) is the third largest province in the country and covers approximately 129 825km^2. Bordered by the Orange River to the south and the Vaal River to the north, the province's landscape varies greatly from Kalahari country and Highveld Grassland to mountain ranges to farmland and wilderness areas. Located at the centre of South Africa, the Free State is bordered by six other provinces, namely North West, Gauteng, Mpumalanga, Eastern Cape and Northern Cape. Lesotho borders the province on its south-eastern side. Major towns within the province include Bloemfontein, the province's capital, as well as Welkom, Sasolburg, Kroonstad and Parys.

The province is divided into the Mangaung Metropolitan Municipality and four District Municipalities, namely Fezile Dabi, Lejweleputswa, Thabo Mofutsanyana and Xhariep. These District Municipalities are then further sub-divided into nineteen Local Municipalities (Cooperative Government and Traditional Affairs, 2014).

In terms of renewable energy, the southern Free State, especially the Xhariep region is regarded as an ideal location for harnessing the natural solar energy, and is noted to have the second highest solar radiation index in the country (Cooperative Government and Traditional Affairs, 2014).

Despite its size the FSP has the second smallest population and population density, with 2 834 714 people (Statistics South Africa, 2016a), making up approximately 5.1% of the total population for the country. With regards to population groups, the majority of the population is black African, 89%, while 8% are white, 3% are coloured, 0.3% are Indian/Asian. The majority of the population (71%) speak Sotho as their first language. The other first languages are Afrikaans (11%), isiXhosa (6%), Setswana (5%) and Zulu (4%) (Statistics South Africa, 2016a).

Education levels in the FSP are lower than the national rate, with 39.7% completing matric or higher, compared to the national rate of 43.37% (Statistics South Africa, 2016a).

8.4.2 MUNICIPAL LEVEL OVERVIEW

8.4.2.1 LEJWELEPUTSWA DIRSTRIC MUNICIPALITY

The Lejweleputswa District Municipality (LDM) is situated in the north-west of the Free State Province. LDM makes up nearly a third of the province and is subdivided in five Local Municipalities, namely Nala, Tswelopele, Masilonyana, Tokologo and Matjhabeng Municipalities (**Figure 67**). The LDM has an area of approximately 32 286km^2. Welkom is a major town within the District, which was established following the discovery of gold in the area.

LDM borders the North-West Province to the north, Fezile Dabi District Municipality to the north east, and Thabo Mofutsanyane District Municipality to the east, Mangaung Metropolitan and Xhariep District to the south and the Northern Cape Province to the west.

The main economic activities within the LDM occur within the primary and tertiary sectors, with the primary sector being driven by mining and agriculture. The LDM economy relies heavily on the gold mining sector, which is the dominant sector in the Matjhabeng and Masilonyana Local Municipalities. The other Local Municipalities are dominated by agriculture.

Most of the mining activities take place within the Matjhabeng Local Municipality (MLM) in particular, gold mining, followed by Masilonyana Local Municipality with some of the gold- and diamond mining. Lately the mining sector has been declining due to the closure of many of the shafts as a result of high costs of production among others and the need for deep mining. The situation has been worsened by a recent decline in world commodity prices (Lejweleputswa District Municipality, 2020).

Figure 67: Lejweleputswa District Municipality and the Location of Matjhabeng Municipality

8.4.2.2 MATJHABENG LOCAL MUNICIPALITY

Matjhabeng Local Municipality (MLM) is situated on the eastern side of the LDM. It is bordered by Nala Local Municipality to the north, Masilonyana to the south, Tswelopele to the west and the Moqhaka Local Municipality (Fezile Dabi District) to the east. MLM has a population of 429 113 and a land mass of 5 699km^2. Notable towns in the municipality are Allanridge, Hennenman, Odendaalsrus, Ventersburg, Virginia and Welkom.

Based on the Desktop Economic Impact Assessment (2021), the Matjhabeng municipal area (where the site is located) is likely to experience some direct, indirect and induced impacts resulting from the activities linked to the proposed development.

8.4.2.2.1 DEMOGRAPHICS

The sex ratio is 50 in the MLM. Regarding the age structure of the population, the majority of the population, 63.1 %, falls within the 18-64 age bracket. 32.1% of the population are younger than 18 years old and 4.8% are 65 years or older (Statistics South Africa, 2016b). The population pyramid for MLM is illustrated in **Figure 68**. Interesting to note is the skew in the size of the male population, particularly for the 30- 54 age bracket. This is expected to be due to an influx of males working in the mining industry. Note that these figures are based on the 2011 Census results, and the current sex/age distribution may differ.

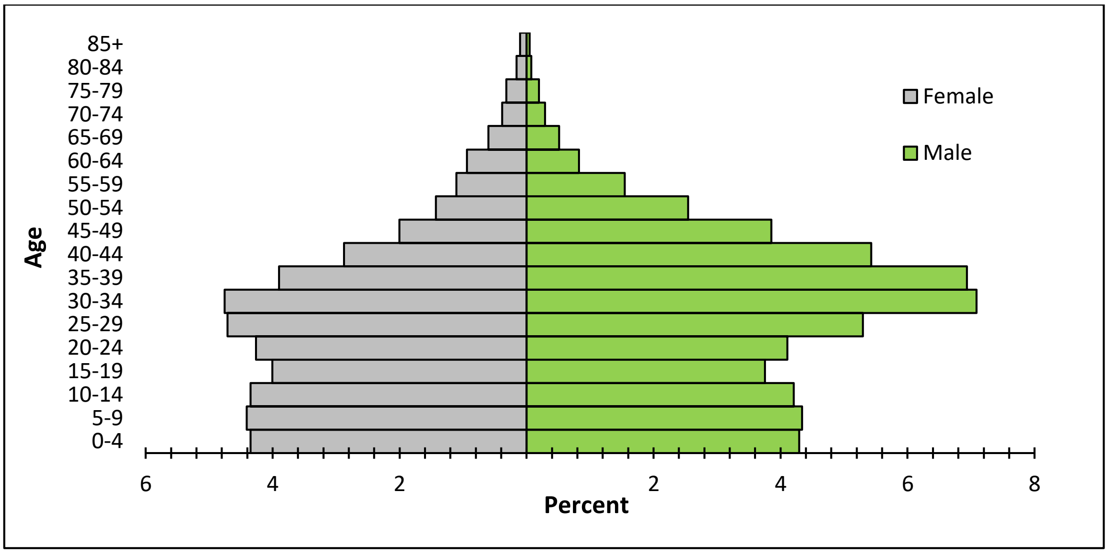


Figure 68: Population pyramid of the Matjhabeng Local Municipality (Statistics South Africa, 2012)

8.4.2.2.2 POPULATION GROUPS AND LANGUAGES

Of the 429 113 people within the MLM the majority, 89%, are black African, while 9% are white. The population groups within the MLM are fairly similar to those of the Free State Province and LDM. The dominant first language is Sesotho, spoken by 74% of the municipality's population. The other main first languages spoken are Afrikaans, (10%), isiXhosa (9%) and English (1%) (Statistics South Africa, 2016b).

8.4.2.2.3 HOUSEHOLDS

There are a total of 149 166 households in MLM. 39.3% of households were female headed and 0.3% were child headed households (Statistics South Africa, 2016b).

Household income is an important factor indicating the welfare of the region. Households with either no income or a low income are classified as falling within the poverty level. Of the four local municipalities MLM has the highest average annual household income when compared to the other municipalities within the Lejweleputswa DM, although it was slightly below the average for the Province. When looking at the different income brackets, 38% of households fall within the Low-Income bracket, earning an annual household income of less than R20 000 (**Figure 69**).

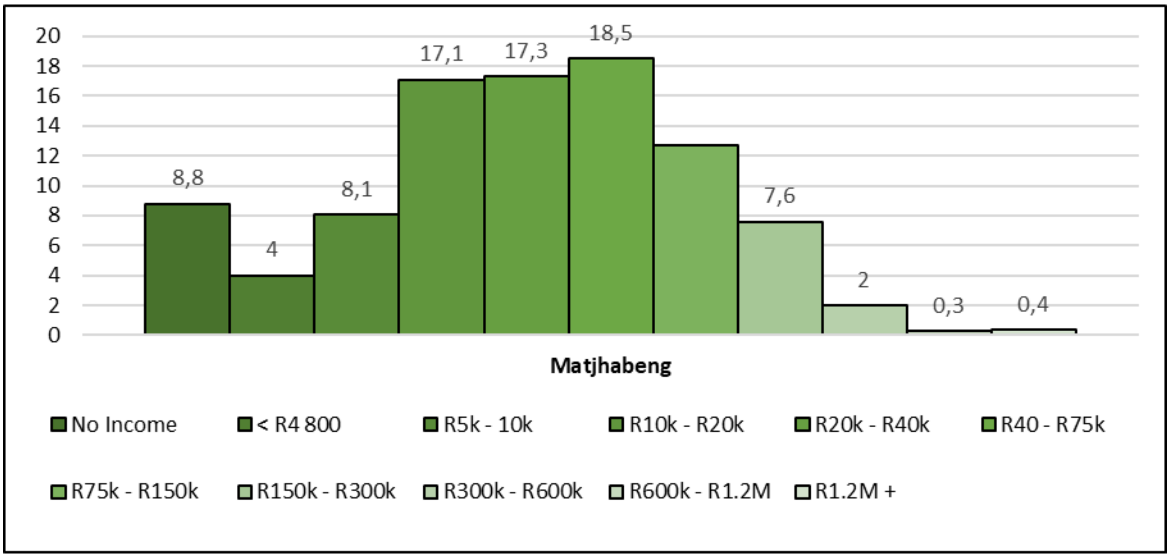


Figure 69: Percentages of the annual average household incomes for Matjhabeng Local Municipality (Statistics South Africa, 2011a).

In MLM piped water is supplied directly to 94.7% of the households, with 86.2% having flush toilets. 3% have no access to electricity. 74% of households receive regular refuse removal. The percentages of households with access to basic service delivery is higher for all basic service delivery indicators, than those of the district and province.

8.4.2.2.4 EDUCATION LEVELS

Education is a crucial factor in creating widespread, meaningful employment opportunities and strengthening the municipality's economy. Improving levels of education is critical for economic development, improving standards of living and reducing unemployment.

The MLM generally had higher levels than those of the rest of the District and the Province, as indicated in **Figure 70.**

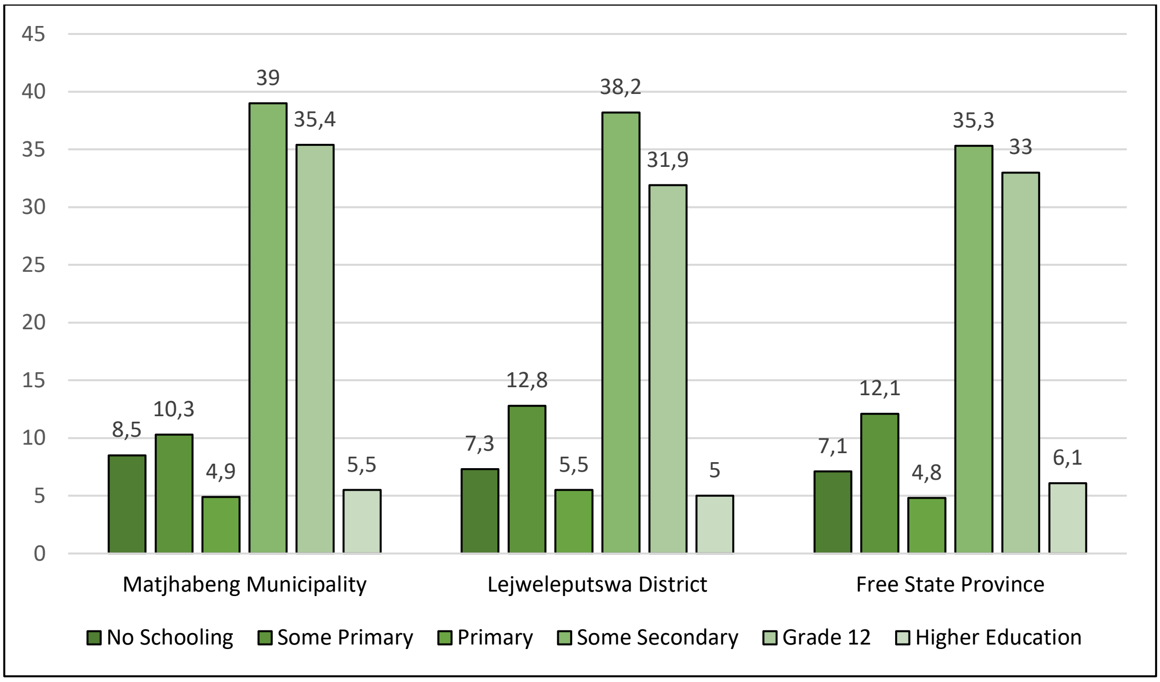


Figure 70: Level of education achieved for those over 20 years of age (Statistics South Africa, 2016b)

8.4.2.2.5 UNEMPLOYMENT

Economically active' persons are defined as those that are either currently employed or actively seeking employment. Members of the population falling within the 15-64 years age bracket are classified as being of working age. MLM Municipality had a slightly higher unemployment rate, 21.2%, than both District Municipality, 19.9% and the Province, 17.5% (Statistic South Africa, 2011)[52]. Please refer to **Figure 71**.

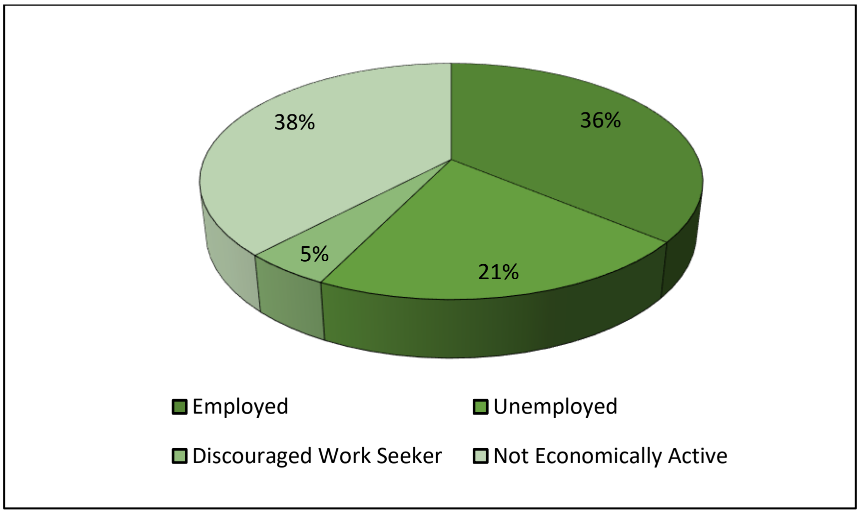


Figure 71: Employment status for Matjhabeng Local Municipality (Statistics South Africa, 2014)

[52] Please note that these figures are based on the 2011 Census and current figures are likely to differ.

8.4.2.2.6 ECONOMIC CONTRIBUTORS

The MLM is a predominantly rural municipality, with urban areas concentrated around the main town, Welkom. Known as the Gold Fields, the region's major economic driver is gold mining.

The MLM economy has the second highest production in the Free State and is hence a relatively important region in comparison to the wider economy. The MLM has a diverse economy, with three key production sectors, namely mining (37,9%), government (15,9%) and trade (14,7%). These sectors also support output in other industries including construction (2,4%), manufacturing (8%) and transportation (6,2%). Interesting to note, is that despite the region being predominantly rural in nature, the agriculture sector only accounts for 1,1% of the output (Myburgh and Bastile, 2019).

8.4.2.3 WARD 10 IN MATJHABENG MUNICIPALITY

Portion 3 of the Farm Kopje Alleen No. 81 and Portion 9 of the Farm Commandants Pan No. 382 are situated within Ward 10 of Matjhabeng LM. Ward 10 had a population of 12 672 people and an area of 792.6km^2, with a density of 16 people per km^2. 60% of the population are between 18 and 64 years of age and 36% are younger than 18 years (Statistics South Africa, 2011b).

8.4.2.3.1 POPULATIION GROUPS AND LANGUAGES

The black African population group make up the majority, 89%, of Ward 10's population. The white population group form 10% of the population and the coloured group 1%. Sesotho is the most widely spoken home language, 64%, followed by isiXhosa 14% (Statistics South Africa, 2011b).

8.4.2.3.2 HOUSEHOLDS

There are 3 656 households within Ward 10, the majority of which are 'male-headed', 61%. Ward 10 had a similar percentage of households earning R10 000 or less, 27%, compared with the district, 28.5%, and province, 26.4%.

8.4.2.3.3 SERVICE DELIVERY

With regards to service delivery, 93% of households receive water via a service provider. 92.% of households had access to flush toilets and 90.8% had their refuse removed on a regular basis (Statistics South Africa, 2011b).

8.4.2.3.4 EDUCATION LEVELS

Education levels for those over 20 years of age in Ward 10 are higher than those of the district municipality, with 35% of people in the ward achieving matric of higher versus 31.8% for the district (Statistics South Africa, 2011b).

8.4.2.3.5 UNEMPLOYMENT

Based on the 2011 Census, Ward 10 had a much higher unemployment rate, 27.2%, than the rest of the District, 19.9%, and the Province, 17.5%, with a considerably smaller percentage of the population being not economically active, 32.1%, compared to the District, 39.8%, and the Province, 40.8%.

It is unlikely that a local economy can be sufficiently diversified to supply all materials and services and support construction and operational activities from start to finish. See **Figure 71**.

It is expected that the proposed project will help diversify the national energy grid and assist in improving energy generation in the region. The project will also have a significant impact on the economy and has the potential for significant job creation and skills development especially during the construction phase of the project.

The only negative impact will be the potential loss of agricultural land, which have to be weighed against the positive impact of the proposed solar PV cluster.

A Socio-Economic Assessment was undertaken as part of the EIA process as outlined in the Plan of Study for EIA.

9 DESCRIPTION OF ENVIRONMENTAL ISSUES AND IMPACTS IDENTIFIED

The aim of the Environmental Impact Report is to identify any potential biophysical and social impacts, associated with the proposed development and then undertake the relevant specialist assessments (as approved in the Scoping Report). The findings of an EIA, on a particular project proposal, conventionally are presented to stakeholders (including decision-makers) in the form of a written report. An EIR forms the basis for review by I&APs and for decision-making. The EIR does not define whether a project is "good" or "bad." It provides a neutral, independent assessment of a proposed project's impacts on the environment. The purpose of an EIR is to provide the decision-makers with an understanding of the environmental consequences of approving a project by giving them useful, reliable and sufficient information.

The EIR in addition to the DFFE Screening tool (**Appendix P**) was used to determine various theme sensitivities within the proposed development footprint. Based on protocols (as stipulated in Government Notices No. 320), the level (Low, Medium, High, or Very high) of these sensitivities were either confirmed or disputed by the site verifications (undertaken by the EAP or specialists).

The various theme sensitivities, and potential biophysical and social impacts were identified by means of:

- Review of available literature;
- Desktop screening assessments; and,
- Site verifications by qualified specialists.

A broad range of potential environmental impacts that may have a significant impact on the environment have been identified. The potential impacts are likely to present themselves during the three main phases of the project life cycle namely;

Construction phase: these potential impacts are likely to be mainly localised and generally of high significance if un-mitigated, but could be reduced to low significance if mitigation measures and environmental management practices are implemented;

Operational phase: this phase is unlikely to have more significant and substantive impacts if mitigated and managed; and,

Decommissioning phase: these impacts are very similar to those of the construction phase, they will be generally localised with low significant impacts.

9.1 OUTCOME OF THE DFFE WEB-BASED SCREENING TOOL

In terms of GNR 960 (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 2014, as amended.

The requirement for the submission of a Screening Report (included as **Appendix P** of the EIA Report) for the 165MW Khauta North SPV Facility is applicable as it triggers Regulations 19 and 21 of the EIA Regulations 2014, as amended.

Table 22 Table 12 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 project site under consideration.

9.2 SPECIALIST STUDIES

As per the Screening Report and recommendations in the approved Scoping Report the following specialist studies was undertaken to inform the impact statement (**Table 22**).

Table 22: Sensitivity of the environmental themes and studies to be undertake in terms of these sensitivities.

ENVIRONMENTAL THEME	SENSITIVITY	REQUIRED INVESTIGATION	DISCUSSION / COMPLIANCE
Agriculture Theme	High	Agricultural Compliance Statement	An Agricultural Compliance Statement has been submitted as part of the EIA process, based on the site verification by the Specialist. Please refer to **Appendix D**.
Animal Species Theme	Low Subject to confirmation	Terrestrial Animal Species Compliance Statement	A Terrestrial Animal Species Compliance Statement has been submitted as part of the EIA process. Please refer to **Appendix G.**
Aquatic Biodiversity Theme	Low	Aquatic Biodiversity Compliance Statement	An Aquatic Biodiversity Assessment has been submitted as part of the EIA process. Please refer to **Appendix E.**
Archaeological and Cultural Heritage Theme	Low	Archaeological Heritage Impact Assessment	An Archaeological Heritage Impact Assessment has been undertaken as part of the EIA process. Please refer to **Appendix I**.
Avian Theme	Low	Avifaunal Impact Assessment	Although assigned a low sensitivity for SPV developments, an Avifaunal Impact Assessment has been undertaken as part

ENVIRONMENTAL THEME	SENSITIVITY	REQUIRED INVESTIGATION	DISCUSSION / COMPLIANCE
			of the EIA phase, due to the surrounding water resources and potential flight collision risks in terms of the proposed 32/44 kV and 33/132kV transmission lines. Please refer to **Appendix F**.
Civil Aviation (Solar PV) Theme	Low	No investigation required.	No significant impacts on the civil aviation installation are expected in low sensitivity areas. It is unlikely for further assessment and mitigation measures to be required.
Defence Theme	Low	No investigation required.	No negative impacts on the defence installation are expected in low sensitivity areas. It is unlikely for further assessment and mitigation measures to be required.
Landscape (Solar) Theme	Very High	Specialist assessment	A Visual Impact Assessment has been undertaken as part of the EIA process. Please refer to **Appendix K**.
Palaeontology Theme	High	Specialist assessment	Forms part of the Archaeological Heritage Impact Assessment that have been undertaken as part of the EIA process. Please refer to **Appendix I**.
Plant Species Theme	Low	Terrestrial Plant Species Compliance Statement	A Terrestrial Plant Species Impact Assessment has been undertaken as part of the EIA process. Please refer to **Appendix G.**
RFI Theme	Low	Compliance Statement	Not to be undertaken – The SKA declared area is approximately 615km southwest of the project site. Considering the distance, the project is unlikely to have any impact on the SKA. The South African SKA Project Office and SARAO have been registered as a key stakeholder on this environmental process and will be given the opportunity to provide comments and input in terms of the Astronomy Geographic Advantage Act and potential impact to SKA.
Terrestrial Biodiversity Theme	Very High	Terrestrial Biodiversity Specialist Assessment	A Terrestrial Biodiversity Specialist Assessment has been undertaken as part of the EIA process. Please refer to **Appendix G.**

ENVIRONMENTAL THEME	SENSITIVITY	REQUIRED INVESTIGATION	DISCUSSION / COMPLIANCE
Geotechnical Assessment	Other	Specialist assessment	A Geotechnical Desktop Assessment was undertaken as part of the preliminary engineering study (**referrer to Appendix L**). Detailed investigations will be done at detailed design stage.
Socio-Economic Assessment	Other	Specialist assessment	A Socio-Economic Assessment was undertaken and is included as Appendix J in the report.

The following specialists and specialist studies have been appointed (**Table 23**) to undertake the specialist studies during the Environmental Impact Assessment Phase.

Table 23: Specialist studies during the Environmental Impact Assessment Phase

SPECIALIST ASSESSMENT	SPECIALIST
Avifaunal Assessment	Mokgatla Molepo (Pri.Nat.Sc.) from Moira Ecological Services (Pty) Ltd
Agricultural Assessment	Dr Johann Lanz (Pri.Nat.Sc.)
Terrestrial & Aquatic Ecological Assessment	Rikus Lamprecht (Pri.Nat.Sc.) from EcoFocus Consulting (Pty) Ltd
Economic Specialist	Petrus J van Jaarsveld (ESSA #0116)
Heritage and Archaeological Assessment	Jonathan Kaplan from Agency for Cultural Resource Management (ACRM)
Palaeontological Assessment	Dr John Almond from Natura Viva CC
Terrestrial Biodiversity, Plant- and Animal Species Assessment	Mr Roy de Kock M.Sc (Pri.Nat.Sc.) from Blue Leaf Environmental (Pty) Ltd Megan Smith M.Sc Biological Sciences (EAPASA: Registered EAP) from Enviroworks
Socio-economic Impact Assessment	Michael Leach (EAPASA Reg: 2021/3872) from Enviroworks
Visual Impact Assessment	Christoff du Plessis (BSc) from Enviroworks
Geo-technical Assessment	BVi Consulting Engineers Western Cape (Pty) Ltd

9.3 IMPACT ASSESSMENT METHODOLOGY

9.3.1 GENERAL METHODOLOGY

The impacts will be evaluated by applying the methodology as described below. The impact is defined and the significance is rated from Low to High as indicated in the table below with an explanation of the impact magnitude and a guide that reflects the extent of the proposed mitigation measures deemed necessary.

For each potential impact, the **EXTENT** (Spatial scale), **MAGNITUDE** (degree of the impact), **DURATION** (time scale), **IRREPLACEABILITY** (loss of resources) and the **REVERSIBILITY** (degree to which the proposed impact can be reversed) and **PROBABILITY** (occurrence) will be assessed by the EAP as well as the Specialists. The assessment of the above criteria will be used to determine the significance of each impact, with and without the implementation of the proposed mitigation measures. The scale to be used to assess these variables and to define the rating categories are tabulated in the **Table 24** below.

