

Vlakfontein Solar PV1

Remainder of Vlakfontein No 15
Portion 1 of Jackalsfontein No 443

DFFE Ref Nr 14/12/16/3/3/1/2739

Final Basic Assessment Report

May 2023

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Project Detail

Project Name	Vlakfontein Solar PV1
DFFE Reference Number	14/12/16/3/3/1/2739
Report Status	Final Basic Assessment Report
Date of Report	May 2023
Purpose of Report	Submission to the Competent Authority (DFFE) for Environmental Authorisation (A 57 days decision-making period applies)

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LIST OF GENERAL ABBREVIATIONS

BAR	Basic Assessment Report
BID	Background Information Document
CBA	Critical Biodiversity Area
CEMP	Construction Environmental Management Programme
CRR	Comment & Responses Report
dBAR	Draft Basic Assessment Report
DEFF	National Department of Environment, Forestry & Fisheries
DSR	Draft Scoping Report
DWS	Department of Water & Sanitation
DMR	Department of Mineral Resources
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMF	Environmental Management Framework
EMPr	Environmental Management Programme
ESA	Ecological Support Area
EWT	Endangered Wildlife Trust
fBAR	Final Basic Assessment Report
GA	General Authorisation
GNR	Government Notice Regulation
ha	Hectare(s)
HIA	Heritage Impact Assessment
IAPs	Interested and Affected Parties
IEM	Integrated Environmental Management
m³	Cubic metres
Mamsl	Metres above mean sea level
n/a	Not applicable
NEMA	National Environmental Management Act, 1998 (Act No 107 of 1998)
NEMPAA	National Environmental Management: Protected Areas Act, 2003 (Act No 57 of 2003)
NEMWA	National Environmental Management: Waste Act, 2008 (Act No 59 of 2008)
PIA	Palaeontological Impact Assessment
PPP	Public Participation Process/Programme
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SR	Scoping Report
PHRA	Provincial Heritage Resources Authority
PoS	Plan of Study
SIP	Strategic Infrastructure Project
TRF	Transnet Freight Rail
TS	Traction Station / Traction Substation
WUA	Water Use Authorisation
WULA	Water Use License Application

ELECTRICAL AND RENEWABLE TERMS AND ABBREVIATIONS

CSP	Concentrated Solar Power
BFD	Bird Flight Diverter
EGI	Electrical Grid Infrastructure
EMI	Electro-Magnetic Interference
Eskom SOC	South Africa's Electricity Supply Commission (State Owned Company)
ICNIRP	International Commission for Non-Ionising Radiation Protection
IEP	Integrated Energy Plan
IPP	Independent Power Producer
IRP	Integrated Resource Plan
ISEP	Integrated Strategic Electricity Planning
LiLo	Loop-in Loop-out (Powerlines)
MTS	Main Transmission Substation
NDP	Network Development Plan
NERSA	National Energy Regulator of South Africa
PV	Photovoltaic (solar panels)
REDZ	Renewable Energy Development Zone
REIPPP	Renewable Independent Power Producer Programme
RFI	Radio Frequency Interference
SS	Substation
STC	Strategic Transmission Corridor

Voltage

kV	Kilovolt (1kV = 1 000V)
MVA	Mega Volt Ampère

Units of power

kW	Kilowatt (1kW= 1 000W)
MW	Megawatt (1MW=1 000kW)

Vlakfontein Solar PV1

Remainder of Vlakfontein No 15
Portion 1 of Jackalsfontein No 443

EXECUTIVE SUMMARY

BACKGROUND TO THE PROJECT

Landscape Dynamics Environmental Consultants (Pty) Ltd was appointed to apply for Environmental Authorisation for the **Vlakfontein Solar PV1** with the Department of Forestry, Fisheries & Environment (DFFE), which is the Competent Authority (CA) for this project. The applicant is Vlakfontein Solar PV1 (Pty) Ltd ('the Applicant'), a special purpose vehicle (SPV) fully owned by Mulilo Renewable Project Developments (Pty) Ltd ('the Developer').

It is the developer's intention to bid the proposed project under the Department of Mineral Resources and Energy's (DMRE's) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme (or similar programme), with the aim of evacuating the generated power into the national grid. This will aid in the diversification and stabilisation of the country's electricity supply, in line with the objectives of the Integrated Resource Plan (IRP), with Vlakfontein Solar PV1 set to inject up to 100 MW into the national grid.

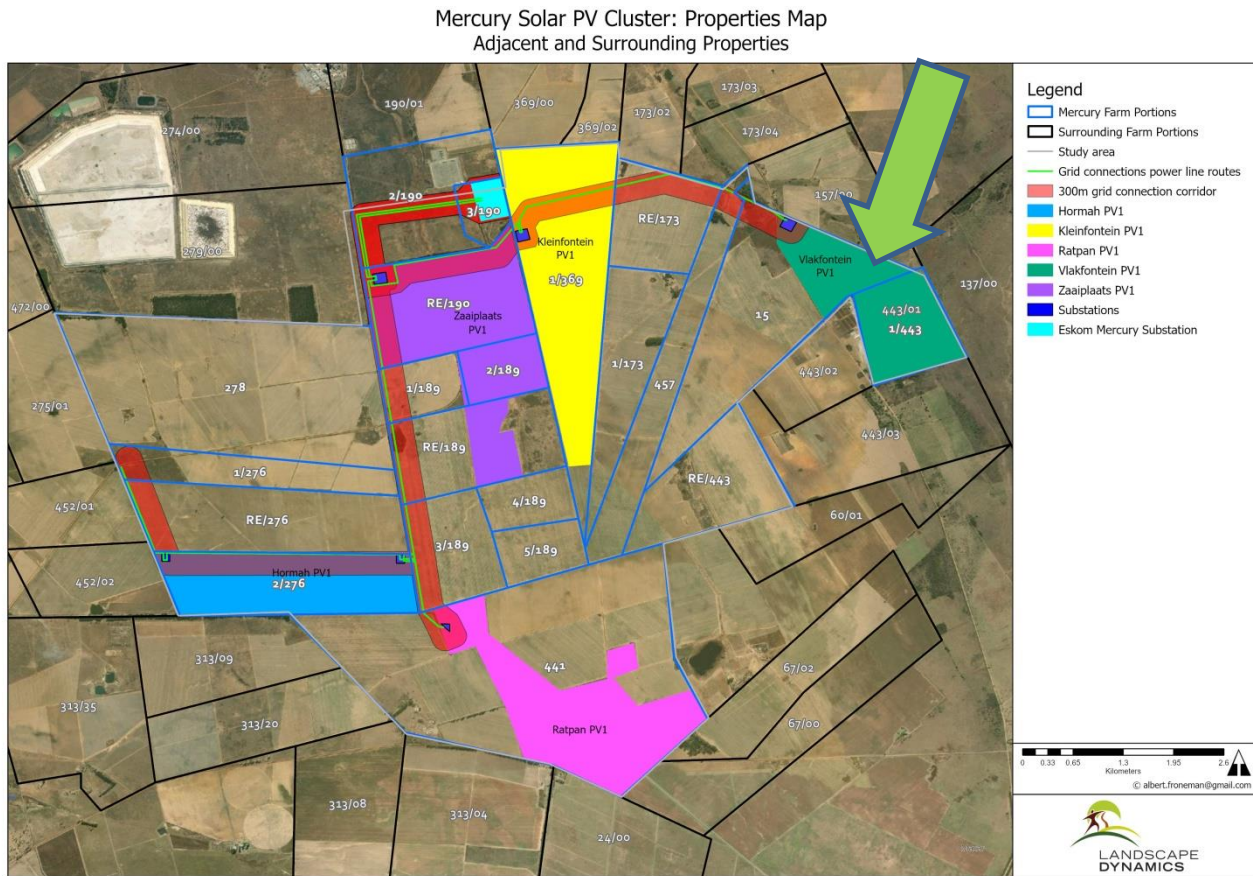
The project is planned as part of a cluster of renewable energy facilities known as the **Mercury Solar PV Cluster**, with associated grid connection infrastructure. The cluster is situated north of the R76 and south of the Vaal River, the closest town being Viljoenskroon in the Free State Province. It falls within the jurisdiction of the Moqhaka Local Municipality (MLM) in the Fezile Dabi District Municipality. The size of the relevant properties combined for the Vlakfontein Solar PV1 facility is 493ha in extent of which the renewable infrastructure will affect 151ha.

Name of PV facility	Farm Name
Ratpan Solar PV1	Remainder of Ratpan No 441
Hormah Solar PV1	Portion 2 of Hormah No 276
Zaaipplaats Solar PV1	Remainder of Zaaipplaats No 190 Remainder of Fraai Uitzicht No 189 Portion 2 of Fraai Uitzicht No 189
Kleinfontein Solar PV1	Portion 1 of the Farm Kleinfontein No 369
Vlakfontein Solar PV1	Portion 1 of Jackalsfontein No 443 Remainder of Vlakfontein Nr 15

Each Photovoltaic (PV) solar facility will be treated as a standalone application and five separate applications for Environmental Authorisations will therefore be made. The electrical grid infrastructure (connecting the facilities to the existing Mercury Substation or existing Eskom powerlines) for these five facilities will be dealt

with in terms of Gazette Notice Nr 2313, 27 July 2022: Standard for the Development and Expansion of Power Lines and Substations within identified Geographical Areas.

This Application for Environmental Authorisation refers only to the Vlakfontein Solar PV1 facility (indicated with a green arrow on the map below)



PROJECT COMPONENTS

Infrastructure associated with the Vlakfontein Solar PV1 Facility will include the following:

Infrastructure	Specifications
Solar PV Array	<p>The Solar PV Array includes the following components:</p> <ul style="list-style-type: none"> • Bifacial PV Modules • Mounting structures using single axis tracking technology • Inverters • Combiner Boxes • Transformers • Cabling between panels • Total PV area is approximately 151 ha.
Onsite 132 kV Independent Power Producer (IPP) Substation	<p>The IPP Substation includes the following components:</p> <ul style="list-style-type: none"> • HV Step-up transformer • MV Interconnection building • Total area approximately 100 m x 100 m (1 ha)

Access and internal roads	<ul style="list-style-type: none"> • Main access to the IPP substation area is required directly off Vermaasdrift Road (S643), approximately 8m wide. The length of the road is approximately 498 m. The coordinates of the access point are: 27° 0'36.07"S 26°51'19.21"E • Existing internal farm roads to be utilised where possible, • Internal roads to be constructed up to 6m wide. • Regraveling of roads to take place if required by the provincial roads authority.
Laydown area	<ul style="list-style-type: none"> • A temporary construction site area of approximately 4ha directly adjacent to the IPP and Eskom substation will be required. • Temporary infrastructure will be rehabilitated following the completion of the construction phase, where it is not required for the operation phase.
Battery Energy Storage System (BESS)	<ul style="list-style-type: none"> • Solid State Batteries (SSB) is the preferred battery technology. • It will be delivered pre-assembled. • It will be constructed on approximately 4.5 ha.
Storage of Dangerous Goods	<ul style="list-style-type: none"> • Storage of dangerous goods (Including lubrications, oils, paints, fuel/diesel, etc.) with a combined capacity of less than 80 cubic metres is required. • Diesel/fuel is generally required for the following purposes: <ul style="list-style-type: none"> ▪ During construction for construction vehicles as well as generators for the construction camp and commissioning whilst waiting for the Eskom grid connection works to be completed ▪ During operations, diesel is required for vehicles at the PV plant as well as for backup diesel generators at the substation. The Generators supply auxiliary power to the substation's protection and communications systems, should there be outages on the grid. This is an Eskom requirement together with a battery room at the substations to act as UPS for these critical systems.
Ancillary facilities	<ul style="list-style-type: none"> • Operations and Maintenance Building • Site Offices • Construction camps • Storage Warehouse • Workshop • Guard House • Ablutions with conservancy tanks • During the construction phase, temporary sanitation facilities will be provided (i.e. chemical toilets) and these toilets will be regularly serviced by a licensed company.

LEGAL REQUIREMENT

National Environmental Management Act (Act 107 of 1998)

This application is done in terms of the National Environmental Management Act, 1998 (Act No 107 of 1998) (NEMA) and the Environmental Impact Assessment Regulations of December 2014, as amended in April 2017 (Government Notice Nr 326). Environmental Authorisation is requested for the following listed activities:

Listing Notice 1

11	<p>The development of facilities or infrastructure for the transmission and distribution of electricity</p> <p>(i) Outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or</p> <p>(ii) Inside urban areas or industrial complexes with a capacity of 275 kilovolts or more,</p> <p>excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is —</p> <p style="margin-left: 40px;">a) temporarily required to allow for maintenance of existing infrastructure;</p> <p style="margin-left: 40px;">b) 2 kilometres or shorter in length;</p> <p style="margin-left: 40px;">c) within an existing transmission line servitude; and</p> <p style="margin-left: 40px;">d) will be removed within 18 months of the commencement of development.</p>	<p>An onsite 132 kV Independent Power Producer (IPP) Substation forms part of the project components for which Environmental Authorisation is required with this application.</p>
12	<p>The development of</p> <p>(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or</p> <p>(ii) infrastructure or structures with a physical footprint of 100 square metres or more;</p> <p>where such development occurs</p> <p style="margin-left: 20px;">(a) within a watercourse;</p> <p style="margin-left: 40px;">(b) in front of a development setback; or</p> <p style="margin-left: 40px;">(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;</p> <p><u>excluding</u></p> <p>(aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;</p> <p>(bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;</p> <p>(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies;</p> <p>(dd) where such development occurs within an</p>	<p>An existing access road will be upgraded and developed across a seepage area. This road will be approximately 6m in width and approximately 265m in length where it crosses the seepage area. A surface area of <u>at least</u> 1 590m² will ultimately be affected.</p> <p>There are four depressions / degraded wetlands modified by agricultural activities which were confirmed by the aquatic ecologist as having a low aquatic sensitivity and can be development. These areas are approximately 4,66ha; 3,33ha; 0,83ha, and 0,5ha, in extent. The combined total surface area is therefore approximately 9,32ha which equals 93 200m².</p>

	<p>urban area;</p> <p>(ee) where such development occurs within existing roads, road reserves or railway line reserves; or</p> <p>(ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared</p>	
19	<p>The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shell grot, pebbles or rock of more than 10 cubic metres from a watercourse,</p> <p>but excluding where such infilling, depositing, dredging, excavation, removal or moving—</p> <ol style="list-style-type: none"> will occur behind a development setback; is for maintenance purposes undertaken in accordance with a maintenance management plan; falls within the ambit of activity 21 in this Notice, in which case that activity applies; 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. 	<p>An existing road will be upgraded and developed across a seepage area. It will be approximately 6m in width and approximately 265m in length where it crosses this seepage area. A surface area of at least 1 590m² will ultimately be affected; therefore infilling or depositing of more than 10m³ will be required in this area</p> <p>In addition, there are four depressions/degraded wetlands modified by agricultural activities which were confirmed by the aquatic ecologist as having a low aquatic sensitivity and can be development. This covers an area of approximately 93 200m²; therefore combine infilling or depositing of more than 10m³ will also be required in these areas.</p> <p>The final calculations in terms of the infilling and/or excavation volumes will only be determined during the design phase of the project.</p>
24	<p>The development of a road—</p> <ol style="list-style-type: none"> for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; <p>but excluding a road—</p> <ol style="list-style-type: none"> which is identified and included in activity 27 in Listing Notice 2 of 2014; where the entire road falls within an urban area; or 	<p>The following roads are planned:</p> <ul style="list-style-type: none"> The main access to the facility will be approximately 8m wide. Internal roads will be constructed up to 6m wide. <p>The approval of this activity will ensure that additional width, if any, required for the access points, turning circles and bends can take place. The exact road widths and lengths will only be confirmed during the design phase of the project.</p>

	c) which is 1 kilometre or shorter.	
28	<p>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:</p> <p>(i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or</p> <p>(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;</p> <p>excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.</p>	The development footprint of the Vlakfontein Solar PV1 facility will be developed on approximately 151 ha which contain areas previously cropped and uncropped outside an urban area.

Listing Notice 2

Even though Listing Notice 2 calls for a full Scoping and EIA to be undertaken, the project site falls within a Renewable Energy Zone (Klerksdorp REDZ) which implies that a Basic Assessment process has to be undertaken regardless if Listing Notice 2 is triggered or not.

1	<p>The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs</p> <p>(a) within an urban area; or</p> <p>(b) on existing infrastructure.</p>	A solar PV facility of up to 100MW with associated infrastructure will be constructed outside an urban area.
15	<p>The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for</p> <p>(i) the undertaking of a linear activity; or maintenance purposes undertaken in accordance with a maintenance management plan</p> <p>(ii) maintenance purposes undertaken in accordance with a maintenance management plan.</p>	<ul style="list-style-type: none"> The combined properties' size is 493 ha in extent of which the development footprint will affect approximately 151 ha of previously cropped and uncropped land. Indigenous vegetation of more than 20 ha will be removed within the total project area.

Listing Notice 3

4	<p>The development of a road wider than 4 metres with a reserve less than 13,5 metres.</p> <p>b. Free State</p> <p>i. Outside urban areas:</p> <p>(aa) A protected area identified in terms of NEMPAA, excluding disturbed areas;</p> <p>(bb) National Protected Area Expansion Strategy Focus areas;</p> <p>(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;</p> <p>(dd) Sites or areas identified in terms of an international convention;</p> <p>(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;</p> <p>(ff) Core areas in biosphere reserves; or</p> <p>(gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas; or</p> <p>ii. Inside urban areas:</p> <p>(aa) Areas zoned for use as public open space;</p> <p>(bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose; or</p> <p>(cc) Areas within urban protected areas.</p>	<p>Listing Notice 3 is applicable because the development site lies outside urban areas; and</p> <ul style="list-style-type: none"> • according to the DFFE Screening Tool Report the entire site falls within a Critical Biodiversity Area. • according to the Protected Areas Register the Mispah Game Farm (Nature Reserve) is situated approximately 1,2km north-west of the PV site. <p>The applicable project components/ activities are the following:</p> <ul style="list-style-type: none"> • The main access to the IPP substation area off the Vermaasdrift Road (S643) will be constructed to a width of approximately 8m. • All other internal roads will be constructed to a width of approximately 6m.
10	<p>The development and related operation of facilities or infrastructure, for the 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.</p> <p>b. Free State</p> <p>i. Outside urban areas</p> <p>(aa) A protected area identified in terms of NEMPAA, excluding conservancies;</p> <p>(bb) National Protected Area Expansion Strategy Focus areas;</p> <p>(cc) Sensitive areas as identified in an environmental management framework as</p>	<p>Listing Notice 3 is applicable because the development site lies outside urban areas; and</p> <ul style="list-style-type: none"> • according to the DFFE Screening Tool Report the entire site falls within a Critical Biodiversity Area. • according to the Protected Areas Register the Mispah Game Farm (Nature Reserve) is situated approximately 1,2km north-west of the PV site. <p>The applicable project components/ activities are the following:</p>

	<p>contemplated in chapter 5 of the Act and as adopted by the competent authority;</p> <p>(dd) Sites or areas identified in terms of an international convention;</p> <p>(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;</p> <p>(ff) Core areas in biosphere reserves;</p> <p>(gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve;</p> <p>or</p> <p>(hh) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland; or</p> <p>ii. Inside urban areas:</p> <p>(aa) Areas zoned for use as public open space; or</p> <p>(bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose.</p>	<ul style="list-style-type: none"> • Storage of dangerous goods (Including lubrications, oils, paints, fuel/diesel. etc.) will be required. The exact storage capacity has not yet been determined, but it will be 30m³ or more, but less than 80m³. • Diesel/fuel is generally required for the following purposes: <ul style="list-style-type: none"> ○ During construction for construction vehicles as well as generators for the construction camp and commissioning whilst waiting for the Eskom grid connection works to be completed ○ During operations required for Operations & Maintenance vehicles at the PV plants but also required for backup diesel generators at the substation. The Generators supply auxiliary power to the substation's protection and communications systems, should there be outages on the grid. This is an Eskom requirement together with a battery room at the substations to act as UPS for these critical systems.
12	<p>The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.</p> <p>b. Free State</p> <p>i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004;</p> <p>ii. Within critical biodiversity areas identified in bioregional plans.</p> <p>iii. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning; or</p> <p>iv. Areas within a watercourse or wetland; or within 100 metres from the edge of a</p>	<p>Listing Notice 3 is applicable because:</p> <ul style="list-style-type: none"> • According to the DFFE Screening Tool Report, the entire site is situated within both a Critical Biodiversity Area and an Endangered Ecosystem. • The ecologist confirmed that the vegetation of the study area belongs to the endangered Vaal-Vet Sandy Grassland vegetation type (Gh 10) (Mucina & Rutherford 2006). • A watercourse (seepage area) to be excluded from the development area and depressions/degraded small wetlands that will form part of the PV area occur on site. <p>The applicable project components/ activities are the following:</p> <ul style="list-style-type: none"> • the development footprint will affect approximately 160 ha of previously cropped and uncropped land indigenous vegetation of way more than 300m² will be removed.

	<p>watercourse or wetland.</p>	<ul style="list-style-type: none"> PV solar panels as well as roads will be constructed that requires clearance of indigenous vegetation exceeding 300m² to take place within 100m from the edge of the above-mentioned watercourses.
<p>14</p>	<p>The development of</p> <p>(i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or</p> <p>(ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs</p> <p>(a) within a watercourse;</p> <p>(b) in front of a development setback; or</p> <p>(c) if no development setback has been adopted within 32 metres of a watercourse, measured from the edge of a watercourse;</p> <p><u>excluding</u> the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.</p> <p>b. Free State</p> <p>i. Outside urban areas</p> <p>(aa) A protected area identified in terms of NEMPAA, excluding conservancies;</p> <p>(bb) National Protected Area Expansion Strategy Focus areas;</p> <p>(cc) World Heritage Sites;</p> <p>(dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;</p> <p>(ee) Sites or areas identified in terms of an international convention;</p> <p>(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or inbioregional plans;</p> <p>(gg) Core areas in biosphere reserves; or</p> <p>(hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve;</p>	<p>Listing Notice 3 is applicable because the development site lies outside urban areas; and</p> <ul style="list-style-type: none"> according to the DFFE Screening Tool Report the entire site falls within a Critical Biodiversity Area. according to the Protected Areas Register the Mispah Game Farm (Nature Reserve) is situated approximately 1,2km north-west of the PV site. <p>The applicable project components/ activities are the following:</p> <ul style="list-style-type: none"> An existing access road will be upgraded and developed across a delineated seepage area. This road will be approximately 6m in width and approximately 265m in length where it crosses the delineated seepage area. A surface area of at least 1 590m² will ultimately be affected. There are also four depressions / degraded wetlands modified by agricultural activities which were confirmed by the aquatic ecologist as having a low aquatic sensitivity and can be development. These areas are approximately 4,66ha'; 3,33ha; 0,83ha, and 0,5ha in extent. The combined total surface area is therefore approximately 9,32ha which equals 93 200m².

	<p>or</p> <p>ii. Inside urban areas: (aa) Areas zoned for use as public open space; or (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority, zoned for a conservation purpose.</p>	
18	<p>The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.</p> <p>b. Free State i. Outside urban areas:</p> <p>(aa) A protected area identified in terms of NEMPAA, excluding conservancies; (bb) National Protected Area Expansion Strategy Focus areas; (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (dd) Sites or areas identified in terms of an international convention; (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (ff) Core areas in biosphere reserves; (gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; or (hh) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland; or</p> <p>ii. Inside urban areas: (aa) Areas zoned for use as public open space; or (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose.</p>	<p>Listing Notice 3 is applicable because the development site lies outside urban areas; and</p> <ul style="list-style-type: none"> • according to the DFFE Screening Tool Report the entire site falls within a Critical Biodiversity Area. • according to the Protected Areas Register the Mispah Game Farm (Nature Reserve) is situated approximately 1,2km north-west of the PV site <p>The applicable project components/ activities are the following:</p> <p>Existing roads will be widened by more than 4 metres and/or lengthened by more than 1km within 100m from the edge of a watercourse / wetland.</p>

Renewable Energy Development Zones (REDZ) and Strategic Transmission Corridors (STC)

The Vlakfontein Solar PV 1 Project falls within the Klerksdorp REDZ as well as the Central STC.

Even though Listing Notice 2 calls for a full Scoping and EIA to be undertaken, the project site falls within a Renewable Energy Development Zones (Klerksdorp REDZ) which means that a Basic Assessment process has to be undertaken regardless if Listing Notice 2 is being triggered or not.

Gazette Notice Nr 2313, 27 July 2022: Standard for the Development and Expansion of Power Lines and Substations within identified Geographical Areas is also applicable to electrical infrastructure that falls within the STCs. The Mercury Cluster PV Project falls within the Central Transmission Corridor (STC). In the case of the Vlakfontein Solar PV1 facility, the onsite 132kV switching station and a 132kV power line which will be handed over to Eskom after construction will be dealt with according to the above-mentioned stipulations in a separate application. The substation however forms part of the project components of the Vlakfontein Solar PV1 facility and will be dealt with under this application.

The National Water Act (Act No 36 of 1998)

The NWA aims to regulate the use of water and activities which may impact on water resources through the categorisation of 'listed water uses'. The Department of Water and Sanitation (DWS) is the administering body in this regard. Defined water use activities require the approval of DWS in the form of a General Authorisation (GA) or a Water Use Licence (WUL).

