PROPOSED IIIKWA SOLAR PV FACILITY: DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT, FREE STATE PROVINCE

Prepared for: South Africa Mainstream Renewable Power Developments

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EXECUTIVE SUMMARY

1. INTRODUCTION

1.1. Project Background

South Africa Mainstream Renewable Power Developments (Pty) Ltd (Mainstream) is proposing to develop, construct and operate four (4) solar photovoltaic (PV) facilities, including Battery Energy Storage Systems (BESS) and associated infrastructure, on a site located approximately 19 km west of the town Sasolburg in the Free State Province. The four (4) projects (including the grid connection infrastructure) are collectively referred to as the Scafell Cluster.

Each solar PV facility will be associated with its own grid connection infrastructure that will comprise of a double circuit transmission line and switching station with a capacity of up to 132 kilovolts (kV). The grid connection infrastructure (namely the double circuit transmission line and switching station) will facilitate the grid connection from each proposed solar PV facility to the ESKOM Scafell Main Transmission Substation (MTS), located approximately 2 km south of the study area. Each solar PV facility and grid connection infrastructure project will be subject to a separate Environmental Authorisation (EA) process and separate application (i.e., separate EIA process).

This EIA Report (EIAR) is compiled for the proposed Ilikwa Solar PV Facility. The location of the Ilikwa Solar PV Facility (this project) in relation to other projects being proposed as part of the Scafell Cluster is presented in Figure 1.

1.2. Purpose of this Report

This Environmental Impact Assessment Report (EIAR) outlines the process followed as part of this application and presents the findings of the EIA process undertaken for the proposed Solar PV Facility. The EIAR has been compiled in accordance with Appendix 3 of the 2014 EIA Regulations (as amended) and is now being distributed for review and comment as part of the EIA process.

This EIAR is being made available for a 30-day review and comment period, from **23 September** to **25 October 2021**, in order to provide Interested and Affected Parties (I&APs) with an opportunity to comment on any aspect of the proposed project as well as the findings of the EIA process to date. A copy of the EIAR (including appendices) has been made available on:

- the SLR website at http://slrconsulting.com/public-documents/mainstream-scafell;
- the corresponding data-free website, where the report can also be downloaded without any data charges using internet-capable mobile phones, a**t** https://www.slrpublicdocs.datafree.co/public-documents/mainstream-scafell.

A hard copy of the report and appendices have also been placed at the following public locations / venues:

Name of Location	Contact Details
Sasolburg City Library	John Vorster Avenue, Sasolburg Tel: 016 973 8464 Fax: 016 976 3083 Email: sasolburg@sacr.fs.gov.za
Zamdela Public Library	3246 Taylor Park, Zamdela Tel: 016 974 2163 Fax: 016 976 0308 Email: zamdela@fslib.gov.za

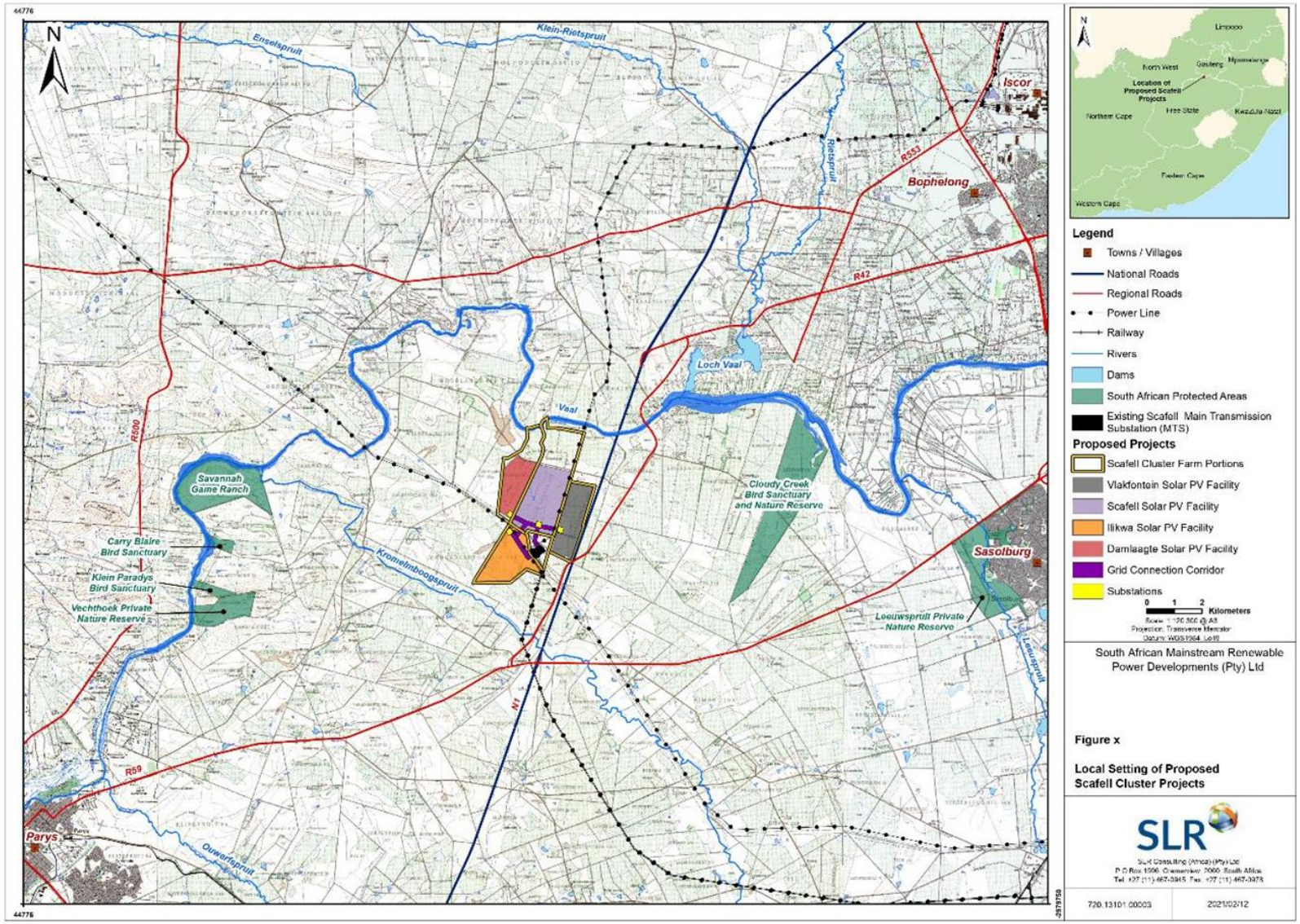

Figure 1-1: A Locality Map illustrating the location of the proposed Scafell Cluster Project

Comments should be forwarded to the SLR at the address, telephone or email address shown below[1]. For comments to be included in the EIAR, it is kindly requested that comments should reach SLR no later than **25 October 2021.**

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1.3. Summary of Authorisation Requirements

The EIA Regulations 2014 (as amended), promulgated in terms of Chapter 5 of NEMA provide for the control of certain listed activities. Such activities are prohibited from commencing until written authorisation is obtained from the competent authority, which in this case is the Department of Forestry, Fisheries and Environment (DFFE). The proposed project triggers the need for an EIA process in order for DFFE to consider the application for Environmental Authorisation.

2. EIA METHODOLOGY

2.1. Scoping Phase

The Scoping Phase complied with the requirements of NEMA and the EIA Regulations 2014, as amended. This involved a process of notifying I&APs of the proposed project and EIA process in order to ensure that all potential key environmental impacts, including those requiring further investigation, were identified. The final Scoping Report, which was prepared in compliance with Appendix 2 of the EIA Regulations 2014, as amended, was accepted by DFFE on 26 August 2021.

2.2. EIA Phase

2.2.1. Specialist Studies

Eight specialist studies were undertaken to address the key issues identified during the Scoping Phase, namely terrestrial ecosystems, avifauna, freshwater resources, heritage, traffic, soils, and agricultural potential, social and visual.

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2.2.2. Integration and Assessment

The specialist information and other relevant information have been integrated into this draft EIAR, which also includes a Construction and Operation Environmental Management Programme (EMPr). The draft EIAR has been distributed for a 30-day review and comment period after which it will be updated into a final EIAR based on the comments received and in compliance with Appendix 3 of the EIA Regulations 2014 (as amended). The final EIAR will then be submitted to DFFE for decision-making. After DFFE has reached a decision, all I&APs on the project database will be notified of the outcome of the application, the reasons for the decision and the statutory appeal process.

3. PROJECT DESCRIPTION

Details of the proposed project are summarised in Table 1-1 below.

Table 1-1: Details of the proposed Ilikwa Solar PV Facility

Component	Ilikwa Solar PV Facility
Property Information	
Farm name & portion number:	Proceederfontein 100 Portion 5
Surveyor General 21-digit code:	F02500000000010000005
Name of Landowner:	Alfred Murray Smit Trust
Property size:	276.85 ha
Study area size:	195 ha
Development footprint size:	180 ha
Centre coordinates of site:	26°48'52.65"S 27°37'38.70"E
Technical Details – Solar PV Facility	
Capacity	Up to 100 MW_{ac}
Installed PV panel height	Up to 3 m
Number of PV panels	Up to 154 440
Mounting structures	Single Axis Tracking, Dual Axis Tracking or Fixed Axis Mounting System Technology
Inverters	Centralised or String Inverter Stations and Power Transformers
Cabling	Underground Direct Current (DC) and Alternating Current (AC) cables of up to 132 kV
Electrical Infrastructure	
IPP Substation capacity	33 / 132 kV
IPP Substation footprint	2.5 ha
Cabling	Underground and overhead transmission lines (up to 132 kV)
Grid Connection corridor length & width	Up to 2.3 km long and 150 m wide

Component		Ilikwa Solar PV Facility
Grid Connection[2]		Two grid connection corridor alternatives are proposed: • **Alternative 1 (Preferred) -** This corridor is 150 m wide and is approximately 2.3 km in length. The proposed grid connection is from the on-site substation (Switching Station) of the proposed Ilikwa Solar Facility located on Procedeerfontein 5 /100 and extends for about 0.3 km in a south-easterly direction before moving north-easterly for 0.7 km across Willow Grange 3/246, then turning east for 0.4 km then directly south for 0.6km crossing Scafell RE/448, then a further 0.3 km in a south easterly direction, before terminating at the ESKOM Scafell MTS. • **Alternative 2 -** This corridor is 150 m wide and is approximately 1.4 km in length. The proposed grid connection is from the on-site substation (Switching Station) of the proposed Ilikwa Solar Facility located on Procedeerfontein 5/100 and extends for about 1.2 km in a south-easterly direction before at 90° northeast for 0.2 km into the ESKOM Scafell MTS located on Scafell RE/448.
Building Infrastructure		
BESS footprint		Up to 2 ha
BESS technology		Solid State or Redox Flow Batteries
Buildings		• Operational Control Centre • Operation and Maintenance Area / Warehouse / Workshop / Control Centre and Office • Ablution Facilities • Substation Building
Laydown Area & Associated Infrastructure		
Size of laydown area		Up to 3 ha
Buildings and Infrastructure		• Permanent Laydown Area • Temporary Construction Camp and Laydown Area • Fencing and Lighting • Lightening protection infrastructure • Telecommunication infrastructure • 400 m^3 reservoir, water pipeline and stormwater channels
Supporting Infrastructure		
Main access road		2.5 km long and up to 12 m wide
Internal access road		12 km long and 5 m wide
Support Services		
Water Demand	Construction	Water for Roads - 15ℓ / m^2 Water for Civil Works - 400 m^3 / project Water for Domestic Use - 225 m^3 / month
	Operation	Water for PV module cleaning - 18 000 m^3 / annum Water for Domestic Use - 20 m^3 / month Water for Dust Suppression - 15ℓ / m^2
Waste Generation	Construction	General Waste would be managed on site in accordance with the principles of the waste management hierarchy. In terms of specific waste streams, the major sources include: • Carboard waste from the panels – Approximately 250 tons of cardboard (per 100 MW). A compactor would be used on site to

[2] The grid connection for the Ilikwa Solar PV Facility will be subject to a separate Environmental Authorisation process and will require a Basic Assessment (BA) process in support of the application for Environmental Authorisation.

Component		Ilikwa Solar PV Facility
		compress the cardboard boxes in which the PVs are stored in order to reduce the space required for the temporary storage of this waste. • Rubber caps placed on all eight corners of the PV panels (total volumes are uncertain). • Wooden pallets on which the PV boxes arrive. • Plastic wrap. Hazardous Waste may be generated on site depending on the design / type of panel procured. Hazardous waste will be disposed of at a registered facility. Effluent would be managed by means of conservancy tanks (16 000 L in capacity which are cleaned once a month and disposed of at the nearest municipal facility).
	Operation	Effluent would be managed using septic Tanks (16 000 L in capacity which are cleaned 2/3 times a week) or a Clarus Fusion System (16 000 L capacity which are cleaned once every six months), or similar, which utilises a chemical process to recycle water from the Operations and Maintenance Buildings as well as Sub-Station Buildings. This treated water can then be used to water vegetation.
Traffic		It is expected that there will be approximately 2 000 trucks in total over the 12-18-month construction phase, approximately 10-20 trucks per day.
Employment Opportunities		
Construction Phase		• At least 230 people however the number of people employed at one time may vary as different contracts and subcontracts on the project are completed at a time onsite.
Operation Phase		• At least 17 people and this is due to the fact that the staff will mainly be responsible for the daily operations and maintenance activities of the project.
Recruitment for the duration of the project lifecycle will be undertaken in collaboration with local authorities, community leadership structures and agencies and no labourers will be hired onsite. Mainstream will therefore implement mitigation and management measures to ensure that no employee or job applicant is discriminated against on the basis of race, gender, nationality, age, religion, or sexual orientation.		

4. DESCRIPTION OF THE AFFECTED ENVIRONMENT

4.1. Climate

The study area is associated with summer rainfall, and a cool – temperate climate. Average monthly temperatures are lowest in July (9.46°C) and highest in January (22.07°C). Average monthly rainfall is lowest in July (4.19 mm) and highest in January (116.9 m) (see Figure 7 1). The area is associated with high extremes between maximum summer and minimum winter temperatures, and frequent occurrence of frost.

4.2. Topography and Geology

The study area is located approximately 1 440 – 1 490 m above sea level. The area is primarily associated with sedimentary rocks, i.e., shale, sandstone, and mudstone, etc, and belong to the Madzringwe Formation of the Karoo Supergroup. The Karoo Suite dolerites which are a common geological feature in the area are also present. Rocks from the Volksrust Formation of the Karoo Supergroup are located to the south of the study area, and older lithologies of the Witwatersrand, Transvaal and Ventersdorp supergroups are located to the west of the study area towards Parys.

4.3. Soils and Land Potential

The study area predominantly consists of the Ba39 and Bb23 Land Types. Land Type Ba39 consists of five terrain units while Land Type Ba23 consists of four terrain units. In terms of the Department of Agriculture, Land Reform and Rural Development (then Department of Agriculture, Forestry and Fisheries) land capability data, a significant portion of the project site for the proposed project consists of land with a Low – Moderate (Class 07 – 08) land capability.

Following the soil classification and analysis, it was concluded that the site has a high, moderate, and low agricultural potential for the rained production of grain crops. wo areas have high agricultural potential, and both of these are located in a horizontal strip along the western boundary of the project site. The high potential areas area associated with the Dundee and Kransfontein areas. The high agricultural potential area is equivalent to 12.5 ha. Soil with moderate agricultural potential is present in the southern third of the project site, and this area includes the Bainsvlei, Clovelly, Griffin, Hutton, Nkonkoni and Pinedene forms. The area associated with moderate agricultural potential is equivalent to 110.3 ha. The remaining portion, approximately 157.6 ha is associated with a low agricultural potential.

4.4. Soils and Land Potential

4.4.1. Flora

The findings of the Terrestrial Biodiversity Impact Assessment indicate that the project site is associated mainly with three (3) habitat units within the Soweto Highveld Grassland Vegetation Type. These habitats units include the transformed and grassland habitats. The grassland habitat is further sub-divided into three (3) habitat subunits, which include the Degraded Grassland, *Seriphium* – dominated Grassland and *Themeda* – rich Grassland subunits. The various types of habitat units and subunits present within the project site are differentiated on the basis of plant species composition.

The project site is not associated with any nationally – listed (in terms of NEMBA) or Red Data – listed plant species. Localised listed and Protected plant species present within the project site are listed in terms of the Free State Nature Conservation Ordinance Act, 1969 (Act 8 of 1969) and the identified species include, *Aloe davyana, Crinum bulbispermum, Helichrysum chionosphaerum, Helichrysum chionosphaerum, Helichrysum actuatum* and *Boophane disticha*.

4.4.2. Fauna

Spoors of a Black – backed Jackal, Porcupine, and evidence of burrowing activity of an Aardvark as well as a spoor of a Warthog (mainly on farm roads) were identified within the study area. The Aardvark was the only fauna species of conservation concern identified during the field-based survey in the area. The current land use of the study area, i.e., grazing; constant human presence and disturbance; homogenous nature of the landscape and limited cover provided reduce the suitability of this area as a habitat for most mammal listed and protected species.

A total of 194 avifauna species could potentially occur within the broader study area, and 62 of these species are classified as priority species. Within the 62 species, only 31 have a medium probability of being present within the study area. 19 species were recorded during the field-based site survey.

4.4.3. Freshwater Features

From the findings of the field-based survey, an unchanneled valley bottom wetland is located within the Ilikwa Solar PV Facility project site. The ecological service of the wetland is considered to be high as the area around the instream impoundment was observed to provide diverse habitat for suitable waterfowl species, and the African Bullfrog.

4.5. Socio-economic profile

The proposed project falls within the Fezile Dabi District Municipality (FDDM) in the Free State Province and falls within Ward 7 of the Ngwathe Local Municipality (NLM).

According to the Community Survey 2016, the number of households in the study area has increased on all levels. The average household size has shown a decrease on all levels, which means there are more households, but with less members. The intensity of poverty has increased slightly in all areas, except the Fezile Dabi District and the Metsimaholo LM where it decreased slightly. Ward 7 has the largest proportion of discouraged work seekers, indicating a shortage of employment opportunities in the area. More than 45% of the households on district, local and ward level had an annual household income of below R19 601 in 2011, except in the Metsimaholo LM and Ward 14, where the proportion is lower.

The Fezile Dabi DM is associated with an expansive road network. Some of the busiest routes within the Fezile Dabi DM and the NLM include the N1 national road and the R59 provincial road. The N1 links Polokwane, Pretoria, Johannesburg, Bloemfontein, and Cape Town. The routes are utilised for the movement of freight and by tourists.

Existing roads within the vicinity of the proposed project, that will be used to provide access to the project site of the proposed project include the Boundary Road and the Road S 171.

4.6. Visual Profile

The landscape of the study area and the surrounding environment (within a 10 km radius of the study area) is characterised mostly by rolling agricultural land, with low hills occurring in the western and southern western parts. The Vaal River located at least 400 m to the northern boundary of the study area is the dominant landscape feature in the area. The only naturally occurring landscape type within the study area is the hills. The general land character and overall visual impression of the study area is open land, punctuated bosques of tall trees (mostly exotic) associated with farmsteads. The land slopes gently to the Vaal River system, where a concentration of tall tree is evident.

Agriculture is by far the dominant land use within the surrounding area, with approximately 90 % of the study area utilized for grazing and cultivated lands. Residential land use within the surrounding area is mostly associated with either recreation-type activities along the Vaal River, or homesteads and scattered Agricultural Holdings. A small resort community, Vaal Oewer, is in the far north - western section of the study area immediately north of the Vaal River on a promontory of land, which affords panoramic views over the north - west. The area is well known for its tourism, primarily associated with the Vaal River.

4.7. Heritage and Palaeontology Resources

The study area is associated with an archaeological record of Early and Middle Stone Age artefacts and rock engravings which have been recorded from previous studies within the surrounding environment. An archaeological record within the vicinity of the study area from the Iron Age include Type N and Type V walling located to the south-east of the study area near Heilbron. Based on the outcomes of the field survey by the Heritage Impact Assessment, the Ilikwa Solar PV Facility project site is associated with stone walled features, historic structures, and a cemetery. Along the southern boundary of the project site, a large area is characterised by clusters of packed stone walled sites. These features show evidence of a square as well as circular walled features, with an extent of up to 2 000 m x 500 m. A large lower grindstone was identified among the stonewalled sites. A small cemetery, located towards the south western edge of the study area was identified. The cemetery extends through the fence of the adjacent property. The graves within the cemetery are extremely overgrown with grass, with others almost entirely covered. The majority of the graves identified were only marked with packed stones, with a few headstones.

5. IMPACT ASSESSMENT CONCLUSIONS

5.1. Summary of potential impacts

A summary of the potential impacts associated with the proposed project is provided in the following sections and in Table 2 below.

5.1.1. Construction and Decommissioning Phases

The majority of the impacts associated with the construction and decommissioning phases would be very localised (i.e., occurring on site only) and of short-term duration (i.e., reversible). The majority of the impacts associated with these two phases, are considered to be **INSIGNIFICANT** or of **VERY LOW to LOW** significance with mitigation. The most significant construction phase impact include:

- The clearance of the project footprints during the construction and decommissioning phases would have associated impacts vegetation and soils (and consequently the associated loss of agricultural potential). The resulting impacts on these features are deemed to be of **MEDIUM** significance; and
- The creation of employment for the duration of the construction period and business opportunities particularly in the local service industry, which is considered to be of **HIGH *(POSITIVE)*** significance with mitigation.

5.1.2. Operational Phase

In general, the impacts associated with the operation phase are long-term, as the Power Purchase Agreement associated with the Solar PV facility is valid for a period of 20 years, after which the Agreement can be renewed, or the facility is the decommissioned. The negative impacts associated with the operational phase are generally considered to be of **VERY LOW** to **LOW** significance.

The key positive impacts associated with the operation of the proposed facility include:

- *Development of a renewable energy facility*: South Africa currently relies on coal-powered energy to meet a large proportion of its energy needs. Although the overall contribution of the proposed project is relatively small it would help to offset the total carbon emissions associated with energy generation in South Africa. This impact is considered to be of **MEDIUM *(POSITIVE)*** significance;
- *Creation of employment and business opportunities*: The proposed project would create a few long-term employment opportunities in the operational phase. Indirect and induced impacts would occur because of the new economic development and would include new jobs at businesses that support the expanded workforce or provide project materials, and associated income. Overall, the impact is considered to be of **HIGH *(POSITIVE)*** significance; and
- *Impact on safety and security on neighbouring residents*: During the operational phase, the presence of the proposed facility is expected increase the overall security of the area as access onto the current property would be restricted. This potential impact is also deemed to be of **HIGH *(POSITIVE)*** significance.

5.1.3. Cumulative Impact

As noted in Section 1, the proposed project forms part of the overall proposed Scafell Cluster project which comprises four (4) solar PV facilities and associated grid connections. A separate Environmental Assessment process has been conducted for each of these proposed projects. These photovoltaic power projects proposed by Mainstream, together with any other proposed and existing projects and activities in the area would have a cumulative impact on the biophysical and socio-economic environment. The cumulative impacts are summarised below.

The cumulative impact on fauna, freshwater and heritage and palaeontology are considered to be **LOW** significance with mitigation. All cumulative impacts on terrestrial flora are considered to be of **LOW** to **MEDIUM** significance. With respect to soils and agriculture perspective, the overall cumulative impact is considered to be **HIGH** due to a large disturbance footprint associated with the proposed projects.

The key cumulative socio-economic impacts include:

- The visual impact associated with the projects on the areas sense of place and landscape character is considered to be of **MEDIUM** to **HIGH** significance;
- The cumulative impact associated with the creation of local employment and business opportunities is considered to be **MEDIUM *(POSITIVE)*** significance, it would go a long way to offsetting the negative socio-economic impacts; and
- The increase in construction activities in the area could potentially exacerbate ongoing safety and security issues currently being experienced in the area. This is deemed to be a **MEDIUM** significant impact on existing social networks and community structures.

Table 1-2: Summary of the significance of potential impacts associated with the proposed projects

Environmental component	Potential Impacts	CONSTRUCTION PHASE		OPERATIONAL PHASE		DECOMMISSIONING PHASE	
		Without mitigation	With mitigation	Without mitigation	With mitigation	Without mitigation	With mitigation
Ecological Impacts	Impacts on Vegetation	High	**MEDIUM**	Medium	**LOW**	Medium	**VERY LOW**

Environmental component	Potential Impacts	CONSTRUCTION PHASE		OPERATIONAL PHASE		DECOMMISSIONING PHASE	
		Without mitigation	With mitigation	Without mitigation	With mitigation	Without mitigation	With mitigation
	Impact on Terrestrial Fauna	Very High	**HIGH**	High	**MEDIUM**	-	-
	Impacts on avifauna	High	**HIGH**	Medium	**LOW**	Medium	**MEDIUM**
	Impacts on freshwater resources	Medium	**LOW**	Medium	**LOW**	Medium	**LOW**
Biophysical Impacts	Nuisance impacts (air quality and noise)	Low	**Insignificant**	-	-	Low	**Insignificant**
	Impacts on soils and associated agricultural potential	High	**MEDIUM**	Medium	**VERY LOW**	High	**MEDIUM**
Socio-economic Impacts	Impacts on the Heritage and Cultural Environment	Very Low	**Insignificant**	-	-	-	-
	Impact on Palaeontological Resources	Very Low	**Insignificant**	-	-	-	-
	Visual Impact	Low	**LOW**	Medium	**LOW**	Very Low	**VERY LOW**
	Development of a renewable energy facility	-	-	*Very High (positive)*	***VERY HIGH (positive)***	-	-
	Creation of employment and business opportunities	*High (positive)*	***HIGH (positive)***	*High (positive)*	***HIGH (positive)***	-	-
	Impact on safety and security on neighbouring residents	Very Low	**VERY LOW**	*High (positive)*	***HIGH (positive)***	-	-
	Impact on traffic	Low	**VERY LOW**	Low	**VERY LOW**	-	-
No-Go Alternative		**LOW to MEDIUM**					

5.2. Mitigation measures

A key component of the EIA process included exploring practical ways of avoiding or reducing potentially significant impacts of the proposed project. These are commonly referred to as mitigation measures, which are aimed at preventing, minimising, or managing significant negative impacts to as low as reasonably practicable, and optimising and maximising any potential benefits of the proposed project. Mitigation measures have been, where relevant, incorporated into the Construction EMPr and Operation EMPr.

5.3. Comparative assessment of project alternatives

5.3.1. Preliminary Layout

Mainstream has produced an indicative preliminary layout (included in Figure 2) for the proposed project that has been informed by preliminary feasibility studies, independent specialist studies and associated environmental sensitivity analysis. The preliminary layout is indicative and is subject to change following the completion of detailed engineering design studies / work that would be undertaken only in the event of the proposed project is issued an EA. Thus, Mainstream is seeking approval from the DFFE of the overall development footprint indicated in this preliminary layout. In addition, a composite sensitivity map illustrating sensitive environmental features identified by the specialists within the project site of the proposed project is included in Figure 3. From the findings of the preliminary investigations and the specialist studies, the project site for the proposed project (Portion 5 of the Farm Proceederfontein 100) presents a suitable site for the development of a Solar PV facility from a technical and environmental perspective. No fatal flaws or impacts of an unacceptable significance following the implementation of the recommended mitigation measures for the proposed project were identified from the specialist studies.

5.3.2. Technology Alternatives

Mainstream has considered two (2) alternatives for each of the key infrastructure components for the proposed project. The alternatives have been considered for the types of PV panel modules, mounting system technology and the BESS. Chapter 6 of this EIAR provides a detailed description of these alternatives considered for the proposed project. From the impact assessment undertaken, there is no material difference in the significance of the potential impacts associated with either technology alternative.

5.3.3. No-Go Alternative

The No-Go alternative represents the option of not to proceed with the proposed project, which leaves the project area of influence in its current state, except for variation by natural causes and other human activities. It, thus, represents the current status quo and the baseline against which all potential project-related impacts are assessed. The No-Go alternative would also forego the potential cumulative negative impacts and possible advantages of the proposed project, e.g., creation of employment opportunities and improvement to security and safety during the operational phase of the proposed facility.

The most significant of the no-go impacts identified, was the likelihood that the proliferation of *Seriphium plumosum* would continue unabated in certain habitats on site. This species has been identified as a problematic encroacher species within the Grassland Biome (Mucina and Rutherford 2006). Thus, it is possible that without any intervention this species would continue to dominate and ultimately reduce the overall habitat for other indigenous species and result in the gradual degradation of CBA and ESA areas. Given the uncertainty, this is deemed to be **LOW** to **MEDIUM** significant impact.

5.4. RECOMMENDATION / OPINION OF ENVIRONMENTAL ASSESSMENT PRACTITIONER

The key principles of sustainability, including ecological integrity, equity and social justice, and economic efficiency, are integrated below as part of the supporting rationale for recommending an opinion on whether the proposed project should be approved.

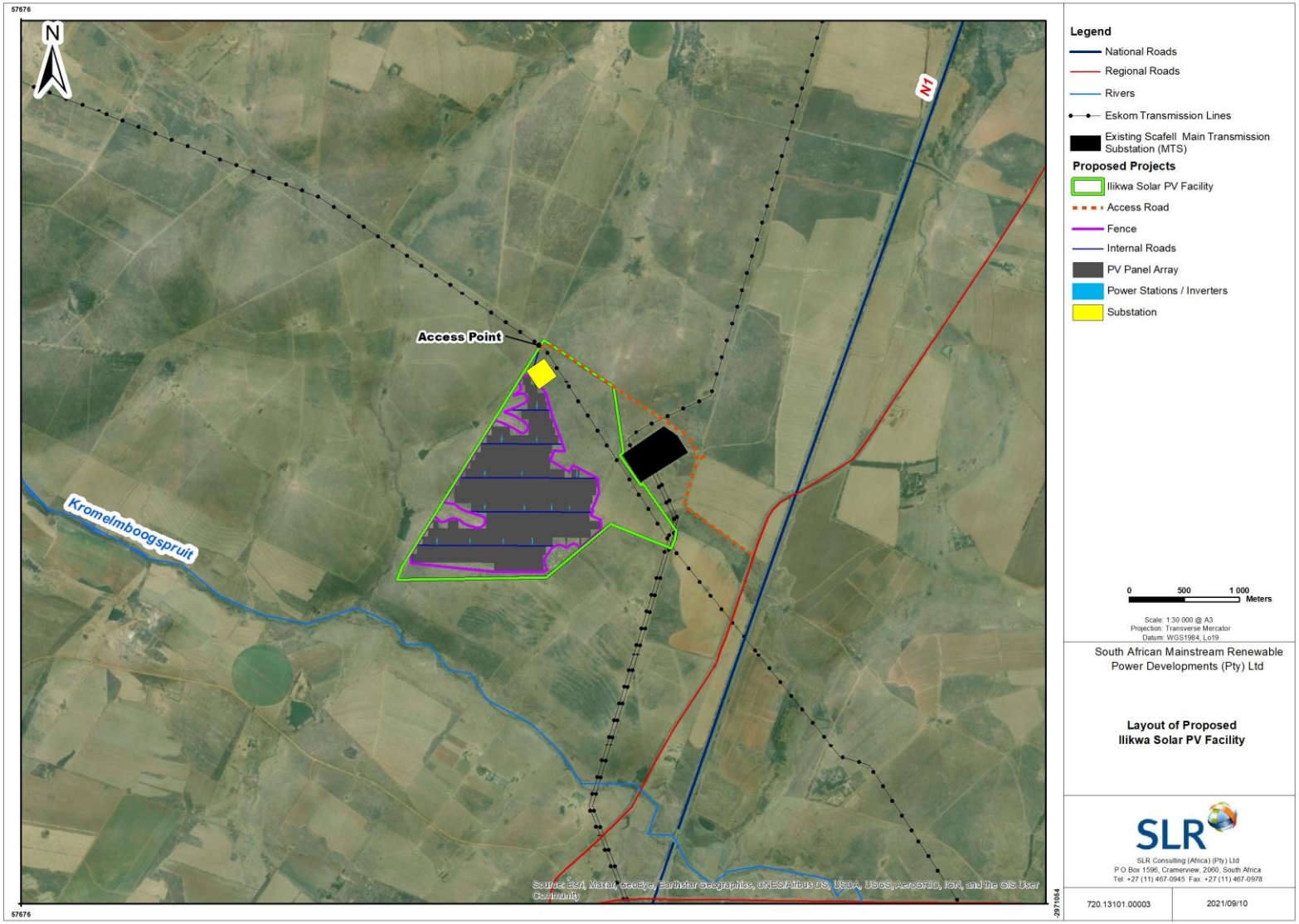

Figure 1-2: Indicative layout map for the project layout assessed and considered in this EIAR

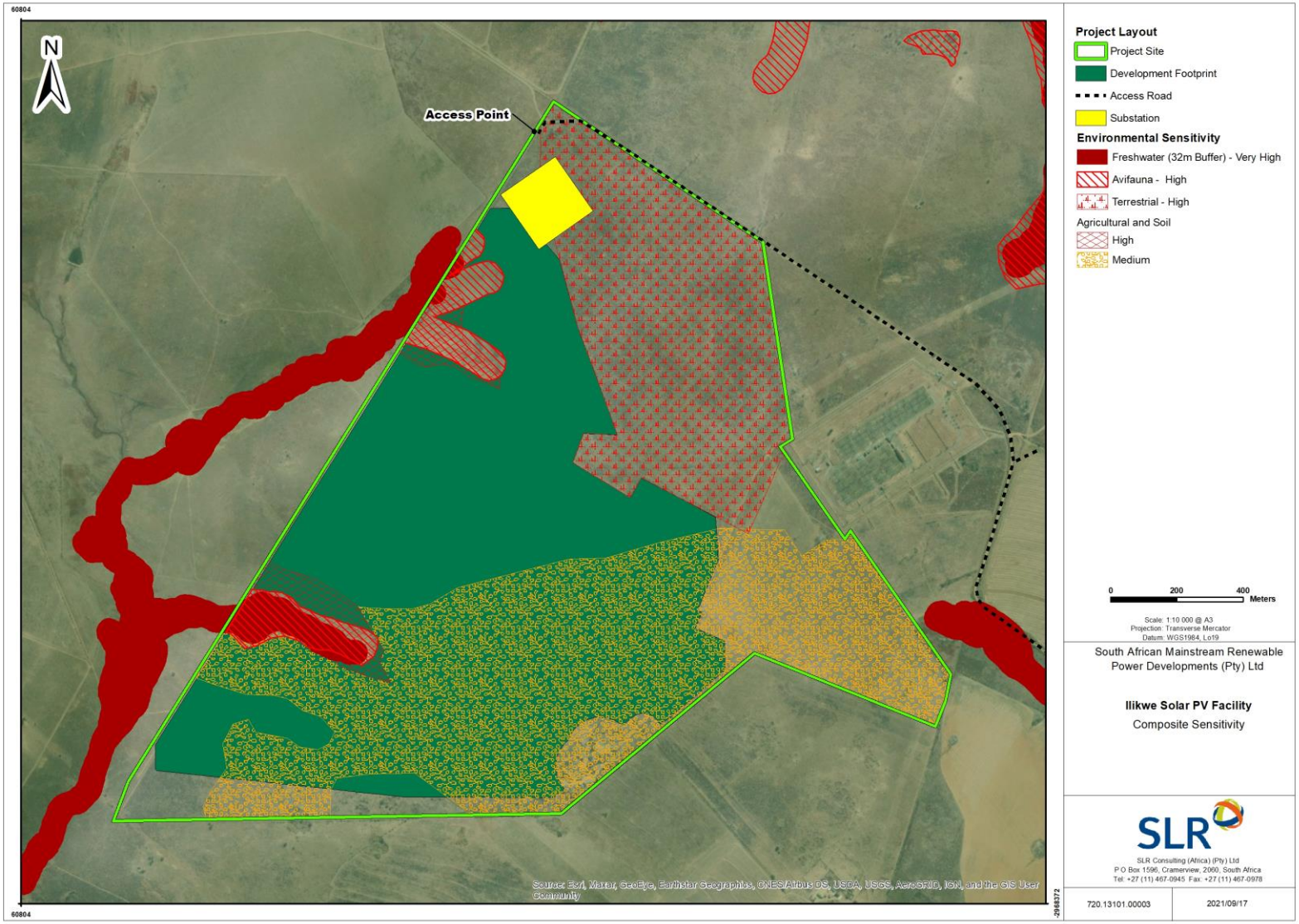

Figure 1-3: Composite environmental sensitivity map for the proposed project overlain with the indicative project layout assessed and considered in this EIAR

5.4.1. Ecological integrity

The use of renewable energy (e.g., solar and wind) is considered to have significant ecological benefits and is a key component in the transition from the economy's dependence on fossil fuels. The proposed solar PV facility would help to offset the total carbon emissions associated with energy generation in South Africa. Reduced carbon emissions through the use of renewable energy would have benefits in terms of global warming and climate change. In terms of site location, the proposed project is located in an area that has suitably high solar radiation intensities and is thus considered to be an efficient use of available resources.

The proposed project would result in the clearing of an estimated 162 ha of existing vegetation generally of low (Degraded Grassland Habitat subunit) to medium sensitivity (*Seriphium*-dominated Grassland subunit) and moderately high sensitivity (*Themeda*-rich Grassland subunit). The specialist noted that although the proposed project will have an impact on the greatest extent of the - *Seriphium* dominated grassland subunit within the project site, this vegetation is not regarded as the reference vegetation within the project site and is well represented in the surrounding landscape. Thus, a loss of the grassland habitat floral community as a result of the proposed project is not anticipated.

For the *Themeda*-rich grassland subunit, it is anticipated that the proposed project will have an impact on this vegetation which will result in the loss of the associated floral community. Furthermore, it is anticipated that the proposed project will also have an impact on the Freshwater Habitat (associated with the unchanneled valley bottom wetland present within the project site) and the associated floral communities, as well as the ecological benefits provided by the wetland. As a result, the indicative preliminary layout (see Figure 1-3) has avoided the footprint of the wetland. Thus, the loss of habitat as a result of the proposed project within the affected area is unlikely to have an unacceptable impact on floral communities at a local and regional level, and the significance of the impact can be managed through the implementation of the recommended mitigation measures.

The findings of the avifaunal specialist indicated that the project site is of low sensitivity on the basis that there were no individuals or confirmed habitat for avian species of conservation. In summary, the proposed project would result in the loss of ecological integrity in the study area but would generally be confined to the extent of the site.

5.4.2. Equity and social justice

With respect to potential impacts on the existing agricultural activities on site, the landowner will enter into an applicable lease agreement with the proponent and as such the loss of grazing would likely be offset by the income the farmer would receive from the lease agreement. From the agricultural assessment it is noted that crop production on the property had been stopped in 2006 and the property has been used for extensive livestock farming. Once crop production was abandoned, the fields were left fallow and pioneer species established themselves.

The proposed project would create a number of local employment and business opportunities. It is anticipated that a large number of the low and medium skilled employment opportunities could be sourced from the local labour force in and around the site with the implementation of a skills development and training programme during the construction phase. The operational phase would create a small number of long-term employment opportunities. In terms of business opportunities for local companies, procurement would create business opportunities for the regional and local economy. A percentage of the monthly wage

bill earned by employees would be spent in the regional and local economy, which would result in indirect benefits to local businesses in the nearby towns of Parys and Sasolburg.

The proposed project would alter the local visual landscape / rural character of the site, which would have a visual impact in the immediate surrounding area and especially along the N1 national road. This impact is mitigated to a certain extent by the existing visual clutter in the rural landscape, which has increased the visual absorption capacity for the proposed project.

Thus, in terms of the issue of equity and social justice, the proposed project is considered to result in the equitable distribution of positive and negative impacts with no one group or community being adversely affected.

5.4.3. Economic efficiency

South Africa is facing a rising demand for power and is looking for other energy sources, including renewable energy, to decrease its dependence on the coal-fired power that provides most of the country's electricity. As such, renewable energy technologies are playing a key role in meeting South Africa's energy needs into the future. The proposed project is intended to support the establishment of a solar PV facility and thus furthers this goal. Furthermore, the proposed project is considered ideally located in order to link into the national grid, due to its close proximity to the existing ESKOM Scafell MTS.

While the proposed project would change the current agricultural land use of the site, 80 % of the site is considered to be of low sensitivity with respect agriculture. The remainder of the site (approximately 110.3 ha or 57 %) is deemed to be medium sensitivity rating for agriculture.

From the above sustainability criteria, the nature and extent of the proposed development, compliance with the relevant legal, policy and planning documentation (i.e., "need and desirability") and the findings of the specialist studies, it is the opinion of SLR that the proposed project can be supported from an environmental perspective and should be considered for Environmental Authorisation, subject to the implementation of the identified recommendations.

CONTENTS

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APPENDICES

ACRONYMS AND ABBREVIATIONS

Acronym / Abbreviation	Definition
BA	Basic Assessment
BAR	Basic Assessment Report
BBBEE	Broad-Based Black Economic Empowerment
B.Sc.	Bachelor of Science
CA	Competent Authority
CARA	Conservation of Agricultural Resources Act, 1983 (No. 43 of 1983)
CBA	Critical Biodiversity Area
CBD	Central Business District
COD	Chemical Oxygen Demand
CR	Critically Endangered
DFFE	Department of Forestry, Fisheries and Environment (formerly Department of Environmental Affairs (DEA))
DWS	Department of Water and Sanitation (formerly Department of Water Affairs (DWA))
DM	District Municipality
DMRE	Department of Mineral Resources and Energy (formerly Department of Mineral Resources (DMR))
EA	Environmental Authorisation, i.t.o. NEMA
EAP	Environmental Assessment Practitioner
EAPASA	Environmental Assessment Practitioners Association of South Africa
EC	Electrical Conductivity
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIA Regulations, 2014	Environmental Impact Assessment Regulations, 2014 (GN R 982 of 2014, as amended by GN R 326 of 2017)
EIAR	Environmental Impact Assessment Report
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programme
En	Endangered
ESA	Ecological Support Areas
FEPA	Freshwater Ecosystem Priority Area
GA	General Authorisation
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GN	Government Notice

Acronym / Abbreviation	Definition
HIA	Heritage Impact Assessment
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IFC	International Finance Corporation
IRP	Integrated Resource Plan
ISO	International Standards Organization
IUCN	International Union for Conservation of Nature
LC	Least Concern
LN	Listing Notice
LN 1, 2014	Environmental Impact Assessment Regulations Listing Notice 1, 2014 (GN R 983 of 2014, as amended by GN R 327 of 2017)
LN 2, 2014	Environmental Impact Assessment Regulations Listing Notice 2, 2014 (GN R 984 of 2014, as amended by GN R 325 of 2017)
LN 3, 2014	Environmental Impact Assessment Regulations Listing Notice 3, 2014 (GN R 985 of 2014, as amended by GN R 324 of 2017)
LoS	Level-of-Service
mamsl	Metres Above Mean Sea Level
MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
MEC	Member of the Executive Council
M.Sc.	Master of Science
NAAQS	National Ambient Air Quality Standard
NAEIS	National Atmospheric Emission Inventory System
NDCR	National Dust Control Regulations, 2013
NDP	National Development Plan
NEMA	National Environmental Management Act, 1998 (No. 107 of 1998)
NEM: AQA	National Environmental Management: Air Quality Act, 2004 (No. 57 of 2003)
NEM:BA	National Environmental Management: Biodiversity Act, 2004 (No. 10 of 2004)
NEM: PAA	National Environmental Management: Protected Areas Act, 2003 (No. 57 of 2003)
NEM: WA	National Environmental Management: Waste Act, 2008 (No. 59 of 2008)
NFEPA	National Freshwater Ecosystem Priority Areas, 2011
NHRA	National Heritage Resources Act, 1999 (No. 25 of 1999)
NPAES	National Protected Areas Expansion Strategy
NT	Near Threatened
NWA	National Water Act, 1998 (No. 36 of 1989)

Acronym / Abbreviation	Definition
PES	Present Ecological State
PM	Particulate Matter
Pr.Sci.Nat.	Registered Professional Natural Scientists
R	Regulation
RE	Remaining Extent
SAAQIS	South African Air Quality Information System
SAAELIP	South African Atmospheric Emission Licensing and Inventory Portal
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resource Information System
SANBI	South African National Biodiversity Institute
SANS	South African National Standards
SAWS	South African Weather Services
SCC	Species of Conservation Concern
SDF	Spatial Development Framework
SHE	Safety, Health and Environment
SIA	Social Impact Assessment
SLR	SLR Consulting (South Africa) (Pty) Ltd
SPLUMA	Spatial Planning and Land Use Management Act, 2013 (No. 16 of 2013)
S&EIA	Scoping and Environmental Impact Assessment
TIA	Traffic Impact Assessment
VAT	Value Added Tax
VIA	Visual Impact Assessment
Vu	Vulnerable
WHO	World Health Organization
WML	Waste Management Licence, i.t.o. NEM: WA
WUL	Water Use Licence, i.t.o. NWA
WULA	Water Use Licence Application

Proposed Ilikwa Solar PV Facility: Draft Environmental Impact Assessment Report, Free State Province

1. INTRODUCTION

1.1 PROJECT BACKGROUND

South Africa Mainstream Renewable Power Developments (Pty) Ltd (Mainstream) is proposing to develop, construct and operate four (4) solar photovoltaic (PV) facilities, including Battery Energy Storage Systems (BESS) and associated infrastructure, on a site located approximately 19 km west of the town Sasolburg in the Free State Province (see Figure 1-1). The four (4) projects (including the grid connection infrastructure) are collectively referred to as the **Scafell Cluster**. The total generation capacity of the proposed four (4) solar PV facilities will be up to 550 MW_{ac}.

Each solar PV facility will be associated with its own grid connection infrastructure that will comprise of a double circuit transmission line and switching station with a capacity of up to 132 kilovolts (kV). The grid connection infrastructure (namely the double circuit transmission line and switching station) will facilitate the grid connection from each proposed solar PV facility to the ESKOM Scafell Main Transmission Substation (MTS), located approximately 2 km south of the study area. Each solar PV facility and grid connection infrastructure project will be subject to a separate Environmental Authorisation (EA) process and separate application (i.e., separate EIA process). **This EIA Report (EIAR) is compiled for the proposed Ilikwa Solar PV Facility**. Details of the Solar PV facilities being proposed as part of the Scafell Cluster is included in Table 1-1 below. In addition, the location of the Ilikwa Solar PV Facility (this project) in relation to other projects being proposed as part of the Scafell Cluster is presented in Figure 1-1.