Table 24: Evaluation Components, Ranking Scales And Descriptions (Criteria)

Evaluation component	Ranking scale and description (criteria)
MAGNITUDE of NEGATIVE IMPACT (at the indicated spatial scale)	**10 - Very high**: Bio-physical and/or social functions and/or processes might be *severely* altered. **8 - High**: Bio-physical and/or social functions and/or processes might be *considerably* altered. **6 - Medium**: Bio-physical and/or social functions and/or processes might be *notably* altered. **4 - Low** : Bio-physical and/or social functions and/or processes might be *slightly* altered. **2 - Very Low**: Bio-physical and/or social functions and/or processes might be *negligibly* altered. **0 - Zero**: Bio-physical and/or social functions and/or processes will remain *unaltered.*
MAGNITUDE of POSITIVE IMPACT (at the indicated spatial scale)	**10 - Very high (positive)**: Bio-physical and/or social functions and/or processes might be *substantially* enhanced. **8 - High (positive)**: Bio-physical and/or social functions and/or processes might be *considerably* enhanced. **6 - Medium (positive)**: Bio-physical and/or social functions and/or processes might be *notably* enhanced. **4 - Low (positive)**: Bio-physical and/or social functions and/or processes might be *slightly* enhanced. **2 - Very Low (positive)**: Bio-physical and/or social functions and/or processes might be *negligibly* enhanced. **0 - Zero (positive)**: Bio-physical and/or social functions and/or processes will remain *unaltered.*
DURATION	**5 – Permanent** **4 - Long term**: Impact ceases after operational phase/life of the activity > 60 years. **3 - Medium term**: Impact might occur during the operational phase/life of the activity – 60 years. **2 - Short term**: Impact might occur during the construction phase - < 3 years. **1 – Immediate**
EXTENT	**5 - International**: Beyond National boundaries. **4 - National**: Beyond Provincial boundaries and within National boundaries. **3 - Regional**: Beyond 5 km of the proposed development and within Provincial boundaries. **2 - Local**: Within 5 km of the proposed development.

Evaluation component	Ranking scale and description (criteria)
(or spatial scale/influence of impact)	**1 - Site-specific**: On site or within 100 m of the site boundary. **0 – None**
IRREPLACEABLE loss of resources	**5 – Definite** loss of irreplaceable resources. **4 – High** potential for loss of irreplaceable resources. **3 – Moderate** potential for loss of irreplaceable resources. **2 – Low** potential for loss of irreplaceable resources. **1 – Very low** potential for loss of irreplaceable resources. **0 – None**
REVERSIBILITY of impact	**5 –** Impact **cannot** be reversed. **4 – Low** potential that impact might be reversed. **3 – Moderate** potential that impact might be reversed. **2 – High** potential that impact might be reversed. **1 –** Impact **will be** reversible. **0 –** No impact.
PROBABILITY (of occurrence)	**5 - Definite**: >95% chance of the potential impact occurring. **4 - High probability**: 75% - 95% chance of the potential impact occurring. **3 - Medium probability**: 25% - 75% chance of the potential impact occurring **2 - Low probability**: 5% - 25% chance of the potential impact occurring. **1 - Improbable**: <5% chance of the potential impact occurring.
Evaluation component	**Ranking scale and description (criteria)**
CUMULATIVE impacts	**High**: The activity is one of several similar past, present or future activities in the same geographical area, and might contribute to a very significant combined impact on the natural, cultural, and/or socio-economic resources of local, regional or national concern. **Medium**: The activity is one of a few similar past, present or future activities in the same geographical area, and might have a combined impact of moderate significance on the natural, cultural, and/or socio-economic resources of local, regional or national concern. **Low**: The activity is localized and might have a negligible cumulative impact. **None**: any cumulative impact on the environment.

Once the evaluation components have been ranked for each potential impact, the significance of each potential impact will be assessed (or calculated) using the following formula:

- **SP (Significance Points) = (Magnitude + Duration + Extent + Irreplaceability + Reversibility) x Probability**

The maximum value is 150 SP (Significance Points). The unmitigated and mitigated scenarios for each potential environmental impact should be rated as per Table 25 below.

Table 25: Unmitigated and Mitigated Scenarios for each potential impact

Significance Points	Environmental Significance	Description
125 – 150	Very high (VH)	An impact of very high significance will mean that the project cannot proceed, and that impacts are irreversible, regardless of available mitigation options.
100 – 124	High (H)	An impact of high significance which could influence a decision about whether or not to proceed with the proposed project, regardless of available mitigation options.
75 – 99	Medium-high (MH)	If left unmanaged, an impact of medium-high significance could influence a decision about whether or not to proceed with a proposed project. Mitigation options should be relooked.
40 – 74	Medium (M)	If left unmanaged, an impact of moderate significance could influence a decision about whether or not to proceed with a proposed project.
<40	Low (L)	An impact of low is likely to contribute to positive decisions about whether or not to proceed with the project. It will have little real effect and is unlikely to have an influence on project design or alternative motivation.
+	Positive impact (+)	A positive impact is likely to result in a positive consequence/effect, and is likely to contribute to positive decisions about whether or not to proceed with the project.

Specialist studies also considered cumulative impacts associated with similar developments within the broader project site. 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; and/or,
- Unacceptable increase in impact.

A conclusion regarding whether the proposed SPV 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 project developer has the responsibility to avoid or minimise impacts and plan for their management (in terms of the requirements of NEMA and the 2014 EIA Regulations (GNR 326)), as amended, the mitigation of significant impacts is discussed. Assessment of impacts with mitigation is made in order to demonstrate the effectiveness of the proposed mitigation measures. A facility EMPr and a generic substation EMPr that include all the mitigation measures recommended by the specialists for the management of significant impacts are included as **Appendix N1 and N2** to this EIA Report.

Refer to the specialist studies contained in **Appendices D - L** for limitations specific to the independent specialist studies.

9.3.2 AQUATIC SPECIFIC METHODOLOGY

Due to the sensitive nature of aquatic environments, the assessment was done in accordance to the "Protocol for the criteria for the assessment and reporting of impacts on aquatic biodiversity for activities requiring environmental authorisation, as Published in GN No. 320 ,Government Gazette 43110 (20 March 2020)" that require the calculation of the Present Ecological State (PES) of water bodies and the Ecological Importance and Sensitivity (EIS) of the identified watercourses/wetlands and/or aquatic features/habitats.

The PES refers to the current state or condition of an area in terms of all its characteristics and reflects the change to the area from its reference condition. The value gives an indication of the alterations that have occurred in the ecosystem. The PES of the identified watercourses/wetlands and/or aquatic features/habitats, was determined and discussed as per the **Table 26** below.

Table 26: Criteria for PES calculations

Ecological Category	Score	Description
A	>90 – 100%	**Unmodified**, natural and pristine.
B	>80 – 90%	**Largely natural**. A small change in natural habitats and biota may have taken place but the ecosystem functionality has remained essentially unchanged
C	>60 – 80%	**Moderately modified**. Moderate loss and transformation of natural habitat and biota have occurred, but the basic ecosystem functionality has still remained predominantly unchanged
D	>40 – 60%	**Largely modified**. A significant loss of natural habitat, biota and subsequent basic ecosystem functionality has occurred.
E	>20 – 40%	**Seriously modified**. The loss of natural habitat, biota and basic ecosystem functionality is extensive.
F	0-20%	**Critically/Extremely modified**. Transformation has reached a critical level and the ecosystem has been modified completely with a virtually complete loss of natural habitat and biota. The basic ecosystem functionality has virtually been destroyed and the transformation is irreversible.

The EIS of an area is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales (**Table 27**). Both abiotic and biotic components of the system are taken into consideration. Sensitivity refers to the system's ability to resist disturbance and its capability to recover from disturbance once it has occurred.

Table 27: Criteria for EIS calculations

EIS Categories	Score	Description
Low/Marginal	**D**	Not ecologically important and/or sensitive on any scale. Biodiversity is ubiquitous and not unique or sensitive to habitat modifications.
Moderate	**C**	Ecologically important and sensitive on local or possibly provincial scale. Biodiversity is still relatively ubiquitous and not usually sensitive to habitat modifications.
High	**B**	Ecologically important and sensitive on provincial or possibly national scale. Biodiversity is relatively unique and may be sensitive to habitat modifications.
Very High	**A**	Ecologically important and sensitive on national and possibly international scale. Biodiversity is very unique and sensitive to habitat modifications.

9.4 LIST OF SPECIALISTS USED DURING THE ASSESSMENT

Based on the outcomes of the Scoping Phase evaluation of the project, the following studies were identified as requiring detailed assessment and the specialist consultants involved in the assessment of these impacts are indicated in **Table 28** below.

Table 28: List of Specialist Assessments and the related Specialists who undertook the studies.

Specialist	Specialist Study	Appendix
Johann Lanz of Johann Lanz	Agricultural compliance Statement	**Appendix D**
Rikus Lamprecht of EcoFocus Consulting (Pty) Ltd	Aquatic Impact Assessment	**Appendix E**
Mokgatla Molepo of MORA Ecological Services (Pty) Ltd	Avifaunal Impact Assessment	**Appendix F**
Megan Smith of King's Landing Trading 507 (Pty) Ltd t/a Enviroworks Mr Roy de Kock M.Sc (Pri.Nat.Sc.) from Blue Leaf Environmental (Pty) Ltd	Animal Species, Plant Species and Terrestrial Biodiversity Impact Assessment Report	**Appendix G**
Jonathan Kaplan from ACRM	Archaeological Heritage Impact Assessment	**Appendix I**
Pierre van Jaarsveld of Urban-Econ Development Economists	Economic Impact Assessment Report	**Appendix H**

Michael Leach of King's Landing Trading 507 (Pty) Ltd t/a Enviroworks	Social Impact Assessment	**Appendix J**
Christoff du Plessis of King's Landing Trading 507 (Pty) Ltd t/a Enviroworks	Visual Impact Assessment	**Appendix K**
Iain Paton of Quteniqua Group	Geotechnical Impact Assessment	**Appendix L**

9.5 POTENTIAL ENVIRONMENTAL IMPACTS AND PROPOSED MITIGATION MEASURES

This section serves to assess the significance of the positive and negative environmental impacts (direct and indirect) expected to be associated with the development of the 165MW Khauta North SPV Facility and associated infrastructure. This assessment has considered the construction of a solar PV facility with a contracted capacity of up to 165MW, within a development footprint of approximately 273ha.

The 165MW Khauta North SPV Facility will compose of the following infrastructure:

- PV modules and mounting structures (monofacial or bifacial) with fixed, single or double axis tracking mounting structures;
- Associated stormwater management infrastructure;
- Battery Energy Storage System (BESS);
- Site- and internal access roads (up to 6 m wide);
- Auxiliary buildings (Control room, general office, access control and security building, kitchen area with ablution facilities, small workshop, and a store);
- Ablution facilities and associated infrastructure;
- Temporary laydown area during the construction phase (which will be a permanent laydown area for the BESS during the operational phase);
- On-site substation;
- Grid connection infrastructure including medium-voltage cabling between the project components and the facility substation (underground cabling will be used where practical);
- Perimeter fencing; and,

  Rainwater and/or groundwater storage tanks and associated water transfer infrastructure.

The full extent of the project site (~515.49ha) was considered through the Scoping Phase of the EIA process by the independent specialists and the EAP. On-site sensitivities were identified through the review of existing information, desktop evaluations and detailed in-field surveys. The identification of a development footprint for the solar PV 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 EIA process have considered the development footprint (which was provided by the developer) as well as recommended No-Go areas (refer to **Figure 59**).

The construction and operation of Photovoltaic modules on a large scale can result in negative local environmental impacts e.g. on landscapes and sustainable land use (including protected areas, etc.). The negative environmental impacts from solar energy installations are much lower in intensity than those produced by conventional energies, but they still have to be assessed and mitigated.

On the other hand, solar generated power also has a number of positive impacts when considering the greater scheme of electricity generation. One of these is the fact that solar power is one of the cleanest renewable resources available. While many of the negative impacts may be on a local scale, the positive impacts may have a global reach. This chapter discusses the impacts (negative and positive) likely to be associated with the project.

9.5.1 QUANTIFICATION OF AREAS OF DISTURBANCE ON THE SITE

Site-specific impacts associated with the construction and operation of the 165MW Khauta North SPV Facility relate to the direct loss of vegetation and species of special concern, disturbance of animals and loss of habitat and impacts on soils. In order to assess the impacts associated with 165MW Khauta North SPV Facility, it is necessary to understand the extent of the affected area.

The development footprint (**Figure 72**) (amended in accordance to the ecological sensitivity of the area (**Figure 51, Figure 58 & Figure 59**)) will include affected areas, which will comprise of PV modules mounted on either a fixed tilt or single axis tracker structure, dependent on optimisation, technology available and cost) at a height of up to 5 - 8m, internal access roads (permanent width of up to 12 – 13m), 1 x onsite collector substation (1.1ha), construction compound & Battery Energy Storage System (BESS) (3.85ha) and an Office Block and parking area of 0.5ha. The maximum area of disturbance is approximated to be ~273ha in extent.

Wherever possible, existing access roads will be utilised to access the project site and development footprint, essentially reducing the extent of disturbance resulting from access road construction. It is unlikely that access roads will need to be upgraded as part of the proposed development.

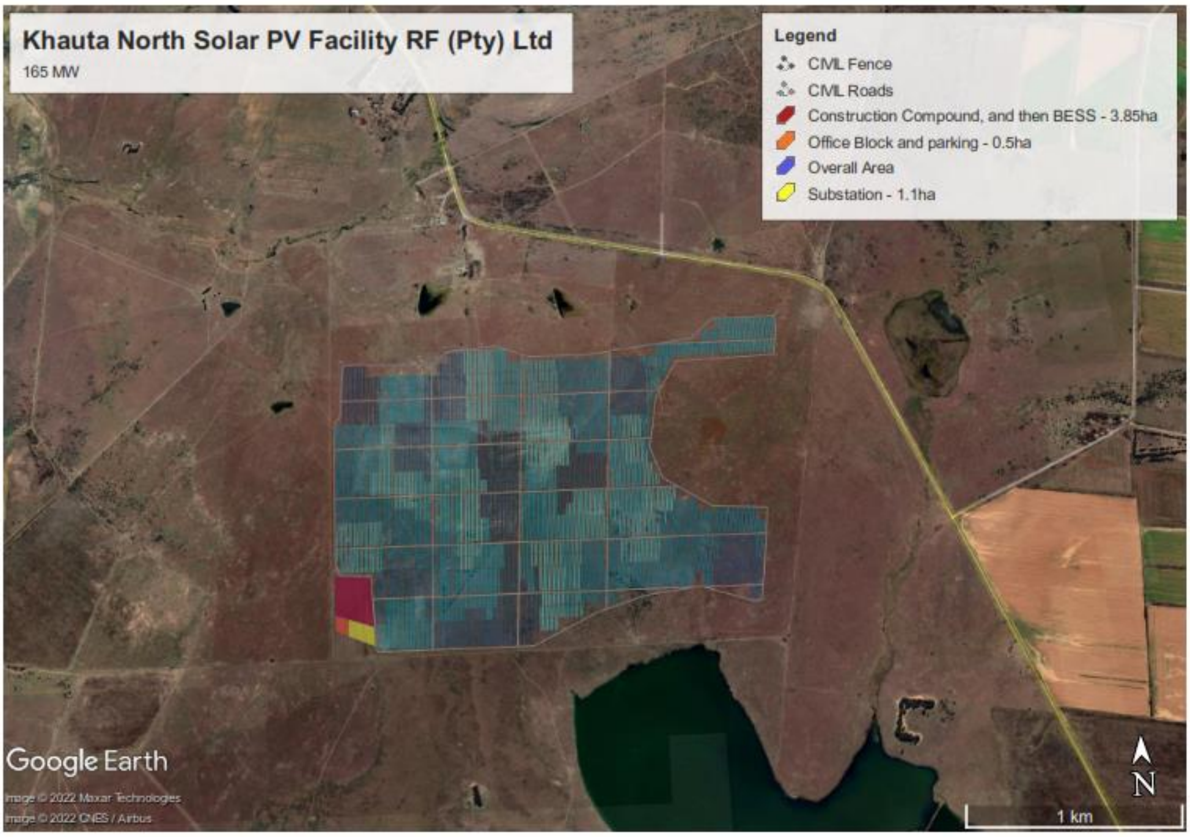


Figure 72: Development footprint of the proposed 165MW Khauta North SPV Facility

In order to identify and effectively assess the potential environmental impacts of the proposed development, an environmental criteria checklist (**Table 29**) was used and completed as follow.

Table 29: Identification of Potential Impacts.

NO.	CRITERIA	YES	NO	DESCRIPTION AND COMMENTS
1. SURFACE WATER AND GROUNDWATER				
1.1	Negative effect on surface water quality and water flow.	Yes	-	• The project could involve construction or decommissioning activities within surface watercourses during construction; • Surface water turbidity, EC, and TDS may be increased by the erosion of construction areas (limited to construction and decommissioning phases only); • The construction and operation of the development will not involve any abstraction of water from a watercourse and will also not involve the usage or storage of significant amounts of water; and, • Surface runoff patterns will not be significantly altered by the project.

NO.	CRITERIA	YES	NO	DESCRIPTION AND COMMENTS
				• During operational phase and in the event of containment failure of the BESS, or in the event of a fire, the molten electrolyte (sulphuric acid-based solution) or sodium hydroxide may contaminate the soil and groundwater.
1.2	Negative effect on groundwater quality and water flow.	Yes	-	• The project will not involve any groundwater abstraction, yet; • There is potential for groundwater contamination due to accidental spills of hazardous substances during the construction, maintenance, and decommissioning phases of the project; and, • The impact on groundwater quality and flow is therefore likely to be of very low significance. • During operational phase and in the event of containment failure of the BESS, or in the event of a fire, the molten electrolyte (sulphuric acid based solution) or sodium hydroxide may contaminate the soil and groundwater.
2.	**SOILS (GEOLOGY) AND TOPOGRAPHY**			
2.1	Negative impact of soils.	Yes	-	• The project will involve the construction of concrete foundations, in some instances where required, for the PV panels and other site associated infrastructure, which is likely to have impact on topsoil loss, compaction of soils and soil erosion; • Although the total area to be disturbed (foundation footprint) is minimal compared to typical construction sites, mitigation measures will have to be put in place to manage these impacts; and, • The more significant impact on soils, will come from clearing activities, the construction of roads, and trenches for the cabling.
2.2	Loss of agricultural land-use.	Yes		• Land will be occupation by PV panels and associated infrastructure, for the duration of the project in all the phases of the project;

NO.	CRITERIA	YES	NO	DESCRIPTION AND COMMENTS
				• Positive impacts include the enhanced agricultural potential through increased financial security for farming operations, and improved security against stock theft and other crime.
2.3	Soil erosion due to alteration of the surface run-off characteristics.	Yes	-	• Alteration of run-off characteristics may be caused by construction related land surface disturbance, vegetation removal, the establishment of hard standing areas and roads, and the presence of panel surfaces. Erosion will cause loss and deterioration of soil resources and may occur during all phases of the project.
3.	**ECOLOGICAL IMPACT**			
3.1	Negative impact on vegetation and fauna.	Yes	-	• The project will entail vegetation clearance and ground cover clearing during the construction phase. This is likely to have some form of impact on vegetation and fauna on the site; • A detailed Ecological Impact Assessment was undertaken to determine the significance of this impact; and, • However, from the site visits undertaken as part of the Scoping Report, the site appears to be in an already transformed or impacted state.
3.2	Negative impact on wetlands and riparian vegetation.	-	No	• The project site has wetlands and watercourses and the ecological impact investigation was conducted to report findings; and, • The development layout avoids significant sensitive areas, which shall be deemed as No-Go areas. Suitable buffer areas were assigned to sensitive wetland and marshy areas that should be maintained during the construction and operational phase.
3.3	Negative impact on Birds and Avian Species.	-	No	• Solar PV projects are not known to have negative impacts on birds, however, a study was undertaken, even though layout avoids significant sensitive areas.

NO.	CRITERIA	YES	NO	DESCRIPTION AND COMMENTS
4.	**HERITAGE IMPACT**			
4.1	Negative impact on graveyards, rock art, historical buildings, archaeological site and artefacts etc.	-	No	• Sites or features of heritage, archaeological and cultural importance observed within the greater area were identified and buffers assigned and incorporated into the layout plan to avoid; and, A Heritage Impact Assessment was conducted during the EIA phase in order to confirm this.
5.	**NOISE IMPACT**			
5.1	Negative impact on of noise on surrounding receptors (residential areas, institutions, and business sites).	Yes	-	• The construction of the PV structures is likely to have some noise impact on the surrounding but there are generally no sensitive receptors near the site; and, • The Operational phase of Solar PVs is not known to have any significant noise impact.
6.	**VISUAL IMPACT**			
6.1	Negative impact on Aesthetically pleasing and scenic landscape.	Yes	-	• The construction of PV structures is likely to have some impact on the viewscape especially since the site is located in a fairly rural natural landscape; • The PV panels are generally located at heights close to the ground level and might not be visible from far distances; and, • This issue was addressed by a visual impact assessment.
7.	**SOCIO-ECONOMIC IMPACT**			
7.1	Negative impact on neighbourhood and community character.	Yes	-	• There are currently no PV facilities in the area thus the neighbourhood and community character will change the agricultural and rural character of the community; and, • However, it is important to note that neighbourhood or community effects are subjective in nature.
7.2	Negative impact on local businesses, institutions or public facilities.	Yes		• Potential impacts anticipated on tourism in the immediate local and regional area were investigated in more detail by the Socio-Economic Assessment and during PPP.

NO.	CRITERIA	YES	NO	DESCRIPTION AND COMMENTS
7.3	Impact on local Tourism.	Yes		• Potential impacts anticipated on tourism in the immediate local and regional area were investigated in more detail by the Socio-Economic Assessment and during PPP.
7.4	Negative impact on the local economy or the municipal economy.	-	No	• No negative impact anticipated, but rather a positive economic impact as a result of increased tax base, job creation, increased capacity of electricity in the area, especially green power; • Job opportunities will involve about three thousand man-months during the 18 months construction phase and approximately 15-20 full time individuals during the 25 years or even up to 30 years of operation; • Reliable income will be generated by the farming enterprises through the lease of the land to the energy facility; • Likely to improve security against stock theft and other crime; and, • A Socio-Economic Assessment was undertaken.
8.	**TRAFFIC IMPACT**			
8.1	Negative impact on traffic.	Yes	-	• During construction and decommissioning, delivery and removal of equipment to the site will result in a temporary increase in local traffic; and, • The operational phase is not likely to have any significant impact on local traffic.
8.2	Negative impact on public health and safety.	Yes	-	• Health and Safety risk related to construction work and electrical installation will be possible during the construction and decommissioning phase; • Mitigation measures based on Occupational Health and Safety Act, will be put in place to manage these risks; and, • All power generation and electrical installations have significant health and safety risks. However, this facility will be a high security and controlled access facility to

NO.	CRITERIA	YES	NO	DESCRIPTION AND COMMENTS
				ensure that any unauthorised person does not access it.

*Yes = Means the impact is identified as a potential impact is discussed further at EIA Phase.

9.5.2 IMPACT OF VEGETATION LOSS AND DISTURBANCE OF HABITATS

The installation of the solar PV modules arrays, and associated infrastructure, is likely to result in the loss of vegetation and disturbance of habitats, and this can consequently affect, alter and/or fragment ecosystems on the site. Although some parts of the site have already been transformed or disturbed through agriculture, there are areas which were intact, and have active ecosystems on the site. These important habitats could be affected if due care in the planning and implementation of mitigation measures, to avoid negative impacts, is not taken during the project phases.

Activities and risk factors associated with the construction and operation phases of the project include the following:

Construction:

- Site clearing and exploration activities for site establishment.
- Vegetation clearing could impact protected plant species. Vegetation clearing would also lead to the loss of vegetation communities and habitats for fauna and avifauna and potentially the loss of faunal as well as avifaunal species, habitats and ecosystems. On a larger and cumulative scale (if numerous and uncontrolled developments are allowed to occur in the future) the loss of these vegetation communities and habitats may potentially lead to a change in the conservation status of the affected vegetation type as well as the ability of this vegetation type and associated features to fulfil its ecological responsibilities (functions). The above impact is most likely to be of low significance due to the fact that most of the development area is situated within an area which has been somewhat degraded due to long term overgrazing.
- Loss of topsoil and soil erosion.
- Movement of construction vehicles and placement of infrastructure within the boundary of the drainage lines may lead to the disturbance of these habitats, removal of vegetation cover and a potential increase in erosion which may eventually spread into downstream areas.
- Presence and operation of construction machinery on the project site. This will create a physical impact as well as generate noise, potential pollution and other forms of disturbance at the site.
- Soil compaction and increased erosion risk would occur due to the loss of plant cover and soil disturbance created during the construction phase. This may potentially impact the downstream watercourses, wetlands and aquatic habitats, mainly due to an increase of surface water and silt inflow from the surrounding disturbed areas (these potential impacts on downslope wetland features have been assessed within the freshwater resource study and assessment). These potential impacts may result in a reduction in the buffering capacities of the landscape during extreme weather events.

- Human presence and uncontrolled access to the site may result in negative impacts on fauna and flora through poaching of fauna and uncontrolled collection of plants for traditional medicine or other purpose and other forms of disturbance such as fire.
- Invasion by alien plants may be attributed to excessive disturbance to vegetation, creating a window of opportunity for the establishment of these alien invasive species. In addition, regenerative material of alien invasive species may be introduced to the project site by machinery traversing through areas with such plants or materials that may contain regenerative materials of such species.