As some of the proposed activities could affect the delineated aquatic features, they pose a risk of changing the bed, banks or characteristics of the watercourses or impeding or diverting flow in the watercourses, with the associated Section 21 (c) and (i) water use activities.

Additional water use activities that may occur would be associated with groundwater abstraction. The threshold for the storage of domestic and biodegradable industrial wastewater for the purpose of disposal is 10 000 m³ per property. The General Authorisations for groundwater abstraction within the Quaternary Catchment C24B is limited to 45 m³/ha for the extent of the associated properties.

The National Heritage Resources Act (Act 25 of 1999)

The proposed project falls within the scope of Section 38 of the National Heritage Resources Act and the most obvious applicable activity is 'any development or other activity which will change the character of a site exceeding 5 000m² in extent'.

The authorisation process in terms of the NHRA forms part of the EIA process. A Heritage Impact Assessment was electronically submitted to the South Africa Heritage Resource Agency (SAHRA) via SAHRIS as well as to the Free State Provincial Heritage Resources Authority as part of the public participation programme. Comment received from these authorities will be addressed and included in the Final BAR.

NEED & DESIRABILITY

The need for this project relates directly to the need for renewable energy projects in South Africa. The proposed Vlakfontein Solar PV1 will connect the generated electricity to the Eskom national grid, thereby assisting in alleviating the immense pressure on the current Eskom capacity.

The need for the project can also be justified when reviewing the South African **Integrated Resource Plan (IRP) 2019** which was gazetted by the Minister of Mineral Resources and Energy, Mr Gwede Mantashe, on 18 October 2019, updating the energy forecast for South Africa from the current period to the year 2030.

The project is furthermore desirable in terms of policy fit:

- The findings of the review of key policy and planning documents indicate that renewable energy is supported at a national, provincial, and local level. At a national level, the development of, and investment in, renewable energy is supported by the National Development Plan, New Growth Path Framework and National Infrastructure Plan, highlighting the importance of renewable energy. The proposed project also supports a number of objectives contained in the Free State Province Provincial Growth and Development Strategy and Free State Green Economy Strategy. At a district and local level, the Moqhaka Local Municipality IDP and SDF support the development of renewable energy. The site is also located within the Klerksdorp REDZ as well as the Central STC. The area has therefore been identified as suitable for renewable energy facilities.
- The Vlakfontein Solar PV1 facility as proposed is in line and in support of applicable legislation on a national, provincial as well as local level.

ALTERNATIVES

The key alternatives associated with solar farms are the following:

- Site Selection
- Technology
- Layout
- No Go

Alternatives for this project relates mostly to the site selection process undertaken for the **Mercury Solar PV Cluster**. Considerations in the choice of the initial assessment area were solar irradiation; existing road infrastructure; access to the Eskom grid; willingness of the landowner to lease the property; Renewable Energy Development Zones (REDZ); Strategic Transmission Corridors (STC's); environmental constraints; as well as current land use and available land

The client originally planned to construct at least ten solar PV facilities within the identified assessment area. High agricultural potential of the study area would however play a major role in the number of sites and areas available for development. Further restrictions on available land resulted from terrestrial biodiversity and aquatic constraints. The number of sites was then downscaled to seven and more detailed investigations and ground-truthing took place to determine the feasibility of these seven sites which were then further downscaled to five PV sites of which the proposed **Vlakfontein Solar PV1** forms a part.

In terms of technology, Photovoltaic (PV) Technology could have been considered against Concentrated Solar Power (SCP) technology. PV technology has however been identified by the developer as the preferred technology.

The layout of the **Vlakfontein Solar PV1** facility was influenced mainly by the following:

- The main access point is provided directly off Vermaasdrift Road (S643) and in compliance with the requirements of the relevant traffic authorities.
- A combined delineated aquatic area with buffer zone, biodiversity terrestrial, avi-fauna and bat sensitivity area with relevant buffer zones had been identified and is excluded from the development footprint area.
- Four depressions/degraded wetlands had been identified but was confirmed by the aquatic ecologist as having a low sensitivity and can be demolished for the purpose of the PV area.
- The visual impact specialist requires a 30m non-development buffer off Vermaasdrift Road.
- The heritage specialist requires a 200m buffer circle around the existing farmstead to be excluded from the development footprint area. It was also recommended that tree avenues located along roads and farm boundaries be retained as far as possible.
- The layout has also been guided by best practice and acceptable solar PV engineering principles.

As illustrated throughout the report, all indications are that the advantages of the provision of green energy from a renewable resource into the national grid outweigh the negative environmental impact associated with the project. It was also confirmed and supported by the relevant specialists that all expected negative impact can be mitigated to acceptable levels. The No Go alternative is therefore not considered viable.

DFFE SCREENING TOOL

A Screening Tool Report of the Department of Forestry and Fisheries website was compiled and verification was done by Landscape Dynamics as well as the appointed specialists. The need for the following specialists' studies was identified:

- Terrestrial Ecological (Fauna & Flora) Impact Assessment
- Aquatic Impact Assessment
- Avifauna Impact Assessment
- Cultural Heritage Impact Assessment
- Visual Impact Assessment
- Bat Screening (Desktop) Assessment
- Social Impact Assessment
- Agricultural Impact Assessment

KEY FINDINGS OF THE SPECIALISTS STUDIES

Terrestrial Ecological Specialist Assessment

A Terrestrial Ecological Specialist Assessment was undertaken and concluded the following;

According to the DFFE Screening Tool, both the fauna and flora of the study site have an overall low sensitivity with smaller sections having a medium sensitivity. The terrestrial biodiversity is regarded as high because of the site being situated within an endangered ecosystem. However, due to the past and current agricultural activities the only area that can be regarded as having high biodiversity sensitivity is the watercourse which runs along the centre of the Vlaktefontein Solar PV1 site. This watercourse has been delineated and is excluded from the development area.

It was concluded that the Vlakfontein Solar PV1 site would not have a significant negative impact on the environment provided that the mitigation measures as indicated in the specialist report are incorporated into the Environmental Management Programme and are implemented.

Aquatic Specialist Impact Assessment

The aquatic specialist impact assessment concluded the following:

- According to the Department of Forestry, Fisheries and the Environment (DFFE) Screening Tool, the bigger study area has overall a low aquatic biodiversity sensitivity.
- The aquatic features occurring within the wider study area comprise seasonal watercourses and wetlands that have been moderately modified and are of moderate ecological importance and sensitivity.
- The site lies south of the Vaal River within the Middle Vaal Management Area (Quaternary Catchment C24B).
- The aquatic features within the wider study area comprise two feeder streams of the unnamed tributary of the Vaal River and their associated seep and valley bottom wetland areas. The eastern stream largely occurs outside of the proposed development area for Vlakfontein Solar PV1 facility.
- The DFFE Screening Tool Report for the Vlakfontein Solar PV1 site identified the site as having a low aquatic sensitivity. However, an unnamed tributary of the Vaal River and its associated seep and valley bottom wetland areas passes through the centre of the project area. This watercourse has been delineated and is indicted with an appropriate buffer zone. This is considered to have a high ecological sensitivity area (contrary to the DFFE Screening Tool). The development footprint of the PV farm must exclude this area.
- If the construction and operation of the PV modules does not require modification to the topography, topsoil or removal of indigenous grassland such that wetland functionality within these degraded wetland areas could be retained, the modules could be placed within the wetland areas mapped as being of low sensitivity.
- The PV components and associated infrastructure will be constructed immediately adjacent to the delineated watercourses (within 500m from a wetland), which pose a risk of changing the bed, banks or characteristics of the watercourses or impeding or diverting flow in the watercourses. Also, an existing access road crossing a watercourse area will be upgraded and developed. Water Use Authorisation is therefore required.
- A preliminary risk assessment was compiled as per DWS requirement and it was concluded that, provided the recommended mitigation measures are implemented, the risk of the activities degrading the adjacent aquatic features will be low; therefore the water use activities would fall within the ambit of General Authorisations for Section 21 (c) and (i) water use activities.
- Based on the findings of this aquatic biodiversity assessment report, there should be no reason why the proposed PV facilities and their associated activities, with the recommended mitigation, cannot be approved from an aquatic ecosystem point of view if mitigated as recommended.

Avifauna Specialist Impact Assessment

An Avifauna Compliance Statement was undertaken and concluded the following:

The total assessment area contains no confirmed habitat for Species of Conservation Concern (SCC) as defined in the protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020, namely listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable. The absence of SCC was confirmed during the site surveys. Based on these criteria, the whole of the **Mercury Cluster Solar PV** area is correctly classified as

low sensitivity for avifauna. No fatal flaws were discovered during the investigations at any of the proposed PV sites.

The wetlands and pans with are important refuges for a number of priority species that often breed in the tall rank grassland around wetlands. A large wetland present on the north-western border of the PV site. Aquatic delineations took place and potentially sensitive habitat with appropriate buffer zones has been excluded from the project development area.

It is recommended that the **Vlakfontein Solar PV 1** be authorised from an avi-faunal point of view, on condition that the proposed mitigation measures as provided in the specialist report are strictly implemented.

Bat Screening Assessment

It was concluded that the proposed **Mercury Solar PV Cluster Project** will not cause significant impact to bat populations in the area. Although very little literature exists on the impacts of solar farms on bats, the specialists believe that any impacts to bats due to construction, operation, and decommissioning of the proposed infrastructure will be relatively low. The desktop study recommended that all 'High' sensitive areas are avoided during construction and operation of the facility.

Heritage Impact Assessment

A Heritage (including Archaeology and Palaeontology) Impact Assessment was undertaken and concluded the following for the Vlakfontein Solar PV1 site:

- No significant archaeological resources were noted within the Vlakfontein Solar PV1 development area.
- It was recommended that tree avenues located along roads, access routes and farm boundaries be retained as far as possible.
- A portion of the tree plantation located within 200m of the marked farm homestead should also be retained in order to shield the existing homestead from the PV facilities and retain some sense of place.
- The palaeontological study concluded that, based on experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the overlying deep soils and sands of the Quaternary which is relevant to the **Vlakfontein Solar PV1** development area. The impact on the palaeontological heritage would be low, therefore, as far as the palaeontological is concerned, the projects should be authorised.
- General mitigatory measures such as procedures to follow in the event that heritage resources such as additional graves are discovered, as well as a Chance Fossil Finds Procedure are included in the Environmental Management Programme.

Social Impact Assessment

Key issues are the following:

- The findings of the SIA concluded that the development of the proposed Vlakfontein Solar PV1 will create employment and business opportunities for locals during both the construction and operational phases of the project.

- The establishment of a Community Trust associated with the proposed Vlakfontein Solar PV1 facility will benefit the local community in the area.
- The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the negative environmental and socio-economic impacts associated a coal-based energy economy and the challenges created by climate change, represents a significant positive social benefit for society as a whole.
- The findings of the SIA also indicate that the Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) has resulted in significant socio-economic benefits, both at a national level and at a local, community level. These benefits are linked to foreign Direct Investment, local employment and procurement and investment in local community initiatives.
- The site is also located within the Klerksdorp REDZ. The area has therefore been identified as suitable for the establishment of renewable energy facilities.
- The owner indicated that there that there are no concerns with the proposed project on his farmland.

Recommendations are made to address the potential negative impacts include the following:

- The final design and layout should ensure that the loss of productive farmland is avoided and or minimised.
- Damage to local farm roads caused by construction traffic must be repaired on an on-going basis throughout and on completion of the construction phase.
- The proponent should prepare a Stakeholder Engagement Plan (SEP) and Community Health, Safety and Security Plan (CHSSP) prior to commencement of construction phase.

The establishment of the Vlakfontein Solar PV1 is supported by the findings of the SIA. The enhancement measures listed in the report should be implemented in order to maximise the potential benefits. The findings of the SIA also indicated that all the potential negative impacts can be effectively mitigated.

Visual Impact Assessment

The Visual Impact Assessment can be summarised as follows:

Visually, the regional landscape has a high absorption capacity. There are many visually intrusive artificial features present in the macro areas which will serve to detract and diminish the visual impact presented by the new PV installations and supporting infrastructure. These include numerous powerlines, converging on a large regional Mercury Transmission Substation, mining features (mine dump) and agro-industrial features. While the reflective nature of the PV panels may draw attention to the installations, visual intensity from receptors located over 6km from the site will further be diminished by hazy atmospheric conditions which tend to prevail during the highveld winters.

The conclusion is that the proposed development could be authorised with mitigation. While landscape resources are not significant such that a fatal flaw is proposed, risks to landscape integrity of a rural area that has medium levels of scenic quality could take place. Mitigation would reduce the visual intrusion of the PV project and retain the rural sense of place along the farm roads partially retaining the existing character of the landscape, where the level of change to the characteristic landscape should be moderate. The inclusion of a 30m buffer zone from the Vermaasdrift Road has been integrated with the project layout.

Agricultural Impact Assessment

The assessment concluded the following ;

The proposed Vlakfontein Solar PV1 development site has not recently been cropped. Farming experience showed that it was too marginal for viable crop production. Soils are limited by shallow depths to underlying bedrock in places and by very low water and nutrient holding capacity across the site.

The proposed development offers a win-win scenario. This is substantiated by the following points:

- The only agricultural land that will be used by the developments has limited agricultural production potential. The layout of the facility has deliberately avoided all higher potential land within the wider assessed area. It will only utilise land that was identified as having insufficient land capability for viable and sustainable crop production and is therefore only good enough for grazing. There is not a scarcity of such agricultural land in South Africa and it is therefore considered to be below the threshold for being prioritised for conservation as agricultural production land.
- The proposed developments offer positive impact on agriculture by way of improved financial security for farming operations, as well as security benefits against stock theft and other crime.
- The PV panels will not totally exclude agricultural production. The area can still be used to graze sheep that will, in addition, be protected against stock theft within the security area of each facility.
- The loss of agricultural potential by occupation of land is not permanent. The land will become fully available again for agricultural production once the proposed activity ceases.
- The proposed development poses a low risk in terms of causing soil degradation, which can be adequately and fairly easily managed by standard, best practice mitigation management actions.
- The proposed developments are within a REDZ, which is an area that has specifically been designated within South Africa for the prioritisation of renewable energy development. The designation of the REDZ has taken into account the country's need to balance renewable energy development against the need to ensure the conservation of land required for agricultural production and national food security.
- The proposed development will also have the wider societal benefits of generating additional income and employment in the local economy.
- It will contribute to the country's need for energy generation, particularly renewable energy that has lower environmental and agricultural impact, on a national scale, than existing, coal powered energy generation.

Due to the factors listed above, the impact of the proposed development on the agricultural production capability of the site is assessed as being acceptable. Therefore, from an agricultural impact point of view, it is recommended that the development be approved.

Cumulative Environmental Impact Assessment

The negative biophysical, heritage, visual and agricultural cumulative impact of the proposed solar PV development is rated as Low and any cumulative impact that may occur is rated as being acceptable, especially when seen in context of the proposed development site situated in a REDZ.

The social cumulative effect is rated as ***High/Very High positive*** due to the potential to create a number of socio-economic opportunities for the local municipality, which, in turn, will result in a positive social benefit. The positive cumulative impacts include creation of employment, skills development and training opportunities and creation of downstream business opportunities. These benefits should also be viewed within the context of the limited economic opportunities in the area and the impact of the decline in the mining sector in recent years.

There is no reason, from a cumulative impact viewpoint, that the proposed project should not be authorised.

PROJECT TEAM REPORTS

High Level Safety, Health & Environmental Risk Assessment

A High Level Safety, Health & Environmental Risk Assessment was undertaken for the BESS component of the Mercury Cluster Project. The key findings are as follows:

- This risk assessment has found that with suitable preventative and mitigation measures in place, none of the identified potential risks are excessively high, i.e., from a SHE perspective no fatal flaws were found with the proposed Solid-state BESS installations for the **Mercury Solar PV Cluster**.
- A 500m buffer surrounding farmsteads is proposed and no BESS is allowed within this buffer area.
- At a large facility, without installation of the state-of-the art battery technology that includes protective features, there can be significant risks to employees and first responders. The latest battery designs include many preventative and mitigation measures to reduce these risks to tolerable levels. State-of-the-art technology should be used, i.e., not old technology as it presents higher risks.
- The design should be subject to a full Hazard and Operability Study (HAZOP) prior to commencement of procurement. A HAZOP is a detailed technical systematic study that looks at the intricacies of the design, the control system, the emergency system etc. and how these may fail under abnormal operating conditions. Additional safeguards may be suggested by the team doing the study.

Traffic & Transport Management Plan

The following main conclusions were made:

- The main access point is provided directly off the Vermaasdrift Road (S643) and complies with the requirements of the relevant traffic authorities.
- The total maximum width required for access roads for the purpose of the PV facility is 8m; however, the statutory road reserve for the S643 is 25 metres. It will therefore not be required to widen this road.
- The construction and decommissioning phases of a development are the significant traffic generators and therefore noise and dust pollution will be higher during these phases. The duration of the phases is short term, i.e. the impact of the traffic on the surrounding road network is temporary and the facility, when operational, will not add any significant traffic to the surrounding road network.
- The Directorate Road Asset Management (Department of Police, Roads & Transport, Free State Province) supports **the Mercury Cluster Solar PV** subject to certain conditions.
- The impacts associated with the **Vlakfontein Solar PV1** facility are acceptable with the implementation of the recommended mitigation measures as provided by the traffic engineers and the relevant roads authorities. The **Vlakfontein Solar PV1** facility is therefore recommended for authorisation from a traffic impact perspective.

Radio Frequency Interference (RFI) Assessment

A Radio Frequency Interference (RFI) Assessment was undertaken for the **Mercury Solar PV Cluster** and it concluded as follows:

- Both Electro-Magnetic Interference (EMI) sensitive receiver sites identified by the DFFE screening tool were identified to be more than 7km away from the closest proposed PV project (Zaaiplaats Solar

PV1) of the proposed Mercury Solar PV Cluster. No other EMI sensitive receivers inside the clearance zone could be identified using Google Maps.

- Vlakfontein Solar PV1 development site has a direct line of sight to the Kopanong Gold Plant but at a distance of 12,8km.
- Pathloss over this distance is high enough for the PV facility to have no significant RFI or EMI impact on the electrical infrastructure at Kopanong Gold Plant.
- There should be no interference from the PV plant to the surrounding medium RFI sensitive areas assuming that the PV plant inverters comply to *CISPR 11 Class A Specifications*, as a technology partner has not yet been selected to provide actual EMC data.

Application for the Change in Land Use

The aim of the motivational report and application to the Department of Agriculture, Land Reform & Rural Development (DALRRD) was to obtain a “No Objection” letter from DALRRD issued to **Vlakfontein Solar PV1** (Pty) Ltd, for the change in land use for the purpose of the **Vlakfontein Solar PV1** facility and associated infrastructure with a generating capacity of up to 100 MW situated on agricultural land.

Site-specific motivation included the following:

- There is no evidence of recent attempts at establishing crops on the Vlakfontein site. Only evidence of historically abandoned cropped areas can be seen.
- The cropping potential of the proposed site is limited by the combination of a somewhat marginal climate (annual rainfall of 503 to 535 mm per annum) and soils with poor drainage, limited depth, and limited water and nutrient holding capacity (see Section 8.1). Crop production on these soils is therefore high risk and no longer considered economically viable.
- There is no irrigation available anywhere across the site.
- The long-term grazing capacity of the farm is high at 7 hectares per large stock unit.
- The agricultural enterprises employ a low number of farm workers (approximately 7) across their entire enterprise. Because of the large size of the total farm operations, the loss of marginal parts of these operations is unlikely to have any impact on agricultural employment. The impact on agricultural employment will be offset by the employment opportunities created by the construction and operation of the Vlakfontein PV Solar Facility.

A “No Objection Letter” for the proposed **Vlakfontein Solar PV1** facility has been obtained from the DARLLD.

PUBLIC PARTICIPATION PROGRAMME

The Public Participation Programme (PPP) is conducted in terms of the Sections 39, 40, 41, 42, 43 & 44 of the NEMA EIA Regulations 2014, as amended. The newspaper advertisements, onsite notices and Background Information Document (BID) advertised the entire Mercury Solar PV Cluster (5x solar PV facilities as well as the grid connections):

- A Register of Interested & Affected Parties (IAPs) was compiled, maintained and updated during the course of the PPP for the project.
- Focus Group Meetings were held with the relevant directly affected landowners at different on-site locations on Thursday 18 November 2021.
- Three A2 laminated onsite notifications were placed on 22 March 2022 at the following places:
 - Placement along the S643 (from which road the facility will be accessed)
 - The Mercury Main Transmission Substation

- The gate of the Viljoenskroon Post Office
- Newspaper advertisements were placed in
 - The Citizen (national newspaper) on 30 March 2022
 - The Vrystaat Kroon (local newspaper) on 30 March 22
- A Background Information Document was distributed to everyone on the IAP Register for a 30-day commenting period (31 March – 4 May 2022).
- The Draft Basic Assessment Report (BAR) was distributed as follows:
 - All IAPs identified in the IAP Register received notification via email that the Draft BAR is available for comment (proof thereof will be provided in the Final BAR).
 - The Draft BAR was distributed for a 30-day (excluding public holidays). The commenting period commenced on 4 April 2023 and ended on 10 May 2023.
 - All IAPs received an email with the Executive Summary and Draft BAR as an attachment. A link to the Draft BAR and all the Appendices were available on the Landscape Dynamics website (www.landscapedynamics.co.za) – detailed instructions on how to access these documents were provided in the said e-mail.
 - A hard copy of the Draft BAR was made available at the Nostalgia Coffee Shop in Viljoenskroon - the availability of the hard copy of the Draft BAR at this location was mentioned in the abovementioned e-mail.
 - The Application Form together with the Draft BAR was submitted to DFFE for comment via their online system.
- Comments & Responses Report (CRR):
A comprehensive CRR was compiled which contains all comment received throughout the process. In this document, the EAP strived to address all comment to a satisfactory level.
- Submission of the Final BAR:
Comment received on the Draft BAR has been included in the Final BAR. The Final BAR will not be distributed for a further 30-day commenting because no substantial changes to the BAR have been made that could impact on the rights of any of the IAPs.
The Final BAR has now been submitted to DFFE for their consideration for Environmental Authorisation.

All reasonable steps were taken to inform the identified IAPs of the proposed Vlakfontein Solar PV1 project. The EAP is confident that all comment could be addressed satisfactorily. No objection to the development proposal was received during the Public Participation Process.

IMPACT ASSESSMENT

The main potential negative impacts associated with the project are the following:

Expected Negative Impacts

Expected Negative Impacts

Design & Pre-Construction Phase

- Risk of failure of structures during design phase
- Risk of failure of structures
- Impact on visual and heritage resources
- Risk of erosion
- Impact on terrestrial and aquatic biodiversity
- Impact on avifauna

- Human safety & environmental health impact resulting from the BESS

Construction Phase

- Impact on agricultural land
- Impact on terrestrial biodiversity
- Impact on aquatic habitat
- Impact on avifauna
- Impact on heritage, archaeology and palaeontology resources
- Risk of groundwater pollution
- Risk of erosion
- Social impact
- Traffic impact
- Human safety & environmental health impact resulting from the BESS

Post- Construction / Operational Phase

- Impact on agriculture
- Continuous impact on natural habitat
- Impact on aquatic environment
- Impact on avifauna
- Risk of erosion
- Continuous risk for groundwater pollution
- Impact on visual resources
- Social Impact
- Traffic Impact
- Human safety & environmental health impact resulting from the BESS

Identified impacts and mitigation / management outcomes will be monitored through the application of the ***Environmental Management Programme (EMPr)*** that is included as an appendix to the Basic Assessment Report.

Expected Positive Impacts

- The establishment of renewable energy infrastructure should be viewed, firstly within the context of the South Africa's current reliance on coal powered energy to meet the majority of its energy needs, and secondly, within the context of the success of the REIPPPP. South Africa has one of the most carbon-intensive economies in the world, thus making the greening of the electricity mix a national imperative. The REIPPPP had contributed significantly towards meeting South Africa's emission targets and, at the same time, supporting energy security, economic stability, and environmental sustainability.
- The proposed solar PV facility will be able to evacuate the solar generated electricity and all the advantages of additional, clean, renewable electrical supply to the national Eskom grid will be realised. This will also assist in alleviating load shedding.
- The solar facility will assist in addressing the serious impact associated with current load-shedding in South Africa which impacts significantly on the country's economy.
- Creation of employment and business opportunities and the opportunity for skills development and on-site training during the construction phase:
 - The construction phase is expected to extend over a period of ±18 months and create approximately 250-300 employment opportunities. The total wage bill for the construction phase is estimated to be in the region of R30 million (2022 Rand value). A percentage of the

- wage bill will also be spent in the local economy which will create opportunities for local businesses in the area.
- The majority of the employment opportunities, specifically the low and semi-skilled opportunities, are likely to be available to local residents and the majority of the beneficiaries are likely to be historically disadvantaged (HD) members of the community. This would represent a significant positive social benefit in an area with limited employment opportunities.
 - The total number of permanent employment opportunities associated with the **Vlakfontein Solar PV1** facility would be approximately 20 and the majority of low and semi-skilled beneficiaries are likely to be members of the community.
 - Procurement during the operational phase will also create opportunities for the local economy and businesses.
 - The establishment of a community benefit structure (typically, a Community Trust) will create an opportunity to support local economic development in the area. The requirement for the project to allocate funds to socio-economic contributions (through structures such as Community Trusts) provides an opportunity to advance local community projects, which is guaranteed for a ±20-30 year period (the project lifespan).
 - The income from the PV facility received by the landowner reduces the risks to the farmer's livelihood posed by droughts and fluctuating market prices for farming outputs and inputs, such as fuel, feed etc. The additional income would therefore improve economic security of farming operations, which in turn would improve job security for farm workers and benefit the local economy.
 - The provision of security for the proposed PV facility can create an opportunity to improve security for local landowners in the area.