Table 1-1: Details of each of the proposed solar PV facility projects (including the associated grid connection infrastructure) which form part of the Scafell Cluster

Applicant	Project Name	Capacity (MW_{ac})	Affected Property
South Africa Mainstream Renewable Power Developments (Pty) Ltd	**Ilikwa Solar PV Facility (part of this application)**	**100**	**Portion 5 of the Farm Proceederfontein 100**
	Scafell Solar PV Facility (part of separate EIA process which forms part of separate application)	150	Portion 3 of the Farm Willow Grange 246
	Damlaagte Solar PV Facility (part of separate EIA process which forms part of separate application)	150	Remaining Extent of the Farm Damlaagte 229
	Vlakfontein Solar PV Facility (part of separate EIA process which forms part of separate application)	150	Portion 6 of the Farm Vlakfontein 161

Taking the above into consideration, Mainstream has appointed SLR Consulting (South Africa) Pty Ltd as the Independent Environmental Assessment Practitioner (EAP) to undertake a full Scoping and Environmental Impact Assessment (EIA) process for the proposed Scafell Cluster Project.

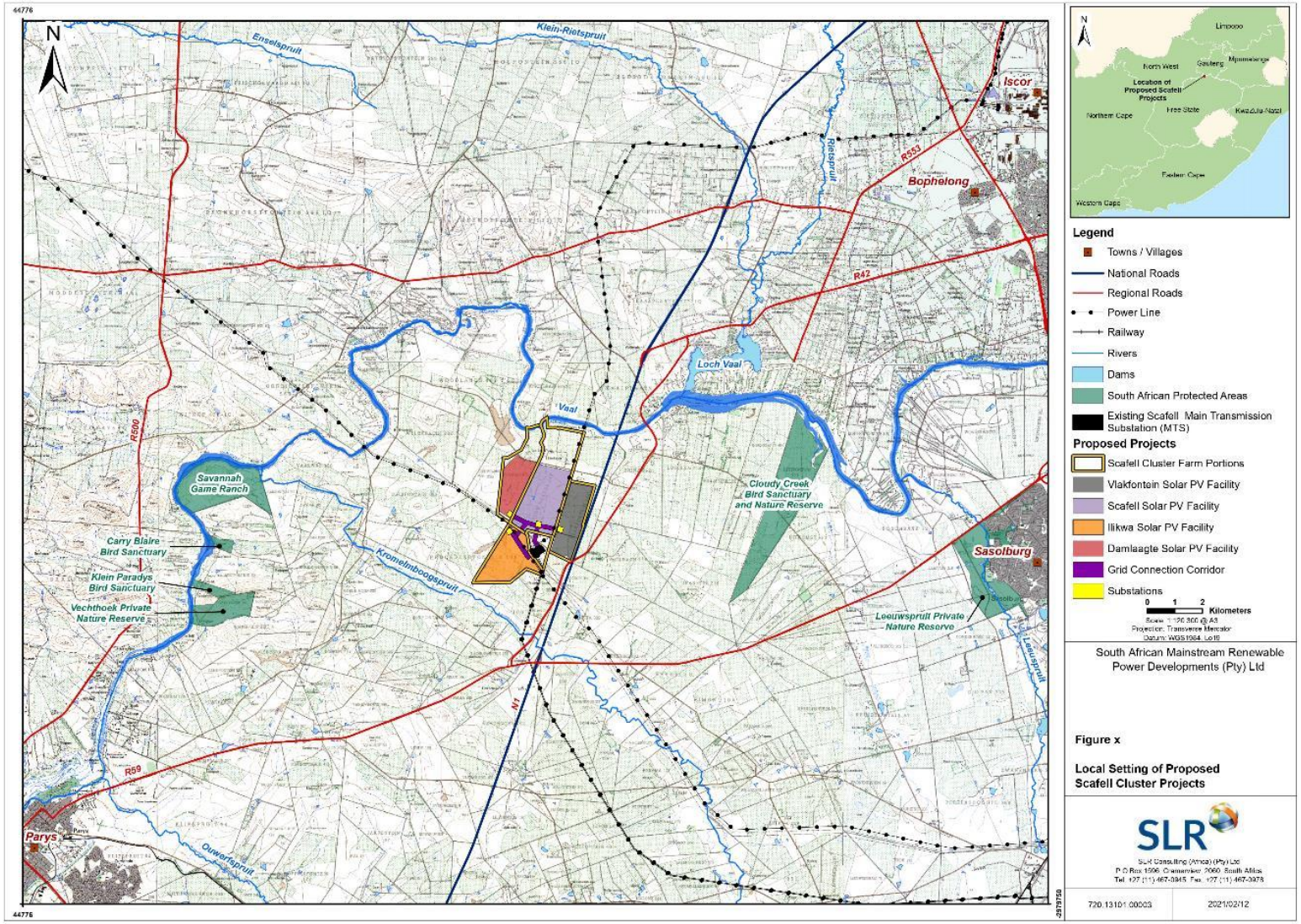

Figure 1-1: A Locality Map illustrating the location of the proposed Scafell Cluster Project

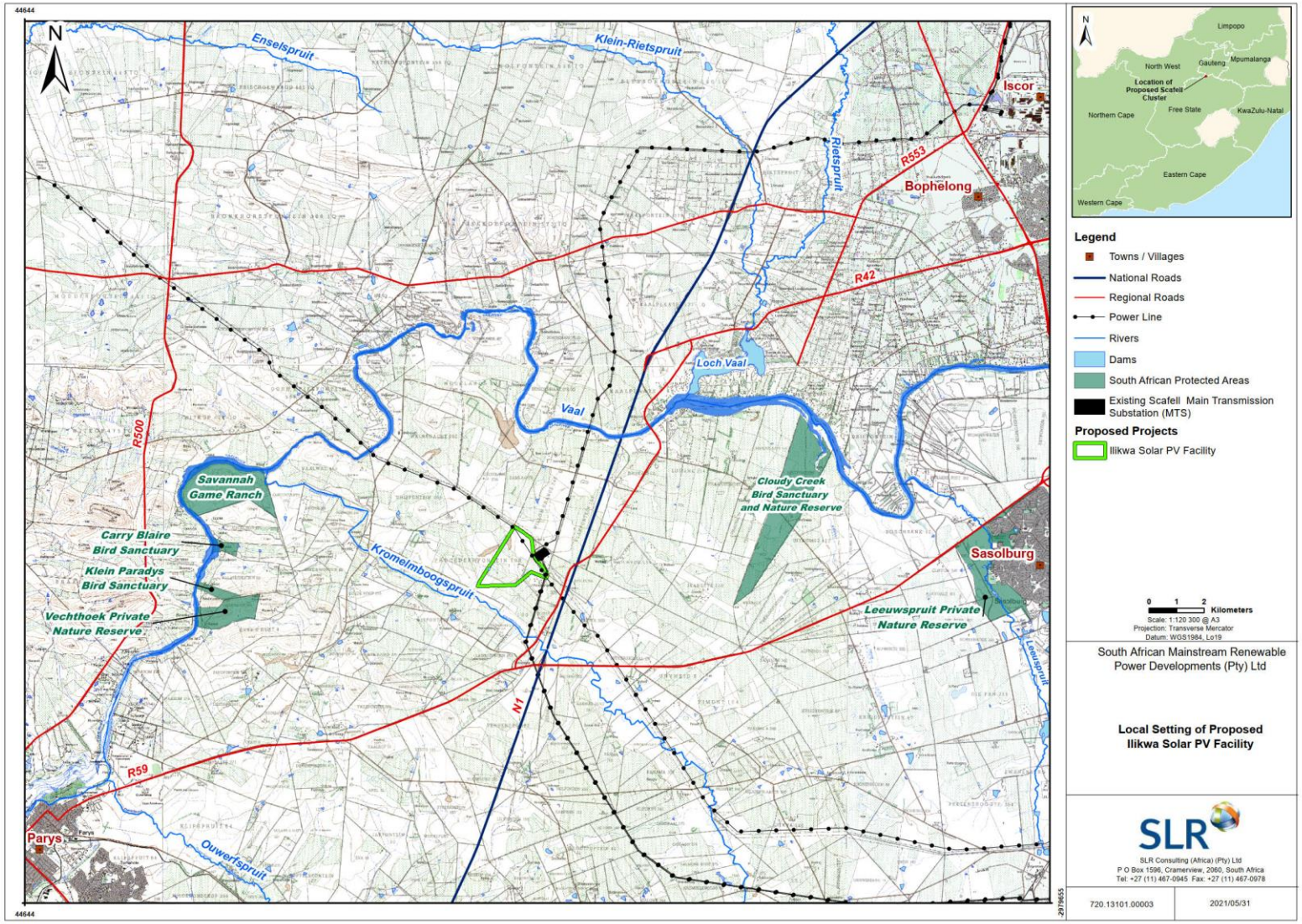

Figure 1-2: Locality Map of the proposed Ilikwa Solar PV Facility (part of this application)

1.2 PURPOSE OF THIS REPORT

This EIAR outlines the process followed as part of this application (i.e., as part of the EIA process) and presents the findings of the EIA process undertaken for the proposed Iikwa Solar PV Facility, in support of the application for Environmental Authorisation (EA). The EIAR has been compiled in accordance with Appendix 3 ('Environmental Assessment Report') of the 2014 EIA Regulations (as amended) and is now being distributed for review and comment as part of the EIA process, in accordance with the requirements of the National Environmental Management Act, 1998 (No. 107 of 1998) (NEMA) (as amended) and Regulations thereto.

This EIAR follows on from the Draft Scoping Report (DSR) that was made available for a 30-day review and comment period (from **23 June** to **22 July 2021**), and which was approved by the Department of Forestry, Fisheries, and the Environment (DFFE) on **26 August 2021**. This permitted the EAP to proceed into the EIA phase of the proposed project, with the undertaking and compilation of an EIAR (this report).

The proposed Iikwa Solar PV Facility (part of this application) has been assigned the following reference number by the DFFE: **14/12/16/3/3/2/2077**. This EIAR is therefore being made available for a 30-day review and comment period, from **23 September** to **25 October 2021**, in order to provide potential Interested and Affected Parties (I&APs) and key stakeholders with an opportunity to comment on any aspect of the proposed project as well as the findings of the EIA process to date.

A copy of the EIAR (including appendices) has been made available:

- the SLR website at http://slrconsulting.com/public-documents/mainstream-scafell;
- the corresponding data-free website, where the report can also be downloaded without any data charges using internet-capable mobile phones, a**t** https://www.slrpublicdocs.datafree.co/public-documents/mainstream-scafell.

A hard copy of the report and appendices have also been placed at the following public locations / venues:

Name of Location	Contact Details
Sasolburg City Library	John Vorster Avenue, Sasolburg Tel: 016 973 8464 Fax: 016 976 3083 Email: sasolburg@sacr.fs.gov.za
Zamdela Public Library	3246 Taylor Park, Zamdela Tel: 016 974 2163 Fax: 016 976 0308 Email: zamdela@fslib.gov.za

Comments should be forwarded to the SLR at the address, telephone or email address shown below[3]. For comments to be included in the EIAR, it is kindly requested that comments should reach SLR no later than **25 October 2021.**

SLR Consulting (South Africa) (Pty) Ltd
Attention: Candice Sadan
720.13101.00003@slrconsulting.com

PO Box 798, RONDEBOSCH, 7701
5th Floor, Letterstedt House, Newlands on Main
Cnr Main and Campground Roads
Newlands
CAPE TOWN

1.3 STRUCTURE OF THE ENVIRONMENTAL IMPACT ASSESSMENT REPORT

This EIAR has been prepared in compliance with Appendix 3 of the EIA Regulations 2014 (as amended) and is divided into various chapters and appendices, the contents of which are outlined below.

Section	Contents
Executive Summary	Provides a comprehensive synopsis of the EIA Report
Chapter 1	**Introduction** Provides a background of the project; describes the purpose of the EIAR; outlines the structure of the report and provides information to I&APs and key stakeholders on the opportunity to provide comments on the EIAR.
Chapter 2	**Legislative requirements** Outlines the key legislative requirements applicable to the proposed project.
Chapter 3	**EIA Process Approach and Process** Outlines the approach and process for the assessment and consultation process undertaken for the EIA process. It also includes a summary of the public participation process undertaken to date and the results thereof.
Chapter 4	**Need and Desirability** Provides an overview of the need and desirability for the proposed project.
Chapter 5	**Project Description** Provides general project information and presents a description of the proposed project.

[3] By providing your Personal Information to be registered as an I&AP for this Project, you consent to SLR keeping and using your Personal Information as part of a contact database for this and other SEIA Projects and processes; contacting you about these projects; disclosing it to other authorized parties for lawful purposes, including transferring to other countries; and processing it for lawful purposes (fulfilling contractual, legal and public policy obligations, and protecting legitimate interests SLR and other authorised parties). SLR will only collect the necessary Personal Information. SLR (and any authorized parties) will only use it for lawful purposes, and use reasonable, appropriate security safeguards to protect it, reasonably prevent any damage to, or loss, unauthorised access, or disclosure thereof.

Your rights: You may request SLR to provide you with names of the authorized parties, and details of your Personal Information held in the I&AP database. You may object to the processing thereof, or request to correct, delete or destroy it, at any time by contacting SLR by e-mail or in writing at the address below. However, you understand that SLR (and any authorized parties) may not be able to delete or destroy it for legal or public policy reasons. SLR will provide you with the reasons. You may lodge a complaint with the Information Regulator at: https://justice.gov.za/inforeg/. Link to SLR's Privacy Policy: https://cdn.slrconsulting.com/uploads/2020-08/SLR-Privacy-Notice.pdf

Section	Contents
Chapter 6	**Alternatives** Provides an overview of the alternatives considered for the proposed project.
Chapter 7	**Description of the affected environment** Describes the existing biophysical and social environment that could potentially be affected by the proposed project.
Chapter 8	**Impact Assessment** Describes key issues and impacts associated with the proposed project.
Chapter 9	**Cumulative Impact Assessment** Describes key cumulative issues and impacts associated with the proposed project.
Chapter 10	**Conclusion** Compares the environmental impacts and risks of the project alternatives.
Chapter 11	**References** Provides a list of the references used in compiling this EIAR.
Appendices	Appendix 1: EAP Declaration & Undertaking Appendix 2: Curricula Vitae (including registrations) of the Project Team Appendix 3: Public Participation Process: Appendix 3.1: Public Participation Plan Appendix 3.2: I&AP Database Appendix 3.3: Advertisements and Notices Appendix 4: Screening Report Appendix 5: Site Sensitivity Screening Report Appendix 6: Site Photographs Appendix 7: Environmental Management Programme(s) Appendix 7.1: Solar PV Facility Appendix 7.2: Facility / On-site Substation Appendix 8: Specialist Studies Appendix 8.1: Terrestrial Biodiversity Assessment Appendix 8.2: Aquatic Biodiversity Assessment Appendix 8.3: Avifauna Compliance Statement Appendix 8.4: Soils, Agriculture Potential and Land Capability Impact Assessment Appendix 8.5: Heritage Assessment Appendix 8.6: Desktop Palaeontological Assessment Appendix 8.7: Visual Impact Assessment Appendix 8.8: Traffic Impact Assessment Appendix 8.9: Social Impact Assessment Appendix 9: Specialist Declaration of Interest Appendix 10: Additional Information

2. ADMINISTRATIVE AND LEGAL FRAMEWORK

2.1 NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NEMA) (ACT NO. 107 OF 1998, AS AMENDED)

The NEMA (Act No. 107 of 1998, as amended) establishes principles and provides a regulatory framework for decision-making with regards to matters affecting the environment. Section 2 of the NEMA sets out a range of environmental principles that are to be applied by all organs of state / authorities when taking decisions that significantly affect the environment. Included amongst the key principles is that all development must be socially, economically, and environmentally sustainable and that environmental management must place people and their needs at the forefront of its concern, as well as serve their physical, psychological, developmental, cultural, and social interests equitably. As part of the NEMA, the participation of Interested and/or Affected Parties (I&APs) is stipulated, as decisions must consider the interests, needs and values of all I&APs.

Chapter 5 of the NEMA provides a framework for the integration of environmental issues into the planning, design, decision-making and implementation of plans and development proposals. Section 24 of the NEMA provides a framework for granting of environmental authorisations (EAs). To give effect to the general objectives of Integrated Environmental Management (IEM), the potential impacts on the environment of listed or specified activities must be considered, investigated, assessed, and reported on to the competent authority. Section 24(4) of the NEMA provides the minimum requirements for procedures for the investigation, assessment, management, and communication of the potential impacts associated with a proposed development.

2.2 NEMA 2014 EIA REGULATIONS (AS AMENDED)

The 2014 EIA Regulations (as amended), promulgated in terms of Chapter 5 of the NEMA and published in Government Notice (GN) R982 (as amended by GN No. 326 of 7 April 2017), control certain listed activities. These activities are listed in GN R983 (Listing Notice 1; as amended by GN R327 of 7 April 2017), R984 (Listing Notice 2; as amended by GN R325 of 7 April 2017) and R985 (Listing Notice 3; as amended by GN R324 of 7 April 2017) and are prohibited until an EA has been obtained from the competent authority (such as the DFFE). Such an EA, which may be granted subject to certain conditions, will only be considered once there has been compliance with GN R982 (as amended).

GN R982 (as amended) sets out the procedures and documentation that need to be complied with when applying for an EA. A BA process must be applied to an application if the authorisation applied for is in respect of an activity or activities listed in Listing Notices 1 and/or 3, while a Scoping and EIA process must be applied to an application if the authorisation applied for is in respect of an activity or activities listed in Listing Notice 2. As the **Ilikwa Solar PV Facility (part of this application)** includes activities listed in Listing Notice 2 (see Table 2-1 below), it is necessary that a full Scoping and EIA process is undertaken in order for the DFFE to consider the application in terms of the NEMA (as amended). The DFFE has been identified as the competent authority for the proposed project, in accordance with GN R779, as it is mandated with issuing EAs for all projects related to the Integrated Resources Plan (IRP) (2010 – 2030), including any updates thereto. The DFFE will be supported by the Free State Provincial Department of Small Business Development, Tourism and Environmental Affairs (DESTEA), as the commenting authority.

Table 2-1: NEMA Listed Activities applied for as part of the proposed project

No.	Activity description	Description of activity in relation to the proposed project
GN R983 (Listing Notice 1)		
11(i)	*The development of facilities or infrastructure for the transmission and distribution of electricity outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kV.*	The solar PV facility will require the construction and operation of internal distribution electrical infrastructure which is required to connect the Ilikwa Solar PV Facility components internally, and to the IPP portion of the onsite substation. The IPP portion of the onsite substation will be rated as 33 / 132 kV and the internal cabling will be up to 132 kV.
12(ii)(a)(c)	*The development of infrastructure or structures with a physical footprint of 100 square metres or more where such development occurs within a watercourse or within 32 m of a watercourse.*	The physical footprint of internal access roads and electrical cabling required to connect the various PV facility infrastructure and components will be confirmed once final designs have been provided. However, these will be located within 32 m of delineated watercourses on site. It is possible that access roads or other associated infrastructure would need to cross watercourses / drainage lines located within the vicinity of the project site in order to gain access to the development area.
14	*The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such good occurs in containers with a combined storage capacity of 80 cubic metres or more but not exceeding 500 cubic metres.*	The proposed project would require the storage and handling of dangerous goods, which could include fuels (i.e., diesel or petrol for the operation of machinery and equipment etc.), lubricants and materials for the BESS. The storage capacity for the dangerous goods associated with the proposed project is not anticipated to exceed 500 cubic metres.
19	*The infilling or depositing of any material of more than 90 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 watercourse; but excluding where such infilling, depositing, dredging, excavation, removal or moving -* *a) will occur behind a development setback;* *b) is for maintenance purposes undertaken in accordance with a maintenance management plan;* *c) falls within the ambit of activity 21 in this Notice, in which case that activity applies;* *d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or* *where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies*	It is possible that access roads or other associated infrastructure being proposed would need to cross watercourses / drainage lines located within the vicinity of the project site, in order to provide access to the development footprint.
24(ii)	*The development of a road where the road is wider than 8 metres*	It is possible that access roads or other associated infrastructure being proposed would need to cross watercourses / drainage lines located within the vicinity of the project site, in order to provide access to the development footprint.

No.	Activity description	Description of activity in relation to the proposed project
27	*The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for –* *(i) the undertaking of a linear activity; or* *(ii) maintenance purposes undertaken in accordance with a maintenance management plan*	The development of the 33 / 132 kV on-site substation will require the clearance of an area in excess of 1 ha.
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:* *(i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or* *(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;*	The proposed project would be established on land previously used for agriculture on or after 01 April 1998 and the total area required for the proposed development is in excess of 1 ha.
56(i)(ii)	*The widening of a road by more than 6 m, or the lengthening of a road by more than 1 km –* *(i) where the existing reserve is wider than 13.5 m; or* *(ii) where no reserve exists, where the existing road is wider than 8 m.*	The proposed project would require the widening of existing roads (for which there is no road reserve) up to 12 m. The access roads would be constructed during the construction phase of the proposed project.
GN R984 (Listing Notice 2) No. 324)		
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 project will have a generating capacity of up to 100 MW_{ac}.
15	*The clearance of an area of 20 hectares or more of indigenous vegetation.*	The construction of the proposed project will require the clearance of 180 ha.
GN R985 (Listing Notice 3)		
4(b)(i)(ee)	*The development of a road wider than 4 metres within a reserve of less than 13.5 metres within (b) the Free State Province, (i) outside urban areas, and (ee) within critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.*	The proposed project will require the construction of a main access road with a width of up to 12 m and internal access roads with a width of up to 5 m, outside an urban area in the Free State Province. The main access road may be required to traverse a CBA 2 area, identified in terms of the Free State Biodiversity Plan (2015), in order to provide access to the project site of the proposed development.
10(b)(i)(hh)	*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 in (b) the Free State Province, (i) outside an urban area, and (ii) within 100 metres from the edge of a watercourse or wetland.*	The proposed project will require the development of storage and operation facilities for dangerous substances with a capacity exceeding 80 cubic metres, outside of an urban area in the Free State Province. It is possible that the dangerous goods and storage facility will be located within 100 m from the edge of a wetland located adjacent to the project site of the proposed project.
12(b)(iv)	*The clearance of area of 300 square metres or more of indigenous vegetation in (b) the Free State Province, (iv) within 100 metres from the edge of a watercourse or wetland.*	The proposed project will require the clearance of up 162 ha of indigenous vegetation within the project site in the Free State Province, and within 100 m from

No.	Activity description	Description of activity in relation to the proposed project
		the edge of a wetland located outside of the boundaries of the project site.
14(ii)(c)(b)(i)	*The development of, (ii) infrastructure or structures with a physical footprint of 10 square metres or more where such development (c) occurs within 32 m from edge of a watercourse, (b) in the Free State Province, (i) outside of an urban area.*	The proposed project will require the development of infrastructure with a footprint in excess of 10 m^2 which is located within 32 m from the edge of a watercourse in the Free State Province, outside of an urban area.

2.3 NATIONAL WATER ACT 36 OF 1998

Chapter 4 of the National Water Act (NWA) (Act No. 36 of 1998, as amended) requires proponents to proposed developments to submit applications to the competent authority [namely the Regional Office of the Department of Water and Sanitation (DWS)] where a water use listed under Section 21 of the NWA is triggered. Water Use is defined broadly by the Act and includes taking and storing water, activities which reduce stream flow, waste discharges and disposals, controlled activities (namely activities which impact detrimentally on a water resource), alteration of a watercourse, removing water underground for certain purposes and recreation. Possible water uses that could be triggered by the proposed project are outlined in Table 2-2. An application for a Water Use License (WUL) or General Authorisation (GA) must be undertaken in accordance with the regulations of GN R267 of 2017, prior to the construction phase of the proposed project commencing.

Table 2-2: List of potential Section 21 water uses applicable to the proposed project

No.	Water Use	Description of activity in relation to the proposed project
a	*Taking water from a water resource*	The proposed project may require the abstraction of water for the construction and operation phase of the proposed project.
c	*Impeding or diverting the flow of water in a watercourse*	An unchanneled valley bottom wetland is located within the project site of the proposed project. As a result, the construction and operation of the project may potentially lead to an impediment or alteration of beds, banks, course of the wetland. Mainstream will be required to submit an application for a Water Use License (WUL) or General Authorisation (GA) Registration to the Regional Head of the Department of Human Settlements, Water and Sanitation in the Free State Province after the proposed project has been awarded preferred bidder status under the REIPPPP of the DMRE, or by another offtaker.
i	*Altering the bed, banks, course, or characteristics of a watercourse*	

2.4 NATIONAL HERITAGE RESOURCES ACT 25 OF 19990

The National Heritage Resources Act, 1999 (No. 25 of 1999) (NHRA) provides for the identification, assessment, and management of the heritage resources of South Africa. Section 38(1) of the NHRA lists development activities that would require authorisation by the responsible heritage resources authority. Activities considered applicable to the proposed project include the following:

"(a) The construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
(c) Any development or other activity which will change the character of a site;
(i) exceeding 5 000 m² in extent".

The NHRA requires that a person who intends to undertake a listed activity notify the relevant provincial heritage authority at the earliest stages of initiating such a development. The relevant provincial heritage authority would then in turn, notify the person whether a Heritage Impact Assessment (HIA) should be submitted. However, according to Section 38(8) of the NHRA, a separate report would not be necessary if an evaluation of the impact of such development on heritage resources is required in terms of the Environment Conservation Act (No. 73 of 1989) (now replaced by NEMA) or any other applicable legislation. The decision-making authority should, however, ensure that the heritage evaluation fulfils the requirements of the NHRA and take into account in its decision-making any comments and recommendations made by the relevant heritage resources authority.

2.5 NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT 59 OF 2008

The National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA) regulates all aspects of waste management and places an emphasis on waste avoidance and minimisation. The NEM:WA creates a system for listing and licensing waste management activities. Listed waste management activities which exceed certain thresholds are subject to a process of impact assessment and licensing. Activities listed in Category A of the NEM:WA require a Basic Assessment (BA) process to be undertaken, while activities listed in Category B of the NEM:WA require an EIA process. The NEM:WA also provides norms and standards for the storage and disposal of waste. These norms and standards are listed in GN R926 of 2013 (storage) and GN R636 of 2013 (disposal) respectively. It should be noted that the proposed project does not trigger a Listed Activity in terms of the NEM:WA and therefore a Waste Management License is not required. Any waste product produced as a result of the proposed project would be disposed of off-site via suitably qualified and licensed third-party service providers.

2.6 LEGISLATION CONSIDERED IN THE PREPARATION OF THE EIR

In accordance with the 2014 EIA Regulations (as amended), all legislation and guidelines that have been considered in the EIA process must be documented. In addition to the 2014 EIA Regulations (as amended), Table 2-3 below provides a summary of other applicable legislation.

Table 2-3: Additional applicable legislation

Applicable legislation	Relevance
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM:BA)	The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA), as amended, aims to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA (as amended), the protection of species and ecosystems that warrant national protection, the sustainable use of indigenous biological resources and the fair and equitable sharing of benefits arising from bio-prospecting involving indigenous biological resources. The Act places severe restrictions on activities that could have adverse effects on threatened or protected species. The purpose of the Act includes the following: • The management and conservation of South Africa's biodiversity within the framework of the NEMA (as amended); • The protection of species and ecosystems that warrant national protection; and • The sustainable use of indigenous resources and the fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources. The Act makes provision for the protection of threatened or protected ecosystems and species, as well as provisions guarding against the introduction of alien and invasive species. The Act identifies restricted activities involving listed threatened, protected or alien species. These activities include picking parts of, or cutting, chopping off, uprooting, damaging, or destroying any specimen of a listed threatened or protected species. As stipulated in Section 57 of the Act, a person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7. A permit will be required to engage in restricted activities for the proposed project, in accordance with Section 88 of the NEM:BA. DESTEA (the provincial commenting authority) will be the Competent Authority for the application.
Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA)	This Act provides for the control over the utilization of the natural agricultural resources of the country, in order to promote the conservation of the soil, water sources and the vegetation. It also assisting in the combating of weeds and invader plants. Section 5 of the Act prohibits the spread of weeds through the prohibition of their sale. GN R1084 (published under the CARA) provides categories for the classification of the various weeds and invader plants, as well as restrictions where these species may occur. Regulation 15E of GN R1084 provides methods to be implemented for the control of weeds and invader species. The CARA finds application throughout the lifecycle of the proposed project. As a result, soil conservation and erosion prevention management and mitigation measures need to be implemented. Thus, a Weed Control and Management Plan must be

Applicable legislation	Relevance
	developed and implemented for the duration of the life cycle of the proposed project.
Subdivision of Agricultural Land Act, 1970 (Act No. 70 of 1970, as amended) (SALA)	The Subdivision of Agricultural Land Act, 1970 (Act No. 70 of 1970, as amended) (SALA), provides for the subdivision of all agricultural land within the Republic, thereby prohibiting certain activities from being undertaken without consent from relevant authority (namely the Minister of the Department of Agriculture, Land Reform and Rural Development – DALRRD). This Act finds relevance to the proposed project as any portion of land that is zoned for agriculture and will need to be leased for a period exceeding ten (10) years is regulated by the Act.
National Forests Act, 1998 (Act No. 84 of 1998) (NFA)	The National Forest Act, 1998 (Act No. 84 of 1998) (NFA), empowers the Minister of the DFFE to declare and list a tree, group of trees, woodland, or a species of trees as protected. A list of protected tree species is included in GN R908, published in November 2014. Section 7 of the Act prohibits the cutting and disturbance of NFA-listed trees. A permit is required for the removal of NFA-listed tree species, in terms of Section 4 of the Act. Prior to the submission of the permit application to the competent authority, a survey of the project site is required in order to ascertain the presence and distribution of NFA-listed tree species. It should be noted that **no NFA-listed trees have been confirmed within the project site by the Terrestrial Biodiversity Specialist** (refer to Appendix 8.1).
National Veld and Forest Fire Act, 1998 (Act No. 10 of 1998) (NVFFA)	Chapter 4 of the National Veld and Forest Fire Act, 1998 (Act No. 10 if 1998) (NVFFA), requires landowners to prepare and maintain firebreaks. It also details the role of adjoining landowners and the fire protection association in an area. In addition, Chapter 5 of the Act requires all landowners to acquire firefighting equipment and have available personnel for firefighting. Landowners who own land where a veldfire may start or burn, or from whose land it may spread, must have firefighting equipment and personnel available. It should be noted that **there are no permitting requirements for the proposed project, in accordance with the NVFFA**. However, it must be ensured that firebreaks within the boundaries of the study area are prepared and maintained, and that firefighting equipment and personnel be made available for the duration of the life cycle of the proposed project.
Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) (OHS), and Major Hazard Installation Regulations 2019	The OHS Act provides for the health and safety of persons at work and the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work. According to this Act, every employer shall provide and maintain, as far as is reasonably practicable, a working environment that is safe and without risk to the health of his employees. The construction and operation of the proposed project will include activities that are deemed as hazardous and/or a risk to the health and safety of the

Applicable legislation	Relevance
	personnel employed on the project. Such hazards/risks should be managed in accordance with the relevant requirements of the Act.
Hazardous Substances Act, 1973 (Act No. 15 of 1973) (HSA)	The Hazardous Substances Act, 1973 (Act No. 15 of 1973) (HSA), was promulgated in order 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 (under certain circumstances) which may injure ill-health, or death in humans. The Act provides for the division of hazardous substances or products into four (4) 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. These groups are as follows: • Group 1: includes all hazardous substances defined in the Act; • Group 2: includes mixtures of Group 1 substances; • Group 3: includes substances found in certain electronic products (i.e., a product with an electronic circuit); and • Group 4: includes all radioactive substances. According to the HSA, the use or sale of Group I, II and III hazardous substances is prohibited. **Should the use of these substances be required for the proposed project, a permit application should be submitted to the Department of Health (DoH), in terms of Section of the Act.**
Municipal Systems Act, 2000 (Act No. 32 of 2000)	The Municipal Systems Act, 2000 (Act No. 32 of 2000), was promulgated for the administration of municipalities. The Act requires that the Constitution and other legislation (i.e., the NEMA) be incorporated into strategic plans at local government level. The Act regulates municipal service delivery and provides a comprehensive range of service delivery mechanisms through which municipalities may provide municipal services. The Act explains the process to be applied / followed and the criteria to be considered in reviewing and selecting municipal service delivery mechanisms. The Act provides that each municipal council must adopt a single, inclusive, and strategic IDP for the development of the municipality. At a municipal level, IDPs may require the implementation of renewable energy projects, such as this project. As a result, IPPs should consult with the relevant structures of the municipality within which a development is located.
The Spatial Planning and Land Use Management Act, 2013 (Act No. 6 of 2013) (SPLUMA)	The Spatial Planning and Land Use Management Act, 2013 (Act No. 6 of 2013) (SPLUMA), aims to confirm and regulate the role of municipalities in land use planning and management. Objectives of the Act relevant to the proposed project ensure that the system of spatial planning and land use management promotes social and economic inclusion, as well as provide for the sustainable and efficient use of land. **The current zoning of the project site is agriculture and therefore a rezoning application**

Applicable legislation	Relevance
	would be required in order to change the zoning of the site from agriculture to special purpose.
Astronomy Geographic Advantage Areas Act, 2007 (Act No. 21 of 2007) (AGAA)	In 2010, the then Minister of Science and Technology declared all land in the Northern Cape Province situated 250 km from the centre of the South African Large Telescope (SALT) Dome as an 'Astronomy Advantage Area (AAA)', for optical astronomy purposes. As a result, the whole of the territory of the province, excluding Kimberly, was declared as an astronomy advantage area for radio astronomy purposes. From a renewable energy perspective, wind energy projects are more likely to contravene the objectives / aims / goals of this Act. **Since the proposed project requires the construction and operation of a solar PV facility and the project site is located outside of an Astronomy Advantage Area[4], the proposed project is not anticipated to contravene the objectives / aims / goals of the Act.**
Civil Aviation Act, 2009 (Act No. 13 of 2009) (CAA)	The Civil Aviation Act, 2009 (Act No. 13 of 2009) (CAA), governs civil aviation in the Republic of South Africa. The Act provides for the establishment of a stand-alone authority mandated with controlling, promoting, regulating, supporting, developing, enforcing and continuously improving levels of safety and security throughout the civil aviation industry. This mandate is fulfilled by the South African Civil Aviation Authority (SACAA), an agency of the Department of Transport (DoT). The SACAA achieves the objectives of the CAA by complying with the Standard and Recommended Practices (SARPs) of the International Civil Aviation Organisation (ICAO), while considering the local context when issuing the South African Civil Aviation Regulations (SA CARs). All proposed development or activities in South Africa that potentially could affect civil aviation must be assessed by SACCAA, in terms of the CARs and the South African Civil Aviation Technical Standards (SA CATs), in order to ensure civil aviation safety. **The SACAA will therefore be provided with the EIAR for the proposed project, in order to provide comments (if required) during the 30-day review and comment period.**
National Traffic Act, 1996 (Act No. 93 of 1996) and National Traffic Regulations, 2000	The National Traffic Act, 1996 (Act No. 93 of 1996), and the National Traffic Regulations, 2000, provide certain limitations on vehicle dimensions as well as axle and vehicle masses that a vehicle using a public road at any given time must comply with. Certain vehicles and loads cannot be moved on public roads without exceeding the limitations, in terms of the dimensions and/or mass as prescribed. Such a load is classified as an abnormal load and is permitted to be transported on public roads under an exemption permit issued in terms of Section 81 of the Act. **A permit application, in terms of Section 81 of the Act, will be required for the transportation of key infrastructure components and machinery to the project site during the construction phase of the proposed project.**

[4] http://bigrat.jb.man.ac.uk/~sjm/Spectrum/Karoo-WebExport/qgis2web_2020_08_03-11_25_02_774525/

Applicable legislation	Relevance
Free State Nature Conservation Ordinance Act, 1969 (Act No. 8 of 1969)	Chapter 4 and Section 30 of the Act prohibits any persons from removing indigenous species listed in Schedule 6 of the Act without a valid permit from the relevant authority. This Act finds relevance to the Scafell Cluster Project on the basis that protected plant species in terms of the Act may be present within the project site and floral permits will be required from the relevant authority for the removal of identified protected plant species prior to the commencement of the construction phase. **Mainstream will be required to obtain permits from the relevant authority for the removal of protected indigenous plant species in terms of the Act, following the completion of the final site walkdown survey of the project site and prior to the commencement of the construction phase.**

2.7 GUIDELINES

The guidelines listed in Table 2-4 below have been or will be considered during the EIA process being undertaken for the proposed project.

Table 2-4: Guidelines considered in the EIA process

Guideline	Governing Body	Relevance
Mitigating biodiversity impacts associated with solar and wind energy development (2021)	International Union of Conservation of Nature	Provides guidelines for mitigating biodiversity impact associated with the development of grid connection infrastructure for solar PV facilities.
Public Participation in terms of NEMA, EIA Regulations (2017)	DFFE	The purpose of this guideline is to ensure that an adequate public participation process is undertaken for the BA process.
Guideline on need and desirability in terms of the EIA Regulations (2014)	DFFE	These guidelines inform the consideration of the need and desirability aspects of the proposed project.

3. EIA APPROACH AND PROCESS

3.1 DETAILS OF THE PROJECT TEAM FOR EIA PROCESS

The details of the project team that were involved in the EIA process which forms part of this application, and the preparation of this EIAR are provided in Table 3-1 below. It should be noted that SLR has no vested interest in the proposed project, other than fair payment for consulting services rendered as part of the EIA process and has declared its independence as required by the 2014 EIA Regulations, as amended (see Appendix 1).

Table 3-1: Details of the Project Team

General				
Organisation	SLR Consulting (South Africa) (Pty) Ltd			
Postal address	PO Box 798 RONDEBOSCH 7701			
Tel No.	+27 (0)21 461 1118 / 9			
Name	**Qualifications**	**Professional registrations**	**Experience (Years)**	**Tasks and roles**
Stuart-Heather Clark	B.Sc. (Hons) Civil Engineering M.Sc. Environmental Management	EAPASA IAIAsa	24	Report and process review
Nicholas Arnott	B.Sc. (Hons) Earth and Geographical Sciences	SACNASP (Pri.Sci. Nat)	15	Management of the EIA process, including process review, specialist study review, management of the public participation process and report compilation
Reuben Maroga	B.Sc. (Hons) Geology B.Sc. Environmental Management & Geology	N/A	3	Project administration, undertaking of public participation process activities and report compilation

3.2 QUALIFICATIONS AND EXPERIENCE OF THE EAP

Stuart Heather-Clark is a Technical Director in SLR's Environmental Management Planning and Approvals (EMPA) team in Africa. He holds a B.Sc. (Honours) in Civil Engineering and a Master's degree in Environmental Science and has 24 years of relevant experience. He has expertise in a wide range of environmental disciplines, including Environmental Impact Assessments (EIAs), Environmental Management Plans/Programmes (EMPs), environmental planning and review and public consultation and is a registered EAP with the Environmental Assessment Practitioners Association of South Africa (EAPASA).

Nicholas Arnott has worked as an EAP since 2006 and has been involved in a number of projects covering a range of environmental disciplines, including Basic Assessments, EIAs and EMPs. He has gained experience in a wide range of projects relating to mining, oil and gas, renewables, infrastructure projects (e.g., roads), housing and industrial developments.

Reuben Maroga holds a B.Sc. in Environmental Management and a B.Sc. (Honours) in Geology and has worked as an EAP since 2018. His key focus is undertaking EIAs, Public Participation, and EMPs.

Curricula Vitae (CVs) of the project team (including proof of professional membership) are attached in Appendix 2.

3.3 DETAILS OF THE INDEPENDENT SPECIALIST TEAM

In accordance with Regulation 2 of the 2014 EIA Regulations (as amended), the assessment of potential environmental and social impacts and benefits associated with any proposed activity that requires an EA dictates that Specialists (where relevant, depending on the nature and scale of the activity) be appointed. As a result, several Specialists have been appointed for the proposed project, in order to adequately identify and assess the potential impacts and benefits associated with the proposed project. Table 3-2 below includes the details of the Specialists that provided input into this EIAR.

Table 3-2: Details of the Independent Specialist Team

Discipline	Company	Name
Terrestrial Ecology	SAS Environmental	Stephen van Staden
Aquatic Ecology		
Avifauna	Chris van Rooyen Consulting	Chris van Rooyen
Soils, Agriculture and Land Potential	TerraAfrica Consultants CC	Mariné Pienaar – Blaauw
Heritage (including Palaeontology)	HCAC	Jaco van der Walt
Visual	Graham A Young Landscape Architect	Graham Young
Social	Equispectives Research and Consulting Services	Dr Ilse Aucamp
Traffic	Siyazi Group of Companies	Paul van der Westhuizen

As per the Regulation 1 (b) of Appendix 6 of the 2014 EIA Regulations (as amended), Declarations of Interest declaring the independence of each of the Specialists which investigated and assessed the impacts associated with the proposed project are included in Appendix 9 of this EIAR.

3.4 ASSUMPTIONS AND LIMITATIONS

The assumptions and/or limitations pertaining to this EIA process are listed below:

- It is assumed that SLR has been provided with all relevant project information and that it was correct and valid at the time it was provided;
- It is assumed that the project site identified for the construction and operation of the proposed project by Mainstream represents a technically feasible site for the construction and operation of a solar PV facility, which is based on the design undertaken by technical consultants on the project.

- There will be no significant changes to the project description or surrounding environment between the completion of the EIA process and implementation of the proposed project that could substantially influence findings and recommendations with respect to mitigation and management, etc.; and
- Should any future infrastructure being proposed within the study area trigger additional listed activities not included in this EIA process, a separate application process for EA would need to be undertaken and submitted to the relevant competent authority.

3.5 EIA PROCESS

3.5.1 Objectives

In accordance with Appendix 3 to the 2014 EIA Regulations (as amended), the objectives of the EIA process are to:

- Determine the policies and legislation relevant to the activity and document how the proposed activity complies with and responds to the policy and legislative context;
- Describe the need and desirability of the proposed activity in the context of the study area;
- Identify feasible alternatives related to the project proposal;
- Ensure that all potential key environmental issues and impacts that would result from the proposed project are identified;
- Assess potential impacts of the proposed project alternatives during the different phases of project development;
- Identify the most ideal location of the activity within the affected property based on the lowest level of environmental sensitivity identified during the assessment;
- Present appropriate mitigation or optimisation measures to avoid, manage or mitigate potential impacts or enhance potential benefits, respectively;
- Identify residual risks that need to be managed and monitored; and
- Provide a reasonable opportunity for I&APs to be involved in the BA process.

The undertaking of the above-mentioned activities as part of the EIA process ensures an informed, transparent, and accountable decision-making process by the Competent Authority. The EIA process consists of a series of steps to ensure compliance with these objectives and the 2014 EIA Regulations, as set out in GN R982 and as amended by GN R326. The process involves an open, participatory approach to ensure that all impacts are identified, and that decision-making takes place in an informed, transparent, and accountable manner. A flowchart indicating the generic EIA process is presented in Figure 3-1.

3.5.2 Pre-Application Authority Consultation and Notification

SLR attended a pre-application meeting with the DFFE on 19 January 2021. The purpose of this meeting was to provide the DFFE with an overview of the proposed Scafell Cluster Project and to obtain clarity on the legislative requirements, including the approach to the S&EIR[5] and EIA processes. This was done in order to ensure agreement on the way forward. Furthermore, the meeting also included a discussion regarding the proposed methodology to be followed for the undertaking of the specialist studies to support the applications for EA, as well as the public participation process being proposed to be undertaken.

[5] A S&EIR process has been undertaken separately for each of the solar PV facilities.

Summary of Pre-Application Meeting with DFFE

The DFFE indicated that the listed activities identified for the proposed project suffice and confirmed that they are the competent authority for all NEMA listed activities related to the development of renewable energy projects, in accordance with GN R779 of July 2016. The Department pointed out that should additional listed activities be triggered based on a review of detailed project-specific information; these activities should be included in an updated application form which should be submitted to the Department. The project team pointed out to the DFFE that a single and consolidated public participation process would be undertaken for the proposed Scafell Cluster Project, given their proximity to each other. The DFFE subsequently agreed with this approach and emphasized that consideration should be given to I&APs that would not necessarily have access to internet-enabled mobile phones, so that they are able to receive project-related information. The DFFE also requested that the project team submit the Public Participation (PP) Plan for consideration. The PP Plan submitted to the DFFE, as well as the proof of acceptance of the Plan by the Department, is included Appendix 3.1 of this EIAR.

The project team pointed out that due to the proximity of the proposed projects to each other, each specialist would produce a single specialist report for all the projects (i.e., one single report including separate impact assessments for the solar PV facilities and the grid connection infrastructure). The DFFE indicated that the approach was acceptable, however, it must be ensured that all project-specific information (i.e., mitigation and management measures for each project) are clearly stated and easily identifiable within the specialist reports.

3.5.3 Application for Environmental Authorisation

An 'Application Form for Environmental Authorisation' was submitted to the DFFE on **23 June 2021**, at the same time as making the draft version of the Scoping Report (i.e., the DSR) available for a 30-day review and comment period. Acknowledgement of receipt of the Application for Environmental Authorisation (EA) for the Ilikwa Solar PV Facility[6] was received from the DFFE on **25 June 2021**. Public Participation activities completed to date in support of the application for EA for the proposed project are outlined in Table 3-3 below.