Operation:

- The PV panels as well as the hard surfaces created by the development may lead to increased runoff (reduction in infiltration) and the potential interception and channelling of surface runoff, particular on surfaces with a steeper gradient. This may potentially lead to:
    - A modification to the surface runoff and infiltration patterns;
    - Increased erosion;
    - Sedimentation of the downslope areas; and,
    - Impairment of nearby located freshwater resource features' functions and services.
- The facility will require management and if this is not done effectively, it could impact adjacent intact areas through impacts such as erosion and the invasion of alien plant species.

Decommissioning:

- During decommissioning, the potential impacts will be very similar to that of the Construction Phase, although with slightly lower significance.

9.5.2.1 FAUNA & FLORA IMPACTS DURING CONSTRUCTION

9.5.2.1.1 DESTRUCTION OF INDIGENOUS VEGETATION

Vegetation loss of rehabilitating grassland (secondary grassland) and natural grassland (primary grassland) will occur during the site establishment and initial construction phase. Although most of the site has been previously transformed/degraded, the footprint is still likely to fulfil important ecosystem functioning and the vegetation does represent at least some of the elements of the indigenous vegetation type.

9.5.2.1.2 LOSS OF TOPSOIL AND SOIL EROSION

Soil disturbance and vegetation removal due to construction activities and vehicular movement is expected during the construction phase. This is expected to create areas of soil which are prone to erosion especially during high rainfall events. The construction activities of the proposed project could potentially result in erosion of sand (especially topsoil) stored in stockpiles. Windblown sand in excessive amount could result in deleterious effects on the surrounding natural environment.

9.5.2.1.3 IMPACT OF LISTED OR PROTECTED SPECIES

No species of conservation concern were found within the development site. However, the footprint does include areas that are likely to be suitable habitat for protected species (as found on the adjacent solar farm development footprints). However, the species found on the adjacent footprints are not threatened and thus, the sensitivity of the site remains low for the proposed development footprint.

9.5.2.1.4 IMPACT ON FAUNAL SPECIES

Some faunal species were observed on the development footprint including suitable habitat for *S. giganteus*. While the majority of these species are not threatened or protected, the impact on the suitable habitat for *S. giganteus* must be taken into consideration.

9.5.2.1.5 ALIEN INVASIVE SPECIES ESTABLISHEMENT

Areas within and around the proposed project footprint are prone to establishment of alien invasive species due to disturbances caused by construction activities. Considering that the proposed solar farm footprint and surrounds consists of patches indigenous vegetation, spreading of alien invasive species into surrounding areas would have a negative impact.

9.5.2.1.6 DAMAGE TO SENSITIVE HABITATS

The development footprint includes areas mapped as sensitive in in terms of the Free State Biodiversity Spatial Plan. These areas have been delineated as Ecological Support Areas (ESA). These areas have been delineated due to the presence and functioning of wetlands. By avoiding wetlands and their buffers, the functioning of the ESAs is expected to be preserved.

Areas outside of the development footprint have been confirmed to be ESAs (areas mapped as wetlands and their buffers). Avoiding these areas will reduce the impact on the ESA.

9.5.2.1.7 DUST GENERATION AND EMMISSIONS

The construction activities of the proposed project could potentially result in significant fugitive dust emissions, due to excavations and vegetation removal, which could spread into the surrounding areas. Due to the remote location of the proposed development, the significance of this potential impact will however be low and only temporary.

9.5.2.1.8 CHANGING LOCAL FIRE REGIME FROM WILDFIRES

Increased fire occurrences may encourage the invasion of alien invasive species and a reduction in geophytic species diversity and abundance. Alterations in the species composition or plant guild (group of species that exploit the same resources, or that exploit different resources in related ways e.g., pollination strategy) composition of the Grassland may negatively impact the ecological functioning of the area. Due to the proximity of the proposed development to natural vegetation, the potential risk of a veld fire is high.

9.5.2.2 *FAUNA & FLORA IMPACTS DURING OPERATION*

9.5.2.2.1 CONTINUED ALIEN INVASIVE SPECIES ESTABLISHEMENT

Areas around the development footprint, could potentially continue to be prone to significant alien invasive species establishment due to the activities associated with the operational phase of the proposed project and continued foot and vehicular traffic. Soil stored seedbanks could also persist in the topsoil stockpiles and thus provide a stepway for the spread and persistence of alien invasive species in the landscape.

9.5.2.2.2 INCREASED RISK OF VELD FIRES

The risk of veld fires is high as a result of human presence and potential electrical fires. The impact of increased frequency of veld fires is expected to be increased by the close proximity of the proposed footprint to natural vegetation.

9.5.2.2.3 IMPACT ON FAUNAL SPECIES

Some faunal species were located on the footprint and surrounding area. However, these species are not threatened or protected. During the operational phase of the mine, faunal species are expected to be impacted by disturbance of vehicles and personnel.

9.5.2.2.4 WASTE MANAGEMENT

The operation of the facilities poses a pollution risk to the environment, should any general and hazardous waste generated be improperly disposed of.

9.5.2.2.5 POSITIVE IMPACT OF REHABILITATION

A positive impact on the environment is possible if the surrounding areas of the site are suitably rehabilitated and restored to host a structure, composition, and ecological functioning similar to the surrounding vegetation. It is expected that a after decommissioning rehabilitation plan must be compiled to provide detailed rehabilitation targets and measures.

9.5.2.2.6 OVERALL RISK RATING

Grasslands are highly threatened ecosystems and severely under protected (Cadman et al., 2013). Therefore, any loss in this vegetation is not favourable. However, the specific footprint inhabits grassland previously disturbed by grazing pressure and agriculture which has resulted in most of the area being classified as Degraded in the Free State Biodiversity Spatial Plan. The footprint’s contribution to the wider area’s ecological functioning and species diversity is expected to be **moderate** due to the disturbance history of the area. Part of the footprint is mapped within ESAs, but this area has been recommended not to be classified as an ESA given the avoidance of wetlands and their buffers.

No threatened species or species of conservation concern (SCC) (or sensitive species as defined by the Screening Tool, as identified by the Screening Tool) were observed within the development footprint during the site visit. However, suitable habitat for *Smaug giganteus* was recorded on the footprint. Preserving these areas of suitable habitat would result in fragmentation and colonising the area would be unlikely; it is thus recommended that suitable habitat areas outside of the development footprint (that were identified and mapped during a specialist site visit) be avoided.

If all mitigation measures are implemented, the likelihood of significant impacts occurring, and the consequence of the impacts are significantly reduced to acceptable levels (see risk ratings and potential impacts). All risk, their ratings and specific mitigation measures can be viewed in Risk ratings and potential impacts section below (**Table 30**).

Table 30: Risk ratings in terms of impacts on the fauna and flora.

Project alternative	Potential environmental impact/ Nature of impact	Environmental significance																	
		Before mitigation									After mitigation								
		Magnitude	Duration	Extent	Irreplaceability	Reversibility	Probability	Total (SP)	Significances	Cumulative	Magnitude	Duration	Extent	Irreplaceability	Reversibility	Probability	Total (SP)	Significances	Cumulative
Project activity	**Site establishment and initial construction phase impacts**																		
PROPOSED DEVELOPMENT OF A 165 MW PHOTOVOLTAIC SOLAR FARM ON PORTION 0 OF THE FARM KOPJE ALLEEN NO. 81 AND PORTION 1 OF THE FARM KOPJE ALLEEN NO. 81, KHAUTA NORTH SOLAR PV FACILITY, NEAR RIEBEECKSTAD, MATJHABENG LOCAL MUNICIPALITY, FREE STATE PROVINCE	Destruction of Indigenous Vegetation	8	5	2	3	4	4	88	Medium High	Medium	6	5	2	3	4	3	60	Medium	Medium
	Loss of topsoil and soil erosion	4	5	2	2	4	3	51	Medium	Medium	2	2	1	2	2	2	11	Low	Low
	Impacts on Listed or Protected Plant Species	4	5	1	2	3	2	30	Low	Low	0	2	0	0	0	2	4	Low	Low
	Impact on Faunal Species	4	5	1	2	3	2	30	Medium	Low	2	2	1	2	2	2	11	Low	Low
	Alien Invasive Species Establishment	4	5	1	2	3	2	30	Low	Low	0	2	0	0	0	2	4	Low	Low
	Damage to sensitive habitats	8	5	2	3	4	4	88	Medium High	Medium	6	5	2	3	4	3	60	Medium	Medium
	Dust generation and emissions	4	3	2	2	4	3	45	Medium	Medium	2	3	2	1	1	3	27	Low	Low

Project alternative	Potential environmental impact/ Nature of impact	Environmental significance																	
		Before mitigation									After mitigation								
		Magnitude	Duration	Extent	Irreplaceability	Reversibility	Probability	Total (SP)	Significances	Cumulative	Magnitude	Duration	Extent	Irreplaceability	Reversibility	Probability	Total (SP)	Significances	Cumulative
	Changing local fire regime from wildfires	6	3	2	3	4	4	72	Medium	Medium	2	3	1	2	2	2	20	Low	Low
Project activity	Operational phase																		
PROPOSED DEVELOPMENT OF A 165 MW PHOTOVOLTAIC SOLAR FARM ON PORTION 0 OF THE FARM KOPJE ALLEEN NO. 81 AND PORTION 1 OF THE FARM KOPJE ALLEEN NO. 81, KHAUTA NORTH SOLAR PV FACILITY, NEAR RIEBEECKSTAD, MATJHABENG LOCAL MUNICIPALITY, FREE STATE PROVINCE	Continued Alien Invasive Species Establishment	6	4	1	3	3	3	51	Medium	Medium	2	4	1	1	1	2	18	Low	Low
	Increased risk of veld fires	6	3	2	3	4	3	54	Medium	Medium	4	3	1	2	3	3	39	Low	Low
	Waste Management	4	2	1	2	2	3	33	Low	Low	2	3	1	1	1	3	24	Low	Low
	Impact on Faunal Species	4	2	1	2	2	3	33	Low	Low	2	3	1	2	3	3	33	Low	Low
	Dust generation and emissions	4	2	1	2	2	3	33	Low	Low	2	3	2	1	1	3	27	Low	Low
	Positive Impact of Rehabilitation	4	3	2	0	0	3	9	Low (+)	-	;4	3	2	0	0	3	27	Low (+)	-

9.5.2.2.7 IMPACT AVOIDANCE MITIGATION

Buffers around sensitive areas were drawn at distances as defined in Listing Notice 3 of the EIA Regulations 2014, as amended.

Based on these a terrestrial sensitivity map was compiled to exclude development in very sensitive areas and to maintain the ecological corridors for species movement. Please refer to **Figure 73.**

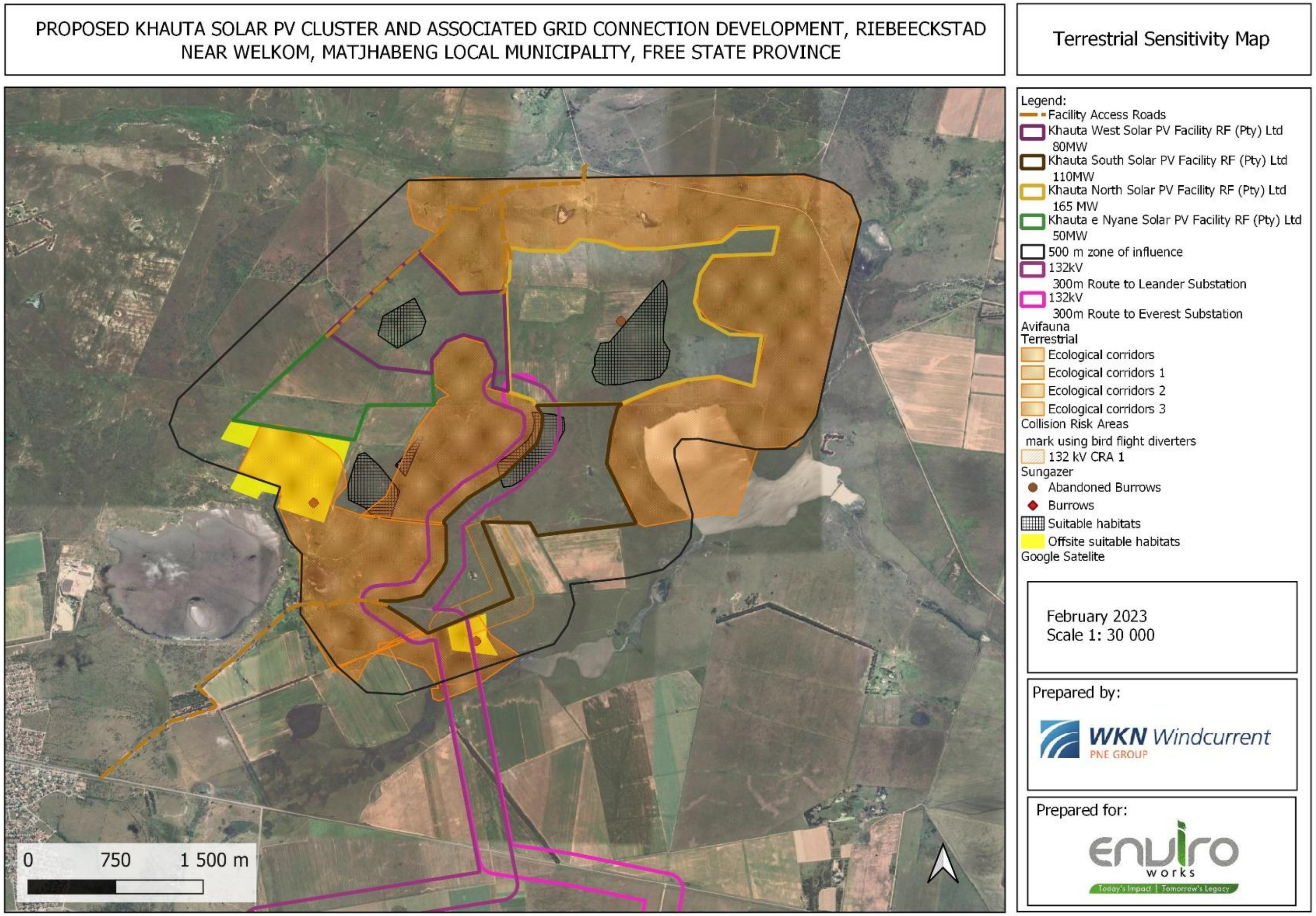


Figure 73: Terrestrial sensitivity map for the Khauta Cluster SPV Facilities

9.5.3 AGRICULTURAL IMPACT

9.5.3.1 DIRECT AND INDIRECT AGRICULTURAL IMPACTS

An Agricultural Compliance Statement is not required to formally rate agricultural impacts. It is only required to indicate whether or not the proposed development will have an unacceptable impact on the agricultural production capability of the site. It must provide a substantiated statement on the acceptability, or not, of the proposed development and a recommendation on the approval, or not of the proposed development.

When the agricultural impact of a development involves the permanent or long-term non-agricultural use of potential agricultural land, as it does in this case, the focus and defining question of the agricultural impact assessment is to determine the importance, from an agricultural production point of view, of that land not being utilised for the development and kept solely for agriculture.

The extent of the loss of land for agriculture is a direct function of two things, firstly the amount of land that will be lost and secondly, the production potential of the land that will be lost. It should be noted that, in assessing agricultural impact on the proposed 165WM Khauta North SPV Facility site, the exact nature and layout of the different infrastructure within a solar energy facility has absolutely no bearing on the significance of agricultural impacts. All that is of relevance is simply the total footprint of the facility that excludes agricultural land use or impacts agricultural land, referred to as the agricultural footprint.

The renewable energy facility has both positive and negative effects on the production potential of land and so it is the net sum of these positive and negative effects that determines the extent of the change in future production potential.

Two potential negative agricultural impacts have been identified, that are direct impacts and lead to a decrease in agricultural potential through:

1. **Occupation of land** - Agricultural land directly occupied by the development infrastructure will become unavailable for agricultural use, with consequent potential loss of agricultural productivity for the duration of the project lifetime.
2. **Soil degradation –** This impact only occurs during the construction and decommissioning phases, but only becomes relevant once the land is returned to agricultural land use after decommissioning. Soil can be degraded by impacts in two different ways: erosion and topsoil loss. Erosion can occur as a result of the alteration of the land surface run-off characteristics, which can be caused by construction related land surface disturbance, vegetation removal, and the establishment of hard surface areas including roads. Loss of topsoil can result from poor topsoil management during construction related excavations. Soil degradation will reduce the ability of the soil to support vegetation growth. The site is not particularly susceptible to soil erosion and it can be fairly easily and effectively prevented by standard best-practice soil degradation control measures, as will be recommended and included in the EMPr.

Two positive agricultural impacts have been identified, that are indirect impacts and lead to an increase in agricultural potential through:

1. **Increased financial security for farming operations -** Reliable income will be generated by the farming enterprises through the lease of the land to the energy facility. This is likely to increase their cash flow and financial security and could improve farming operations and productivity through increased investment into farming.
2. **Improved security against stock theft and other crime** due to the presence of security infrastructure and security personnel at the energy facility.

The extent to which any of these impacts is likely to actually affect levels of agricultural production is small and the significance of agricultural impacts is therefore **low**.

9.5.3.2 IMPACTS OF THE NO-GO ALTERNATIVE ON AGRICULTURE

The No-Go alternative considers impacts that will occur to the agricultural environment in the absence of the proposed development. The one identified potential such impact is that due to non-regular rainfall in the area, which is likely to be exacerbated by climate change, agriculture in the area will come under increased pressure in terms of economic viability.

The development offers an alternative income source to agriculture, but it restricts agricultural use of the site. Therefore, even though the excluded land has low agricultural production potential, the negative agricultural impact of the development is more significant than that of the No-Go alternative, and so, purely from an agricultural impact perspective, the No-Go alternative is the preferred alternative between the development and the No-Go. However, the No-Go option would prevent the proposed development from contributing positive agricultural impacts to the farm as well as contributing to the environmental, social and economic benefits associated with the development of renewable energy in South Africa.

9.5.4 AQUATIC IMPACT

The proposed development area and the approximate 500 m 'zone of influence' surrounding the proposed development area, were assessed on foot and with the use of a vehicle. Visual observations/identifications were made of any significant watercourses/wetlands and/or other ecologically sensitive/conservation significant aquatic features/habitats and their conditions, as well as relevant aquatic species present.

Identified aquatic species were listed and categorised as per the Red Data Species List; Protected Species List of the National Forests Act (Act No. 84 of 1998), Invasive Species List of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004), Alien and Invasive Species Regulations, 2014 as well as the Provincially Protected species of the Free State's Nature Conservation Ordinance (No 8 of 1969).

9.5.4.1 PRESENT ECOLOGICAL AND STATE (PES) & ECOLOGICAL IMPORTANCE AND SENSITIVITY (EIS)

The table (**Table 31**) below summarise the PES and EIS scores and assessments as calculated by the aquatic specialist.

Table 31: Overall PES and EIS Scores per surface water feature on the site.

Surface Water Feature	PES		EIS Class		
	Score	Class	Score	Class	Additional comments
Significant watercourse	24/35	C	25/50	C	The watercourse discharges into the Sandspruit, approximately 700 m to the north-west of the proposed development area and therefore forms an important part of the local and broader quaternary surface water catchment- and drainage area, towards the west.
Depression wetlands	33/35	A	25/50	C	The presence of the CBA 1, substantiates the ecological importance of the area associated with the westerly located wetland.
Unchanneled valley-bottom wetland	31/35	B	18/50	C	The PES of the wetland is classified as Class B as it is largely natural. A small change in natural habitats and biota may have taken place, mainly as a result of continual livestock grazing activities. The ecosystem functionality has however remained essentially unchanged.
Depression pan (Commandants Pan)	32/35	A	25/50	C	The PES of the Commandants Pan is classified as Class A as it is unmodified, natural and pristine. The pan houses a locally distinct and important semi-aquatic habitat within its basin and around its edges, which is mainly dominated by hydrophytic grass- and graminoid species.

The PES of the depression wetlands and the depression pan were classified as **Class A** as they are unmodified, natural and pristine. The wetlands and pan house locally distinct and important semi-aquatic habitats within their basins and around their edges, which are mainly dominated by hydrophytic grass- and graminoid species. These locally distinct and important semi-aquatic habitats are also likely utilised by various common and habitat-specific waterbirds, amphibian species and aquatic invertebrates as refuge and for breeding, foraging and/or persistence purposes.

The EIS of all the surface water features were classified as **Class C** (moderate) as they are viewed as being ecologically important and sensitive on provincial scale.

In accordance with the aquatic specialist findings and recommendations it should be noted that these surface water features as well as a portion of the surrounding natural undisturbed terrestrial grassland, must be adequately buffered out. No current or future development is allowed to take place within the buffer zones around these sites. Based on the above findings a site sensitivity map was compiled to delineate the surface water features with their recommended associated buffer zones (**Figure 51**).

9.5.4.2 AQUATIC IMPACT DURING CONSTRUCTION

9.5.4.2.1 TRANSFORMATION OF AN AQUATIC CRITICAL BIODIVERSITY AREA ONE (CBA1)

The mechanical clearance associated with the proposed solar power generation facility development, will in all probability completely transform the majority of the existing surface vegetation within the PV grid-, internal access/services road network- and other associated facility infrastructure footprints.

The broader area to the north-west of the proposed development area associated with the watercourse and the Sandspruit, is classified as a CBA 1, according to the Free State Provincial Spatial Biodiversity Plan 2018 (Collins, 2018).

Prior to mitigation the significance of this potential impact will be **medium-high** for the watercourse, **medium** for the depression wetland (west) and **zero** for the depression wetland (east) unchanneled valley-bottom wetland and Commandants Pan (Please refer to the risk rating Table 13 in the Aquatic Specialist Report). It is the opinion of the specialist from an aquatic ecological and hydrological perspective, that the proposed development area is of **low** sensitivity and should be considered by the competent authority, for Environmental Authorisation and approval. All recommended mitigation measures as per this aquatic ecological report must however be adequately implemented and managed for both the construction and operational phases of the proposed development. All necessary authorisations, permits and licenses must also be obtained prior to the commencement of any construction.

9.5.4.2.2 DISTURBANCE TO SEMI-AQUATIC FAUNAL HABITATS

Although four (4) earth dams have been artificially constructed within the watercourse, the watercourse and associated earth dams still house locally distinct and important aquatic and semiaquatic habitats, which are mainly dominated by hydrophytic grass- and -graminoid species.

The two depression wetlands house locally distinct and important semi-aquatic habitats within their basins and around their edges, which are mainly dominated by hydrophytic grass- and -graminoid species.

The Commandants Pan houses a locally distinct and important semi-aquatic habitat within its basin and around its edges, which is mainly dominated by hydrophytic grass- and -graminoid species.

Due to the sloping topography of the area along with a lack of continuous water flow through the local area, the unchanneled valley-bottom wetland does not possess any ecologically/conservationally significant semi-aquatic habitat. It rather houses a similar terrestrial grassland vegetation composition and -structure, relative to the surrounding landscape, with merely slight variations in species representation. The unchanneled valley-bottom wetland is therefore not expected to be specifically utilised by any habitat-specific waterbirds, amphibian species and/or aquatic invertebrates as refuge or for breeding, foraging and/or persistence purposes.

The significance of this potential impact will be **medium-high** for the watercourse, two depression wetlands and Commandants Pan and **zero** for the unchanneled valley-bottom wetland (Please refer to the risk rating Table 13 in the Aquatic Specialist Report).

9.5.4.2.3 TERRESTRIAL AND AQUATIC ALIEN INVASIVE SPECIES

At the time of the site assessment, no significant legally declared alien invasive species establishments were found to be present throughout the watercourse, two depression wetlands, unchanneled valley-bottom wetland or Commandants Pan.

The significance of this potential impact will be **low** for the watercourse, two depression wetlands, unchanneled valley-bottom wetland and Commandants Pan (Please refer to the risk rating Table 13 in the Aquatic Specialist Report).

9.5.4.2.4 CONTAMINATION OF THE SURFACE WATER FEATURES

The mechanical clearance associated with the proposed solar power generation facility development, will in all probability completely transform the majority of the existing surface vegetation within the PV grid-, internal access/services road network- and other associated facility infrastructure footprints. The proposed development area could therefore likely be prone to significant potential surface soil erosion, due to the sloping landscape mainly towards the north but also slightly towards the south, together with the loosening of surface materials and clearance of vegetation caused by construction activities, which usually binds the soil surface. Such soil erosion could potentially lead to a gradual, continual increase in sediment inputs into- and substantial contamination of the watercourse as well as subsequent downstream waterbodies, over time. The depression wetland (east) could potentially also be slightly affected by sediment inputs, over time.

Surface water flow towards the depression wetland (west) will not be directly impacted by the proposed development as the area rather drains away from the wetland, towards the north.

Surface water flow towards the unchanneled valley-bottom wetland will also not be directly impacted by the proposed development as the wetland and proposed development area are topographically separated by the presence of the highpoint/ridge apex.

Surface water flow towards the Commandants Pan will merely be very slightly impacted by the proposed development as the pan and proposed development area are mostly topographically separated by the presence of the highpoint/ridge apex. Merely the small south-eastern portion of the proposed development area drains towards the south, in the direction of the pan.

The significance of this potential impact will be **low** for the watercourse, depression wetland (east) and Commandants Pan and **zero** for the depression wetland (west) and unchanneled valley-bottom wetland (Please refer to the risk rating Table 13 in the Aquatic Specialist Report).

9.5.4.2.5 IMPEDING FLOW REGIMES

The construction activities associated with the proposed development, could potentially result in significant impeding of natural surface water flow through the proposed development area towards the watercourse and slight impeding towards the depression wetland (east) and Commandants Pan, within the associated local and broader quaternary surface water catchment- and drainage area, due to artificial obstruction of flow during rainfall events.