CONCLUSION

The application can be summarised as follows:

- The proposed **Vlakfontein Solar PV1** is planned in a legal, pro-active and structured manner taking all development components, potential and restrictions into account.
- All relevant legal requirement in terms of the Environmental Impact Assessment Regulations published in 2014 as amended, were complied with. This Basic Assessment Report includes all relevant proceedings, findings and recommendations which resulted from this study.
- The specialist input obtained is comprehensive and effective in providing an assessment of the status quo of the study area, identifying potentially sensitive areas and issues of concern as well as identifying impact that require re-consideration of alternatives.
- The EAPs are confident that the infrastructure presented is acceptable and viable. The assessment of additional alternative is not justified.
- Significant and reasonable actions were taken to identify and notify all Interested & Affected Parties that include government departments, relevant authorities, general stakeholders and potentially affected landowners of the project. No objections had yet been received regarding this project.
- The proposed project components and layout as motivated and recommended for authorisation will, after the application of mitigation measures, have an acceptable impact on the environment. This will be accomplished through the implementation of the mitigation measures specified in the Environmental Management Programme (EMPr) that is included as Appendix H of the Basic Assessment Report.

RECOMMENDATION

- There is no significant reason from a technical, environmental and social perspective why the **Vlakfontein Solar PV1** should not be authorised.
- It is requested that both the EMPr and project layout be approved with the Environmental Authorisation.
- It is requested that the EA be valid for a period of 10 years.

CHAPTER 1: INTRODUCTION

1.1 Background

Landscape Dynamics Environmental Consultants (Pty) Ltd was appointed to apply for Environmental Authorisation for the **Vlakfontein Solar PV1** with the Department of Forestry, Fisheries & Environment (DFFE), which is the Competent Authority (CA) for this project. The applicant is Vlakfontein Solar PV1 (Pty) Ltd ('the Applicant'), a special purpose vehicle (SPV) fully owned by Mulilo Renewable Project Developments (Pty) Ltd ('the Developer').

It is the developer's intention to bid the proposed project under the Department of Mineral Resources and Energy's (DMRE's) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme (or similar programme), with the aim of evacuating the generated power into the national grid. This will aid in the diversification and stabilisation of the country's electricity supply, in line with the objectives of the Integrated Resource Plan (IRP), with Vlakfontein Solar PV1 set to inject up to 100 MW into the national grid.

1.1.1 Locality

The project is planned as part of a cluster of renewable energy facilities known as the Mercury Solar PV Cluster, with associated grid connection infrastructure. The development site is situated north of the R76 and south of the Vaal River close to the town of Viljoenskroon in the Free State Province. It falls within the jurisdiction of the Mophaka Local Municipality (MLM) in the Fezile Dabi District Municipality.

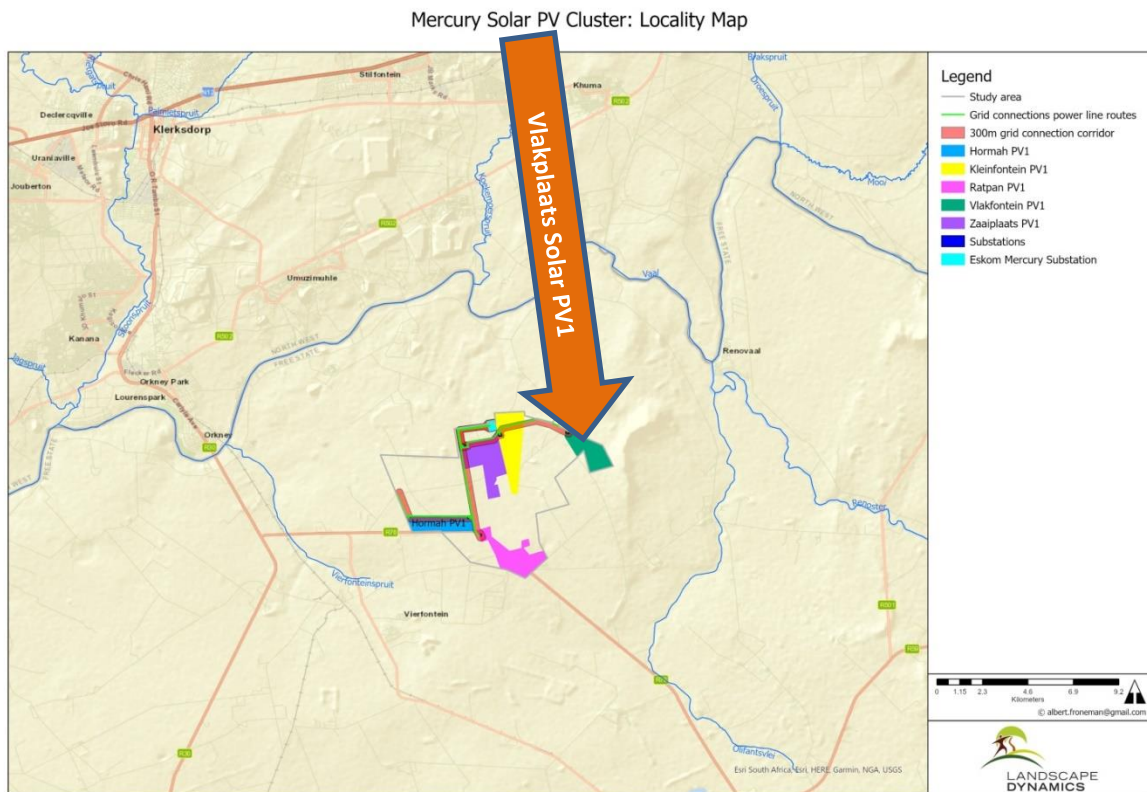


Figure 1: Locality Map – Mercury Solar PV Cluster

1.1.2 The Mercury Solar PV Cluster

The Mercury Solar PV Cluster involves the following 5 PV farms:

Name of PV facility	Farm Name
Ratpan Solar PV1	Remainder of Ratpan No 441
Hormah Solar PV1	Portion 2 of Hormah No 276
Zaaipplaats Solar PV1	Remainder of Zaaipplaats No 190 Remainder of Fraai Uitzicht No 189 Portion 2 of Fraai Uitzicht No 189
Kleinfontein Solar PV1	Portion 1 of the Farm Kleinfontein No 369
Vlakfontein Solar PV1	Portion 1 of Jackalsfontein No 443 Remainder of Vlakfontein Nr 15

Table 1 Mercury Cluster Solar PV Project: Detail of property area

Each Photovoltaic (PV) solar facility will be treated as a standalone application and five separate applications for Environmental Authorisations will therefore be made. The electrical grid infrastructure (connecting the facilities to the existing Mercury Substation or existing Eskom powerlines) for these five facilities will be dealt with in terms of Gazette Notice Nr 2313, 27 July 2022: Standard for the Development and Expansion of Power Lines and Substations within identified Geographical Areas.

This Application for Environmental Authorisation refers only to the Vlakfontein Solar PV1 facility (indicated in green on the map on the next page).

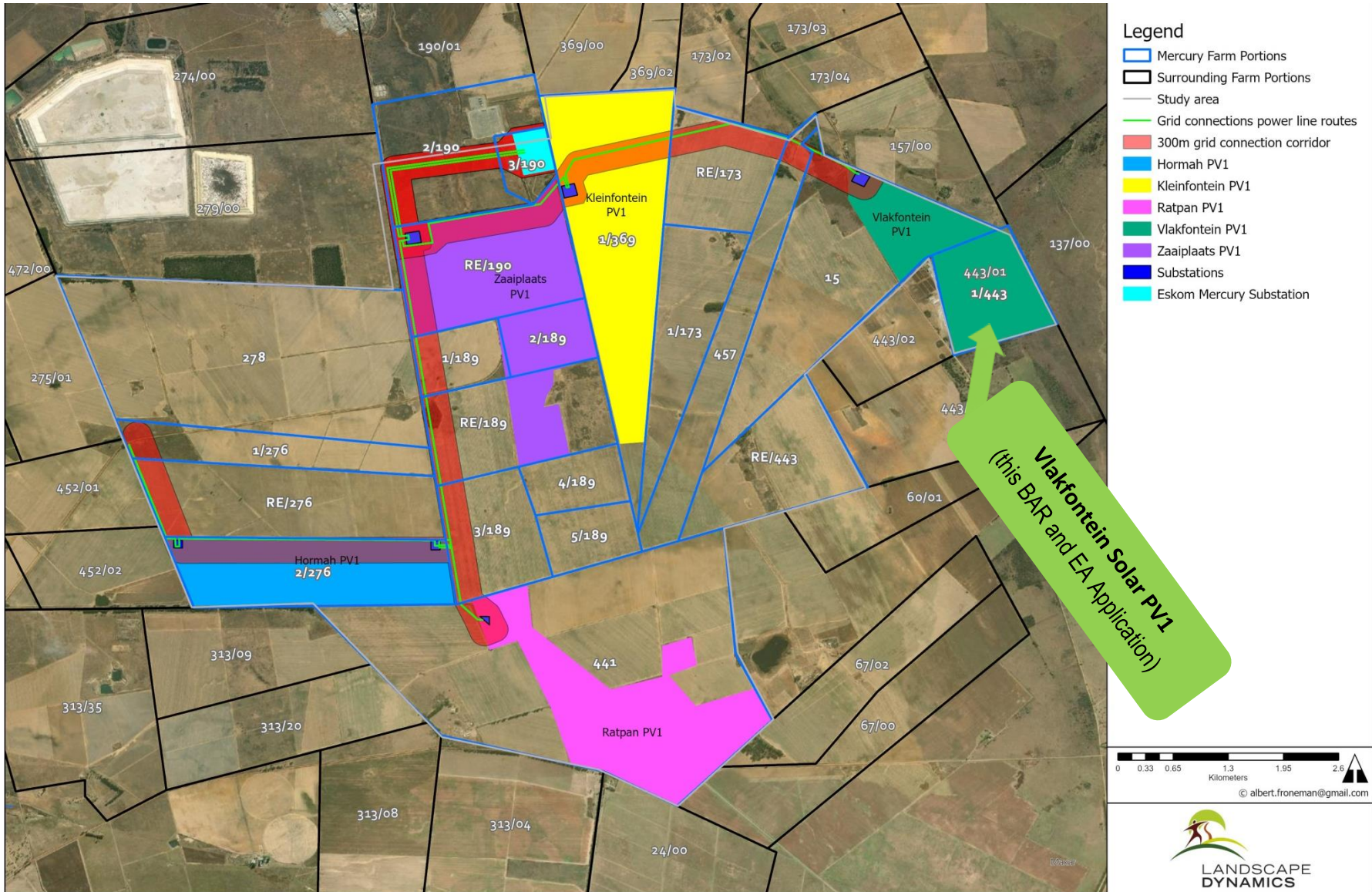


Figure 2: The Mercury Solar PV Cluster Project

1.1.3 Renewable Energy Development Zones

Government Gazette 41445, Notice Number 114 of 16 February 2018 identifies Renewable Energy Development Zones (REDZs) within which a Basic Assessment process, instead of a full Scoping and EIA process, needs to be undertaken for projects that constitutes activities as per NEMA Listing Notice 2. The Mercury Solar PV Cluster project falls entirely within the REDZ and a Basic Assessment will therefore be undertaken.

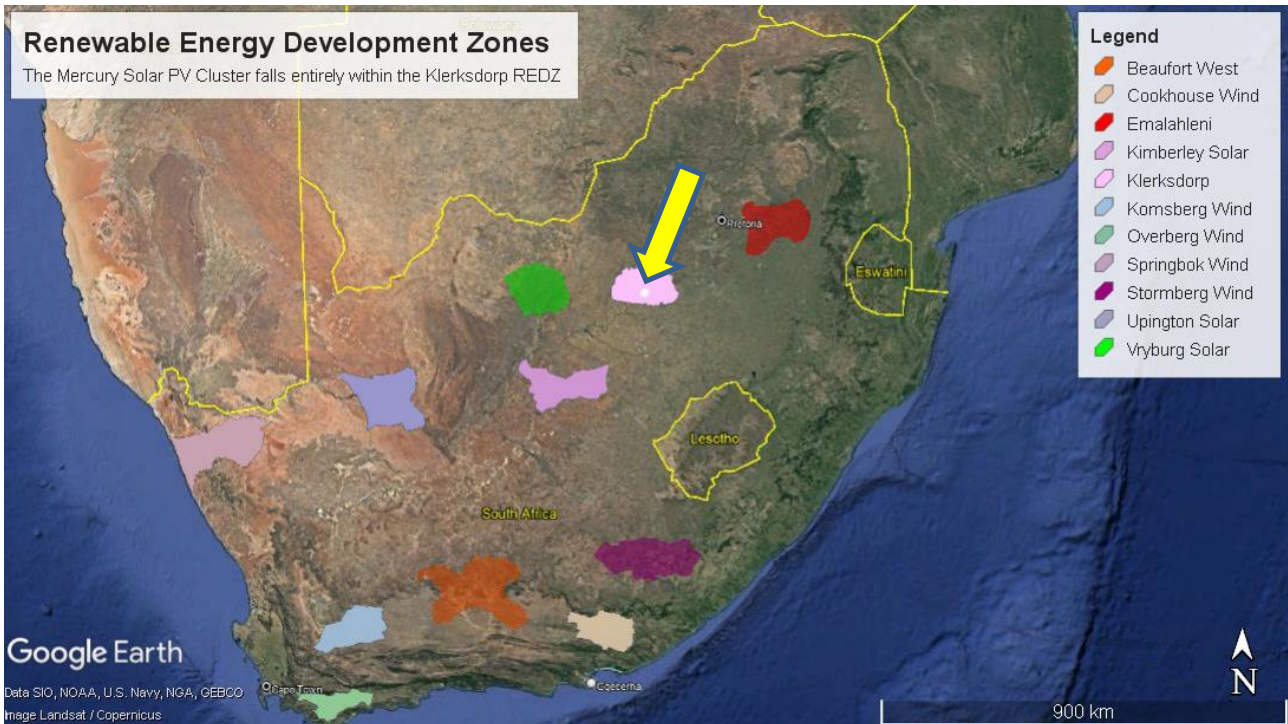
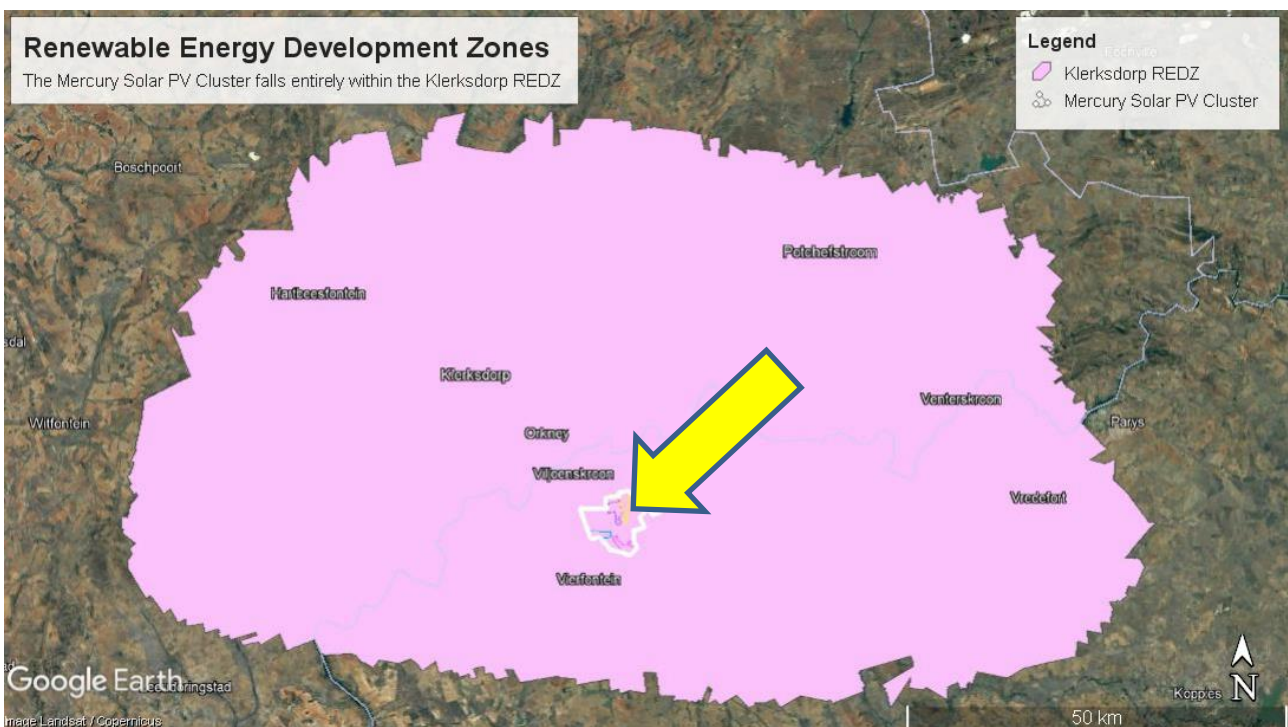


Figure 3: Renewable Energy Development Zones



1.1.4 Strategic Transmission Corridors

Government Gazette 41445, Notice Number 113 of 16 February 2018 identifies Strategic Transmission Corridors (STCs) and provides for the procedure to be followed in applying for environmental authorisation for large scale electricity transmission and distribution developments that fall within these STCs.

Gazette Notice Nr 2313, 27 July 2022: Standard for the Development and Expansion of Power Lines and Substations within identified Geographical Areas is also applicable to electrical infrastructure that falls within the STCs.

In the case of the Vlakfontein Solar PV1 facility, the associated electrical infrastructure will be dealt with according the above-mentioned stipulations in a separate application.

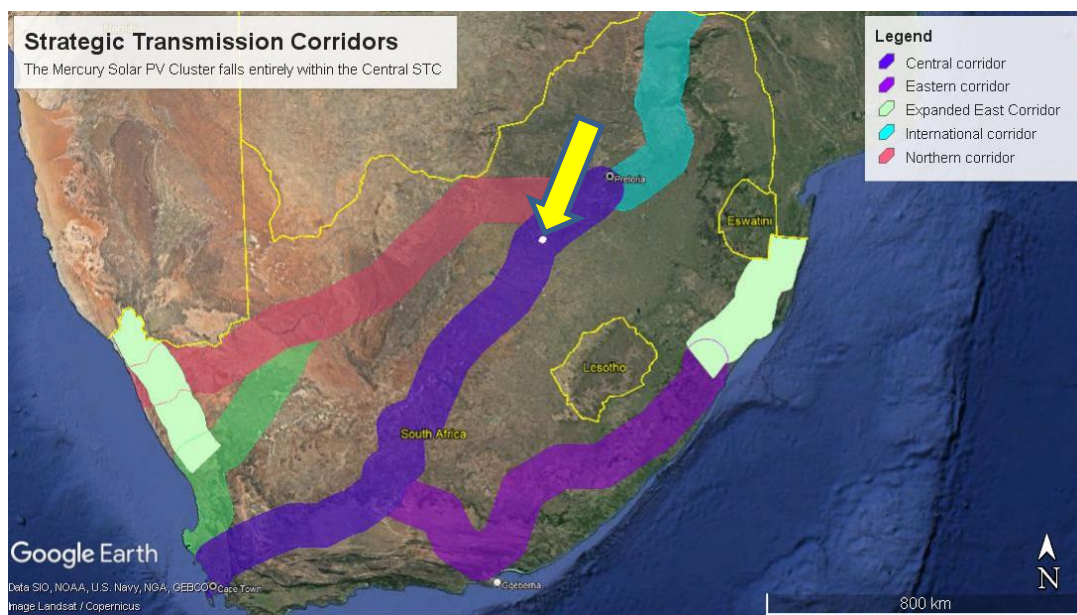
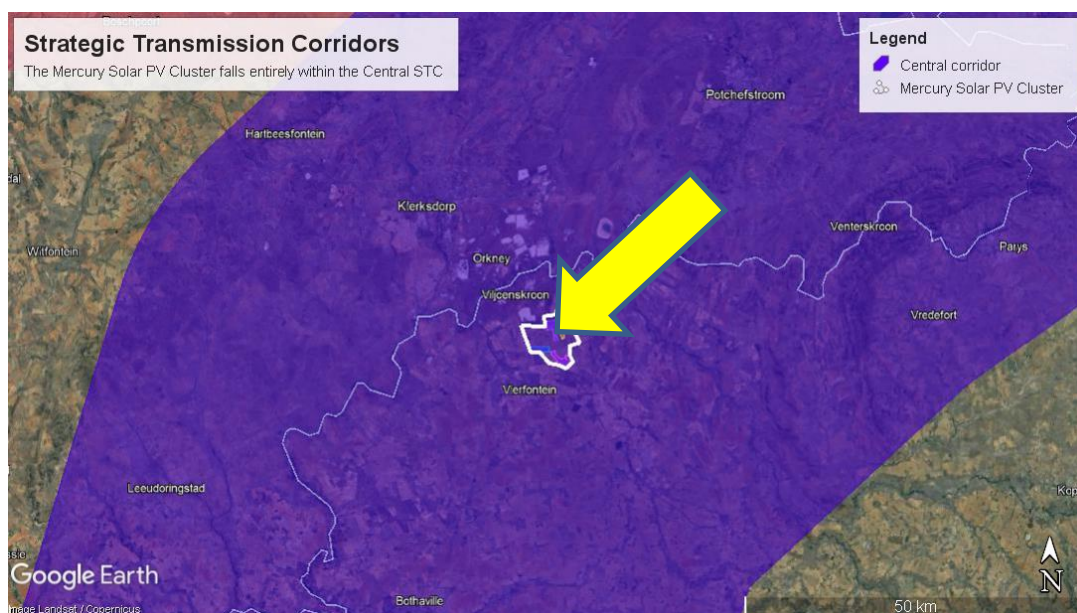


Figure 4: Strategic Transmission Corridors



1.1.5 Competent Authority

Government Notice 779 in Government Gazette No. 40110 confirms that the Minister is the competent authority for activities which are identified as activities in terms of Section 24(2)(a) of NEMA, which may not commence without an EA, and which relates to the IRP and any updates thereto.

The Minister is the Competent Authority (CA) for applications for Environmental Authorisations for facilities or infrastructure, including its ancillary activities, that will form part of the IRP Programmes for technologies whose procurement processes have been determined under the Electricity Regulation Act, 2006 and / or the Electricity Regulations on New Generation Capacity as well as any future determinations that may be made. It is the intention of the Applicant to bid the five solar PV facilities of the Mercury Cluster PV Project in the next, and other future bidding rounds of the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). The fact that the Applicant intent to bid is in support of the IRP implies that the Department of Forestry, Fisheries & the Environment is the Competent Authority (CA) for this project.

If the proponent will not, or does not intend to, participate in any of the IRP programmes, the competent authority will be the MEC responsible for environmental affairs in the respective province, unless another subsection of Section 24C of NEMA specifies the Minister to be the competent authority.

The EA applications that will be dealt with by the Minister for the above-mentioned IRP Programmes include applications for:

- a) **new power generation facilities, including ancillary activities;**
- b) *new power lines, including ancillary activities;
- c) **new substations, including ancillary activities;**
- d) expansion of existing power generation facilities;
- e) lengthening or expansion of existing power lines;
- f) expansion of existing substations;
- g) ancillary activities, directly related to existing power generation facilities;
- h) ancillary activities, directly related to existing substations;
- i) ancillary activities, directly related to existing power lines;
- j) amendment of an existing EA that was granted by the DFFE or by any of the provincial environmental departments —

provided that such application related to the electricity generation facility, substation or power lines will form / forms / formed part of the IRP Programmes.

*Ancillary activities' are those activities providing necessary support to the primary activity (power generation plant, substation or power line). For example, a new substation may need a road, a fence, ablutions, a parking area, etc.

1.1.6 DFFE Decision making timeframe

Because this project site falls entirely within the Klerksdorp REDZ, the reduced timeframe in which DFFE has to issue/refuse the EA of 57 days, instead of 107 days, applies.

1.2 The Basic Assessment Process

1.2.1 Objectives of the Basic Assessment process

According to the NEMA Regulations' Appendix 1, the objective of the environmental impact assessment process is to, through a consultative process

- a) determine the policy and legislative context within which the proposed activity is located and how the activity complies with and responds to the policy and legislative context;
- b) identify the alternatives considered, including the activity, location, and technology alternatives;
- c) describe the need and desirability of the proposed alternatives;
- d) through the undertaking of an impact and risk assessment process, inclusive of cumulative impacts which focused on determining geographical, physical, biological, social, economic, heritage, and cultural sensitivity of the sites and locations within sites and risk of impact of the proposed activity and technology alternatives on these aspects to determine—
 - (i) the nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and
 - (ii) 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; and
- e) through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on sites and location identified through the life of the activity to—
 - (i) identify and motivate a preferred site, activity and technology alternative;
 - (ii) identify suitable measures to avoid, manage or mitigate identified impacts; and
 - (iii) identify residual risks that need to be managed and monitored.