[6] DFFE Reference No.: 14/12/16/3/3/2/2077

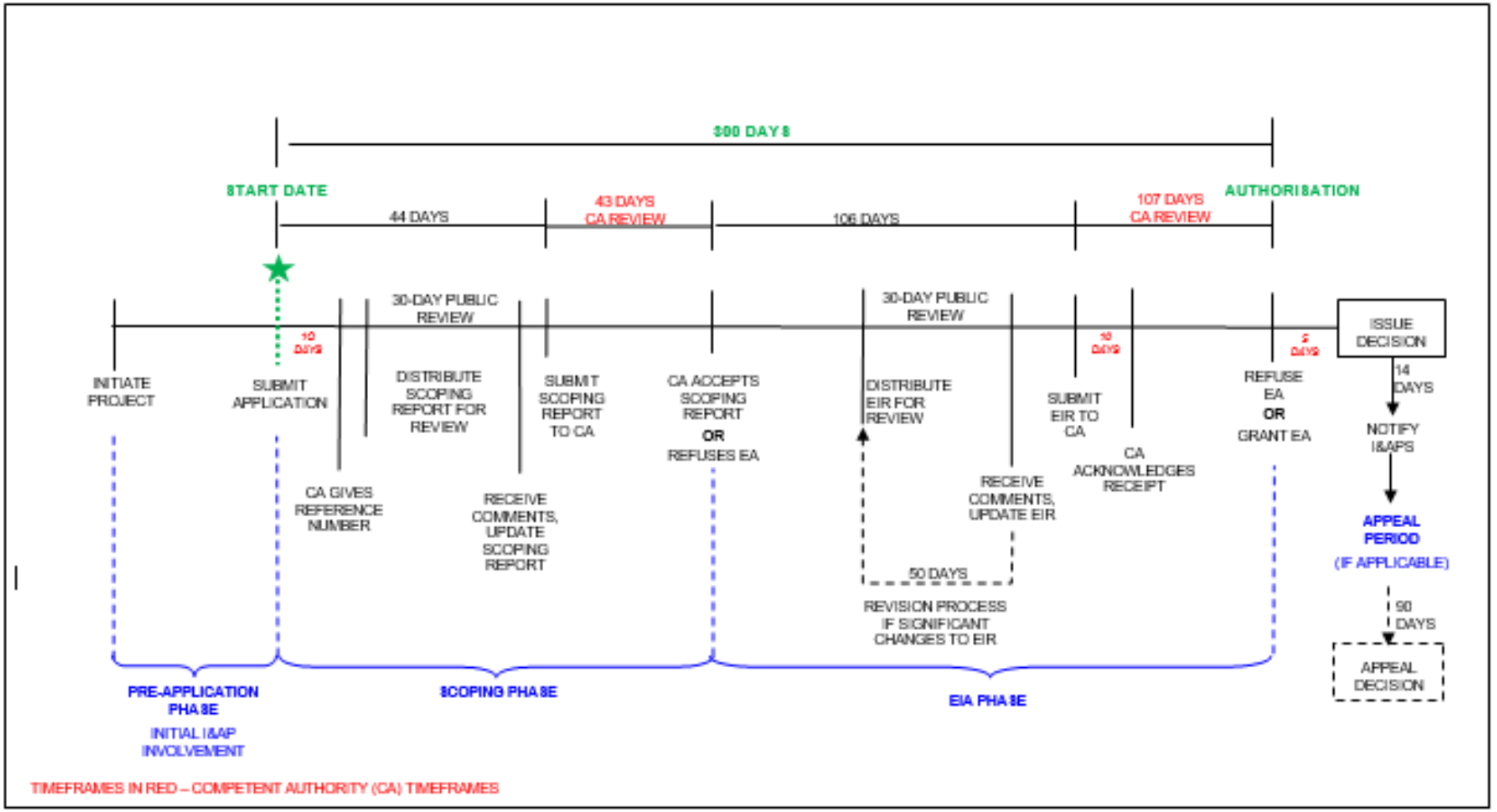

Figure 3-1: Flow Diagram of an EIA Process

Table 3-3: Public Participation tasks undertaken as part of the EIA process

TASKS UNDERTAKEN DURING AS PART OF THE PUBLIC PARTICIPATION PROCESS

- **I&AP Identification**

  The I&AP database has been developed through a process of obtaining information from SLR's existing stakeholder database of projects in the area, as well as liaison with potentially affected interested and/or affected parties within the surrounding area. Key stakeholders, including organs of state and affected and adjacent landowners, have been identified and registered on the database (see Appendix 3.2).

- **Advertisements and Site Notices**

  A newspaper advert, providing notification of the proposed project and the S&EIR and EIA processes, was placed on **23 June 2021,** at the start of the 30-day review and comment period for the Scoping Reports for each of the respective solar PV facilities. The advert was placed in the '*Vaal Week Blad*' local community newspaper (see Appendix 3.3). The advert included the details of the grid connection projects which are aimed at connecting each of the solar PV facilities to the ESKOM Scafell MTS. Site notices (in English) have also been placed at the entrances of the project site and in the town of Sasolburg, where there is a lot of foot traffic (filling stations, supermarkets etc.), in order to advertise the S&EIR and EIA processes being undertaken for the Scafell Cluster Project. Registered I&APs will be notified of the availability of the EIARs for review and comment at the start of the 30-day review and comment period, and where comments can be submitted.

3.5.4 Compilation of the EIA Report

This EIAR has been prepared in compliance with Appendix 3 of the 2014 EIA Regulations, as amended (see Table 3-4). This report aims to present all information in a clear and understandable format suitable for easy interpretation by I&APs, State Departments / Organs of State and competent and commenting authorities. It also provides an opportunity for I&APs to comment on the proposed project.

Table 3-4: Requirements of a EIAR in terms of the 2014 EIA Regulations (as amended)

Appendix 3	Content of the EIA Report	Completed (Y/N or N/A)	Location in report
2(a)	*(i & ii) Details and expertise of the EAP who prepared the report.*	Y	Section 3.1 Appendix 2
(b)	*The location of the activity, including:*	Y	Section 5.2
	(i) The 21-digit Surveyor General code of each cadastral land parcel;	Y	
	(ii) Where available, the physical address and farm name; and	Y	
	(iii) Where the required information in items (i) and (ii) is not available, the co-ordinates of the boundary of the property or properties.	N/A	

Appendix 3	Content of the EIA Report	Completed (Y/N or N/A)	Location in report
(c)	*A plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is:*	Y	Figure 1-2
	(i) A linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or	N/A	
	(ii) On land where the property has not been defined, the coordinates within which the activity is to be undertaken.	N/A	
(d)	*A description of the scope of the proposed activity, including:*	Y	Section 2.2 Table 2-2
	(i) All listed and specified activities triggered and being applied for;		
	(ii) A description of the associated structures and infrastructure related to the development.	Y	Chapter 5
(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.*	Y	Chapter 4
(f)	*A motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred location.*		
(g)	*A motivation for the preferred development footprint within the approved site.*	Y	Section 4.3.4
(h)	*A full description of the process followed to reach the proposed development footprint within the approved site, including:*	Y	Chapter 6
	(i) Details of the development footprint alternatives considered;		
	(ii) Details of the public participation process undertaken in terms of Regulation 41 of the Regulations, including copies of the supporting documents and inputs;	Y	Chapter 3
	(iii) A summary of the issues raised by I&APs, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	Y	To be included in the FEIAR
	(iv) The environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Y	Chapter 7
	(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.*	Y	Chapter 8

Appendix 3	Content of the EIA Report	Completed (Y/N or N/A)	Location in report
	(vi) The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;	Y	Appendix 10
	(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;	Y	Chapter 8
	(viii) The possible mitigation measures that could be applied and level of residual risk;		
	(ix) If no alternative development locations for the activity were investigated, the motivation for not considering such;	Y	Chapter 6
	(x) A concluding statement indicating the preferred alternative development location within the approved site;	Y	Chapter 9
(i)	*A full description of the process undertaken to identify, assess and rank the impacts the activity and associated infrastructure will impose on the preferred location through the life of the activity, including:*	Y	Chapter 8
	(i) A description of all environmental issues and risks that were identified during the EIA process; and		
	(ii) An assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.		
(i)	*An assessment of each identified significant impact and risk, including:* *(i) Cumulative impacts;* *(ii) The nature, significance and consequence of the impact and risk;* *(iii) The extent and duration of the impact and risk;* *(iv) The probability of the impact occurring;* *(v) The degree to which the impact and risk can be reversed;* *(vi) The degree to which the impact and risk may cause irreplaceable loss of resources; and* *(vii) The degree to which the impact and risk can be mitigated.*		
(k)	*Where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report.*	Y	Section 9.2
(l)	*An environmental impact statement which contains:*	Y	Section 9.2
	(i) A summary of the key findings of the EIA;		

Appendix 3	Content of the EIA Report	Completed (Y/N or N/A)	Location in report
	(ii) A map at an appropriate scale which superimposes the activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and	Y	Figure 9-2
	(iii) A summary of the positive and negative impacts of the proposed activity and identified alternatives.	Y	Section 9.2
(m)	*Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation.*	Y	Chapter 8 Appendix 7.1 Appendix 7.2
(n)	*The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment.*	Y	Chapter 8
(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.*	Y	Appendix 8
(p)	*A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed.*	Y	Chapter 3
(q)	*A reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation.*	Y	Section 9.2
(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.*	N/A	-
(s)	*An undertaking under oath or affirmation by the EAP in relation:* *(i) The correctness of the information provided in the report;* *(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 I&APs and any responses by the EAP to comments or inputs made by I&APs.*	Y	Appendix 1
(t)	*Where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts.*	N/A	-
(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*	N/A	-

Appendix 3	Content of the EIA Report	Completed (Y/N or N/A)	Location in report
	(ii) A motivation for the deviation.		
(v)	*Any specific information that may be required by the competent authority*	N/A	-
(w)	*Any other matters required in terms of section 24(4)(a) and (b) of the Act.*	N/A	-

3.5.5 Screening Tool and Specialist Studies

In accordance with GN R960 of 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 DFFE's national web-based screening tool[7] is considered compulsory for the submission of applications for EA, in terms of Regulations 19 and 20 of the 2014 EIA Regulations (as amended). The requirement of the submission of a Screening Report is triggered by the application for EA for the proposed project, as the application falls within the ambit of Regulation 19 of the 2014 EIA Regulations (as amended). The specialist assessments / themes, sensitivity ratings identified by the Screening Tool and, in accordance with GN R320 of 20 March 2020, the outcomes of the site verification are summarised in Table 3-5 below. The detailed findings of the specialist assessments relating to the outcome of the Site Sensitivity Verification is set out in the Site Sensitivity Verification reports (see Appendix 5). Where required, the specialist assessments will be undertaken in line with the requirements of GN R320 of 20 March 2020 (i.e., the "protocols"), including any updates thereto. Where no protocols have been provided, the specialist assessment will be undertaken in accordance with Appendix 6 of the 2014 EIA Regulations (as amended).

Table 3-5: Specialist Assessments and Sensitivity Ratings identified by the DFFE's web-based Screening Tool

Specialist Assessment / Theme	Sensitivity Rating as per Screening Report	Sensitivity Rating as per Specialist / EAP Verification	Response
Agriculture	High	Low to High	The north-eastern corner of the Ilikwa Solar PV Facility project site is deemed to be of high sensitivity, as a result of the soil suitability for crop production and the recent (within the last six years) cultivation of land for the establishment of pasture. The rest of project site is considered to be of low and medium sensitivity. A Soil and Agricultural Agro-Ecosystem Specialist Assessment has been undertaken and is included in Appendix 8.4.
Landscape / Visual Impact Assessment	Very High	Medium to Very High	The sensitivity of the study area's landscape is dependent on the character, quality, value, and capacity for change. In this context, the study area is deemed to comprise of areas with a low (power utility and sand mining areas), moderate (drainage lines, open farmland, and urban recreation development) and high sensitivity for the bush-covered low hills and the Vaal River (including its associated embankments).

[7] https://screening.environment.gov.za/screeningtool/#/pages/process

Specialist Assessment / Theme	Sensitivity Rating as per Screening Report	Sensitivity Rating as per Specialist / EAP Verification	Response
			A Visual Impact Assessment has been undertaken for the proposed project and is included in Appendix 8.7.
Archaeological and Cultural Heritage	Low	Low	Several heritage sites were identified by the Specialist during the field-based survey and include a cemetery and a large area characterised by a cluster of packed stone walled sites. From a palaeontological perspective, the Ilikwa Solar PV Facility project site is underlain by the lithologies of Karoo Supergroup – well known for being a host of fossils as well as coal deposits. According to the SAHRIS Palaeosensitivity Map, the project site is associated with a moderate to low sensitivity. Given that there are no paleochannels or rivers present within the broader study area, and there is a well-documented history within the surrounding area of historical mining activities, the possibility of locating fossils within the project site is deemed to be low. A Heritage Impact Assessment has been undertaken for the proposed project and is included in Appendix 8.5
Palaeontology	Very High	Low	The site for the proposed project is located within an area associated with low and moderate palaeosensitivity. A Palaeontological Impact Assessment has been undertaken and is included in Appendix 8.7.
Terrestrial Biodiversity	Very High	Medium	In accordance with the "*Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity",* as the Screening Tool identified the site as being of "very high sensitivity" for terrestrial biodiversity. A Terrestrial Biodiversity Assessment has thus been undertaken and is included in Appendix 8.1.
Aquatic Biodiversity	Low	Low	While the Screening Tool identified the site as being of "low sensitivity" for aquatic biodiversity, the freshwater specialist confirmed highlighted that the larger portion of the Ilikwa Solar PV Facility project site was considered to be modified as a result of current and historic cultivation and grazing by cattle. However, an unchanneled valley bottom wetland was identified, and it is located along the south west boundary of the project site. The wetland is considered to be largely natural and to be of a high ecological importance and sensitivity. Thus, an Aquatic Biodiversity Impact Assessment has been undertaken and is included in Appendix 8.2.
Avian (birds)	High	Low	The outcomes of the field-based survey by the specialist indicated that the project site is associated with a low sensitivity as no species of conservation concern (SCC) were identified within the project site. Furthermore, the project site is not located within an Important Bird Area (IBA). The recommendations of the site sensitivity verification report prepared by the Specialist required that a Compliance Statement be undertaken for the proposed project. Thus, the Compliance Statement is included in Appendix 8.3.
Civil Aviation	Low	Low	The South African Civil Aviation Authority (SACAA) has been identified as a key stakeholder on the project database and will be afforded an opportunity to provide comments of the relevant reports during the respective 30-day review and comment periods.

Specialist Assessment / Theme	Sensitivity Rating as per Screening Report	Sensitivity Rating as per Specialist / EAP Verification	Response
Defence	Low	Low	There are no military bases / facilities present within the vicinity of the study area. The nearest military base is Bloemspruit Air Force Base, located approximately 282 km south of the project site outside of Bloemfontein in the Free State Province. Thus, no further assessment is deemed necessary from a defence perspective.
RFI	Low	Low	The study area for the Scafell Cluster Project falls outside of the Karoo Central Astronomy Advantage Area (KCAAA). The South African Radio Astronomy Observatory (SARAO) has been identified as a key stakeholder on the project database and will be afforded with the opportunity to provide comments during the 30-day review and comment periods of this EIA process. No further assessment is deemed necessary.
Geotechnical	-	-	Mainstream will undertake a detailed Geotechnical Assessment of the preferred project site for the proposed project after the EIA process has been completed, prior to the commencement of the construction phase.
Plant Species	Medium	Medium	These requirements are addressed in the Terrestrial Biodiversity Impact Assessment included in Appendix 8.1 of the EIAR.
Animal Species	Medium	Medium	

Appendix 8 of this EIAR includes the Specialist Studies undertaken for the proposed project. All Specialist Studies undertaken involved the gathering of data (desktop and site verification, where required) relevant to ground-truthing and assessing environmental impacts that may occur as a result of the proposed project. The identified environmental impacts have been assessed in accordance with the SLR Impact Assessment Methodology (see Chapter 8). Specialists have also recommended appropriate mitigation or optimisation measures to minimise potential impacts or enhance potential benefits associated with the proposed project.

4. NEED & DESIRABILITY

The DFFE [known then as the Department of Environmental Affairs (DEA)] Guideline on Need and Desirability (GN R891, 2014) notes that while addressing the growth of the national economy through the implementation of various national policies and strategies, it is also essential that these policies take cognisance of strategic concerns such as climate change, food security, as well as the sustainability in supply of natural resources and the status of South Africa's ecosystem services. Thus, the over-arching framework for considering the need and desirability of development in general is taken at the policy level, through the identification and promotion of activities / industries / developments required by civil society as a whole. The DFFE guideline further notes that at a project level (i.e., as part of a BA process), the need and desirability of the project should take into consideration the content of regional and local plans, frameworks, and strategies.

Taking the above into consideration, this section of the report aims to provide an overview of the need and desirability for the proposed Scafell Cluster Project, by highlighting how the proposed project is aligned with the strategic context of international, national, regional, and local development policy and planning, as well as broader societal needs (as appropriate).

4.1 INTERNATIONAL POLICY AND PLANNING FRAMEWORK

4.1.1 United Nations Framework Convention on Climate Change and Kyoto Protocol

The United Nations Framework Convention on Climate Change (UNFCCC, 1992) is an international environmental treaty aimed at addressing climate change, which was negotiated and signed by 154 countries at the United Nations Conference on Environment and Development (UNCED), informally known as the 'Earth Summit', held in Rio de Janeiro (Brazil) from 3 to 14 June 1992. The primary objective of this international environmental treaty is to stabilize greenhouse gas emissions in the atmosphere to a level that prevents harmful / dangerous human-induced interference with the earth's climate system. The treaty places an obligation on signatory countries such as South Africa to adopt national policies and take measures to mitigate the impacts of climate change by limiting their anthropogenic (i.e., man-made) emissions of greenhouse gases, as well as to report on the steps undertaken to return their emissions to pre-1990 levels. The treaty called for on-going scientific research and regular meetings, negotiations and future policy agreements designed to allow ecosystems to adapt naturally to climate change, in order to enable economic development to proceed in a sustainable manner. In addition, the treaty requires more developed economies (such as the United States of America) to provide financial resources to meet the costs incurred by developing nations (such as South Africa) in complying with their obligations to produce national inventories of their emissions.

The UNFCCC (1992) laid the foundation for the implementation of the Kyoto Protocol, which was signed by Parties in 1997 and enforced in 2005. In 2016, the UNFCCC was superseded by the 2016 Paris Agreement, which is a legally binding international treaty on climate change.

The Kyoto Protocol (1998) marked the implementation of the first measures of the UNFCCC and applies to six (6) greenhouse gases, namely Carbon Dioxide (CO_2); Methane (CH_4); Nitrous Oxide (N_2O); Hydrofluorocarbons (HFCs); Perfluorinated Compounds (PFCs) and Sulfur Hexafluoride (SF_6). The protocol primarily puts into operation the aims of the UNFCCC (1992) by committing industrialised countries and

economies in transition to limit and reduce their greenhouse gas emissions, in accordance with the agreed individual targets. The protocol requires signatories to adopt policies, measures on mitigation and to report greenhouse gas emissions periodically[8]. South Africa is the world's 14th largest emitter of greenhouse gases and accounts for the highest emissions of CO_2 in Africa[9]. South Africa's emissions are a result of its reliance on the combustion of fossil fuels (such as coal) for the generation of electricity. In 2019, South Africa emitted approximately 478.61 million tonnes of CO_2 annually, with 279.9 million tonnes of this as a result of electricity generation[10].

In order to fulfil the requirements of the UNFCCC (1992) and the Kyoto Protocol (1998), the South African government has developed legislation and policy to provide the framework for indicating how commitments to reduce greenhouse gas emissions will be met. These policies include the National Climate Change Response Policy (2011), Draft Climate Change Bill (2018) and the Carbon Tax Act (Act No. 15 of 2019). These policies are explored further in Section 4.2 of this EIAR. Taking the above into consideration, the proposed development of the Scafell Cluster Project will generate at least 550 MW_{ac} of electricity from renewable energy (namely solar energy), thereby reducing government reliance on electricity generation from the combustion of fossil fuels, which leads to the inevitable release of greenhouse gases such as CO_2 into the atmosphere. From this perspective, taking the information above into consideration, the proposed Scafell Cluster Project is in alignment with the obligations placed on South Africa in response to climate change through the UNFCCC (1992) and the Kyoto Protocol (1998).

4.1.2 Paris Agreement

The United Nations Framework Convention on Climate Change (UNFCCC, 1992) is an international environmental treaty aimed at addressing climate change, which was negotiated and signed by 154 countries at the United Nations Conference on Environment and Development (UNCED), informally known as the 'Earth Summit', held in Rio de Janeiro (Brazil) from 3 to 14 June 1992. The primary objective of this international environmental treaty is to stabilize greenhouse gas emissions in the atmosphere to a level that prevents harmful / dangerous human-induced interference with the earth's climate system. The treaty places an obligation on signatory countries such as South Africa to adopt national policies and take measures to mitigate the impacts of climate change by limiting their anthropogenic (i.e., man-made) emissions of greenhouse gases, as well as to report on the steps undertaken to return their emissions to pre-1990 levels. The treaty called for on-going scientific research and regular meetings, negotiations and future policy agreements designed to allow ecosystems to adapt naturally to climate change, in order to enable economic development to proceed in a sustainable manner. In addition, the treaty requires more developed economies (such as the United States of America) to provide financial resources to meet the costs incurred by developing nations (such as South Africa) in complying with their obligations to produce national inventories of their emissions.

The UNFCCC (1992) laid the foundation for the implementation of the Kyoto Protocol, which was signed by Parties in 1997 and enforced in 2005. In 2016, the UNFCCC was superseded by the 2016 Paris Agreement, which is a legally binding international treaty on climate change.

[8] What is the Kyoto Protocol? | UNFCCC. Accessed on 7 April 2021
[9] The Carbon Brief Profile: South Africa | Carbon Brief. Accessed on 7 April 2021
[10] https://ourworldindata.org/co2/country/south-africa. Accessed on 7 April 2021

The Kyoto Protocol (1998) marked the implementation of the first measures of the UNFCCC and applies to six (6) greenhouse gases, namely Carbon Dioxide (CO_2); Methane (CH_4); Nitrous Oxide (N_2O); Hydrofluorocarbons (HFCs); Perfluorinated Compounds (PFCs) and Sulfur Hexafluoride (SF_6). The protocol primarily puts into operation the aims of the UNFCCC (1992) by committing industrialised countries and economies in transition to limit and reduce their greenhouse gas emissions, in accordance with the agreed individual targets. The protocol requires signatories to adopt policies, measures on mitigation and to report greenhouse gas emissions periodically[11]. South Africa is the world's 14th largest emitter of greenhouse gases and accounts for the highest emissions of CO_2 in Africa[12]. South Africa's emissions are a result of its reliance on the combustion of fossil fuels (such as coal) for the generation of electricity. In 2019, South Africa emitted approximately 478.61 million tonnes of CO_2 annually, with 279.9 million tonnes of this as a result of electricity generation[13].

In order to fulfil the requirements of the UNFCCC (1992) and the Kyoto Protocol (1998), the South African government has developed legislation and policy to provide the framework for indicating how commitments to reduce greenhouse gas emissions will be met. These policies include the National Climate Change Response Policy (2011), Draft Climate Change Bill (2018) and the Carbon Tax Act (Act No. 15 of 2019). These policies are explored further in Section 4.2 of this EIAR. Taking the above into consideration, the proposed development of the Scafell Cluster Project will generate at least 550 MW_{ac} of electricity from renewable energy (namely solar energy), thereby reducing government reliance on electricity generation from the combustion of fossil fuels, which leads to the inevitable release of greenhouse gases such as CO_2 into the atmosphere. From this perspective, taking the information above into consideration, the proposed Scafell Cluster Project is in alignment with the obligations placed on South Africa in response to climate change through the UNFCCC (1992) and the Kyoto Protocol (1998).

4.2 NATIONAL POLICY AND PLANNING FRAMEWORK

4.2.1 Energy White Paper, 1998

The 1998 White Paper on the Energy Policy of the Republic of South Africa is the primary policy document which guides all subsequent policies, strategies, and legislation within the energy sector. It provides specific policy statements on what government intends for the energy system as a whole and sets out five (5) key objectives. These objectives have subsequently formed the foundation of and informed the development of energy policy in South Africa and remain relevant. Various other energy policies have been developed and are in different stages of implementation. Some of the key policies developed following the 1998 White Paper on Energy Policy include the following:

- The White Paper on Renewable Energy, 2003;
- The National Energy Efficiency Strategy of the Republic of South Africa, 2008; and
- The Integrated Resources Plan 2010.

The proposed Scafell Cluster Project will have a total generating capacity of up to 550 MW_{ac}, which will be added to the national electricity grid. This capacity will, through the REIPPPP, aid the South African

[11] What is the Kyoto Protocol? | UNFCCC. Accessed on 7 April 2021
[12] The Carbon Brief Profile: South Africa | Carbon Brief. Accessed on 7 April 2021
[13] https://ourworldindata.org/co2/country/south-africa. Accessed on 7 April 2021

government in meeting its targets of ensuring energy security and supply, as per the objectives of the provisions of the 1998 White Paper on Energy Policy.

4.2.2 Integrated Energy Plan, 2016

The development of a National Integrated Energy Plan (IEP, 2016) was envisaged in the White Paper on the Energy Policy of the Republic of South Africa of 1998, and in terms of the National Energy Act, 2008 (No. 34 of 2008), which places an obligation on the Minister of the DMRE to publish the IEP in the Government Gazette. The intention of the IEP is to provide a roadmap of the future of the energy landscape for South Africa, which guides future energy infrastructure investments and policy development. The National Energy Act requires the IEP to have a planning horizon of no less than 20 years. The development of the IEP is therefore a continuous process as it needs to be reviewed periodically in order to consider changes in the macro-economic environment, developments in new technologies and changes in national priorities and imperatives. As a fast-emerging economy, South Africa needs to balance the competing need for continued growth with its social needs and the protection of the natural environment. South Africa needs to grow its energy supply to support economic expansion and in so doing, alleviate supply bottlenecks and supply-demand deficits. In addition, it is essential that all citizens are provided with clean and modern forms of energy at an affordable price. From the numerous factors which had to be considered and addressed during the Integrated Planning Process, eight (8) key objectives were identified, as follows:

- Objective 1: Ensure security of supply;
- Objective 2: Minimise the cost of energy;
- Objective 3: Promote the creation of jobs and localisation;
- Objective 4: Minimise negative environmental impacts from the energy sector;
- Objective 5: Promote the conservation of water;
- Objective 6: Diversify energy supply sources and primary sources of energy;
- Objective 7: Promote energy efficiency in the economy; and
- Objective 8: Increase access to modern energy.

In the 2016 Draft version, the IEP indicates the South Africa is endowed with renewable energy resources in the form of solar irradiation and wind in coastal and mountainous areas, which have in the past remained unused. In addition, the country receives a substantial amount of sunlight to support a sustainable solar power industry. The Northern Cape Province is considered one (1) of the world's highest solar irradiation areas in the world. The IEP indicates that the daily solar irradiation in South Africa varies between 4.5 and 6.5 kilowatt hours per square meter (KWh/m^2). The total area of high solar irradiation in South Africa amounts to 194 000 km^2, including the Northern Cape Province. With electricity per square kilometre of mirror surface in solar power station being 30.2 MW, and just 1 % of the high radiation area in the country being made available for solar power generation, the generation potential is approximately 64 gigawatts (GW). Solar energy has the potential to contribute substantially to South Africa's future energy needs. This would, however, require large investments in transmission lines from areas of high radiation, such as the Northern Cape Province, and the main electricity consumer centres.

The proposed Scafell Cluster Project is aligned with the principles of the IEP by exploring renewable energy sources in the country in order to ensure a security of supply to promote the creation of jobs whilst minimising negative environmental impacts within the energy sector. Solar PV facilities have limited water

requirements in comparison to other energy generation technologies, such as coal-fired power stations, which further supports the objectives of the IEP regarding the promotion of water conservation. As a result, the construction and operation of the proposed project supports the objectives of the IEP from a needs and desirability perspective.

4.2.3 Integrated Resources Plan, 2019

The Integrated Resource Plan (IRP), a subset of the IEP, which was published in 2010 and promulgated in March 2011, is an electricity capacity plan which aims to provide an indication of the country's electricity demand, as well as how this demand will be supplied and how much this will cost. The recent IRP 2019 supports a diverse energy mix and presents policy interventions to ensure energy security for South Africa's electricity supply. Following the promulgation of the IRP in 2010, a total of 18 000 MW of new generation capacity has been committed. This comprises 9 564 MW of coal power from the Medupi and Kusile power stations, 1 332 MW from the Ingula Pump Storage Project, 6 422 MW from renewable energy facilities and Independent Power Producers (IPPs) and 1 055 MW from Open Cycle Gas Turbine Peaking Plants that will make use of diesel[14]. Through the IRP 2019, government recognises that coal will continue to play a significant role in electricity generation given the abundance of coal reserves. However, the existing Eskom fleet of coal-fired power stations will be decommissioned until 2030, and only then will 1 500 MW be procured from coal-fired power sources. From a renewable energy perspective, government has allocated 6 000 MW of new capacity to be procured from solar PV facilities between 2022 and 2030. Figure 4-1 below illustrates a snapshot of South Africa's energy mix to date, as presented in the IRP 201915.

In line with the IRP 2019, the DMRE launched a Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP) in August 2020[16] in order to fill the current 2 000 MW short-term supply gap of electricity between 2019 and 2022, to alleviate supply constraints and to reduce the extensive need of diesel-based peaking electrical generators. Due to the nature of the RMIPPPP, the objective of the DMRE was to procure energy from projects that were near ready. By December 2020, at least 28 "bidders" with near ready projects submitted bids to the DMRE, in order to potentially supply the required 2 000 MW of electricity. These projects comprised gas, solar, wind and hybrid energy[17] projects. In March 2021, the DMRE announced eight (8) successful preferred "bidder" projects which would supply 2 000 MW to the national electricity grid. Following the announcement of the preferred "bidders" for the RMIPPPP, the DMRE announced further Request for Proposals (RFPs) for the procurement of an additional 2 600 MW of electricity from renewable energy sources. This will be issued as part of the upcoming "Bidding" Round 5 of the REIPPPP[18]. "Bidding" Round 5 will comprise 1 600 MW of electricity from wind and 1 000 MW from solar PV facilities.

[14] **What you need to know: South Africa's Integrated Resource Plan 2019 (miningreview.com)**. Accessed on 7 April 2021.
[15] **Cliffe Dekker Hofmeyr - The Integrated Resource Plan 2019: A promising future roadmap for generation capacity in South Africa**. Accessed on 7 April 2021.
[16] **IPP Risk Mitigation (ipp-rm.co.za)**. Accessed on 7 April 2021.
[17] Refers to facilities that utilise an integration of several types of energy generation equipment such as electrical energy generators, electricity energy storage systems, and renewable energy sources.
[18] **The preferred bidders for the RMIPPPP - Gwede Mantashe - NEWS & ANALYSIS | Politicsweb**. Accessed on 7 April 2021.

	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 4-1: Snapshot of the IRP 2019

The proposed Scafell Cluster Project has a total generating capacity of up to 550 MW_{ac}, which would assist in achieving the targets set out in the IRP. It is understood that Mainstream will "bid" the projects into the REIPPPP or in other renewable energy "bidding" programmes for Independent Power Producers (IPPs), upon receiving a positive EA from the DFFE. Considering that the project will utilise solar PV technology in order to generate electricity, the proposed project is therefore aligned with the targets of the IRP 2019 for the procurement of 6 000 MW of electricity from solar PV facilities by 2030.

4.2.4 Renewable Energy Independent Power Producer Procurement Programme

The Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) is a competitive tender process that was launched to facilitate private sector investment into grid-connected renewable energy generation. Through the REIPPPP, government intends to enhance its power generation capacity, reduce reliance on the combustion of fossil fuels (such as coal) for the generation of electricity, stimulate an indigenous renewable energy industry and contribute to socio-economic development and environmentally sustainable growth. The programme supports the implementation of the National Development Plan (NDP, 2030) and is centred on the procurement of electricity produced by the private sector through IPPs. Technologies such as solar PV, amongst others, are currently considered under the programme, as the IRP 2019 has made an allocation for the procurement of up to 6 000 MW of electricity from solar PV facilities.

The programme evaluates projects through various criteria which include job creation, local content, enterprise development and socio-economic development. The requirement from each criterion is summarised below.

- ***Job Creation***

  Under the REIPPPP, this criterion requires IPPs to disclose the percentage of the project's total jobs that will be awarded to South African citizens, especially historically disadvantaged community members within communities where projects are located (Eberhard, 2015). The Scafell Cluster Project will provide at least 3 980 employment opportunities[19] for the duration of the construction and operation phase of the project. These employment opportunities will be provided to local communities within the vicinity of the study area.

- ***Local Content***

  This criterion requires IPPs to spend a certain percentage of the total project value in South Africa, in order to ensure that the country derives positive economic benefits from the implementation of these projects. To date, REIPPPP projects have attracted at least USD 20.5 billion in investment into the South African economy. With regards to the proposed Scafell Cluster Project, at least 45 % of the Capital Expenditure from the project will be spent in South Africa.

- ***Enterprise Development***

  This criterion intends to direct investment from IPPs towards Exempted Micro Enterprises and Qualifying Small Enterprises that are owned by historically disadvantaged women. Since its inception, the REIPPPP has directed at least R6 billion towards enterprise development (Eberhard and Naude, 2015).

- ***Socio-economic Development***

  This criterion aims to direct funding to socio-economic initiatives in such a way that a project has a positive socio-economic impact on an area. This is done by funding initiatives and projects related to improvements in healthcare, infrastructure, and education. This criterion requires that funding for this be directed towards initiatives within the project area. IPPs are required to spend a threshold of 1 % of the project revenue towards these initiatives, with a target of up to 1.5 %. According to Eberhard and Naude (2015), R9.3 billion was pledged to socio-economic developments in "Bidding" Round 4.

  Taking the above into consideration, socio-economic initiatives with focus on improving healthcare, infrastructure, and education within the study area of the Scafell Cluster Project will derive positive economic benefits from the implementation of the project through this criterion, especially as IPPs are required to meet this criterion under the REIPPPP.

4.2.5 Renewable Energy Development Zones and Strategic Transmission Corridors

In 2015, the DFFE (then known as the DEA), through the Council for Scientific and Industrial Research (CSIR), embarked on a programme of Strategic Environmental Assessments (SEAs) for large-scale developments to

[19] This will be subject to all four solar PV facilities and grid connection infrastructure being granted environmental authorisations by the DFFE and awarded preferred bidder status under the REIPPPP.

support Strategic Integrated Projects (SIPs). The intention of the SEAs was to pre-assess environmental sensitivities within development areas at a regional scale in order to simplify site-specific EIAs when they are undertaken and to focus the assessment on addressing the specific sensitivities of the site. The outcome of the programme led to the identification of eight (8) Renewable Energy Development Zones (REDZ) meant for the development of large-scale wind and solar renewable energy facilities in terms of SIP 8: Green Energy in Support of the South African Economy, as well as the associated Strategic Transmission Corridors meant for the development of grid connection infrastructure (power lines and substation) in terms of SIP 10: Electricity Transmission and Distribution. Following the undertaking of further SEAs by the CSIR, the DFFE (through GN R144 which was published on 26 February 2021) identified three (3) additional REDZs for the development of large-scale wind and solar renewable energy facilities. These three (3) additional REDZs are within the Mpumalanga, North West, and Western Cape Provinces. The additional REDZs which have been identified and formally gazetted include the Emalahleni REDZ (REDZ 9), Klerksdorp REDZ (REDZ 10) and Beaufort West REDZ (REDZ 11). Furthermore, in 2021 the DFFE issued GN R383 (published on 29 April 2021) which identifies two (2) additional Strategic Transmission Corridors within the Northern Cape and KwaZulu-Natal Provinces for the development of large-scale grid connection infrastructure. The identified Strategic Transmission Corridors include the Expanded Western Corridor and Expanded Eastern Corridor.

Should a proposed renewable energy project (such as this project) fall within one (1) of the eleven (11) REDZs which have formally been gazetted in South Africa, a BA process can be followed instead of a full Scoping and EIA process. In addition, a reduced decision-making timeframe (namely 57 days, as opposed to 107 days) for processing of applications for EA by the competent authority (namely the DFFE) will be applicable. With regards to the Strategic Transmission Corridors, a BA process and reduced decision-making timeframe will also be applicable should the entire extent of the grid connection infrastructure (power lines and/or substations) being proposed be located within one (1) of the Strategic Transmission Corridors which have formally been gazetted in South Africa.

It should be noted that the solar PV facilities which form part of the proposed Scafell Cluster Project are not located within any of the eleven (11) REDZs which have formally been gazetted in South Africa. As a result, the Application for EA for the proposed project requires the undertaking of a full Scoping and EIA process, in accordance with Regulation 21 – 24 of the 2014 EIA Regulations (as amended). In addition, the application will be considered within a period of 107 days from the day of acknowledgment of receipt of the final EIAR by the DFFE.

The proposed grid connection corridor (which is being assessed within a separate BA process) which forms part of the proposed project is however located within one (1) of the Strategic Transmission Corridors, namely the Central Corridor (see Figure 4-2). However, due to the capacity of the grid connection infrastructure being below 275 kV, the proposed project does not fulfil the requirements of GN R118 of 2018. As such, the proposed project is thus subject to a BA process in accordance with Regulation 19 and 20 of the 2014 EIA Regulations (as amended).

4.2.6 National Climate Change Response Strategy

The need for a National Climate Change Response Strategy was recognised as an urgent requirement by government during the ratification process of the UNFCCC in 1997. The document notes that climate change is a '*cross cutting issue that affects the entire economy as well as many specific sectors including energy,*

transport, agriculture, water resources management and provision of water services and health'. The aim of the strategy is to promote and maximise the integration of the government department programmes whilst minimising negative impacts associated with climate change.

Taking into consideration that South Africa is the largest emitter of greenhouse gas emissions on the continent and 14th worldwide, as well as the fact that majority of these emissions are from electricity generation through the combustion of fossil fuels (such as coal), the proposed Scafell Cluster Project will positively contribute towards the reduction in greenhouse gas emissions - a key objective of the National Climate Change Response Strategy. The proposed Scafell Cluster Project is therefore considered to be aligned with the aims of the National Climate Change Response Strategy

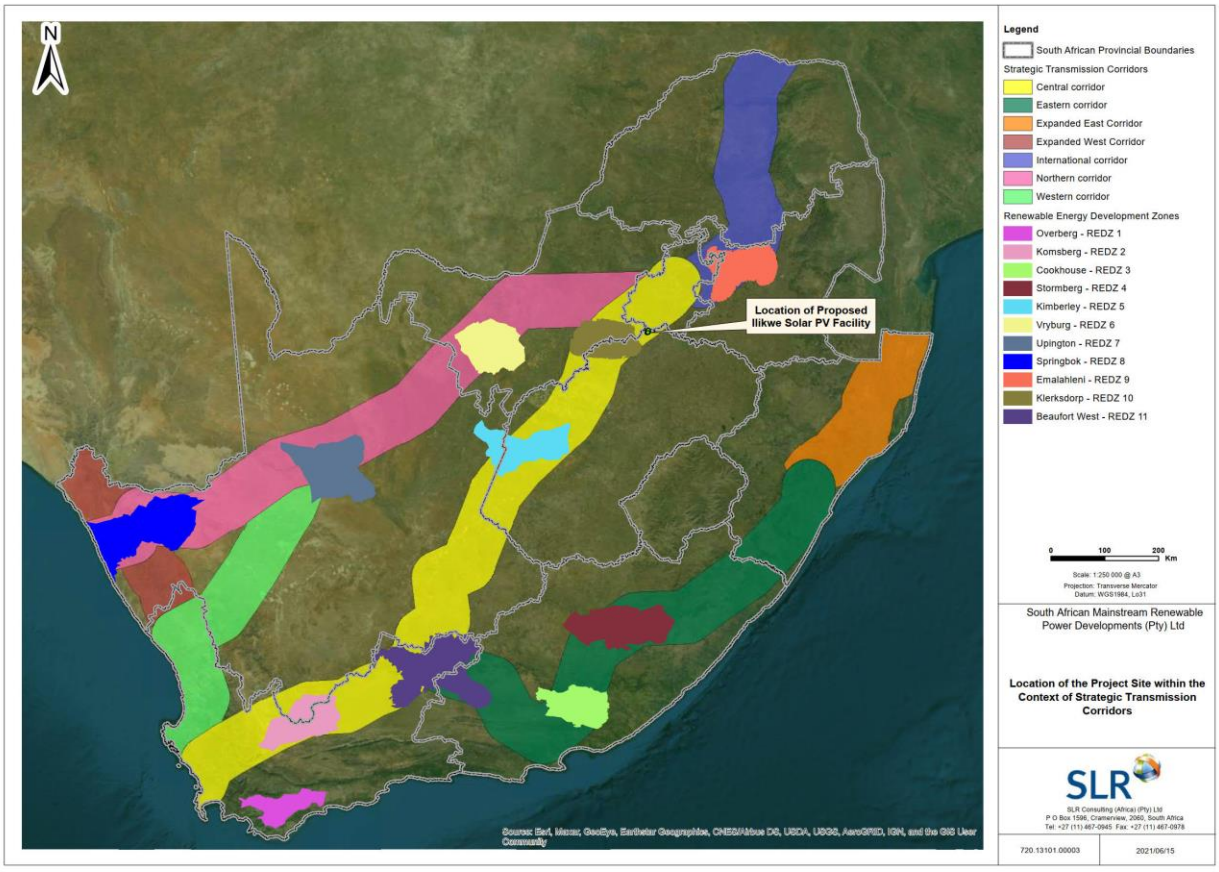

Figure 4-2: Location of the study area within the context of the REDZ and Strategic Transmission Corridor

4.3 REGIONAL, LOCAL POLICY AND PLANNING FRAMEWORK

A summary of provincial and local planning policies in the Free State Province aligned to the proposed project as well the suitability of the study area for the development of solar PV facilities and grid connection infrastructure are described below. The proposed construction and operation of the Scafell Cluster Project is considered to be in alignment with provincial and local planning policies of the Free State Province although the contributions to planning objectives from the proposed project will be negligible.

4.3.1 Free State Provincial Growth and Development Strategy, 2005 – 2014

The objectives of the Free State Provincial Growth and Development Strategy include the following:

- Stimulate economic development;
- Develop and enhance the infrastructure for economic growth and social development;
- Poverty alleviation through human and social development;
- Ensure a safe and secure environment for all the people of the province; and
- Promote effective and efficient governance and administration.

The construction and operation of the proposed Scafell Cluster Project is aligned to the objectives of the Free State Provincial Growth and Development Strategy, as the implementation of the project will stimulate the local economy within the towns Sasolburg and Parys. Stimulation of the local economy will be as a result of the creation of employment and business opportunities for residents within the vicinity of the study area. The project will require numerous support services which can be rendered by Small Medium and Micro Enterprises (SMMEs) within the surrounding area during the construction and operation phase. Support services that will be required and can be provided by the SMMEs within the project area include, waste and sewage removal, security services, transportation of staff and the supply of construction material (i.e., sand and cement).

4.3.2 Fezile Dabi District Municipality Reviewed Integrated Development Plan, 2010 - 2021

The vision statement of the Fezile Dabi District Municipality IDP (2010 - 2011) states, '*Improving the lives of citizens and progressively meeting their basic, social and economic needs, thereby restoring community confidence and trust in government'*. With regards to electricity and energy, the IDP indicates that approximately 11 926 households do not have access to electricity within the municipal area of the Fezile Dabi District Municipality. The IDP further indicates that the electricity, gas, and water sectors within the District Municipality provide the least employment opportunities, contributing approximately 1 %. In addition, the IDP states that the Fezile Dabi District Municipality has made provision for three (3) electrification projects to be implemented within its municipal area between 2020 – 2021.

Given that at least 11 926 households do not have access to electricity within the municipal area of the Fezile Dabi District Municipality, the addition of 550 MW_{ac} of electricity from the Scafell Cluster Project will provide much needed capacity to the electricity grid and aid the municipality in meeting some of its targets aimed at the electrification of communities. The development of the proposed project will ensure that the 550 MW_{ac} of electricity from the proposed solar PV facilities which form part of the Scafell Cluster Project is added to the national electricity grid, which will be made available to industries, businesses, and residents. Furthermore, indirect positive socio-economic benefits of the proposed project (namely project expenditure within the surrounding area and employment opportunities for residents) will negligibly contribute to the Fezile Dabi District Municipality's economy. As a result, the proposed project is considered to be in alignment with the objectives of the district municipality's IDP.

4.3.3 Ngwathe Local Municipality Reviewed Integrated Development Plan, 2020 – 2021

The Ngwathe Local Municipality IDP (2020 – 2021) indicates that the municipality has a 35 % unemployment rate, which is equivalent to approximately 19 643 residents. The IDP further indicates that approximately 1 835 households within the municipal area do not have access to electricity. The construction and

operation of the proposed Scafell Cluster Project, with a generation capacity of up to 550 MW_{ac}, will add much needed capacity to the electricity grid and positively contribute towards the electrification of households without electricity within the municipal area. Although negligible, the employment opportunities associated with the construction and operation phases of the proposed project will contribute towards the stimulation of the local economy, through the creation of employment and business opportunities for unemployed residents within the municipal area.

Taking into consideration the need for electricity within the municipality and the high unemployment rate, the implementation of the Scafell Cluster Project will enable the municipality in reaching some of its key objectives, as outlined in the IDP (2020 – 2021). As a result, the project is considered to be aligned with the goals / aims / objectives of the IDP for the Ngwathe Local Municipality (2020 – 2021).

4.3.4 Site Suitability

The identification and selection of the site as a suitable area for the development of the Scafell Cluster Project was determined based on the levels of solar irradiation, topography, extent of the area available for development and the proximity of the site to the nearest grid connection point. From a technical perspective, the project site identified for development is considered to be feasible for the development of solar PV facilities with a total generating capacity of up to 550 MW_{ac}. The site-specific characteristics for the project site that support the development of solar PV facilities are described below:

Solar Irradiation

The project site is associated with Global Horizontal Irradiation (GHI) values of approximately of 5.648 KWh / m^2 per day and a PV potential of 2 251 KWh / m^2 (see Figure 4-3). Based on these values, the development of solar PV facilities on the site is considered highly desirable from a technical perspective.

Topography

The project site is associated with a flat topography, with average slope of 3.2 % and an approximate elevation of 1 400 m above sea level. The topography of a project site is critical as it informs the nature and level of foundations required for the mounting structures of the PV panel modules and other project infrastructure. It also has an impact on the total output of energy generated from the facility. Although the nature of the topography on the project site will be investigated further through detailed geotechnical investigations, based on the outcomes of the Preliminary Engineering Assessment (BVi Consulting Engineers, 2021), the flat nature of the topography associated with the project site is considered feasible for the placement of the proposed Scafell Cluster Project.