The construction phase could potentially also result in significant contamination of natural surface water flow through the proposed development area towards the two depression pans, three unchanneled valley-bottom wetlands and artificially constructed earth dam, within the associated local and broader quaternary surface water catchment- and drainage area, due to hydrocarbon and/or other chemical spills by construction machinery and equipment.

Surface water flow towards the depression wetland (west) will not be directly impacted by the proposed development as the area rather drains away from the wetland, towards the north.

Surface water flow towards the unchanneled valley-bottom wetland will also not be directly impacted by the proposed development as the wetland and proposed development area are topographically separated by the presence of the highpoint/ridge apex.

Prior to mitigation the significance of this potential impact will be **medium** for the watercourse, **low** for the depression wetland (east) and Commandants Pan and **zero** for the depression wetland (west) and unchanneled valley-bottom wetland (Please refer to the risk rating Table 13 in the Aquatic Specialist Report). However, after mitigation the potential impact will be **low**.

9.5.4.3 AQUATIC IMPACTS DURING OPERATIONAL PHASE

Transformation of an aquatic CBA 1, associated with the identified watercourse and depression wetland (west); disturbance of-/damage to semi-aquatic faunal habitats, associated with the identified watercourse, two depression wetlands and Commandants Pan as well as impeding and contamination of the flow regimes of the identified watercourse, depression wetland (east) and Commandants Pan, within the associated local and broader quaternary surface water catchment- and drainage area, were identified and addressed as significant potential long-term aquatic ecological impacts, associated with the construction phase of the proposed development. Potential aquatic ecological impacts could also likely occur during the operational phase. The following continued and additional potential aquatic ecological impacts could take place during the operational phase:

9.5.4.3.1 CONTINUED CONTAMINATION

The operational activities associated with the proposed solar development, could potentially result in continued moderate fugitive dust emissions, due to the area having been mechanically cleared and subsequently being devoid of significant portions of surface vegetation cover. Continued movement of machinery and equipment will likely also increase the significance of fugitive dust emissions. Generated dust could continue to spread into the surrounding undeveloped landscape and contaminate the watercourse, two depression wetlands, unchanneled valley-bottom wetland and Commandants Pan.

The significance of this potential impact will be **low** for the watercourse, two depression wetlands, unchanneled valley-bottom wetland and Commandants Pan (Please refer to the risk rating Table 13 in the Aquatic Specialist Report).

9.5.4.3.2 CONTINUED IMPEDING FLOW REGIMES

The established solar facility could potentially continuously and significantly impede on natural surface water flow through the proposed development area towards the watercourse and slightly impede towards the depression wetland (east) and Commandants Pan, within the associated local and broader quaternary surface water catchment- and drainage area, due to artificial obstruction of flow during rainfall events.

The operations of the solar facility could further also potentially result in continued contamination of natural surface water flow within the associated local and broader quaternary surface water catchment- and drainage area, due to dirty surface water runoff as a result of the area having been mechanically cleared and subsequently being devoid of significant portions of surface vegetation cover.

Prior to mitigation the significance of this potential impact will be **medium-high** for the watercourse, **low** for the depression wetland (east), **medium** for the Commandants Pan and **zero** for the depression wetland (west) and unchanneled valley-bottom wetland (Please refer to the risk rating Table 13 in the Aquatic Specialist Report).

9.5.4.3.3 OVER EXTRACTION OF OPERATIONAL WATER FROM BOREHOLES

The operational phase of the proposed solar facility will require significant volumes of raw and potable water to maintain the processes. According to the information received from the applicant, water for the operational processes associated with the proposed solar facility, will either be sourced from the local municipality (if adequate capacity is available) or be extracted from a borehole. Significant volumes of groundwater will therefore in all probability continually be extracted from the borehole, which could potentially lead to over extraction from the aquifer over time, if not adequately managed.

The significance of this potential impact will be **medium** (Please refer to the risk rating Table 13 in the Aquatic Specialist Report).

9.5.5 AVIFAUNA IMPACT

9.5.5.1 AVIFAUNA IMPACTS DURING CONSTRCTION

The site assessment revealed that the solar panels will be located on old farmlands that consist of overgrown vegetation. The broader surrounding area has several pans that attract a potential variety of waterfowl, including migrants. The anticipated impacts on avifauna during construction are listed in **Table 32**.

Table 32: Avifaunal impact ratings for the construction of the PV array and associated infrastructure at the proposed Khauta Solar PV development site.

Construction Phase	Preferred Alternative (Alternative 1)	
	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ASPECTS		
POTENTIAL ENVIRONMENTAL IMPACT / NATURE OF IMPACT:	Displacement of priority avian species from important habitats.	Minimise the construction footprint and reserve indigenous vegetation wherever possible. Avoid constructing during the breeding season (summer). If not feasible, a Site Environmental Officer together with the Avifaunal Specialist should conduct ground nest surveys prior to vegetation clearance as the construction progresses. Construct development in shortest timeframe and control pollution.
Magnitude:	6	4
Duration:	2	1
Extent:	1	1
Irreplaceable:	3	2
Reversibility:	3	2
Probability:	3	1
Total SP:	45	10
Significance rating:	Medium (M)	Low (H)
POTENTIAL ENVIRONMENTAL IMPACT / NATURE OF IMPACT:	Displacement of resident avifauna through increased disturbance.	Minimise the construction footprint and reserve indigenous vegetation wherever possible. Avoid constructing during the breeding season (summer). If not feasible, a Site Environmental Officer together with the Avifauna Specialist should conduct ground nest surveys prior to vegetation clearance as the construction progresses. Construct development in shortest timeframe and control pollution.
Magnitude:	6	4
Duration:	2	1
Extent:	1	1
Irreplaceable:	2	2
Reversibility:	2	1

Construction Phase	Preferred Alternative (Alternative 1)	
	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ASPECTS		
Probability:	4	2
Total SP:	52	18
Significance rating:	Medium (M)	Low (H)
POTENTIAL ENVIRONMENTAL IMPACT / NATURE OF IMPACT:	Loss of important avian habitats.	Use designated roads to access the site. Minimise the construction footprint and reserve indigenous vegetation wherever possible. Avoid constructing during the breeding season (summer). If not feasible, a Site Environmental Officer together with the Avifauna Specialist should conduct ground nest surveys prior to vegetation clearance as the construction progresses. Construct development in shortest timeframe and control noise pollution. Rehabilitate area with indigenous flora.
Magnitude:	6	6
Duration:	2	4
Extent:	1	1
Irreplaceable:	3	3
Reversibility:	3	3
Probability:	3	2
Total SP:	45	34
Significance rating:	Medium (M)	Low (H)

9.5.5.2 AVIFAUNA IMPACTS DURING OPERATION

The anticipated impacts on avifauna during operation are listed in **Table 33**.Table 33: Avifaunal impact ratings for the operation of the PV array and associated infrastructure at the proposed Khauta Solar PV development site

Table 33: Avifaunal impact ratings for the operation of the PV array and associated infrastructure at the proposed Khauta Solar PV development site.

Operation Phase	Preferred Alternative (Alternative 1)	
	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ASPECTS		
POTENTIAL ENVIRONMENTAL IMPACT / NATURE OF IMPACT:	Collisions with PV panels leading to injury or loss of avian life.	Ensure panels are flat during the night time, preferably low-sheen/matt surfaces. Conduct quarterly fatality monitoring assessments.
Magnitude:	6	4
Duration:	3	3
Extent:	1	1
Irreplaceable:	2	2
Reversibility:	4	3

Operation Phase	Preferred Alternative (Alternative 1)	
	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ASPECTS		
Probability:	3	2
Total SP:	48	26
Significance rating:	Medium (M)	Low (H)

9.5.5.3 AVIFAUNA IMPACTS DURING DECOMMISSIONING

The anticipated impacts on avifauna during construction are listed in **Table 34**.Table 33: Avifaunal impact ratings for the operation of the PV array and associated infrastructure at the proposed Khauta Solar PV development site

Table 34: Avifaunal impact ratings for the decommissioning of the PV array and associated infrastructure at the proposed Khauta Solar PV development site.

Decommissioning Phase	Preferred Alternative (Alternative 1)	
	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ASPECTS		
POTENTIAL ENVIRONMENTAL IMPACT / NATURE OF IMPACT:	Displacement of priority avian species from important habitats.	None required due to low significance.
Magnitude:	4	4
Duration:	2	1
Extent:	1	1
Irreplaceable:	2	2
Reversibility:	2	2
Probability:	2	1
Total SP:	22	10
Significance rating:	Low (H)	Low (H)
POTENTIAL ENVIRONMENTAL IMPACT / NATURE OF IMPACT:	Displacement of resident avifauna through increased disturbance.	None required due to low significance.
Magnitude:	2	2
Duration:	2	2
Extent:	1	1
Irreplaceable:	2	2
Reversibility:	2	2
Probability:	2	2
Total SP:	18	18
Significance rating:	Low (H)	Low (H)
Post Decommissioning Phase	Preferred Alternative (Alternative 1)	
	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ASPECTS		

Decommissioning Phase	Preferred Alternative (Alternative 1)	
	Before Mitigation	**After Mitigation**
POTENTIAL ENVIRONMENTAL IMPACT / NATURE OF IMPACT:	Cumulative displacement of priority avian species from important habitats.	Minimise development footprint and habitat transformation, limit ongoing human activity to the minimum required for ongoing operation, control noise to minimum, rehabilitate with native vegetation and retain indigenous vegetation throughout as far as possible, limit roadways and vehicle speeds; rehabilitate thoroughly post-decommissioning with locally native species.
Magnitude:	6	4
Duration:	5	3
Extent:	2	2
Irreplaceable:	3	2
Reversibility:	3	2
Probability:	3	2
Total SP:	57	26
Significance rating:	Medium (M)	Low (H)
POTENTIAL ENVIRONMENTAL IMPACT / NATURE OF IMPACT:	Cumulative displacement of resident avifauna.	Minimise development footprint and habitat transformation, limit ongoing human activity to the minimum required for ongoing operation, control noise pollution, rehabilitate with indigenous flora and reserve indigenous vegetation throughout as far as possible, limit roadways and vehicle speeds.
Magnitude:	6	4
Duration:	2	2
Extent:	1	1
Irreplaceable:	2	2
Reversibility:	2	2
Probability:	2	2
Total SP:	26	22
Significance rating:	Low (H)	Low (H)
POTENTIAL ENVIRONMENTAL IMPACT / NATURE OF IMPACT:	Cumulative loss of important avian habitats.	Minimise development footprint and habitat transformation, rehabilitate with indigenous flora and reserve indigenous vegetation throughout as far as possible.
Magnitude:	4	4
Duration:	4	3
Extent:	2	1
Irreplaceable:	2	2
Reversibility:	2	2
Probability:	3	2
Total SP:	42	24

Decommissioning Phase	Preferred Alternative (Alternative 1)	
	Before Mitigation	**After Mitigation**
Significance rating:	Medium (M)	Low (H)

The impact ratings shown above rank the proposed 165MW Khauta North SPV Facility development site as **Medium (M)** for the PV array and associated infrastructure before mitigations. After mitigations, the impact rating is borderline with a **Low (L)** rating (20.71 score), as summarised in **Table 35** below.

Overall, considering all impacts and all infrastructure, the average impact rating for the proposed 165MW Khauta North SPV Facility development on avifauna is **Medium**, however this can be reduced to **Low** with sufficient application of recommended mitigations. No No-Go areas are applicable to the project site from an avifaunal perspective (**Table 35**).

Table 35: Summary of avifaunal impact ratings for the proposed 165 MW Khauta Solar PV development.

	Average impact rating	**Significance class**	**Average mitigated impact**	**Significance class**
Avifaunal impacts of the PV array and associated infrastructure	40.18	Medium (M)	20.73	Low (L)

9.5.6 ECONOMIC IMPACT

The following sub-sections indicate the economic impacts that are likely to occur during the construction phase of the proposed facility. Since the facility is expected to have both positive and negative effects in terms of the same indicator, the evaluation of impacts has been grouped accordingly.

9.5.6.1 ECONOMIC IMPACTS DURING CONSTRUCTION PHASE

9.5.6.1.1 POSITIVE ECONOMIC IMPACTS

a) Temporary stimulation of the national and local economy

The proposed facility will cost R 2.53 billion (2022 prices) to establish. This will equate to a total impact of R 10.3 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 24 months during construction. It is estimated that the project will increase the GDP directly in the country by R 721.7 million in 2022 prices, which will translate into a total impact of R 2.9 billion (direct, indirect, and induced) of Gross Domestic Product (GDP). 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 and initial investment impacts (**Table 36**). The former refers to the impact generated along 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 (**Table 37**).

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; and,
- Electrical machinery and apparatus.

Table 36: Initial investment spend on the project.

Construction Phase	**Preferred Alternative (Alternative 1)**	
	Before Mitigation	**After Mitigation**
Temporary stimulation of the national and local production - Positive		
Nature of Impact	The initial investment spend on the project will inject significant business sales/ production for the local and regional economy. The economic impact arising from the initial investment will be felt throughout the economy with windfall effects benefitting related sectors in the economy. The effect is allocated according to direct, indirect and induced impacts, together forming the "multiplier effect".	
Magnitude:	10	10
Duration:	2	2
Extent:	3	3
Irreplaceable:	2	2
Reversibility:	5	5
Probability:	5	5
Total SP:	**110**	**110**
Significance rating:	**High**	**High**
Cumulative Impact:	Low	Low
Proposed Enhancement:	The project developer should use locally sourced inputs where feasible in order to maximize the benefit to the local economy. Sub-contracting of local construction companies to occur as far as possible for the construction of facilities.	

Table 37: Temporary increase in country's GDP.

Construction Phase	**Preferred Alternative (Alternative 1)**	
	Before Mitigation	**After Mitigation**
Temporary stimulation of the national and local GDP - Positive		

Nature of Impact	Temporary increase in the country's GDP due to capital expenditure during construction. The primary method of expanding GDP levels is through investment into infrastructure and enterprises that generate goods and services. Investment into the creation of new and improved goods and services, creates heightened levels of value added within the economy. Industries that will experience the largest temporary growth in value added, as a result of this, will include the building and construction, manufacturing and trade and accommodation sectors.	
Magnitude:	8	8
Duration:	2	2
Extent:	3	3
Irreplaceable:	2	2
Reversibility:	5	5
Probability:	5	5
Total SP:	**100**	**100**
Significance rating:	**High**	**High**
Cumulative Impact:	Low	Low
Proposed Enhancement:	The project developer is to use locally sourced inputs where feasible in order to maximize the benefit to the economy.	

b) Temporary increase employment in the national and local economies

The construction of the facility will create 417 Full Time Equivalent (FTE) employment positions over the course of the development. The total number of employment opportunities that will be created is estimated to 1 696 (including direct, indirect and induced). As evident by **Table 38** the construction sector of the Local Municipality is relatively small employing only 5 222 people in 2022 (Quantec, 2022). Given the size of the construction sector within the municipality, it is anticipated that there will be sufficient local labour to satisfy the demand for 417 South African based construction workers.

Furthermore, if most of the local staff comes from the Local 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 728 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 24 months (**Table 38**).

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 the Local Municipality rather than from outside of the municipal boundaries.

Table 38: Temporary increase employment.

Construction Phase	**Preferred Alternative (Alternative 1)**	
	Before Mitigation	**After Mitigation**
Temporary increase of employment in the national and local economies - Positive		

Nature of Impact	The construction of the project will positively impact on the community and beyond by creating a number of job opportunities (albeit temporary).	
Magnitude:	8	8
Duration:	2	2
Extent:	2	2
Irreplaceable:	2	2
Reversibility:	4	4
Probability:	4	4
Total SP:	**72**	**72**
Significance rating:	**Medium**	**Medium**
Cumulative Impact:	Low	Low
Proposed Enhancement:	Organise local community meetings to advise the local labour on the project that is planned to be established and the jobs that can potentially be applied for. Where feasible, effort must be made to employ locally in order to create maximum benefit for the communities.	

c) Contribution to skills development in the country and local economy

During the assembly and manufacturing period which is included as part of the construction phase and is planned to be conducted in Free State, 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 (**Table 39**).

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.

Table 39: Contribution to skills development/

Construction Phase	Preferred Alternative (Alternative 1)	
	Before Mitigation	**After Mitigation**
Contribution to skills development - Positive		
Nature of Impact	Employees will develop and enhance skills thereby increasing experience and knowledge.	
Magnitude:	2	2
Duration:	2	2
Extent:	1	1
Irreplaceable:	1	1
Reversibility:	5	5
Probability:	3	3
Total SP:	**33**	**33**
Significance rating:	**Low**	**Low**
Cumulative Impact:	Low	Low
Proposed Enhancement:	The project developer is to use locally sourced inputs where feasible in order to maximize the benefit to the economy.	

d) Temporary increase in household earnings

Workers and their households in the sectors of basic metals, structural metal products and other fabricated metal products industries, trade, insurance, transport services, electrical machinery and apparatus may experience the greatest stimulus from this project during the construction phase (**Table 40**). It is anticipated that the additional income will contribute positively to their (workers) standards of living.

Table 40: Household income and improved standard of living.

Construction Phase	Preferred Alternative (Alternative 1)	
	Before Mitigation	**After Mitigation**
Positive impact on household income and improved standard of living - Positive		
Nature of Impact	Employed individuals will increase the income of their respective households and thereby experience an improvement in their standard of living.	
Magnitude:	8	8
Duration:	2	2
Extent:	1	1
Irreplaceable:	1	1
Reversibility:	5	5
Probability:	4	4
Total SP:	**68**	**68**
Significance rating:	**Medium**	**Medium**
Cumulative Impact:	Low	Low
Proposed Enhancement:	Local employment will benefit local households and the local area.	

e) Temporary increase in government revenue

It is estimated that the project will increase the GDP directly in the country by R 721.7 million in 2022 prices, which will translate into a total impact of R 2.9 billion (direct, indirect, and induced) of GDP. These effects will take place for the duration of construction (**Table 41**).

Table 41: Temporary increase in government revenue.

Construction Phase	Preferred Alternative (Alternative 1)	
	Before Mitigation	**After Mitigation**
Temporary increase in government revenue - Positive		
Nature of Impact	Government revenue will be increased by the additional tax that will be paid from the labourers.	
Magnitude:	6	6
Duration:	2	2
Extent:	4	4
Irreplaceable:	1	1
Reversibility:	4	4
Probability:	3	3
Total SP:	**51**	**51**
Significance rating:	**Medium**	**Medium**
Cumulative Impact:	Low	Low
Proposed Enhancement:	None	

9.5.6.1.2 NEGATIVE ECONOMIC IMPACTS

a) Impact on economic and social infrastructure

The proposed solar energy facility will create and estimated 417 FTE employment positions (South African based 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. Given the proximity of the development site to Riebeeckstad and Welkom, it is most likely that the health facilities in the area will experience additional demand for medical services brought about by the influx of job seekers.

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. The deterioration of these roads could place additional financial burdens on the municipality through additional maintenance costs.

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** (**Table 42**).

Table 42: Impact on economic and social infrastructure.

Construction Phase	**Preferred Alternative (Alternative 1)**	
	Before Mitigation	**After Mitigation**
Impact on economic and social infrastructure- Negative		
Nature of Impact	Additional workforce will put pressure on service delivery which will have an economic impact on the local municipality.	
Magnitude:	2	2
Duration:	2	2
Extent:	1	1
Irreplaceable:	1	1
Reversibility:	5	5
Probability:	4	3
Total SP:	**44**	**33**
Significance rating:	**Medium**	**Low**
Cumulative Impact:	Low	Low
Proposed Enhancement:	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.	

b) Negative impact on the local agriculture operations

As construction begins at the proposed site, disturbances will likely be minimal. The presence of construction machinery, increased traffic to and from the site (transporting staff, equipment, and material) and staff on or near the site will likely be the largest disturbances. The longer construction continues, the greater the disturbances will likely be. As the infrastructure are erected there is likely to be an increased disturbance as it become increasingly visible in the surrounding area.

Once construction is completed the disturbances associated with the vehicular traffic, equipment and staff will be reduced and the remaining disturbance will be that of the solar farm itself. According to the landowner's survey's they indicated that some agricultural land will be lost, but the economic impact thereof will be minimal, as the farmers will get compensation for the installed infrastructure. Thus, the impact on the agricultural operations will be **low** (**Table 43**).

Table 43: Impact on local agriculture operations.

Construction Phase	Preferred Alternative (Alternative 1)	
	Before Mitigation	**After Mitigation**
Impact on local agriculture operations- Negative		
Nature of Impact	Construction activities can impact the farmers due to increase in noise and reduced space.	
Magnitude:	4	2
Duration:	2	2
Extent:	1	1
Irreplaceable:	1	1
Reversibility:	5	5
Probability:	3	3
Total SP:	**39**	**33**
Significance rating:	**Low**	**Low**
Cumulative Impact:	Low	Low
Proposed Enhancement:	Ensure that the farm owners are aware of construction activities that will take place on their premisses.	

9.5.6.2 ECONOMIC IMPACTS DURING OPERATION

9.5.6.2.1 POSITIVE ECONOMIC IMPACTS

a) Sustainable increase in production and GDP nationally and locally

The proposed facility will require an annual operational expenditure of R 38 million over 20 years. The total impact on production in the country as a result of the project's operations will equate to R 102.6 million per annum in 2022 prices for the 20 years.

It is estimated that the project will generate R 62.3 million of value add per year over the 20-year period (comprising gross operating surplus before taxes and labour) and taxes. 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. The contribution to the Local Municipality, although small relative to the combined size of the municipality's economy, will nevertheless be positive and more importantly, a sustainable contribution, especially in terms of electricity supply (**Table 44 & Table 45**).

Table 44: Increased Production.

Operational Phase	Preferred Alternative (Alternative 1)	
	Before Mitigation	**After Mitigation**
Increased Production - Positive		

Nature of Impact	The initial investment spend on the project will inject significant business sales/ production for the local and regional economy. The economic impact arising from the initial investment will be felt throughout the economy with windfall effects benefitting related sectors in the economy. The effect is allocated according to direct, indirect and induced impacts, together forming the "multiplier effect".	
Magnitude:	4	4
Duration:	4	4
Extent:	2	2
Irreplaceable:	1	1
Reversibility:	5	5
Probability:	5	5
Total SP:	**80**	**80**
Significance rating:	**Medium-High**	**Medium-High**
Cumulative Impact:	Low	Low
Proposed Enhancement:	The project developer should use locally sourced inputs where feasible in order to maximize the benefit to the local economy. Sub-contracting of local construction companies to occur as far as possible for the operation of facilities.	

Table 45: Impact on GDP.

Operational Phase	Preferred Alternative (Alternative 1)	
	Before Mitigation	After Mitigation
Impact on GDP - Positive		
Nature of Impact	Positive impact on GDP due to operating expenditure during operations. The primary method of expanding GDP levels is through investment into infrastructure and enterprises that generate goods and services. Industries that will experience the largest growth in value added, as a result of this, will include the transport, storage and manufacturing sectors. The operational spend on the project will create value added for the local and regional economy.	
Magnitude:	4	4
Duration:	4	4
Extent:	2	2
Irreplaceable:	1	1
Reversibility:	4	4
Probability:	5	5
Total SP:	**75**	**75**
Significance rating:	**Medium-High**	**Medium-High**
Cumulative Impact:	Low	Low
Proposed Enhancement:	The project developer is to use locally sourced inputs where feasible in order to maximize the benefit to the economy.	

b) Creation of sustainable employment positions nationally and locally

The proposed facility will create an estimated 20 permanent employment positions across the operation phase of the development which, will be retained for approximately 20 years. Of these, an estimated 20 will be South African based positions. Aside from the direct employment opportunities, the facility will support an estimated 54 FTE employment positions created through the production and consumption induced effects. The trade, agriculture and community and personal services sectors will benefit the most from these new employment opportunities (**Table 46**).

Table 46: Employment Creation.

Operational Phase	Preferred Alternative (Alternative 1)	
	Before Mitigation	After Mitigation
Employment Creation - Positive		

Nature of Impact	The construction of the project will positively impact on the community and beyond by creating a number of job opportunities (albeit temporary).	
Magnitude:	2	2
Duration:	4	4
Extent:	2	2
Irreplaceable:	1	1
Reversibility:	5	5
Probability:	4	4
Total SP:	**56**	**56**
Significance rating:	**Medium**	**Medium**
Cumulative Impact:	Low	Low
Proposed Enhancement:	Where feasible, effort must be made to employ locally in order to create maximum benefit for the communities.	

c) Improved standards of living for benefiting households

The creation of an estimated 20 FTE employment positions throughout the country will generate R 6.4 million of personal income (2022 prices), which will be sustained for the entire duration of the project's lifespan. 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 Local Municipality, as the average income per employee at the facility would far exceed the average household income within these municipalities. Skills development coupled with sustainable employment creation opportunities as a result of the developer's intended SED spend, are expected to contribute towards an improved standard of living amongst families that might not have had a sustainable income previously (**Table 47**).

Table 47: Positive impact on household income and improved standard of living.

Operational Phase	**Preferred Alternative (Alternative 1)**	
	Before Mitigation	**After Mitigation**
Positive impact on household income and improved standard of living - Positive		
Nature of Impact	Employed individuals will increase the income of their respective households and thereby experience an improvement in their standard of living.	
Magnitude:	4	4
Duration:	4	4
Extent:	2	2
Irreplaceable:	1	1
Reversibility:	5	5
Probability:	4	4
Total SP:	**64**	**64**
Significance rating:	**Medium**	**Medium**
Cumulative Impact:	Low	Low
Proposed Enhancement:	Local employment will benefit local households and the local area.	

d) Sustainable increase in national and local government revenue

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. 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 may contribute to the national fiscus (**Table 48**).