1.2.2 Basic Assessment process followed

Refer to diagram on the next page for a summary of the Basic Assessment process followed.

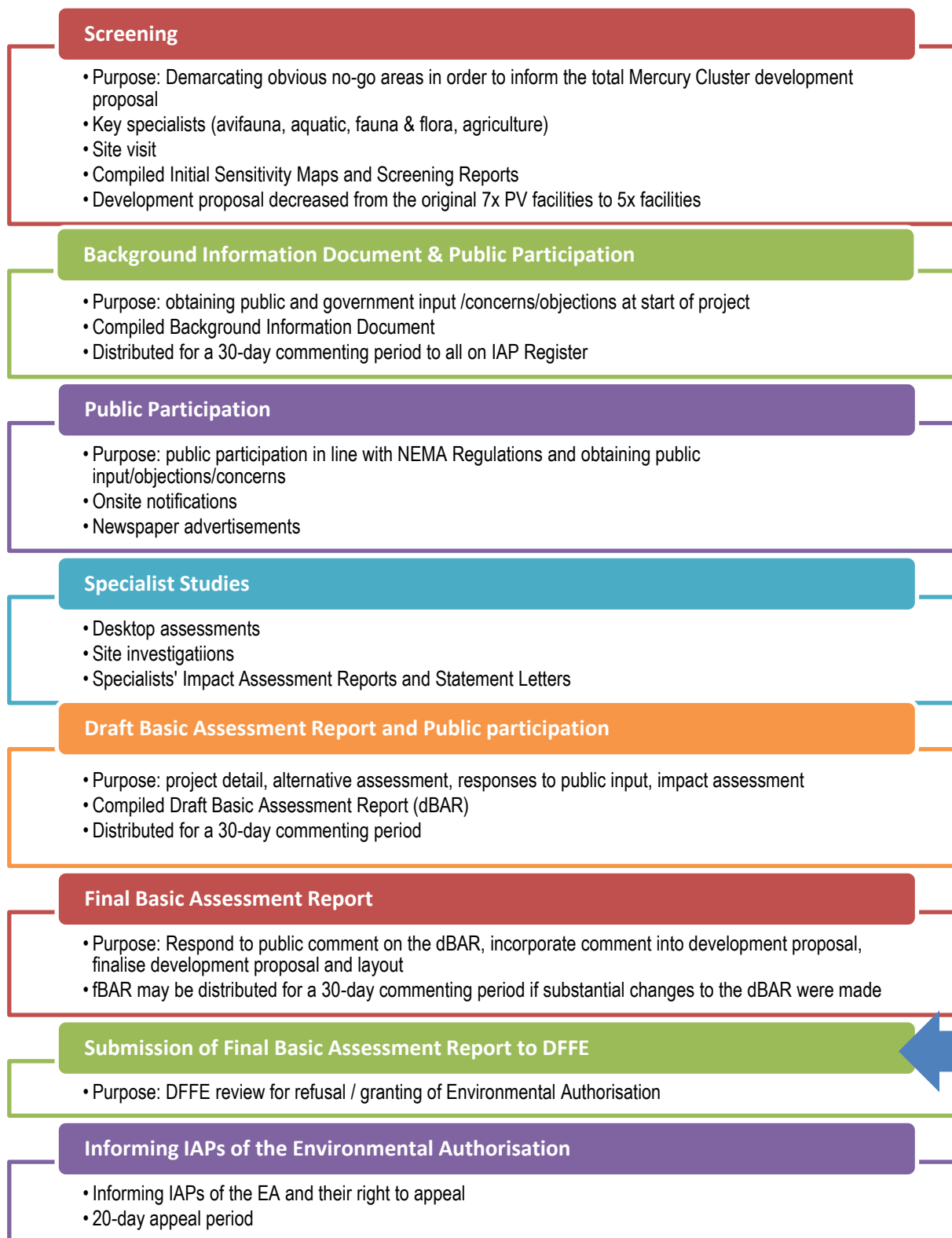


Table 2: Basic Assessment process followed

1.2.3 Content of the Basic Assessment Report

According to the NEMA 2014 Regulations (as amended in April 2017), Appendix 1, Section 3, the Basic Assessment Report must contain the information that is necessary for the competent authority to consider and come to a decision on the application. The items are listed below with appropriate reference to the relevant Chapters in the BAR where the item is addressed.

Regulation Requirement	Section in BAR where addressed
(a) details of <ul style="list-style-type: none"> (i) the EAP who prepared the report; and (ii) the expertise of the EAP, including a curriculum vitae; 	Chapter 1, Paragraph 1.3 Appendix J
(b) the location of the activity, including: <ul style="list-style-type: none"> (i) the 21 digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name; (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties; 	Chapter 3
(c) a plan which locates the proposed activity or activities applied for as well as associated structures and infrastructure at an appropriate scale; or, if it is <ul style="list-style-type: none"> (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken; 	Chapter 3 Appendix A
(d) a description of the scope of the proposed activity, including— <ul style="list-style-type: none"> (i) all listed and specified activities triggered and being applied for; and (ii) a description of the activities to be undertaken including associated structures and infrastructure; 	Chapter 2, Paragraph 2.1 Chapter 3
(e) a description of the policy and legislative context within which the development is proposed including— <ul style="list-style-type: none"> (i) an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are applicable to this activity and have been considered in the preparation of the report; and (ii) how the proposed activity complies with and responds to the legislation (iii) and policy context, plans, guidelines, tools frameworks, and instruments; 	Chapter 2
(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;	Chapter 4
(g) a motivation for the preferred site, activity and technology alternative;	Chapter 5

<p>(h) a full description of the process followed to reach the proposed preferred alternative within the site, including</p> <ul style="list-style-type: none"> (i) details of all the alternatives considered; (ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; (iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them; (iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (v) the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts— <ul style="list-style-type: none"> (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated; (vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives; (vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (viii) the possible mitigation measures that could be applied and level of residual risk; (ix) the outcome of the site selection matrix; (x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and (xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity; 	<p>Chapter 5</p> <p>Chapter 8, Paragraph 8.2</p> <p>Chapter 8, Paragraph 8.3 and 8.4</p> <p>Chapter 5</p> <p>Chapter 9</p> <p>Chapter 9, Paragraph 9.3.1</p> <p>Chapter 9, Paragraph 9.2 and 9.3</p> <p>Chapter 9, Paragraph 9.3.2</p> <p>Chapter 9, Paragraph 9.5.1</p> <p>Chapter 9.5</p>
<p>(i) a full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including—</p> <ul style="list-style-type: none"> (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures; 	<p>Chapter 9, Paragraph 9.1; 9.2 and 9.3</p>
<p>(j) an assessment of each identified potentially significant impact and risk, including—</p> <ul style="list-style-type: none"> (i) cumulative impacts; (ii) the nature, significance and consequences of the impact and risk; (iii) the extent and duration of the impact and risk; (iv) the probability of the impact and risk occurring; (v) the degree to which the impact and risk can be reversed; (vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and (vii) the degree to which the impact and risk can be avoided, managed or mitigated; 	<p>Chapter 9, Paragraph 9.3</p>

(k) where applicable, a summary of the findings and impact management measures identified in any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final report;	Chapter 6 Appendix H
(l) an environmental impact statement which contains— (i) a summary of the key findings of the environmental impact assessment; (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	Chapter 11
(m) based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management outcomes for the development for inclusion in the EMPr;	Chapter 9, Chapter 11
(n) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	Chapter 12, Paragraph 12.4
(o) a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Chapter 12 and included in specialist reports in Appendix F
(p) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	Chapter 12, Paragraph 12.2
(q) where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised;	Chapter 12, Paragraph 12.3
(r) an undertaking under oath or affirmation by the EAP in relation to (i) the correctness of the information provided in the reports; (ii) the inclusion of comments and inputs from stakeholders and I&APs; (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties; and	Chapter 12, Paragraph 12.5 Appendix I(3)
(s) where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	Not applicable
(t) any specific information that may be required by the competent authority; and	To be included in the Final BAR
(u) any other matters required in terms of section 24(4)(a) and (b) of the Act	Not applicable

Table 3: Content of the Basic Assessment Report

1.3 Details and Expertise of the Environmental Assessment Practitioners

Landscape Dynamics Environmental Consultants (Pty) Ltd is the environmental consultants appointed for this project. Landscape Dynamics is an environmental consultancy firm established in May 1997. The main line of business since that time up to the present is the compilation of Environmental Impact Assessments. Landscape Dynamics has a broad client base from both the private and government sectors which has developed over the past 25 years of professional services supplied.

The operating base for Landscape Dynamics is the entire South Africa with local representation in Gauteng, the Western Cape, Mpumalanga and Kwazulu-Natal.

The Environmental Assessment Practitioners (EAPs) for this project are Ms Annelize Erasmus and Ms Susanna Nel. Both EAPs are registered with EAPASA. The Landscape Dynamics Company Profile with the relevant condensed Curriculum Vitae's is attached under Appendix I.

1.4 Project Team

The impact that this project might have on the environment can only be effectively assessed if all the environmental project components are satisfactorily identified and considered. A multi-disciplinary approach is therefore required for this basic Environmental Impact Assessment process.

The EIA Project Team members are the following (Landscape Dynamics' Company Profile with condensed CVs of the EAPs and Declaration of Interest of the specialists are attached in Appendix I):

Environmental Assessment Practitioners

Company name	Contact person(s)	Responsibility
Landscape Dynamics Environmental Consultants	Ms Annelize Erasmus Ms Susanna Nel	<ul style="list-style-type: none">○ EIA Project Management○ Environmental Assessment Practitioners○ Public Participation Programme

Environmental Specialist Team

Company name	Contact person(s)	Specialist field of study
Enviroguard Ecological Services CC	Prof Leslie Brown Clayton Cook	Fauna & Flora Impact Assessment
BlueScience (Pty) Ltd	Ms Toni Belcher	Aquatic Impact Assessment
CTS Heritage	Ms Jenna Lavin	Heritage & Palaeontology Impact Assessment
Chris van Rooyen Consulting and Afrimage Photography	Mr Chris van Rooyen Mr Albert Froneman	Avifauna Impact Assessment
Inkululeko Wildlife Services (Pty) Ltd	Dr Caroline Lötter	Bat Screening Assessment

VRM Afrika	Mr Steve Stead	Visual Impact Assessment
Tony Barbour Environmental Consulting and Research	Mr Tony Barbour	Socio-economic Impact Assessment
Johann Lanz Soil Scientist	Mr Johann Lanz	Agricultural Impact Assessment

Project Team

Company Name	Contact person	Engineering field of study
Interference Testing And Consultancy Services (Pty) Ltd	Mr Callie Fouché	RFI Impact Assessment
ISHECON	Ms Debbie Mitchel	High Level Risk Assessment
JG Afrika	Ms Iris Wink	Traffic and Transportation1
INDEX Social Consulting Services	Ms Marchelle Terblanche	Application for Change in Land Use
Afrimage Photography	Mr Albert Froneman	Mapping and GIS support

Note

The Environmental Specialists Team mentioned above are considered 'specialists' as per the EIA Regulations and they comply with all the required qualification and registrations. The Project Team mentioned provides professional and technical studies relating to the project design and components and the requirements as stipulated in "Appendix 6 – Specialist reports" do not apply to them.

Applicant

The EIA Project Team is supported by the following team members from within Mulilo Renewable Project Developments (Pty) Ltd, on behalf of the applicant, Vlakfontein Solar PV1 (Pty) Ltd:

Contact Person	Responsibility
Mr Warren Morse	Director: Solar & Energy Storage
Mr Andrew Pearson	Environmental Manager
Mr Lloyd Barnes	Project Manager: Permitting and Environmental
Mr Johan Janse van Rensburg	Project Engineer
Mr Gerhard Mc Namara	Project Engineer
Mr Constantin Hatzilambros	Project Manager

1.5 Working Programme

Activity	Month
Site Visit by Landscape Dynamics and specialists	November 2021
Screening Report completed	December 2021
<i>Public Participation & advertising</i>	
<ul style="list-style-type: none"> • Placement of newspaper ads 	March 2022
<ul style="list-style-type: none"> • Placement of onsite ads 	March 2022
<ul style="list-style-type: none"> • Distribution of Background Information Document (30 day commenting period plus holidays) 	March 2022
Specialist studies finalised	November 2022
<i>Draft BAR</i>	
<ul style="list-style-type: none"> • Draft BAR sent to IAPs (30 day commenting period excluding holidays) 	March/April 2023
<ul style="list-style-type: none"> • Submission of Draft BAR and Application Form to DFFE 	March/April 2023
Submission of Final BAR to DFFE	May 2023
Date EA received (57 days decision making time frame)	July/August 2023
Notification to all I&AP's of EA and right to appeal	July-August 2023
20 days appeal period ended	August 2023

Figure 5 Working Programme

CHAPTER 2: LEGAL REQUIREMENT

The paragraphs below illustrate how this project complies with relevant legislation, guidelines and policies specifically written for the renewable industry as well as provincial and municipal frameworks and policies.

2.1 National Environmental Management Act (Act 107 of 1998)

This application is done in terms of the National Environmental Management Act, 1998 (Act No 107 of 1998) (NEMA) and the Environmental Impact Assessment Regulations of December 2014, as amended in April 2017 (Government Notice Nr 326). Environmental Authorisation is requested for the following listed activities:

Listing Notice 1

11	<p>The development of facilities or infrastructure for the transmission and distribution of electricity</p> <p>(iii) Outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or</p> <p>(iv) Inside urban areas or industrial complexes with a capacity of 275 kilovolts or more,</p> <p>excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is —</p> <ol style="list-style-type: none"> a) temporarily required to allow for maintenance of existing infrastructure; b) 2 kilometres or shorter in length; c) within an existing transmission line servitude; and d) will be removed within 18 months of the commencement of development. 	<p>An onsite 132 kV Independent Power Producer (IPP) Substation forms part of the project components for which Environmental Authorisation is required with this application.</p>
12	<p>The development of</p> <p>(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or</p> <p>(ii) infrastructure or structures with a physical footprint of 100 square metres or more;</p> <p>where such development occurs</p> <ol style="list-style-type: none"> (a) within a watercourse; (b) in front of a development setback; or 	<p>An existing access road will be upgraded and developed across a seepage area. This road will be approximately 6m in width and approximately 265m in length where it crosses the seepage area. A surface area of <u>at least</u> 1 590m² will ultimately be affected.</p> <p>There are four depressions / degraded wetlands modified by agricultural activities which were confirmed by the aquatic ecologist</p>

	<p>(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;</p> <p><u>excluding</u></p> <p>(aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;</p> <p>(bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;</p> <p>(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies;</p> <p>(dd) where such development occurs within an urban area;</p> <p>(ee) where such development occurs within existing roads, road reserves or railway line reserves; or</p> <p>(ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared</p>	<p>as having a low aquatic sensitivity and can be development. These areas are approximately 4,66ha; 3,33ha; 0,83ha, and 0,5ha, in extent. The combined total surface area is therefore approximately 9,32ha which equals 93 200m².</p>
19	<p>The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shell grot, pebbles or rock of more than 10 cubic metres from a watercourse,</p> <p>but excluding where such infilling, depositing, dredging, excavation, removal or moving—</p> <p>f) will occur behind a development setback;</p> <p>g) is for maintenance purposes undertaken in accordance with a maintenance management plan;</p> <p>h) falls within the ambit of activity 21 in this Notice, in which case that activity applies;</p> <p>i) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or</p> <p>j) 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.</p>	<p>An existing road will be upgraded and developed across a seepage area. It will be approximately 6m in width and approximately 265m in length where it crosses this seepage area. A surface area of at least 1 590m² will ultimately be affected; therefore infilling or depositing of more than 10m³ will be required in this area</p> <p>In addition, there are four depressions/degraded wetlands modified by agricultural activities which were confirmed by the aquatic ecologist as having a low aquatic sensitivity and can be development. This covers an area of approximately 93 200m²; therefore combine infilling or depositing of more than 10m³ will also be required in these areas.</p> <p>The final calculations in terms of the infilling and/or excavation volumes will only be determined during the design phase of the project.</p>

24	<p>The development of a road—</p> <p>(iii) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or</p> <p>(iv) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;</p> <p>but excluding a road—</p> <p>d) which is identified and included in activity 27 in Listing Notice 2 of 2014;</p> <p>e) where the entire road falls within an urban area; or</p> <p>f) which is 1 kilometre or shorter.</p>	<p>The following roads are planned:</p> <ul style="list-style-type: none"> • The main access to the facility will be approximately 8m wide. • Internal roads will be constructed up to 6m wide. <p>The approval of this activity will ensure that additional width, if any, required for the access points, turning circles and bends can take place. The exact road widths and lengths will only be confirmed during the design phase of the project.</p>
28	<p>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:</p> <p>(iii) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or</p> <p>(iv) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;</p> <p>excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.</p>	<p>The development footprint of the Vlaktefontein Solar PV1 facility will be developed on approximately 151 ha which contain areas previously cropped and uncropped outside an urban area.</p>

Listing Notice 2

Even though Listing Notice 2 calls for a full Scoping and EIA to be undertaken, the project site falls within a Renewable Energy Zone (Klerksdorp REDZ) which implies that a Basic Assessment process has to be undertaken regardless if Listing Notice 2 is triggered or not.

1	<p>The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs</p> <p>(a) within an urban area; or</p> <p>(b) on existing infrastructure.</p>	<p>A solar PV facility of up to 100MW with associated infrastructure will be constructed outside an urban area.</p>
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15	<p>The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for</p> <ul style="list-style-type: none"> (iii) the undertaking of a linear activity; or maintenance purposes undertaken in accordance with a maintenance management plan (iv) maintenance purposes undertaken in accordance with a maintenance management plan. 	<ul style="list-style-type: none"> • The combined properties' size is 493 ha in extent of which the development footprint will affect approximately 151 ha of previously cropped and uncropped land. • Indigenous vegetation of more than 20 ha will be removed within the total project area.
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Listing Notice 3

4	<p>The development of a road wider than 4 metres with a reserve less than 13,5 metres.</p> <p>b. Free State</p> <p>i. Outside urban areas:</p> <ul style="list-style-type: none"> (aa) A protected area identified in terms of NEMPAA, excluding disturbed areas; (bb) National Protected Area Expansion Strategy Focus areas; (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (dd) Sites or areas identified in terms of an international convention; (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (ff) Core areas in biosphere reserves; or (gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas; or <p>ii. Inside urban areas:</p> <ul style="list-style-type: none"> (aa) Areas zoned for use as public open space; (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose; or (cc) Areas within urban protected areas. 	<p>Listing Notice 3 is applicable because the development site lies outside urban areas; and</p> <ul style="list-style-type: none"> • according to the DFFE Screening Tool Report the entire site falls within a Critical Biodiversity Area. • according to the Protected Areas Register the Mispah Game Farm (Nature Reserve) is situated approximately 1,2km north-west of the PV site. <p>The applicable project components/ activities are the following:</p> <ul style="list-style-type: none"> • The main access to the IPP substation area off the Vermaasdrift Road (S643) will be constructed to a width of approximately 8m. • All other internal roads will be constructed to a width of approximately 6m.
10	<p>The development and related operation of facilities or infrastructure, for the storage and</p>	<p>Listing Notice 3 is applicable because the development site lies outside urban areas; and</p>

handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres.

b. Free State

i. Outside urban areas

- (aa) A protected area identified in terms of NEMPAA, excluding conservancies;
 - (bb) National Protected Area Expansion Strategy Focus areas;
 - (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;
 - (dd) Sites or areas identified in terms of an international convention;
 - (ee) **Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority** or in bioregional plans;
 - (ff) Core areas in biosphere reserves;
 - (gg) Areas within 10 kilometres from national parks or world heritage sites **or 5 kilometres from any other protected area identified in terms of NEMPAA** or from the core areas of a biosphere reserve; or
 - (hh) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland; or
- ii. Inside urban areas:
- (aa) Areas zoned for use as public open space; or
 - (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose.

- according to the DFFE Screening Tool Report the entire site falls within a Critical Biodiversity Area.
- according to the Protected Areas Register the Mispah Game Farm (Nature Reserve) is situated approximately 1,2km north-west of the PV site.

The applicable project components/ activities are the following:

- Storage of dangerous goods (Including lubrications, oils, paints, fuel/diesel. etc.) will be required. The exact storage capacity has not yet been determined, but it will be 30m³ or more, but less than 80m³.
- Diesel/fuel is generally required for the following purposes:
 - During construction for construction vehicles as well as generators for the construction camp and commissioning whilst waiting for the Eskom grid connection works to be completed
 - During operations required for Operations & Maintenance vehicles at the PV plants but also required for backup diesel generators at the substation. The Generators supply auxiliary power to the substation's protection and communications systems, should there be outages on the grid. This is an Eskom requirement together with a battery room at the substations to act as UPS for these critical systems.

The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.

12

b. Free State

- i. Within any critically endangered or **endangered ecosystem** listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in

Listing Notice 3 is applicable because:

- According to the DFFE Screening Tool Report, the entire site is situated within both a Critical Biodiversity Area and an Endangered Ecosystem.
- The ecologist confirmed that the vegetation of the study area belongs to the endangered Vaal-Vet Sandy Grassland vegetation type (Gh 10) (Mucina & Rutherford 2006).
- A watercourse (seepage area) to be excluded from the development area and

	<p>the National Spatial Biodiversity Assessment 2004;</p> <p>ii. Within critical biodiversity areas identified in bioregional plans.</p> <p>iii. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning; or</p> <p>iv. Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland.</p>	<p>depressions/degraded small wetlands that will form part of the PV area occur on site.</p> <p>The applicable project components/ activities are the following:</p> <ul style="list-style-type: none"> the development footprint will affect approximately 160 ha of previously cropped and uncropped land indigenous vegetation of way more than 300m² will be removed. PV solar panels as well as roads will be constructed that requires clearance of indigenous vegetation exceeding 300m² to take place within 100m from the edge of the above-mentioned watercourses.
<p>14</p>	<p>The development of</p> <p>(i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or</p> <p>(ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs</p> <p>(a) within a watercourse;</p> <p>(b) in front of a development setback; or</p> <p>(c) if no development setback has been adopted within 32 metres of a watercourse, measured from the edge of a watercourse;</p> <p><u>excluding</u> the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.</p> <p>b. Free State</p> <p>i. Outside urban areas</p> <p>(aa) A protected area identified in terms of NEMPAA, excluding conservancies;</p> <p>(bb) National Protected Area Expansion Strategy Focus areas;</p> <p>(cc) World Heritage Sites;</p> <p>(dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;</p> <p>(ee) Sites or areas identified in terms of an international convention;</p> <p>(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic</p>	<p>Listing Notice 3 is applicable because the development site lies outside urban areas; and</p> <ul style="list-style-type: none"> according to the DFFE Screening Tool Report the entire site falls within a Critical Biodiversity Area. according to the Protected Areas Register the Mispah Game Farm (Nature Reserve) is situated approximately 1,2km north-west of the PV site. <p>The applicable project components/ activities are the following:</p> <ul style="list-style-type: none"> An existing access road will be upgraded and developed across a delineated seepage area. This road will be approximately 6m in width and approximately 265m in length where it crosses the delineated seepage area. A surface area of at least 1 590m² will ultimately be affected. There are also four depressions / degraded wetlands modified by agricultural activities which were confirmed by the aquatic ecologist as having a low aquatic sensitivity and can be development. These areas are approximately 4,66ha'; 3,33ha; 0,83ha, and 0,5ha in extent. The combined total surface area is therefore approximately 9,32ha which equals 93 200m².

	<p>biodiversity plans adopted by the competent authority or inbioregional plans;</p> <p>(gg) Core areas in biosphere reserves; or</p> <p>(hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; or</p> <p>ii. Inside urban areas:</p> <p>(aa) Areas zoned for use as public open space; or</p> <p>(bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority, zoned for a conservation purpose.</p>	
18	<p>The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.</p> <p>b. Free State</p> <p>i. Outside urban areas:</p> <p>(aa) A protected area identified in terms of NEMPAA, excluding conservancies;</p> <p>(bb) National Protected Area Expansion Strategy Focus areas;</p> <p>(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;</p> <p>(dd) Sites or areas identified in terms of an international convention;</p> <p>(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;</p> <p>(ff) Core areas in biosphere reserves;</p> <p>(gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; or</p> <p>(hh) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland; or</p> <p>ii. Inside urban areas:</p> <p>(aa) Areas zoned for use as public open space;</p>	<p>Listing Notice 3 is applicable because the development site lies outside urban areas; and</p> <ul style="list-style-type: none"> • according to the DFFE Screening Tool Report the entire site falls within a Critical Biodiversity Area. • according to the Protected Areas Register the Mispah Game Farm (Nature Reserve) is situated approximately 1,2km north-west of the PV site <p>The applicable project components/ activities are the following:</p> <p>Existing roads will be widened by more than 4 metres and/or lengthened by more than 1km within 100m from the edge of a watercourse / wetland.</p>

or
 (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose.