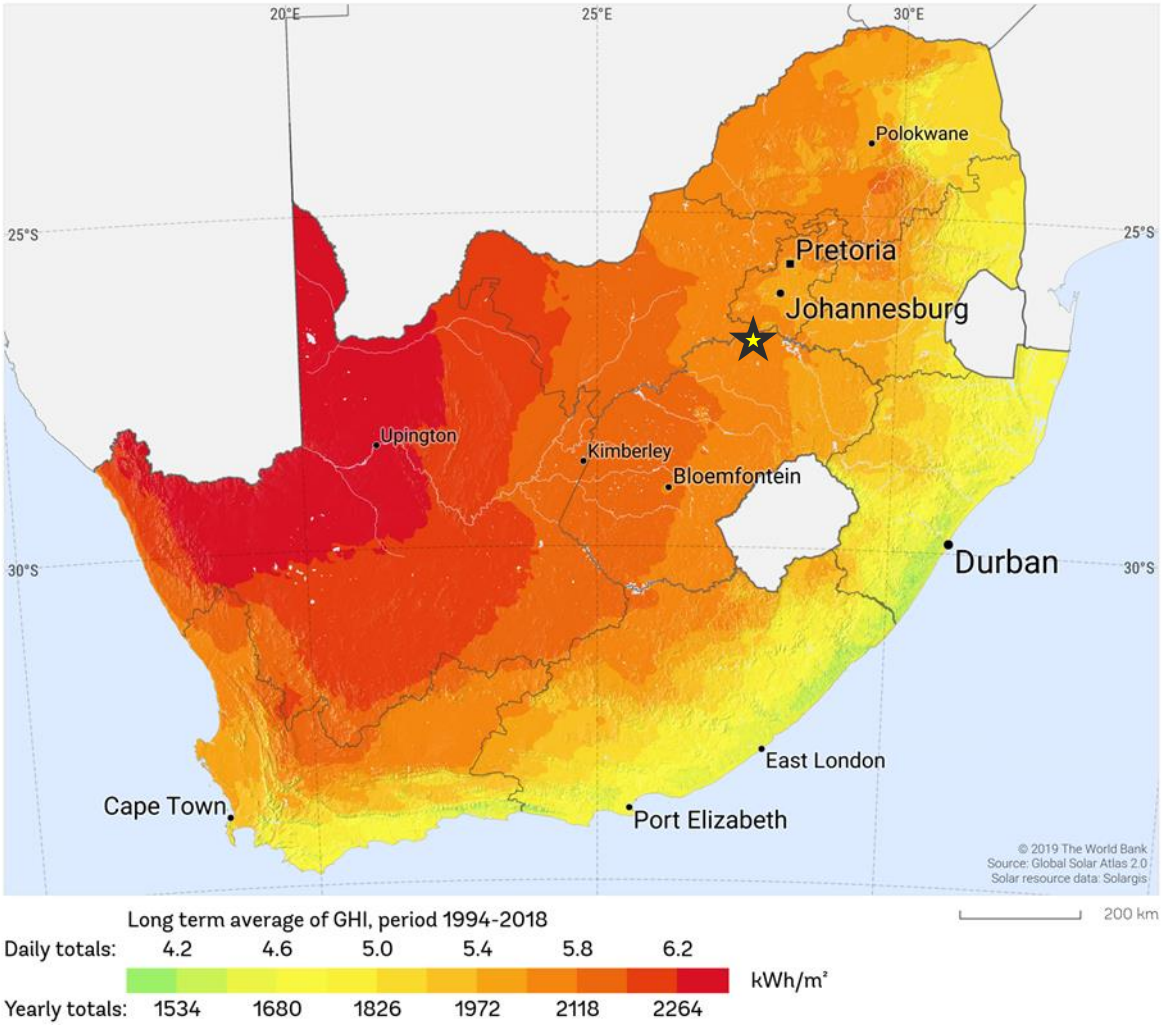

Figure 4-3: Global Horizontal Irradiation (GHI) Map showing the approximate location of the project site ('Yellow Star')

Extent of the area available for development

The project site for the placement of the Ilikwa Solar PV Facility comprises of the property Portion 5 of the Farm Proceederfontein 100. The property has an extent of up to 276.85 ha. The Ilikwa Solar PV Facility will have a total development footprint[20] of up to 180 ha, which is approximately 60 % of the total extent of the property. As a result, the extent of the area available for development is considered sufficient for the placement of the Ilikwa Solar PV Facility.

Access to a grid connection point

The ESKOM Scafell MTS has been identified by Mainstream as the nearest grid connection point to be utilised to connect the solar PV facilities into the grid. The substation has a capacity of up to 132 / 275 kV and following discussions between Mainstream and ESKOM, the substation has sufficient capacity to support the grid connection from the solar PV facilities of the Scafell Cluster Project. Furthermore, it is understood that upgrades in the form of new transformers and other components will be made to the ESKOM Scafell MTS in order to accommodate the Scafell Cluster Projects. The study area has also already

[20] The actual area to be disturbed for the placement of infrastructure for the solar PV facility.

seen some form of transformation / disturbance as several existing transmission lines have already been constructed within the vicinity of the project site. Existing transmission lines present (see Table 4-1) within the vicinity of the project site being proposed for the Ilikwa Solar PV Facility and the ESKOM Scafell MTS include the following:

Table 4-1: Existing grid connection infrastructure within the vicinity of the project site

Name	Capacity (kV)
Scafell Main Transmission Substation	275 / 132
Eiland Rural – Scafell Transmission Lines	132
Scafell - West Wits Transmission Line	132
Scafell - West Wits 2 Transmission Line	132
Bernina - Leeudoring Shaft / Scafell Transmission Line	132
Lochvaal Rural / Scafell Transmission Line	132
Scafell - Tahiti Transmission Line	132
Midland - Scafell 1 Transmission Line	132
Mercury – Zeus 1 Transmission Line	765
Olympus – Scafell 1 Transmission Line	275
Scafell – Snowdown 1 Transmission Line	275
Makalu – Scafell 1 Transmission Line	275

For the proposed project, two alternative grid connection corridors[21] have been identified and being assessed through a separate BA process. Through the assessment of a 150 m wide and up to 2.3 km long grid connection corridors that are wider than the transmission line servitude (up to 31 m), Mainstream is thus able to avoid sensitive environmental features present and optimally place the grid connection infrastructure in the area. The assessment of a wider grid connection corridor is in line with the mitigation hierarchy – avoid, minimise, and mitigate. Thus, the application of the mitigation strategy to the proposed project will result in the optimal placement of grid connection infrastructure within the preferred grid connection corridor.

Access Routes

The project site is located in proximity to the N1 national road. The proximity of the project site to a highway decreases the impact of traffic on secondary roads during the construction and operation phase of the project. Site access was a key factor in the selection of the project site as a preferred area for the placement of the Ilikwa Solar PV Facility as it significantly reduces transportation costs for equipment that will be incurred during the construction phase.

[21] **Grid Connection Corridor Alternative 1 (Preferred)**: This corridor is 150 m wide and is approximately 2.3 km in length. The proposed grid connection is from the on-site substation (Switching Station) of the proposed Ilikwa Solar PV Facility located on Proceederfontein 5/100 and extends for about 0.3 km in a south-easterly direction before moving north-easterly for 0.7 km across Willow Grange 3/246, then turning east for 0.4 km the directly south for 0.6 km crossing Scafell RE/448, then a further 0.3 km in a south easterly direction, before terminating at the ESKOM Scafell MTS.

Grid Connection Corridor Alternative 2: This corridor is 150 m wide and is approximately 1.4 km in length. The proposed grid connection is from the on-site substation (Switching Station) of the proposed Ilikwa Solar Facility located on Procedeerfontein 5/100 and extends for about 1.2 km in a south-easterly direction before at 90° northeast for 0.2km into the ESKOM Scafell MTS located on Scafell RE/448.

5. PROJECT DESCRIPTION

This chapter provides general project information and presents a description of the project considered by Mainstream.

5.1 GENERAL PROJECT INFORMATION

5.1.1 Applicant Details

Component	Description
Company Name:	South Africa Mainstream Renewable Power Developments (Pty) Ltd
Address:	4th Floor Mariendahl House Newlands on Main Corners Main & Campground Roads Claremont 7800
Responsible person:	Eugene Marais
Tel:	021 657 4045
Fax:	073 871 5781
E-mail:	eugene.marais@mainstreamrp.com

5.2 LOCATION OF THE PROPOSED PROJECT

The Scafell Cluster Project consists of four (4) separate solar PV facilities with a total generating capacity of up to 550 MW_{ac}. This EIAR has been compiled for the proposed **Ilikwa Solar PV Facility** (see Figure 5-1 below). A project site located approximately 20 km west of the town Sasolburg has been identified for the construction and operation of the proposed solar PV facility. Access to the project site is provided via an unnamed road situated to the north of the project site, which also routes above the N1 national road for approximately 4 km in a westerly direction. This unnamed road connects to the Boundary Road at the Vaal Eden intersection. The project site is located within the Central Strategic Transmission Corridor, a node for the development and expansion of large-scale electricity / grid connection infrastructure (i.e., transmission lines and substations etc.). Table 5-2 provides the details of existing grid connection infrastructure within the vicinity of the project site.

It should be noted that a fuel pipeline, approximately 22 km, in length extends across Portion 6 of the Farm Vlakfontein 161 and Portion 3 of the Farm Willow Grange 246. A 40 m buffer has been applied across the fuel pipeline.

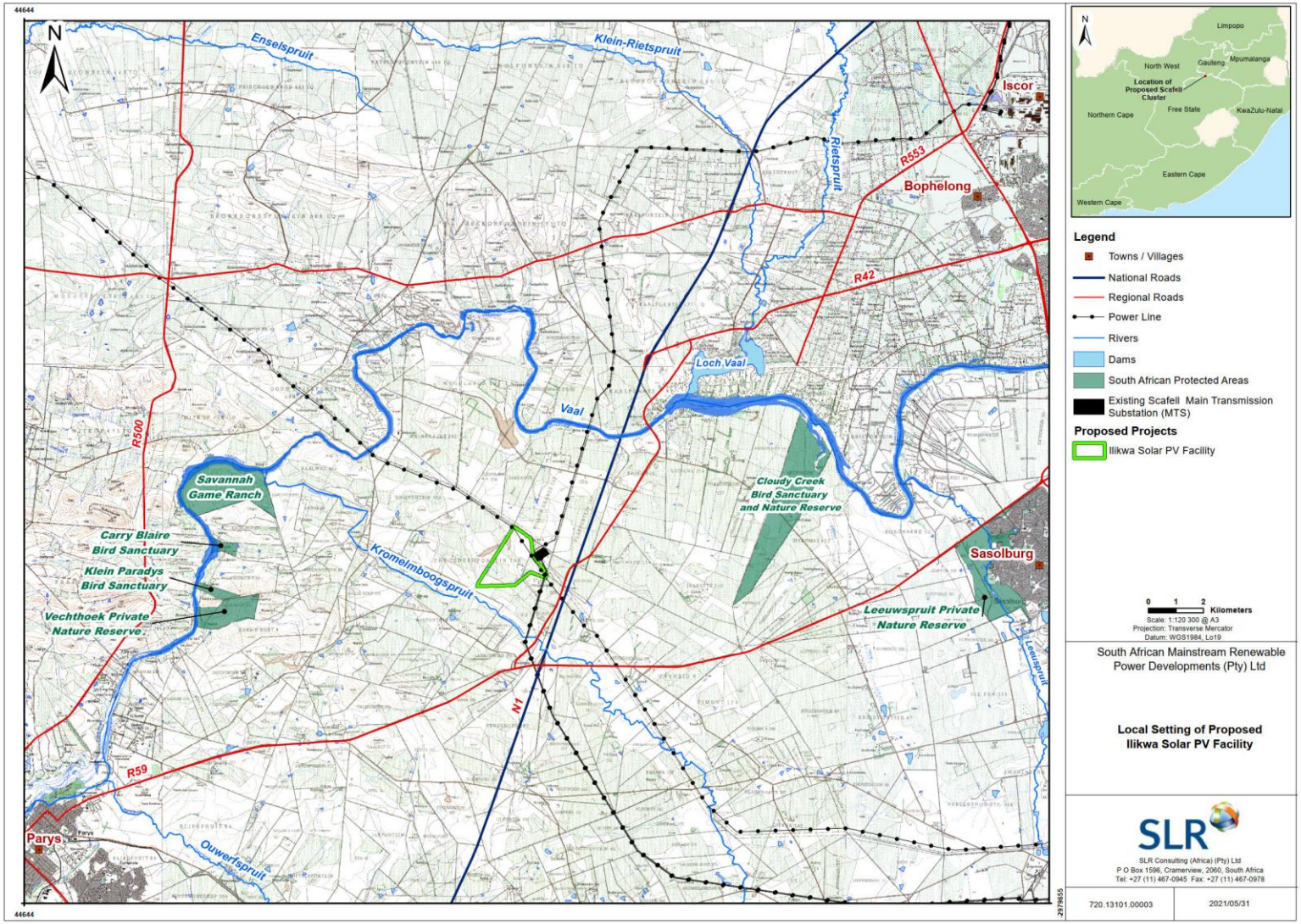

Figure 5-1: Locality Map of the Ilikwa Solar PV Facility

Existing grid connection infrastructure that connect in and out of the ESKOM Scafell MTS within the vicinity of the study area include the following:

Table 5-1: Details of existing grid connection infrastructure within the study area

Name	Capacity (kV)
Scafell Main Transmission Substation	275 / 132
Eiland Rural – Scafell Transmission Lines	132
Scafell - West Wits Transmission Line	132
Scafell - West Wits 2 Transmission Line	132
Bernina - Leeudoring Shaft / Scafell Transmission Line	132
Lochvaal Rural / Scafell Transmission Line	132
Scafell - Tahiti Transmission Line	132
Midland - Scafell 1 Transmission Line	132
Mercury – Zeus 1 Transmission Line	765
Olympus – Scafell 1 Transmission Line	275
Scafell – Snowdown 1 Transmission Line	275
Makalu – Scafell 1 Transmission Line	275

5.3 SUMMARY OF THE PROJECT AND TECHNICAL INFORMATION

Table 5-2 below includes technical and project-specific details of the key infrastructure components and support services that will be required to support the operations of the solar PV facility and grid connection infrastructure for a 20-year period. Mainstream has proposed a layout (see Figure 5-3 below) which has been assessed in this EIAR for the construction and operation of the solar PV facility.

5.4 KEY PROJECT COMPONENTS

Solar energy systems produce energy by converting photons ("solar radiation") into electrons when then flow as electricity or heat. This process is referred to as the 'Photoelectric Effect'. Three (3) types of solar panels are proposed and will be assessed in the Impact Assessment Phase for the proposed project. These include monocrystalline, polycrystalline, and thin film modules solar panels. The main components of solar PV technology to be utilized for this project include the following components:

5.4.1 PV Cell

The PV cell is the device that generates electricity when exposed to solar radiation. The absorbed solar energy excites the electrons inside the PV cell and produces electrical energy (see Figure 5-2 below). All PV cells produce Direct Current (DC). There are three (3) main types of solar cells:

- Monocrystalline – made from a single silicon crystal;
- Polycrystalline — made from multiple silicon crystals; and
- Thin film — common material used for thin film modules are Cadmium Telluride (CdTe) and Copper indium gallium selenide (CIGS).

5.4.2 PV module

The PV module is the set of interconnected photovoltaic cells encapsulated between a transparent front (usually glass) and a backing support material of either laminate or glass then mounted in an aluminium frame, or frameless with durable tempered glass. The modules will appear dark blue or black and will be mounted in an aluminium frame or laminated between durable glass sheets. The modules are designed to absorb the solar radiation and hence are not susceptible to reflection or glinting. Newer modules can also absorb irradiation reflected off the ground via the back of the panel, should the back of the panel be made of glass. This type of module technology is referred to as bi-facial modules which are produced by a number of panel suppliers and can be produced in either monocrystalline or polycrystalline form. The proposed solar PV facility will utilise monofacial or bifacial PV modules.

5.4.3 PV array

The PV array is the complete power generating plant consisting of multiple PV modules wired in series and in parallel. The PV modules will be connected by DC cables to combiner boxes mounted underneath the PV module mounting structures. Each combiner box will occupy an area of approximately one square metre ($1m^2$). The power generated by many PV module strings is combined in the combiner box and transmitted via DC cables to an inverter and transformer enclosure.

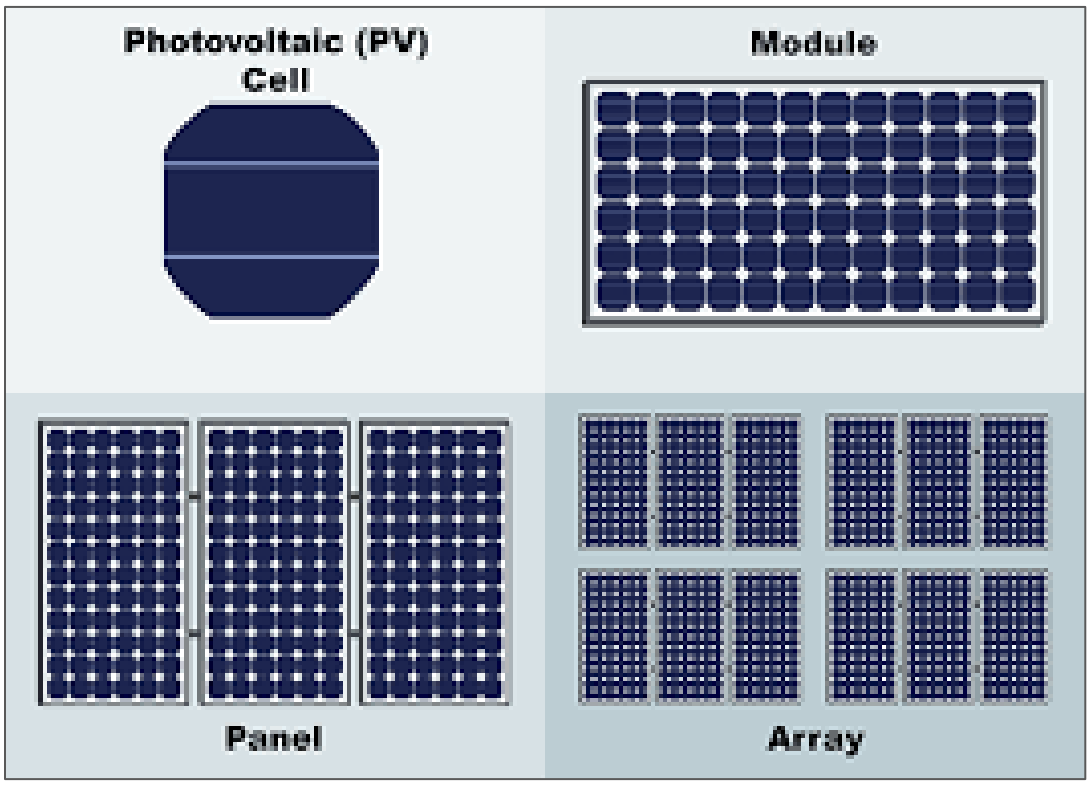

Figure 5-2: Illustration of the various components that make up a typical PV panel array

Table 5-2: Detailed Project Information

Component	Ilikwa Solar PV Facility
Property Information	
Farm name & portion number:	Proceederfontein 100 Portion 5
Surveyor General 21-digit code:	F02500000000010000005
Name of Landowner:	Alfred Murray Smit Trust
Property size:	276.85 ha
Study area size:	195 ha
Development footprint size:	180 ha
Centre coordinates of site:	26°48'52.65"S 27°37'38.70"E
Technical Details – Solar PV Facility	
Capacity	Up to 100 MW_{ac}
Installed PV panel height	Up to 3 m
Number of PV panels	Up to 154 440
Mounting structures	Single Axis Tracking, Dual Axis Tracking or Fixed Axis Mounting System Technology
Inverters	Centralised or String Inverter Stations and Power Transformers
Cabling	Underground Direct Current (DC) and Alternating Current (AC) cables of up to 132 kV
Electrical Infrastructure	
IPP Substation capacity	33 / 132 kV
IPP Substation footprint	2.5 ha
Cabling	Underground and overhead transmission lines (up to 132 kV)
Grid Connection corridor length & width	Up to 2.3 km long and 150 m wide
Grid Connection[22]	Two grid connection corridor alternatives are proposed: • **Alternative 1 (Preferred) -** This corridor is 150 m wide and is approximately 2.3 km in length. The proposed grid connection is from the on-site substation (Switching Station) of the proposed Ilikwa Solar Facility located on Procedeerfontein 5 /100 and extends for about 0.3 km in a south-easterly direction before moving north-easterly for 0.7 km across Willow Grange 3/246, then turning east for 0.4 km then directly south for 0.6km crossing Scafell RE/448, then a further 0.3 km in a south easterly direction, before terminating at the ESKOM Scafell MTS.

[22] The grid connection for the Ilikwa Solar PV Facility will be subject to a separate Environmental Authorisation process and will require a Basic Assessment (BA) process in support of the application for Environmental Authorisation.

Component		Ilikwa Solar PV Facility
		• **Alternative 2 -** This corridor is 150 m wide and is approximately 1.4 km in length. The proposed grid connection is from the on-site substation (Switching Station) of the proposed Ilikwa Solar Facility located on Procedeerfontein 5/100 and extends for about 1.2 km in a south-easterly direction before at 90° northeast for 0.2 km into the ESKOM Scafell MTS located on Scafell RE/448.
Building Infrastructure		
BESS footprint		Up to 2 ha
BESS technology		Solid State or Redox Flow Batteries
Buildings		• Operational Control Centre • Operation and Maintenance Area / Warehouse / Workshop / Control Centre and Office • Ablution Facilities • Substation Building
Laydown Area & Associated Infrastructure		
Size of laydown area		Up to 3 ha
Buildings and Infrastructure		• Permanent Laydown Area • Temporary Construction Camp and Laydown Area • Fencing and Lighting • Lightening protection infrastructure • Telecommunication infrastructure • 400 m^3 reservoir, water pipeline and stormwater channels
Supporting Infrastructure		
Main access road		2.5 km long and up to 12 m wide
Internal access road		12 km long and 5 m wide
Support Services		
Water Demand	Construction	Water for Roads - 15ℓ / m^2 Water for Civil Works - 400 m^3 / project Water for Domestic Use - 225 m^3 / month
	Operation	Water for PV module cleaning - 18 000 m^3 / annum Water for Domestic Use - 20 m^3 / month Water for Dust Suppression - 15ℓ / m^2
Waste Generation	Construction	General Waste would be managed on site in accordance with the principles of the waste management hierarchy. In terms of specific waste streams, the major sources include: • Carboard waste from the panels –Approximately 250 tons of cardboard (per 100 MW). A compactor would be used on site to compress the cardboard boxes in which the PVs are stored in order to reduce the space required for the temporary storage of this waste. • Rubber caps placed on all eight corners of the PV panels (total volumes are uncertain). • Wooden pallets on which the PV boxes arrive. • Plastic wrap. Hazardous Waste may be generated on site depending on the design / type of panel procured. Hazardous waste will be disposed of at a registered facility.

Component		Ilikwa Solar PV Facility
		Effluent would be managed by means of conservancy tanks (16 000 L in capacity which are cleaned once a month and disposed of at the nearest municipal facility).
	Operation	Effluent would be managed using septic Tanks (16 000 L in capacity which are cleaned 2/3 times a week) or a Clarus Fusion System (16 000 L capacity which are cleaned once every six months), or similar, which utilises a chemical process to recycle water from the Operations and Maintenance Buildings as well as Sub-Station Buildings. This treated water can then be used to water vegetation.
Traffic		It is expected that there will be approximately 2 000 trucks in total over the 12-18-month construction phase, approximately 10-20 trucks per day.
Employment Opportunities		
Construction Phase		• At least 230 people however the number of people employed at one time may vary as different contracts and subcontracts on the project are completed at a time onsite.
Operation Phase		• At least 17 people and this is due to the fact that the staff will mainly be responsible for the daily operations and maintenance activities of the project.
Recruitment for the duration of the project lifecycle will be undertaken in collaboration with local authorities, community leadership structures and agencies and no labourers will be hired onsite. Mainstream will therefore implement mitigation and management measures to ensure that no employee or job applicant is discriminated against on the basis of race, gender, nationality, age, religion, or sexual orientation.		

5.4.4 Mounting Structures

Multiple PV modules are bolted onto a mounting structure which tracks the sun's progress across the sky, usually in an east to west direction. PV arrays either use fixed or tracking (single or double axis) mounting structure in order to optimise the amount of solar irradiation. In a tracking system, the panels are mounted on a steel or aluminium rack and a tracking motor is placed at the end of the PV panel array to control the tilt and movement of the array (as required) to track sunlight. The proposed project will utilise either fixed or tracking (single or double axis) mounting structures.

5.4.5 Inverter

The inverter converts the direct current (DC) to alternating current (AC). The inverter and transformer are anticipated to be housed within the same inverter station housing (typically an insulated, steel-framed 6 m shipping container or small brick building). The transformers transform the low voltage AC from the inverter to medium voltage. The actual number of the required inverter stations for the proposed project will be determined prior to the commencement of the construction phase of the project. The inverters will vary in size and frequency depending on technology. Inverter stations will be installed in between the PV panel rows (see Figure 5-4 below), in a line inside the layout area at the end of each row, located on a concrete plinth. The proposed project will utilise either central inverter stations, string inverters or power transformers.

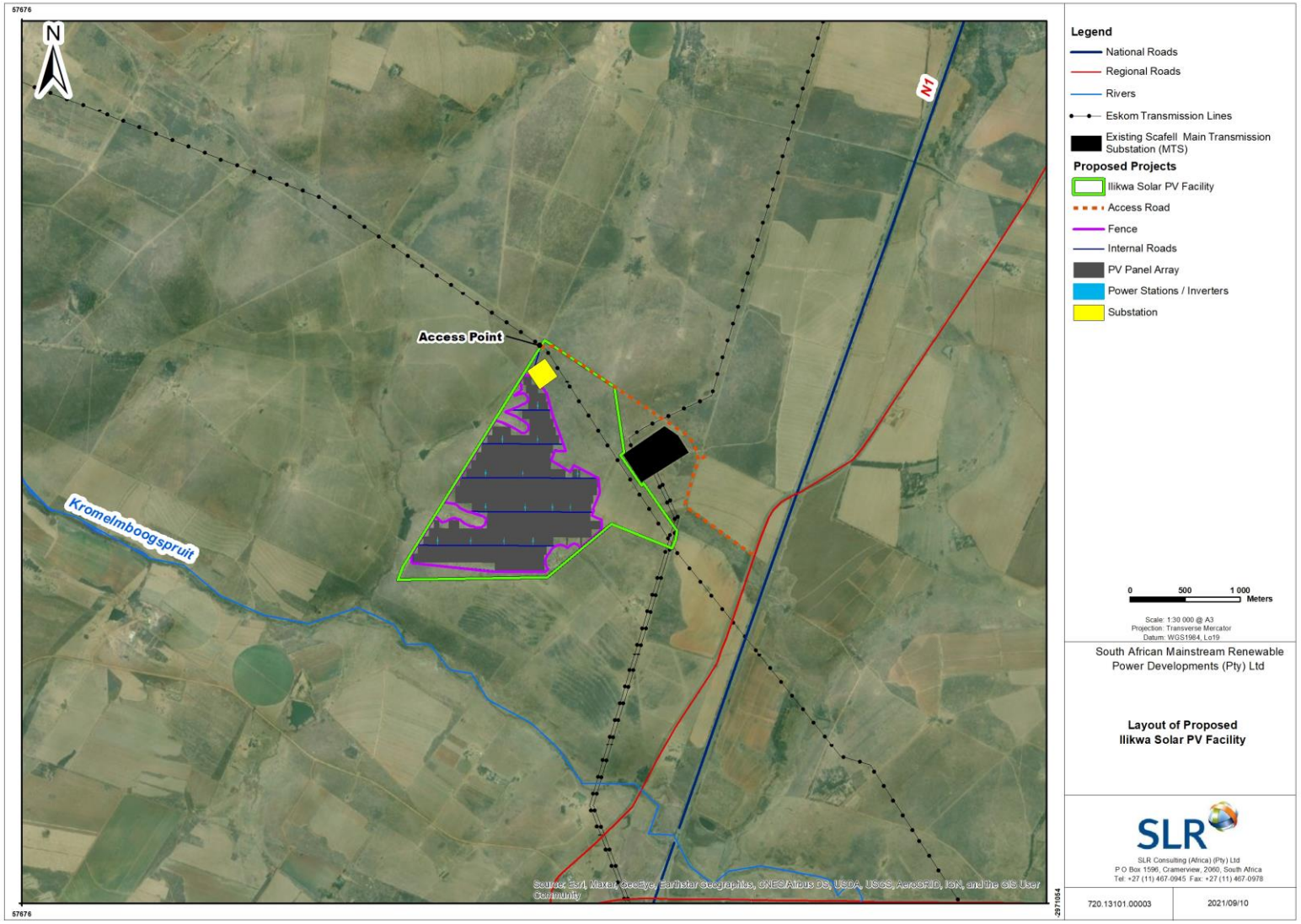

Figure 5-3: Indicative layout Map for the Ilikwa Solar PV Facility

Figure 5-4: Inverter positioning on a PV panel array. The red block illustrates the location of an inverter within a PV panel array.

5.4.6 Substation

The IPP portion of the on-site 33 / 132 kV substation comprises an inverter (step-up facility) which converts power from DC to AC and will step up electrical current from 33 kV to 132 kV. The substation will consist of at least one (1) small building, outdoor electrical plant, equipment, and transformers. The development footprint of the substation will be up to 2.5 ha. An ESKOM Switching Station with a development footprint of up to 2.5 ha will be constructed adjacent to the IPP Substation. The Switching Station will be assessed separately in a BA process being undertaken for the grid connection infrastructure associated with the solar PV facility.

5.4.7 Battery Energy Storage System (BESS)

The Battery Energy Storage System (BESS) allows for the storage of surplus energy generated by the solar PV facility for later use. The BESS enables a balance between supply and demand of electricity during the day and uses the stored energy during peak demand periods (i.e., morning and evenings). Energy generated from the PV panel array is a DC and is converted to an AC by the inverters and then transferred to the on-site substation where it is determined if the energy should be stored or evacuated. When the energy is required, it is evacuated into the grid network. Should the energy not be required, it is transferred to the BESS and stored for later use (see Figure 5-6). A BESS typically either consists of stacked containers or a multi-story building with a maximum height of 8 m and will have a footprint of up to 2 ha (see Figure 5-6). Several battery technologies are being considered for utilisation as part of the proposed project. These include solid state and flow type batteries. Solid State batteries consist of one (1) or more electrochemical cells that convert chemical energy into electrical energy. Each cell consists of an anode and cathode. Electrolytes

within the cells allow ions to move between the electrodes and terminals, which enables the flow of current out of the battery. Examples of solid-state batteries include Lithium-ion and Sodium Sulphur batteries. Flow batteries are rechargeable and the rechargeability function is enabled by the dissolution of chemical components in liquids contained within the system that are separated by a membrane. The advantage associated with flow batteries is that they are easily rechargeable through the replacement of the electrolyte fluid. Typical examples of flow batteries include Vanadium Redox (VRB) flow batteries. The preferred BESS technology for utilisation for the proposed project will be selected during the detailed design of the solar PV facility, post the issuance of the Environmental Authorisation, when the project has been granted preferred bidder status under the DMRE's REIPPPP and a supplier of the batteries has been appointed. This EIAR considers and assesses solid state and redox flow BESS technology options.

Figure 5-5: An IPP Substation under construction[23]

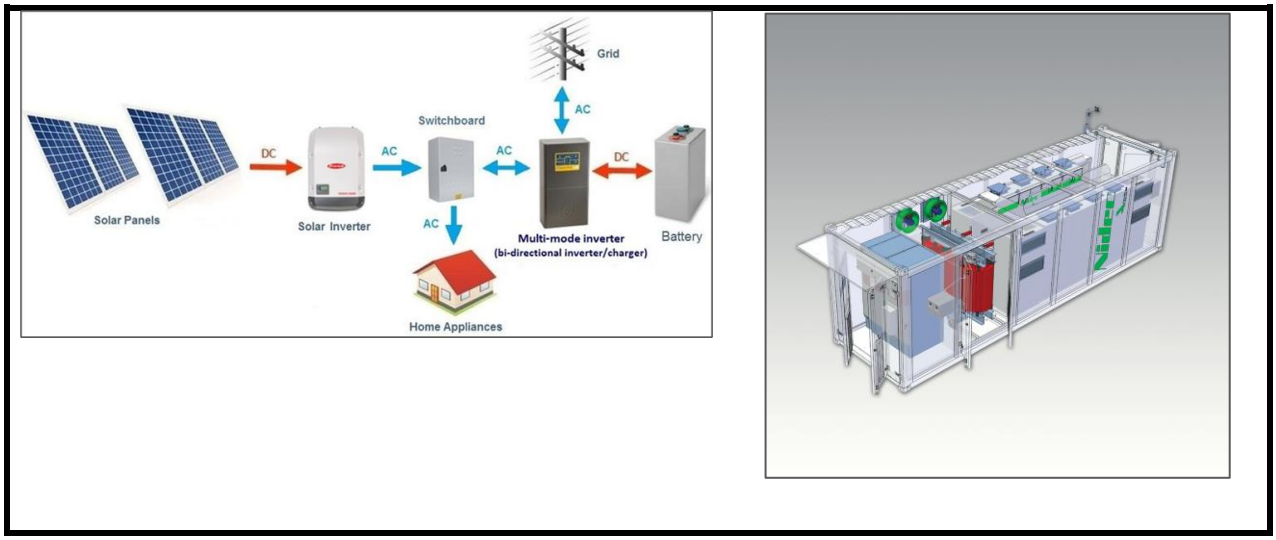

Figure 5-6: A flow diagram illustrating the use of a BESS in a grid.

[23] Source: http://www.hvt.co.za/groeipunt-substation/

5.4.8 Operations and Maintenance (O&M) Buildings

Additional infrastructure is required in order to support the operations of a solar energy facility, as well as to provide services to personnel tasked with the operations and maintenance of a facility. Operations & Maintenance (O&M) Buildings typically include Offices, Operational and Control Centre, Workshop, Warehouse and Ablution Facilities.

5.4.9 Access Roads

A main access road will be constructed for the provision of access from the existing road network to the project site. Within the project site, internal access roads will be constructed to provide access to the PV panel array and other components of the solar PV facility.

5.5 SUPPORT SERVICES

The proposed project will require support services and infrastructure for the duration of the Scafell Cluster Project. Support services and infrastructure required will cater to the solar PV facilities and grid connection infrastructure construction projects and will include water, waste and sewage removal, water, and electricity.

5.5.1 Water Demand

During the construction phase of the proposed project, water will be either from a registered service provider, existing boreholes within the study area or through surface water abstraction. The anticipated water usage for the project for the duration of the 12 to 18-month construction phase is included in Table 5-2 below includes technical and project-specific details of the key infrastructure components and support services that will be required to support the operations of the solar PV facility and grid connection infrastructure for a 20-year period. Mainstream has proposed a layout (see Figure 5-3 below) which has been assessed in this EIAR for the construction and operation of the solar PV facility.
above. The water would be required for the following uses:

- Drinking;
- Ablution facilities;
- Access Road construction;
- Dust suppression
- Fire-fighting reserve
- Cleaning of facilities; and
- Construction of foundations for PV panel mounting structures and the grid connection infrastructure, i.e., transmission line pylons and switching station, etc.

During the operation phase, negligible water will be required for the operation of the grid connection infrastructure and will mainly be for domestic use within the footprint of the switching station. However, for the solar PV facilities, water during the operation phase will be used for domestic use as well as the cleaning of solar PV panels with each of the solar PV facilities. The anticipated water demand quantities for the Scafell Cluster Project are included in Table 5-2 below includes technical and project-specific details of the key infrastructure components and support services that will be required to support the operations of

the solar PV facility and grid connection infrastructure for a 20-year period. Mainstream has proposed a layout (see Figure 5-3 below) which has been assessed in this EIAR for the construction and operation of the solar PV facility.

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5.5.2 Wastewater and Waste Removal

Wastewater: Approximately 16 000 m^3 per annum of effluent will be generated during the construction and operation phase of the proposed project. A Service Level Agreement will be reached with a registered service provider for the collection of sewage from site using a honey sucker truck and be disposed of at the near Wastewater Treatment Works (WWTWs) during the 12 – 18-month construction phase. A new clarisfusion system will be deployed during the construction phase of the proposed project which will utilise a chemical process to recycle water from the Operations and Maintenance Buildings. The recycled water will be used for domestic applications within the site, i.e., watering vegetation, etc.

Solid Waste: There will be solid waste generated for the duration of the proposed project and will comprise of hazardous and non-hazardous waste components. During the construction and operation phase of the proposed project, non-hazardous solid waste components will comprise spoil from construction-related activities, general domestic waste (i.e., wooden pallets, cardboards, etc.) and concrete.

Hazardous materials used on site during operations will include fuels, oils, lubricants, cleaning products, and specialised gases (for use in switchgear etc.). Minimal waste is expected to be generated during the operation phase. For certain types or transformers or backup generators, oil that needs to be replaced will be recycled, if possible, or safely stored and removed from the site and correctly disposed of.

All solid wastes generated (hazardous and non- hazardous) will be disposed of at a licensed landfill site by means of contracting a suitably registered waste handling company. This will be the responsibility of the Engineering Procurement Construction (EPC) Contractor during the construction phase of the proposed project and will have overall oversight to verify that the collection, transport, handling, and disposal of these wastes is being undertaken in a suitable manner.

Waste during the decommissioning phase will be similar to that produced during the construction phase; this includes wooden and plastic packaging, cable off cuts, disused transformers, office, and domestic waste. All solid wastes generated will be disposed of at appropriately licenced landfill sites for general, and/or hazardous waste streams.

5.5.3 Air and Noise Emissions

Air emissions: Temporary air emissions will occur during the construction phase due to the use of construction machinery and the clearing of vegetation which may result in wind-blown dust and fugitive dust emissions. Little to no emissions are anticipated during the operation phase through management of on-site vehicle speed and vegetation and soil landscaping.

Noise emissions: The key temporary noise sources during the construction phase will be from the mobile machinery, vehicles, workers, and plant construction activities including high speed ramming using percussion hammers. Some construction activities may be required afterhours. The operation of the grid

connection infrastructure is not expected to generate noise additional to that generated from the existing ESKOM Scafell MTS located 2 km south of the project site.

5.5.4 Traffic

There will be some traffic during the construction phase of the proposed project for the delivery of project components, machinery, and labour. The transportation route has not yet been finalised but is most likely to be one of the following routes:

- Durban via Harrismith and Vereeniging;
- East London via Bloemfontein and Kroonstad; and
- Cape Town via Beaufort West, Bloemfontein, and Kroonstad.

Transport routes for the proposed project will be finalised once all suppliers are finalised after undergoing a procurement period. Traffic volumes are anticipated to diminish during the construction phase of the proposed project, and only a limited number of vehicles will travel to and from the project site for operation and maintenance purposes. A Traffic Impact Assessment has been undertaken to determine the nature, extent and significance of the traffic impacts associated with the Scafell Cluster Project (see Appendix 8.9). Recommended mitigation and management measures from the TIA for the control and management of traffic-related impacts are included in the EMPrs for the proposed project (see Appendices 7.1 and 7.2).

5.5.5 Schedule and Life of Project

It is anticipated that a Power Purchase Agreement (PPA) will be signed with ESKOM or other third party off takers for a period of up to 20 years. Beyond this duration, the proposed project may continue to operate subject to further approvals or be decommissioned.

5.6 MAIN ACTIVITIES

The proposed project will be carried out in the following phases:

- Development / Planning phase;
- Site preparation;
- Construction phase;
- Operational phase; and
- Decommissioning phase.

Activities to be undertaken during each of the phases are described in the following sections of this EIAR.

5.6.1 Development and Planning Phase

During the development and planning phase of the proposed project, Mainstream will assess the key parameters required for the construction and operation of the solar PV facility. This will include:

- Enviro-legal and other permitting;
- A detailed layout of the proposed project;
- ESKOM grid connection requirements; and
- Detailed geotechnical investigations of the project site.

During the development and planning phase of the proposed project, the project will be adapted in order to meet regulatory requirements, time schedules and expectations of all relevant parties.

5.6.2 Site Preparation Phase

Should the proposed project be granted a positive decision by the DFFE and be selected as a preferred bidder in a REIPPPP and Financial Close be achieved, site preparation activities will commence. This phase would include the clearance of vegetation, installation of perimeter fencing, levelling of the site and preliminary earthworks. Thereafter the site will be marked out, a construction camp set up and the access road to the site will be constructed. The clearance of vegetation is not anticipated to be site wide and will be limited to the transmission line servitude of the transmission line and the footprint of the switching station. The extent of vegetation clearance within the transmission line servitude and the switching station footprint will depend on the outcomes of the detailed layout of the grid connection infrastructure.

5.6.3 Construction Phase

The construction phase of the proposed project will be initiated following the completion of the site preparation activities. The construction phase will include the following:

- Excavation of cable trenches;
- Ramming or drilling of the mounting structure frames;
- Installation of the PV modules onto the frames;
- Installation of measuring equipment;
- Laying of cables between the module rows to the inverter stations;
- Optionally laying of gravel or aggregate from nearby quarries placed in the rows between the PV panel array for enhanced reflection onto the panels, assisting in vegetation control and drainage;
- Construction of foundations for the inverter stations and installation of the inverters;
- Construction of the substation and BESS foundations and installation of the substation components and placement of BESS;
- Construction of operations and maintenance buildings;
- Undertaking of rehabilitation on cleared areas where required;
- Testing and commissioning; and
- Removal of equipment and disassembly of construction camp.

Where possible, materials, plant and equipment will be sourced from suppliers within the vicinity of the project site. The bulk of the specialist equipment, i.e., PV modules, inverters, BESS, substation components and BESS, etc, will be imported from China, Europe or the United States of America and be shipped to South Africa. The construction phase of the proposed project will be for a period of up to 12 – 18 months.

5.6.4 Operation Phase

The proposed project will be operated on a 24 hour, 7 days a week basis. The operation phase of the proposed project will comprise the following activities:

- Regular cleaning of the PV modules by trained personnel;
- Vegetation management under and around the PV modules to allow maintenance and operation at full capacity;

- Maintenance of all components including PV modules, mounting structures, trackers, inverters, substation transformers, BESS, and equipment;
- Office management and maintenance of operations and maintenance buildings;
- Supervision of the solar PV facility operations; and
- Site security monitoring.

5.6.5 Decommissioning Phase

The proposed project is expected to operate for at least 20 years. Once the solar PV facility reaches the end of its life, the facility will be decommissioned or continue to operate following the issuance of a new PPA by ESKOM, or the relevant third party offtaker. If decommissioned, all components will be removed, and the site rehabilitated. Where possible all materials will be recycled, otherwise they will be disposed of in accordance with local regulations and international best practice.

6. ALTERNATIVES

The 2014 EIA Regulations (as amended), through Regulation 3 of Appendix 3 ('EIA Assessment Report'), requires that alternatives be considered as part of an EIA process for a proposed development. Chapter 1 of the 2014 EIA Regulations (as amended) defines 'alternatives' in relation to a proposed activity / project, '*as a different means of meeting the general purpose and requirements of the activity*'. Thus, alternatives may include:

- property on which or location where the activity is proposed to be undertaken;
- type of activity to be undertaken;
- design or layout of the activity;
- technology to be used in the activity; or
- operational aspects of the activity; and\
- the option of not implementing the activity.

The alternatives considered in relation to the Scafell Cluster Project are discussed in detail in the following sections.

6.1 LOCATION ALTERNATIVES

For the Ilikwa Solar PV Facility, no property or location alternatives were taken into consideration as the location of the project was based on the location of the ESKOM Scafell MTS – the grid connection point for the project, which will be used to feed 100 MW_{ac} of electricity generated from renewable energy into the grid. In general, the site selection process for the development of a solar PV facility is dependent on several aspects, of which are favourable at the identified project site for the construction and operation of the Ilikwa Solar PV Facility. These aspects include the solar irradiation, topography, extent of the area available for development, proximity of the site to the nearest grid connection point and access to the site. Taking the detail included in Section 4.3.4 into consideration, the project location is considered suitable for the placement of the Ilikwa Solar PV Facility, and no other locations are being assessed or considered for the placement of the project.

6.2 TYPE OF ACTIVITY ALTERNATIVES

The development of the Ilikwa Solar PV Facility is required in order to add 100 MW_{ac} of electricity generated from a renewable energy facility into the grid. Therefore, no other activity alternatives have been considered for the project.

6.3 DESIGN AND LAYOUT ALTERNATIVES

Mainstream appointed specialists to undertake field-based surveys of the project site prior to the commencement of the EIA process, in order to determine the suitability of the site for the placement of the Ilikwa Solar PV Facility in the area from an environmental perspective. Areas with sensitive environmental features within the project site were delineated by the specialists and, together with the Preliminary Engineering Assessment (BVi Consulting Engineers, 2021), have informed the layout being considered and proposed for authorisation for the Ilikwa Solar PV Facility. This indicative layout (see Figure 5-3) has been assessed in detail as part of the EIA process and is provided in this EIAR. The layout takes into consideration the environmental sensitivities and features that are present within the project site.

6.4 TECHNOLOGY ALTERNATIVES

Based on the solar irradiation resource available as well as the topography of the site, the placement of a solar PV facility on the proposed project site is considered to be the preferred option from a technology perspective. Furthermore, the IRP 2019 has allocated 6000 MW of electricity to be procured from solar PV facilities up to 2030 and no allocation has been made for Concentrated Solar Power (CSP) facilities. PV technology is considered as the preferred option in comparison to CSP as it is associated with limited water demand requirements and a lower visual profile.

For the Ilikwa Solar PV Facility project, two (2) types of PV panel modules, mounting system technology and Battery Energy Storage System (BESS) options are being considered. These include the following:

PV panel module alternatives:

Monofacial and Bifacial PV panel modules – monofacial PV panel modules generate electricity from one (1) side of the module, whereas bifacial PV panel modules generate electricity from both the front and rear side of the module. Bifacial PV panel modules are regarded as having a higher energy yield in comparison to monofacial PV panel modules. Mainstream will consider the utilisation of the either the monofacial or bifacial PV panel modules based on detailed technical assessments of the proposed project prior to construction.

PV panel mounting technologies:

Fixed Tilt and Tracking (Single or Dual Axis) – fixed-tilt mounting structures for PV modules are typically aligned on a North – South path, are cheaper, reliable and have a longer life span in comparison to tracking options. They, however, are associated with a lower energy output. Tracking mounting structures provide a flexibility in the orientation and motion of the PV panel modules. The tracking mounting structures work on primary and secondary axes, which enable the structures to point PV panel modules to specific points in the sky for greater energy output. They therefore allow for a greater energy output and a higher degree of accuracy in directional pointing of these structures. Mainstream will consider the utilisation of the either the monofacial or bifacial PV panel modules based on detailed technical assessments of the proposed project prior to construction.