Table 48: Increased Government Revenue.

Operational Phase	Preferred Alternative (Alternative 1)	
	Before Mitigation	**After Mitigation**
Increased Government Revenue - Positive		
Nature of Impact	Government revenue will be increased by the additional tax that will be paid from the labourers.	
Magnitude:	4	4
Duration:	4	4
Extent:	4	4
Irreplaceable:	1	1
Reversibility:	4	4
Probability:	3	3
Total SP:	**51**	**51**
Significance rating:	**Medium**	**Medium**
Cumulative Impact:	Low	Low
Proposed Enhancement:	None	

e) Sustainable rental revenue for farms where the facility is located

It is anticipated that farms where the solar panels are located on will enter into a rental agreement with the developer. The owners will likely thus receive rental revenue as a result of hosting the infrastructure 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. The revenue generated from the rental of land for the panels 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 panels located on their properties, the impact of additional revenue is likely to be significant to those impacted (**Table 49**).

Table 49: Compensation for landowners.

Operational Phase	Preferred Alternative (Alternative 1)	
	Before Mitigation	**After Mitigation**
Compensation for landowners - Positive		
Nature of Impact	The landowners will get compensations from the area used by the project, this will result in additional income for the landowners	
Magnitude:	4	4
Duration:	4	4
Extent:	1	1
Irreplaceable:	1	1
Reversibility:	4	4
Probability:	3	3
Total SP:	**42**	**42**
Significance rating:	**Medium**	**Medium**
Cumulative Impact:	Low	Low
Proposed Enhancement:	None	

f) Sustainable increase in electricity available for the local region and South Africa

The development of the solar farm will lead to a sustainable increase in the supply of electricity for the country that is currently experiencing sever loadshedding schedules. 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 farm alone is unlikely to make a large impact in the shortages of electricity in the country, the cumulative impact of all the proposed renewable energy products in the country will be substantial (**Table 50**).

Table 50: Improvement in Energy Sector Generation.

Operational Phase	**Preferred Alternative (Alternative 1)**	
	Before Mitigation	**After Mitigation**
Improvement in Energy Sector Generation - Positive		
Nature of Impact	Improved energy security and energy sector will result due to the development of the Solar PV project.	
Magnitude:	4	4
Duration:	4	4
Extent:	1	1
Irreplaceable:	1	1
Reversibility:	4	4
Probability:	5	5
Total SP:	**70**	**70**
Significance rating:	**Medium**	**Medium**
Cumulative Impact:	Medium	Medium
Proposed Enhancement:	None	

9.5.6.2.2 NEGATIVE ECONOMIC IMPACTS DURING OPERATION

a) Negative impact on agricultural operations

The impact on agricultural land was assessed through a survey that was distributed among the landowners. Some of the landowners indicated that they will be impacted by reduced dryland farming portions due to the infrastructure. The main agriculture activity indicated was livestock farming (cattle) and tourism activities in the form of hunting. Overall, the landowners which responded is concerned about social impacts that the Project could cause. One responded mentioned that he will have a loss in grazing space for is cattle, which will have an economic impact on the farmer. However, the Project will compensate the farmers for the use of their property and thus the farmers will have limited to none loss of income, or even benefit from the additional monthly income (**Table 51**).

Table 51: Impact on agriculture.

Operational Phase	**Preferred Alternative (Alternative 1)**	
	Before Mitigation	**After Mitigation**
Impact on agriculture - Negative		

Nature of Impact	The infrastructure will take space that was previously used as grazing land for cattle.	
Magnitude:	2	2
Duration:	4	4
Extent:	1	1
Irreplaceable:	1	1
Reversibility:	4	4
Probability:	4	3
Total SP:	**48**	**36**
Significance rating:	**Medium**	**Low**
Cumulative Impact:	Low	Low
Proposed Enhancement:	Utilise space that will reduce grazing space the least.	

9.5.6.3 ECONOMIC IMPACTS DURING DECOMMISSIONING PHASE

Upon the expiry of the Project's 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 operation 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. Economic impacts stimulated during the decommissioning phase are expected to be similar to those that took place during the construction.

These impacts would however be experienced over a much shorter period and would be associated with significantly lower gains. Some impacts on the local infrastructure and the lives of the communities in the area could take place, however, they will also be short lived. Overall, the trade-offs between positive and negative impacts would be small.

9.5.7 ARCHAEOLOGOCAL AND HERITAGE IMPACT

No pre-colonial Stone Age, or historical archaeological resources (including evidence of any Late Iron Age, Anglo-Boer War battlefield sites, fossil remains or graves) were recorded in the proposed development area for the 165MW Khauta North SPV Facility (**Figure 74**). Therefore, the overall findings were **low** (**Table 52**).

Table 52: Summary of assessment of potential impact of the proposed activities.

Potential impact on archaeological resources	
Nature of impact	Damage to, or destruction of archaeological & heritage resources
Extent and duration of impact	Localized short term
Intensity of impact	Low
Probability of occurrence	Improbable
Degree to which impact can be reversed	Reversible
Irreplaceability of resources	Low
Cumulative impact prior to mitigation	Low
Significance of impact pre-mitigation	Low
Degree of mitigation possible	High
Proposed mitigation	None required
Cumulative impact post mitigation	Low
Significance after mitigation	Insignificant

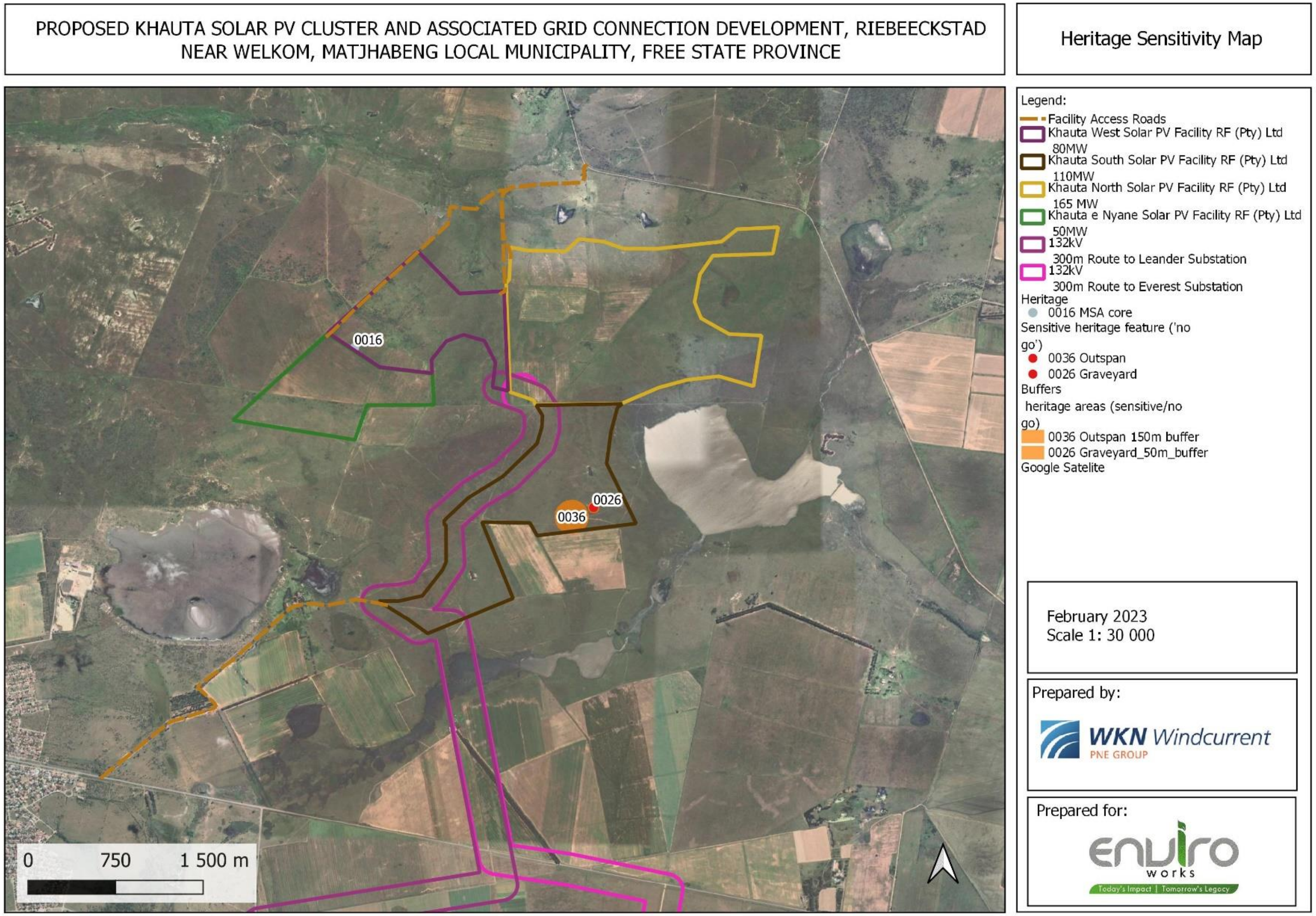


Figure 74: Heritage Sensitivity Map for the Khauta Cluster SPV Facilities

9.5.8 VISUAL IMPACT

Landscape perceptions and visual impacts are key environmental issues in determining the type and position of the solar energy facilities, as landscape and visual impacts are by nature subjective and changing over time and location. The PV modules, depending on the location and topographical features, have the potential of attracting people's attention. PV Solar facilities spread over an area may become dominant points within the landscape, and may cause negative landscape and visual effects. The key features of these facilities including (location, landscape, size, height, number, material and colour), access and site tracks, substation buildings, compounds, grid connection, anemometer masts, and transmission lines, are critical to determining the visual impact. However, an important characteristic of these facilities is that they permanently transform only a very small footprint, so the area where the PVs have been located can return to its original condition after the decommissioning phase.

Some of the techniques commonly used to inform the landscape and visual impact assessment are:

- Zone of Theoretical Visibility (ZTV) maps define the areas from which a solar plant can be totally or partially seen as determined by topography;
- These areas represent the limits of visibility of the plant; and,
- Photographs to record the baseline visual resource.

Mitigation measures to prevent and or minimize visual impact on landscape can be devised.

The construction of PV structures is likely to have some impact on the viewscape especially since the site is located in a fairly rural natural landscape. The PV panels are generally located at heights close to the ground level and might not be visible from far distances. This issue was addressed by a high-level visual impact assessment study.

Based on the Desktop Visual Impact Assessment (2021) compiled in accordance with the Guidelines for involving a Visual and Aesthetic Specialist in the EIA process (DEA&DP, 2005). the viewshed analysis of each of the solar PV facility was compiled within a ten-kilometre (10 km) radius from the proposed development (**Figure 75**).

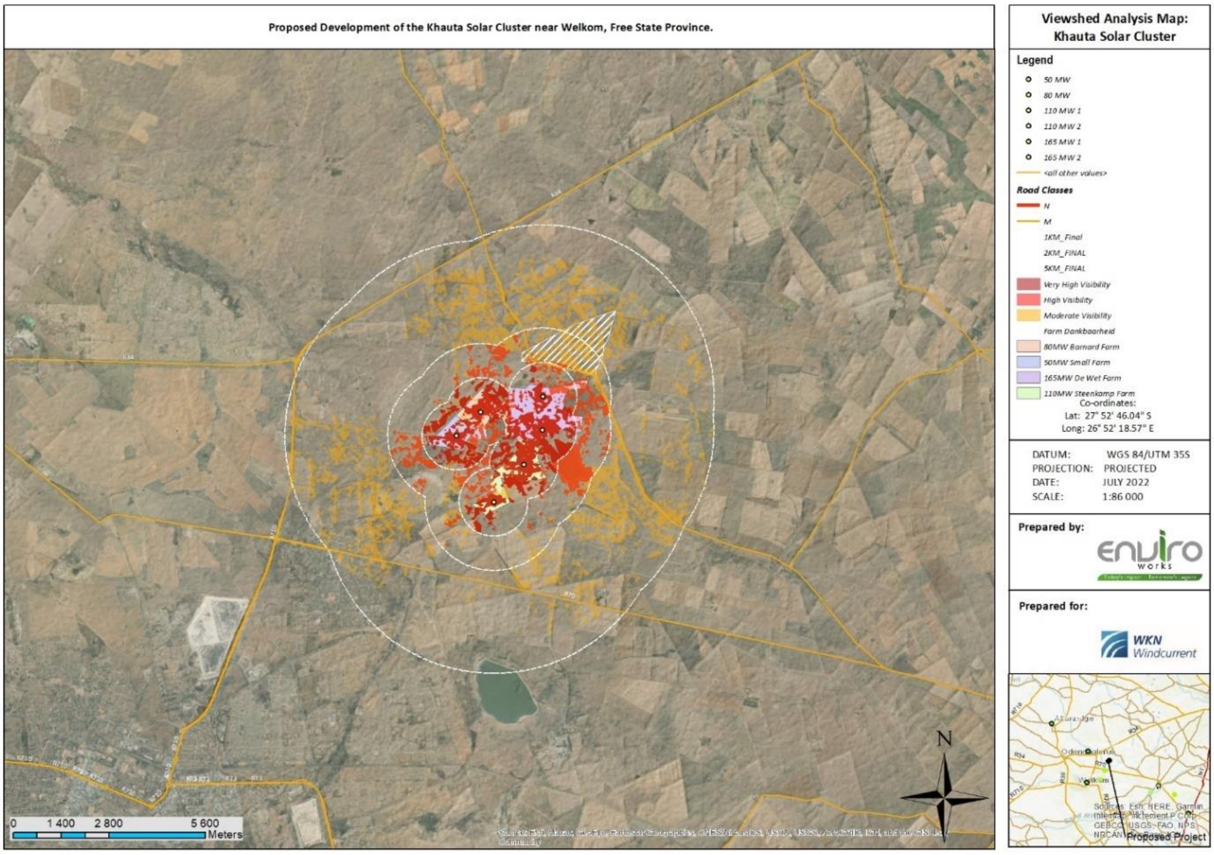


Figure 75: Desktop viewshed analyses of the proposed SPV facility

The solar PV facility is likely to have some impact on the viewscape especially since the site is located in a fairly rural natural landscape. The following mitigation measures has been assessed during the EIA:

1. Galvanized steel structures could be coated to prevent glare; and,
2. Buildings can be painted different colours to blend in with the surrounding landscapes.
3. Additional mitigation measures will be discussed and confirmed with neighbours that do have concerns about visual impacts, also taking into consideration their viewshed's level of impact and location points of visual sensitivity (i.e. tourist facilities or areas frequented by tourists or visitors).

9.5.8.1 VISUAL IMPACTS DURING CONSTRUCTION

The visual impact for the 165MW Khauta SPV Facility's during the construction period was calculated within a 5km radius of the proposed site (**Table 53**). The overall impact was rated as **low**.

Two (2) height alternatives are proposed for the Battery Energy Storage System. **Design Alternative 1** was assessed at a maximum height of **eight meters (8 m**) and **Design Alternative 2** was assessed at a maximum height of **fifteen meters (15 m)**. The results comparing the two designs alternatives for the BESS is listed below.

Table 53: Impact Ratings of the Construction Phase within a 5 km radius.

Planning, design and construction phase	Design Alternative 1		Design Alternative 2		No-Go Alternative
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation	
POTENTIAL VISUAL IMPACTS:					
Nature of impact: Impact on the sense of place for surrounding users.	**Activity:** The movement of construction vehicles, machinery and personnel on site shall result in a visual impact on surrounding users. Furthermore to this, the storage of materials and excavation shall result in disturbance and an unsightly character.				No construction phase impacts are associated with the No-Go alternative thus no assessment has been undertaken.
Duration:	2		2		-
Extent:	2		2		-
Intensity:	3		3		-
Probability:	1		1		-
Total SP:	7		7		-
Significance rating:	Low (L)		Low (L)		-
Cumulative impact:	-		-		-
Proposed Mitigation:	• Access roads are to be kept clean; • Site offices and structures should be limited to one location and carefully situated to reduce visual intrusions; • Roofs should be grey and non-reflective; • Construction camps as well as development areas should be screened with netting; • Lights within the construction camp should face directly down; • Vegetation clearance should be limited to the development footprint only; • Litter should be strictly controlled, as the spread thereof through wind could have a very negative visual impact; • All areas disturbed by construction activities must be subject to landscaping and rehabilitation; • All spoil and waste will be disposed to a registered waste site and certificates of disposal provided;				N/A

<table>
<tr><th rowspan="2">Planning, design and construction phase</th><th colspan="2">Design Alternative 1</th><th colspan="2">Design Alternative 2</th><th rowspan="2">No-Go Alternative</th></tr>
<tr><th>Before Mitigation</th><th>After Mitigation</th><th>Before Mitigation</th><th>After Mitigation</th></tr>
<tr><td></td><td colspan="4">

The project must be timed so that rehabilitation can take place at the optimal time for vegetation establishment;
Signage, if essential, should be discrete and confined to entrance gates. No corporate or advertising signage should be permitted;
Avoid shiny materials in structures. Where possible shiny metal structures should be darkened or screened to prevent glare; and,
Mitigation of visual impacts associated with the construction phase would entail proper planning, management and rehabilitation of the construction site. Mitigation measures include the following:

Reduce the time of construction through careful planning of logistics and ensure the productive implementation of resources;
Limit disturbance of the environment to the development footprint; and,
Limit construction activities to business hours (07:00 – 17:00).

</td><td></td></tr>
</table>

9.5.8.2 VISUAL IMPACTS DURING OPERATION

The visual impact assessment for the proposed project during the operational phase were taken within a radius of:

- 1km (**Table 54**)
- 2km (**Table 55**)
- 5km (**Table 56**)
- 10km (**Table 57**)

As expected, the highest visual impact will be experienced by land users closest to the development within the 1km radius) where the impact rating was calculated at **moderate** to **low** in areas of 5km and more away from the proposed development.

Table 54: Impact Ratings of the Operational Phase within a 1 km radius.

Operational Phase	Design Alternative 1	Design Alternative 2	No-Go Alternative
POTENTIAL VISUAL IMPACTS:			
Nature of impact: Impact on the sense of place for surrounding users.	**Activity:** The development of the 165 MW SPV Facility can cause a visual intrusion to observers within a one-kilometre (1 km) radius from the proposed development.		No operational phase impacts are associated with the No-Go alternative thus no assessment has been undertaken.
Duration:	3	4	5
Extent:	2	2	0
Intensity:	3	3	0
Probability:	3	4	5
Total SP:	24	36	25
Significance rating:	Moderate (M)	Moderate-High (MH)	P (+)
Cumulative impact:	-	-	-

Proposed Mitigation:	• Avoid shiny materials in structures. Where possible shiny metal structures should be darkened or screened to prevent glare;
	• Mitigation to minimise lighting impacts include the following:
	  • Shielding the sources of light by physical barriers (walls, vegetation or structures itself);
	  • Limit mounting heights of lighting fixtures, or alternatively using foot-lights or bollard level lights);
	  • Make use of downward directional lighting fixtures;
	  • Make use of minimum lumen or wattage in lights;
	  • Any navigation lights must be shielded to prevent disturbance to adjacent landowners; and,
	  • Use motion sensors to activate lighting ensuring light is available when needed.
	• Mitigation measures will be discussed and confirmed with neighbours that do have concerns about visual impacts, also taking into consideration their viewshed's level of impact and location points of visual sensitivity (i.e. tourist
			N/A

Operational Phase	Design Alternative 1	Design Alternative 2	No-Go Alternative

	facilities or areas frequented by tourists or visitors). If the parameter fence consists of palisade fencing, the palisading must be painted either a red-brownish or light brown-colour;
	• The power station buildings must be painted a light brown or red-brownish matt colour to ensure a higher landscape compatibility;
	• Rehabilitation and Post-closure measures:
	  • All above-ground structures should be removed, safely disposed of, or possibly recycled for use elsewhere; and,
	  • The affected area should be regraded to pre-development topographic conditions, unless the area is required for new specific uses.		

Table 55: Impact Ratings of the Operational Phase within a 2 km radius.

Operational Phase	Design Alternative 1	Design Alternative 2	No-Go Alternative
POTENTIAL VISUAL IMPACTS:			
Nature of impact: Impact on the sense of place for surrounding users.	**Activity:** The development of the 165 MW SPV Facility can cause a visual intrusion to observers within a two-kilometre (2 km) radius from the proposed development.		No operational phase impacts are associated with the No-Go alternative thus no assessment has been undertaken.
Duration:	3	4	5
Extent:	2	2	0
Intensity:	3	3	0
Probability:	3	3	5
Total SP:	24	27	25
Significance rating:	Moderate (M)	Moderate (M)	P (+)
Cumulative impact:	-	-	-
Proposed Mitigation:	Please refer to Mitigation Measures listed above.		N/A

Table 56: Impact Ratings of the Operational Phase within a 5 km radius.

Operational Phase	Design Alternative 1	Design Alternative 2	No-Go Alternative
POTENTIAL VISUAL IMPACTS:			
Nature of impact: Impact on the sense of place for surrounding users.	**Activity:** The development of the 165 MW SPV Facility can cause a visual intrusion to observers within a five-kilometre (5 km) radius from the proposed development.		No operational phase impacts are associated with the No-Go alternative thus no assessment has been undertaken.
Duration:	3	3	5
Extent:	2	3	0
Intensity:	2	2	0
Probability:	2	2	5
Total SP:	14	16	25
Significance rating:	Low (L)	Moderate (M)	P (+)
Cumulative impact:	-	-	-
Proposed Mitigation:	Please refer to Mitigation Measures listed above.		N/A

Table 57: Impact Ratings of the Operational Phase within a 10 km radius.

Operational Phase	Design Alternative 1	Design Alternative 2	No-Go Alternative
POTENTIAL VISUAL IMPACTS:			
Nature of impact: Impact on the sense of place for surrounding users.	**Activity:** The development of the 165 MW SPV Facility can cause a visual intrusion to observers within a ten-kilometre (10 km) radius from the proposed development.		No operational phase impacts are associated with the No-Go alternative thus no assessment has been undertaken.
Duration:	3	3	5
Extent:	0	0	0
Intensity:	1	1	0
Probability:	2	2	5
Total SP:	8	8	25
Significance rating:	Low (L)	Low (L)	P (+)

Operational Phase	Design Alternative 1	Design Alternative 2	No-Go Alternative
Cumulative impact:	-	-	-
Proposed Mitigation:	Please refer to Mitigation Measures listed above.		N/A

9.5.9 NOISE IMPACT

Apart from the construction phase, the operation of the proposed Solar PV project is not likely to generate any significant Noise. Therefore, in this case we do not consider Noise as a significant potential aspect and hence no detailed Noise Impact Assessment has been undertaken during the EIA phase.

9.5.10 SOCIAL IMPACTS ASSOCIATED WITH THE CONSTUCTION PHASE OF THE PROJECT

Most impacts are anticipated to occur during the Construction Phase, when the number of personnel and activities on site will be greater.

9.5.10.1 SOCIAL IMPACTS DURING CONSTRUCTION PHASE

During the Construction Phase roads will be developed, the site would need to be cleared, boundary fencing will be erected, infrastructure would be delivered to site and installed, and a substation constructed. Other than security personnel, no construction personnel are expected to remain on site overnight. Other activities associated with the Construction Phase include advertising for the new jobs available. This advertising process may lead to an influx of work seekers and possibly an increase in crime.

The social categories assessed include:

1. Health and social well-being impacts;
2. Quality of the living environment impacts;
3. Economic impacts and material well-being impacts; and,
4. Family and community impacts

9.5.10.1.1 HEALTH AND SOCIAL WELL-BEING IMPACTS

The following health and social well-being impacts, relating to the Construction Phase, were assessed:

- Increased noise (**Table 58**);
- Potential increase in crime/fear of increased crime (**Table 59**); and,
- Health implications (**Table 60**).

Table 58: Impact Ratings for Increased Noise.

Impact: Excessive noise from construction vehicles, construction activities and personnel.		
Nature of Impact	**Preferred Alternative (Alternative 1)**	
	Before Mitigation	**After Mitigation**
Magnitude	8	4
Duration	2	2

Impact: Excessive noise from construction vehicles, construction activities and personnel.		
Nature of Impact	**Preferred Alternative (Alternative 1)**	
	Before Mitigation	**After Mitigation**
Extent	2	2
Irreplaceable loss of resources	2	2
Reversibility	2	2
Probability	3	3
Total Significance Points	48	36
Significance rating	**M**	**L**
Cumulative Impact	**M**	**L**
Mitigation measures:	• Construction works must be restricted to usual work hours, 07:00 – 18:00, Monday to Saturday. No work on Sundays and public holidays. • Delivery of construction material and components must be restricted to the usual work hours. • A Code of Conduct must be drawn up and personnel must adhere to the code. • As far as possible, noisy activities must be screened. • A Complaints Register must be maintained and measures to address complaints must be implemented timeously.	
Assessment of the No-Go Option If the proposed solar facility is not developed, then the proposed development site will continue to be used for agricultural activities and there will be no increase in noise experienced		

Table 59: Potential increase in crime and/or fear of an increase in crime.

Impact: Construction personnel may take part in criminal activities and/or the activity in the area may draw other criminals to the area. Farmsteads are particularly vulnerable to crime.		
Nature of Impact	**Preferred Alternative (Alternative 1)**	
	Before Mitigation	**After Mitigation**
Magnitude	10	10
Duration	2	2
Extent	2	2
Irreplaceable loss of resources	4	2
Reversibility	4	2
Probability	3	2
Total Significance Points	66	36
Significance rating	**M**	**L**
Cumulative Impact	**M**	**M**
Mitigation measures:	• The recruitment process should be conducted at the expected source of local laborers, in order to avoid a potential influx of work seekers to the area immediately surrounding the solar facility. • Contractors to strictly monitor for any non-employees on site and to report any immediately. • All employees are required to have a form of identification. • No farm gates to be left open. • Farmers to report cases of livestock theft to the Contractor to investigate internally.	