Table 4 NEMA Listed Activities which require Environmental Authorisation

NEMA can be regarded as the most important piece of general environmental legislation. It provides a framework for environmental law reform and covers three areas, namely:

- Land, planning and development;
- Natural and cultural resources, use and conservation; and
- Pollution control and waste management.

The law is based on the concept of sustainable development. The objective of the NEMA is to provide for co-operative environmental governance through a series of principles relating to:

- The procedures for state decision-making on the environment; and
- The institutions of state which make those decisions.

By providing electricity from a renewable source, this project will contribute to a sustainable environment.

2.2 The National Water Act (Act No 36 of 1998)

The NWA aims to regulate the use of water and activities which may impact on water resources through the categorisation of 'listed water uses', encompassing water abstraction and flow attenuation within catchments as well as the potential contamination of water resources. The Department of Water and Sanitation (DWS) is the administering body in this regard. Defined water use activities require the approval of DWS in the form of a General Authorisation (GA) or a Water Use Licence (WUL).

In the case of the Vlakfontein Solar PV1 site, the following is applicable:

- The PV components and associated infrastructure will be constructed immediately adjacent to the delineated watercourses (within 500m from a wetland), which pose a risk of changing the bed, banks or characteristics of the watercourses or impeding or diverting flow in the watercourses. Also, an existing access road crossing a watercourse area will be upgraded and developed. Water Use Authorisation is therefore required.
- A preliminary risk assessment was compiled as per DWS requirement and it was concluded that, provided the recommended mitigation measures are implemented, the risk of the activities degrading the adjacent aquatic features will be low; therefore the water use activities would fall within the ambit of General Authorisations for Section 21 (c) and (i) water use activities.
- Additional water use activities could also require water use authorisation, i.e. groundwater abstraction and storage thereof. This will be determined during the design phase of the project and will be included in the application for water use authorisation.

Note that an application for a GA / WUL can only be made once Preferred Bidder status for this project has been awarded.

2.3 The National Heritage Resources Act (Act 25 of 1999)

The proposed project falls within the scope of Section 38 of the National Heritage Resources Act and the

applicable activities are:

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

The authorisation process in terms of the NHRA forms part of the EIA process. A Heritage Impact Assessment was electronically submitted to the South Africa Heritage Resource Agency (SAHRA) via SAHRIS as well as to the Free State Provincial Heritage Resources Authority as part of the public participation programme. Comment received from these authorities will be included and addressed in the Final BAR.

2.4 Department of Agriculture, Land Reform & Rural Development

A renewable energy facility requires approval from the National Department of Agriculture, Land Reform and Rural Development (DALRRD) if the facility is on agriculturally zoned land. There are three approvals that may apply:

- No Objection letter;
- Consent for Long Term Lease in terms of the Subdivision of Agricultural Land Act (Act 70 of 1970) (SALA); and-
- Consent in terms of the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA)

2.4.1 No Objection Letter

A No Objection Letter for the change in land use is issued by the Deputy Director General (Agricultural Production, Health and Food Safety, Natural Resources and Disaster Management) and is required as a first step in the agricultural approval process. This letter is also one of the requirements for receiving municipal rezoning.

Application for the No Objection letter has to be made as early as possible in the renewable development process because not receiving this DALRRD approval may be a fatal flaw for a project. This application requires a motivation backed by solid evidence that the development will not significantly compromise the future agricultural production potential of the development site. Note that a positive EA does not assure DALRRD's approval of the development.

Refer to Paragraph 7.4 of this report for a summary of the motivation report which was submitted in support of the relevant application submitted to DALRRD. This motivation report is included in Appendix F(4)(a). A No Objection letter was subsequently received and is provided as Appendix F(4)(b).

2.4.2 Subdivision of Agricultural Land Act (Act 70 of 1970)

The second required approval is Consent for Long-Term Lease in terms of the Subdivision of Agricultural Land Act (Act 70 of 1970) (SALA). If DALRRD's approval for the development has already been obtained in the form of the No Objection letter, then SALA approval should not present any difficulties. SALA approval (if required) can only be applied for once the Municipal Rezoning Certificate and EA is in hand.

2.4.3 Conservation of Agricultural Resources Act (Act 43 of 1983)

Consent in terms of the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA) is required for the

cultivation of virgin land. Cultivation is defined in CARA as “any act by means of which the topsoil is disturbed mechanically”. The purpose of this consent for the cultivation of virgin land is to ensure that only land that is suitable as arable land is cultivated. Therefore, despite the above definition of cultivation, disturbance to the topsoil that results from the construction of a renewable energy facility and its associated infrastructure does not constitute cultivation as it is understood in CARA. This statement was corroborated by the Acting Scientific Manager: Natural Resources Inventories and Assessments in the Directorate: Land and Soil Management of DALRRD.

The construction and operation of the proposed Vlakfontein Solar PV1 facility will therefore not require consent from the Department of Agriculture, Land Reform and Rural Development in terms of this provision of CARA.

2.5 DFFE EIA Guidelines

2.5.1 EIA Guideline for Renewable Energy Projects, 2015

The purpose of this document is primarily to provide guidance on the environmental management legal framework applicable to renewable energy operations and all the role players in the sector.

The guideline also seeks to identify activities requiring authorisation prior to commencement of that activity, and provide an interface between national EIA regulations and other legislative requirements of various authorities.

Impacts

The guideline provides a list of potential impacts associated with the full range of solar energy project development. It is stipulated that these are (under normal circumstances) the main impacts, but other impacts maybe relevant depending on project specifics. The table below shows a list of potential impacts and where they have been considered in this report.

Potential Impact	Applicability / Section in report where it is addressed
Visual Impact	Chapter 6, paragraph 6.5.2
Noise Impact (CSP)	Not applicable - this is not a Concentrated Solar Power (CSP) project
Land Use Transformation	The impact on agriculture is assessed in Chapter 6, paragraph 6.6
Impacts on Cultural Heritage	Chapter 6, paragraph 6.4.1
Impacts on Biodiversity	Chapter 6, paragraphs 6.3.1, 6.3.3 and 6.3.4
Impacts on Water Resources	Chapter 6, paragraphs 6.3.2
Hazardous Waste Generation (CSP and PV)	The EMPr (Annexure H) addresses hazardous waste
Electromagnetic Interference	Chapter 7, paragraph 7.3
Aircraft Interference	The CAA is registered IAP and has the opportunity to comment on this development proposal, which will be included and addressed in the Final BAR
Loss of agricultural land	Chapter 6, paragraph 6.6 and Chapter 7, paragraph 7.4.

Figure 6 Potential impact of solar energy facilities and applicability

Mitigation

Project-specific measures designed to mitigate negative impacts and enhance positive impacts should be informed by good industry practice and are to be included in the EMP. Potential mitigation measures for solar energy projects include but are not limited to:

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

Above-mentioned mitigation was addressed through the required specialist studies and recommended mitigation measures are included in the EMP.

Legislation

The NEMA listed activities and other applicable legislation are addressed in appropriate detail in this report.

2.5.2 Public Participation Guideline, 2017

According to Section (2)(4)(f) and (o) of NEMA,

- the participation of all IAPs in environmental governance must be promoted and all people must have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, and participation by vulnerable and disadvantaged persons must be ensured, and
- the environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage.

In order to give effect to the above sections, it is essential to ensure that there is adequate and appropriate

opportunity for public participation in decisions that may affect the environment. Section 24(1A)(c) of the Act allows for this participation by requiring that the person conducting public participation comply with any regulated procedure related to public consultation and information gathering through the public participation process.

The NEMA EIA Regulations set out very specific steps and stipulations that need to be undertaken to ensure that participation by interested and affected persons are encouraged. Refer to Chapter 8 of this report for detail regarding the public participation process undertaken for this development.

2.5.3 Guideline on Need & Desirability, 2017

The guidelines have a list of questions to be engaged with when the Need & Desirability of project are being considered. The need for and desirability of a proposed activity should specifically and explicitly be addressed throughout the EIA process when dealing with individual impacts and specifically in the overall impact summary by taking into account the answers to the questions as stated in the guidelines.

Reference must be made to Chapter 4 of this report for a list of these questions with explanations of how the need and desirability of the proposed development was taken into consideration when the development proposal was finalised.

2.6 National legislation applicable to the Renewable Energy Sector

2.6.1 National Energy Act (Act No 34 of 2008)

The National Energy Act aims:

- to ensure that diverse energy resources are available, in sustainable quantities and at affordable prices, to the South African economy in support of economic growth and poverty alleviation, taking into account environmental management requirements and interactions amongst economic sectors;
- to provide for energy planning, increased generation and consumption of renewable energies, contingency energy supply, holding of strategic energy feedstocks and carriers, adequate investment in, appropriate upkeep and access to energy infrastructure;
- to provide measures for the furnishing of certain data and information regarding energy demand, supply and generation;
- to establish an institution to be responsible for promotion of efficient generation and consumption of energy and energy research; and
- to provide for all matters connected therewith.

2.6.2 National Infrastructure Plan 2050

The goal of the National Infrastructure Plan 2050 (NIP 2050) is to create a foundation for achieving the NDP's vision of inclusive growth, targeting a 30% investment-to-GDP ratio.

This phase of the NIP 2050 focuses on four critical network sectors that provide a platform: energy, freight transport, water and digital infrastructure.

A National Infrastructure Plan with 18 identified Strategic Integrated Projects (SIPs) was developed and adopted by Cabinet in 2012. The Infrastructure Development Act, No 23 of 2014 was gazetted, which saw the establishment of the Presidential Infrastructure Coordinating Commission (PICC) Council, Management Committee and Secretariat. A PICC Technical Task Team was established to support the Commission Structures plus create technical capacity in infrastructure. The number of SIP projects increased to 21 since its inception in 2012.

The energy SIPs are:

- SIP 8 includes green energy projects, including procurement of renewable energy under the REIPPPP.
- SIP 9 includes the expansion of electricity generation capacity, including that from Kusile and Medupi, with attention to reducing the carbon footprint being given.
- SIP 10 includes the expansion of electricity transmission and distribution network.
- SIP 20 includes the following:
 - Emergency or Risk Mitigation Power Purchase Procurement Programme (2,000MW) – national
 - Embedded Generation Investment Programme (EGIP) (400MW) – national.

2.6.3 National Development Plan 2030

The National Development Plan aims to eliminate poverty and reduce inequality by 2030. South Africa can realise these goals by drawing on the energies of its people, growing an inclusive economy, building capabilities, enhancing the capacity of the state, and promoting leadership and partnerships throughout society.

The following infrastructure investments should be prioritised:

- Procuring at least 20 000MW of renewable electricity by 2030, importing electricity from the region, decommissioning 11 000MW of ageing coal-fired power stations and stepping up investments in energy-efficiency.

The country would need an additional 29 000MW of electricity by 2030. About 10 900MW of existing capacity is to be retired, implying new build of more than 40 000MW. One of the objectives under “Economic Infrastructure” as well as “Environmental Sustainability and Resilience” is that at least 20 000MW of this capacity should come from renewable sources.

2.6.4 Integrated Resource Plan, 2019

South Africa’s NDP 2030 offers a long-term plan for the country. It defines a desired destination where inequality and unemployment are reduced and poverty is eliminated so that all South Africans can attain a decent standard of living. Electricity is one of the core elements of a decent standard of living.

The NDP envisages that, by 2030, South Africa will have an energy sector that provides reliable and efficient energy service at competitive rates; that is socially equitable through expanded access to energy at affordable tariffs; and that is environmentally sustainable through reduced emissions and pollution. In formulating its vision for the energy sector, the NDP took as a point of departure the Integrated Resource Plan (IRP) 2010–2030 promulgated in March 2011.

Energy security in the context of this IRP is defined as South Africa developing adequate generation capacity to meet its demand for electricity, under both the current low-growth economic environment and even when

the economy turns and improves to the level of 4% growth per annum. Generation capacity must accordingly be paced to restore the necessary reserve margin and to be ahead of the economic growth curve at least possible cost.

Renewable Energy: Solar PV, wind and CSP with storage present an opportunity to diversify the electricity mix, to produce distributed generation and to provide off-grid electricity. Renewable technologies also present huge potential for the creation of new industries, job creation and localisation across the value chain.

In line with the planned capacity in the promulgated IRP 2010–2030 and in accordance with Section 34 of the Electricity Regulation Act No. 4 of 2006, the Minister of Energy has, to date, determined that 39 730MW of new generation capacity must be developed. Of the 39 730MW determined, about 18 000MW has been committed to date. This new capacity is made up of 6 422MW under the REIPPPP with a total of 3 876MW operational on the grid.

2.6.5 National Integrated Energy Plan, 2016

One of the key objectives of the Department of Energy (DoE) is to ensure energy security which, in essence, is about ensuring the availability of energy resources, and access to energy services in an affordable and sustainable manner, while minimising the associated adverse environmental impacts.

As a fast emerging economy, South Africa needs to balance the competing need for continued economic 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.

Eight key objectives were identified during the Integrated Energy Planning process:

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

Solar PV and CSP with storage present excellent opportunities to diversify the electricity mix, to produce distributed generation and to provide off-grid electricity. Solar technologies also present the greatest potential for job creation and localisation.

2.6.6 New Growth Path Framework, 2010

The New Growth Path Framework aims at enhancing growth, employment creation and equity. This framework reflects government's commitment to prioritising employment creation in all economic policies. It identifies strategies that will enable South Africa to grow in a more equitable and inclusive manner while attaining South Africa's developmental agenda.

Central to the New Growth Path is a massive investment in infrastructure as a critical driver of jobs across the economy.

- The framework identifies investments in five key areas namely: energy, transport, communication, water and housing. Sustaining high levels of public investment in these areas will create jobs in construction, operation and maintenance of infrastructure.
- The new growth path sees the infrastructure programme as a trigger to build a local supplier industry

- for the manufacture of the components for the build-programme.
- Specific measures, particularly changes to procurement policy and regulations, are identified to ensure that this is achieved. Risks include the still fragile global recovery; competition and collaboration with the new fast-growing economies; and competing interests domestically.

The New Growth Path identifies five other priority areas as part of the programme to create jobs, through a series of partnerships between the State and the private sector. One of these priority areas is Green Economy:

- Expansions in construction and the production of technologies for solar, wind and biofuels are supported by the draft Energy on Integrated Resource Plan. Clean manufacturing and environmental services are projected to create 300 000 jobs over the next decade.

2.6.7 White Paper on Renewable Energy, 2003

The world is facing the challenge of harnessing the earth's resources effectively and efficiently. There is still a vast dependence on fossil fuels, and the use of this energy source is common to both developing and developed countries. It is well known that the excessive burning of fossil fuels does not go without a price as they release large amounts of carbon dioxide into the atmosphere.

Government is committed to the introduction of greater levels of competition in electricity markets. Promoting renewable energy will contribute towards the diversification of electricity supply and energy security. In doing so, Government will create an enabling environment to facilitate the introduction of independent power producers that generate electricity from renewable energy sources. To complement these reforms, there should be a greater investment by the private sector in renewable energy power producers, and in the commercialisation and local manufacturing of renewable energy technologies.

2.6.8 White Paper on the Energy Policy of the RSA, 2002

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

The policy recognises that South Africa has neglected the development and implementation of renewable energy applications. However, the significant medium and long-term potential of renewable energy is recognised. Government policy on renewable energy is concerned with meeting the following challenges:

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

2.7 Free State Provincial Spatial Development Framework, 2007

The Free State PSDF is a policy document that promotes a 'developmental state' in accordance with national and provincial legislation and directives. It aligns with the Free State Provincial Growth and Development Strategy which has committed the Free State to 'building a prosperous, sustainable and growing provincial

economy which reduces poverty and improves social development.

The PSDF includes comprehensive plans and strategies that collectively indicate which type of land-use should be promoted in the Province, where such land-use should take place, and how it should be implemented and managed. In broad terms, the PSDF:

- Indicates the spatial implications of the core development objectives of the Free State Provincial Growth and Development Strategy.
- Serves as a spatial plan that facilitates local economic development.
- Lays down strategies, proposals and guidelines as it relates to sustainable development.
- Facilitates cross-boundary co-operation between municipalities, adjoining provinces, and bordering countries.
- Serves as a manual for integration and standardisation of the planning frameworks of all spheres of government in the Province.

The PSDF is prepared in accordance with bioregional planning principles that were adapted to suit the site-specific requirements of the Free State. It incorporates and complies with the relevant protocols, conventions, agreements, legislation and policy at all applicable levels of planning, ranging from the international to the local.

One of the main objectives of the PSDF is to reduce unemployment from 38% to 20%. Note that the current unemployment rate is 38.1%.

2.8 Municipal Frameworks

2.8.1 *Moqhaka Local Municipality Environmental Management Framework, 2013*

Biodiversity and conservation

The four threatened ecosystems in the study area are the Vaal-Vet Sandy Grassland, the Rand Highveld Grassland, the Vredefort Dome Granite Grassland and the Eastern Free State Clay Grassland. These listed terrestrial ecosystems are very important features from a national perspective and should be considered during any development. (Note however that most of the study area of the Mercury Cluster PV Project is cropped with most of the land with biodiversity value situated within the buffered delineated watercourses.)

Most of the MLM area is regarded as 'endangered' and 'vulnerable' from a national perspective. This could be ascribed to the fact that many of the vegetation types present in the area have been extensively transformed by agricultural activities. 'Endangered' ecosystems are very close to becoming 'critically endangered' if any further loss of natural habitat is experienced. Conservation efforts in these areas are encouraged because it is currently not well protected in the national context.

Areas of high biodiversity are important indicators for sensitivity, as it reflects the status of available habitat and connectivity in the areas. These areas should be considered sensitive for any activities that might cause serious disruption and/or lead to further fragmentation of an already fragmented landscape.

Refer to the relevant specialist studies in Chapter 6 and Appendix E for the relevant ecological specialist reports confirming substantial consideration of the natural environmental (terrestrial biodiversity, avifauna and aquatic environment) directly relating to the Vlakfontein Solar PV1 facility.

Agricultural potential

Increased pressure on agricultural land for use other than agriculture makes it important to protect agricultural

land, especially high potential agricultural land, for the exclusive use by agriculture. This is especially important if one takes into consideration the harsh environmental conditions of the country and the fact that only about 4% of the country's land is regarded as high potential agricultural land.

In order to protect high potential agricultural land, intensive agricultural studies was undertaken for this proposed solar PV development. Application has been made to DALRRD for a No Objection letter, thereby obtaining confirmation that the land in question may be used for purposes other than agriculture.

Refer to Chapter 7 and Appendix F(4) for information directly relating to the Vlakfontein Solar PV1 facility.

2.8.2 Moqhaka Local Municipality Integrated Development Plan, 2017-2022

The planning undertaken by a municipality must be aligned with, and complement, the development plans and strategies of other affected municipalities and other organs of state to give effect to the principles of co-operative government contained in Section 41 of the Constitution. Municipalities must participate in national and provincial development programmes as required in Section 153 (b) of the Constitution.

Aligned plans ensure that resources are creatively harnessed and, as such, a lot more is achieved than would have had there been a piecemeal approach. Both the IDPs of Fezile Dabi District and Moqhaka Local Municipalities should serve as a platform for all the spheres of government to converge and define the development path of the District in general and more specifically the Moqhaka Municipal area. The alignment of planning instruments in the different spheres of government should allow for impact to be maximised by ensuring that limited resources are efficiently utilised. The alignment of selected National, Provincial, District and Local objectives is illustrated below:

- Decent employment through inclusive growth path
 - National NDP: Speed up economic growth and transform the economy to create decent work and sustainable livelihoods
 - MLM IDP: Create an environment that promotes the development of the local economy and facilitate job creation
- Environmental assets and natural resources that are well protected and continually enhanced
 - National NDP: Ensure sustainable resource management and use
 - MLM IDP: Broaden access and improve quality of municipal services.
- Create a better South Africa and contribute to a better and safer Africa and World
 - National NDP: Pursue African advancement and enhanced international cooperation

The Moqhaka Local Municipality gives directives to the developmental agenda of the Municipality. The broader developmental agenda of the MLM consists of short, medium and long term development goals. The MLM is committed to the objectives of local government which are enshrined in section 152 (1) of the Constitution of the Republic of South Africa, 1996 namely:

- (a) To provide democratic and accountable government for local communities;
- (b) To ensure the provision of services to communities in a sustainable manner;
- (c) To promote social and economic development;
- (d) To promote a safe and healthy environment; and
- (e) To encourage the involvement of communities and community organisations in the matters of local government.

The municipality's development strategies are crafted within the context of ensuring that efforts are focused on delivering the expected outcomes of the developmental mandate of the local sphere of government.

The vision of the MLM "strives to be a Municipality that creates an enabling environment for socio economic growth and sustainable development."

The IDP is about determining the stakeholder and community needs and priorities which need to be addressed to contribute to the improvement of the quality of life of residents within the Municipal Area.

Unemployment

The official unemployment rate for South Africa climbed to 30,8% in the third quarter of 2020 from 23,3% in the second quarter. Eastern Cape had the highest unemployment rate in the third quarter (at 45,8%), followed by Free State, Gauteng and North West. Western Cape had the lowest rate, at 21,6%.

In 2011 the official unemployment rate was 35.2% and the youth unemployment rate was 47.2%. It is expected that the unemployment rate today will be similar to these figures.

The Vlakfontein Solar PV1 facility as proposed in this report is in line with the vision as stipulated in the IDP because it will provide much needed employment during the construction and operational phases of the project. Specialist studies undertaken for the solar facility and associated recommended mitigation measures also ensure that the biophysical and social environments are being protected.

2.8.3 Moqhaka Local Municipality Spatial Development Framework, 2019-2020

The Spatial Development Framework (SDF) aims to be in support of the NDP, the Mid Term Strategic Framework as well as the PSDF:

- The SDF identifies ten spatial related directives and objectives under reference to the NDP and Directive Nr 8 refers to “Surface Infrastructure”. One of the objectives of this directive is “Renewable energy (20 000 MW)”.
- Under the *Mid Term Strategic Framework: Planning Policies - Spatial Related Drivers and Objectives* the SDF again refers to Driver Nr 8 namely “Expand and maintain basic and road infrastructure” with one of the objectives being “Commission at least 7000 MW of renewable energy by 2020”. It is not known if this goal has been achieved but the Vlakfontein Solar PV1 Facility will contribute to existing/future renewable energy goals of the municipality.
- The SDF further make reference to the Spatial Related Directives and Objectives of the PSDF that, under Driver Nr 8 specifically refer to the promotion of “development of renewable energy supply schemes”.

Considering the above, the proposed Vlakfontein Solar PV1 facility as a renewable energy supply project is directly in line with the SDF.

2.8.4 Free State Green Economy Strategy

The Green Economy Strategy for Free State Province (2014) was developed in alignment with the national green economy strategy elaborated in the National Green Economy Framework and Green Economy Accord, as well the Free State Provincial Growth and Development Strategy. The objective was to develop a green economy strategy to assist the province to, amongst others, improve environmental quality and economic growth, and to develop green industries and energy efficiency within the province.

The Vlakfontein Solar PV1 facility as proposed will contribute to the aim of energy efficiency and green industry whilst promoting economic growth and is therefore consistent with this Green Economy Strategy as well as the Climate Change Response Plan.

2.9 Conclusion of the Legislative Framework

The findings of the review of key policy and planning documents indicate that renewable energy is supported at a national, provincial, and local level. At a national level, the development of, and investment in, renewable energy is supported by the National Development Plan, New Growth Path Framework and National Infrastructure Plan, highlighting the importance of renewable energy. The proposed project also supports a number of objectives contained in the Free State Province Provincial Growth and Development Strategy and Free State Green Economy Strategy. At a district and local level, the Moqhaka Local Municipality IDP and SDF support the development of renewable energy. The site is also located within the Klerksdorp REDZ as well as the Central STC. The area has therefore been identified as suitable for the establishment of renewable energy facilities.

It has effectively been illustrated in the above paragraphs that the Vlakfontein Solar PV1 facility as proposed is in support of applicable legislation and development objectives on a national, provincial and local level.