Battery Energy Storage System (BESS):

Mainstream is considering the use of either Solid State (i.e., Lithium-ion) or Redox Flow batteries for the proposed project. These are discussed in the sections below:

- **Solid State** – these typically Lithium-ion (Li-ion) based batteries which have the highest energy density and are considered safe. No memory or schedule cycling is required to prolong the battery life. Li-ion batteries are used in chemical devices such as cameras, calculators, laptops, mobile phones and are increasingly being used for electric mobility. The advantages of Li-ion batteries include high specific energy and high load capabilities with power cells; long cycle and extended shelf-life; they are maintenance free and provide high capacity, low internal resistance, good coulombic efficiency; and require a simple charge algorithm and reasonably short charge times. The disadvantages associated with Li-ion batteries include the need for protection and circuit prevention in order to prevent thermal runaway if stressed; degradation at high temperatures and when stored at high voltage; the impossibility of rapid charge at freezing temperatures; and the need for transportation regulations when shipping in large quantities. Several types of Li-ion batteries are available on the market and include Lithium cobalt dioxide ($LiCoO_2$),

Lithium manganese oxide ($LiMn_2O_4$), Lithium nickel manganese cobalt oxide ($LiNiMnCoO_2$, or NMC), Lithium iron phosphate ($LiFeO_4$) and Lithium titanate ($Li_4Ti_5O_{12}$).

- **Redox Flow Batteries (RFB)** – these charged and discharged by means of an oxidation – reduction reaction of ions. These batteries have an excellent long service life, with almost no degradation of electrodes or electrolytes, and are considered safe as they are free of combustible materials and can be operated under normal temperatures. The advantages of RFBs include the fact that they have a long service – the RFBS have a system of endurance for a period of up to 20 years, with an unlimited number of charge and discharge cycles available without any degradation. Furthermore, the electrolytes can be used semi permanently. The RFBs are versatile, allow flexible design and enable a single system to address both short and long periods of output variation, enabling cost-effective power generation. In addition, the batteries can operate under normal temperatures and are composed of non-combustible or flame-retardant materials. Thus, the possibility of a fire with an RFB is extremely low. In terms of disadvantages, RFBs are considered to be complex, as the system requires pumps, sensors, flow and power management and secondary containment vessels. Furthermore, the RFBs have a low energy density compared with other types of batteries. Several types of RFBs are available and include the Vanadium redox battery (VRB), Polysulfide-bromine battery (PSB) and the Zinc-bromine (Zn-Br) battery.

Following high-level feasibility studies and assessments, **Mainstream has selected the Solid-State BESS technology type as the preferred alternative for use as part of the proposed project**. A Risk Assessment has been undertaken for the Li-ion-based BESS being proposed and is included in Appendix 10 of this EIAR.

6.5 'NO-GO' ALTERNATIVE

Should the 'No-Go' alternative be considered, there would be no environmental impacts and no benefits to the local economy associated with the construction and operation of the proposed project. In addition, the consideration of this alternative means that 100 MW_{ac} of electricity from a renewable energy source cannot be added to the grid. An assessment of the 'No-Go' alternative for the proposed project is included in Chapter 8 of this EIAR.

7. DESCRIPTION OF THE BASELINE ENVIRONMENT

7.1 CLIMATE

The study area and project site is associated with summer rainfall, and a cool – temperate climate. Average monthly temperatures are lowest in July (9.46°C) and highest in January (22.07°C). Average monthly rainfall is lowest in July (4.19 mm) and highest in January (116.9 m) (see Figure 7-1). The area is associated with high extremes between maximum summer and minimum winter temperatures, and frequent occurrence of frost.

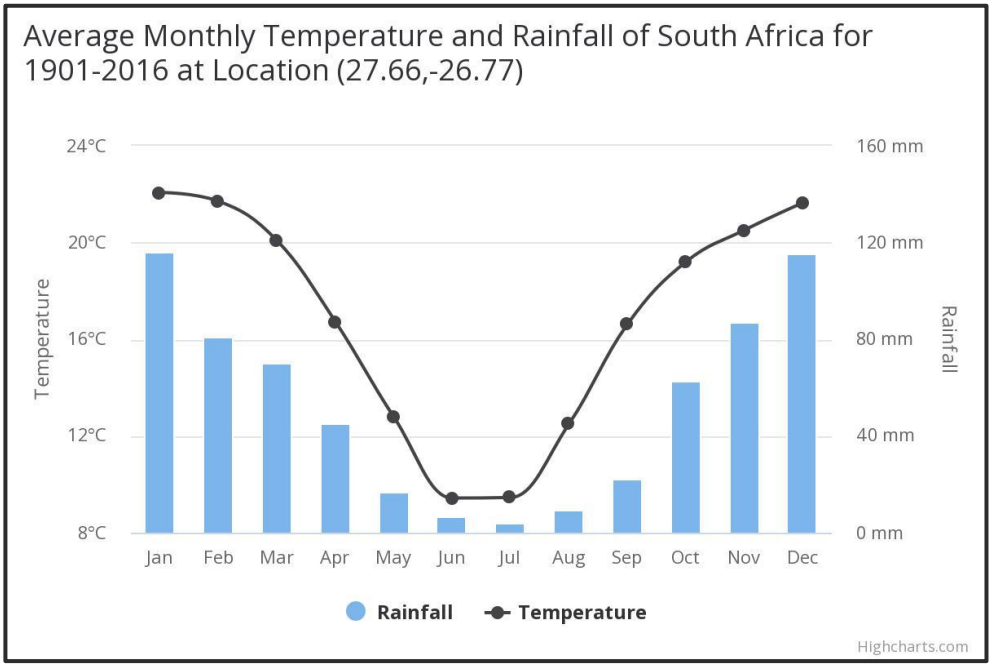

Figure 7-1: Average temperature and rainfall of the project site[24]
Source: https://climateknowledgeportal.worldbank.org/country/south-africa/climate-data-historical

7.2 BIOPHYSICAL ENVIRONMENT

7.2.1 Topography and Geology

The study area and project site is located approximately 1 440 – 1 490 m above sea level, and the area is associated with shale, sandstone, or mudstone lithologies. These rocks belong to the Madzringwe Formation of the Karoo Supergroup or the intrusive Karoo Suite dolerites which are a common geological feature in the area. Rocks from the Volksrust Formation of the Karoo Supergroup are located to the south of the study area, and older lithologies of the Witwatersrand, Transvaal and Ventersdorp supergroups are located to the west of the study area and project site towards Parys.

[24] Refers to the grid connection corridors considered and assessed for the placement of grid connection infrastructure within the study area.

7.2.2 Soils and Land Potential

i. Land Type

The study area predominantly consists of the Ba39 Land Type, except for the north-eastern corner of the site that is Land Type Bb23. Land Type Ba39 represent consist of five terrain units (see Figure 7-2) with approximately 50% of the total land type area consisting of mid-slopes (Terrain unit 3). The mid-slopes have slight slope (2 to 6%) and long slope lengths of 1 000 to 1 500 metres above sea level (masl). The dominant soil form of the mid-slopes is the Hutton form and soil depths range between 0.9 and 1.1 m. The mid-slopes also include soil of the Avalon form that is underlain by soft plinthite at depths of 0.8 to 1.0 m. Approximately 11% of the mid-slopes consist of shallow Mispah soils which are between 0.1 and 0.2 m deep.

The second most prevalent terrain form are crests (Terrain unit 1) that consists of a mixture of rock, shallow topsoil on rock (the Mispah form) and deeper red apedal soils of the Hutton form. Around 10% of the total land type area consists of toe-slopes (Terrain unit 4) consisting of a large variety of soil forms such as the Avalon, Glenrosa, Westleigh, Sterkspruit, Glencoe, Wasbank and Clovelly forms. The valley bottoms (Terrain unit 5) are characterised by soil with higher clay content and stronger structure. Soil forms include hydric soils of the Willowbrook and Rensburg forms as well as soil with a thick vertic horizon (Arcadia form).

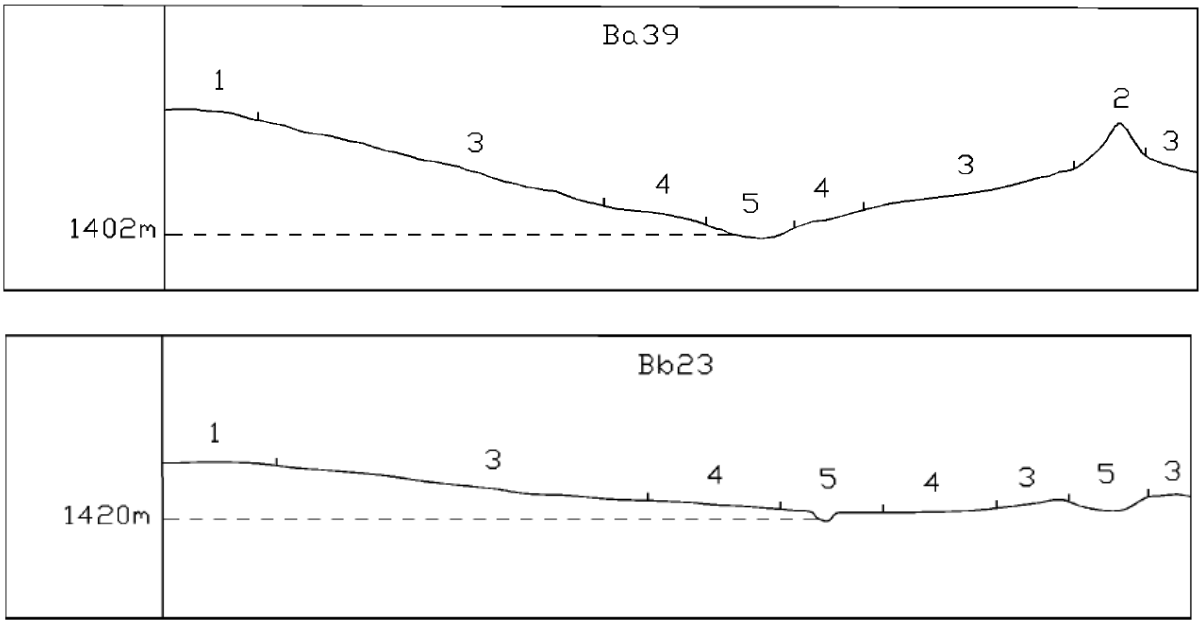

Figure 7-2: Terrain form sketches of Land Types Ba39 and Bb23

Land Type Ba23 consists of four terrain units (refer to Figure 7-2). The land type represent a flat landscape (at elevations between 1 420 and 1 1435 masl and consists predominantly of mid-slopes (Terrain unit 3) and toe-slopes (Terrain unit 4). These terrain units comprise sandy soils of the Longlands and Wasbank forms, apedal soils of the Hutton and Clovelly forms as well as soils with strong structure such as the Valsrivier and Sterkspruit forms. The valley bottoms consist of hydric soils with a gley horizon i.e., the Rensburg and Katspruit forms.

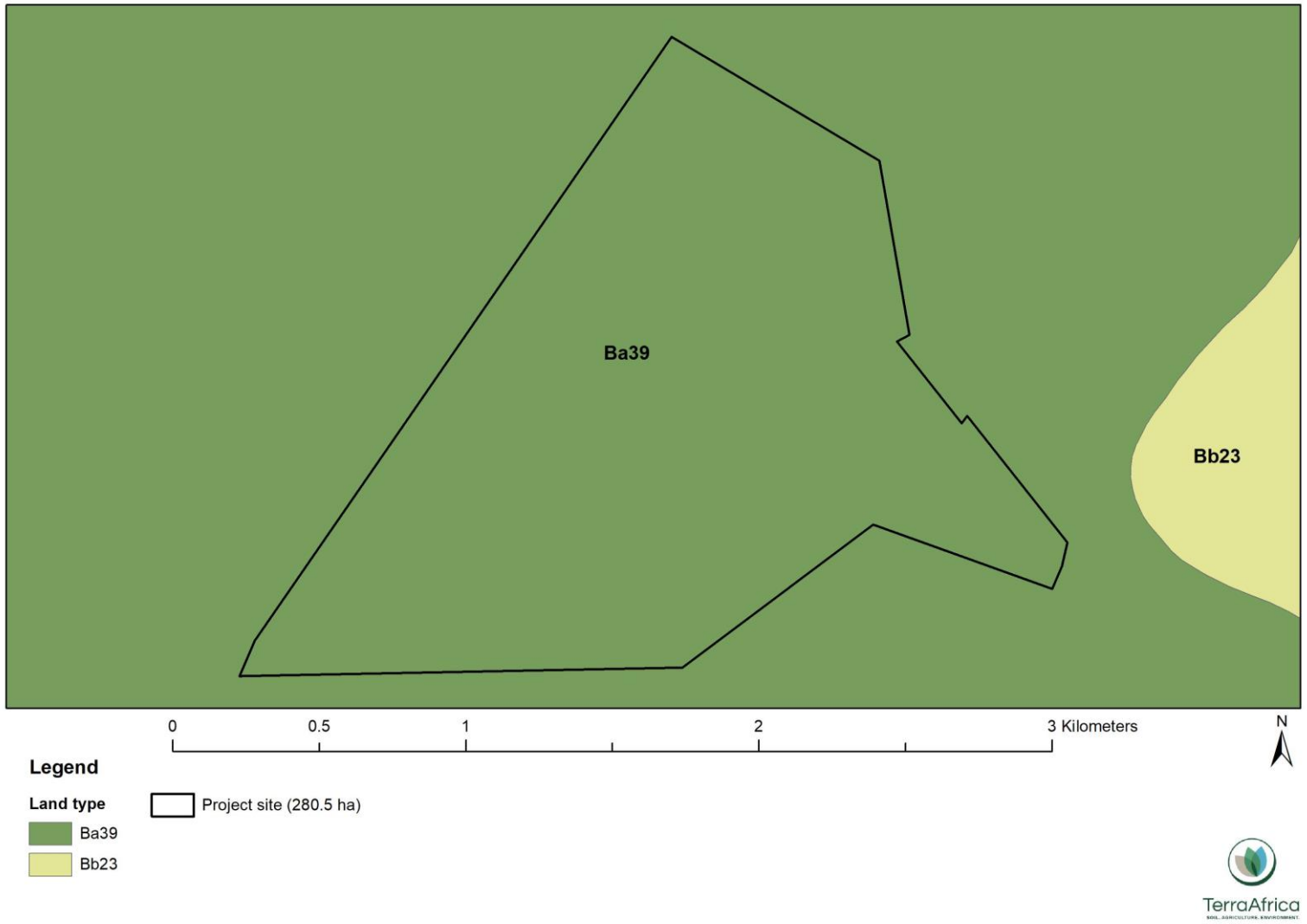

Figure 7-3: Land type map of the proposed project

ii. Soil properties

Two soil forms with vertic topsoil are present within the Scafell Cluster Project study area, i.e., the Rustenburg form (where soil depth is limited by hard rock) and the Rensburg form (associated with the wetland area) where the vertic horizon is underlain by gley. Within the wetland area associated with the study area, the Katspruit form is also present. The southern boundary of the study area consists of shallower soil profiles, including Mispah, Glenrosa, Carolina, Clovelly. Vaalbos and Nkonkoni. The soil depth of these forms is a limiting factor to crop production and these areas are better used as grazing fields for livestock farming.

iii. Land capability

In terms of the Department of Agriculture, Land Reform and Rural Development (then Department of Agriculture, Forestry and Fisheries) land capability data, the middle section of the project site is associated with a Moderate (Class 08) capability, and a Low – Moderate (Class 07) is found along the boundaries of the project site. The Class 08 and 07 are the predominant land capability classes of the project site. The project site also has a small, isolated patches with Moderate – High (Class 09) in the middle of the project site and Low – Moderate (Class 06) and Low (Class 05) land capability along the western boundary of the project site (see Figure 7-4).

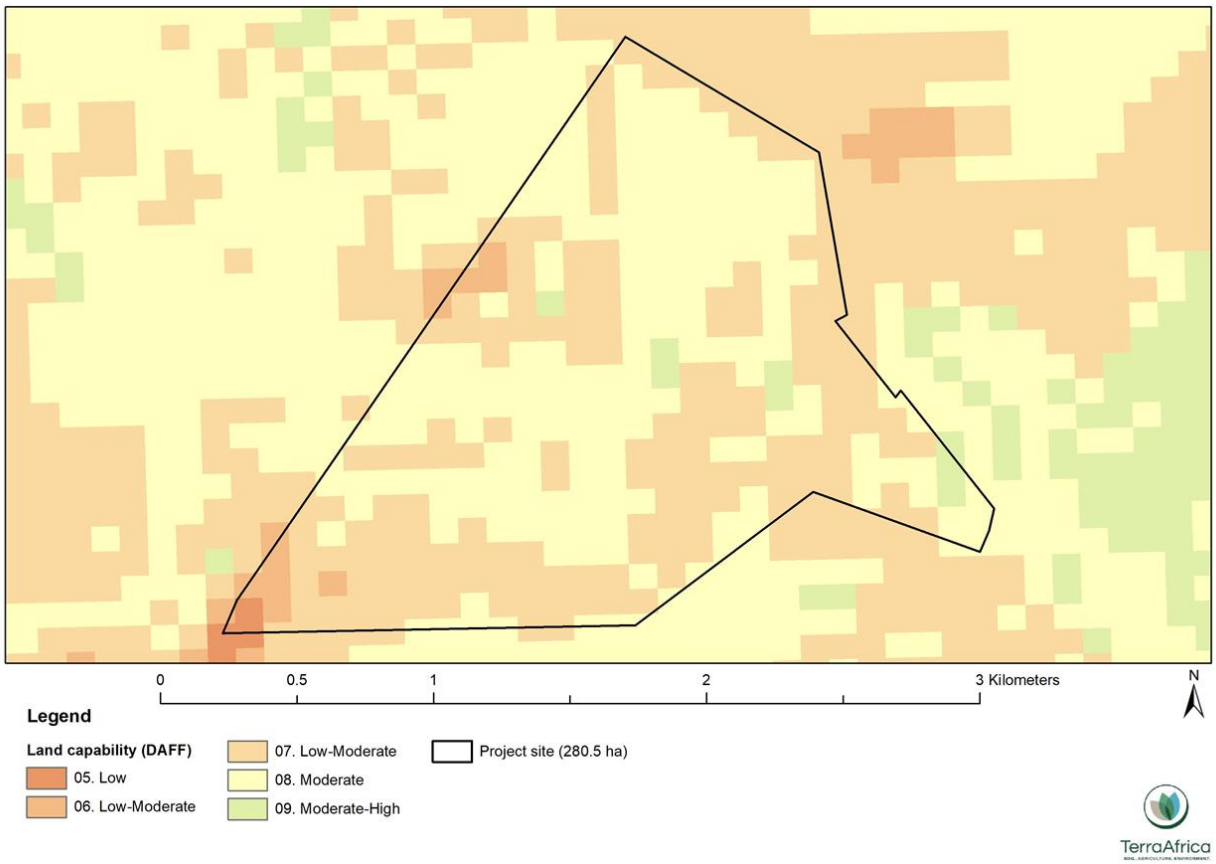

Figure 7-4: Land capability map of the project site

iv. Sensitivity analysis

According to the DALRRD (2016), agricultural potential is defined as a measure of potential productivity per unit area and unit time achieved with specified management inputs and for a given crop or veld type and level of management, largely determined by the interaction of soil climate and terrain. For the proposed project, the agricultural potential for the project site was derived from the soil classification of the site and its potential for rainfed production of grain crops, especially maize.

Following the soil classification and analysis, it was concluded that the site has a high, moderate, and low agricultural potential for the rainfed production of grain crops (see Figure 7-5). Two areas have high agricultural potential, and both of these are located in a horizontal strip along the western boundary of the project site. The high potential areas area associated with the Dundee and Kransfontein areas. The high agricultural potential area is equivalent to 12.5 ha. Soil with moderate agricultural potential is present in the southern third of the project site, and this area includes the Bainsvlei, Clovelly, Griffin, Hutton, Nkonkoni and Pinedene forms. The area associated with moderate agricultural potential is equivalent to 110.3 ha. The remaining portion, approximately 157.6 ha is associated with a low agricultural potential.

Figure 7-5: Agricultural potential map of the project site

7.2.3 Biodiversity

i. Flora

According to Mucina and Rutherford (2006) and the 2018 Final Vegetation Map of South Africa, the study area for the proposed project falls within the remaining extent of the Soweto Highveld Grassland Vegetation Type (see Figure 7-6), which is considered to be vulnerable with a conservation target of 24 % and is not protected. The vegetation type has been impacted by anthropogenic activities such as agriculture, mining, and infrastructure development activities.

The Soweto Highveld Grassland Vegetation Type is associated with a gently to moderately undulating landscape on the Highveld Plateau and is mainly distributed in the Mpumalanga and Gauteng Provinces, and to a lesser extent in the neighbouring Free State and North West provinces. This vegetation type supports short – medium – high, dense, tuffed grasslands that are dominated by *Themeda trianda* with associations to *Elionrus muticus*, *Erasgrostis racemosa*, *Heteropogon contortus* and *Tristachya leuxothrix*. In addition, the study area is located within 10 km of conservation and protected areas identified in terms of the South African Protected Area Database (SAPAD, 2020_Q2) which include, the Carry Blaire Bird Sanctuary and Nature Reserve, Cloudy Creek Bird Sanctuary and Nature Reserve, Klein Paradys Bird Sanctuary, and the Savannah Game Ranch (see Figure 7-7).

The findings of the field-based survey indicate that the project site for the Ilikwa Solar PV Facility is associated mainly with three (3) habitat units within the Soweto Highveld Grassland Vegetation type of the study area. These habitats units include the transformed and grassland habitats. The grassland habitat is further sub-divided into three (3) habitat subunits, which include the Degraded Grassland, *Seriphium* – dominated Grassland and *Themeda* – rich Grassland subunits. The various types of habitat units and subunits present within the project site of the Ilikwa Solar PV Facility are differentiated on the basis of plant species composition and are described below.

a) <u>Transformed Habitat</u>

This habitat unit is present within the project site of the Ilikwa Solar PV Facility. The field-based survey undertaken by the Specialist indicated that the unit had experienced acute anthropogenic disturbances, which has led to subpar habitat conditions, decreased habitat integrity and a low diversity of indigenous species diversity. The low species diversity recorded within the habitat unit is attributed to disturbed and transformed nature of the area. Although indigenous species are poorly species throughout the habitat unit, those present, and indicative of disturbed areas include the *Gomphocarpus fruticosus* and *Plantago lancelota* (see Figure 7-8). As a result of the scarcity of natural vegetation within this habitat unit, invasive alien plant species such as *Verbena bonariensis, Datura stramonium, Conyza bonariensis* and *Xanthium strumanium* (see Figure 7-8) are abundant and make up the majority of the vegetation present throughout this habitat unit. No plant species of conservation concern were observed within this habitat unit and does not provide suitable conditions to support plant species listed under the National Forest Act, 1998 (Act No. 84 of 1998).

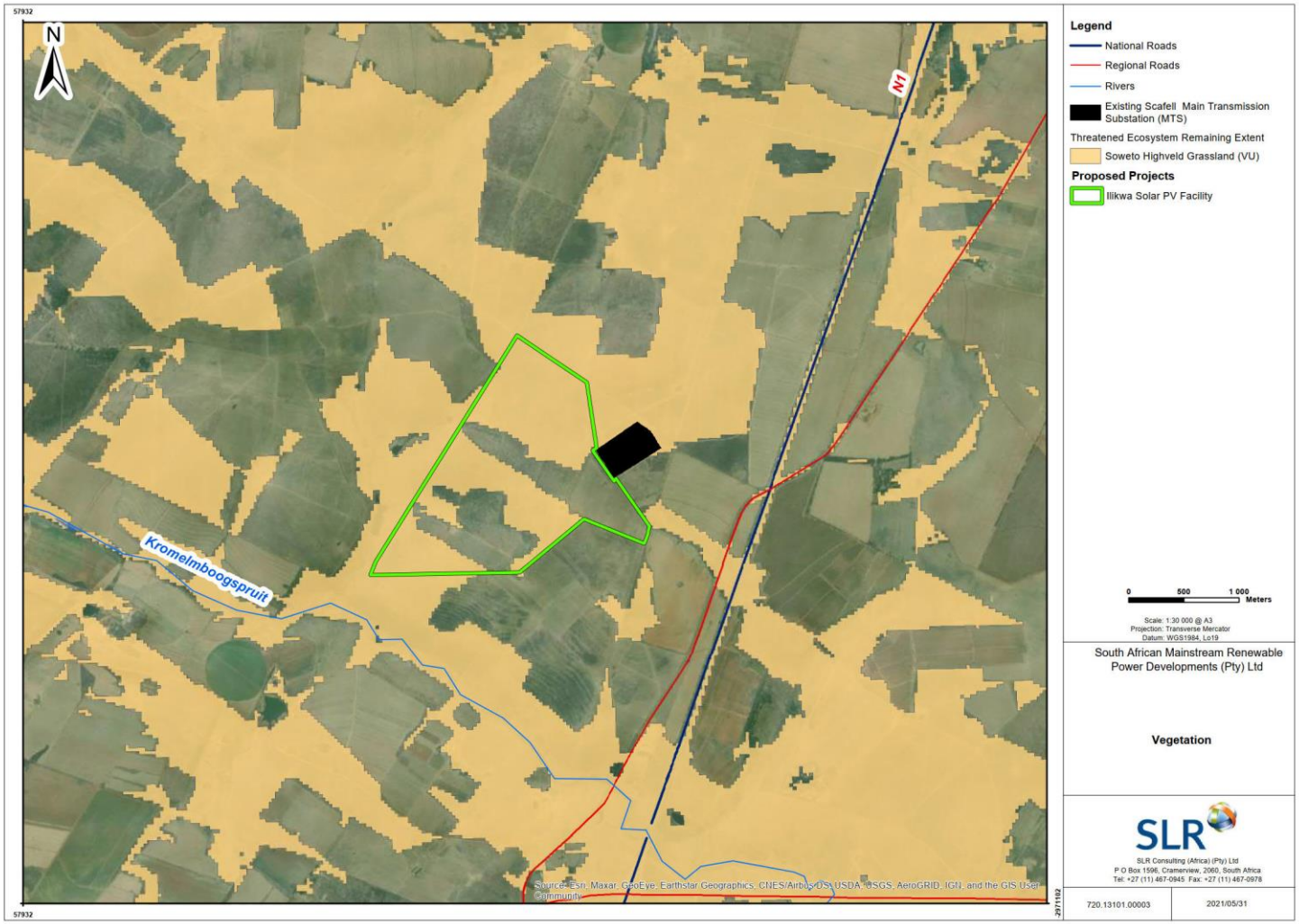

Figure 7-6: The location of the Ilikwa Solar PV Facility project site in relation to the mapped extent of the remaining Soweto Highveld Grassland vegetation type

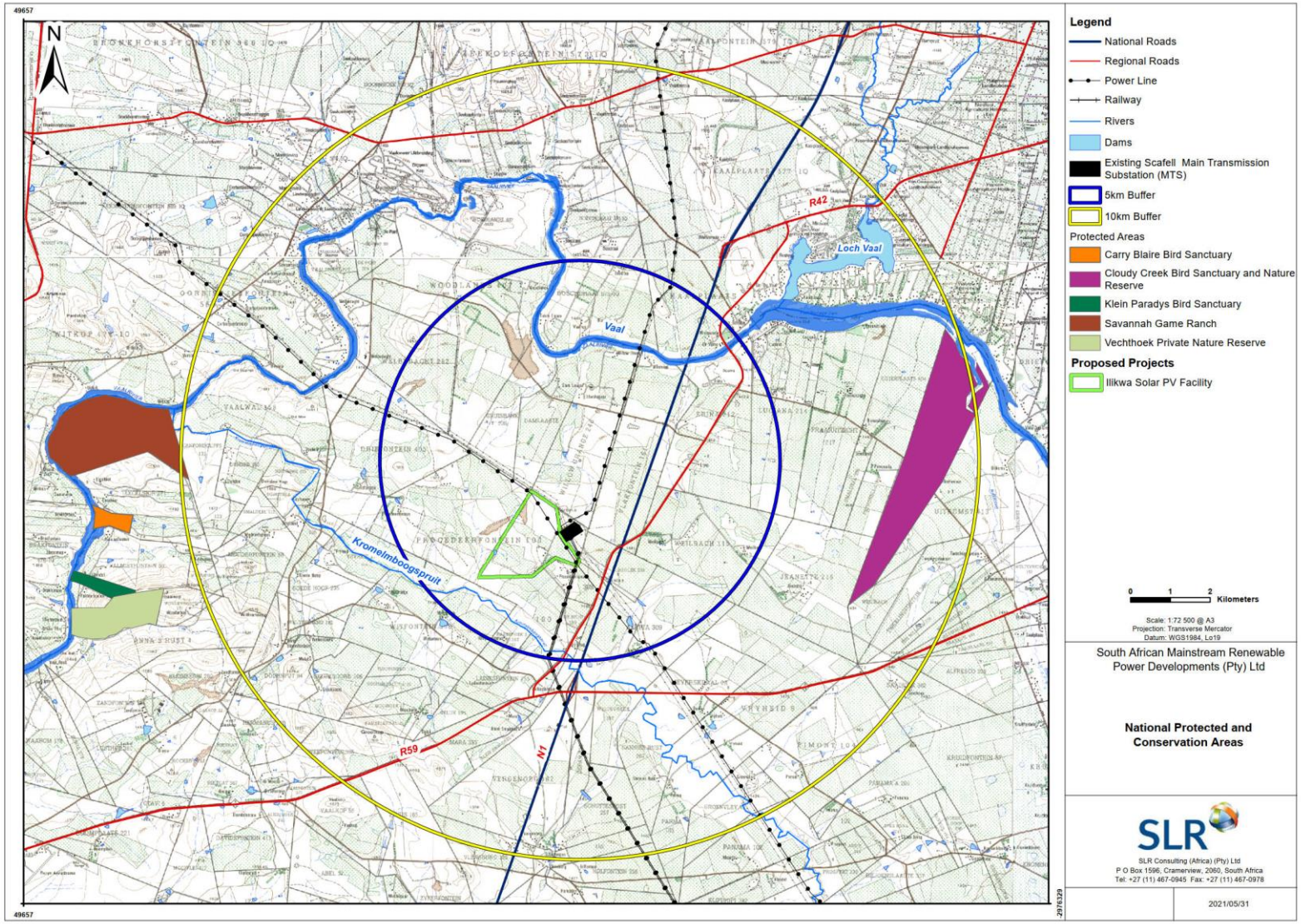

Figure 7-7: Protected areas within the vicinity of the Ilikwa Solar PV Facility project site

b) Grassland Habitat

This habitat unit has identified within the Ilikwa Solar PV Facility project site and is characterised by the dominance of grass species and consists of three (3) subunits, namely Degraded Grassland, *Seriphium* – dominated Grassland and *Themeda* – rich Grassland. Generally, the overall plant species composition of this habitat unit was moderate and characterised mainly by indigenous floral species, with invasive alien plant species present within all the subunits. All three (3) subunits were identified within the project site of the Ilikwa Solar PV Facility and are described in detail below

Gomphocarpus fruticosus

Conyza bonariensis

Tagetes minuta

Figure 7-8: Photographs of plant species associated with the Transformed Habitat subunit

c) Degraded Grassland

The Degraded Grassland Unit is associated with a low species diversity, which is attributed to the disturbed nature of the study area (see Figure 7-8). Representative graminoid plant species present within this subunit

include *Cynodon dactylon, Andropogon appendiculatus, Hyparrhenia hirta* and *Melinis repens*, whereas representative forb and herb species include *Commilena africana, Hilliardiella elaegnoides* and *Gomphorarpus fruticosus.* Although this subunit appeared not to support an established woody layer of vegetation*, Searsia pyroides* and *Vachellia karroo* were infrequently recorded throughout the subunit. Furthermore, alien invasive plant species associated with this subunit include *Verbena bonariensis, Verbena brasiliensis, Tagetes minuta, Conyza bonariensis* and *Campuloclinium macrocephalum.*

d) *Seriphium* – dominated Grassland

This vegetation subunit is described as a *Seriphium* – rich grassland that supports a moderate species diversity and is associated with a high density of *Seriphium* plumosum in comparison with the other subunits within the Grassland Habitat unit (see Figure 7-9). Based on the findings of the field-based survey, graminoids represented the dominated plant species within this subunit, and representative graminoid species include *Kyllinga alba, Helichrysum chionosphaerum, Polygala hottentotta,* and *Hibiscus microcarpus.* Although the woody layer of vegetation of this subunit was poorly represented*, Ziziphus zeyheriana, Vachellia karroo* and *Searsia pyroides* were infrequently identified. Furthermore, identified alien invasive plant species within this subunit include *Verbana bonariensis, Verbena brasiliensis, Conyza bonariensis* and *Campuloclinium macrocephalum.*

e) *Themeda* – dominated Grassland

This vegetation subunit is described as a *Themeda* – rich grassland that supports a moderate to high species diversity. This subunit represents the highest species diversity in comparison to the other Grassland subunits and supports species that were not identified within any of the other subunits which include *Hypoxis hemerocallidea* and *Peucedanum magalismontana.* Based on the results of the field-based survey, dominant graminoid representative species identified include *Aristida congesta subsp. congesta, Eragrostis gummiflua, Themeda triandra* and *Melinis repens* (see Figure 7-9). Representative forb and herb species identified include *Asclepias eminens, Dipcadi longifolium, Delosperma herbeum, Trifolium africanum* and *Pelargonium luridum.* The woody vegetation layer was represented by occasional woody clumps in which *Celtis africana, Searsia pyroides* and *Ziziphus mucronata* were dominant. Invasive alien plant species identified within this subunit include *Tagetes minuta, Bidens pilosa* and *Tragopogon dubis.*

f) Freshwater Habitat

The Freshwater Habitat is present within the Ilikwa Solar PV Facility project site and is associated with the unchanneled valley bottom wetland located within the south western section of the project site (see Section 7.2.4). The habitat is typical of saturated areas and is moderately intact, however several invasive alien plant species have encroached into sections of the habitat unit. The habitat reflects wetland conditions, with moderate species diversity. Dominant species present within the habitat include *Typha capensis, Eragrostis lehmanniana, Miscanthus junceus, Aristida congesta subsp. congesta, Cyperus congestus, Juncus effuscus, Cyperus marginatus* and *Cyperus esculentus.* The habitat is associated with occasional and scarce forb and herb species which include *Wahlenbergia caledonia, Gomphocarpus fruticosus, Nemesia fruticans* and *Haplocarpha lyrata.* Woody plant species are infrequent within this habitat, however species of Searsia pyroides were identified. Despite the presence of alien invasive plant species such as *Cosmos bipinnatus, Cirsium vulgare, Campuloclinium macrocephalum, Persicaria limbate* and *Verbena bonariensis,* the habitat is nevertheless considered important for the ecological functions of the study area (see Figure 7-9).

Listed and Protected Plant Species

The Ilikwa Solar PV Facility project site is not associated with any nationally – listed (in terms of NEMBA) or Red Data – listed plant species. Listed and Protected plant species present within the project site are listed in terms of the Free State Nature Conservation Ordinance Act, 1969 (Act 8 of 1969) and the identified species include, *Aloe davyana, Crinum bulbispermum, Helichrysum chionosphaerum, Helichrysum chionosphaerum, Helichrysum actuatum* and *Boophane disticha* (see Figure 7-9). Mainstream will require permits from Free State DESTEA and DFFE (where nationally threatened plant species are concerned) prior to the commencement of the construction phase of the proposed project for the translocation or removal of listed and protected plant species present within the project site. Furthermore, no tree plant species listed in terms of the National Forest Act, 1984 (Act 84 of 1984) were identified within the project site of the proposed project.

Degraded Grassland

Seriphium – dominated Grassland

Themeda – dominated Grassland

Freshwater Habitat

Boophone disticha

Campuloclinium macrocephalum

Figure 7-9: Photographs illustrating the habitat associated with the Degraded, *Seriphium*-dominated and *Themeda*-rich grassland habitat subunits and the Freshwater Habitat

Critical Biodiversity and Ecological Support Areas

Critical Biodiversity Areas (CBAs) are divided into two sub-categories – CBA 1 and CBA 2. Areas classified as CBA 1 are irreplaceable from an ecological perspective and this means no other places in the landscape where conservation and ecological objectives associated with the CBAs can be met. CBA 2 areas contain options that may be available to proponents of developments for meeting conservation and ecological objectives associated with those CBAs in certain parts of the landscape, however this can only be achieved at the cost of losing a certain portion of the spatial efficiency of the network of the CBAs. Should a CBA 2 area be lost to development, an alternative area elsewhere is identified to become part of the CBA network, and the identified area is normally larger in extent compared to the area that is lost in order to increase the CBA network. Within the Free State Province, CBAs account for at least 12 % of the province land area. Ecological Support Areas (ESAs) are areas of land that are considered important in ensuring the long – term persistence species or functioning of other important ecosystems. Areas identified as ESAs should be at least kept in a semi – natural condition, i.e., with their basic ecological functioning still intact. Within the Free State Province, ESAs make up 53 % of the province's land area. Taking the above into consideration, the project site for the Ilikwa Solar PV Facility falls within an ESA 1, ESA 2, and Degraded Area (see Figure 7-10) in terms of the Free State Biodiversity Plan (2015). The development of the Ilikwa Solar PV Facility is anticipated to have an ecological impact on these areas, however terrestrial biodiversity impacts associated with the development of the solar PV facility, as well as the recommended mitigation measures to mitigate anticipated terrestrial impacts will explored in detail in the EIA Report of the proposed project.

ii. Fauna

a) Habitats

From a fauna perspective, three vegetation units, namely Transformed, Grassland and Freshwater habitats are identified within the study area. The Transformed Habitat has been acutely impacted by anthropogenic activities – agriculture (cultivation) and infrastructure development. Natural vegetation within this habitat has been replaced by crops and the habitat no longer retains a natural floristic composition. This habitat consists of a low plant species diversity and therefore offers minimal habitat for fauna. The habitat provides no areas of niche habitat for fauna and no varying habitat structure due to the lack of woody plant species. Common fauna species may periodically forage within the project site, but this is likely to be *ad hoc* foraging whilst moving between more suitable areas.

The Grassland Habitat is characterised by grass species and consists of three subunits namely, the Degraded Grassland, *Seriphium* – dominated Grassland, *Themeda* – dominated Grassland and Freshwater Habitat. The Degraded Grassland habitat is fairly small in size and comprises a poor floral species representation and provides limited forage or niche habitat for many faunae, particularly invertebrates. The *Seriphium* – dominated Grassland comprises the largest extent of the overall Grassland Habitat and comprises a moderate floral composition, with a well – developed grass layer providing suitable and valuable habitat for most fauna. This subunit has the potential to host common and SCC fauna species. The Freshwater Habitat is present within the Ilikwa Solar PV Facility and is associated with the unchanneled valley bottom wetland present (see Section 7.2.4). The vegetation present is indicative of wetland conditions. The habitat functions as a valuable source of drinking water for fauna and provides water dependent fauna (i.e., invertebrates, amphibians, and avifauna) with habitat within the study area.

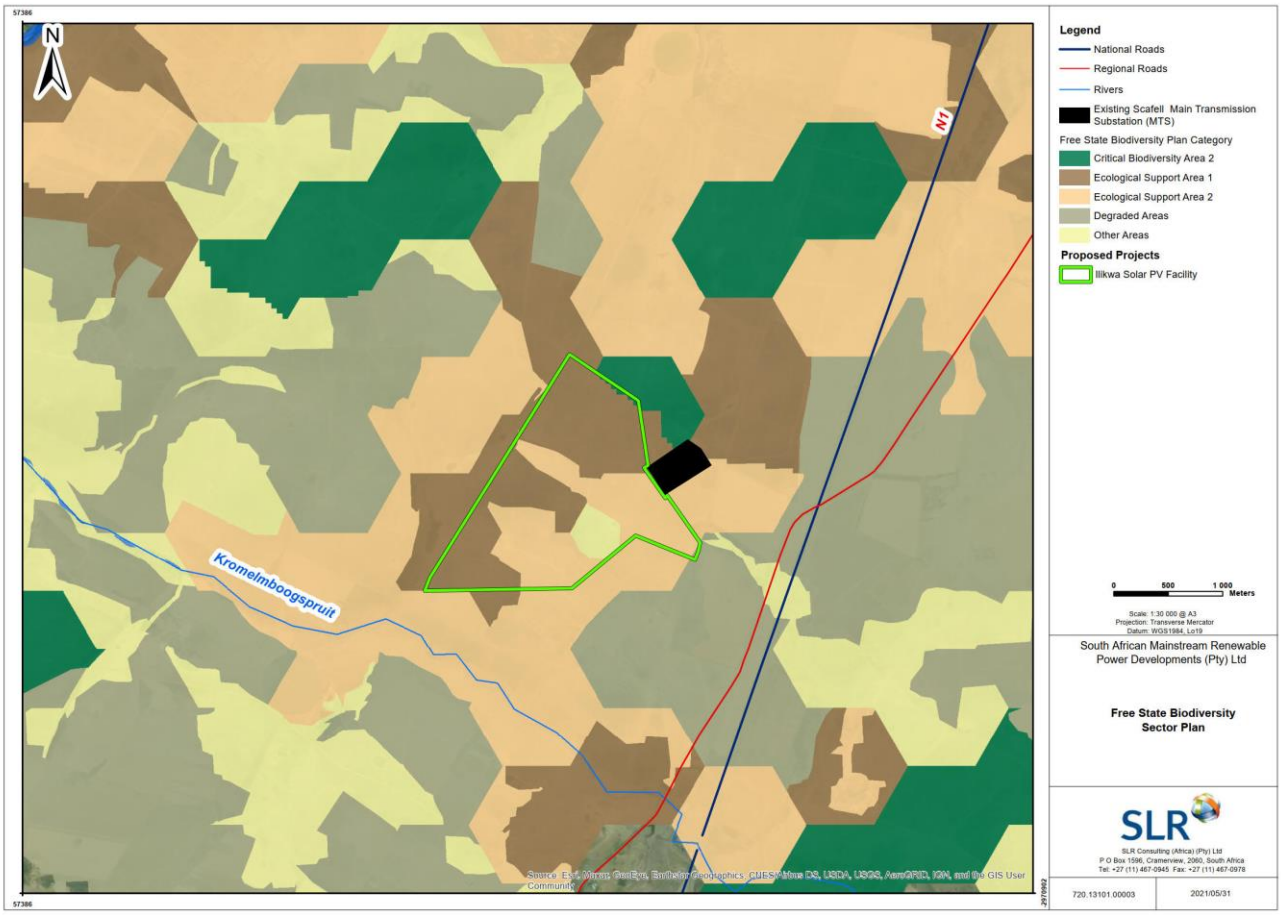

Figure 7-10: CBA Map of the Ilikwa Solar PV Facility project site

b) Mammals

Spoors of a Black – backed Jackal, Porcupine, and evidence of burrowing activity of an Aardvark as well as a spoor of a Warthog (mainly on farm roads) were identified within the study area (see Figure 7-11). The Aardvark was the only fauna species of conservation concern identified during the field-based survey in the area. The current land use of the study area and project site – grazing; constant human presence and disturbance; homogenous nature of the landscape and limited cover provided within the study are and project site reduce the suitability of this area for most mammal listed and protected species.

A Porcupine quill and a Spoor of a Black – backed Jackal

Evidence of Aardvark burrowing activity

a Warthog spoor

Figure 7-11: Photographs illustrating the evidence of fauna present within the study area

c) Avifauna

A total of 194 avifauna species could potentially occur within the broader study area, and 62 of these species are classified as priority species. Within the 62 species, only 31 have a medium probability of being present within the project study area. 19 species were recorded during the field-based site survey held on 18 January 2021, and no Red Data listed species were identified within the study area. Avifauna with a high and medium probability of occurring within the study area include Common Buzzard, Cloud Cisticola, Western Cattle Egret, Black-headed Heron, Black-winged Kite, Pied Starling, Blacksmith Lapwing, Long-crested Eagle, Spotted Eagle-owl, Amur Falcon, Lesser Kestrel, Marsh Owl and Greater Kestrel. Habitat present within the study area associated with avifauna include medium to tall grassland (including the

habitat associated with the wetlands), woodlands and existing grid connection infrastructure. According to the Avifauna Site Sensitivity Verification Report, the study area is associated with a low sensitivity, and there are no avifauna species of conservation concern present. In addition, the study area is not located within an Important Bird Area (IBA).

d) Herpetofauna

Herpetofauna species diversity within the study area is low as reptile and amphibians are difficult to detect, owing to their secretive nature. A juvenile African Bullfrog was noted during the field-based survey by the Specialist within the south - western section of the Ilikwa Solar PV Facility project site, within an artificial impoundment. The freshwater habitat associated with the unchanneled valley bottom wetland within the study area provides a suitable habitat for herpetofauna species within the area. A single snake was noted within the clutches of a Black – chested Snake Eagle, which means that the presence of this raptor indicates the abundance of reptile species, particularly snakes within the area to support the presence of avifauna. Few amphibian species are anticipated to occur within the grassland habitat as a result of the lack of surface water sources or areas of increased soil moisture which are needed to maintain the respiration of amphibians. However, these locations serve as significant foraging habitats. The African Bullfrog is the only listed and protected amphibian species identified within the study area. Furthermore, it is envisaged that the Common Girdled Lizard, a reptile species of conservation may inhabit the study area, however the lack of rocky habitat within the study does not provide for the persistence of these species.

e) Invertebrates

Invertebrate diversity within the study area is considered intermediate. The Freshwater and *Themeda* - dominated Grassland habitats are associated with a rich invertebrate diversity within the study area. The small size of invertebrates enables them to inhabit small areas and form niche habitats at different scales. Invertebrates' species identified during the field-based survey are associated with broad habitat requirements and mainly belong to the orders *Coleoptera, Hemiptera* and *Orthoptera.* No invertebrate species of conservation concern were identified within the study area, and only the Golden Starburst Baboon Spider is anticipated to occur within the study area.

7.2.4 Freshwater Resources

The proposed project is located within the Vaal Catchment and the Upper Vaal Water Management Area. According to the National Freshwater Ecosystem Priority Areas (NFEPA) database, there is one artificial channelled valley bottom wetland situated towards the south – west of the study area; two artificial channelled valley bottom wetlands to the west and north of the study area; and one depression wetland to the south of the study area. The three artificial channelled valley bottom wetlands are considered to be in a severely degraded ecological condition (Class Z3) whereas the depression wetland is associated with a moderately modified ecological condition (Class C). The wetland vegetation within the study area falls within the Mesic Highveld Grassland Group 3 Wetland Type and is considered Least Threatened (Mbona *et al.,* 2015). In addition, the NFEPA database identifies the Kromelmboogspruit River within the broader study area that is located approximately 400 m south of the Ilikwa Solar PV Facility project site. The Kromelmboogspruit River is associated with a largely modified ecological condition (Class D) and is not classified as a river Freshwater Ecosystem Priority Area (FEPA).