Impact: Construction personnel may take part in criminal activities and/or the activity in the area may draw other criminals to the area. Farmsteads are particularly vulnerable to crime.		
Nature of Impact	**Preferred Alternative (Alternative 1)**	
	Before Mitigation	**After Mitigation**
	• The Applicant and Contractors to work closely with farm watch groups. • No construction personnel to be accessing or leaving the construction site before 05:00 or after 20:00. • Apart from security personnel, no construction staff are to remain on site overnight. All personnel are to be housed offsite. • Sufficient security staff must be placed at the solar facility during all phases of the proposed development.	
Assessment of the No-Go Option If the proposed solar facility is not developed, then the proposed development site will continue to be used for agricultural activities and there will be no increase in crime as a result of the solar facility. Residents in the area would not fear a potential increase in crime. Crime levels may still alter, but this would be due to other factors.		

Table 60: Health implications.

Impact: Dangerous conditions created by construction activities and increased vehicles using access roads, leading to accidents. An influx of workers/work seekers may increase the spread of HIV/AIDS.		
Nature of Impact	**Preferred Alternative (Alternative 1)**	
	Before Mitigation	**After Mitigation**
Magnitude	8	8
Duration	2	2
Extent	3	3
Irreplaceable loss of resources	4	2
Reversibility	4	2
Probability	3	2
Total Significance Points	63	34
Significance rating	**M**	**L**
Cumulative Impact	**L**	**L**
Mitigation measures:	• Monitor dust levels and ensure dust mitigation measures are in place. • All employees to be supplied with appropriate PPE. • Speed limits must be enforced on access roads. • As far as possible, employment positions should be filled by local persons residing in the area. • HIV/AIDS awareness talks to be incorporated into induction talks. • No non-employees to be allowed on the construction site/construction camp.	
Assessment of the No-Go Option If the proposed solar facility is not developed, then there will not be any potentially health hazards created (dust, traffic, dangerous activities) and there will be no influx of work seekers to the area. Potential negative health impacts will not be realised.		

9.5.10.1.2 QUALITY OF THE LIVING ENVIRONMENT IMPACTS

The following living environment impacts, relating to the Construction Phase, were assessed:

- Disruption of daily living (**Table 61**);
- Loss of the area's sense of place (**Table 62**); and,
- Increased demand on existing infrastructure (**Table 63**).

Table 61: Disruption of daily living.

Impact: Increased noise, increased traffic on roads, increased dust and interference with farming activities.		
Nature of Impact	**Preferred Alternative (Alternative 1)**	
	Before Mitigation	**After Mitigation**
Magnitude	8	6
Duration	2	2
Extent	1	1
Irreplaceable loss of resources	2	2
Reversibility	3	2
Probability	3	2
Total Significance Points	48	26
Significance rating	**M**	**L**
Cumulative Impact	**M**	**L**
Mitigation measures:	• The Applicant and their appointed contractors must maintain good communication channels with the farmers in the surrounding area and notify them timeously if any activities will take place which may disrupt the farmers' daily activities. • Access roads must not be blocked. • The Applicant should contribute towards the maintenance of public access roads, in particular the gravel roads. The Applicant's responsibilities with regard to road maintenance must be confirmed prior to construction commencing. • Construction works must be restricted to usual work hours, 07:00 – 18:00, Monday to Saturday. No work on Sundays and public holidays. • Delivery of construction material and components must be restricted to the usual work hours. • A Code of Conduct must be drawn up and personnel must adhere to the code. • A Complaints Register must be maintained and measures to address complaints must be implemented timeously.	
Assessment of the No-Go Option If the proposed solar facility is not developed, then there will be no activities taking place which would disrupt daily living. The site would continue to be used for agricultural activities.		

Table 62: Loss of sense of place / visual impact.

Impact: Temporary impact on area's rural sense of place, due to construction of infrastructure, increase noise and activities.		
Nature of Impact	**Preferred Alternative (Alternative 1)**	
	Before Mitigation	**After Mitigation**
Magnitude	8	6
Duration	2	2
Extent	1	1
Irreplaceable loss of resources	2	2
Reversibility	3	2

Impact: Temporary impact on area's rural sense of place, due to construction of infrastructure, increase noise and activities.		
Nature of Impact	**Preferred Alternative (Alternative 1)**	
	Before Mitigation	**After Mitigation**
Probability	4	3
Total Significance Points	64	39
Significance rating	**M**	**L**
Cumulative Impact	**M**	**M**
Mitigation measures:	• Notify residents prior to conducting activities that may cause excessive noise. • Use attenuation for machinery and screen noisy activities were possible. • Construction works must be restricted to usual work hours, 07:00 – 18:00, Monday to Saturday. No work on Sundays and public holidays. • Delivery of construction material and components must be restricted to the usual work hours. • A Code of Conduct must be drawn up and personnel must adhere to the code. • A Complaints Register must be maintained and measures to address complaints must be implemented timeously. • Limit the amount of lighting on site to what is necessary. • Retain natural vegetation wherever possible. • The recommendations of the Visual Impact Assessment must be implemented.	
Assessment of the No-Go Option If the proposed solar facility is not developed, then there will be no activities taking place which would create noise and visual intrusion that would alter the area's sense of place. The site would continue to be used for agriculture and potential impacts to the area's sense of place would not be realised.		

Table 63: Increased demand on existing infrastructure.

Impact: Additional construction vehicles using the roads to access the site will cause additional wear and tear on road infrastructure already in a poor state.		
Nature of Impact	**Preferred Alternative (Alternative 1)**	
	Before Mitigation	**After Mitigation**
Magnitude	8	6
Duration	2	2
Extent	3	3
Irreplaceable loss of resources	3	3
Reversibility	3	2
Probability	2	2
Total Significance Points	38	32
Significance rating	**L**	**L**
Cumulative Impact	**M**	**L**
Mitigation measures:	• The Applicant must draw up an agreement with local farmers and the municipality for the maintenance of gravel access roads and contribute to the maintenance of the roads as per the agreement.	

	• The Applicant should consider contributing to the maintenance of tarred roads, in collaboration with the local municipality.
Assessment of the No-Go Option If the proposed solar facility is not developed, then there will be no additional vehicles using the tar and gravel roads in the area. Roads will not be damaged as a result of the solar facility being constructed.	

9.5.10.1.3 ECONOMIC IMPACTS AND MATERIAL WELL-BEING IMPACTS

The economic impacts and material well-being impacts, relating to the Construction Phase, assessed include:

- Livestock theft (**Table 64**);
- Creation of employment opportunities (**Table 65**); and,
- Knock-on effects for local business (**Table 66**).

Table 64: Livestock theft.

Impact: Construction activities in the area may directly and/or indirectly increase livestock theft, which can cause significant economic losses for farmers.		
Nature of Impact	**Preferred Alternative (Alternative 1)**	
	Before Mitigation	**After Mitigation**
Magnitude	8	6
Duration	2	2
Extent	2	2
Irreplaceable loss of resources	3	2
Reversibility	3	2
Probability	3	2
Total Significance Points	54	28
Significance rating	**M**	**L**
Cumulative Impact	**M**	**L**
Mitigation measures:	• The recruitment process should be conducted at the expected source of local laborers, in order to avoid a potential influx of work seekers to the area immediately surrounding the proposed facility. • Contractors to strictly monitor for any non-employees on site and to report any immediately. • All employees are required to have a form of identification. • No farm gates to be left open. • Farmers to report cases of livestock theft to the Contractor to investigate internally. If it can be proved that particular instances of livestock theft were a direct result of the construction activities on the solar facility, farmers must be compensated. • The Applicant and Contractors to work closely with farm watch groups. • No construction personnel to be accessing or leaving the construction site before 05:00 or after 20:00. • Apart from security personnel, no construction staff are to remain on site overnight. All personnel are to be housed offsite.	
Assessment of the No-Go Option If the proposed solar facility is not developed, then there will be no increase, or decrease, in livestock theft as a result of construction activities on the solar facility.		

Table 65: Creation of employment opportunities.

Impact: During the Construction Phase of the solar facility, an estimated 417 contract (i.e. temporary) employment positions will be created. Some of these positions would be filled by locals.		
Nature of Impact	**Preferred Alternative (Alternative 1)**	
	Before Enhancement	**After Enhancement**
Magnitude	6	8
Duration	2	2
Extent	2	2
Irreplaceable loss of resources	0	0
Reversibility	5	5
Probability	4	4
Total Significance Points	60	68
Significance rating	**M (+)**	**M (+)**
Cumulative Impact	**L (+)**	**L (+)**
Mitigation measures:	• As far possible, fill employment positions with local personnel from the surrounding areas. • If there is a deficit of locals who are sufficiently skilled, the Applicant should endeavour to provide training for locals to fill the positions.	
Assessment of the No-Go Option If the proposed solar facility is not developed, then no new jobs will be created, and the potential positive impacts will not be realised. Skilled and unskilled people in the area, who may have applied for the positions, would continue to be unemployed or need to seek work elsewhere.		

Table 66: Knock-on effects for local business.

Impact: Money spent on local goods and services by the Applicant and their appointed contractors during the construction phase.		
Nature of Impact	**Preferred Alternative (Alternative 1)**	
	Before Enhancement	**After Enhancement**
Magnitude	8	10
Duration	3	3
Extent	3	3
Irreplaceable loss of resources	0	0
Reversibility	5	5
Probability	4	5
Total Significance Points	76	105
Significance rating	**M (+)**	**H (+)**
Cumulative Impact	**L (+)**	**L (+)**
Mitigation measures:	As far as possible, the developer and Contractor must make use of local service providers for building materials, accommodation, food and services.	
Assessment of the No-Go Option If the proposed solar facility is not developed, then there will be no construction activities taking place, and there will be no need for the Applicant to purchase local goods and services. Potential positive economic impacts would not be realised.		

9.5.10.2 SOCIAL IMPACTS DURING THE OPERATIONAL PHASE

Once constructed, it is anticipated that activities at the proposed solar facility will be reduced to daily operational and maintenance activities. The facility will have a maximum electrical generation capacity of 165MW, which will be discharged into the local or national grid.

The social categories assessed include:

1. Quality of the living environment impacts;
2. Economic impacts and material well-being impacts (positive and negative);
3. Family and community impacts; and,
4. Institutional, legal, political and equity impacts.

9.5.10.2.1 QUALITY OF THE LIVING ENVIRONMENT

The following quality of the living environment impacts, relating to the Operational Phase, were assessed:

- Loss of the area's sense of place/visual impact (**Table 67**); and,
- Improvement of national electricity supply (**Table 68**).

Table 67: Loss of area's sense of place.

Impact: Loss of sense of place and visual impact of the solar facility will detract from the area's rural feel.		
Nature of Impact	**Preferred Alternative (Alternative 1)**	
	Before Mitigation	**After Mitigation**
Magnitude	8	8
Duration	3	3
Extent	2	2
Irreplaceable loss of resources	3	3
Reversibility	3	3
Probability	3	2
Total Significance Points	57	38
Significance rating	**M**	**L**
Cumulative Impact	**MH**	**M**
Mitigation measures:	• Retain as much natural vegetation as possible on the site, particularly along the site boundaries. • Infrastructure should be screened by planting additional trees around the boundary of the solar facility. • Buildings and infrastructure must be painted matt colours that blend into the surrounding environment. • Mitigation measures described in the Visual Impact Assessment must be implemented.	
Assessment of the No-Go Option If the proposed solar facility is not developed, then there will be no permanent infrastructure creating a visual impact and detracting from the areas sense of place. The sense of place will remain as it is currently, i.e. rural agricultural land.		

Table 68: Improvement of national electricity supply.

Impact: Addition of 165MW generation capacity contributing to the municipal or national electricity supply.		
Nature of Impact	**Preferred Alternative (Alternative 1)**	
	Before Enhancement	**After Enhancement**
Magnitude	4	N/A
Duration	3	

Impact: Addition of 165MW generation capacity contributing to the municipal or national electricity supply.		
Nature of Impact	**Preferred Alternative (Alternative 1)**	
	Before Enhancement	**After Enhancement**
Extent	3	
Irreplaceable loss of resources	0	
Reversibility	4	
Probability	5	
Total Significance Points	76	
Significance rating	**M (+)**	
Cumulative Impact	**M (+)**	
Mitigation measures:	Electricity should preferably be bought by the local municipality so that it can be supplied the communities surrounding the solar facility. This is however outside of the Applicant's control and will be stipulated as per the agreement with Eskom.	
Assessment of the No-Go Option If the proposed solar facility is not developed, then an additional 165MW of generation capacity will not be created. There will be no additional electricity supplied to the municipal and/or national power grid and no contribution to resolving the national electricity shortage.		

9.5.10.2.2 ECONOMIC AND MATERIAL WELL-BEING

The positive and negative economic and material well-being impacts, relating to the Operational Phase, assessed include:

- Decreased tourism potential for the surrounding area (**Table 69**);
- Creation of employment opportunities (**Table 70**);
- Knock-on effects for local business (**Table 71**); and,
- Financial benefit for landowners (**Table 72**).

Table 69: Decreased tourism potential for the surrounding area.

Impact: Loss of sense of place will compromise the economic viability of tourism operations in the surrounding area. A planned game and hunting farm will likely no longer be economically viable.		
Nature of Impact	**Preferred Alternative (Alternative 1)**	
	Before Mitigation	**After Mitigation**
Magnitude	8	8
Duration	3	3
Extent	2	2
Irreplaceable loss of resources	3	3
Reversibility	3	3
Probability	3	2
Total Significance Points	57	38
Significance rating	**M**	**L**
Cumulative Impact	**M**	**M**
Mitigation measures:	• Implement mitigation measures to reduce the visual impact by the solar facility as much as possible. • Activities and personnel on site must be managed in a way that ensures minimal noise is generated during daily operation.	
Assessment of the No-Go Option If the proposed solar facility is not developed, then there will be no infrastructure built on the site which could detract from the sense of place of surrounding areas. The site would continue to be used for its current use,		

Impact: Loss of sense of place will compromise the economic viability of tourism operations in the surrounding area. A planned game and hunting farm will likely no longer be economically viable.		
Nature of Impact	**Preferred Alternative (Alternative 1)**	
	Before Mitigation	**After Mitigation**
i.e. agriculture, and there would be no impacts to the sense of place of the existing and planned game/hunting farms to the west and north of the proposed development site.		

Table 70: Creation of employment opportunities.

Impact: Creation of approximately 15 to 20 full time equivalent (FTE) employment positions annually, for 20 years or for the operational lifetime of the facility if extended beyond 20 years. Some of these positions will be filled by locals.		
Nature of Impact	**Preferred Alternative (Alternative 1)**	
	Before Enhancement	**After Enhancement**
Magnitude	6	8
Duration	3	3
Extent	2	2
Irreplaceable loss of resources	0	0
Reversibility	4	4
Probability	4	4
Total Significance Points	60	68
Significance rating	**M (+)**	**M (+)**
Cumulative Impact	**L (+)**	**L (+)**
Mitigation measures:	• As far as possible employ local personnel from the surrounding areas. • If there is a deficit of locals who are sufficiently skilled, the Applicant should endeavour to provide training for locals to fill the positions.	
Assessment of the No-Go Option If the proposed solar facility is not developed, then no new jobs will be created, and the potential positive impacts will not be realised. Skilled and unskilled people in the area, who may have applied for the positions, would continue to be unemployed or need to seek work elsewhere.		

Table 71: Knock-on effects for local business.

Impact: Money spent on local goods and services by the Applicant and their appointed contractors.		
Nature of Impact	**Preferred Alternative (Alternative 1)**	
	Before Enhancement	**After Enhancement**
Magnitude	2	4
Duration	3	3
Extent	3	3
Irreplaceable loss of resources	0	0
Reversibility	0	0
Probability	2	3
Total Significance Points	16	30
Significance rating	**L (+)**	**L (+)**
Cumulative Impact	**L (+)**	**L (+)**
Mitigation measures:	As far as possible, the developer and Contractor must make use of local service providers for building materials, accommodation, food and services.	
Assessment of the No-Go Option		

Impact: Money spent on local goods and services by the Applicant and their appointed contractors.		
Nature of Impact	**Preferred Alternative (Alternative 1)**	
	Before Enhancement	**After Enhancement**
If the proposed solar facility is not developed, then there will be no need for the Applicant to purchase local goods and services during the Operational Phase and no contractors working in the area who would spend money on local goods and services. Potential positive economic impacts would not be realised.		

Table 72: Financial benefit for landowners.

Impact: Landowners will receive additional income from renting out their land for the solar facility. The income received will be more than if the land were to continue to be used for agricultural activities.		
Nature of Impact	**Preferred Alternative (Alternative 1)**	
	Before Enhancement	**After Enhancement**
Magnitude	4	N/A
Duration	3	
Extent	1	
Irreplaceable loss of resources	0	
Reversibility	0	
Probability	5	
Total Significance Points	40	
Significance rating	**M (+)**	
Cumulative Impact	**L (+)**	
Mitigation measures:	No enhancement measures are applicable.	
Assessment of the No-Go Option If the proposed solar facility is not developed, then the landowners will not receive financial benefit from renting out their land. The landowners would continue to generate income from the land through agricultural activities.		

9.5.10.2.3 FAMILY AND COMMUNITY IMPACTS

The proposed solar facility is unlikely to affect the surrounding area at a family level but may lead to negative impacts among the surrounding communities. These impacts are likely to include:

- Decreased level of satisfaction with the living environment (**Table 73**).

Table 73: Decreased level of satisfaction with the living environment.

Impact: Increased activity and visual impacts may lead to a decreased level of satisfaction with the living environment for farmers and residents in the area.		
Nature of Impact	**Preferred Alternative (Alternative 1)**	
	Before Mitigation	**After Mitigation**
Magnitude	8	8
Duration	3	3
Extent	1	1
Irreplaceable loss of resources	3	3
Reversibility	4	3
Probability	3	2
Total Significance Points	57	36
Significance rating	**M**	**L**
Cumulative Impact	**MH**	**M**
Mitigation measures:	• Implement mitigation measures to reduce the visual impact by the solar facility as much as possible.	

Impact: Increased activity and visual impacts may lead to a decreased level of satisfaction with the living environment for farmers and residents in the area.		
Nature of Impact	**Preferred Alternative (Alternative 1)**	
	Before Mitigation	**After Mitigation**
	• Maintenance works must be restricted to usual work hours, 07:00 – 18:00, Monday to Saturday. No work on Sundays and public holidays, apart from emergency maintenance. • A Code of Conduct must be drawn up and personnel must adhere to the code. Activities and personnel on site must be managed in a way that ensures minimal noise is generated during daily operation. • A Complaints Register must be maintained and measures to address complaints must be implemented timeously.	
Assessment of the No-Go Option If the proposed solar facility is not developed, then there will be no infrastructure built on the site which could detract from the sense of place of surrounding areas and there will be no new operational activities taking place in the area. The site would continue to be used for its current use, i.e. agriculture, and there would be no new impacts to farmers and residents' daily lives.		

9.5.10.2.4 INSTITUTIONAL, LEGAL, POLITICAL AND EQUITY IMPACTS

The institutional, legal, political and equity impacts, relating to the Operational Phase, assessed include:

- Alignment with national, provincial and local planning (**Table 74**).

Table 74: Alignment with national, provincial and local planning.

Impact: The proposed development will contribute to South Africa achieving its renewable energy goals.		
Nature of Impact	**Preferred Alternative (Alternative 1)**	
	Before Enhancement	**After Enhancement**
Magnitude	6	N/A
Duration	3	
Extent	4	
Irreplaceable loss of resources	0	
Reversibility	0	
Probability	5	
Total Significance Points	65	
Significance rating	**M (+)**	
Cumulative Impact	**M (+)**	
Mitigation measures:	• Ensure that the development of the proposed solar facility does not compromise on the goals of other national, provincial and local planning documents. • Electricity must first be used within the Free State Province, as stipulated in the Free State Provincial Spatial Development Framework.	
Assessment of the No-Go Option If the proposed solar facility is not developed, an opportunity to contribute to a shift in electricity production to renewable energy sources will not be realised. The facility, or similar, will need to be developed elsewhere if the goals of the White Paper on the Renewable Energy Policy of RSA 2003 are to be achieved.		

9.5.10.3 SOCIAL IMPACTS DURING DECOMMISSIONING

The solar facility will have an estimated lifespan of approximately 25 years, after which the facility will either need to be upgraded to extend its lifespan or it will be decommissioned. Decommissioning would involve removing all the infrastructure on site and rehabilitating the land to its previous condition.

Similar impacts as those assessed for the Construction Phase are expected to occur during the Decommissioning Phase. Once decommissioned, the Operational Phase impacts would cease. A key positive impact following decommissioning is the removal of visually intrusive infrastructure. Assuming that land uses on surrounding farms remains the same and that the site is rehabilitated, the site and surrounds would regain their current sense of place, i.e. rural/agricultural.

The No-Go option of not decommissioning the facility would result in no change from the Operational Phase impacts.

9.5.10.4 IMPACTS OF THE NO-GO ALTERNATIVE

Potential negative impacts associated with the No-Go option include forfeiting the jobs that could be created and the spend on local goods and services. Considering the relatively high unemployment rate of the local municipality and declining mining industry in the area, this is not favourable. An opportunity to mitigate the electricity shortages being experienced in South Africa and to strengthen the renewable energy sector will not be realised. Given the current energy crisis, not developing the facility is likely to have a regional impact on electricity provision. Opportunities to develop the facility, or similar will have to be sought elsewhere.

In terms of potential positive impacts, the No-Go option would result in the current land use continuing, i.e. agriculture. There would be no impact to the area's sense of place and there will be no increase in crime or fear of an increase in crime (solely as a result of the solar facility). The financial viability of existing and planned game farms to the west and north of solar facility site would be unaffected. Positive impacts in terms of sense of place and satisfaction with the living environment would be relatively localised, as there are only approximately 8 neighbouring farmsteads The No-Go option of not developing on identified environmental sensitive areas (i.e. excluding them from development) will avoid the negative environmental impacts that could occur and mitigate potential impacts to tourism attractions such as the Commandants Pan.

9.5.11 IMPACT ON LAND USE AND VALUE

Two potential negative agricultural impacts were identified, loss of agricultural land use, and land degradation. Two positive agricultural impacts were identified as enhanced agricultural potential through increased financial security for farming operations, and improved security against stock theft and other crime. The impact assessment of these issues have been addressed by a high-level visual impact assessment socio-economic impact study during the EIA Phase, as per section 9.5.6 and 9.5.8 above.

9.5.12 POTENTIAL IMPACT ON AQUATIC ECOLOGY

According to the guidelines specified within GN509 of 2016 all wetlands within a radius of 500m of the facility footprint were identified and mapped (**Figure 51**). The development of the 165MW Khauta North SPV Facility is likely to result in a variety of impacts from an aquatic perspective. Vulnerable aquatic areas have been identified and appropriate buffers have been recommended around the areas. These areas should be regarded as No-Go areas apart from activities and infrastructure which may be allowed (although restricted to the minimum footprint):

- Only activities relating to the route access and cabling:
    - The use/upgrade of existing roads (**Figure 76**) and watercourse crossings is the preferred option.
    - Where no suitable existing roads and watercourse crossings exist, the construction of new access roads and watercourse crossings can be allowed, however this should be deemed as a last resort.
    - All underground cabling should be laid either within access roads or next to access roads (as close as possible).

The current existing infrastructure within the footprint area include existing gravel roads and dilapidated old buildings (**Figure 62 & Figure 63**).

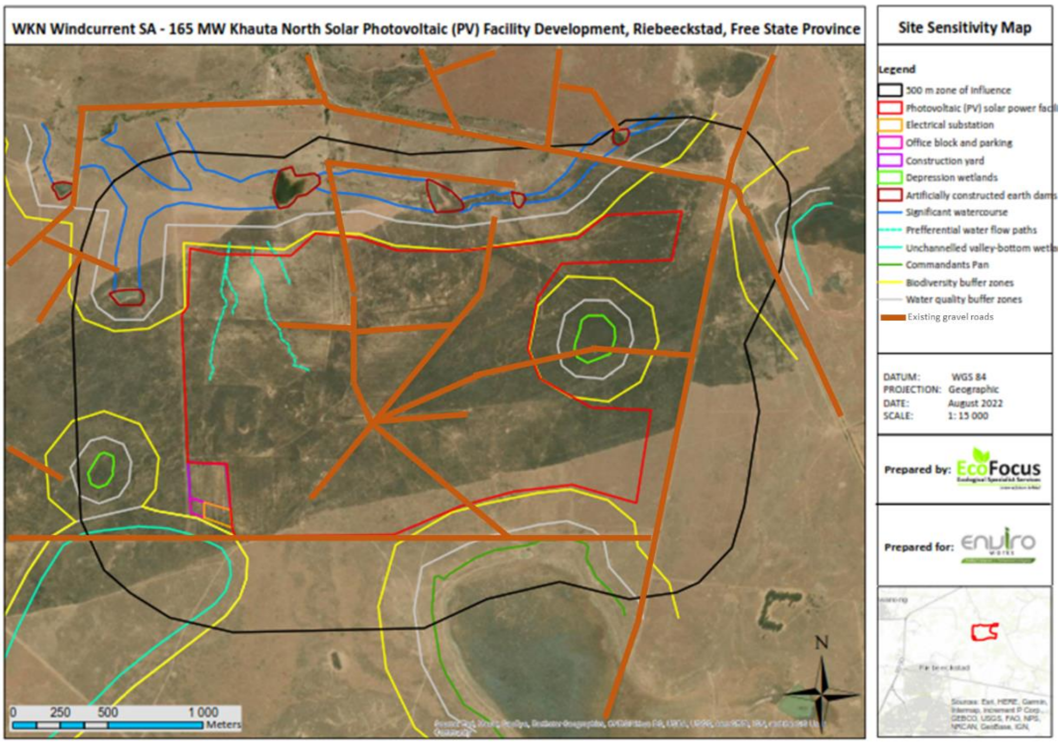


Figure 76: Overview of existing roads on the proposed project site.