CHAPTER 3: PROJECT INFORMATION

3.1 Project Description

Infrastructure associated with the Vlakfontein Solar PV1 facility includes the following:

Infrastructure	Specifications
Solar PV Array	<p>The Solar PV Array includes the following components:</p> <ul style="list-style-type: none"> • Bifacial PV Modules • Mounting structures using single axis tracking technology • Inverters • Combiner boxes • Transformers • Cabling between panels • Total PV area is approximately 151 ha.
Onsite 132 kV Independent Power Producer (IPP) Substation	<p>The IPP Substation includes the following components:</p> <ul style="list-style-type: none"> • HV Step-up transformer • MV Interconnection building • Total area approximately 100 m x 100 m (1 ha)
Access and internal roads	<ul style="list-style-type: none"> • Main access to the IPP substation area is required directly off Vermaasdrift Road (S643), approximately 8m wide. The length of the road is approximately 498 m. The coordinates of the access point are: 27° 0'36.07"S 26°51'19.21"E • Existing internal farm roads to be utilised where possible, • Internal roads to be constructed up to 6m wide. • Regraveling of roads to take place if required by the provincial roads authority.
Laydown area	<ul style="list-style-type: none"> • A temporary construction site area of approximately 4ha directly adjacent to the IPP and Eskom substation will be required. • Temporary infrastructure will be rehabilitated following the completion of the construction phase, where it is not required for the operation phase.
Battery Energy Storage System (BESS)	<ul style="list-style-type: none"> • Solid State Batteries (SSB) is the preferred battery technology. • It will be delivered pre-assembled. • It will be constructed on approximately 4.5 ha.
Storage of Dangerous Goods	<ul style="list-style-type: none"> • Storage of dangerous goods (Including lubrications, oils, paints, fuel/diesel, etc.) with a combined capacity not exceeding 80 cubic metres is required. • Diesel/fuel is generally required for the following purposes: <ul style="list-style-type: none"> ▪ During construction for construction vehicles as well as generators for the construction camp and commissioning whilst waiting for the Eskom grid connection works to be completed ▪ During operations, diesel is required for vehicles at the PV plant as well as for backup diesel generators at the substation. The Generators supply auxiliary power to the substation's protection and

	communications systems, should there be outages on the grid. This is an Eskom requirement together with a battery room at the substations to act as UPS for these critical systems.
Ancillary facilities	<ul style="list-style-type: none"> • Operations and Maintenance Building • Site Offices • Construction camps • Storage Warehouse • Workshop • Guard House • Ablutions with conservancy tanks • During the construction phase, temporary sanitation facilities will be provided (i.e. chemical toilets) and these toilets will be regularly serviced by a licensed company.

Note the following:
 Components of a separate Application for Environmental Authorisation as it would be handed over to Eskom (to be developed by the IPP under a self-build agreement with Eskom):

- The onsite 132kV Eskom switching station
- A 132kV power line connecting the Vlakfontein Solar PV1 facility to the Mercury MTS

Refer to the map on the following page which indicates the project components applicable to this project.

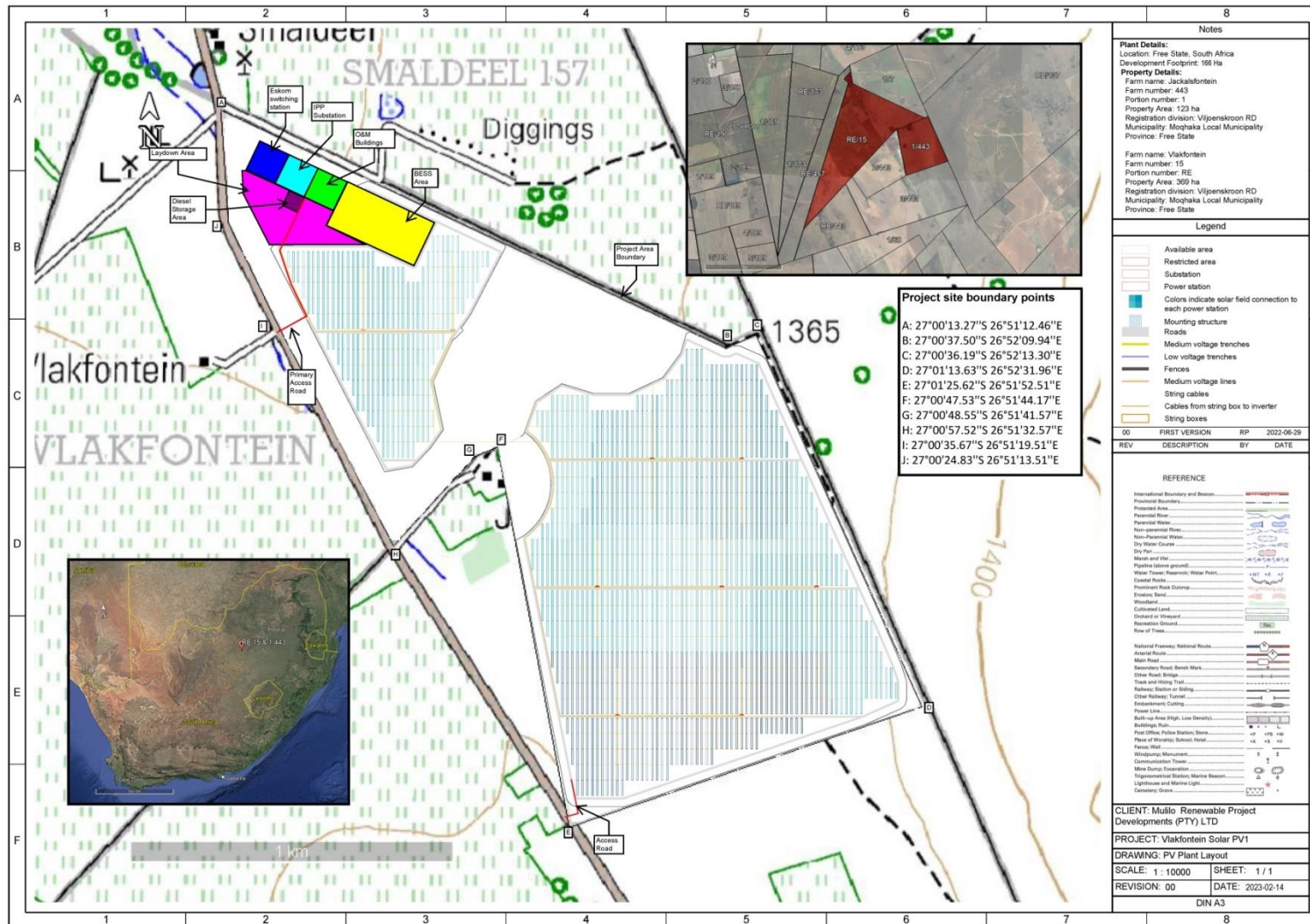


Figure 7 Site Layout with Project Components and coordinate

3.2 Coordinates

Coordinates of the outside boundaries of the PV development area are provided and referenced in the Site Layout provided on the previous page and are supplied below.

A	27°00'13.27"S and 26°51'12.46"E
B	27°00'37.50"S and 26°52'09.94"E
C	27°00'36.19"S and 26°52'13.30"E
D	27°01'13.63"S and 26°52'31.96"E
E	27°01'25.62"S and 26°51'52.51"E
F	27°00'47.53"S and 26°51'44.17"E
G	27°00'48.55"S and 26°51'41.57"E
H	27°00'57.52"S and 26°51'32.57"E
I	27°00'35.67"S and 26°51'19.51"E
j	27°00'24.83"S and 26°51'13.51"E

IPP Substation

Northern point	27°00'17.85"S and 26°51'20.64"E
Eastern point	27°00'19.22"S and 26°51'23.85"E
Southern point	27°00'22.16"S and 26°51'22.34"E
Western point	27°00'20.86"S and 26°51'19.11"E

Operations & Maintenance Buildings

Northern point	27°00'19.22"S and 26°51'23.85"E
Eastern point	27°00'20.62"S and 26°51'27.17"E
Southern point	27°00'23.56"S and 26°51'25.66"E
Western point	27°00'22.16"S and 26°51'22.34"E

BESS Area

Northern point	27°00'20.62"S and 26°51'27.17"E
Eastern point	27°00'24.71"S and 26°51'37.03"E
Southern point	27°00'29.18"S and 26°51'34.72"E
Western point	27°00'25.13"S and 26°51'24.85"E

Diesel storage

Northern point	27°00'21.49"S and 26°51'20.66"E
Eastern point	27°00'22.16"S and 26°51'22.34"E
Southern point	27°00'23.64"S and 26°51'21.59"E
Western point	27°00'22.96"S and 26°51'19.92"E

Laydown area

North-west point	27°00'19.22"S and 26°51'15.34"E
North-eastern point 1	27°00'21.49"S and 26°51'20.66"E
North-eastern point 2	27°00'22.96"S and 26°51'19.92"E
North-eastern point 3	27°00'23.64"S and 26°51'21.59"E
North-eastern point 4	27°00'22.16"S and 26°51'22.34"E
North-eastern point 5	27°00'23.53"S and 26°51'25.59"E
North-eastern point 6	27°00'25.12"S and 26°51'24.79"E
South-eastern point	27°00'26.93"S and 26°51'29.36"E
South-western point	27°00'27.04"S and 26°51'18.51"E
Western point	27°00'21.34"S and 26°51'15.41"E

Primary (main) access road

Entrance of the S643 (Vermaasdrift Road)	27°00'36.07"S and 26°51'19.21"E
Turning point 1	27°00'34.22"S and 26°51'21.85"E

Turning point 2	27°00'33.56"S and 26°51'22.28"E
Turning point 3	27°00'27.68"S and 26°51'19.61"E
End point	27°00'22.16"S and 26°51'22.34"E

3.3 Farm and portion number & Surveyor General 21 Digit Code

The project is situated on the following two properties:

- Remainder of Vlakfontein No 15
- Portion 1 of Jackalsfontein No 443

The 21 digit codes are as follows:

Major region				Minor region				Farm / Erf number							Portion number					
F	0	3	6	0	0	0	0	0	0	0	0	0	0	1	5	0	0	0	0	0
F	0	3	6	0	0	0	0	0	0	0	0	0	4	4	3	0	0	0	0	1

CHAPTER 4: NEED & DESIRABILITY

4.1 Need

The need for this project relates directly to the need for renewable energy projects in South Africa. The proposed Vlakfontein Solar PV1 facility will connect the generated electricity to the Eskom national grid, thereby assisting in alleviating the immense pressure on the current Eskom capacity.

The need for the project can also be justified when reviewing the South African **Integrated Resource Plan (IRP) 2019** which was gazetted by the Minister of Mineral Resources and Energy, Mr Gwede Mantashe, on 18 October 2019, updating the energy forecast for South Africa from the current period to the year 2030.

In summary, it is an electricity capacity plan which aims to provide an indication of the country's electricity demand, how this demand will be supplied and what it will cost. The IRP 2019 further states the following on renewables:

- “South Africa continues to pursue a diversified energy mix that reduces reliance on a single or a few primary energy sources. The extent of decommissioning of the existing coal fleet due to end of design life could provide space for a completely different energy mix relative to the current mix. In the period prior to 2030, the system requirements are largely for incremental capacity addition (modular) and flexible technology, to complement the existing installed inflexible capacity.”
- “Renewable Energy: Solar PV and wind present an opportunity to diversify the electricity mix, to produce distributed generation and to provide off-grid electricity. Renewable technologies also present huge potential for the creation of new industries, job creation and localisation across the value chain.”

The REIPPPP was developed in support of the IRP and the Vlakfontein Solar PV1 will be bid in the next, and possibly future REIPPPP rounds.

4.2 Desirability

The desirability of a project is also measured in terms of the policy fit of the proposed development in terms of national, provincial and municipal legislation. Policy fit for the Vlakfontein Solar PV1 facility is rated as high – please refer to Chapter 2 of this report for an in-depth discussion in this regard.

The following tables address further issues as highlighted in the DFFE Need & Desirability Guidelines (2014).

Is this project part of a **national programme** to address an issue of national concern or importance?

Yes, this project addressed an issue of national concern. It is necessary to connect more renewable energy generation projects to the national grid in support of the IRP 2019 and this project will be bid in the next, and possibly future REIPPPP bidding rounds.

Do location factors favour this land use (associated with the development proposal) at this place? (This relates to the contextualisation of the proposed land use on the proposed site within its broader context.)

The proposed solar PV facility is perfectly situated because

- *It falls entirely within a Renewable Energy Development Zone*
- *The entire project area falls within a Strategic Transmission Corridor*
- *It is closely situated to an Eskom substation which has capacity to receive the generated electricity*
- *There are no environmental sensitivities on the site that needs to be avoided*

Will the development proposal or the land use associated with the development proposal applied for, impact on sensitive natural and cultural areas (built and rural/natural environment)?

The development proposal (or the land use associated with the development proposal applied for) will not significantly impact on sensitive natural and cultural areas. The development proposal was assessed by the following specialists:

- *Terrestrial Biodiversity (Fauna & Flora) specialist*
- *Aquatic specialist*
- *Ornithologist*
- *Bat specialist*
- *Heritage consultant*
- *Socio-economic specialist*
- *Visual specialist*
- *Agricultural specialist*
- *Engineering specialists to address storm water, traffic as well as RFI and a high-level risk assessment for the BESS.*

It was concluded that all impacts can be mitigated to acceptable levels and that the project could go ahead on condition that the Environmental Management Programme (EMPr) (attached as Appendix H) should be implemented at all times.

Will the development impact on people's health and well-being (e.g., in terms of noise, odours, visual character and 'sense of place', etc.)?

Dust and noise will be created during the construction phase but mitigation measures are in place to minimise these temporary impacts. An Environmental Control Officer will be permanently on site to ensure that the mitigation is applied and to handle and act on complaints that may be received during this period.

A visual impact assessment was undertaken and it concluded that the proposed development should commence with mitigation for the following key reasons:

- *The proposed development areas have background views of degraded mining landscapes or are within proximity of the Mercury Substation where the rural agricultural landscape is partially degraded.*
- *Receptors are few and have partial visual screening of the proposed landscape change.*
- *No tourist related activities are making use of the rural agricultural landscapes.*

Is the development the best practicable environmental option for this land/site?

The, 'environment' should be seen as the sum total of one's surroundings, which include the natural, social and economic environments. Taking all constraints into account, the development as proposed underlines the principles as advocated by the term 'triple bottom line' (people, planet, profit) and this development proposal is in support of the goals of economic, social and ecological integration and sustainability.

What will the benefits be to society in general and to the local communities?

The proposed development will contribute to, amongst others, energy security and blackout relief, benefiting the entire South Africa. Temporary and permanent employment opportunities will be created and the work force will as far as possible be sourced from the local communities. This will bring much needed relief to an area which experiences an unemployment rate of 38.1%.

Will the benefits of the proposed land use/development outweigh the negative impacts of it?

Negative impacts associated with the proposed development could be mitigated to levels that will be acceptable within the receiving environment. It is suggested that the positive impact of creation of job and business opportunities, energy security, blackout relief, increase electricity capacity, reduction in the need to use diesel and other fossil fuels for peaking and baseload power far outweighs the negative impact that this project could have.

Describe how the general objectives of Integrated Environmental Management as set out in Section 23 of the NEMA have been taken into account:

Current procedures and/or organisational structures are not necessarily achieving integrated decision-making and/or co-operative governance and, as a result, there is a failure to properly achieve the objectives of IEM as set out in Section 23 of NEMA. EIA's however often focus on the immediate harm a project will cause rather than any benefits it might create in the long term to sustainable development.

The stated objectives of Section 23 are to ensure integrated decision-making and co-operative governance so that NEMA's principles and the general objectives for integrated environmental management of activities can be achieved. The goals are to

- a) promote the integration of the principles of environmental management set out in section 2 into the making of all decisions which may have a significant effect on the environment;*
- b) identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage, the risks and consequences and alternatives and options for mitigation of activities, with a view to minimising negative impacts, maximising benefits, and promoting compliance with the principles of environmental management set out in section 2;*
- c) ensure that the effects of activities on the environment receive adequate consideration before actions are taken in connection with them;*
- d) ensure adequate and appropriate opportunity for public participation in decisions that may affect the environment;*
- e) ensure the consideration of environmental attributes in management and decision-making which may have a significant effect on the environment; and*
- f) identify and employ the modes of environmental management best suited to ensuring that a particular activity is pursued in accordance with the principles of environmental management set out in section 2.*

For this project the following actions were taken to reach the general objectives of Integrated Environmental Management as set out in Section 23 of NEMA:

- a) Applicable environmental, economic and social aspects have been assessed, thereby ensuring an integrated approach in order to balance the needs of all whom would be affected by this development.*

- b) *Mitigation measures have been supplied in the EMPr in order to ensure that all identified impacts are mitigated to acceptable levels.*
- c) *The EA application has to be evaluated and approved by DFFE and no construction may commence prior to the issuing of the Environmental Authorisation.*
- d) *The procedures which are followed during the public participation programme are based on the NEMA EIA Regulations 2014, as amended.*
- e) *DFFE will take all information as represented in this report into consideration and may request further information should they feel that further studies/information is required before an informed decision can be made.*
- f) *The project team (inclusive of the specialists) is confident that the mitigation measures as supplied in the EMPr are reasonable and will be the best way to manage anticipated impacts.*

Describe how the principles of environmental management as set out in Section 2 of the NEMA have been taken into account

Chapter 2 of NEMA provides a number of principles that decision-makers have to consider when making decisions that may affect the environment, therefore, when a Competent Authority considers granting or refusing environmental authorisation based on an Environmental Impact Assessment, these principles must be taken into account.

The NEMA principles with which this application conforms are described as follows —

1. *Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably.*
2. *Development must be socially, environmentally and economically sustainable.*
3. *Sustainable development requires the consideration of all relevant factors.*

The social, economic and environmental impacts of activities, including disadvantages and benefits, were considered, assessed and evaluated, and informed decision-making by the authority is hereby made possible.

Describe in which way the development is in line with other applicable legislation

The findings of the review of key policy and planning documents (also refer to Chapter 2: Legal Requirement) indicate that renewable energy is supported at a national, provincial, and local level. At a national level, the development of, and investment in, renewable energy is supported by the National Development Plan (NDP), New Growth Path Framework and National Infrastructure Plan. The proposed project also supports a number of objectives contained in the Free State Province Provincial Growth and Development Strategy and Free State Green Economy Strategy. At a district and local level, the Moqhaka Local Municipality IDP and SDF support the development of renewable energy. The site is also located within the Klerksdorp REDZ and Central STC. The area has therefore been identified as suitable for the establishment of renewable energy facilities.

Cumulative impact and the desirability of the Vlaktefontein Solar PV1 project

Further to the above, the cumulative impact needs to be assessed in determining the desirability of a project of this nature.

The following is applicable to the proposed Vlaktefontein Solar PV1 project:

- The negative biophysical, heritage, visual and agricultural cumulative impact of the proposed solar PV development is rated as Low and any cumulative impact that may occur is rated as being acceptable, especially when seen in context of the proposed development site situated in a REDZ.
- The social cumulative effect is rated as High/Very High *positive* due to the potential to create a

number of socio-economic opportunities for the local municipality, which, in turn, will result in a positive social benefit. The positive cumulative impacts include creation of employment, skills development and training opportunities and creation of downstream business opportunities. These benefits should also be viewed within the context of the limited economic opportunities in the area and the impact of the decline in the mining sector in recent years. This impact is rated as being highly positive.

It is clear that the cumulative impact associated with this solar PV development is desirable in terms of the high positive socio-economic impacts that will be realised when this, and the other 4 projects that form part of the Mercury Solar PV Cluster are being constructed.

CHAPTER 5: ALTERNATIVES

The NEMA EIA Regulations define *alternatives* as follows:

Alternatives, in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to the—

- a) property on which or location where the activity is proposed to be undertaken;
- b) type of activity to be undertaken;
- c) design or layout of the activity;
- d) technology to be used in the activity; or
- e) operational aspects of the activity;

and includes the option of not implementing the activity (the no-go or 'do nothing' alternative').

The key alternatives to consider with solar farms are the following :

- Site Selection
- Technology
- No Go Alternative

5.1 Site Selection Alternatives

The following main factors should be taken into consideration when selecting sites for solar PV facilities (in no particular order of importance):

- Solar irradiation
- Existing road infrastructure
- Access to the Eskom grid
- Willingness of the landowner to lease the property
- Renewable Energy Development Zones
- Strategic Transmission Corridors
- Environmental constraints
- Current land use and available land

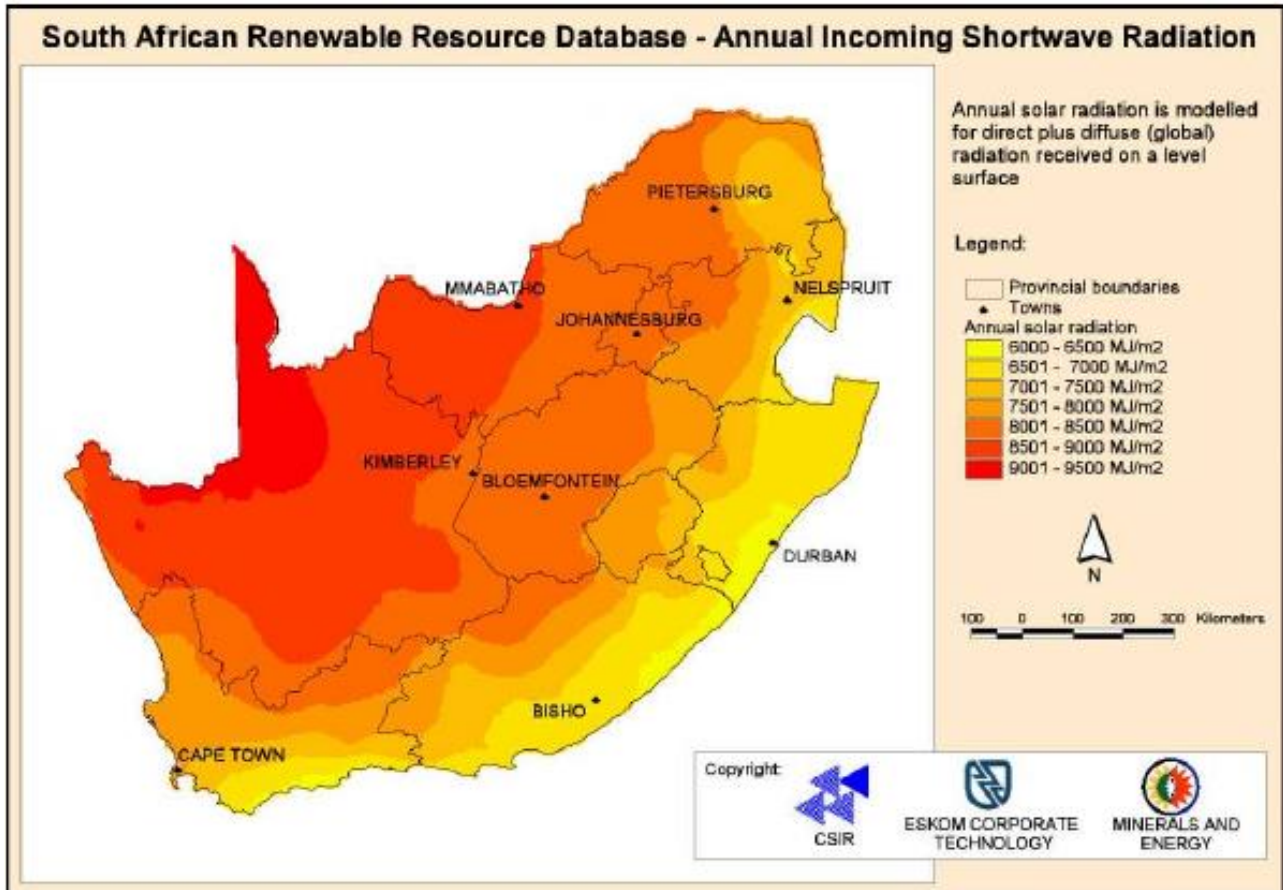
Taking the above into account, a site assessment area of approximate 4 580 hectares was initially identified within which further investigations took place. These specific points are discussed below to determine the fit of the development proposal in relation to these factors.

Solar Irradiation

South Africa experiences some of the highest levels of solar radiation in the world. The average daily solar radiation varies between 4.5 and 6.5 kWh/m² (16 and 23 MJ/m²). The figure below shows the annual solar radiation (direct and diffuse) for South Africa, which reveals considerable solar resource potential for solar water heating applications, solar photovoltaic and solar thermal power generation.

The solar radiation levels of an area are the one of the main determining factor in the success of a solar PV facility and it also play an important part during the selection process of a preferred bidder in the REIPPPP programme.

The proposed development site falls within an area which varies between 8001 –8500 MJ/m² per annum, which makes the site highly viable for a solar PV facility.



Existing road infrastructure

Construction material and PV components will be transported during the construction phase. The existing road infrastructure should therefore be in support of the proposed development in terms of access to the site(s), condition of the roads and existing road upgrades where required must be possible. This is a key factor when the economic viability of the project is being determined because transportation cost plays an important part in the overall financial viability of a project.

The Mercury Solar PV Cluster is accessible via the primary road (P15/2 / R76) in the south and an established network of existing farm roads, amongst them the S729 and the T3762 as well as the secondary road, Vermaasdrift Road (S643) from which the main access to the Vlakfontein Solar PV1 is possible.

Access to the Eskom grid

The Mercury Cluster solar PV facilities will be bid in future REIPPPP bidding rounds, which means that the generated electricity has to feed into the Eskom grid. Electrical infrastructure (substations and power lines) required to evacuate the energy are self-build projects which will be handed over to Eskom after construction. Construction cost plays a huge part in determining the overall liability of the project and constructing power lines over long distances can make the project economically not viable. The distance from the nearest Eskom substation therefore plays a crucial part when a site is being selected.

The distance between the existing Eskom Mercury Main Transmission Substation (MTS) and the proposed IPP Substation on the Vlakfontein Solar PV1 is approximately 3,1 km which implies that the project will be viable when the construction costs are taken into account.

Willingness of the landowner to lease the property

A solar development will not be possible without the buy-in of the landowner and the willingness of a landowner to lease the farm/property for solar development is being determined right at the onset of the site selection process.

The two registered landowners of the proposed Vlakfontein Solar PV1 facility has confirmed their willingness to lease the land for development, which is evident in the relevant consent form submitted with the application to DFFE and also the 'Notes on the Meeting with Directly Affected Landowners' submitted as Appendix G(3)(a) in this report.