From the findings of the field-based survey, an unchanneled valley bottom wetland is located within the Ilikwa Solar PV Facility project site (see Figure 7-13). The ecological service of the wetland is considered to be high as the area around the instream impoundment was observed to provide diverse habitat for suitable waterfowl species, and the African Bullfrog species was also identified in this area. Other significant ecological services which are at an intermediate level include toxicant assimilation, sediment trapping, phosphate assimilation and erosion control.

A view of the unchanneled valley bottom wetland. Indicated on the photograph is the impoundment within the wetland which was found to be an important habitat for the African Bullfrog species.

Soil sample augured within the permanent zone of the wetland

Figure 7-12: Photographs illustrating the unchanneled valley bottom wetland located along the south westerly section of the Ilikwa Solar PV Facility project site

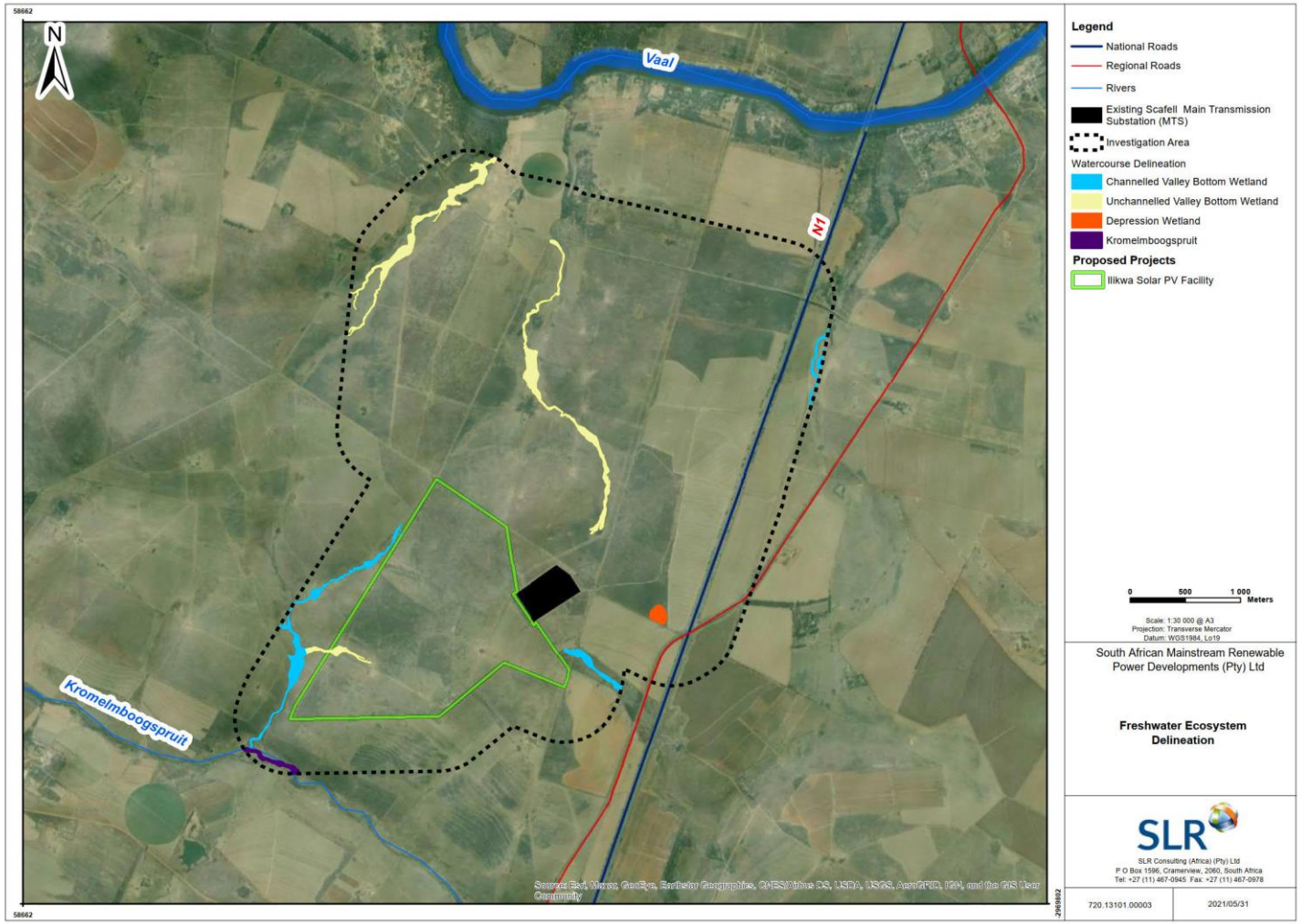

Figure 7-13: Freshwater resources present within Ilikwa Solar PV Facility project site and its vicinity

7.3 SOCIO-ECONOMIC PROFILE

7.3.1 District Municipality

The proposed project falls within the Fezile Dabi District Municipality (FDDM) in the Free State Province. The FDDM is a Category C[25] municipality, established in 2000 and is located in the northern most portion of the Free State Province. The district municipality is 20 829.1 km^2 in extent, and is the smallest district municipality in the province, making up 16 % of the province's geographical area. The main attraction within the district is the Vredefort Dome –the third largest meteorite site in the world and is located 26 km south -west of the project site for the proposed project. The FDDM comprises four (4) local municipalities namely: Moqhaka, Metsimaholo, Ngwathe and Mafube.

The proposed project is located within Ward 7 of the Ngwathe Local Municipality (NLM). The NLM is located on the most northern part of the FDDM, and the Vaal River forms the northern boundary of the municipal area, which also forms the boundary between the Free State, North West, and Gauteng provinces. The municipal area comprises 7 055 km^2 which is equivalent to 33.87 % of the FDDMs geographical area. Major towns present within the NLM include, Parys, Vredefort, Heilbron, Koppiesand and Edenville.

7.3.2 Population and Household Sizes

According to the Community Survey 2016, the population of South Africa is approximately 55,7 million and has shown an increase of about 7.5% since 2011. In 2016 the country had approximately 16,9 million households, representing an increase of about 17.12% since 2011. The household density for the country is estimated on approximately 3.29 people per household, indicating an average household size of 3-4 people (leaning towards 3) for most households, which is down from the 2011 average household size of 3.58 people per household. Smaller household sizes are in general associated with higher levels of urbanisation.

The greatest increase in population since 2011 has been in the Metsimaholo Local Municipality (Table 7-1) higher than both the national average and the averages for Gauteng and the Free State Province. The Ngwathe Local Municipality showed a slight decrease in population. Population density refers to the number of people per square kilometre and the population.

Table 7-1: Population density and growth estimates[26]

Area	Size in km^2	Population 2011	Population 2016	Population density 2011	Population density 2016	Growth in population (%)
Free State Province	**129,825**	**2,745,590**	**2,834,714**	**21.15**	**21.83**	**3.25**
Fezile Dabi DM	*20,668*	*488,036*	*494,777*	*23.61*	*23.94*	*1.38*
Ngwathe LM	7,055	120,520	118,907	17.08	16.85	-1.34
Metsimaholo LM	1,717	149,108	163,564	86.84	95.26	9.69
Gauteng Province	**18,178**	**12,272,263**	**13,399,724**	**675.12**	**737.14**	**9.19**
Sedibeng DM	4,173	916,484	957,528	219.62	229.46	4.48
Emfuleni LM	966	721,663	733,445	747.06	759.26	1.63

[25] Municipalities for wider areas, outside cities.
[26] Source : Census 2011, Community Development Survey 2016

The number of households in the study area has increased on all levels (see Table 7-2). The proportionate increases in households were greater than the increases in population on all levels, and greater than the increase in households on a national level, except in the Ngwathe and Emfuleni Local Municipalities where the increase in households were below the national average. The average household size has shown a decrease on all levels, which means there are more households, but with less members.

Table 7-2: Household sizes and growth estimates[27]

Area	Households 2011	Households 2016	Average household size 2011	Average household size 2016	Growth in households (%)
Free State Province	823,316	946,639	3.33	2.99	14.98
Fezile Dabi DM	144,980	172,370	3.37	2.87	18.89
Ngwathe LM	37,102	40,910	3.25	2.91	10.26
Metsimaholo LM	45,757	59,113	3.26	2.77	29.19
Gauteng Province	3,909,022	4,951,137	3.14	2.71	26.66
Sedibeng DM	*279,768*	*330,828*	*3.28*	*2.89*	*18.25*
Emfuleni LM	220,135	253,488	3.28	2.89	15.15

The total dependency ratio is used to measure the pressure on the productive population and refer to the proportion of dependents per 100 working-age population. As the ratio increases, there may be an increased burden on the productive part of the population to maintain the upbringing and pensions of the economically dependent. A high dependency ratio can cause serious problems for a country as the largest proportion of a government's expenditure is on health, social grants and education that are most used by the old and young population.

The total dependency ratio is the highest in the NLM (see Table 7-3) and the lowest in Ward 14 of the Metsimaholo LM. The same trend applies to the youth, aged and employment dependency ratios. Employed dependency ratio refers to the proportion of people dependent on the people who are employed, and not only those of working age. The dependency ratios suggest that the NLM has the highest levels of poverty in the area.

Table 7-3: Dependency ratios

Area	Total dependency	Youth dependency	Aged dependency	Employed dependency
Free State Province	**52.9**	**44.5**	**8.4**	**76.3**
Fezile Dabi DM	*51.9*	*42.7*	*9.2*	*75.9*
Ngwathe LM	60.2	48.2	12.0	78.7
Ward 7	56.2	49.9	6.3	73.0
Metsimaholo LM	44.3	38.0	6.3	70.3
Ward 14	34.8	25.9	8.9	50.0
Gauteng Province	**39.0**	**32.9**	**6.0**	**63.6**
Sedibeng DM	*43.8*	*36.5*	*7.4*	*70.4*
Emfuleni LM	43.8	36.8	7.1	71.9
Ward 25	47.4	39.6	7.8	70.3

[27] Source : Census 2011, Community Development Survey 2016

Poverty is a complex issue that manifests itself in economic, social, and political ways and to define poverty by a unidimensional measure such as income or expenditure would be an oversimplification of the matter. Poor people themselves describe their experience of poverty as multidimensional. The South African Multidimensional Poverty Index (SAMPI) (Statistics South Africa, 2014) assess poverty on the dimensions of health, education, standard of living and economic activity using the indicators child mortality, years of schooling, school attendance, fuel for heating, lighting, and cooking, water access, sanitation, dwelling type, asset ownership and unemployment.

The poverty headcount refers to the proportion of households that can be defined as multi-dimensionally poor by using the SAMPI's poverty cut-offs (Statistics South Africa, 2014). The poverty headcount has increased in the areas located in the Free State since 2011 (see Table 7-4), indicating an increase in the number of multi-dimensionally poor households. In the areas located in Gauteng, the poverty headcount has decreased. The intensity of poverty experienced refers to the average proportion of indicators in which poor households are deprived (Statistics South Africa, 2014). The intensity of poverty has increased slightly in all areas, except the Fezile Dabi District and the Metsimaholo LM where it decreased slightly. The intensity of poverty and the poverty headcount is used to calculate the SAMPI score. A higher score indicates a very poor community that is deprived on many indicators. The SAMPI score has increased in the areas located in the Free State, indicating that households in these areas might be getting poorer, especially in the NLM area. In Emfuleni the score has remained more or less the same.

Table 7-4: Poverty and SAMPI scores[28]

Area	Poverty headcount 2011 (%)	Poverty intensity 2011 (%)	SAMPI 2011	Poverty headcount 2016 (%)	Poverty intensity 2016 (%)	SAMPI 2016
Free State Province	**5.5**	**42.2**	**0.023**	**5.5**	**41.7**	**0.023**
Fezile Dabi DM	*4.4*	*42.2*	*0.019*	*4.9*	*41.9*	*0.021*
Ngwathe LM	4.7	42.2	0.020	5.4	42.5	0.023
Metsimaholo LM	5.1	42.8	0.022	5.8	41.6	0.024
Gauteng Province	**4.8**	**43.8**	**0.021**	**4.6**	**44.1**	**0.020**
Sedibeng DM	*3.9*	*42.5*	*0.017*	*3.5*	*42.9*	*0.015*
Emfuleni LM	3.4	42.3	0.014	3.2	43	0.014

7.3.3 Population composition, age, gender, and home language

On a ward level most of the population belong to the Black population group (see Figure 7-14), except in Ward 14 of the Metsimaholo LM where most people belong to the White population group. Ward 7 of the NLM has the lowest average age while Ward 14 of the Metsimaholo LM has the highest average age (see Table 7-5). Ward 7 consists mostly of farmland, but also include a portion of the Tumahole township in Parys, while Ward 14 includes a portion of the town of Sasolburg but also consists mainly of farmland.

[28] Source: Census 2011 and Community Development Survey 2016

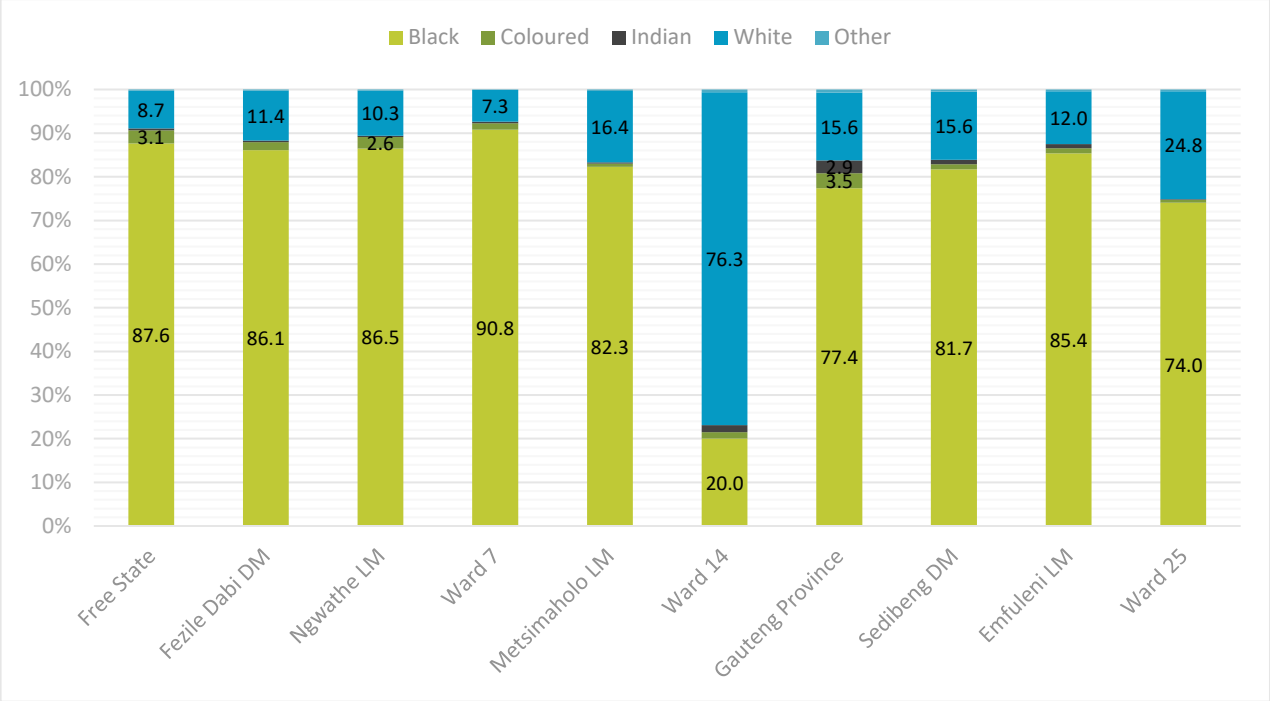

Figure 7-14: Population distribution[29] (shown in percentages)

Table 7-5: Average Age

Area	Average Age (in years)
Free State Province	**28.38**
Fezile Dabi DM	*29.22*
Ngwathe LM	29.32
Ward 7	26.78
Metsimaholo LM	28.64
Ward 14	34.08
Gauteng Province	**29.31**
Sedibeng DM	*29.58*
Emfuleni LM	29.36
Ward 25	29.61

Although the Ngwathe LM has the greatest proportion of people of retirement age, almost a third of the population in Ward 7 is aged 14 years or younger (Figure 7-15). Such a young population holds the potential for a great future demand in terms of employment and other means of making a livelihood, and increased pressure on infrastructure. The sex distribution in the area is more or less equal, except in the NLM where it is biased towards females (Figure 7-16). This trend is often observed in rural areas where males tend to migrate to urban areas to look for employment or other means of making a livelihood.

[29] Source: Census 2011

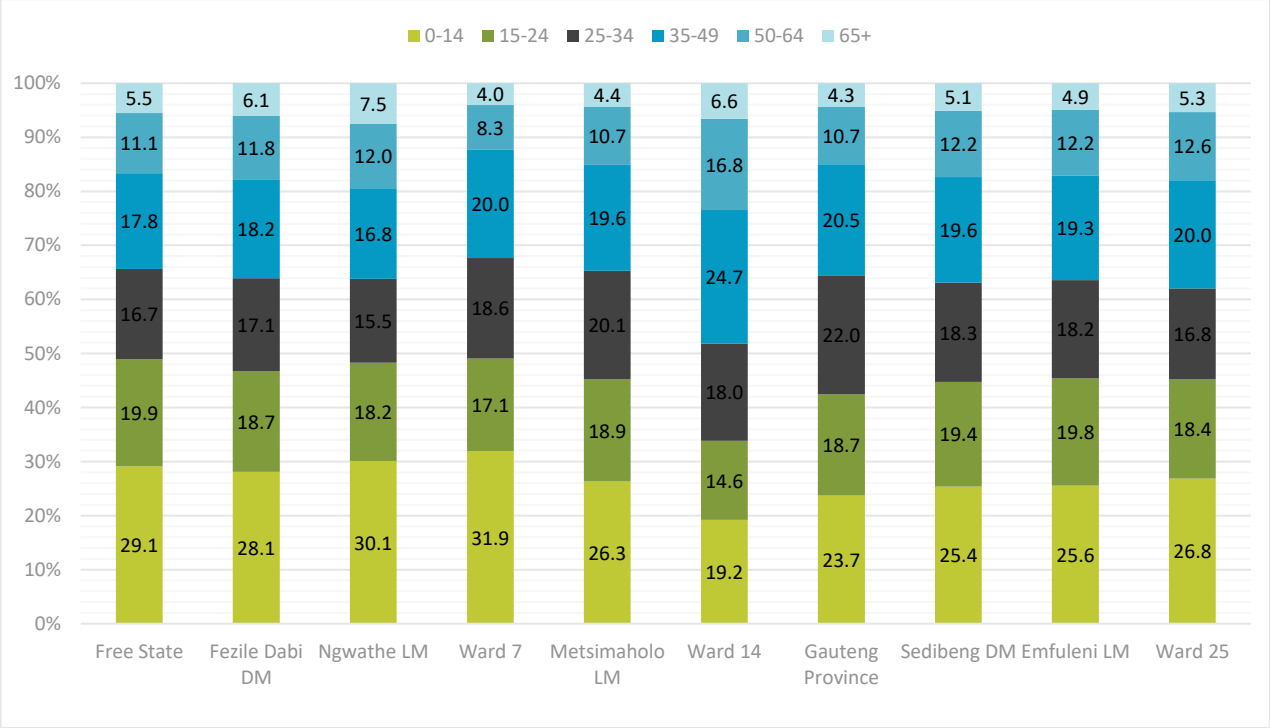

Figure 7-15: Age distribution[30]

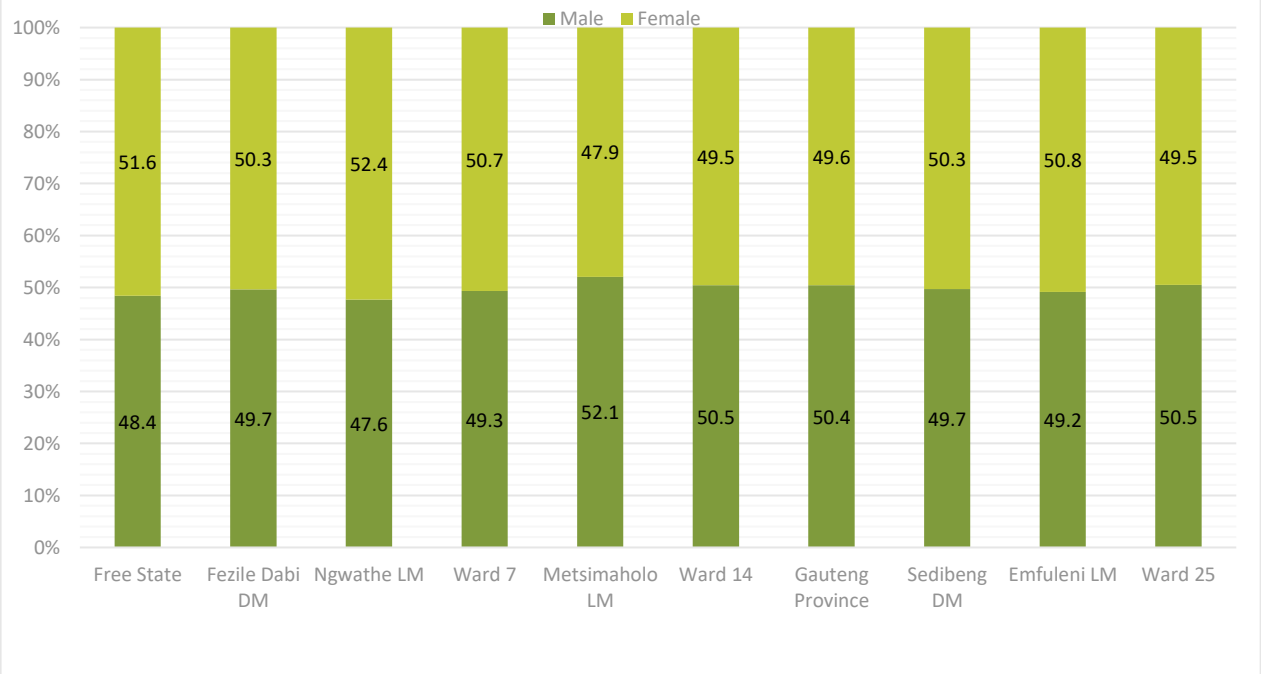

Figure 7-16: Sex distribution[31]

[30] Source: Census 2011
[31] Source: Census 2011

Sesotho is the home language of most people in the Free State area, except in Ward 14 where Afrikaans is the home language of the majority. The language profiles in the Gauteng area look slightly different, with Sesotho, Afrikaans, IsiZulu and IsiXhosa being the main languages on a district and local level. Home language can indicate the degree of cultural diversity in an area.

7.3.4 Education

A third of the population in Ward 14 of the NLM aged 20 years or older have completed an education higher than Grade 12, whereas Ward 7 has the highest proportion of people who has not completed their primary school education.

7.3.5 Employment, livelihoods, and economic activities

Ward 14 has the highest proportion of people aged between 15 – 65 years that are employed, with more than 80 % of this group being employed in the formal sector. Ward 7 has the largest proportion of discouraged work seekers, indicating a shortage of employment opportunities in the area. More than 45% of the households on district, local and ward level had an annual household income of below R19 601 in 2011, except in the Metsimaholo LM and Ward 14, where the proportion is lower.

Statistics South Africa (2015) has calculated the Food Poverty Line (FPL) for the Free State Province as R334 per capita per month for 2011 where the FPL is the Rand value below which individuals are unable to purchase or consume enough food to supply them with the minimum per-capita-per-day energy requirement for good health. The FPL is one of three poverty lines, the others being the upper bound poverty line (UBPL) and the lower bound poverty line (LBPL). The LBPL and UBPL both include a non-food component. Individuals at the LBPL do not have enough resources to consumer or purchase both adequate food and non-food items and are forced to sacrifice food to obtain essential non-food items, while individuals at the UBPL can purchase both adequate food and non-food items. The LBPL for the Limpopo Province was R520 per capita per month in 2011 and the UBPL R718 per capita per month respectively. The FPL for Gauteng was R339 per capita per month, the LBPL was R523 and the UPL was R963. More recent poverty lines than the rebased poverty lines for 2011 are not available. Based on this, a household with four members needed an annual household income of approximately R17 000 in 2011 to be just above the FPL. When comparing this with the SAMPI data it seems as if there are more households below the poverty lines in the area than who are multi-dimensionally poor. This is due to the poverty lines using a financial measure and do not take into consideration payment in kind and livelihood strategies such as subsistence farming. If these were to be converted into a Rand value, the poverty line picture may have a closer resemblance to the SAMPI data.

7.3.6 Housing

Most households live in urban areas, except in Ward 7 of the NLM and Ward 25 of the Emfuleni Local Municipality where more than 14% of households live on farms (see Table 7-6). Most households live in areas classified as formal residential, except in Ward 25 of the Emfuleni Local Municipality where about a third of households live on smallholdings. More than 75% of households on district or municipal level live in houses or brick structures on separate stands or yards, except in Ward 7 of the NLM where approximately a third of households live in informal dwellings that are either in a backyard or informal settlement, whereas Ward 17 of the Metsimaholo Local Municipality has the highest incidence of households renting their dwellings. In addition, most households

own their dwellings or occupy it rent-free, and more than 60 % of households in the area consist of up to three members with larger household sizes present in Ward 14.

Table 7-6: Geotypes

Area	Urban	Tribal/Traditional	Farm
Free State Province	84.5	8.8	6.7
Fezile Dabi DM	92.5	0.0	7.5
Ngwathe LM	90.7	0.0	9.3
Ward 7	85.1	0.0	14.9
Metsimaholo LM	97.7	0.0	2.3
Ward 14	97.9	0.0	2.1
Gauteng Province	97.6	0.9	1.5
Sedibeng DM	96.6	0.0	3.4
Emfuleni LM	99.4	0.0	0.6
Ward 25	85.9	0.0	14.1

7.3.7 Access to basic services

Access to basic services such as water, sanitation and electricity relate to standard of living according to SAMPI (Statistics South Africa, 2014). Households that use paraffin, candles, or nothing for lighting; or fuels such as paraffin, wood, coal, dung or nothing for cooking or heating; have no piped water in the dwelling or on the stand and do not have flush toilets can be described as deprived in terms of these basic services. On a municipal level most, households get their water from a regional or local water scheme. Almost a third of households in Ward 25 of the Emfuleni LM get their water from a borehole. In Ward 7 of the NLM, about 12 % of households get their water from a borehole, while almost 6 % get their water from a water tanker. The incidence of households with access to piped water inside their dwellings on a ward level varies. More than 90 % of households in Ward 14 of the Metsimaholo Local Municipality have piped water inside the dwelling, compared to just about a third in Ward 7 in the NLM.

Access to electricity for lighting purposes give an indication of whether a household has access to electricity, as poor households sometimes only use electricity for lighting, but use other sources of energy for heat and cooking. More than 85 % of households in the area have access to electricity for lighting purposes, with the highest incidence in Ward 14 of the Metsimaholo Local Municipality. Candles are the alternative that is most used for lighting purposes. In terms of sanitation, most households in the area have access to a pit toilet with or without ventilation. Ward 7 of the NLM has the greatest proportion of households (21.3 %) using a bucket toilet. Furthermore, most households in the area have their refuse removed by a local authority or private company, with the lowest incidences in Ward 7 of the NLM and Ward 25 of the Emfuleni Local Municipality. A large proportion of households in these two wards either have their own refuse dumps or no rubbish disposal.

7.3.8 Existing Road Network

The Fezile Dabi DM is associated with an expansive road network. Some of the busiest routes within the Fezile Dabi DM and the NLM include the N1 national road and the R59 provincial road. The N1 links Polokwane, Pretoria, Johannesburg, Bloemfontein, and Cape Town. The routes are utilised for the movement of freight and by tourists.

An existing intersection along the Boundary Road will be used to provide direct access to the project site of the proposed project (see Figure 7-17). The Boundary Road is a Class R3 road and forms an intersection with Road S 171 approximately 1 km west of the project site (see Figure 7-17 and Figure 7-18). The Boundary Road also links the R42 and R59 roads within the area. The Road S 171 (a Class 4 road) routes from the intersection with the Boundary Road, over the N1, past the project site to the homesteads located along the banks of the Orange River. The Road S 171 will provide access to the project site of the proposed Damlaagte Solar PV Facility.

The findings of the Traffic Assessment Report indicate that the road network within the vicinity of the project site contains sufficient capacity for the transportation of construction materials and workers during the construction and operation phase of the proposed project. However, the report notes that a dedicated right-turn lane on the northern approach and a left-turn deceleration land on the southern approach along the Boundary Road at Point C (see Figure 7-17). Further details regarding the recommendations of the report are included in Chapter 8 of this EIAR.

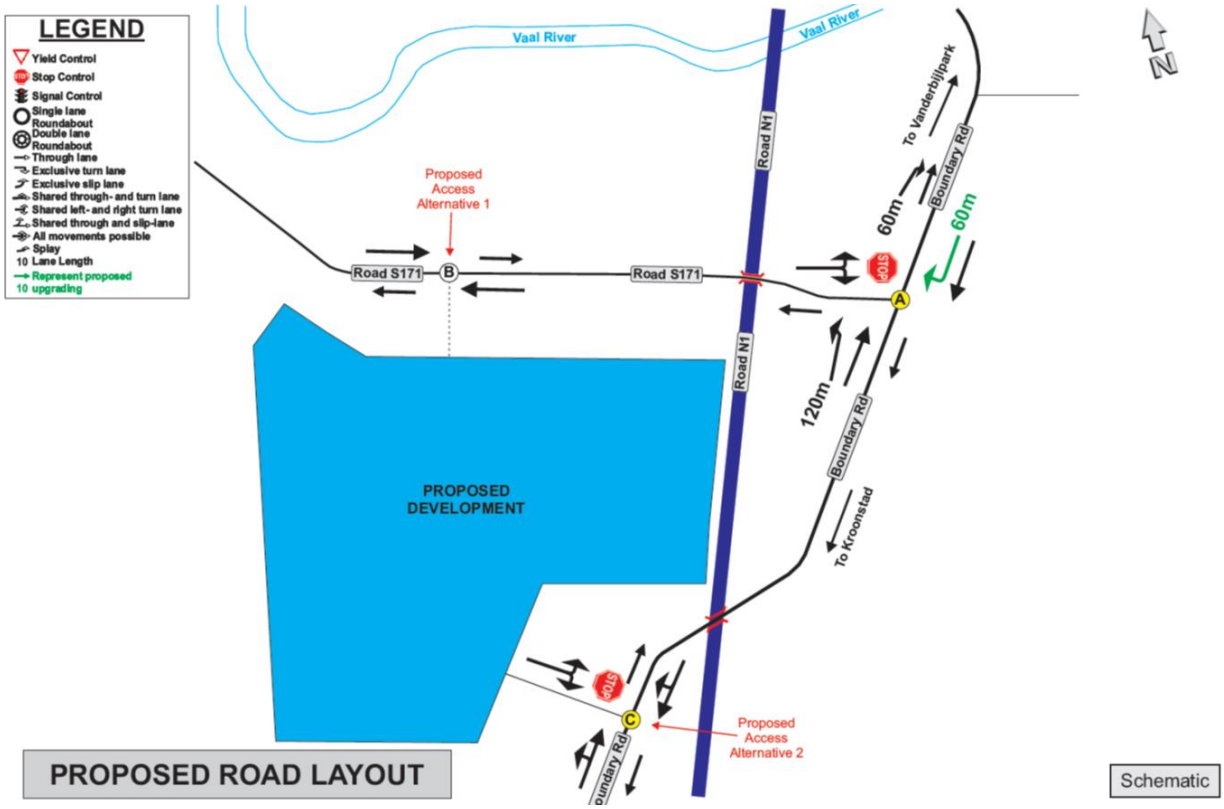

Figure 7-17: Existing Road network within the vicinity of the proposed project

Figure 7-18: A view of the Boundary Road. The road links the R42 and R59 roads within the surrounding area.

7.4 VISUAL PROFILE

7.4.1 Landscape Character

The landscape of the study area and the surrounding environment (within a 10 km radius of the Scafell Cluster) is characterised mostly by rolling agricultural land, with low hills occurring in the western and southern western parts (see Figure 7-19 and Figure 7-20). The Vaal River located at least 400 m to the northern boundary of the study area is the dominant landscape feature in the area. The only naturally occurring landscape type within the study area is the hills which are covered with Soweto Highland Grassland Vegetation.

The dominant landscape type is agricultural land which is being used mainly for grazing or cultivation. The project site for the proposed project falls within this landscape. In addition, the Vaal River is the primary focus of recreation tourism activities that stretch along its embankments within the surrounding area.

The general land character and overall visual impression of the study area is open land, punctuated bosques of tall trees (mostly exotic) associated with farmsteads. The land slopes gently to the Vaal River system, where a concentration of tall tree is evident (see Figure 7-21). A major drainage line, which flows into the Vaal River drains the southwestern sector of the study area.

7.4.2 Land Use

i. Residential

Residential land use within the broader area is mostly associated with either recreation-type activities along the Vaal River, or homesteads and scattered Agricultural Holdings. A small resort community, Vaal Oewer, is

in the far north - western section of the study area immediately north of the Vaal River on a promontory of land, which affords panoramic views over the north - west.

ii. Agriculture

Agriculture is by far the dominant land use within the broader area, with approximately 90 % of the study area utilized for grazing and cultivated lands.

iii. Industrial and Mining

There are no major industrial areas within the vicinity of the study area. Some sand mining occurs to the south of the Vaal River and mostly north – west of the project site.

iv. Urban

The major urban centres in the area are Parys (located 20 km south – west of the study area), Sasolburg (19 km east), and Vanderbijlpark (22 km north – east) and are all located outside of the study area.

v. Infrastructure and Roads

The main roads within the vicinity of the study area include the N1 national road (located immediately to the east of the study area), the R59 that passes through the southern portion of the study area, and the R42 that connects the N1 to Vanderbijlpark in the north – east. Boundary Road passes south and east of the project site for the proposed project and provides direct access to the site. Several other roads that service the farming community within the vicinity of the study area and properties along the banks of the Vaal River crisscross the central parts of the study area. The study area is also traversed by existing power lines, that emanate from the ESKOM Scafell MTS located 140 m east of the project site. The substation will be the grid connection point for the proposed project.

vi. Recreation and Tourism

The area is well known for its tourism, primarily associated with the Vaal River. Tourist destinations within a 3 km radius of the broader study area include Pont de Val Boutique Hotel and Spa, River Lodge Estate, Westvaal Holiday Resort, Kamdebo-on-Vaal, Eden Manor, Bishop's Bay and Club Milos which are all located to the north and east of the project site. To the north – west and along the Vaal River is the resort village of Vaal Oewer, and downstream of it is Vaal – Eden and many B&B – type establishments along the banks of the river.

Figure 7-19: Views of the project site from the N1 looking south

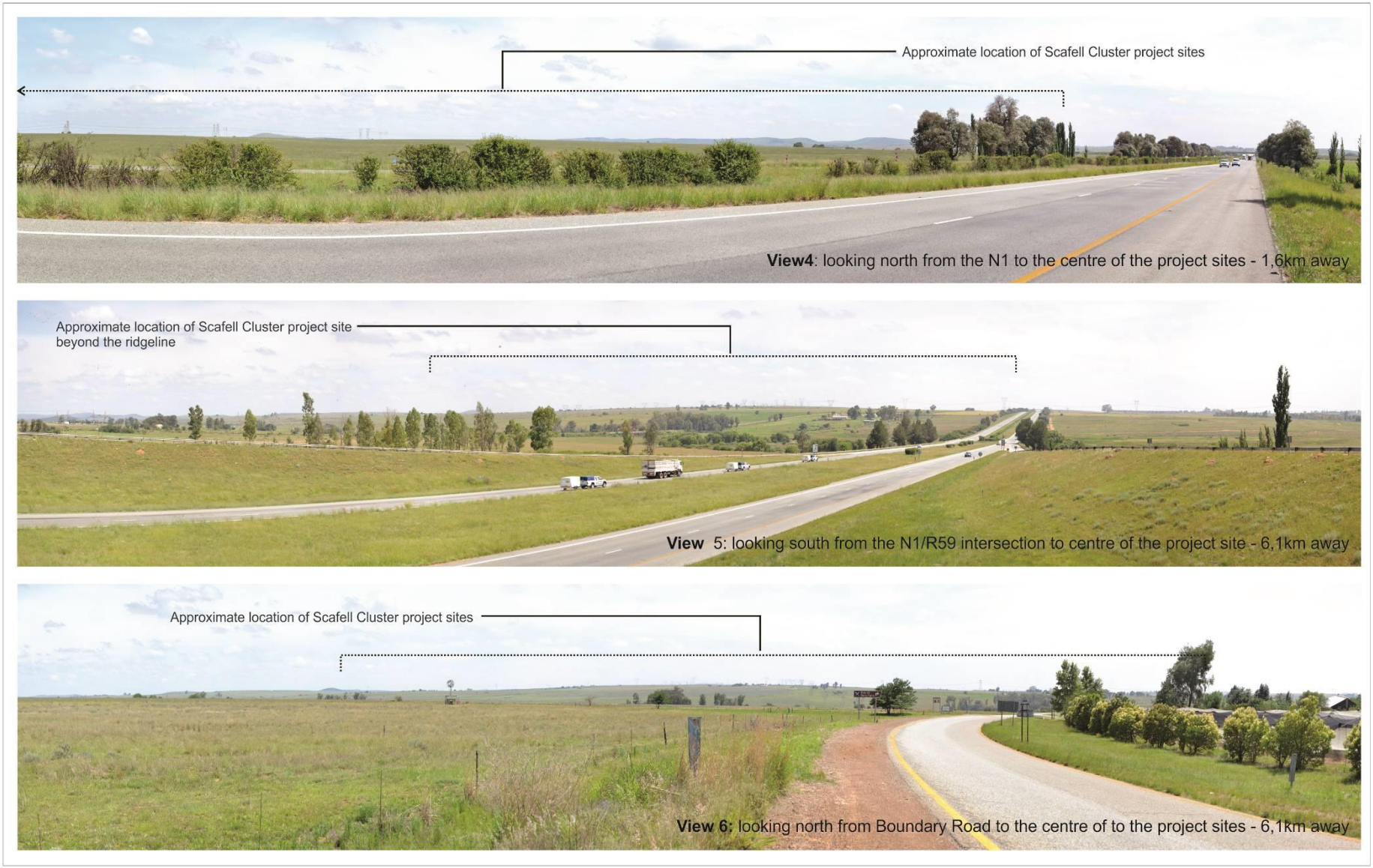

Figure 7-20: Views of the project site looking north from the N1

Figure 7-21: Views of the project site looking towards the banks of the Vaal River

7.5 HERITAGE RESOURCES

7.5.1 Archaeology

The Scafell Cluster Project study area is associated with an archaeological record of Early and Middle Stone Age artefacts and rock engravings which have been recorded from previous studies within the surrounding environment. An archaeological record within the vicinity of the study area from the Iron Age include Type N and Type V walling located to the south-east of the study area near Heilbron.

Based on the outcomes of the field survey by the Specialist, the Ilikwa Solar PV Facility project site is associated with stone walled features, historic structures, and a cemetery. Along the southern boundary of the project site, a large area is characterised by clusters of packed stone walled sites. These features show evidence of a square as well as circular walled features, with an extent of up to 2 000 m x 500 m. A large lower grindstone was identified among the stonewalled sites. A small cemetery, located towards the south western edge of the study area was identified. The cemetery extends through the fence of the adjacent property. The graves within the cemetery are extremely overgrown with grass, with others almost entirely covered. The majority of the graves identified were only marked with packed stones, with a few headstones.

7.5.2 Palaeontology

The Scafell Cluster Project study area is associated with lithologies of the Karoo Supergroup – well known for being a host of fossils as well as coal deposits. According to the SAHRIS Palaeosensitivity Map (see Figure 7-22), the study area is associated with a low to moderate sensitivity. Given that there are no paleochannels or rivers present within the study area and there is a well-documented history within the surrounding area of historical mining activities, the possibility of locating fossils within the study area is low. However, this will be explored in detail during the Impact Assessment phase of the proposed project.

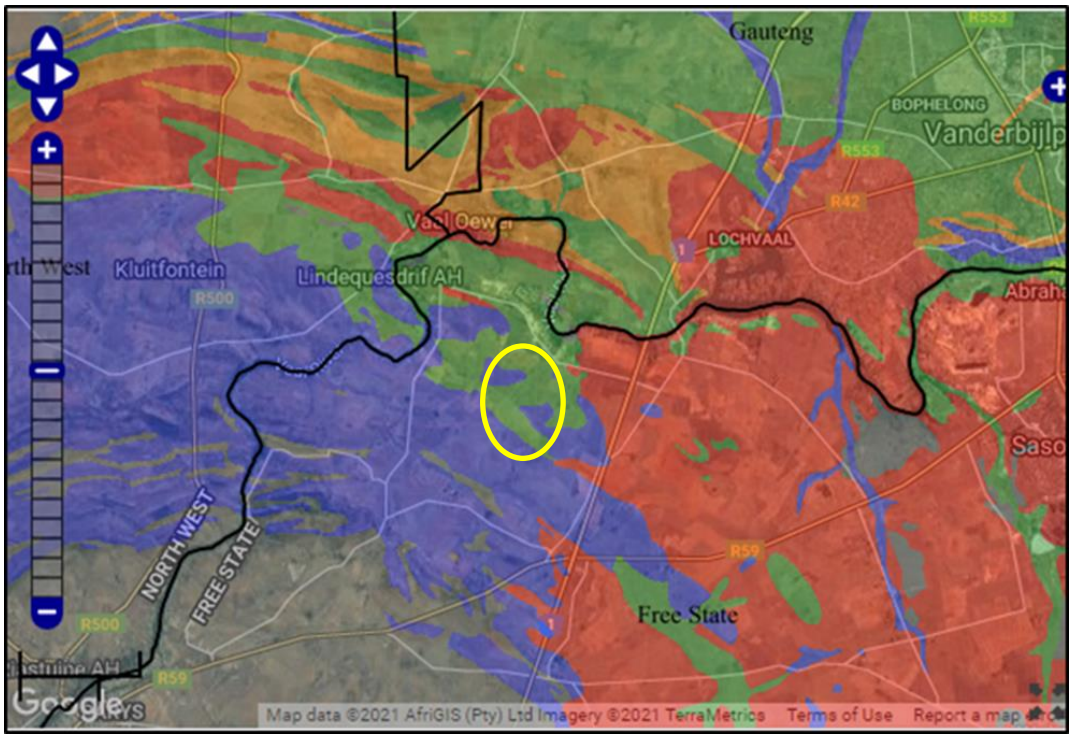

Figure 7-22: Palaeosensitivity Map of the study area

8. IMPACT DESCRIPTION AND ASSESSMENT

This chapter describes and assesses the significance of potential impacts related to the proposed 150 MW_{ac} Ilikwa Solar PV Facility. The methodology used to determine the significance of potential impacts is presented in Appendix 4 of this EIAR. Mitigation measures to avoid, reduce, remediate, or compensate for potential impacts are provided, as are optimisation measures to enhance the potential benefits. The impacts that remain following mitigation are assessed and presented as residual impacts. The status of all impacts should be considered to be negative unless otherwise indicated.

The following specialist input was obtained in the assessment of potential impacts:

- Terrestrial Ecology Assessment;
- Aquatic Assessment;
- Agriculture and Land Capability Assessment;
- Heritage Assessment;
- Visual Assessment;
- Social Assessment; and
- Traffic Assessment.

The assessment of impacts is structured as follows:

- Section 8.1: Ecological Impacts:
  - Section 8.1.1: Impacts on Vegetation;
  - Section 8.1.2: Impacts on Terrestrial Fauna;
  - Section 8.1.3: Avifauna Impacts;
  - Section 8.1.4: Freshwater Impacts;
- Section 8.2: Biophysical Impacts:
  - Section 8.2.1: Nuisance impacts (air quality and noise)
  - Section 8.2.2: Impacts on Soils and associated Agriculture Potential
- Section 8.3: Socio-Economic Impacts:
  - Section 8.3.1: Heritage Impacts;
  - Section 8.3.2.: Palaeontology Impacts;
  - Section 8.3.3.: Visual Impacts;
  - Section 8.3.4- 8.3.6.: Social Impacts; and
  - Section 8.3.7.: Traffic Impacts.
- Section 8.4.: Cumulative Impacts
- Section 8.5.: No-Go alternative.

8.1 ECOLOGICAL IMPACTS

8.1.1 Impacts on Vegetation

Description of Impact

The construction of the Solar PV facility and the associated infrastructure would result in the removal of vegetation within the development footprint of the proposed project infrastructure. The exposure of soils through vegetation clearance may increase the risk of erosion (by wind and water) and loss of topsoil, which may further impact the surrounding vegetation. During decommissioning, similar impacts would be expected to those during construction, albeit likely of lower intensity.

During the operational phase, maintenance activities for the site, would result in disturbance of vegetation.

Impact Assessment

The following direct and indirect impacts associated with the proposed project relating to the anticipated impacts on vegetation were identified by the specialist in the Terrestrial Ecology Assessment:

- Impact on floral habitat and diversity; and
- Impact on floral species of conservation concern; and
- Impact on CBAs, ESAs, Threatened Vegetation and Protected Areas.

With regards to the impact on floral habitat and diversity, the specialist assessed all aspects on floral ecology deemed likely to be affected by the proposed project. The construction of the Solar PV facility (including associated components) would require the clearance of vegetation, which in turn would lead to total loss of habitat and diversity within the affected area.

Based on the specialist field work, the proposed project will result in the loss of floral habitat and floral communities associated with the Grassland Habitat Unit (including all three (3) subunits[32]) as well as the Freshwater Habitat Unit. The specialist notes that although the proposed project will have an impact on the greatest extent of the *Seriphium*-dominated grassland subunit within the project site, this vegetation is not regarded as the reference vegetation within the project site and is well represented in the surrounding area. Thus, as the *Seriphium*-dominated grassland subunit is well represented in the surrounding landscape, a significant loss of the grassland habitat floral community as a result of the proposed project is not anticipated.

For the *Themeda*-rich grassland subunit, it is anticipated that the proposed project will have an impact on this vegetation which will result in the loss of the associated floral community. Furthermore, it is anticipated that the proposed project will also have an impact on the Freshwater Habitat (associated with the unchanneled valley bottom wetland present within the project site) and the associated floral communities, as well as the ecological process avoided by the wetland. As a result, the preliminary layout (see Figure 5-3) proposed for the proposed project avoids the footprint of this unchanneled valley bottom wetland.