Potential impacts and the relative significance of the impacts are summarised below (**Table 75**).

Table 75: Summary of potential impacts relating to the aquatic environment.

Construction Phase
• Transformation of an aquatic CBA 1, associated with the identified watercourse and depression wetland (west). • Disturbance of-/damage to semi-aquatic faunal habitats, associated with the identified watercourse, two depression wetlands and Commandants Pan. • Terrestrial and aquatic alien invasive species establishment within the identified watercourse, two depression wetlands, unchanneled valley-bottom wetland and Commandants Pan. • Contamination of the identified watercourse, depression wetland (east) and Commandants Pan by surface material erosion. • Contamination of the identified watercourse, two depression wetlands, unchanneled valley bottom wetland and Commandants Pan by dust generation and emissions. • Impeding and contamination of the flow regimes of the identified watercourse, depression wetland (east) and Commandants Pan, within the associated local and broader quaternary surface water catchment- and drainage area.
Operational Phase
• Continued contamination of the identified watercourse, two depression wetlands, unchanneled valley-bottom wetland and Commandants Pan by dust generation and emissions. • Continued impeding and contamination of the flow regimes of the identified watercourse, depression wetland (east) and Commandants Pan, within the associated local and broader quaternary surface water catchment- and drainage area. • Over-extraction of operational water from a borehole. • Cumulative Impacts.

A total of 8 freshwater resource features were identified and delineated within the 500m regulated area and include;

- One (1) first-order seasonal watercourse;
- Three (3) small preferential water flow paths/drainage lines;
- Two (2) naturally occurring depression wetlands;
- One (1) naturally occurring unchanneled valley-bottom wetland; and,
- One (1) naturally occurring depression pan (Commandants Pan).

The buffer zone recommendations of the specialist, whereby the development footprint was amended to incorporate the No-Go areas (as stipulated by the specialist) will ensure that no infrastructure will be located within any freshwater resource feature.

With mitigation measures in place, impacts on the freshwater resource features' integrity and functioning can be potentially reduced to sufficiently low levels. This would be best achieved by incorporating the recommended management & mitigation measures into an EMPr for the site, together with appropriate rehabilitation guidelines and ecological monitoring recommendations.

Based on the outcomes of this study it is the aquatic specialist’s recommendation that the proposed project detailed in the EIA report could be authorised from a freshwater resource perspective.

Since there are watercourses present within the development area (even though excluded from the development footprint) of the 165MW Khauta North SPV Facility as identified in the Aquatic Ecological Assessment (**Appendix E**), and since water may be abstracted from boreholes for use during the construction and operational phases, a water use authorisation for the project will be required from the DWS for water uses identified in Section 21(a), Section 21(c) and 21(i) of the National Water Act (Act 36 of 1998).

It is the opinion of the specialist (EcoFocus Consulting, 2022), by application of the National Environmental Management Act (Act No. 107 of 1998) Mitigation Hierarchy, that there may be potentially significant aquatic ecological impacts associated with the proposed development site. <u>But</u> that these can be suitably reduced and mitigated to within acceptable residual levels, by implementation of the recommended buffer zones and comprehensive mitigation measures that has been provided in the Aquatic Ecological Assessment Report (**Appendix E**).

9.5.13 POTENTIAL IMPACTS ON THE GEOTECHNICAL ENVIRONMENT

Based on preliminary assessments of the geological nature of the site and the proposed activity, the project could potentially involve the following negative direct impacts:

a. Soil and/or bedrock degradation - Soil degradation is the negative alteration of the natural soil profile, usually directly or indirectly related to human activity, including erosion, excavation/removal, loosening, mixing, compaction and contamination/pollution or chemical alteration. Soil degradation negatively affects soil formation, natural weathering processes, moisture levels and soil stability. This could, in time, have a significant effect on agricultural potential and biodiversity (not assessed as part of this study). Soil erosion induced or increased by human activity is termed accelerated erosion and is an integral element of global soil degradation. Accelerated soil erosion is generally considered the most important impact in any development due to its potential impact on a local and regional scale (i.e. on and off site) and as a potential threat to global biodiversity. Soil erodibility – the susceptibility of soil to erosion – is a complex variable, not only because it depends on soil chemistry, texture, and characteristics, but because it varies with time and other variables, such as mode of transport (i.e. wind or water). Erosion of soil due to water run-off is generally considered as being more important due to the magnitude of the potential impact over a relatively short period of time, which can be very difficult to control or reverse. Erosion potential is typically increased in areas where soil is loosened and vegetation cover is stripped (such is the case on most construction sites). Removal of vegetation (ground cover) may increase the risk of soil erosion, making the soil less fertile and less able to support the regeneration of vegetation in future. Generally speaking, unconsolidated or partly consolidated, fine-grained soils of low plasticity occurring along drainage lines, on moderate to steep slopes or at the base of steep slopes are most vulnerable to severe levels of erosion due to water run-off. Areas where these factors occur are typically classified as "highly erosion-sensitive" areas.

The activity may also lead to the following negative indirect impacts:

a. Dust pollution;
b. Siltation of watercourses adjacent to or away from the site or activity areas.

Negative impacts are dominantly related to the construction phase with insignificant additional impacts in the post construction and decommissioning phases. Please see the tables below.

Table 76: Geohydrological impact on soil degradation

Construction Phase	Preferred Alternative (Alternative 1)	
	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ASPECTS		
POTENTIAL ENVIRONMENTAL IMPACT / NATURE OF IMPACT:	Soil degradation (soil removal, mixing, compaction, etc) due to the construction of roads and structures (PV panels, buildings, substations, powerlines).	Minimise the construction footprint and reserve indigenous vegetation wherever possible.
Magnitude:	4	2
Duration:	2	2
Extent:	1	1
Irreplaceable:	1	1
Reversibility:	3	2
Probability:	3	5
Total SP:	55	40
Significance rating:	Medium (M)	Low (L)
Can impacts be mitigated?	Yes, by adhering to EMP and engineering specifications.	
Mitigation:	-Minimise excavations and disturbance areas. -Rehabilitate topsoil & vegetation around site after construction.	
Cumulative impacts:	Soil degradation in the Welkom area has been significantly affected by mining activity, which is generally carries a higher significance. Further development of the area may have increasing impact on the natural soil but the additional cumulative impact of the proposed activity is considered minimal.	
Residual impacts:	Minor loss of soil under roads and structures.	

Table 77: Geotechnical impact due to pollution

Construction Phase	Preferred Alternative (Alternative 1)	
	Before Mitigation	**After Mitigation**
POTENTIAL IMPACTS ASPECTS		
	Soil degradation due to pollution of soil by contaminants used on site during construction (e.g. fuel, oil, chemicals, cement).	Minimise the construction footprint and reserve indigenous vegetation wherever possible. Construct development in shortest timeframe and control pollution.
Magnitude:	4	2
Duration:	2	2
Extent:	1	1
Irreplaceable:	1	1
Reversibility:	3	2
Probability:	3	2
Total SP:	33	16
Significance rating:	Low (L)	Low (L)
Can impacts be mitigated?	Yes, by adhering to EMP and engineering specifications.	
Mitigation:	-Provide contamination prevention systems on site. -Control use and disposal of potential contaminants or hazardous materials. -Remove contaminants and contaminated topsoil and replace topsoil in affected areas.	
Cumulative impacts:	Soil degradation in the Welkom area has been significantly affected by mining activity, which is generally carries a higher significance. Further development of the area may have increasing impact on the natural soil but the additional cumulative impact of the proposed activity is considered minimal.	
Residual impacts:	Negligible.	

Table 78: Geotechnical impact on soil from wind erosion

Construction Phase	Preferred Alternative (Alternative 1)	
	Before Mitigation	**After Mitigation**
POTENTIAL IMPACTS ASPECTS		
	Soil erosion by wind and/or water on construction areas	Minimise the construction footprint and reserve indigenous vegetation wherever possible. Construct development in shortest timeframe and control pollution.
Magnitude:	4	2
Duration:	2	2
Extent:	1	1
Irreplaceable:	1	1
Reversibility:	3	2
Probability:	3	2
Total SP:	33	16
Significance rating:	Low (L)	Low (L)
Can impacts be mitigated?	Yes, by adhering to EMP and engineering specifications.	
Mitigation:	-Minimise size of the construction footprint/camp. -Restrict activity outside of construction camp areas.	

Construction Phase	Preferred Alternative (Alternative 1)	
	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ASPECTS		
	-Implement effective erosion control measures around site. -Carry out earthworks in phases across site to reduce the area of exposed ground at any one time. -Protect and maintain denuded areas and material stockpiles to minimise erosion and instability.	
Cumulative impacts:	Soil degradation in the Welkom area has been significantly affected by mining activity, which is generally carries a higher significance. Further development of the area may have increasing impact on the natural soil but the additional cumulative impact of the proposed activity is considered minimal.	
Residual impacts:	Negligible.	

Table 79: Geotechnical impact on the watercourses

Construction Phase	Preferred Alternative (Alternative 1)	
	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ASPECTS		
	Degradation of watercourses due to siltation (silt-loading) due to erosion from site.	Minimise the construction footprint and reserve indigenous vegetation wherever possible. Construct development in shortest timeframe and control pollution.
Magnitude:	4	2
Duration:	2	1
Extent:	1	1
Irreplaceable:	1	1
Reversibility:	4	4
Probability:	3	2
Total SP:	36	20
Significance rating:	Low (L)	Low (L)
Can impacts be mitigated?	Yes, by adhering to EMP and engineering specifications.	
Mitigation:	Install anti-erosion measures such as silt fences, geosynthetic erosion protection, and/or flow attenuation along watercourses below construction sites. Strictly control activity near water courses/natural drainage lines as sediment transport is higher in these areas. Minimise increased run-off from hard surfaces (PV panels) by channelising and capturing rainwater for re-use (rainwater harvesting)	
Cumulative impacts:	Soil degradation in the Welkom area has been significantly affected by mining activity, which is generally carries a higher significance. Further development of the area may have increasing impact on the natural soil but the additional cumulative impact of the proposed activity is considered minimal.	
Residual impacts:	Negligible.	

Table 80: Geotechnical impact due to dust

Construction Phase	Preferred Alternative (Alternative 1)	
	Before Mitigation	**After Mitigation**
POTENTIAL IMPACTS ASPECTS		
	Dust pollution due to wind erosion from site	Minimise the construction footprint and reserve indigenous vegetation wherever possible. Construct development in shortest timeframe and control pollution.
Magnitude:	4	2
Duration:	2	2
Extent:	1	1
Irreplaceable:	1	1
Reversibility:	4	4
Probability:	3	2
Total SP:	36	20
Significance rating:	Low (L)	Low (L)
Can impacts be mitigated?	Yes, by adhering to EMP and engineering specifications.	
Mitigation:	Apply dust control measures such as straw bales or dampen dusty denuded areas.	
Cumulative impacts:	Soil degradation in the Welkom area has been significantly affected by mining activity, which is generally carries a higher significance. Further development of the area may have increasing impact on the natural soil but the additional cumulative impact of the proposed activity is considered minimal.	
Residual impacts:	Negligible.	

The most significant potential negative impacts on the geological environment are that of soil degradation. However, if these impacts are successfully mitigated the proposed activity will have an overall low negative impact on the environment. An assessment of the cumulative impacts on soil degradation in the vicinity takes into account the nearby mining activities which have been a significant potential contributor to cumulative soil degradation in the area. In comparison, the proposed solar energy development is considered to be a relatively small contributor to the cumulative impact of the degradation of the local soil resource and this should not hinder its development.

9.6 CUMULATIVE AND INDIRECT IMPACTS

This section describes the likely cumulative impacts of the project on the environment. It identifies the scope of the assessment, the potential cumulative environmental effects, which may require associated mitigation measures to be addressed.

9.6.1 CUMULATIVE IMPACTS

Cumulative impacts are those Impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project (EU, 1999). The **Table 81** below shows the various impacts, which have been considered for cumulative impact assessment during the EIA phase of the proposed project.

Table 81: Potential Cumulative impacts.

POTENTIAL IMPACT	CONSIDERED FOR POTENTIAL CUMULATIVE IMPACT
Air Quality	No
Archaeological and Cultural Heritage and Palaeontological	No
Avian	Yes
Agriculture	Yes
Flora	No
Fauna	Yes
Surface and Groundwater	Yes
Social Impact	Yes
Visual Impact	Yes
Local Economy	Yes

9.6.1.1 CUMALATIVE AGRICULTURAL IMPACT

The cumulative impact of a development is the impact that development will have when its impact is added to the incremental impacts of other past, present or reasonably foreseeable future activities that will affect the same environment.

In quantifying the cumulative impact, the area of land taken out of agricultural production as a result of the development of the Khauta Cluster (total generation capacity of 450 MW) will amount to a total of approximately 1,125 hectares. This is calculated using the industry standards of 2.5 and 0.3 hectares per megawatt for solar and wind energy generation respectively, as per the Department of Environmental Affairs (DEA) Phase 1 Wind and Solar Strategic Environmental Assessment (SEA) (2015). As a proportion of the total area within a 30km radius (approximately 282,700 ha), this amounts to only 0.40% of the surface area. That is within an acceptable limit in terms of loss of land which is mostly only suitable for grazing, of which there is no particular scarcity in the country.

Due to all of the considerations discussed above, the cumulative impact of loss of agricultural land use will not have an unacceptable negative impact on the agricultural production capability of the area.

9.6.1.2 CUMULATIVE SOCIAL IMPACTS

The proposed Khauta North solar facility is the largest facility of a proposed cluster including three other solar facilities. Developing Khauta North, along with the other three solar facilities will significantly cumulate impacts to sense of place, which is anticipated to be the most significant negative cumulative impact during the construction and operational phases. Furthermore, Environmental Authorisation has been granted for seven other solar facilities within 30km of the Khauta Cluster, with the closest of the these being 11.4km away. With the implementation of mitigation measures, other negative impacts are expected to be Low to Medium when factoring in the other solar facility developments. Many of the Free State's roads are in a poor state, which will be compounded, particularly gravel roads, with additional construction vehicles frequenting the roads in the area. It would be the responsibility of the project to ensure that roads are repaired to a similar or better state than before.

While some of the cumulative impacts are rated as **Medium**, in spite of implementing mitigation measures, these impacts are expected to be localised and are not considered a fatal flaw to the proposed development.

Positive impacts are expected to be Medium-High during the operational phase when the cumulative benefit of electricity generation capacity will occur.

9.6.1.3 CUMULATIVE AVIFAUNA IMPACTS

The proposed 165 MW Khauta Solar PV is situated in an area of high avian sensitivity due to the presence of priority habitats. Assessments for the present waterbodies were conducted where only species of Least Concern were encountered. As a result, from an avifaunal perspective, the overall impacts (including cumulative) for the project are considered to be **Low** and will not cause detrimental impacts to the avifauna species located within the development area.

9.6.1.4 CUMULATIVE AQUATIC IMPACTS

The proposed development area constitutes a combined single footprint area of approximately 273ha in size. The proposed development area and surrounding 500 m 'zone of influence' consist of a mosaic of mainly natural undisturbed terrestrial grassland and to a lesser extent, old historically cultivated agricultural lands.

The mechanical clearance associated with the proposed solar power generation facility development, will in all probability completely transform the majority of the existing surface vegetation within the PV grid-, internal access/services road network- and other associated facility infrastructure footprints.

The local and broader region surrounding the proposed development area forms a mosaic of undeveloped natural landscapes intertwined with extensive agricultural cultivation transformation.

The various aquatic features identified within the 500 m 'zone of influence' surrounding the proposed development area, all scored moderate EIS values and are viewed as being of moderate to high conservational significance/value for habitat preservation and ecological functionality persistence in support of the surrounding aquatic ecosystem and the associated habitat-specific waterbirds, amphibian species and aquatic invertebrates along with the likely presence of ecologically important, habitat-specific and range limited bird species. The presence of the CBA 1, further substantiates the ecological importance of the area.

Transformation of an aquatic CBA 1, associated with the identified watercourse and depression wetland (west); disturbance of-/damage to semi-aquatic faunal habitats, associated with the identified watercourse, two depression wetlands and Commandants Pan as well as impeding and contamination of the flow regimes of the identified watercourse, depression wetland (east) and Commandants Pan, within the associated local and broader quaternary surface water catchment- and drainage area, were identified and addressed as significant potential long-term aquatic ecological impacts, associated with the construction phase of the proposed development.

Continued impeding and contamination of the flow regimes of the identified watercourse, depression wetland (east) and Commandants Pan, within the associated local and broader quaternary surface water catchment- and drainage area as well as over-extraction of operational water from a borehole, were furthermore identified and addressed as significant potential long-term aquatic ecological impacts, associated with the operational phase of the proposed development.

The proposed development merely forms a small part of a significantly sized and extensive combined solar power generation facility cluster, which is envisaged and consequently being applied for throughout the local and broader landscape surrounding the proposed development area. This extensive combined cluster development and subsequent transformation in the same geographical area, which will highly likely take place, will therefore lead to substantial cumulative aquatic ecological impacts.

The significant potential long-term aquatic ecological impacts identified for the proposed development, could therefore potentially add moderate cumulative impact to the existing and anticipated future negative impacts, associated with the envisaged significantly sized and extensive combined solar power generation facility cluster.

It is however the opinion of the specialist, by application of the NEMA Mitigation Hierarchy, that all the identified potential cumulative aquatic ecological impacts associated with the proposed development, can be suitably reduced and mitigated to within acceptable residual levels, by implementation of the recommended mitigation measures. It is therefore **not anticipated that the proposed development will add any significant residual cumulative aquatic ecological impacts to the surrounding environment**, if all recommended mitigation measures as per this aquatic ecological report are adequately implemented and managed, for both the construction- and operational phases of the proposed development.

9.6.1.5 CUMULATIVE FAUNA & FLORA IMPACTS

The area surrounding the proposed development footprint is adjacent to natural vegetation, residential areas, and agricultural lands. Therefore, the proposed development will contribute cumulatively to the removal of grassland and habitat for faunal species (including *S. giganteus*). However, this impact is not expected to be large since the footprint consists of a vegetation type classified as Least Threatened. It is also noted that the ESA 1 and 2 mapped within the footprint has been verified to be outside the development footprint.

Note that it is doubtful whether an isolated patch of suitable habitat will be inhabited by individuals of *S. giganteus*, due to the absence of burrows. Therefore, areas of suitable habitat identified outside of the footprint (which are also connected to natural vegetation) are then recommended to rather be avoided. The suitable habitat identified outside the cluster's development footprint is new habitat that has been delineated and is not present in the current Free State Spatial Biodiversity Plan. Thus, the isolated patch of suitable habitat that will potentially be lost by the cluster's development, is more than compensated for by the additional habitat that was identified outside of the cluster's footprint.

The proposed project will provide significant socio-economic benefits to the local community via job creation and security. If mitigation measures are implemented and best-practice environmentally friendly excavation-, and operation methods are followed, the project will provide significant benefits gaining socio-economic benefits from the energy sector while resulting in minimal impact on the ecological function of the overall area.

9.6.1.6 CONCLUSION REGARDING CUMULATIVE IMPACTS

Cumulative impacts are expected to occur with the development of the 165MW Khauta North SPV Facility throughout all phases of the project life cycle and within all areas of study considered as part of this EIA report.

The main aim for the assessment of cumulative impacts considering the 165MW Khauta North SPV Facility is to test and determine whether the development will be acceptable within the Riebeeckstad 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 165MW Khauta North SPV Facility and other renewable energy projects within the surrounding area, provided the recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.
- There will be no significant loss of sensitive and significant aquatic features. The cumulative impact is therefore acceptable.
- There will be no unacceptable risk to avifauna with the development of the 165MW Khauta North SPV Facility and other renewable energy projects within the surrounding area, provided the recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.
- Cumulative impact of loss of agricultural land use will not have an unacceptable negative impact on the agricultural production capability of the area.
- **Positive impacts** are expected to be **Medium-High** during the operational phase when the cumulative benefit of electricity generation capacity will occur.
- There will be no unacceptable loss of heritage resources associated with the development. There will also be no unacceptable impacts to the cultural landscape as a result of the development of the SPV facility.

Based on the specialist's cumulative assessment and findings, the development of the 165MW Khauta North SPV Facility and its contribution to the overall impact of all renewable energy projects to be developed within a 30km radius, it can be concluded that the165MW Khauta North SPV Facility cumulative impacts will not result in unacceptable, high cumulative impacts and will not result in a whole-scale change of the environment.

9.6.2 INDIRECT IMPACTS

Indirect Impacts on the environment are those impacts, which are not a direct result of the project, often produced away from or as a result of a complex pathway. Sometimes referred to as second or third level impacts, or secondary impacts.

The proposed project will not only supply renewable electricity to the National grid, but also contribute to the sustainable development of the local community. This includes the supply of zero-emitting renewable energy to the national grid, saving the coal and water resources and improving the local energy infrastructure. A small number of direct new jobs will be created by the solar energy facility during their operation. However, both skilled and unskilled labour is required during the construction of supporting service infrastructure.

10 CONCLUSIONS AND RECOMMENDATIONS

This section of the EIA Report includes the following information required in terms of Appendix 3: Scope of Assessment and Content of Environmental Impact Assessment Reports as per the legal requirements.

10.1 EVALUATION OF THE 165MW KHAUTA NORTH SPV FACILITY

The preceding sections 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 165MW Khauta North SPV Facility. This section concludes the environmental assessment of the solar facility, based in the Free State, by providing a summary of the results and conclusions of the assessment of both the project site and development footprint for the solar energy facility. In so doing, it draws on the information gathered as part of the EIA 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.

Effort was made to include the recommendations of all the specialists into the final layout of the SPV Facility design and placement on the site (**Figure 77**).

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 and the undertaking of the construction and operational bird monitoring, as specified by the specialists.

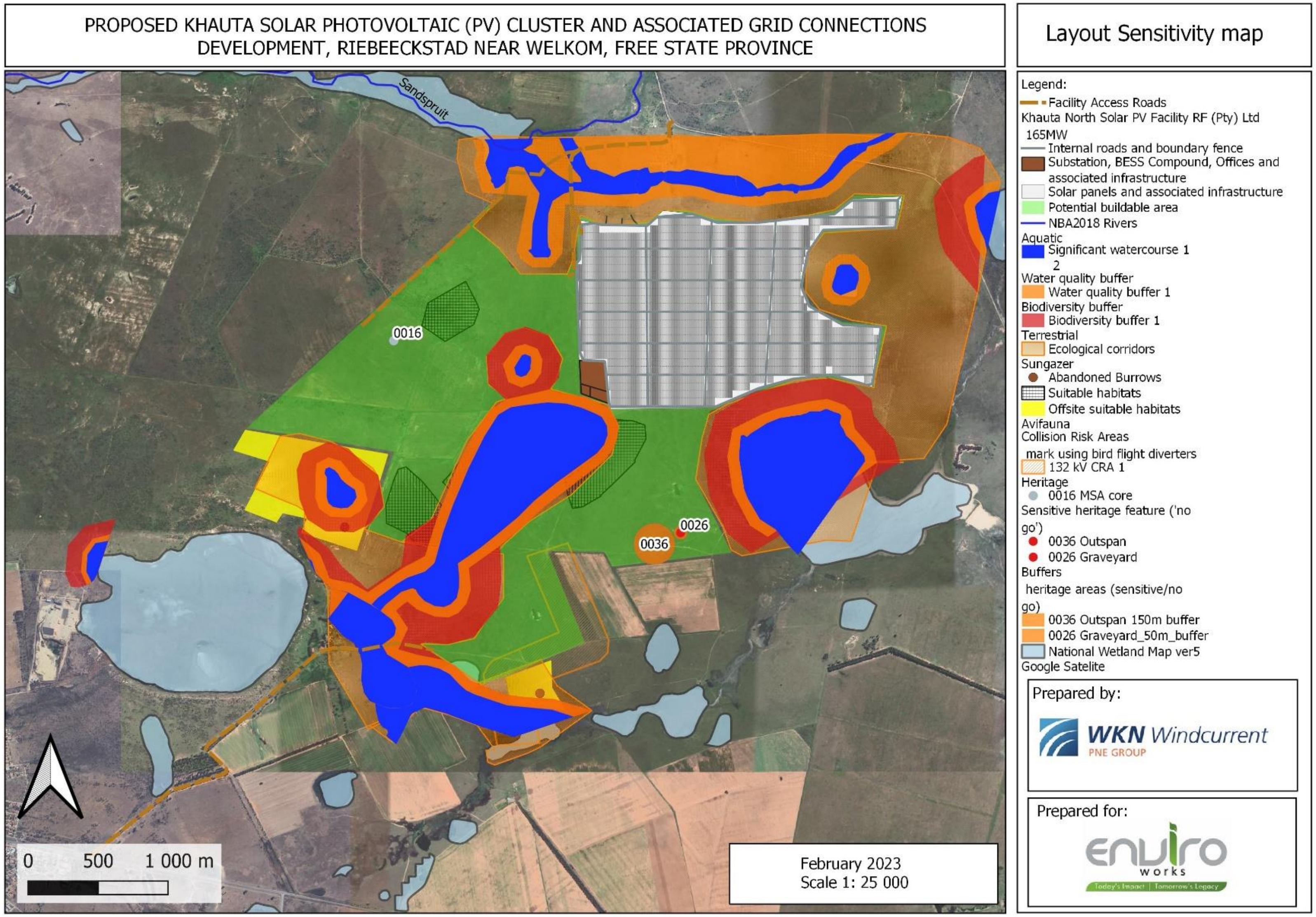


Figure 77: Combined Site Sensitivity Map for the Khauta SPV Cluster

The potential environmental impacts associated with the 165MW Khauta North SPV Facility assessed through the EIA process included:

- Impacts on the agricultural potential;
- Impacts on freshwater ecology;
- Impacts on avifauna;
- Impacts on terrestrial ecology (including biodiversity, fauna & flora);
- Impacts of heritage, archaeological and palaeontology;
- Positive and negative impacts on the economy;
- Positive and negative social impacts;
- Visual impacts; and,
- Impacts on geohydrology.