Renewable Energy Development Zones

The Strategic Environmental Assessment for Wind and Solar Photovoltaic Energy in South Africa, 2015 has identified 11 Renewable Energy Development Zones (REDZs) that are of strategic importance for large scale wind and solar photovoltaic energy development, including the rollout of its supporting transmission and distribution infrastructure, in terms of Strategic Integrated Project 8: Green Energy in Support of the South African Economy.

Cabinet approved an integrated decision-making process for applications in terms of NEMA which states that a Basic Assessment process should be undertaken instead of a full Scoping and EIA process, even though Listing Notice 2 Nr 1 is being triggered. A shortened decision-making timeframe of 57 days will also apply.

The Mercury Solar PV Cluster falls entirely within the Klerksdorp REDZ.

Strategic Transmission Corridors

The Strategic Environmental Assessment for Electricity Grid Infrastructure (EGI) in South Africa has identified STCs that are of strategic importance for the rollout of the supporting large scale electricity transmission and distribution infrastructure in terms of Strategic Integrated Project 10: Electricity Transmission and Distribution.

Cabinet approved an integrated decision-making process for applications in terms of NEMA by means of

Government Gazette 41445, Notice Number 113 of 16 February 2018 which provides for the procedure to be followed in applying for environmental authorisation for large scale electricity transmission and distribution developments that fall within these STCs.

The Mercury Solar PV Cluster falls entirely within the Central STC, which further points to the desirability of the project at the proposed sites.

Environmental constraints

Environmental constraints, such as sensitive plant communities, wetlands, etc. have a direct impact on land available for development and form the backbone of the environmental impact assessment process. If large areas of land need to be conserved, the viability of the project will be jeopardised and other available land may be required. It is thus a crucial step in the site selection process.

Initial screening assessments followed by detailed environmental studies were done for the proposed solar PV facilities and the development layouts were guided by the results of these studies.

Current land use and available land

Almost the entire assessment area of the Mercury Solar PV Cluster is used for agriculture and is rated as having a high agricultural potential in the DFFE Screening Tool, dated 31 August 2022 (refer to Appendix B(1)). DALRRD's viewpoint is that land which is suitable for the viable and sustainable production of cultivated crops (arable land), should not be used for solar power generation, but rather conserved for crop production. This is justified by the fact that there is a scarcity of arable production land in South Africa, but there is an abundance of, particularly arid, non-arable land that could be used for solar development.

The client originally planned to construct at least 10x solar PV facilities within the identified assessment area. However, it quickly became clear that the high agricultural potential of the study area would play a major role in the number of sites and area size to be available for development. After the detailed screening assessments, which included site investigations by the agricultural specialist, fauna & flora specialist, avifauna specialist as well as an aquatic specialist, it was determined that five areas will be suitable for solar development. These five areas are known as the Mercury Solar PV Cluster.

The DFFE Screening Tool (included as Appendix B(1)) guided the choice of specialist involvement. The Basic Screening Assessment Report is attached under Appendix B(2). Detailed site-specific specialist reports are included in Appendix E. The result of these assessments and studies confirmed that the proposed PV facilities (inclusive of the Vlakfontein Solar PV1) are the most acceptable and viable alternatives from an environmental point of view.

5.2 Technology Alternatives

Two different technologies could be applicable, namely Photovoltaic (PV) Technology and Concentrated Solar Power (SCP)

PV Technology

Photovoltaic (PV) technologies, more commonly known as solar panels, generate power using devices that absorb energy from sunlight and convert it into electrical energy through semiconducting materials. These devices, known as solar cells, are then connected to form larger power-generating units known as modules or panels.

Advantages

- PV panels provide clean – green energy. During electricity generation with PV panels there is no harmful greenhouse gas emissions thus solar PV is environmentally friendly.
- PV cells have a very long lifespan that needs minimum upkeep.
- PV is currently the lowest price solar technology due to the lower costs of PV panels.
- Minimal operations and maintenance support staff required.
- Requires a minimal amount of water.

Disadvantages

- Some toxic chemicals, like cadmium and arsenic, are used in the PV production process. These environmental impacts are minor and can be easily controlled through recycling and proper disposal.
- Solar energy is somewhat more expensive to produce than conventional sources of energy due in part to the cost of manufacturing PV devices and in part to the conversion efficiencies of the equipment. As the conversion efficiencies continue to increase and the manufacturing costs continue to come down, PV will become increasingly cost competitive with conventional fuels.
- Energy storage options (batteries) are expensive.
- Significant power output fluctuations due to no inertia in the system.
- PV efficiency is significantly affected at high ambient temperatures.
- Solar power is a variable energy source, with energy production dependent on the sun. Solar facilities may produce no power at all some of the time, which could lead to an energy shortage if too much of a region's power comes from solar power.

Concentrated Solar Power (SCP)

CSP technologies use a mirror configuration that concentrates the sun's solar energy onto a receiver, which converts it to heat. The heat is then converted into steam to drive a turbine that produces electrical power.

Advantages

- CSP plants can use thermal energy storage systems to store the power until it's needed, for example during periods of minimal sunlight. The ability to store energy is what makes CSP a flexible source of renewable energy.
- CSP also provides a relatively continuous source of electricity, particularly in comparison to solar photovoltaics (PV) and wind power, which provide intermittent supplies.
- Because CSP plants can store solar energy in the form of molten salts, the electricity generated is predictable and reliable.

Disadvantages

- Concentrated solar power uses a lot of water to drive steam turbines and to cool thermochemical reactors. Although seawater may be seen as a possible solution, this could present solar radiation issues for the surrounding landscape.
- Similarly, CSP plants can attract animals with its light, and the heat can be fatal for some species.
- CSP plants are also expensive to run.
- Thermal energy storage materials that can withstand high temperatures are costly and difficult to source.

- Molten salt, for example, has a limited operating range because it solidifies at low temperatures and decomposes at high temperatures.
- Competition from other energy sources like solar PV and fission-based nuclear power means that CSP doesn't always receive the development it needs to become a primary energy source. As breakthroughs continue in other areas, concentrated solar power runs the risk of becoming obsolete.

In terms of technology, Photovoltaic (PV) Technology could have been considered against Concentrated Solar Power (SCP) technology. PV technology has however been identified by the developer as the preferred technology.

5.3 Layout Alternatives

The site layout of the Vlaktefontein Solar PV1 facility, included as Appendix A(5), was influenced mainly by the following:

- The main access point is provided directly off the S643 and in compliance with the requirements of the relevant traffic authorities.
- A combined delineated aquatic area with buffer zone, biodiversity terrestrial, avi-fauna and bat sensitivity area with relevant buffer zones had been identified and is excluded from the development footprint area.
- The visual specialist requires a 30m non-development buffer off Vermaasdrift Road.
- The heritage specialist requires a 200m buffer circle around the existing farmstead to be excluded from the development footprint area.
- The layout has also been guided by best practice and acceptable solar PV engineering principles.

5.4 The No Go Alternative

South Africa currently relies on coal-powered energy to meet more than 90% of its energy needs. As a result, South Africa is one of the highest per capita producers of carbon emissions in the world and Eskom, as an energy utility, has been identified as the world's second largest producer of carbon emissions.

The Vlaktefontein Solar PV1 facility will be bid in future REIPPPP rounds and the no-go option will mean that this bidding cannot take place. All the advantages of additional, clean, renewable electrical supply to the national Eskom grid will not be realised. A loss opportunity to reduce South Africa's very high carbon emissions would represent a huge negative social cost.

This project will contribute to the total renewable energy mix as targeted by the SA government and the no-go option will mean that an opportunity to be part of reaching this goal has been lost.

Temporary and permanent employment opportunities that will be created by the construction of this solar PV facility and electrical infrastructure will be forgone, another negative social cost that can be ill-afforded by South Africa which has a current unemployment rate of 34,9% as calculated in the third quarter of 2021; the Mqohaka municipality has an even higher unemployment rate which currently stands at 38.1%.

Negative impact that this project may have can all be mitigated to acceptable levels. The positive impacts, such as the establishment of a Community Trust and generation of income for the affected landowner

outweigh the negative impact which will all be low after mitigation has been applied. There is therefore no reason why the no-go option should be applied.

The No-Go option is not recommended and will not be further assessed during this Basic Assessment process.

5.5 Conclusion of Alternatives

Based on careful consideration documented in the previous paragraphs, the EAPs are confident that the proposed alternative of the Vlakfontein Solar PV1 facility with a contracted capacity of up to 100MW is a technically viable land use option for the site and is also acceptable from an environmental perspective since all expected negative impact can be mitigated to acceptable levels. The site selection assessment process clearly indicates that alternative solar PV facility sites for the Mercury Solar PV Cluster were thoroughly assessed.

CHAPTER 6: RECEIVING ENVIRONMENT & SPECIALIST STUDIES

6.1 General Description of the Study Area

6.1.1 General description

The centre point of the proposed Vlakfontein Solar PV1 is situated approximately 22km north-west of the small town of Viljoenskroon, 8,5km south of the Vaal River and approximately 6,6km north of the R76. It falls within the jurisdiction of the Moqhaka Local Municipality (MLM) in the Fezile Dabi District Municipality. The size of the combined properties is 493ha in extent of which the development footprint will affect approximately 151 ha.

Infrastructure affecting the sense of place in the macro area includes mining and electricity infrastructure. Mining includes the Harmony Moab Khotsong's gold mine approximately 6,4km west and the Vierfontein Colliery approximately 11,6km southwest of the proposed Vlakfontein Solar PV1 facility. The closest corner of the Vlakfontein Solar PV1 to the existing Mercury Transmission Substation is approximately 3,1km. Numerous powerlines (transmission and distribution lines) traverse the landscape.

There are three private nature reserves within the macro area, namely the Viljoenskroon Nature Reserve (declared a Private Nature Reserve in 1996) approximately is ± 20 km southeast of the site and the Mahemsvlei Private Nature Reserve (declared a Private Nature Reserve in 1994) approximately 16km north of the proposed Vlakfontein Solar PV1. These reserves are registered on the DFFE Protected Areas database but further information about these reserves could not be found and it is not known if the land is being managed as nature reserves or not. According to the Protected Areas Register the Mispah Game Farm (Nature Reserve) is situated approximately 5km west of the PV site. No information could be sourced on the Mispah Game Farm, but from Google Earth imagery it is obvious that the property is highly transformed with a large slime dam present on the property.

Farming activities within the macro area involves mostly maize (*Zea mays*) production. The Northern Free State is a major producer of staple crops and livestock. The project site of the proposed Vlakfontein Solar PV1 facility however, comprises mostly of *Eragrostis curvula-Cynodon dactylon* grassland. The entire proposed Vlakfontein Solar PV1 development site is not being cropped. Farming experience showed that it was too marginal for viable crop production.

The project site is relatively flat with the highest point being 1 388 masl in the south and 1 337masl in the north of the site.

The average temperatures vary from 9.3°C in June/July to 22.4°C in January and February. The wet season occurs from mid-November to mid-April with February tending to be the wettest month and July the driest month. The mean annual rainfall for the area is 511 mm, with the highest rainfall month on average being January (77mm) and the lowest, July (0mm).

6.1.2 Renewable energy projects in the macro area

Refer also to Paragraph 6.2 with regards to Cumulative Impact.

The development site falls within the Klerksdorp REDZ. In as far as could be established, no operational renewable energy sites are currently located in significant proximity to the site. The nearest operational facility, the 68MW Bokamoso PV facility, is located 42km southwest of the site, near Leeudoringstad. Bokamoso achieved commercial production in 2020. A total of 13 renewable energy facilities have historically been proposed or are currently being proposed within a 35km radius of the site. These include cluster developments currently being proposed (different applications), viz. Mercury Solar PV Cluster (Zaaiplaats Solar PV1, Vlakfontein Solar PV1 (this application), Kleinfontein Solar PV1, Hormah Solar PV1 and Ratpan Solar PV1), Red Rocket's Dominion Cluster, located 5km west of Klerksdorp and Naos Solar PV1, PV2 and PV3 approximately 2km directly north of the Vlakfontein Solar PV1 facility. Phofu Solar Power Plant is situated at Vierfontein directly south of the proposed Ratpan Solar PV1.

The table below was obtained from the Social Impact Assessment Report attached as Appendix E(6) and Items 12 and 13 were added resulting from public participation relating to the relevant projects.

	PROJECT	TYPE	MW	APPLICANT	STATUS
1	Dominion Cluster	Solar PV	300	Red Rocket	In process
2	Orkney PV	Solar PV	100	Genesis Orkney	EIA 2016
3	Kabi Vaalkop	Solar PV	225	Kabi Solar	Amendment 2017
4	Witkop Solar 2	Solar PV	61	Unknown	EIA 2013
5	Buffels 1	Solar PV	75	Unknown	EIA 2015
6	Buffels 2	Solar PV	100	Kabi Solar	EIA 2014
7	Unknown	Solar PV	50	Omega Invest	EIA 2010
8	Paleso	Solar PV	150	Paleso Solar	BAR 2021
9	Rietvlei	Solar PV	50	Keren properties	EIA 2012
10	Mercury Cluster (The Vlakfontein Solar PV1 forms part of this cluster)	Solar PV	540	Care of Mulilo Renewable Energy	In process
11	Unknown	Solar PV	50	Afropause 538	BAR 2011
12	Naos Solar PV1, PV2 and PV3	Solar PV	300 200 240	SOLA Group	In process
13	Phofu Solar Power Plant	Solar PV	250	Care of Environamics (EAP)	In process

Table 5 Historic and current renewable energy applications within 35km of the project area

6.2 DFFE Screening Tool

The DFFE Screening Tool Report dated 31 August 2022 is attached under Addendum B(1)(a).

Environmental Sensitivities

The Screening Tool Report identified certain Environmental Sensitivities within the proposed development area and, based on these results recommend specialist studies that need to be undertaken.

The following table is applicable to the Vlaktefontein Solar PV1 facility:

Theme	Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Agriculture Theme		X		
Animal Species Theme			X	
Aquatic Biodiversity Theme				X
Archaeological and Cultural Heritage Theme				X
Avian Theme				X
Civil Aviation (Solar PV) Theme				X
Defence Theme				X
Landscape (Solar) Theme	X			
Palaeontology Theme		X		
Plant Species Theme			X	
RFI Theme				X
Terrestrial Biodiversity Theme	X			

Table 6 Key Results from the Screening Tool Report

EAP consideration of the of the recommendations of the DFFE Screening Tool Report

The above sensitivities identified in the DFFE Screening Tool Report are indicative only and were verified by suitably qualified persons (the EAP or relevant specialist) which guided the extent of specialist assessments undertaken.

Impact Assessment	Motivation
Agricultural Impact Assessment	An <i>Agricultural Impact Assessment</i> was done and is summarised in Chapter 6, paragraph 6.6 and is included as Appendix E(8) of this report.
Landscape / Visual Impact Assessment	A <i>Visual Impact Assessment</i> was done and is summarised in Chapter 6, paragraph 6.5.2 and included as Appendix E(7) of this report.
Archaeological and Cultural Heritage Impact Assessment	A Heritage Impact Assessment which includes an Archaeological Specialist Study was done and is summarised in Chapter 6, paragraph 6.4.1 and included under Appendix E(5) of this report.
Palaeontology Impact Assessment	A Heritage Impact Assessment which includes a Palaeontological Desktop Study is summarised in Chapter 6, paragraph 6.4.2 is and included under Appendix F(5) of this report.
Terrestrial Biodiversity Impact Assessment	A <i>Terrestrial Ecological Assessment</i> was done and is summarised in Chapter 6.3.1 and is included under Appendix E(1) of this report.
Aquatic Biodiversity Impact Assessment	An <i>Aquatic Impact Assessment</i> was done and is summarised in Chapter 6, paragraph 6.3.2 and is included under Appendix E(2) of this report.
Civil Aviation Assessment	The Civil Aviation Theme was rated as having a Low Sensitivity and therefore no specialist input is proposed. The SA Civil Aviation Authority was approach for comment and further actions will be based on their instructions.
Defence Assessment	The Defence Theme was rated as having a Low sensitivity, and therefore no specialist input is proposed.
RFI Assessment	The RFI theme was rated as low sensitivity; however an <i>RFI Assessment</i> was done and is summarised in Chapter 7, paragraph 7.3 and is included under Appendix F(3) of this report.
Geotechnical Assessment	<p>The applicant will undertake site-specific geotechnical investigations during the design phase of the project, in other words after the EA has been issued. The final design of the foundations is done by engineers strictly according to generally acceptable engineering standards and norms, taking the site-specific geotechnical constraints into account.</p> <p>The absence of a geotechnical study during the EIA stages of the project should not impact on the viability of the project and is therefore not proposed to form part of the studies for Environmental Authorisation.</p>
Socio-economic Impact Assessment	A <i>Socio-economic Impact Assessment</i> was done and is summarised in Chapter 6, paragraph 6.5.1 and is included under Appendix E(6) of this Report.
Plant Species Assessment	This component is addressed under the <i>Terrestrial Ecological Assessment</i> as mentioned above. It is summarised in Chapter 6, paragraph 6.3.1 and is included under Appendix E(1) of this Report.

Animal Species Assessment	This component is addressed under the <i>Terrestrial Ecological Assessment</i> as mentioned above. It is summarised in Chapter 6, paragraph 6.3.1 and is included under Appendix E(1) of this Report.
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Table 7 Recommendation in terms of Specialist Studies

The need for the following specialist studies was subsequently confirmed:

- Terrestrial Ecological (Fauna & Flora) Impact Assessment
- Aquatic Impact Assessment
- Avifauna Impact Assessment
- Cultural Heritage Impact Assessment
- Visual Impact Assessment
- Bat Screening (Desktop) Assessment
- Social Impact Assessment
- Agricultural Impact Assessment

All specialist studies were undertaken according to the relevant protocol as stipulated in the Screening Tool Report.

Site Verification Report of the DFFE Screening Tool Report

In terms of the gazetted agricultural protocol, a site sensitivity verification must be submitted that:

- confirms or disputes the current use of the land and the environmental sensitivity as identified by the screening tool, such as new developments or infrastructure, the change in vegetation cover or status etc.;
- contains a motivation and evidence (e.g. photographs) of either the verified or different use of the land and environmental sensitivity.

A **Site Verification Report** was compiled and is included in Addendum B(1)(b).

6.3 Biophysical Environment

6.3.1 Terrestrial Biodiversity Assessment

A Terrestrial Biodiversity Assessment, dated March 2022, was undertaken by Enviroguard CC, represented by Prof Leslie Brown, and is attached under Appendix E(1). A summary thereof follows below.

The objectives of this study were to:

- Identify, describe, and delineate the different vegetation units present on the study site;
- Provide a description of the fauna (mammals, reptiles, amphibians) occurring within the study area;
- Identify species of conservation importance that could possibly occur on the proposed site;
- To provide a sensitivity map of the study area (where applicable); and
- To provide management recommendations to mitigate negative and enhance positive impacts of the proposed development.

FLORA

The Screening Tool Report included in Appendix B(1) identified the study area has having a very high sensitivity in terms of the Biodiversity Terrestrial Theme because according to the database portions of the site fall within an endangered ecosystem. The vegetation of the study area belongs to the endangered Vaal-Vet Sandy Grassland vegetation type (Gh 10) (Mucina & Rutherford 2006). The vegetation type is found on aeolian and colluvial sand overlying sand and mudstone. The ecologist for the project confirmed however that the vegetation of the study area shows little resemblance with this vegetation type. According to the Free State Nature Conservation (SANBIGIS) the larger area including the **Vlakfontein Solar PV1** site is listed as degraded, refer to Appendix B(3).

According to the Free State Biodiversity Plan (SANBI) the Mercury Cluster assessment area is listed as degraded or “other” with only two very small areas identified as CBAs. The **Vlakfontein Solar PV1** site (in green below) is listed as ‘degraded’, “Critical Biodiversity Area (CBA1 and CBA2) and “Ecological Support Area (ESA). Also refer to Appendix B((3) for a copy of this map.

Mercury Solar PV Cluster: Critical Biodiversity Areas and Ecological Support Areas Map

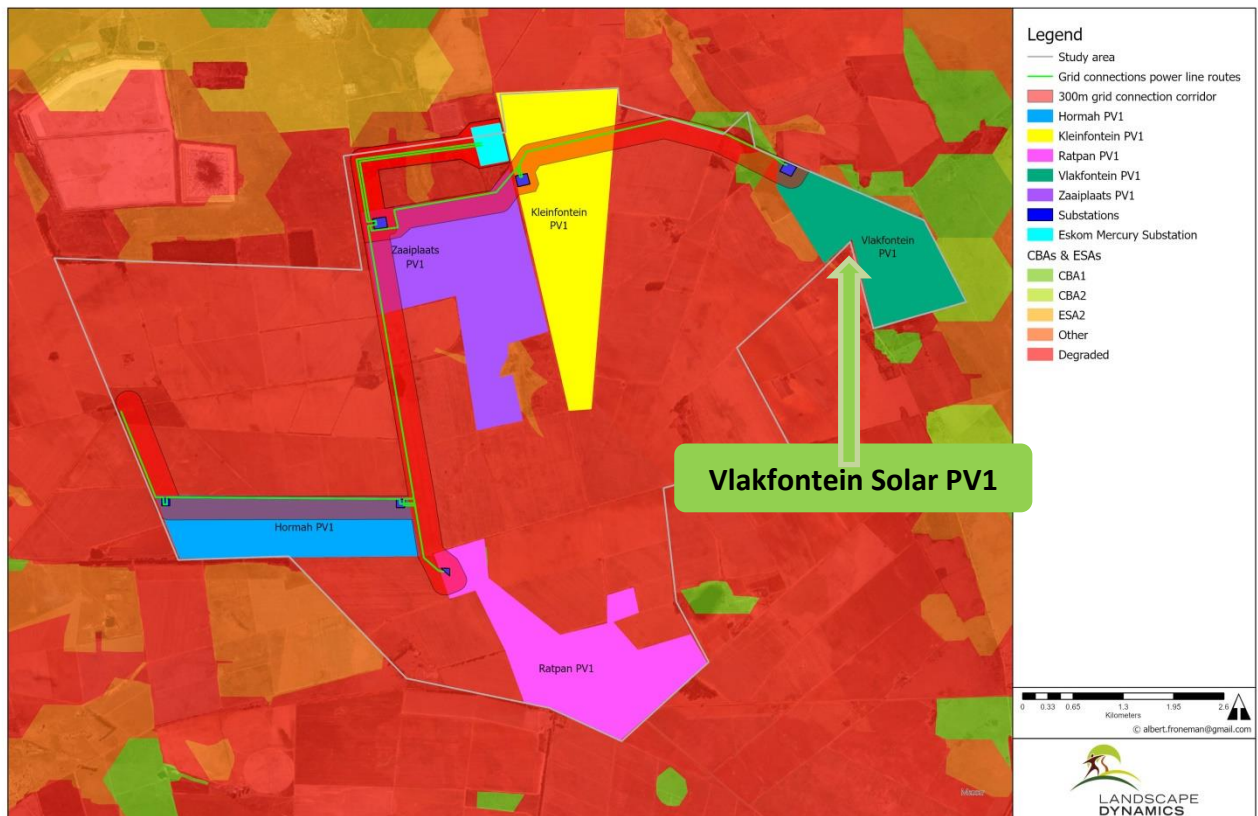


Figure 8: CBAs and ESAs Map, Free State Biodiversity Plan (SANBI)

Red data species

No protected plant species were identified in the project area. Marginally suitable habitat exists however for one species.

Alien plant species

The few individuals of the declared alien invader species present must be controlled. Alien invader species are a cause for concern since these species are not only spreading into the adjacent vegetation units, but also spread their seeds via bird species that utilise their fruits. The old forest plantations are dominated by the declared alien invader tree *Eucalyptus camaldulensis* (bluegum) and *Datura stramonium* (thorn apple / jimson weed); *Verbena bonariensis* (purple top) occurs in the wetland area.

Vegetation Units

The vegetation units applicable to the Vlakfontein Solar PV 1 are the following:

- *Digitaria eriantha-Eragrostis curvula* grassland
This grassland is currently used for grazing purposes by cattle. It seems as though some overseeding of the grasses *Eragrostis curvula* and *Digitaria eriantha* has taken place in the past to improve grazing value. Secondary successional / pioneer grass *Cynodon dactylon* also occurs. The area is used for rotational grazing practices and is thus fairly well managed with the vegetation cover remaining high. The vegetation has a moderate to low species richness and is mostly not representative of the original native vegetation that occurred. There are, however, little signs of erosion or habitat degradation. This unit has from a faunal and floral ecological perspective a medium ecological sensitivity.

- *Wetland areas*
This vegetation unit occurs on clay soil. There are no rocks present, and the vegetation is dominated by forb (sedge) species. The vegetation is characterised by the prominence of various grass and forb species such as *Paspalum dilatatum*, *Agrostis lachnantha*, *Eragrostis inamoena*, *Andropogon eucomus*, *Mariscus congestus*, *Coleochloa setifera*, *Kyllinga alba*, *Rorippa nasturtium-aquaticum*, *Cyperus rupestris*, *Cyperus congestus*, *Juncus spp.* Other species around the edges include the dwarf shrub *Seriphium plumosum*, the grasses *Eragrostis plana*, *Digitaria eriantha* and the forbs *Wahlenbergia caledonica*, *Ranunculus multifidus* and *Verbena bonariensis*. Refer to the Aquatic Assessment in Appendix E(2) which provides specific detail..