From the findings of the specialist, the total loss of habitat as a result of the proposed project within the affected area is unlikely to have an impact on floral communities at a local and regional level, and the significance of the impact can be managed through the implementation of the recommended mitigation measures.

[32] Degraded Grassland, *Seriphium*-dominated Grassland, and the *Themeda*-rich Grassland.

The specialist notes that the placement of a solar PV facility project may unfavourably have an impact on protected floral species. For the proposed project, two (2) individual species of *Boophone disticha* (Least Concern) and one (1) species of *Aloe dayvana* (Least Concern) were identified from the *Seriphium*-dominated grassland subunit present within the project site. Other protected floral species that may be present within the surrounding habitat outside of the project site include individuals of the *Crinum bulbispermum* (Least Concern), *Helichrysum chionosphaerum* (Least Concern), and *Helichrysum actuatum* (Least Concern). All the above-mentioned protected plant species were found to be mainly associated with the *Seriphium* and *Themeda*-dominated grassland habitat subunits.

In terms of the impact on CBAs, ESAs, Threatened Vegetation and Protected Areas, portions of the proposed project fall within the mapped extent of the Soweto Highveld Grassland vegetation type (see Figure 7-7) which is classified as a vulnerable ecosystem. The specialist notes that the development of the proposed project will lead to the loss of the threatened ecosystem within the affected area, as the *Themeda*-rich grassland subunit is considered to be a secondary grassland and shares an affinity with the reference vegetation type. Thus, the *Themeda*-rich grassland subunit provides potential habitat to support the vegetation characteristic of the Soweto Highveld Grassland vegetation type.

According to the 2015 Free State Biodiversity Plan, the project site for the proposed project is located within ESA 1 and ESA 2 areas that are associated with the *Seriphium*-dominated and *Themeda-rich* grassland subunits. It is anticipated that the proposed project will have a negative impact on these mapped ESA areas.

It is estimated that the proposed project would result in the loss of approximately 180 ha of vegetation. Based on the findings of the Specialist, the impacts on floral habitat and diversity and on species of conservation concern would permanent, localised and of high to medium intensity. Thus, these impacts are considered to be of **medium** and **high** significance without mitigation, and **MEDIUM** and **VERY LOW** with mitigation for the construction phase (see Table 8-1). For the operation phase, both impacts are associated with a medium-term duration, medium intensity and would be localised. Thus, this assessment takes into cognisance of the fact that the layout (see Figure 5-2) of the proposed project assessed in this EIAR is indicative and could change slightly during the detailed design phase. From the assessment, it is clear that the impact on vegetation due to the proposed project can be reasonably managed to an acceptable level with the implementation of the recommended mitigation measures.

Following the completion of construction, the vegetation within all disturbed areas located outside of project infrastructure footprints would be able to recover over time. However, during operations, some degree of management of vegetation located within the project site would be required to prevent the proliferation of AIP species. The potential operational impacts on terrestrial vegetation are considered of local extent, medium-term duration and of medium intensity resulting in an overall significance of **VERY LOW** (with mitigation).

Table 8-1: Impact on Vegetation

Criteria	Without Mitigation	With Mitigation
Construction Phase		
Intensity	High	High
Extent	Local	Local
Duration	Long-term	Long-term

Criteria	Without Mitigation	With Mitigation
Probability	Definite	Definite
Consequence	High	Medium
Confidence	High	High
Significance	**High**	**MEDIUM**
Operational Phase		
Intensity	Medium	Low
Extent	Local	Local
Duration	Medium-term	Short-term
Probability	Probable	Possible
Consequence	Medium	Low
Confidence	Low	Low
Significance	**Medium**	**VERY LOW**
Reversibility	Reversible	
Loss of resource	Medium	
Mitigation potential	Low	

Comparative Assessment of Alternatives

Mainstream has considered two (2) alternatives for each of the key infrastructure components for the proposed project. The alternatives have been considered for the types of PV panel modules, mounting system technology and the BESS. Chapter 6 of this EIAR provides a detailed description of these alternatives considered for the proposed project.

From a floral perspective, no additional impacts are anticipated as a result of the selection of the preferred alternative for the PV panel modules, mounting system technology and the BESS. Thus, the selection of either alternative as the preferred alternative is considered acceptable form a terrestrial ecology perspective.

Mitigation Measures

- Design / Planning-related mitigation:
  - Undertake a walkdown survey of the project footprint (the area to be cleared for the placement of infrastructure with a suitability qualified botanical specialist to undertake a search and rescue operation of species of conservation concern that can be translocated to a suitable area and all transplantable plant material prior to construction (including bulbs and others deemed transplantable);
  - Ensure that the necessary permits are obtained from the DESTEA or DFFE where relevant for the removal or translocation of protected plant species located within the project footprint of the proposed project;
  - Appoint an Environmental Control Officer (ECO) for the duration of the construction phase prior to construction. The ECO must be responsible for enforcing no-go areas, environmental induction for all construction workers and awarding penalty fines for any transgressors; and

> The ECO in liaison with the Contractor and Developer should compile an Alien and Invasive Plant Management Control / Plan prior to construction. The following mitigation should be included in the plan:
  - Manage the spread of AIP species, which may affect remaining natural habitat within surrounding areas. Specific mention in this regard is made to Category 1b and 2 species identified within the development footprint areas (refer to section 2.7.3 of the Terrestrial Ecology Assessment Report);
  - Undertake ongoing alien and invasive plant monitoring and clearing / control throughout the construction phase, including a 30 m buffer surrounding the study area, to check for AIP proliferation and to prevent spread into surrounding natural areas. Specific mention in this regard is made of Category 1b and 2 AIP species (as listed in the NEMBA Alien species lists, 2020), in line with the NEMBA Alien and Invasive Species Regulations (2020); and
  - Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility.

- Construction-related mitigation:

> Restrict vehicles to travel only on designated roadways or existing roads / tracks to limit the ecological footprint of the construction activities;
> No collection of indigenous floral species must be allowed by construction personnel, especially with regards to floral species of conservation concern (if encountered);
> Care should be taken during the construction and operation phase of the proposed project to limit edge effects to surrounding natural habitat. This can be achieved by:
  - Demarcating all footprint areas during construction activities;
  - Ensuring no construction rubble or cleared alien invasive species is disposed of outside of demarcated areas. Waste disposal containers and bins should be provided during the construction phase for all construction rubble and general waste. Vegetation cuttings must be carefully collected and disposed of at a separate and licensed waste facility; and
  - All soils compacted as a result of construction activities should be ripped and profiled and reseeded.
> If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line. Spill kits should be kept on-site within workshops. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil;
> No collection of floral species of conservation concern must be allowed by construction personnel;
> No illicit fires must be allowed during the construction phase of the proposed development;
> Upon completion of construction activities, it must be ensured that no bare areas remain, and that indigenous species be used to revegetate the disturbed area. Any natural areas beyond the direct footprint, which have been affected by the construction activities must be rehabilitated using indigenous species; and

> All soils compacted because of construction activities falling outside of the project area should be ripped and profiled. Special attention should be paid to alien and invasive control within these areas.

- Operation-related mitigation:
  > No additional habitat is to be disturbed during the operational phase of the proposed project;
  > No vehicles are allowed to indiscriminately drive through sensitive habitat and natural areas;
  > No dumping of litter must be allowed on-site;
  > Ongoing alien and invasive plant monitoring and clearing / control should take place throughout the operational and maintenance phase, and the project perimeters should be regularly checked for AIP establishment to prevent spread into surrounding natural areas; and
  > Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility.

8.1.2 Impacts on Terrestrial Fauna

Description of Impact

The construction of the proposed project would result in the removal of vegetation within the project footprint of the solar PV facility which will lead to an impact on faunal diversity, habitat as well as on faunal species of conservation concern. During decommissioning, similar impacts would be expected to those during construction, albeit likely of lower intensity.

During the operational phase, maintenance activities for the proposed project may result in the disturbance of fauna.

Impact Assessment

The specialist noted that the key anticipated impacts on fauna were the impact on faunal habitat and diversity and potential impacts on faunal species of conservation concern.

With regards to the impact on faunal habitat and diversity, the specialist noted that the study area still has experienced historic disturbance from agricultural activities such as livestock grazing. Nonetheless, the study area still provides habitat for species of conservation concern, common and widespread species and impacts from the development are likely to remain significant post mitigation.

From the field work undertaken by the specialist within the study area, juveniles of the *Pyxicephalus adspersus* (African Bullfrog) were observed within the Freshwater Habitat. Furthermore, the specialist further notes that the *Harpactira hamiltoni* species (Golden Stardust Baboon Spider) may potentially occur within the *Seriphium*-dominated and *Themeda*-rich grassland as they provide suitable breeding habitat. However, given the degraded nature of the central and eastern portions of the study area, species of conservation have a medium probability of occurring in this area.

The majority of potential impacts on fauna identified for the construction phase would be of high and medium intensity, regional extent, and long-term duration. Thus, the impacts are considered to be **very high** and **high** without mitigation. Following the implementation of the recommended mitigation measures, the significance of the impact on faunal species of conservation concern will be **LOW**. For the impact on faunal habitat and diversity, the impact will be **HIGH** with mitigation (see Table 8-2).

During operations, activities would generally be restricted to maintenance activities within the project footprint resulting in general disturbance of fauna, e.g., noise from equipment that may be used for maintenance purposes, etc. The potential operational impacts without mitigation are considered to be of a medium intensity, long-term duration and regional extent which culminates in a **high** significance. Following the implementation of the recommended mitigation measures, the impacts will be **MEDIUM.**

Table 8-2: Impact on Terrestrial Fauna

Criteria	Without Mitigation	With Mitigation
Construction		
Intensity	High	High
Extent	Regional	Local
Duration	Long-term	Medium-term
Probability	Definite	Probable
Consequence	Very Low	Very Low
Confidence	Low	Low
Significance	**Very High**	**HIGH**
Operational Phase		
Intensity	Medium	Low
Extent	Regional	Local
Duration	Long-term	Long-term
Probability	Definite	Probable
Consequence	Medium	Medium
Confidence	Medium	Medium
Significance	**High**	**MEDIUM**
Reversibility	Partially Irreversible	
Loss of resource	Low	
Mitigation potential	Low	

Comparative Assessment of Alternatives

Mainstream has considered two (2) alternatives for each of the key infrastructure components for the proposed project. The alternatives have been considered for the types of PV panel modules, mounting system technology and the BESS. Chapter 6 of this EIAR provides a detailed description of these alternatives considered for the proposed project.

From a fauna perspective, no additional impacts are anticipated as a result of the selection of the preferred alternative for the PV panel modules, mounting system technology and the BESS. Thus, the selection of either alternative as the preferred alternative is considered acceptable from a terrestrial ecology perspective

Mitigation Measures

- Design / Planning-related mitigation:

- A suitably qualified biodiversity specialist must review the final layout and provide any additional mitigations (if required).

- Construction-related (including decommissioning) mitigation:
  - Should any lights be installed, they should face downwards to reduce the abundance of insects attracted to the night lights;
  - Do not disturb or alter faunal habitat beyond the demarcated project footprint areas;
  - Restrict travel of construction equipment to designated roadways to limit the ecological footprint of the development activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimal;
  - No fires are allowed by construction personnel as this will increase the risk of the surrounding veld catching fire and burning down not only the immediate faunal habitat but also that of the larger local areas;
  - Inspect access roads and areas adjacent to the development footprints after heavy rains to detect any signs of erosion. Where found, these areas must be immediately rectified through appropriate erosion control measures;
  - During the site-pegging phase of surface infrastructure, should any faunal species of conservation concern (albeit considered unlikely) be observed, all activities should be halted, and a suitably qualified specialist is to be contacted to advise on the best way forward;
  - Should any other faunal species protected under the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) or the Free State Nature Conservation Ordinance (1969) be encountered, a suitably qualified specialist should be consulted. Should it be deemed necessary to move the taxa authorisation to relocate such species, a permit must be obtained from DESTEA or the DFFE where relevant;
  - Edge effect control needs to be implemented to ensure no further degradation and potential loss of faunal habitat outside of the proposed project footprint areas occurs;
  - Smaller species such as scorpions and reptiles are likely to be less mobile during the colder periods of the year, as such should any be observed in the footprint sites during clearing and operational activities. They are to be carefully and safely moved to an area of similar habitat outside of the disturbed footprint. Construction personnel are to be educated about these species and the need for their conservation. Smaller scorpion species and harmless reptiles should be carefully relocated by a suitably nominated construction person or staff member. For larger venomous snakes, a suitably trained official or specialist should be contacted regarding the relocation of the species, should it not move off on its own;
  - All rescue and relocation plans for species of conservation concern should be overseen by a suitably qualified specialist;
  - Disturbed and cleared areas need to be revegetated with indigenous grass species to help stabilise the soil surface. Where bare soils are left exposed because of construction activities, they should be immediately rehabilitated; and
  - It is recommended that construction activities take place in a phased manner, so as to ensure that as far as possible faunal species can naturally disperse out of the area ahead of sequential construction activities;

- Operation-related mitigation:

> All vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the development activities;
> No hunting / trapping or collecting of any faunal species is allowed; and
> No fires should be lit outside of designated locations as this will increase the risk of the surrounding veld catching fire and burning down not only the immediate faunal habitat but also that of the larger local areas.
> Alien vegetation must be removed from the proposed study area during both the construction and operational phases, in line with the NEMBA Alien and Invasive Species Regulations (2016).
> No collection or persecution of faunal species of conservation concern within the study area is allowed; and
> Any faunal species of conservation concern that are observed should be logged (with a GPS position) and uploaded to the iNaturalist site. Such data can also be used as part of the biodiversity and conservation awareness of the area over the long term.

8.1.3 Impacts on Avifauna

Description of Impact

The construction and decommissioning phases of the proposed project would result in the disturbance of avifauna and potential habitat destruction. During the operational phase, avifauna may collide with the surface of the PV panel modules or be entrapped within the perimeter fence of the proposed project. Furthermore, avifauna may be electrocuted by the components of the on-site substation and the 33 kV overhead transmission lines.

Impact Assessment

The following direct and indirect impacts associated with the proposed project relating to the anticipated impacts on avifauna were identified by the specialist:

- Displacement of priority species due to disturbance and habitat destruction associated with construction of the PV facility and associated infrastructure;
- Mortality of priority species due to collisions with solar panels;
- Entrapment of birds in the perimeter fence;
- Mortality of priority species due to electrocution in the onsite substation and the 33kV overhead transmission lines; and
- Displacement of priority species due to disturbance associated with decommissioning of the PV facility and associated infrastructure.

As noted in Section 8.1.1 above, approximately 180 ha of vegetation would be cleared during the construction phase, which could impact on avifauna breeding, foraging, and roosting in or in close proximity to the project site through the disturbance and transformation of the habitat. Thus, vegetation clearance within the project site could result in a temporary or permanent displacement of avifauna. Furthermore, disturbance impacts associated with construction activities could also potentially result in breeding failure if the disturbance happens during a critical part of the breeding cycle within the study area. Terrestrial avifauna species and ground nesting raptors such as the Helmeted Guineafowl, Marsh Owl, Northern Black Korhaan, and the Spotted Eagle-Owl are the most likely to be affected by displacement due to disturbance.

For the operation phase, impacts on avifauna include the potential entrapment of species in the perimeter fence of the proposed project, electrocutions with electrical hardware (i.e., components of the on-site substation and the 132 kV overhead transmission lines, etc.) and the mortality of priority species due to collisions with the solar PV panel modules. The specialist notes that it is not foreseen that entrapment in the perimeter fence of the proposed project would pose a significant impact as the only species likely to be affected is the Marsh Owl that often gets entangled in fences. With regards to electrocutions, the specialist notes that the risk will be determined by the design of the electrical hardware of the proposed project. Thus, there will be some risk of electrocution to certain species, mostly raptors, but also some waterbirds present within the vicinity of the project site, but it is unlikely that electrocution of species will be a regular occurrence for any of the priority species. The risk of electrocution from the 132 kV overhead transmission lines will be dependent on the design of the pylons, which can pose a risk to certain priority species such as raptors, which is a more significant risk than the risk posed by the on-site substation.

The specialist notes that the available literature on the impact of avifauna collisions with PV panel modules lacks compelling evidence to indicate that these collisions are a cause of large-scale mortality among avifauna at Solar PV facilities. In addition, the specialist indicated that it is not foreseen that collisions with PV panel modules of the proposed project could pose a significant impact. The priority species that are at risk from this impact are mostly small birds that forage within the PV panel array, and raptors that prey on them, and a variety of waterbirds which may be at risk due to the 'lake effect'.

During the construction phase it is expected that the potential impacts on avifauna within the project site would be of high intensity, local extent, and long-term duration. Thus, the impact is considered to be of **HIGH** significance with and without mitigation (see Table 8-3). For the operation phase, the potential impacts are of a medium intensity, local extent, and long-term duration, resulting in an overall significance of **medium** without mitigation. With the implementation of mitigation, the overall significance will be **low** (see Table 8-3).

During the decommissioning phase, it is expected that the potential impact on avifauna within the project site would be of a high intensity, local extent, and short-term duration. Thus, the impact on avifauna is considered to be of a **MEDIUM** significance with and without mitigation (Table 8-3).

Table 8-3: Impact on Avifauna

Criteria	Without Mitigation	With Mitigation
Construction		
Intensity	High	High
Extent	Local	Local
Duration	Long-term	Long-term
Probability	Definite	Probable
Consequence	High	High
Confidence	Medium	Medium
Significance	**High**	**HIGH**
Operational Phase		
Intensity	Medium	Medium

Criteria	Without Mitigation	With Mitigation
Extent	Local	Local
Duration	Long-term	Long-term
Probability	Probable	Probable
Consequence	Medium	Medium
Confidence	Medium	Medium
Significance	**Medium**	**LOW**
Decommissioning Phase		
Intensity	High	High
Extent	Local	Local
Duration	Short-term	Short-term
Probability	Definite	Definite
Consequence	Medium	Medium
Confidence	High	High
Significance	**Medium**	**MEDIUM**
Reversibility	Irreversible	
Loss of resource	High	
Mitigation potential	High	

Comparative Assessment of Alternatives

Mainstream has considered two (2) alternatives for each of the key infrastructure components for the proposed project. The alternatives have been considered for the types of PV panel modules, mounting system technology and the BESS. Chapter 6 of this EIAR provides a detailed description of these alternatives considered for the proposed project.

From an avifauna impact perspective, the proposed alternative technologies for the infrastructure will not make a difference on the nature and significance of the impacts identified for the proposed project. Thus, the impacts will be the same for all the proposed technologies.

Mitigation Measures

- Construction-related mitigation:
  - > Construction activity should be restricted to the immediate footprint of the infrastructure.
  - > Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species.
  - > Measures to control noise and dust should be applied according to current best practice in the industry.
  - > Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum.
  - > The mitigation measures proposed by the vegetation specialist must be strictly enforced.
  - > The mitigation measures proposed by the vegetation specialist must be strictly enforced.
  - > A 50 m buffer zone must be maintained around the wetlands.
- Decommissioning-related mitigation:

> Decommissioning activity should be restricted to the immediate footprint of the infrastructure.
> Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species.
> Measures to control noise and dust should be applied according to current best practice in the industry.

8.1.4 Freshwater Impacts

Description of Impact

Although the proposed project is not located within the vicinity of any freshwater resources, i.e., wetlands, or rivers, etc., the project is located within the 500 m buffer of freshwater resources present within the broader study area.

Impact Assessment

From the findings of the Freshwater Assessment, an unchanneled valley bottom wetland was identified and is located along the south westerly portion of the project site. The wetland is deemed to be of high ecological importance and sensitivity, and given the extent of the wetland, the specialist has recommended that this area be excluded from development and the necessary buffer be applied. The high ecological importance and sensitivity of the wetland is associated with an area around the instream impoundment that provides diverse habitat for waterfowl species. In addition, juveniles of the *Pyxicephalus adspersus* (African Bullfrog) were observed within this area during the field-based survey.

The freshwater assessment identified various activities during the project life that could result in indirect impacts on the downstream water features. Such impacts included, modifications of wetland hydrological function, changes to the wetland geomorphological processes (due to erosion, and sedimentation), loss of wetland habitat and ecological integrity and impacts on wetland biota. Due to the fact that the proposed preliminary layout for the proposed project (see Figure 5-3) is located outside of the buffer for the wetland, the majority of the impacts on freshwater for the proposed project area of **medium** significance without mitigation. The impacts are deemed to be of medium intensity, local extent and long-term without mitigation. The overall significance of these impacts with mitigation was deemed to be **LOW.**

Table 8-4: Impacts on Freshwater Resources

Criteria	Without Mitigation	With Mitigation
Construction, Operation and Decommissioning Phases		
Intensity	Medium	Low
Extent	Local	Local
Duration	Long-term	Short-term
Probability	Definite	Probable
Consequence	Medium	Low
Confidence	High	High
Significance	**MEDIUM**	**LOW**
Reversibility	Irreversible	
Loss of resource	High	
Mitigation potential	High	

Comparative Assessment of Alternatives

Mainstream has considered two (2) alternatives for each of the key infrastructure components for the proposed project. The alternatives have been considered for the types of PV panel modules, mounting system technology and the BESS. Chapter 6 of this EIAR provides a detailed description of these alternatives considered for the proposed project. From a freshwater impact perspective, the proposed alternative technologies for the infrastructure will not make a difference. The impacts will be the same for all the proposed technologies.

Mitigation Measures

- Design / Planning, Construction and Operation-related mitigation:
  - Undertake any construction work located near identified wetland during the dry, winter months when surface flow is very low within the freshwater ecosystem to avoid runoff of sediment to downgradient freshwater ecosystems;
  - It should be feasible to utilise existing roads to gain access to the construction area. This will limit edge effects, erosion, and sedimentation of the delineated unchanneled valley bottom wetland during the construction phase;
  - The assessed unchanneled valley bottom wetland and associated 32 m NEMA Zone of Regulation (ZoR) should be clearly demarcated with a danger tape by the Environmental Control Officer (ECO) and marked as a 'No go' area where no construction activities are planned;
  - All footprint areas must remain as small as possible and vegetation clearing to be limited to what is absolutely essential to ensure as much indigenous vegetation is retained;
  - All stockpiles may not be higher than 2 m and must remain outside the delineated extent of the wetland including its associated 32 m NEMA ZoR. Stockpiling of removed materials may only be temporary (may only be stockpiled during the period of construction) and should be disposed of at a registered waste disposal facility;
  - All exposed soil, including stockpiles, must be protected for the duration of the construction phase with a suitable geotextile (e.g., Geojute or hessian sheeting) in order to prevent excessive dust generation, erosion, and sedimentation of the receiving freshwater environment;
  - All excavated areas must be compacted to natural soil compaction levels to prevent the formation of preferential surface flow paths and subsequent erosion. Conversely, areas compacted as a result of construction activities must be loosened to natural soil compaction levels under the guidance of the ECO;
  - Any remaining soil following the completion of backfilling of the pits are to be spread out thinly surrounding the installed pylon (outside the identified features) to aid in the natural reclamation process;
  - During operation of the facility, regular inspection of the area surrounding the surface infrastructure (proposed PV facility and grid connection infrastructure) should occur to monitor the establishment of vegetation, prevent the establishment of alien and invasive vegetation species, and their potential spread into the surrounding freshwater ecosystem;
  - Should alien and invasive plant species be identified, they must be removed and disposed of as per an Alien and Invasive Species Control Plan and the area must be revegetated with suitable indigenous vegetation; and

> No water may be directly released from the proposed Solar PV facility and other surface infrastructure into the receiving freshwater environment. A Stormwater Management Plan for the proposed Solar PV facility be consulted in this regard.

8.2 BIOPHYSICAL IMPACTS

8.2.1 Nuisance impacts (air quality and noise)

Description of Impact

Construction and decommissioning activities has the potential to create a localised increase in dust and noise levels. These impacts may be a nuisance to local residents.

Impact Assessment

Increases in dust and ambient noise levels during construction and decommissioning are expected during the construction phase. Although the intensity of these impacts could be high at times during construction, the overall construction period would be over the short-term. However, the adoption of standard measures of dust control and reduction of noise levels, as well as the adoption of mitigation measure noted below will reduce to overall significance of the impact to **INSIGNIFICANT** levels.

Table 8-5: Nuisance Impacts (Air Quality and Noise)

Criteria	Without Mitigation	With Mitigation
Construction and Decommissioning Phases		
Intensity	High	Medium
Extent	Local	Local
Duration	Short-term	Short-term
Probability	Definite	Possible
Consequence	Low	Very Low
Confidence	High	High
Significance	**LOW**	**INSIGNIFICANT**
Reversibility	Reversible	
Loss of resource	N/A	
Mitigation potential	High	

Comparative Assessment of Alternatives

Mainstream has considered two (2) alternatives for each of the key infrastructure components for the proposed project. The alternatives have been considered for the types of PV panel modules, mounting system technology and the BESS. Chapter 6 of this EIAR provides a detailed description of these alternatives considered for the proposed project. No difference in the significance of the potential nuisance impacts is expected for either technology alternative.

Mitigation Measures

- Construction and Decommissioning-related mitigation:

- Adopt suitable measures to manage fugitive dust generated during the construction of the proposed project and the associated infrastructure. This will include a comprehensive programme of dust management that limits both occupational and community exposure to dust.
- Adhere to local municipality by-laws regarding the generation of noise and working hours.
- Residents near the development site should be notified 24 hours prior to any planned activities that will be visible.
- Mainstream should demarcate construction boundaries and minimise areas of surface disturbance.
- Construction of new roads should be minimised, and existing roads should be used where possible.

8.2.2 Impacts on Soils and Associated Agricultural Potential

Description of Impact

The development of the proposed project will lead to several impacts from a soils and agricultural potential perspective. These impacts are anticipated to occur during the pre-construction, construction (including decommissioning) and the operation phase of the proposed project.

Impact Assessment

From the findings of the Soils and Agriculture Assessment, the project site for the proposed project comprises of 10 different soils forms which include the Avalon, Clovelly, Glenrosa, Kransfontein, Mispah, Dundee, Griffin, Hutton, Pinedene and Nkonkoni soil forms. The soil texture for the project site is considered to be sandy loam. The results from the chemical analysis of soils samples from the project site indicate that the pH of the soils ranges from very strongly acidic to strongly acidic.

The Soils and Agriculture Assessment identified several activities associated with the proposed project that could have an impact on soil resources and lead to an increased risk of soil erosion for the immediate project footprint and the surrounding area.

The potential impacts identified for the pre-construction and construction phase (including decommissioning) phase of the proposed project are of a high intensity, long-term duration, and local extent. These impacts are of a **high** significance (without mitigation), and of a **MEDIUM** significance with the implementation of mitigation (Table 8-6). For the operation phase, the potential impact is of a low intensity, long-term duration, and local extent. Thus, the impact is considered to be of a **MEDIUM** significance without mitigation and **VERY LOW** with mitigation.

Table 8-6: Impacts on Soils and Agriculture Potential

Criteria	Without Mitigation	With Mitigation
Pre-Construction, Construction and Decommissioning Phases		
Intensity	High	Low
Extent	Regional	Local
Duration	Long-term	Long-term
Probability	Definite	Definite

Criteria	Without Mitigation	With Mitigation
Consequence	High	Low
Confidence	High	High
Significance	**High**	**MEDIUM**
Reversibility	Irreversible	
Loss of resource	High	
Mitigation potential	High	
Operation Phase		
Intensity	Low	Very Low
Extent	Regional	Local
Duration	Long-term	Short-term
Probability	Probable	Possible
Consequence	Medium	Low
Confidence	High	High
Significance	**Medium**	**VERY LOW**
Reversibility	Reversible	
Loss of resource	Low	
Mitigation potential	High	

Comparative Assessment of Alternatives

Mainstream has considered two (2) alternatives for each of the key infrastructure components for the proposed project. The alternatives have been considered for the types of PV panel modules, mounting system technology and the BESS. Chapter 6 of this EIAR provides a detailed description of these alternatives considered for the proposed project.

From a soils and agriculture potential impact perspective, the proposed alternative technologies for the infrastructure will not make a difference on the nature and significance of the impacts identified for the proposed project. Thus, the impacts will be the same for all the proposed technologies.

Mitigation Measures

- Pre-Construction and Construction-related (including decommissioning) mitigation:
  - Vegetation clearance must be restricted to areas where infrastructure is constructed.
  - No materials transported to the project site must be allowed to be dumped in nearby livestock farming areas.
  - Prior arrangements must be made with the landowners to ensure that livestock are moved to areas where they cannot be injured by vehicles traversing the area.
  - Ensure that construction workers do not establish informal settlements on the property or neighbouring properties.
  - No boundary fence must be opened without the landowners' permission.
  - No open fires made by the construction teams are allowable during the construction phase.
  - Land clearance must only be undertaken immediately prior to construction activities and only within the development footprint.

- Unnecessary land clearance must be avoided.
- Levelling of soil must be restricted to areas where it is necessary for construction.
- Any topsoil that remain on the surface after levelling, must be incorporated into areas of disturbance and not allowed to remain as stockpiles on the surface where it will be prone to soil erosion.
- Restrict earthworks to only that which is essential for the construction phase of the project.
- Vegetation clearance, site levelling and earthworks must only be undertaken within the development footprint.
- Level any remaining soil that remained on the surface after site preparation instead of allowing small stockpiles of soil to remain on the surface.
- Design and implement a Stormwater Management System / Plan where run-off from the access road is expected.
- Where possible, conduct the site preparation activities outside of the rainy season.
- Regularly monitor areas where vegetation removal and earthworks took place, for early signs of soil erosion.
- Vegetation establishment during the construction phase must be monitored to see whether it was successful and provide sufficient coverage for bare soil surface.

- Operation-related mitigation:
  - Losses of fuel and lubricants from the oil sumps and steering racks of vehicles and equipment should be contained using a drip tray with plastic sheeting filled with absorbent material;
  - Using biodegradable hydraulic fluids, using lined sumps for collection of hydraulic fluids, recovering contaminated soils, and treating them off-site, and securely storing dried waste mud by burying it in a purpose-built containment area;
  - Avoiding waste disposal at the site wherever possible, by segregating, trucking out, and recycling waste at licensed waste disposal / recycling facilities;
  - Containing potentially contaminating fluids and other wastes; and
  - Cleaning up areas of spillage of potentially contaminating liquids and solids.

8.3 SOCIO-ECONOMIC IMPACTS

8.3.1 Impacts on the Heritage and Cultural Environment

Description of Impact

The proposed project could have an impact on heritage resources during vegetation clearing and excavations for the proposed project.

Impact Assessment

The proposed project will require excavations for the placement of foundations for the mounting structures for the placement of the PV panel array, busbars and transformers linked to the on-site substation. Furthermore, excavations may be required for the placement of stormwater management structures, i.e., drainage channels for the management of surface water run-off within the PV panel array, etc. For the proposed project, several heritage sites resources were identified within the project site. These resources include stone walled features, and a cemetery. The stone walled features are concentrated along the southern boundary of the project site, whereas the cemetery / small graveyard is located towards the

southwestern edge of the project site. According to the specialist, there are approximately 15 – 20 graves in this area and most of them are marked by packed stones with few headstones. Furthermore, most of these graves are almost entirely covered with grass.

Should any buried heritage resources be impacted upon during the construction phase, these impacts would be of low intensity, local extent, and long-term duration (as the resources may be lost if irreparably damaged). Given the low likelihood that such impacts would take place, the overall impact is deemed to be of **very low** significance without mitigation. However, any effects to subsurface heritage resources can be successfully mitigated by implementing a Chance Find Procedure, thus the potential impact is deemed to be **INSIGNIFCANT** (see Table 8-7).

Table 8-7: Impacts on the Heritage and Cultural Environment

Criteria	Without Mitigation	With Mitigation
Construction Phase		
Intensity	Low	Low
Extent	Local	Local
Duration	Long-term	Long-term
Probability	Possible	Improbable
Consequence	Low	Very Low
Confidence	High	High
Significance	**Very Low**	**INSIGNIFICANT**
Reversibility	Reversible	
Loss of resource	N/A	
Mitigation potential	High	

Comparative Assessment of Alternatives

Mainstream has considered two (2) alternatives for each of the key infrastructure components for the proposed project. The alternatives have been considered for the types of PV panel modules, mounting system technology and the BESS. Chapter 6 of this EIAR provides a detailed description of these alternatives considered for the proposed project.

As there were no conservation worthy heritage resources identified within the project site, the selection of either of the proposed technology alternatives for the infrastructure will not make a difference on the nature and significance of the heritage impacts identified for the proposed project. Thus, the impacts will be the same for all the proposed technologies.

Mitigation Measures

- Construction phase mitigation:
  - The recorded cemetery should be mitigated preferably by avoidance. A 30 m buffer should be implemented around this area and an access gate for family members be included. The last resort should be the relocation of these graves subject to all legal requirements being met.

- The packed stone features older than 60 years and should thus be subjected to Phase 2 mitigation, including clearing and mapping after which a Destruction Permit should be applied for from the relevant authority.
- The possibility of the occurrence of subsurface finds cannot be excluded. Therefore, if during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped, and a qualified archaeologist must be contacted for an assessment of the find and implement the chance find procedure set out below:
  - This procedure applies to the developer's permanent employees, its subsidiaries, contractors and subcontractors, and service providers. The aim of this procedure is to establish monitoring and reporting procedures to ensure compliance with this policy and its associated procedures. Construction crews must be properly inducted to ensure they are fully aware of the procedures regarding chance finds as discussed below:
    - If during the pre-construction phase, construction, operations or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance or heritage site, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the Senior On-Site Manager.
    - It is the responsibility of the Senior On-Site Manager to make an initial assessment of the extent of the find and confirm the extent of the work stoppage in that area.
    - The Senior On-Site Manager will inform the Environmental Control Officer (ECO) of the chance find and its immediate impact on operations. The ECO will then contact a professional archaeologist for an assessment of the finds who will notify the SAHRA.

8.3.2 Impact on Palaeontological Resources

Description of Impact

Impacts to palaeontological resources will occur during the construction phase of the proposed project as construction activities (i.e., excavations for the placement of infrastructure, etc.) may potentially destroy fossils that are below surface within the project footprint area.

Impact Assessment

The broader study area is associated with igneous and sedimentary rocks of the Ventersdorp, Witwatersrand and Karoo Supergroups. Although rocks from the Vryheid Formation are present within the project footprint, they are unlikely to contain fossils because the project site is located at the extreme margins of the Karoo sediments and no fossils have been reported to date in this area. Furthermore, the study area has been ploughed previously, thus no fossils are expected on the surface of the project site.

According to the SAHRIS palaeosensitivity mapping (see Figure 7-22), the study area is considered to have a sensitivity ranging from moderate (green, associated with Quaternary alluvium and sands) to low (blue, associated with Ventersdorp and Witwatersrand Supergroups).

Taking the above into consideration, the potential impact on palaeontological resources is deemed to be of low intensity, local extent, and permanent duration (if destroyed) and of **VERY LOW** significance without

mitigation. With the implementation of a fossil Chance Find Procedure, the overall impact is deemed to be **INSIGNIFICANT**.

Table 8-8: Potential Impact on Palaeontological Resources

Criteria	Without Mitigation	With Mitigation
Construction Phase		
Intensity	Low	Low
Extent	Local	Local
Duration	Long-term	Long-term
Probability	Probable	Improbable
Consequence	Low	Very Low
Confidence	High	High
Significance	**Very Low**	**INSIGNIFICANT**
Reversibility	Reversible	
Loss of resource	N/A	
Mitigation potential	High	

Comparative Assessment of Alternatives

Mainstream has considered two (2) alternatives for each of the key infrastructure components for the proposed project. The alternatives have been considered for the types of PV panel modules, mounting system technology and the BESS. Chapter 6 of this EIAR provides a detailed description of these alternatives considered for the proposed project.

As project site is located in an area of low to moderate palaeonsensitivity, the selection of either of the proposed technology alternatives for the infrastructure will not make a difference on the nature and significance of the palaeontological impact identified for the proposed project. Thus, the impact will be the same for all the proposed technologies.

Mitigation Measures

- Construction phase mitigation measures:
  - The following procedure is only required if fossils are seen on the surface and when excavations commence:
    - When excavations begin, a palaeontologist should be appointed to carry out a site visit of the extent of the project footprint.
    - The rocks must be given a cursory inspection by the ECO or designated person. Any fossiliferous material (plants, insects, bone, coal) should be put aside in a suitably protected place. This way the project activities will not be interrupted;
    - Photographs of similar fossils must be provided to the Contractor to assist in recognizing the fossil plants, vertebrates, invertebrates or trace fossils in the shales and mudstone. This information will be built into the EMP's training and awareness plan and procedures.

- Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.
- If there is any possible fossil material found by the developer / environmental control officer then the qualified palaeontologist sub-contracted for this project, should visit the site to inspect the selected material and check the dumps where feasible.
- Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist must be removed, catalogued, and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site a SAHRA permit must be obtained. Annual reports must be submitted to SAHRA as required by the relevant permits.
- If no good fossil material is recovered then no site inspections by the palaeontologist will be necessary. A final report by the palaeontologist must be sent to SAHRA once the project has been completed and only if there are fossils.
- If no fossils are found and the excavations have finished then no further monitoring is required.

8.3.3 Visual Impacts

Description of Impact

The proposed development would potentially alter the visual landscape / rural character of the site, which would have a visual impact in the immediate surrounding area and along the N1 national road, Boundary Road, local roads to the north, west and south of the project site, and homesteads that are present within this area.

Impact Assessment

The visual specialist has considered a number of elements to assess the potential impact of the proposed project, namely:

- *Sensitive Viewers and Locations*: Most of the identified sensitive viewing locations are positioned in a general arc from the north to west to the southern sectors of the study area. Within this general area, people living in or visiting the study area could have open, partially obstructed, and, in many instances along the Vaal River, screened views of the proposed development from varying angles.
- *Visibility*: The proposed project infrastructure would be located within a landscape type which has a low visual absorption capacity; thus, the facilities would potentially be highly visible to people travelling along the N1 and within a 3 km radius west, south, and east of the site. However, visibility from the Vaal River and its environs would be low, due to the density of large tree species growing along its banks, the relative low aspect of these viewing locations, and the fact that most views from these areas would most likely be focused on the river itself (i.e., the main reason for the development along its banks).
- *Visual exposure*: As distance between the viewer and the object increases, the visual perception of the object reduces exponentially. The three basic areas of concern are:

  (i) The public roads including the N1 arterial road, the R59 and R42 connector roads, Boundary Road, and local roads generally servicing the farms and tourist facilities throughout the study area;

(ii) Tourist facilities associated with the Vaal River; and

(iii) Residential (mostly farmsteads) areas surrounding the project site.

- *Visual intrusion:* Based on the visual simulations undertaken by the specialist, it is expected that the proposed project infrastructure could appear in some foreground views and would be considered highly intrusive from sections of the adjacent local roads north and east of the site, and for two farmsteads immediately north and south of the cluster site. Moderate intrusion is anticipated when project components appear in the middle ground of views from the N1 and farmsteads to the south, west, north, and east of the site, Boundary Road, and the two local roads immediately north and south of the cluster site. In all other views, project components would appear in the background and not appear intrusive. A low to insignificant intrusion would be experienced by visitors to the tourist facilities along the Vaal River.

Taking the above collectively, the intensity of visual impact of the proposed project will be high during construction, medium during operations and very low during decommissioning. The significance of this impact is, therefore, assessed to range from **low** during construction and **medium** for the operational phase (without mitigation). With mitigation the significance would be **LOW** for both the construction and operational phases (see Table 8-9). Associated decommissioning impacts are expected to be **VERY LOW** (with or without mitigation).

Table 8-9: Visual Impact

Criteria	Without Mitigation	With Mitigation
Construction and Operation Phases		
Intensity	High (construction) Medium (operation)	High (construction) Low (operation)
Extent	Local	Local
Duration	Short-term (construction) Long-term (operation)	Short-term (construction) Long-term (operation)
Probability	Probable	Probable
Consequence	Low (construction) Medium (operation)	Low
Confidence	High	High
Significance	**LOW** (construction) **MEDIUM** (operation)	**LOW**
Decommissioning Phase		
Intensity	Very Low	Very Low
Extent	Local	Local
Duration	Short-term	Short-term
Probability	Probable	Probable
Consequence	Very Low	Very Low
Confidence	High	High
Significance	**Very Low**	**VERY LOW**

Criteria	Without Mitigation	With Mitigation
Reversibility	Reversible	
Loss of resource	High	
Mitigation potential	High	

Comparative Assessment of Alternatives

From a visual impact perspective, the proposed alternative technologies for the infrastructure will not make a difference on the nature and significance of the visual impacts identified for the proposed project. Thus, the impacts will be the same for all the proposed technologies.

Mitigation Measures

The following mitigation measures are proposed for the management of visual impacts associated with the proposed project:

- Design / Planning, Construction and Operation-related mitigation:
  - The construction footprint must be kept as small as possible in order to minimise impact on the surrounding environment and the removal of vegetation and soils must be restricted to what is absolutely necessary and should remain within the approved grid connection corridor and servitude.
  - Ensure, wherever possible, natural indigenous vegetation is retained and incorporated into the site rehabilitation.
  - All topsoil that occurs within the proposed footprint of an activity must be removed and stockpiled for later use. The construction contract must include the stripping and stockpiling of topsoil. Topsoil would be used later during the rehabilitation phase of disturbed areas. The presence of degraded areas and disused construction roads, which are not rehabilitated, will increase the overall visual impact.
  - Screen or position the construction camp in areas where they would be less visible from human settlements and main roads.
  - Adopt responsible construction practices aimed at strictly containing the construction / establishment activities to specifically demarcated areas.
  - Building or waste material discarded should be undertaken at an authorised location, which should not be within any sensitive areas.
  - Earthworks should be executed in such a way that only the footprint and a small 'construction buffer zone' around the proposed activities are exposed. In all other areas, the naturally occurring vegetation should be retained, especially along the periphery of the sites.
  - All cut and fill slopes (if any) and areas affected by construction work should be progressively top soiled and re-vegetated as soon as possible.
  - Any soil must be exposed for the minimum time possible once cleared of vegetation to avoid prolonged exposure to wind and water erosion and to minimise dust generation.
  - Where new vegetation is proposed to be introduced to the site, an ecological approach to rehabilitation, as opposed to a horticultural approach should be adopted. For example, communities of indigenous plants will enhance biodiversity, a desirable outcome for the area. This approach can significantly reduce long-term costs as less maintenance would be required

over conventional landscaping methods as well as the introduced landscape being more sustainable.

- Progressive rehabilitation of all construction areas should be carried out immediately after they have been established.
- Undertake planting of screening vegetation along the northern boundary of the project site.
- Ensure the perimeter fence around the site is of a 'see through' variety and that its colour blends with the environment.
- "Housekeeping" procedures should be developed for the project to ensure that the project site and lands adjacent to the project site are kept clean of debris, garbage, graffiti, fugitive trash, or waste generated onsite; procedures should extend to control of "track out" of dirt on vehicles leaving the active construction site and controlling sediment in stormwater runoff.
- During construction, temporary fences surrounding the material storage yards and laydown areas should be covered with 'shack' cloth (khaki coloured).

- Operation-related mitigation:
  - Install light fixtures that provide precisely directed illumination to reduce light "spillage" beyond the immediate surrounds of the site i.e., lights (specifically spotlights) are to be aimed away from the N1 and R59 road and areas south and west of the site.
  - Night lighting of the construction sites should be minimised within requirements of safety and efficiency.
  - Avoid high pole top security lighting along the periphery of the site and use only lights that are activated on illegal entry to the site.
  - Minimise the number of light fixtures to the bare minimum, including security lighting.

8.3.4 Development of a renewable energy facility

Description of Impact

The establishment of a clean, renewable energy facility would reduce, albeit minimally, South Africa's reliance on coal-generated energy and the generation of carbon emissions into the atmosphere.

Impact Assessment

South Africa is one of the highest per capita producers of carbon emissions in the world. While the overall contribution to South Africa's total energy requirements of the proposed project is relatively small, it would help to offset the total carbon emissions associated with energy generation in South Africa. Given South Africa's reliance on ESKOM as a power utility, the benefits associated with an REIPP based on renewable energy are regarded as an important contribution.

The development of a clean, renewable energy project is considered to be a national, long-term impact of high intensity. The significance of this potential impact is, therefore, assessed to be ***VERY HIGH (POSITIVE)*** before and after mitigation (see Table 8-10).

Table 8-10: Development of a renewable energy facility

Criteria	Without Mitigation	With Mitigation
Operation Phase		
Intensity	High	High

Criteria	Without Mitigation	With Mitigation
Extent	National	National
Duration	Long-term	Long-term
Probability	Definite	Definite
Consequence	Very High	Very High
Confidence	High	High
Significance	***Very High (Positive)***	***VERY HIGH (POSITIVE)***
Reversibility	Partially reversible	
Loss of resource	Low	
Mitigation potential	High	

Comparative Assessment of the Alternatives

There would be no difference in the impact of either technology alternative.

Mitigation Measures

No optimisation measures are considered necessary.

8.3.5 Creation of employment and business opportunities

Description of Impact

The proposed development would create a number of local employment and business opportunities during construction. In addition, there would be an opportunity for skills development and on-site training.

Impact Assessment

The proposed project would create a number of short-term employment opportunities during the construction phase. Indirect and induced impacts would occur because of the new economic development and would include new jobs at businesses that support the expanded workforce or provide project materials, and associated income. These indirect impacts are anticipated to occur locally, through the use of national goods and services including, but not limited to, construction materials and equipment and workforce essentials such as food, clothing, safety equipment, and other goods. Off-site accommodation would also be required for those construction staff not located in the area, and there is a large amount of accommodation available in Sasolburg, Parys, Vereeniging and Vanderbijlpark.

The local area and its activities (businesses and shops, etc.) are expected to be stimulated economically, due to the increased spending expected from the increased salaries and wages paid to employees during construction. Service industries in the region will benefit from this, which in turn will have a knock-on effect on suppliers of goods and services in other areas. This positive impact is likely to be experienced in terms of the increased markets for the sale of local goods to construction staff and direct employment by construction contractors.

With respect to skills transfer, in all likelihood, skills would be transferred in the form of on-the-job training during the construction phase. These skills will enable these individuals to seek other construction and related employment once the construction phase is complete. The construction related work opportunities

could also lead to capacity building. Capacity building refers to the conscious increasing of knowledge, networking capability and the skills base.