10.2 RECOMMENDATIONS FROM THE VARIOUS SPECIALISTS

10.2.1 AGRICULTURAL RECOMMENDATION

The entire site was verified in this assessment as being of medium sensitivity for impacts on agricultural resources with a land capability value of 6 to 7. Parts of the site are allocated high agricultural sensitivity on the screening tool, because they were under crop production in the past. However, the high sensitivity was disputed because the lands have not been used for crop production for an extended period and so should no longer be classified as cropland or allocated high sensitivity because of it. The land was assessed as being of insufficient land capability for viable and sustainable future crop production. The cropping potential of the site is limited by the combination of fairly low rainfall and shallow soils limited by dense clay and poor drainage in the subsoil.

Two potential negative agricultural impacts were identified, loss of agricultural land use, and land degradation. Two positive agricultural impact were identified as enhanced agricultural potential through increased financial security for farming operations, and improved security against stock theft and other crime. All of these are likely to have a low impact on future agricultural production potential and are therefore assessed as having low significance.

The conclusion of this assessment is that the proposed development will not have an unacceptable negative impact on the agricultural production capability of the site. Instead, the development represents the ideal, win-win situation for both agricultural production and for electricity generation in South Africa, where renewable energy facilities are integrated with agricultural production in a way that provides benefits to agriculture and leads to little loss of future agricultural production potential.

This is substantiated by the following points:

- The layout of the facility has been deliberately designed to include only land within the farm that was identified as having soil limitations that make it unsuitable or marginal for supporting viable and sustainable crop production. There is not a scarcity of such agricultural land in South Africa and it is therefore considered to be below the threshold for being prioritised for conservation as agricultural production land.

- The amount of agricultural land loss is well within the allowable development limits prescribed by the agricultural protocol. These limits reflect the national need to conserve valuable agricultural land and therefore to steer, particularly renewable energy developments, onto land with lower agricultural production potential.
- The proposed development offers positive impact on agriculture by way of improved financial security for farming operations, as well as security benefits against stock theft and other crime.
- The PV panels will not totally exclude agricultural production. The area can still be used to graze sheep that will, in addition, be protected against stock theft within the security area of the facility.
- The loss of agricultural potential by occupation of land is not permanent. The land will become fully available again for agricultural production once the proposed activity ceases.
- The proposed development poses a low risk in terms of causing soil degradation, which can be adequately and fairly easily managed by standard, best practice mitigation management actions. Co-land use (e.g. using the land for solar as well as grazing grounds could be regarded as a viable land use option (**Figure 78**). This option has not been assessed in the EIR as discussion with relevant land owners will only commence once a decision on the layout has been made.
- The proposed development will also have the wider societal benefits of generating additional income and employment in the local economy.
- In addition, the proposed development will contribute to the country's urgent need for energy generation, particularly renewable energy that has much lower environmental and agricultural impact than existing, coal powered energy generation.
- All renewable energy development in South Africa decreases the need for coal power and thereby contributes to reducing the large agricultural impact that open cast coal mining has on highly productive agricultural land throughout the coal mining areas of the country.

Figure 78: Illustration of co-land use or multiple land use options around solar installations

The impact of the proposed development on the agricultural production capability of the site is assessed as being acceptable because of the above factors. Therefore, from an agricultural impact point of view, it is recommended that the development be approved.

The conclusion of this assessment on the acceptability of the proposed development and the recommendation for its approval is not subject to any conditions, other than recommended mitigation.

10.2.2 AQUATIC RECOMMENDATION

The significant potential long-term aquatic ecological impacts identified for the proposed development, could potentially add moderate cumulative impact to the existing and anticipated future negative impacts, associated with the envisaged significantly sized and extensive combined solar power generation facility cluster.

A number of ecologically/conservation significant and sensitive aquatic features/habitats and species were Identified throughout the original assessment area and the surrounding 500m 'zone of influence'. Based on these findings and the subsequent initial recommendations of the Site Verification Report, the original proposed development area was significantly reduced in size and the design layouts of the Photovoltaic (PV) grid were revised by the applicant. By taking these recommendations into consideration the proposed development area is adequately kept away from any of the identified ecologically/conservation significant and sensitive aquatic features/habitats and -species. The proposed development area discussed in this report, therefore constitutes this final acceptably reduced and revised area.

It is the considered opinion of the specialist, by application of the NEMA Mitigation Hierarchy, that all the identified potential cumulative aquatic ecological impacts associated with the proposed development, can be suitably reduced and mitigated to within acceptable residual levels, by implementation of the recommended mitigation measures. It is therefore not anticipated that the proposed development will add any significant residual cumulative aquatic ecological impacts to the surrounding environment, if all recommended mitigation measures as per this aquatic ecological report are adequately implemented and managed, for both the construction- and operational phases of the proposed development.

It is also the opinion of the specialist from an aquatic ecological and hydrological perspective, that the proposed development area is of low sensitivity and should be considered by the competent authority, for Environmental Authorisation and approval. All recommended mitigation measures as per the aquatic ecological report must however be adequately implemented and managed for both the construction and operational phases of the proposed development. All necessary authorisations, permits and licenses must also be obtained prior to the commencement of any construction.

10.2.3 AVIFAUNAL RECOMMENDATION

The proposed 165 MW Khauta Solar PV is situated in an area of high avian sensitivity due to the presence of priority habitats. Assessments for the present waterbodies were conducted where only species of Least Concern were encountered. As a result, from an avifaunal perspective, there is no objection to the development of the proposed Khauta Solar PV Facility and associated infrastructure, provided to the recommended mitigation measures are strictly followed. The overall impacts (including cumulative) for the project are considered to be low and will not cause detrimental impacts to the avifauna species located within the development area.

Specific conditions recommended for the EA from an avifaunal perspective:

1. Implement mitigation controls during the construction phase as specified in the MITIGATION REQUIREMENTS. Monitor and report on their effectiveness.
2. Implement mitigation controls during the operational phase as specified in the MITIGATION REQUIREMENTS. Monitor and report on their effectiveness.
3. Monitoring of implementation of mitigation controls, along with reporting, should be undertaken at least quarterly throughout the construction phase, and bi-annually during the operational phase. Monitoring, at the minimum, should consist of:
    a. Quarterly monitoring of the Solar PV array area for evidence of PV collisions;
4. As much of the natural habitat as possible should be preserved during construction and operation to lessen the operational impacts and to reduce the irreversibility of impacts.
5. Effective restoration of the natural habitats that were intact before the development should be implemented and reported on after decommissioning.

10.2.4 TERRESTRIAL ECOLOGY RECOMMENDATION

Grasslands are highly threatened ecosystems and severely under protected (Cadman et al., 2013). Therefore, any loss in this vegetation is not favourable. However, the specific footprint inhabits grassland previously disturbed by grazing pressure and agriculture which has resulted in most of the area being classified as Degraded in the Free State Biodiversity Spatial Plan. The footprint's contribution to the wider area's ecological functioning and species diversity is expected to be moderate due to the disturbance history of the area. Part of the footprint is mapped within ESAs, but this area has been recommended not to be classified as an ESA given the avoidance of wetlands and their buffers.

No threatened species or species of conservation concern (SCC) (or sensitive species as defined and identified by the Screening Tool) were observed within the development footprint during the site visit. However, suitable habitat for *Smaug giganteus* was recorded on the footprint. Preserving these areas of suitable habitat would result in fragmentation and colonising the area would be unlikely, it is recommended that suitable habitat areas outside of the development footprint be avoided. These areas are connected to areas of intact vegetation and thus, it would be more likely that these areas would be utilised or colonised.

To reduce the potential loss of grassland vegetation, it is expected that areas between the solar panels be kept as natural as possible, and a rehabilitation plan be compiled by Botanical/Rehabilitation specialist should the site be decommissioned. This rehabilitation plan is expected to set rehabilitation targets and measures for areas disturbed outside of the footprint. To reduce the visual impact of the proposed development (see Visual Impact Assessment; Enviroworks, 2022), it is recommended that the solar farm be screened by a row of trees including *Vachelia karroo, Olea europaea* and *Searsia lancea.*

If all mitigation measures are implemented, the likelihood of significant ecological impacts occurring within the ecosystems, found within the development site, will be reduced to acceptable **low-medium** levels. The overall footprint of the proposed facility is not likely to generate a high-very high impact on broad scale ecological processes or landscape connectivity, on condition that all mitigation measures are followed. It is thus recommended that the proposed development application be approved from an Animal Species, Plant Species, and Terrestrial Biodiversity Theme perspective provided that all mitigation measures are implemented.

10.2.5 ECONOMIC RECOMMENDATION

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 the negative impacts would be largely borne by the nearby farms and households residing on them, whilst the positive impacts will be distributed throughout both the local and national economies. Due to this imbalance, it is recommended that the mitigation measures suggested be 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.

10.2.6 HERITAGE, PALAEONOTOLOGY RECOMMENDATIONS

Regarding the proposed 165MW Khauta North Solar PV Facility on Portion 0 and Portion 1 of the Farm Kopje Alleen No. 81 in Riebeeckstad, the following recommendation are made:

1. It is recommended that the proposed development should be authorised.
2. No mitigation of archaeological resources is required.
3. If any human burials are uncovered during construction activities, then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and will require inspection by a professional archaeologist.

10.2.7 SOCIAL RECOMMENDATIONS

This SIA has found the surrounding community to generally be accepting of the proposed solar facility development, although there are at least two instances where surrounding landowners have raised objections relating to the cumulative impacts that the solar cluster, including Khauta North, will have on the area's sense of place.

A change in sense of place is anticipated to be the most significant impact experienced by surrounding and nearby landowners. Impacts to the sense of place will occur during both the construction and operational phases, but are expected to be greater during the operational phase given the duration of the impact (i.e., for the entire life time of the solar facility). The Free State PSDF notes that the locating of renewable energy developments must avoid visual impacts on landscapes of significant symbolic, aesthetic, cultural or historic value and should blend in with the surrounding environment as far as possible. The landscape surrounding the proposed development does hold aesthetic value at a local scale, but not at a regional scale, thus sense of place impacts will be localised.

Despite being localised, impacts on surrounding landowners, in particular the game farms, must be considered and mitigated wherever possible. In this regard, the visual impacts at the northern boundary should be mitigated should to reduce impacting the sense of place at the Farm Dankbaarheid No. 244 to the north of the facility. The renewable energy generated must first be used to address the needs of the province before being exported, as stated in the PSDF.

Negative impacts of an economic nature due to a change in sense of place are expected to be limited to the known game farms. The significance of a change in sense of place impact will thus vary between landowners based on whether it has economic implications (game farmers) or is only a nuisance. Where the impact is economic, animosity towards the solar facility may be created as well as fear/anxiety over future economic viability. Altering the sense of place will also reduce the likelihood of future tourism-related initiatives in the immediate area.

Disturbance to daily life, due to increased noise and activity in the area, will be temporal and chiefly associated with the Construction Phase. Through implementing mitigation measures, good planning and close working with the surrounding landowner, these impacts can be reduced to acceptable levels. A potential increase in crime, while also likely to be temporal, needs to be mitigated however possible, as it has the potential to have Very High negative consequences if impacts are realised. While an increase in crime is not entirely within the Applicant’s control, they must work closely with farmers to reduce the potential for an increase.

It is expected that potential health impacts during construction can be sufficiently mitigated and are not expected to be a significant concern.

Economic benefits to the surrounding area will be significant and benefits are expected to outweigh the negative economic impacts (van Jaarsveld, 2022). Economic benefits will extend across the construction and operational phases, with greater positive impacts expected during the construction phase. Positive economic impacts relate directly to positive social impacts. With a decline in the mining industry (Myburgh and Bastile, 2019), developing the solar facility will assist in offsetting job losses, albeit a small influence.

The proposed development can be considered to align with the reviewed planning documentation, as it is expected to have positive economic impacts which outweigh other impacts, without significantly compromising other sectors. It is noted that agricultural resources must be protected. While agriculture is a small contributor to the local municipality’s economic output (1.1%) (Myburgh and Bastile, 2019) economic resources should still be protected. In this regard, a design that allows for agricultural activities to continue (e.g., grazing beneath panels) should be considered. A design with lower visual impacts should however take preference.

10.2.8 VISUAL RECOMMENDATIONS

The proposed development will be highly visible within the short distance zone due to the short distance between the proposed development and the observer. The study area within the short distance zone predominantly consists of old agricultural farmland (have not been cultivated in recent years) and natural grassland from where a high temporary visual impact is expected at this stage as observers will only remain within the area temporarily. Should these areas be cultivated or developed in the future a high visual impact will occur from these vantage points. It must; however, be noted that a high temporary visual impact will occur from the alternative access road situated at kilometre one point eight (km 1.8) towards the east of the proposed development. Furthermore, a high permanent visual impact will occur from the farmsteads situated at kilometre one and a half (km 1.5) towards the northwest of the proposed development.

The highest visual impact within the short to medium distance zone will occur from the farmstead situated at kilometre two point four (km 2.4) towards the north as well as from the tourist accommodation situated two point eight kilometres towards the northeast of the proposed development. The visual impact from these vantage points will be moderate and permanent as observers will experience a change in the aesthetic value of the surrounding landscape.

Within the medium to long distance zone, four (4) vantage points were inspected to determine the visual exposure; however, the proposed development will only be visible from one (1) of these vantage points inspected. It was determined that a moderate visual impact will occur from three point three kilometres (3.3 km) towards the north of the proposed development from where the visual impact will be temporary as observers will only traverse through the area.

It is advised that the eight metre (8 m) BESS be installed on site as the fifteen metre (15 m) BESS will have a higher visual impact on observers situated within the immediate vicinity. Furthermore, should the 15 m BESS be installed mitigation measures will need more time to be effective. If all mitigation measures are implemented on site as listed under Section 18.1 of the Visual Impact Assessment Report the proposed 165 MW Khauta SPV Facility will have a low visual impact on the surrounding observers and as such can be authorised from a visual perspective. It must be noted that if any of the natural grassland areas or old agricultural farmland be developed in the future the visual impact will change depending on the location.

10.2.9 GEOTECHNICAL RECOMMENDATIONS

Although the preliminary level of investigation was deemed acceptable for environmental assessment, project feasibility and planning purposes, a detailed geotechnical investigation would have to be commissioned during the detailed design phase of the project. The proposed development is supported and the layout should consider the constraints and no-go areas identified by the specialists.

No electrical infrastructure or buildings are recommended within a buffer zone of at least 32m from the centreline of natural drainage lines where these occur on the site. Box or pipe culverts with properly designed wingwalls are recommended where access roads cross drainage lines. No buildings are recommended on slopes steeper than 1:5 unless special measures are taken to ensure stable foundations and excavations. Erosion is not considered to be a major risk in areas away from drainage lines but practical steps should be taken to minimise erosion of loosened soil or where vegetation is stripped, such as silt fences and stormwater control. Single story masonry buildings, such as substation control rooms, maintenance buildings, etc would be generally suited to shallow spread footings or rafts, taking into account geotechnical information provided from detailed on-site testing.

PV array frames and overhead powerline structures would typically be founded on shallow spread (gravity) foundations, frictional driven piles or pre-manufactured steel piles cast into pre-bored holes. The method would largely be dictated by the ground profile to be determined in detailed geotechnical investigations. Short frictional piles cast into a pre-bored hole would be more suitable in shallow very dense/stiff soils or rock, whereas driven piles would be more suitable in thicker granular soil profiles. The dominant forces in consideration in the design of foundations for PV arrays are horizontal forces and moments due to wind acting on the panels, which are then transferred into the frame and down into the ground. The foundations should be deep enough or heavy enough to resist uplift forces and overturning moments. The founding conditions on the site would have to be investigated with subsurface testing to determine soil/rock profile and geotechnical properties.

Internal access roads will be required to service the panels and other infrastructure. Typically, access roads and platforms would be surfaced with gravel materials obtained from site or imported from commercial sources if the insitu subgrade is poor or unfavourable. In areas where the subgrade soils are poor (soft silty sandy), such as near drainage lines, imported gravel material may be required. Geotechnical investigations would be required to investigate and identify potential sources of natural materials on site.

10.3 CONCLUDING RECOMMENDATIONS

Considering the findings of the independent specialist studies, the impacts identified, the development footprint proposed by the developer, 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 165MW Khauta North SPV Facility is acceptable within the landscape and can reasonably be authorised subject to implementation of the refined optimised facility layout and the mitigation and enhancement measures recommended by the specialists.

The 165MW Khauta North SPV Facility with a contracted capacity of up to 165MW includes the following infrastructure (to be included within an authorisation issued for the project):

- PV modules and mounting structures (monofacial or bifacial) with fixed, single or double axis tracking mounting structures;
- Associated stormwater management infrastructure;
- Battery Energy Storage System (BESS);
- Site- and internal access roads (up to 6 m wide);
- Auxiliary buildings (Control room, general office, access control and security building, kitchen area with ablution facilities, small workshop, and a store);
- Ablution facilities and associated infrastructure;
- Temporary laydown area during the construction phase (which will be a permanent laydown area for the BESS during the operational phase);
- On-site substation;
- Grid connection infrastructure including medium-voltage cabling between the project components and the facility substation (underground cabling will be used where practical);
- Perimeter fencing; and,
- Rainwater and/or groundwater storage tanks and associated water transfer infrastructure.

- The internal access roads and MV Cabling will utilise the existing main access road to the north and all other infrastructure will remain within low-sensitive green developable area.

The following key conditions would be required to be included within an authorisation issued for the 165MW Khauta North SPV Facility:

- The Final Layout Plan is to be submitted to the Department with all preferred design and technologies; as well as cabling, grid connection, inverter, stormwater, effluent and water supply infrastructure prior to commencement of construction.
- All mitigation measures detailed within this EIA Report, as well as the specialist reports contained within Appendices D to L are to be implemented.
- The EMPr (for the facility and onsite substation) as contained within Appendix N of this EIA 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 165MW Khauta North SPV Facility is considered key in achieving the appropriate environmental management standards as detailed for this project.
- Following the final design of the 165MW Khauta North SPV Facility, a final layout must be submitted to DFFE for review and approval prior to commencing with construction. Micro-siting must take all recommended mitigation measures into consideration. No development is permitted within the identified No-Go areas as detailed in **Figure 59**.
- 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.
- A preconstruction walk-through of the final development footprint for protected species that would be affected and that can be translocated must be undertaken. The survey must also cover sensitive habitats and species that are required to be avoided. Permits from the relevant provincial authorities, will be required to relocate and/or disturb listed plant species.
- Prevent birds from nesting in substation infrastructure through exclusion covers or spikes if required (determined on a case-by-case basis).
- The implementation of the development exclusion zones identified as No-Go areas. It is recommended that the watercourse, two depression wetlands, unchanneled valley-bottom wetland and Commandants Pan as well as portions of the surrounding natural undisturbed terrestrial grasslands, must be adequately buffered out. No current or future development is allowed to take place within these buffered zones.
- The BESS to be installed on-site will not exceed eight metre (8 m) to minimise the visual impact.
- It is expected that areas between the solar panels be kept as natural as possible, if and where reasonable practically feasible, to reduce the potential loss of grassland vegetation;.
- It is recommended that should the 165MW Khauta North SPV Facility be approved by DFFE, the applicant along with the owners of Newlands Game Ranch come to an agreement as to how parts of the solar farm could be

screened to reduce the perceived visual impact from the proposed development. Should an agreement be reached relating to the planting of trees – it is advised that *Vachelia karroo, Olea europaea* and *Searsia lancea* be considered.

- All other relevant environmental permits must be obtained prior to the construction of the facility.

A validity period of a minimum of **10 years** of the Environmental Authorisation is requested, should the project obtain approval from DFFE.

11 ENVIRONMENTAL MANAGEMENT PLAN

An Environmental Management Programme (EMPr) has been compiled in accordance with Regulation 33 of the EIA Regulations 2014, as amended. The EMPr is attached as **Appendix N** to the Draft EIR and aim to provide practical management measures to be introduced in order to ensure that impacts as a result of the proposed projects are minimised and prevented where possible.

11.1 PROPOSED MITIGATION MEASURES OF IMPACTS

This section highlights the mitigation measures recommended in the Environmental Impact Assessment Guideline for Renewable Energy in terms of section 24J of the NEMA, published on 16 October 2016. In terms of the above-mentioned guideline, an IPP project that triggers the need for a Scoping & EIR process under the EIA Regulations 2014, as amended should include project-specific measures designed to mitigate negative impacts and enhance positive impacts, and be informed by good industry practice and are to be included in the EMPr.

The project-specific measures designed to mitigate negative impacts and enhance positive impacts, potential measures include but are not limited to the following:

- Conduct pre-disturbance surveys as appropriate to assess the presence of sensitive areas, fauna, flora and sensitive habitats; - Refer to the recommendations in the Faunal Survey Report for *Smaug giganteus (*Giant girdled lizards), dated 11 May 2022 (Appendix D6);
- Plan visual impact reduction measures such as natural (vegetation and topography) and engineered (berms, fences, and shades, etc.) screens and buffers;
- Utilise existing roads and servitudes as much as possible to minimise project footprint;
- Site projects to avoid construction too near to pristine natural areas and communities;
- Locate developments away from important habitat for faunal species, particularly species which are threatened or have restricted ranges, and are collision-prone or vulnerable to disturbance, displacement and/or habitat loss;
- Fence sites as appropriate to ensure safe restricted access;
- Ensure dust abatement measures are in place during- and post-construction;
- Implement the Storm Water Management Plan (**Appendix N3**);
- Implement waste management as per the requirements in the EMPr, and,

- Re-vegetation with appropriate indigenous species to prevent dust and erosion, as well as establishment of alien species.

Detailed mitigation measures have been outlined in the EMPr, which has been compiled as part of the EIR phase. Mitigation of impacts in this report will follow the following approach:

- **Avoiding or preventing** the impact through the early consideration of opportunities and constraints and development alternatives (positive planning) and by modifying the proposal accordingly;
- **Reducing or minimising** negative impacts and maximising benefits, by considering alternatives and modifying the proposal;
- **Rectifying** negative impacts by restoring the affected environment to its previous condition, or rehabilitating it for a different land use; and as a 'last resort',
- **Providing an offset to compensate** for the residual negative impact on biodiversity or ecosystem services, by replacing or providing 'like for like or better' substitutes for these impacts. In cases where residual impacts affect threatened, unique or irreplaceable biodiversity, offsets are not an option as substitutes do not exist.

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EIA PROJECT TEAM & SPECIALIST CV'S

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APPENDIX B:

AUTHORITY CONSULTATION

B1: DFFE

B2: DESTEA

B3: 3 OTHER AUTHORITIES

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APPENDIX C:

PUBLIC PARTICIPATION PROCESS

C1: I&AP DATABASE

C2: SITE NOTICES & NEWSPAPER ADVERT

C3: BACKGROUND INFORMATION DOCUMENT

C4: ORGANS OF STATE CORRESPONDANCE

C5: STAKEHOLDER CORRESPONDANCE

C6: COMMENTS RECEIVED

C7: MINUTED OF MEETING

C8: COMMENTS & RESPONSE REPORT

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APPENDIX D:

AGRICULTURE COMPLAINCE STATEMENT

Today's Impact | Tomorrow's Legacy

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APPENDIX E:

AQUATIC ECOLOGICAL IMPACT ASSESSMENT

Today's Impact | Tomorrow's Legacy

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APPENDIX F:

AVIFAUNAL IMPACT ASSESSMENT

Today's Impact | Tomorrow's Legacy

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APPENDIX G:

ANIMAL SPECIES, PLANT SPECIES AND TERRESTRIAL BIODIVERISTY IMPACT ASSESSMENT

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APPENDIX H:

ECONOMIC IMPACT ASSESSMENT

APPENDIX I:

ARCHAEOLOGICAL HERITAGE IMPACT ASSESSMENT

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APPENDIX J:

SOCIAL IMPACT ASSESSMENT

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APPENDIX K:

VISUAL IMPACT ASSESSMENT

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APPENDIX L:

GEOTECHNICAL ASSESSMENT

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APPENDIX M:

SPECIALIST DECLARATIONS

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APPENDIX N:

ENVIRONMENTAL MANAGEMENT PLANS

N1: ENVIRONMENTAL MANAGEMENT PLAN (EMPR)

N2: GENERIC SUBSTATION ENVIRONEMTNAL MANAGEMENT PLAN

N3: STORMWATER MANAGEMENT PLAN

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APPENDIX P:

DFFE SCREENING REPORT

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APPENDIX Q:

EAP DECLARATION OF INDEPENDENCE & AFFIRMATIONS

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APPENDIX R:

SG CODE OF AFFECTED PROPERTIES

APPENDIX S:

APPROVED SCOPING REPORT

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APPENDIX T:

SITE SENSITIVITY VERIFICATION REPORT

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APPENDIX U:

PROOF OF WATER USE LICENCE APPLICATION

APPENDIX V:

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