The operational phase of the project will require a small direct workforce of approximately 17 people. Routine activities would include monitoring and maintenance activities to ensure safe and consistent operation of the facility, such as washing solar panels and vegetation control. Indirect and induced job creation potential, albeit very small, also exists from the increased energy production during the operation phase. The Department of Mineral Resources and Energy (DMRE), requires that all renewable energy bidders must illustrate how the project will benefit the local community. At present, the DMRE is stipulating that one percent of revenue generated by the project must be contributed towards socio-economic development. In accordance with the relevant BBBEE legislation and guidelines, up to four percent of profit after tax could be used for community development over and above that associated with expenditure in the area. The BBBEE Scorecard specifies the following contributions (totalling four percent):

- Enterprise development – maximum of 15 points awarded for the contribution of three percent of profit after tax, or more; and
- Socio-economic development – maximum of five points awarded for the contribution of one percent of profit after tax, or more.

If these contributions are realised, the project could make a real difference in the local community. The creation of employment and business opportunities, as well as skills transfer, during the construction and operational phases is likely to occur over the long-term, be of impact of high intensity, and be of national extent. The significance of this potential impact is, therefore, assessed to be ***HIGH (positive)*** before and after mitigation.

Table 8-11: Creation of Employment and Business Opportunities

Criteria	Without Mitigation	With Mitigation
Construction and Operational Phase		
Intensity	High	High
Extent	National	National
Duration	Long-term	Long-term
Probability	Definite	Definite
Consequence	High	High
Confidence	High	High
Significance	***High (positive)***	***HIGH (POSITIVE)***
Reversibility	Irreversible	
Loss of resource	Low	
Mitigation potential	High	

Comparative Assessment of the Alternatives

With respect to the creation of employment and business opportunities, there would be no difference in the impact of either technology alternative.

Mitigation Measures

- Construction phase mitigation measures:
  - It is recommended that a local procurement policy be adopted to maximise the benefit to the local economy.
  - Mainstream should seek to develop a database of local companies, specifically Broad Based Black Economic Empowerment (BBBEE) companies, which qualify as potential service providers (e.g., construction companies, security etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work. As many goods and services as possible must be sourced from the local area. Mainstream must engage with local authorities and business organisations to investigate the possibility of procurement of construction materials, goods, and products from local suppliers where feasible.
  - Mainstream need to liaise with the Local Economic Development section of the municipality, local leaders, and NGOs about their recruitment policy to ensure it is in line with the local practices and tap into existing knowledge. The recruitment policy must set reasonable targets for the employment of local people and women. Mainstream and the municipality should identify these targets before recruitment commences. The definition of "local" must be clarified with the affected stakeholders. Mainstream must provide the local municipality with a list of skills required before the construction period commences, and the municipality must distribute the list to all stakeholders to allow them to prepare for the opportunities. All labour opportunities must be accessed through a labour desk in town, and no recruitment must be allowed on site. Mainstream must implement mitigation and management measures to ensure that no employee or job applicant is discriminated against based on race, gender, nationality, age, religion, or sexual orientation.
  - Where reasonable and practical, the contractors appointed by the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, due to the low skills levels in the area, many skilled posts are likely to be filled by people from outside the area.
  - Opportunities for training of workers should be maximised.
  - Ways to enhance local community benefits with a focus on broad based BEE need to be explored.
  - Local construction companies should be used whenever possible, especially for subcontracting work.
  - Local suppliers should be used as far as possible.
  - Labour-based construction methods should be used whenever practically possible. It is important to follow the principles of the Expanded Public Works Programme and apply effective labour-based construction technologies to increase the job creation effects.
  - The use of local labour should be approached in such a manner that large numbers of residents can benefit from this action rather than only a select few.
  - While preference to local employees and companies is recommended, it is recognised that a competitive tender process may not guarantee the employment of local labour for the construction phase.

8.3.6 Impact on safety and security on neighbouring residents

Description of Impact

The presence of construction workers on the site could potentially increase the risk of stock theft and poaching in the neighbouring area. The movement of construction workers on and off the site also poses a potential threat to farm infrastructure, such as fences and gates, which may be damaged. Livestock losses may also result from gates being left open and/or fences being damaged.

Impact Assessment

From interviews undertaken by the social specialist, local residents have indicated that the project site is a crime hotspot due to its proximity to the N1 national road and the fact that many people do not reside on the properties. An increase in the number of people moving around the area during the construction phase could make it easier for opportunistic criminals to enter the area without being noticed.

It was also noted that stock theft is a significant problem in the area where property fences are cut, and cattle are herded towards the N1. Thus, neighbouring farmers have expressed the concern that the presence of construction workers in the area would result in an increase in stock theft.

During the operational phase the presence of the solar facility is likely to result in an increase in the security in the area from which neighbouring landowners would benefit.

The potential safety and security impacts are considered to extend outside the site boundaries and be of high intensity for the community as a whole for the duration of construction. The significance of this potential impact is, therefore, assessed to be **VERY LOW** before and after the implementation of mitigation.

During the operational phase, an improvement in safety and security is deemed to be of high (positive) intensity, over the long-term. The significance of this potential impact is, therefore, assessed to be **HIGH *(POSITIVE)*** with or without mitigation.

Table 8-12: Impact on Safety and Security on Neighbouring Residents

Criteria	Without Mitigation	With Mitigation
Construction Phase		
Intensity	Medium	Medium
Extent	Local	Local
Duration	Short-term	Short-term
Probability	Definite	Definite
Consequence	Very Low	Very Low
Confidence	High	High
Significance	**Very Low**	**VERY LOW**
Operation Phase		
Intensity	Low	Low
Extent	Local	Local
Duration	Long-term	Long-term
Probability	Possible	Possible
Consequence	Low	Low

Criteria	Without Mitigation	With Mitigation
Confidence	High	High
Significance	***Very Low***	***VERY LOW***
Reversibility	Partially Reversible	
Loss of resource	Low	
Mitigation potential	High	

Comparative Assessment of Alternatives

From a social perspective, the technically technology alternative is nominated as the preferred alternative for development.

Mitigation Measures

- Design / Planning-related mitigation:
  - > Mainstream should work with existing farmers' security groups and farmers' associations to create a farm access protocol for everybody that need to access the properties, and a safety plan. Mainstream should also become a member of these forums. Mainstream should give a roster to the directly affected landowners stating dates and approximate times that contractors will be on the farms. Farmers emphasised that they need to know of people accessing the farm ahead of time. It is too late to inform them when entering the property. All access arrangements should be made at least 24 hours before access is required.
  - > Mainstream must meet with the landowners before the construction phase commences and formalise security arrangements. The perimeter of the construction site should be appropriately secured to prevent any unauthorised access to the site; the fencing of the site should be erected before construction commences and maintained throughout the construction period. Security lighting should be implemented. No construction workers other than security services should be allowed to stay on the farms. Construction workers must stay in one of the adjacent towns and be transported to work daily. To minimise the risk of petty crime and violent behaviour, proper procedures such as screening prior to hiring should be undertaken, and proper monitoring procedures should be adhered to during this phase.
  - > All contractors and employees need to wear photo identification cards. Mainstream and its contractors must develop an induction programme that includes a Code of Conduct for all workers (including sub-contractors). The induction programme must include HIV/AIDS awareness programmes, education on tuberculosis, alcohol, and substance abuse. Any person that does any work on site must sign the Code of Conduct and presented with a copy. The Code of Conduct must include the following aspects:
    - Respect for residents, their customs and property.
    - Respect for farm infrastructure and agricultural activities.
    - No hunting or un-authorised taking of products or livestock.
    - Zero tolerance of illegal activities by construction personnel including: prostitution; illegal sale or purchase of alcohol; sale, purchase, or consumption of drugs; illegal gambling or fighting.
    - Compliance with the Traffic Management Plan and all road regulations; and

- Description of disciplinary measures for violation of the Code of Conduct and company rules.

- Construction phase mitigation measures:
  - Vehicles should be marked as construction vehicles and should have the Mainstream or the contractor's logo clearly exhibited. Entry and exit points of the site should be controlled. Areas where materials are stockpiled must be fenced, or suitably bunded with appropriate barriers. If a security company is used, their schedules should be communicated to the landowners.
  - No unauthorised entry to the site is to be allowed; access control and a method of identification of maintenance personnel must always be required for the duration of the project life cycle.
  - Mainstream must also establish a grievance mechanism and appoint a Community Liaison Officer that the community can access easily. The grievance mechanism must be communicated to the affected communities.
  - If any damage to farm infrastructure or stock losses occurs, Mainstream must compensate the affected landowner for his losses. Mainstream must develop a grievance mechanism and a complaints procedure that allows the landowners to log their grievance and submit a claim for damages. The construction teams must be educated about the impact of damages to fences, water troughs and gates on the activities of the farmers through toolbox talks. Inspections of boundary fences and gates should be done daily in areas where there are activities.
  - Water use must be negotiated with the farmers and written into their contracts with Mainstream. During a drought water for livestock must be prioritised.
  - Mainstream must join the Vaal-Eden Fire Fighters Association and adhere to their rules. They must become active members of the fire fighter's association. Safety at and around the site should be ensured by limiting any fire risks, fencing off the site to avoid unauthorised access and employing security personnel. The security must be provided with adequate firefighting equipment on site and be provided with firefighting training.
  - While it is true that the landowners will lose productive grazing areas, it must be considered that they will be compensated for the use of the land through a commercial transaction with Mainstream. If any long grass or vegetation must be cut for maintenance the farmers must be given the option to utilise the grass for their livestock.
  - Mainstream must ensure effective waste management on the site during construction and operation, especially with regards to plastic waste or anything that is poisonous to the livestock. They must ensure that open fires on the site for heating, smoking, or cooking are not allowed except in designated areas.

- Decommissioning-related mitigation:
  - All structures and infrastructure associated with the proposed project should be dismantled and transported off-site on decommissioning.
  - Rehabilitation of the decommissioned site could entail grading, scarifying, seeding, and planting.
  - If workers are found to be in contravention of the Code of Conduct, which they will be required to sign at the beginning of their contract, they will face disciplinary procedures that could result in dismissal. Stock theft should be noted as a dismissible offence.

8.3.7 Impact on traffic

Description of Impact

The movement of heavy construction vehicles during the construction phase has the potential to damage roads and create noise and dust. In addition, the movement of construction vehicles may pose safety risks for other road users.

Impact Assessment

The following vehicle traffic related activities are expected from the proposed project:

- Delivery of construction materials during the construction phase.
- Transportation of waste materials created due to construction off site to registered waste disposal sites.
- Delivery of consumables during the construction and operational phases.
- Transport of workers to and from the Proposed Development via taxi or private transport during the construction and operational phases.

Based on the capacity calculations undertaken by the specialist, it is expected that the proposed project would have a manageable impact on vehicle traffic during all phases, regardless of whether only one of the proposed sites are constructed and operated at one time or all the proposed sites are constructed and operated at the same time, subject to the implementation of recommended road infrastructure improvements.

The potential impacts on traffic are considered to be local to regional in extent, short-term and of medium intensity. The significance of this potential impact is, therefore, assessed to be **LOW** before mitigation and **VERY LOW** after mitigation.

Table 8-13: Impact on Traffic

Criteria	Without Mitigation	With Mitigation
Construction and Operational Phases		
Intensity	Medium	Low
Extent	Local to Regional	Local to Regional
Duration	Short-term	Short-term
Probability	Probable	Probable
Consequence	Low	Low
Confidence	High	High
Significance	**LOW**	**VERY LOW**
Reversibility	Reversible	
Loss of resource	N/A	
Mitigation potential	High	

Comparative Assessment of Alternatives

From a social perspective, the technically technology alternative is nominated as the preferred alternative for development.

Mitigation Measures

- Construction phase mitigation measures:
  - The Community Liaison Forum should be utilised to discuss traffic, dust, noise, and other construction related concerns.
  - Construction-related activities should be limited to workdays (Monday to Friday daylight hours) and the impact on traffic patterns should be mitigated by instating traffic off-peak times.
  - If landowners are currently allowed to use servitude roads to access their properties, they must continue to be allowed to do so.

8.4 CUMULATIVE IMPACTS

As noted in Section 1, the proposed project forms part of the overall proposed Scafell Cluster project which comprises four (4) Solar PV facilities and associated grid connections. A separate Environmental Assessment process has been conducted for each of these proposed projects. These photovoltaic power projects proposed by Mainstream, together with any other proposed and existing projects and activities in the area would have a cumulative impact on the biophysical and socio-economic environment. It should be noted that the significance rating after mitigation assumes that all projects would also implement mitigation / optimisation measures.

To contextualise potential cumulative impacts, it is noted that the nearest towns are located over 19 km away and include Parys, Sasolburg, Vereeniging and Vanderbijlpark and that the neighbouring area to the Scafell Cluster is a farming community that reside close to the project sites.

There are no other solar projects close-by, with the nearest application (a proposed 75 MW Solar PV facility at Lethabo Power Station[33] which was submitted in November 2014) located approximately 30 km east of the proposed Scafell Cluster project (see Figure 8-1). However, there are a number of transmission lines associated with the existing ESKOM Scafell MTS already established adjacent to the proposed sites.

To the north there are sand mining operations located along the Vaal River. The social specialist notes that the most significant impact of the mines reported by community members is on the quality of the road infrastructure and the communities think that most of the mines operate illegally.

[33] DFFE Reference No.: 14/12/16/3/3/2/753

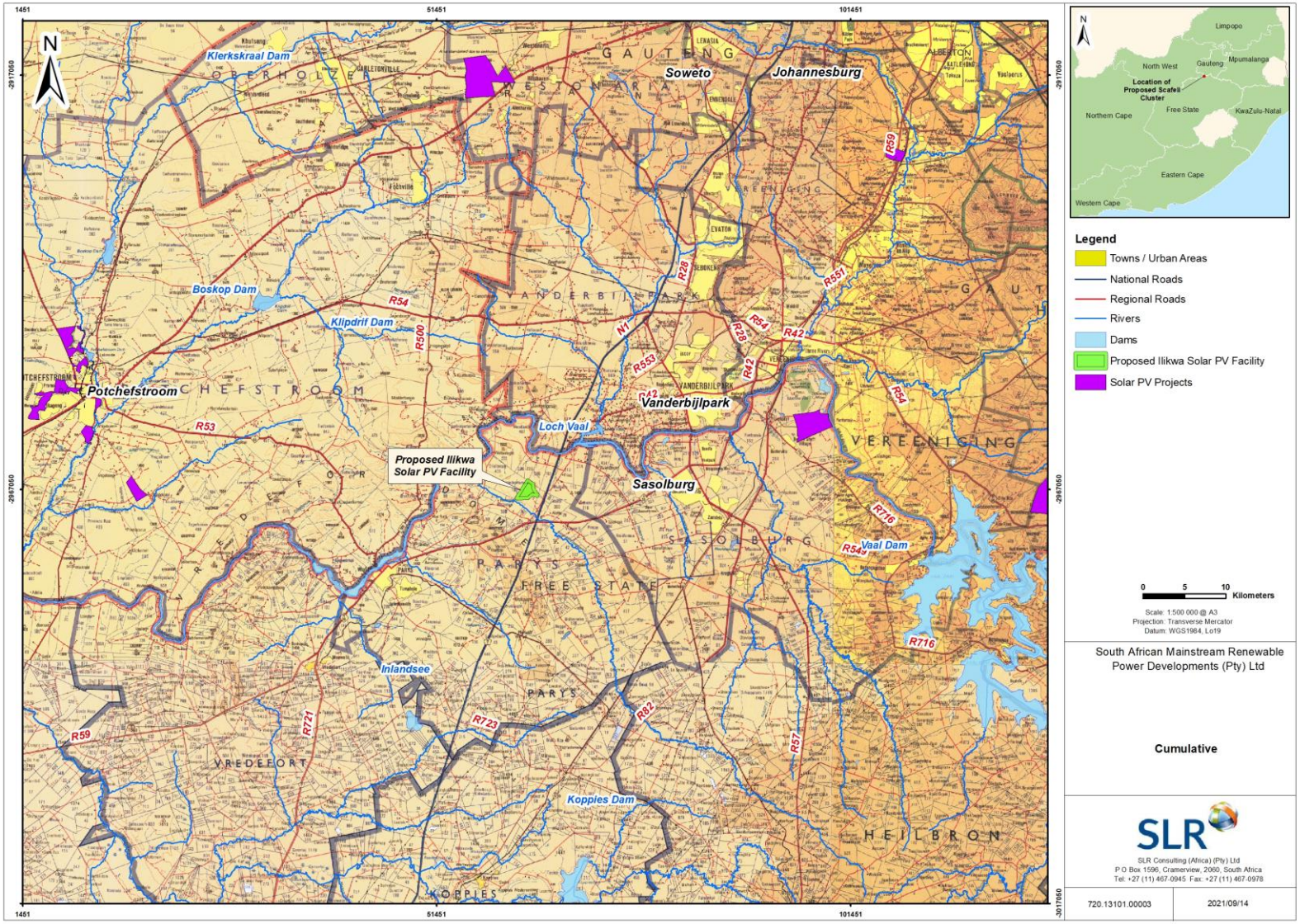

Figure 8-1: A cumulative map of the Ilikwa Solar PV Facility

Vegetation

Within the surrounding areas, the current greatest threat to the floral ecology that are likely to contribute to cumulative impacts include:

(i) The continued loss of the vulnerable Soweto Highveld Grassland that could impact on the remaining extent of the vegetation type (seeing as it is not protected) thereby also increasing the threat status of the vegetation type;

(ii) The continued proliferation of alien invasive plant species, resulting in the overall loss of native floral communities within the local area; and

(iii) The continued encroachment of *Seriphium plumosum* into the surrounding habitats.

As the Scafell Cluster is situated within the middle of a large and mapped ESA, the further development of all the associated projects would likely have indirect impacts on the mapped ESA area. The anticipated cumulative impact is considered to be of **LOW** to **MEDIUM** significance with mitigation.

Fauna

As noted by the specialist, the study area is currently subjected to grazing by domestic cattle and cultivation. The increased competition for grazing and the constant human presence reduces faunal abundance and diversity within the broader study area. The proposed establishment of the PV facilities would likely lead to the displacement of faunal species currently inhabiting those proposed footprint areas, pushing them out into the surrounding vegetated areas leading to increased competition for territories and breeding sites. Moreover, there is likely to be a knock-on dispersal affect, leading to increased resource competition and possible increased mortality rates, resulting in a decreased species abundance and diversity and suitable habitat for species of conservation concern. Proliferation of alien vegetation and insufficient rehabilitation will ultimately lead to loss of viable habitat in the surrounding areas, displacing faunal species further as indigenous floral species (faunal habitat and food resources) are displaced and lost. In light of the overall level of anthropogenic activity within the broader area, the overall impact on terrestrial fauna is deemed to be of **LOW** significance

Avifauna

In addition to the proposed Scafell Cluster projects, there are a number of existing transmission lines that can potentially impact on avifauna. Furthermore, the establishment of numerous PV panels will create additional reflective surfaces which birds may think are water resources. Qualitatively, the larger spatial extent of reflective surfaces could potentially increase the probability of avifaunal collisions with this infrastructure. In order to minimise the contribution of impacts to avifauna in the region, a detailed monitoring protocol for the operational phase of the PV projects has been proposed by the specialist. The overall cumulative impact on avifauna is considered to be of **MEDIUM** significance.

Freshwater

Generally, the nature of photovoltaic power projects, and associated transmission lines, allows them to have a limited impact on surface water features. However, the agricultural practices within the study area have led to impacts on the existing freshwater features. The specialist notes that the cumulative impact of this project is considered to be of **LOW** significance as the proposed development does not encroach within any freshwater ecosystem and as such direct impacts will be avoided.

Soils and Agriculture

The development of the proposed Scafell Cluster Project will lead to several cumulative impacts from a soils and agriculture perspective. The specialist notes that the cumulative impacts for the proposed Scafell Cluster Project will be **HIGH** due to a larger area being affected by the proposed project.

Heritage and Palaeontology

Heritage resources include sites of paleontological, archaeological, cultural, or historical importance. There are a number of activities and infrastructure related to the combined project that have the potential to damage heritage (including cultural) resources and result in the loss of the resource for future generations.

The heritage specialist identified heritage resources of varying significance within the project footprints associated with the Scafell Cluster, thus cumulative impacts in the unmitigated scenario could be expected for known heritage resources located within the Scafell Cluster project. Furthermore, the establishment of these projects increases the possibility that unknown heritage and paleontological resources are uncovered. In the unmitigated scenario, when considering the significance of the impact on undiscovered paleontological and heritage resources is a significant potential impact.

By employing a chance-find procedure in the event such previously undiscovered resources are uncovered, conducting detailed studies, and obtaining the relevant permits for the destruction or removal of the heritage sites (if required) that could be directly impacted by project infrastructure and by protecting those that could be indirectly impacted, the significance can be reduced.

As most heritage resources are point specific and, in general, impacts are found to be localised and impacting on the specific resource in a development, the cumulative impact on heritage and paleontological resources is deemed to be **LOW** with the implementation of mitigation.

Visual Impact

The cumulative impact of the project, all facilities and infrastructure taken together, along with the existing power infrastructure (ESKOM Scafell MTS and Transmission lines emanating from it), is deemed to be significant by the visual specialist. Intervisibility for the proposed Scafell Cluster project and the existing infrastructure would be evident. As the visual absorption capacity of the study area is relatively low, the combined effect over time of these developments would result in the study area being impacted upon in a manner beyond the anticipated negative impacts of the proposed project alone. With mitigation, the impact can be reduced when the proposed vegetation screening along the northern and southern edge of the Scafell Cluster project begin to mature. The overall cumulative visual impact is considered to be of negative **MEDIUM** to **HIGH** significance.

Socio-economic

Most social impacts would impact on the farming community that resides close to the project site and, to a lesser extent, the towns closest to the proposed development – Parys, Sasolburg, Vereeniging and Vanderbijlpark. The creation of additional economic opportunities for the area would go a long way to offset the negative socio-economic impacts and establishment of Community Trusts or funding of development initiatives in the area would support local economic and community development. This benefit is considered to be of ***MEDIUM (POSITIVE)*** significance.

However, as noted in Section 8.3.6 above, the ongoing safety and security issues could potentially be exacerbated by the proposed projects. This is deemed to be a **MEDIUM** significant impact on existing social networks and community structures.

8.5 'NO-GO' ALTERNATIVE

The No-Go alternative represents the option not to proceed with the proposed project, which leaves the project site in its current state (refer to the baseline description presented in Chapter 7), except for variation by natural causes and other human activities. It, thus, represents the current status quo and the baseline against which all potential project-related impacts are assessed. The No-Go alternative would also forego the potential cumulative negative impacts and possible advantages of the proposed project, e.g., job creation and community upliftment.

Vegetation

The botanical specialist has noted that bush encroachment was observed within the study area, particularly with respect to the proliferation of *Seriphium plumosum* in certain habitats on site. This species has been identified as a problematic encroacher species within the Grassland Biome (Mucina and Rutherford 2006). Thus, it is possible that without any intervention this species would continue to dominate and ultimately reduce the overall habitat for other indigenous species and result in the gradual degradation of CBA and ESA areas. Given the uncertainty, this is deemed to be **LOW** to **MEDIUM** significant impact.

Fauna and avifauna

The study area contains no unique or important faunal habitats relative to the surrounding area. The no-go alternative would result in no change to the existing land use activities on the site and associated impacts on faunal species and habitats.

Freshwater

As the proposed project area does not encroach within any freshwater ecosystems, there are no impacts associated with the no-go alternative.

Soils and Agriculture Potential

The No-go option from a soils and agriculture potential perspective will result in no impacts and the only impact from this alternative will be that of livestock grazing. The impact of livestock grazing on agriculture potential is deemed to be minimal unless the grazing capacity of the project site is exceeded.

Heritage

The site is already highly disturbed from past and present farming activities. No further destruction or disturbance to the cultural landscape is considered likely to occur.

Socio-economic

The impacts of pursuing the No-Go option are both positive and negative as that there is no change in status quo in terms of the negative impacts described above during all project phases which would be experienced by neighbours, society, and the landscape – namely through disruption, noise, visual, traffic and safety impacts. However, there would also be an opportunity loss in terms of job creation, skills development and associated economic multipliers for the local economy. The impact is deemed to be negative and of **LOW** significance.

9. SUMMARY AND CONCLUSION

9.1 CONCLUSIONS

A summary of the assessment of potential environmental impacts associated with the proposed project is provided below and in

Table 9-1: Summary of the significance of potential impacts associated with the proposed project

Environmental component	Potential Impacts	CONSTRUCTION PHASE		OPERATIONAL PHASE		DECOMMISSIONING PHASE	
		Without mitigation	With mitigation	Without mitigation	With mitigation	Without mitigation	With mitigation
Ecological Impacts	Impacts on Vegetation	High	**MEDIUM**	Medium	**LOW**	Medium	**VERY LOW**
	Impact on Terrestrial Fauna	Very High	**HIGH**	High	**MEDIUM**	-	-
	Impacts on avifauna	High	**HIGH**	Medium	**LOW**	Medium	**MEDIUM**
	Impacts on freshwater resources	Medium	**LOW**	Medium	**LOW**	Medium	**LOW**
Biophysical Impacts	Nuisance impacts (air quality and noise)	Low	**Insignificant**	-	-	Low	**Insignificant**
	Impacts on soils and associated agricultural potential	High	**MEDIUM**	Medium	**VERY LOW**	High	**MEDIUM**
Socio-economic Impacts	Impacts on the Heritage and Cultural Environment	Very Low	**Insignificant**	-	-	-	-
	Impact on Palaeontological Resources	Very Low	**Insignificant**	-	-	-	-
	Visual Impact	Low	**LOW**	Medium	**LOW**	Very Low	**VERY LOW**
	Development of a renewable energy facility	-	-	*Very High (positive)*	***VERY HIGH (positive)***	-	-
	Creation of employment and business opportunities	*High (positive)*	***HIGH (positive)***	*High (positive)*	***HIGH (positive)***	-	-
	Impact on safety and security on neighbouring residents	Very Low	**VERY LOW**	*High (positive)*	***HIGH (positive)***	-	-
	Impact on traffic	Low	**VERY LOW**	Low	**VERY LOW**	-	-
No-Go Alternative		**LOW to MEDIUM**					

9.1.1 Fit With Legislation, Policy and Planning

A review of the relevant legislation, policies and documents pertaining to the energy sector indicate that renewable energy and supporting infrastructure are supported at a national, provincial, and local level. Thus, the

establishment of the proposed project is supported by the relevant policy and planning documentation at a national and local level.

9.1.2 Construction and Decommissioning Phases

The majority of the impacts associated with the construction and decommissioning phases would be very localised (i.e., occurring on site only) and of short-term duration (i.e., reversible). The majority of the impacts associated with these two phases, are considered to be **INSIGNIFICANT** or of **VERY LOW** to **LOW** significance with mitigation. The most significant construction phase impact include:

- The clearance of the project footprints during the construction and decommissioning phases would have associated impacts vegetation and soils (and consequently the associated loss of agricultural potential). The resulting impacts on these features are deemed to be of **MEDIUM** significance; and
- The creation of employment for the duration of the construction period and business opportunities particularly in the local service industry, which is considered to be of **HIGH *(POSITIVE)*** significance with mitigation.

9.1.3 Operation Phase

The assessment is based on a preliminary layout as presented in Figure 5-1. In general, the impacts associated with the operation phase are long-term, as the Power Purchase Agreement associated with the Solar PV facility is valid for a period of 20 years, after which the Agreement can be renewed, or the facility is the decommissioned. The negative impacts associated with the operational phase are generally considered to be of **VERY LOW** to **LOW** significance.

The key positive impacts associated with the operation of the proposed facility include:

- *Development of a renewable energy facility*: South Africa currently relies on coal-powered energy to meet a large proportion of its energy needs. Although the overall contribution of the proposed project is relatively small it would help to offset the total carbon emissions associated with energy generation in South Africa. This impact is considered to be of **VERY HIGH *(POSITIVE)*** significance;
- *Creation of employment and business opportunities*: The proposed project would create a few long-term employment opportunities in the operational phase. Indirect and induced impacts would occur because of the new economic development and would include new jobs at businesses that support the expanded workforce or provide project materials, and associated income. Overall, the impact is considered to be of **HIGH *(POSITIVE)*** significance; and
- *Impact on safety and security on neighbouring residents*: During the operational phase, the presence of the proposed facility is expected increase the overall security of the area as access onto the current property would be restricted. This potential impact is also deemed to be of **HIGH *(POSITIVE)*** significance.

9.1.4 Cumulative Impact

As noted in Section 1, the proposed project forms part of the overall proposed Scafell Cluster project which comprises four (4) solar PV facilities and associated grid connections. A separate Environmental Assessment process has been conducted for each of these proposed projects. These photovoltaic power projects proposed by Mainstream, together with any other proposed and existing projects and activities in the area would have a

cumulative impact on the biophysical and socio-economic environment. The cumulative impacts are summarised below.

The cumulative impact on fauna, freshwater and heritage and palaeontology are considered to be **LOW** significance with mitigation. All cumulative impacts on terrestrial flora are considered to be of **LOW** to **Medium** significance. With respect to soils and agriculture perspective, the overall cumulative impact is considered to be **HIGH** due to a large disturbance footprint associated with the proposed projects.

The key cumulative socio-economic impacts include:

- The visual impact associated with the projects on the areas sense of place and landscape character is considered to be of **MEDIUM** to **HIGH** significance;
- The cumulative impact associated with the creation of local employment and business opportunities is considered to be **MEDIUM** ***(POSITIVE)*** significance, it would go a long way to offsetting the negative socio-economic impacts; and
- The increase in construction activities in the area could potentially exacerbate ongoing safety and security issues currently being experienced in the area. This is deemed to be a **MEDIUM** significant impact on existing social networks and community structures.

9.1.5 Comparative Assessment of Project Alternatives

Preliminary Layout

Mainstream has produced a preliminary layout (see Figure 9-1) for the proposed project that has been informed by preliminary feasibility studies, and associated environmental sensitivity analysis. The preliminary layout is indicative and is subject to change following the completion of detailed engineering design studies / work that would be undertaken only in the event of the proposed project is issued an EA. Thus, Mainstream is seeking approval from the DFFE of the overall development footprint indicated in this preliminary layout. In addition, a composite sensitivity map illustrating sensitive environmental features identified by the specialists within the project site of the proposed project is included in Figure 9-2. The independent specialist studies for the proposed project are included in Appendix 8.1 – 8.7 of this EIAR. From the findings of the preliminary investigations and the specialist studies, the project site for the proposed project (Portion 5 of the Farm Proceederfontein 100) presents a suitable site for the development of a Solar PV facility from a technical and environmental perspective. No fatal flaws or impacts of an unacceptable significance following the implementation of the recommended mitigation measures for the proposed project were identified from the specialist studies.

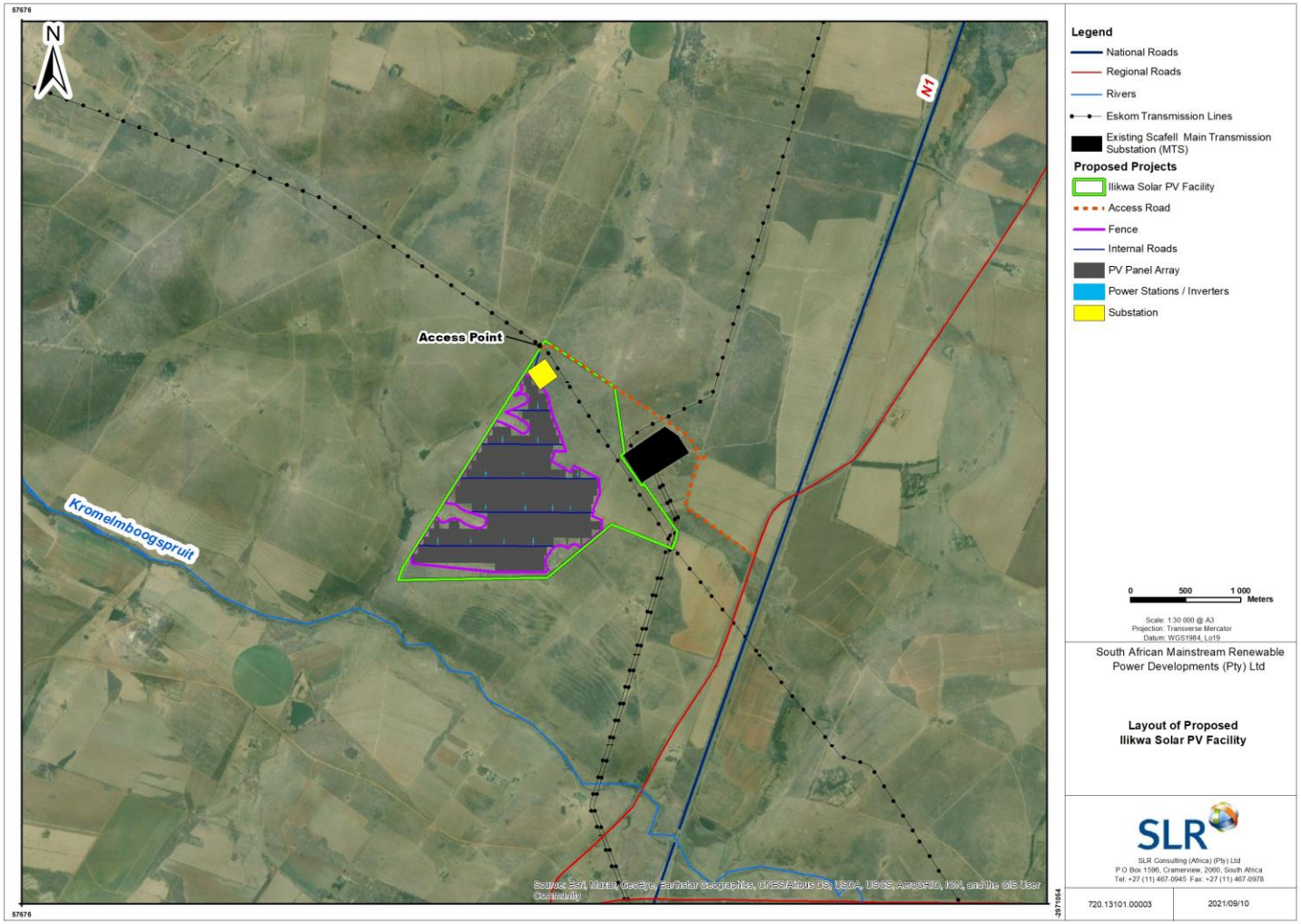

Figure 9-1: Indicative layout map of the project layout assessed and considered in this EIAR

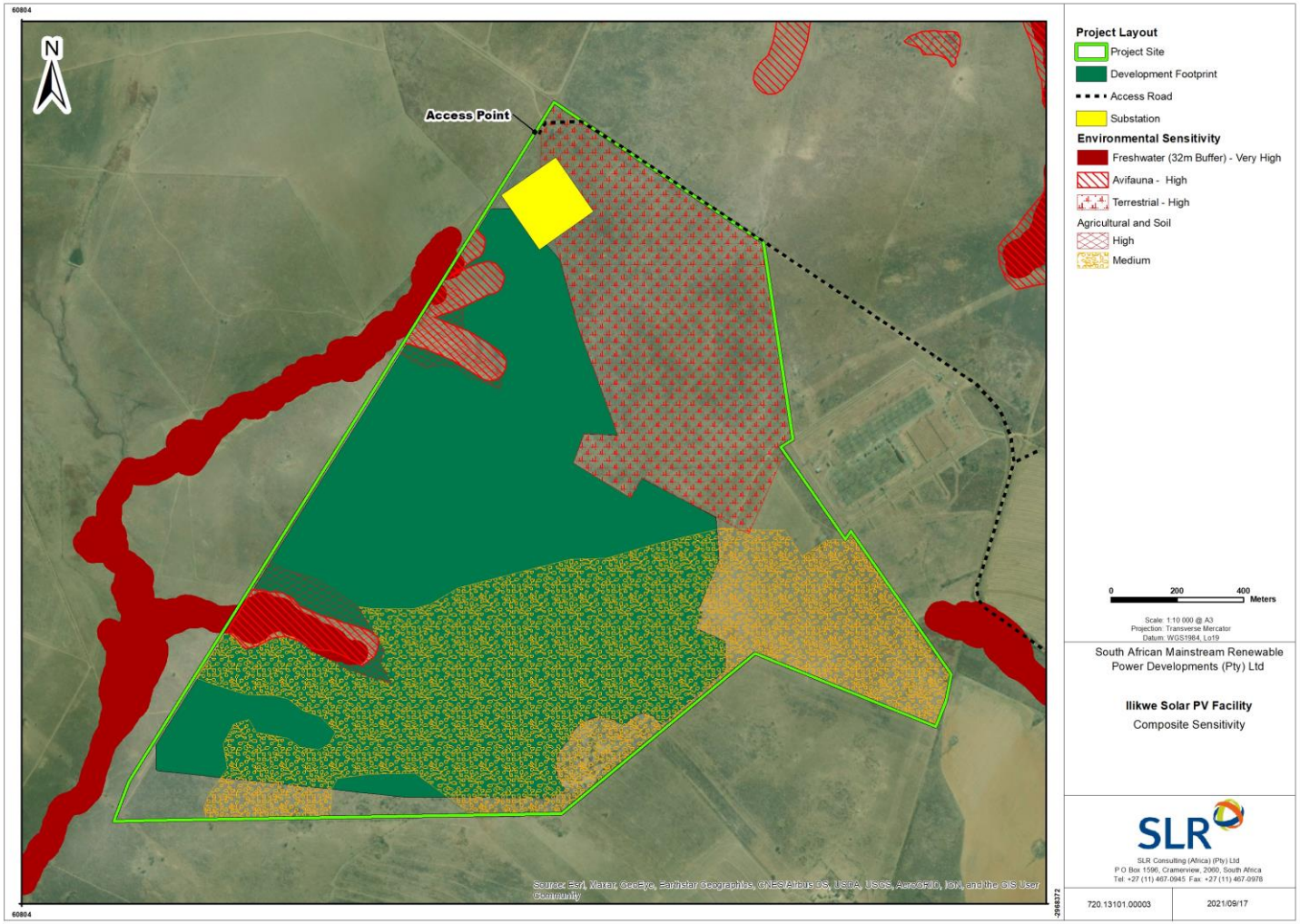

Figure 9-2: Composite environmental sensitivity map for the proposed project overlain with the development footprint assessed and considered in this EIAR

Technology Alternatives

Mainstream has considered two (2) alternatives for each of the key infrastructure components for the proposed project. The alternatives have been considered for the types of PV panel modules, mounting system technology and the BESS. Chapter 6 of this EIAR provides a detailed description of these alternatives considered for the proposed project. From the impact assessment undertaken in Chapter 8, there is no material difference in the significance of the potential impacts associated with either technology alternative. Thus, the technically preferred alternatives for development are included in Table 9-2 below.

Table 9-2: Technical Details of the Preferred Project Alternative

Component	Ilikwa Solar PV Facility
Property Information	
Farm name & portion number:	Proceederfontein 100 Portion 5
Surveyor General 21-digit code:	F02500000000010000005
Name of Landowner:	Alfred Murray Smit Trust
Property size:	276.85 ha
Study area size:	195 ha
Development footprint size:	180 ha
Centre coordinates of site:	26°48'52.65"S 27°37'38.70"E
Technical Details – Solar PV Facility	
Capacity	Up to100 MW_{ac}
Installed PV panel height	Up to 3 m
Number of PV panels	Up to 154 440
Mounting structures	Single Axis Tracking, Dual Axis Tracking or Fixed Axis Mounting System Technology
Inverters	Centralised or String Inverter Stations and Power Transformers
Cabling	Underground Direct Current (DC) and Alternating Current (AC) cables of up to 132 kV
Electrical Infrastructure	
IPP Substation capacity	33 / 132 kV
IPP Substation footprint	2.5 ha
Cabling	Underground and overhead transmission lines (up to 132 kV)
Grid Connection corridor length & width	Up to 2.3 km long and 150 m wide

Component	Ilikwa Solar PV Facility
Grid Connection[34]	The grid connection corridor is 150 m wide and is approximately 2.3 km in length. The proposed grid connection is from the on-site substation (Switching Station) of the proposed Ilikwa Solar Facility located on Procedeerfontein 5 /100 and extends for about 0.3 km in a south-easterly direction before moving north-easterly for 0.7 km across Willow Grange 3/246, then turning east for 0.4 km then directly south for 0.6km crossing Scafell RE/448, then a further 0.3 km in a south easterly direction, before terminating at the ESKOM Scafell MTS.
Building Infrastructure	
BESS footprint	Up to 2 ha
BESS technology	Solid State Batteries
Buildings	• Operational Control Centre • Operation and Maintenance Area / Warehouse / Workshop / Control Centre and Office • Ablution Facilities • Substation Building
Laydown Area & Associated Infrastructure	
Size of laydown area	Up to 3 ha
Buildings and Infrastructure	• Permanent Laydown Area • Temporary Construction Camp and Laydown Area • Fencing and Lighting • Lightening protection infrastructure • Telecommunication infrastructure • 400 m^3 reservoir, water pipeline and stormwater channels
Supporting Infrastructure	
Main access road	2.5 km long and up to 12 m wide
Internal access road	12 km long and 5 m wide

No-Go Alternative

The No-Go alternative represents the option of not to proceed with the proposed project, which leaves the project area of influence in its current state, except for variation by natural causes and other human activities. It, thus, represents the current status quo and the baseline against which all potential project-related impacts are assessed. The No-Go alternative would also forego the potential cumulative negative impacts and possible advantages of the proposed project, e.g., creation of employment opportunities and improvement to security and safety during the operational phase of the proposed facility.

The most significant of the no-go impacts identified, was the likelihood that the proliferation of *Seriphium plumosum* would continue unabated in certain habitats on site. This species has been identified as a problematic encroacher species within the Grassland Biome (Mucina and Rutherford 2006). Thus, it is possible that without any intervention this species would continue to dominate and ultimately reduce the overall habitat for other indigenous species and result in the gradual degradation of CBA and ESA areas. Given the uncertainty, this is deemed to be **LOW** to **MEDIUM** significant impact.

[34] The grid connection for the Ilikwa Solar PV Facility will be subject to a separate Environmental Authorisation process and will require a Basic Assessment (BA) process in support of the application for Environmental Authorisation.

9.2 RECOMMENDATION / OPINION OF ENVIRONMENTAL ASSESSMENT PRACTITIONER

The key principles of sustainability, including ecological integrity, equity and social justice, and economic efficiency, are integrated below as part of the supporting rationale for recommending an opinion on whether the proposed project should be approved.

9.2.1 Ecological integrity

The use of renewable energy (e.g., solar and wind) is considered to have significant ecological benefits and is a key component in the transition from the economy's dependence on fossil fuels. The proposed solar PV facility would help to offset the total carbon emissions associated with energy generation in South Africa. Reduced carbon emissions through the use of renewable energy would have benefits in terms of global warming and climate change. In terms of site location, the proposed project is located in an area that has suitably high solar radiation intensities and is thus considered to be an efficient use of available resources.

The proposed project would result in the clearing of an estimated 180 ha of existing vegetation generally of low (Degraded Grassland Habitat subunit) to medium sensitivity (*Seriphium*-dominated Grassland subunit) and moderately high sensitivity (*Themeda*-rich Grassland subunit). The specialist noted that although the proposed project will have an impact on the greatest extent of the *Seriphium*-dominated grassland subunit within the project site, this vegetation is not regarded as the reference vegetation within the project site and is well represented in the surrounding landscape. Thus, a loss of the grassland habitat floral community as a result of the proposed project is not anticipated.

For the *Themeda*-rich grassland subunit, it is anticipated that the proposed project will have an impact on this vegetation which will result in the loss of the associated floral community. Furthermore, it is anticipated that the proposed project will also have an impact on the Freshwater Habitat (associated with the unchanneled valley bottom wetland present within the project site) and the associated floral communities, as well as the ecological benefits provided by the wetland. As a result, the preliminary layout (see Figure 5-3) has avoided the footprint of the wetland. Thus, the loss of habitat as a result of the proposed project within the affected area is unlikely to have an unacceptable impact on floral communities at a local and regional level, and the significance of the impact can be managed through the implementation of the recommended mitigation measures.

The findings of the avifaunal specialist indicated that the project site is of low sensitivity on the basis that there were no individuals or confirmed habitat for avian species of conservation. In summary, the proposed project would result in the loss of ecological integrity in the study area but would generally be confined to the extent of the site.

9.2.2 Equity and social justice

With respect to potential impacts on the existing agricultural activities on site, the landowner will enter into an applicable lease agreement with the proponent and as such the loss of grazing would likely be offset by the income the farmer would receive from the lease agreement. From the agricultural assessment it is noted that crop production on the property had been stopped in 2006 and the property has been used for extensive livestock farming. Once crop production was abandoned, the fields were left fallow and pioneer species established themselves.

The proposed project would create a number of local employment and business opportunities. It is anticipated that a large number of the low and medium skilled employment opportunities could be sourced from the local labour force in and around the site with the implementation of a skills development and training programme during the construction phase. The operational phase would create a small number of long-term employment opportunities. In terms of business opportunities for local companies, procurement would create business opportunities for the regional and local economy. A percentage of the monthly wage bill earned by employees would be spent in the regional and local economy, which would result in indirect benefits to local businesses in the nearby towns of Parys and Sasolburg.

The proposed project would alter the local visual landscape / rural character of the site, which would have a visual impact in the immediate surrounding area and especially along the N1 national road. This impact is mitigated to a certain extent by the existing visual clutter in the rural landscape, which has increased the visual absorption capacity for the proposed project.

Thus, in terms of the issue of equity and social justice, the proposed project is considered to result in the equitable distribution of positive and negative impacts with no one group or community being adversely affected.

9.2.3 Economic efficiency

South Africa is facing a rising demand for power and is looking for other energy sources, including renewable energy, to decrease its dependence on the coal-fired power that provides most of the country's electricity. As such, renewable energy technologies are playing a key role in meeting South Africa's energy needs into the future. The proposed project is intended to support the establishment of a solar PV facility and thus furthers this goal. Furthermore, the proposed project is considered ideally located in order to link into the national grid, due to its close proximity to the existing Scafell substation.

While the proposed project would change the current agricultural land use of the site, 80 % of the site is considered to be of low sensitivity with respect agriculture. The remainder of the site (approximately 110.3 ha or 57 %) is deemed to be medium sensitivity rating for agriculture.

From the above sustainability criteria, the nature and extent of the proposed development, compliance with the relevant legal, policy and planning documentation (i.e., "need and desirability") and the findings of the specialist studies, it is the opinion of SLR that the proposed project can be supported from an environmental perspective and should be considered for Environmental Authorisation, subject to the implementation of the identified recommendations.

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