- *Eucalyptus camaldulensis* woodland
This unit is from an ecological point of view regarded as being transformed with no resemblance to the original native vegetation. It has low ecological sensitivity.is regarded as having a low ecological sensitivity

FAUNA

The faunal survey focused on the current status of threatened animal species occurring, or likely to occur within the proposed **Mercury Solar PV Cluster** assessment area, describing the available and sensitive habitats, identifying potential impacts resulting from the development and providing mitigation measures for the identified impacts.

Faunal habitat within the entire Mercury Cluster assessment area

- Transformation of the natural open grasslands and palustrine wetlands into homogenous transformed agricultural lands will have resulted in the alteration of the faunal composition as well as adjacent transformed agricultural, mining (north and east of the assessment area) and degraded or alien

- invaded areas.
- The majority of the total assessment and adjacent areas are utilised for intensive agricultural (maize) and planted pasture activities as well as livestock (cattle and sheep) grazing.
- Basal cover was low adjacent to current off-road tracks, livestock pathways as well as kraals or feeding lots.
- Forb species diversity was low throughout the assessment area due to utilisation of the remnant patches of open secondary succession grasslands for livestock (cattle) grazing activities as well as planted pastures.
- Dense weed and alien invader floral species, i.e. *Verbena bonariensis* are present especially within the moist fallow lands as well as *Eucalyptus camaldulensis* woodlots.

Amphibians

The macro area comprises homogenous transformed agricultural lands. Fallow agricultural lands have been re-colonised by pioneer weedy plant and grass species. Frogs have been heavily impacted on by habitat destruction, transformation of wetlands as well as pesticides and fertilizers associated with intensive agricultural activities. Several frog species were however recorded within the area.

The Giant Bullfrog (*Pyxicephalus adspersus*) is a protected frog species whose conservation status has been revised and was previously included as a Red Data Species under the category 'Lower Risk near threatened' (Minter et al. 2004). The seasonal stream and wetland within the area offers no suitable breeding habitat for Giant Bullfrogs as they have been heavily impacted by previous agricultural activities. The shallow seasonal pans or depressions have been ploughed and planted with maize.

Reptiles

No threatened reptile species are likely to occur due to lack of suitable habitat.

Mammals

The majority of larger mammal species are likely to have been eradicated or have moved away from the area, as a result of previous and current agricultural activities, hunting and poaching as well as severe habitat alteration and degradation. The site offers no suitable habitat for Tsessebe, Bontebok, Hartman's Mountain Zebra or Lechwe - these will be restricted to the private and provincial nature reserves. The open secondary succession grasslands and palustrine wetlands and seasonal drainage line offer marginally suitable habitat for serval, African clawless otters and South African hedgehogs.

TERRESTRIAL ECOLOGICAL IMPACTS IDENTIFIED

The main potential impacts on Terrestrial Ecology identified are as follows:

Construction Phase

- Vegetation clearance/habitat destruction
- Soil erosion and pollution
- Spread and establishment of alien invasive plant species
- Negative effect of human activities on fauna and road mortalities
- Loss of biodiversity

Operational Phase

- Soil and water pollution
- Spread and establishment of alien invasive species
- Negative effect of human activities on fauna and road mortalities
- Negative effect of fences on dispersal movements of fauna

- Negative effect of light pollution on nocturnal fauna

These impacts and proposed mitigation measures are discussed in detail in Chapter 9 of this report.

CONCLUSION OF THE TERRESTRIAL ECOLOGY ASSESSMENT

According to the DFFE screening tool the vegetation of the study site has an overall low sensitivity, the faunal aspects a low sensitivity with smaller sections regarded as medium sensitivity for both plants and animals. Overall, the terrestrial biodiversity regarded as high. Due to the past and current agricultural activities the only areas regarded as having a high biodiversity sensitivity is the water courses. All of the envisaged impacts identified were either Low or Negligible. Only the Seasonal Stream has connectivity with similar areas further north and act as a potential dispersal or biological corridor for remaining wetland associated faunal species. It is imperative that the dispersal movements of remaining faunal species are not further restricted by impenetrable fences or walls. Suitable migratory fences must be erected adjacent to the conserved wetlands and seasonal stream and buffer zones. No artificial lighting must be directed into the conserved wetlands and stream as well as appropriate rehabilitated buffer zones.

Based on the site verification and detailed survey visit, the ecological impacts of the proposed development of the area for the purpose of the **Vlakfontein Solar PV1** farm were assessed and is not thought that development of the majority of the vegetation units would have a large negative impact on the environment provided that the mitigation measures as indicated in the specialist report are incorporated into the management plan and adhered to. No development is however allowed within the watercourse and its associated buffer zones.



Figure 9 Terrestrial Biodiversity Sensitivity Map

Key: Yellow=Low; Orange=Medium; Red=High

6.3.2 Aquatic Specialist Impact Assessment

An *Aquatic Specialist Impact Assessment*, dated April 2022, was undertaken by BlueScience (Pty) Ltd,

represented by Ms Toni Belcher, and is attached under Appendix E(2). A summary thereof follows below.

The **Mercury Solar PV Cluster** falls within the Middle Vaal Water Management Area within the catchment of the Vaal River. The site is not in a Strategic Water Source Area for surface or groundwater, neither is it considered a Freshwater Priority Area River sub-catchment. The freshwater features in the wider study area consist primarily of small unnamed, non-perennial tributaries of the Vaal River. The water quality is relatively poor and the aquifer has a medium to high susceptibility to contamination from anthropogenic activities. Some depression wetlands or pans are scattered within the Mercury Cluster assessment area. The wetlands have mostly been severely modified or even lost within the agricultural area but there are still pockets of wetlands remaining that have also been avoided by agricultural activities due to their seasonal wetness. The wetland areas within the wider study area can be classified as Dry Highveld Grassland pans.

The DFFE Screening Tool Report (updated in August 2022) for the **Vlakfontein Solar PV1** site identified the site as having a low aquatic sensitivity. However, an unnamed tributary of the Vaal River and its associated seep and valley bottom wetland areas passes through the centre of the project area. This watercourse has been delineated and is indicated with an appropriate buffer zone. This is considered to have a high ecological sensitivity area (contrary to the DFFE Screening Tool). The development footprint of the PV farm must exclude this area. No development is allowed within this area without water use authorisation in place – i.e. this will refer only to roads and bridges if construction activity is required that will affect this delineated watercourse area.

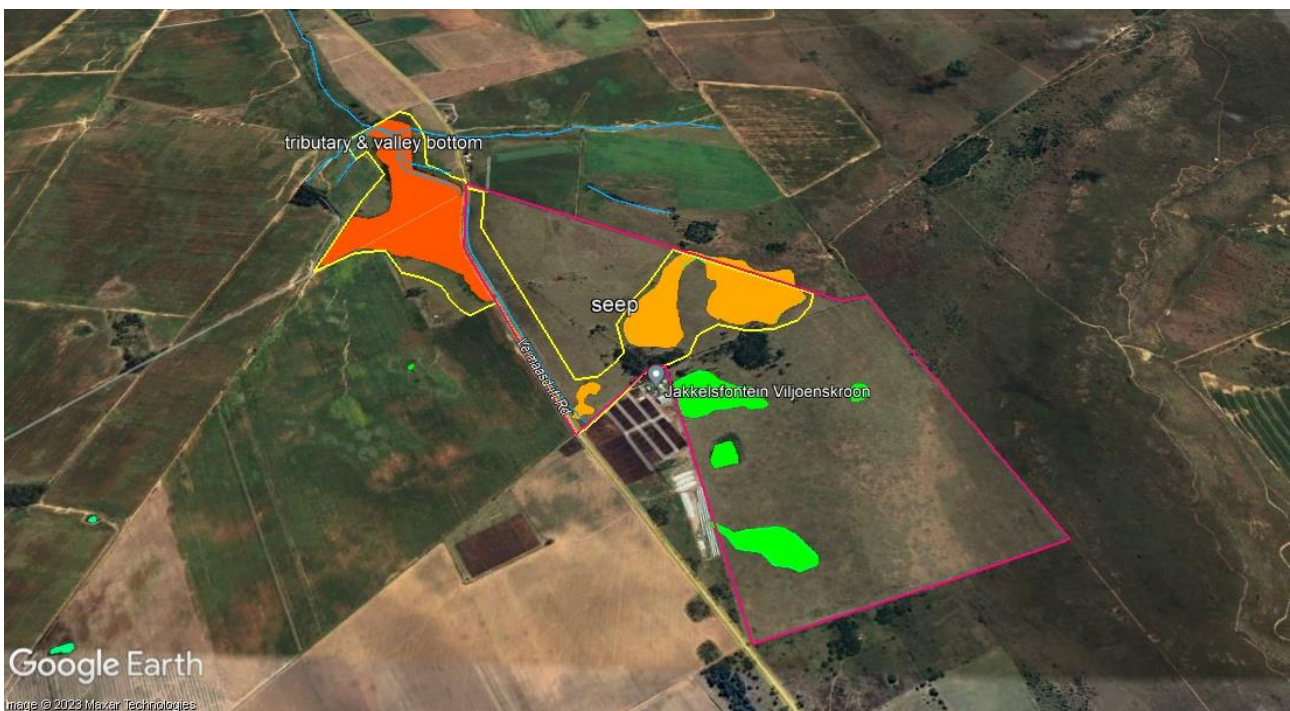


Figure 10 Aquatic Impact Sensitivity Map for Vlakfontein Solar PV1

Key: Pink line = Vlakfontein Solar PV1 boundary; yellow line = delineated watercourse with buffer zone (high ecological sensitivity, must be excluded from the development footprint); green = small or degraded wetlands (low aquatic sensitivity, modified by agricultural activities no constraint for development).

Legislative Requirement in terms of the National Water Act, 1998 (Act No 36 of 1998)

The NWA aims to regulate the use of water and activities which may impact on water resources through the categorisation of 'listed water uses', encompassing water abstraction and flow attenuation within catchments

as well as the potential contamination of water resources. The Department of Water and Sanitation (DWS) is the administering body in this regard. Defined water use activities require the approval of DWS in the form of a General Authorisation (GA) or a Water Use Licence (WUL).

The PV components and associated infrastructure will be constructed immediately adjacent to the delineated watercourses (within 500m from a wetland), which pose a risk of changing the bed, banks or characteristics of the watercourses or impeding or diverting flow in the watercourses. Also, an existing access road crossing a watercourse area will be upgraded and developed. Water Use Authorisation is therefore required.

A preliminary risk assessment was compiled as per DWS requirement and it was concluded that, provided the recommended mitigation measures are implemented, the risk of the activities degrading the adjacent aquatic features will be low; therefore the water use activities would fall within the ambit of General Authorisations for Section 21 (c) and (i) water use activities.

CONCLUSION OF THE AQUATIC IMPACT ASSESSMENT

Based on the findings of the aquatic biodiversity assessment report, there should be no reason why the proposed **Vlaktefontein Solar PV1** facility and its associated activities, cannot be approved from an aquatic ecosystem point of view on condition that mitigation as proposed is implemented.

6.3.3 Avifaunal Compliance Statement & Impact Assessment

An Avifaunal Compliance Statement & Impact Assessment, dated April 2022, was undertaken by Chris van Rooyen Consulting, represented by ornithologist Mr Chris van Rooyen and Mr Albert Froneman, and is attached under Appendix E(3). A summary thereof follows below.

Important Bird Areas (IBAs)

The Suikerbosrand Nature Reserve IBA SA022 is the closest IBA and is located approximately 125km north-east of the site. The proposed development is not expected to have any impact on the avifauna in this IBA due to the distance from the development.

Protected Areas

The site does not form part of a formally protected area. The closest officially protected area is the Mispah Game Farm which is located approximately 5 km to the east of the site. No information could be sourced on the Mispah Game Farm, but from Google Earth imagery it is obvious that the property is highly transformed with a large slime dam present on the property. The proposed development is not expected to have any impact on the avifauna in this nature reserve due to the highly degraded nature of the habitat.

Bird Habitat

The habitat in the assessment area is highly transformed and very little natural grassland remains. The following bird habitats were recorded within the Vlaktefontein Solar PV1 assessment area:

- Disturbed grassland
- Wetlands and drainage lines
- Agriculture (crops and cultivated grazing)
- Alien trees

Of importance in the assessment area of the **Vlaktefontein Solar PV1** is the drainage line associated with a wetland system. Wetlands are important refuges for a number of priority species, including the Marsh Owl that often breeds in the tall rank grassland around wetlands. The wetland must be buffered with a 50m solar panel

exclusion zone to prevent the disturbance of wetland birds during the construction period, and to allow free access to the wetland for birds commuting to and from the wetland.

IMPACTS ON AVIFAUNA IDENTIFIED

The following impacts have been identified relative to avifauna:

Planning & Design Phase

- Entrapment in perimeter fences (planning the fence design)

Construction Phase

- Displacement of priority species due to disturbance and habitat transformation associated with the construction of the solar PV facility and associated infrastructure.

Operational Phase

- Mortality of priority species due to collision with solar panels
- Entrapment of birds in the perimeter fence.

These impacts and proposed mitigation measures are discussed in detail in Chapter 9 of this report.

CONCLUSION OF AVIFAUNA IMPACT ASSESSMENT

The total assessment area contains no confirmed habitat for species of conservation concern (SCC) as defined in the Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020, namely listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable. The absence of SCC was confirmed during the site surveys. Based on these criteria, the study area is correctly classified as low sensitivity for avifauna. No fatal flaws were discovered during the investigation at the Vlakfontein Solar PV1 site.

It is recommended that the **Vlakfontein Solar PV 1** be authorised on condition that the proposed mitigation measures as detailed in the Impact Assessment Tables in Chapter 9 and the EMPr (Appendix H) are strictly implemented.

6.3.4 Bat Screening Assessment

A Bat Screening Assessment (dated May 2022) was undertaken by Inkululeko Wildlife Services, represented by Ms Caroline Lötter, and is attached as Appendix E(4). A summary thereof follows below.

As detailed bat surveys, monitoring, and impact assessments are currently not required for proposed solar projects in South Africa, this desktop bat screening assessment serves to inform on the potential impact of the Mercury Solar PV Cluster project on bats in the region.

Based on available bat occurrence records, eight bat species have been recorded in the region, all of which are listed as Least Concern. None of the listed species are endemic to South Africa, nor do any have any special protection associated with them.

Bat activity in the Highveld Grasslands ecoregion is considered low and only one migratory bat species, *viz.*

the Natal Long-fingered Bat (*M. natalensis*) is highly likely to occur in the study area. Given the infrastructure associated with the proposed solar development, and that the study area does not intercept a known or predicted migratory pathway for this species, these bats should not be at any higher risk of fatality from the proposed development than other bat species. The proposed development is also unlikely to pose a risk to the migratory Temminck's Myotis (*Myotis tricolor*), which was rated with a low likelihood of occurrence.

Two important bats roosts, namely the Venterskroon and Rooipoort caves, are situated within 40km north-east of the proposed site. While the proposed project would not infringe on a protective 20km buffer around these caves it is important to consider that destruction of habitat surrounding major roosts can severely impact the associated bat population(s).

Considering that the **Mercury Solar PV Cluster** assessment area largely comprises cultivated fields and disturbed fallow and/or pasture fields, construction and operation will most likely impact the availability of crop pest and other insect prey for aerial-foraging species such as the Egyptian Free-tailed Bat (*Tadarida aegyptiaca*). A growing number of studies indicate that bat activity in southern Africa can be highly concentrated over cultivated fields where there is a high abundance of insect pests. This can be a concern for wind energy developments, but for solar developments, disturbance of terrestrial habitats is a greater concern.

Surface water resources (whether natural or artificial, or perennial or non-perennial) provide bats with essential drinking water, a concentrated availability of insect prey, possible roosting trees, as well as landmarks and corridors for movement. For these reasons, all surface water resources should be treated with high conservation importance for bats.

The main potential impacts on bats identified are as follows:

- Destruction or disturbance of bat roosts
- Destruction or disturbance of bat foraging habitat
- Displacement of bats from habitat
- Bat collisions with infrastructure

These impacts and proposed mitigation measures are discussed in detail in Chapter 9 of this report.

It was concluded that the proposed Mercury Solar PV Cluster Project will not cause significant impact to bat populations in the area. Although very little literature exists on the impacts of solar farms on bats, the specialists believe that any impacts to bats due to construction, operation, and decommissioning of the proposed infrastructure will be relatively low. The desktop study recommended that all 'High' sensitive areas are avoided during construction and operation of the facility.



Figure 11: Bat sensitivity map for the Vlakfontein Solar PV1 site

Key: Red = High – to be excluded from the project development area; orange = medium; yellow = low

CONCLUSION OF THE BAT SCREENING ASSESSMENT

It was concluded that the proposed Mercury Solar PV Cluster Project will not cause significant impact to bat populations in the area. Although very little literature exists on the impacts of solar farms on bats, the specialists believe that any impacts to bats due to construction, operation, and decommissioning of the proposed infrastructure will be relatively low.

Provided that all 'High' sensitive areas are avoided during construction and operation of the facility, the specialists regard the development of the **Mercury Solar PV Cluster** as feasible from a bat impact perspective.

6.4 Cultural / Historical Environment

6.4.1 Heritage Impact Assessment

A Heritage (including Archaeology and Palaeontology) Impact Assessment (dated May 2022) was undertaken by CTS Heritage, represented by Ms Jenna Lavin and is attached under Appendix F. It concluded as follows:

ARCHAEOLOGY & HERITAGE

- No significant archaeological resources were noted within the Vlakfontein Solar PV1 development area.
- It was recommended that tree avenues located along roads, access routes and farm boundaries be retained as far as possible.

- A portion of the tree plantation located within 200m of the marked farm homestead should also be retained in order to shield the existing homestead from the PV facilities and retain some sense of place.

General mitigatory measures such as procedures to follow in the event that additional heritage resources such as additional graves are discovered had been provided.

PALAEONTOLOGY

Based on experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the overlying deep soils and sands of the Quaternary. There is however a very small chance that fossils may occur in the shales below ground of the early Permian Vryheid Formation. The impact on the palaeontological heritage would be low, therefore, as far as the palaeontological is concerned, the projects should be authorised. A Chance Fossil Finds Procedure is included in the Environmental Management Programme.

HERITAGE SENSITIVITIES MAP

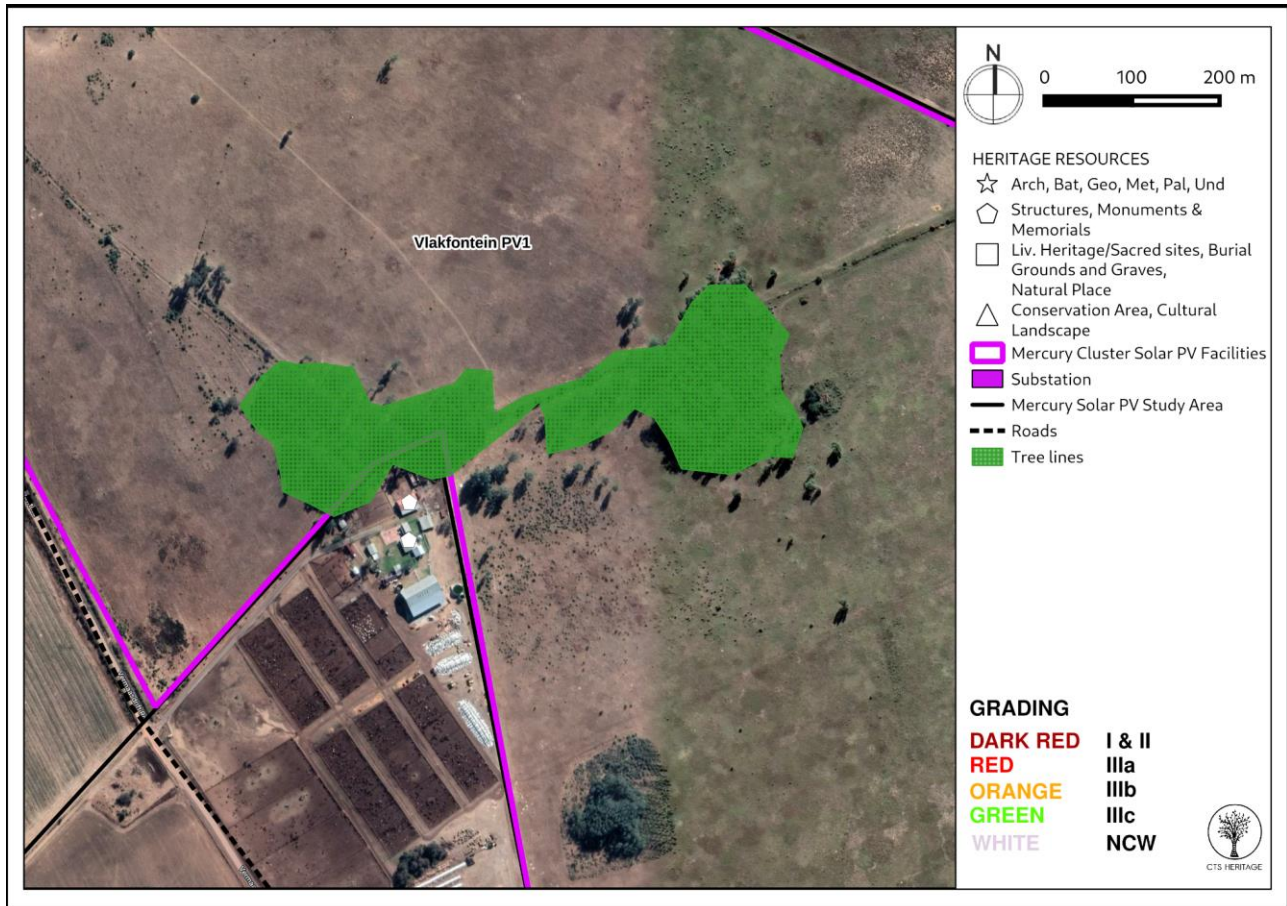


Figure 12 Heritage Sensitivities Map

Key: Green = Tree lines to be excluded from development area

CONCLUSION OF HERITAGE IMPACT ASSESSMENT

From a heritage (inclusive of archaeology and palaeontology) there is no reason why the proposed Vlakfontein Solar PV1 cannot be approved, on condition that the mitigation measures proposed are implemented.

6.5 Social Environment

6.5.1 Social Impact Assessment

A Social Impact Assessment (SIA), dated May 2022, was undertaken by Tony Barbour Environmental Consulting and is attached under Appendix E(6). A concise summary thereof follows below.

A key component of the SIA process is to assess the proposed development in terms of its fit with key planning and policy documents. As such, if the findings of the study indicate that the proposed development in its current format does not conform to the spatial principles and guidelines contained in the relevant legislation and planning documents, and there are no significant or unique opportunities created by the development, the development cannot be supported. Compliance with the following planning documents and policies have however effectively been illustrated:

National Policy

National Energy Act (Act No 34 of 2008)

White Paper on the Energy Policy of the Republic of South Africa

White Paper on Renewable Energy

Integrated Energy Plan

National Development Plan

New Growth Path Framework

National Infrastructure Plan

The three energy SIPS are SIP 8, 9 and 10.

SIP 8: Green energy in support of the South African economy

SIP 9: Electricity generation to support socio-economic development

SIP 10: Electricity transmission and distribution for all

Integrated Resource Plan

Strategic Environmental Assessment (SEA) for Wind and Solar PV energy in South Africa

Provincial and Municipal Policies and Frameworks

Free State Provincial Spatial Development Framework

Free State Green Economy Strategy

Free State Investment Prospectus

Fezile Dabi District Municipality Integrated Development Plan

Fezile Dabi District Municipality Climate Change Vulnerability Assessment and Response Plan

Moqhaka Local Municipality Integrated Development Plan

Moqhaka Local Municipality Spatial Development Framework

The primary mandate of the Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) is to secure electrical energy from the private sector for renewable and non-renewable energy sources. With regard to renewables, the programme is designed to reduce the country's reliance on fossil fuels, stimulate an indigenous renewable energy industry and contribute to socio-economic development and environmentally sustainable growth. The IPPPP has been designed not only to procure energy but has also been structured to contribute to the broader national development objectives of job creation, social upliftment and broadening of economic ownership. Key considerations are energy supply; energy costs, investments; South African Citizen Shareholding (contributing to BBBEE); community shareholding and community trusts; as well as procurement spend and preferential procurement; leveraging employment opportunities, socio-economic development contributions and Contribution to cleaner energy and water savings.

Potentially sensitive social receptors in significant proximity to the **Mercury Solar PV** cluster site are limited. This is linked to the sparse settlement pattern in general, and the absence of dwellings on most properties. As indicated above, the land uses to the north of the study area have been affected by mining and the Mercury substation. The areas to the west, east and south consist of intensively cropped land largely associated with maize. The relatively flat landscape limits sighting distances. No tourism receptors are located in significant proximity to the site.

IMPACTS IDENTIFIED DURING THE SOCIAL IMPACT ASSESSMENT

Construction

Potential positive impacts

- Creation of employment and business opportunities, and opportunity for skills development and on-site training.

Potential negative impacts

- Impacts associated with the presence of construction workers on local communities.
- Impacts related to the potential influx of jobseekers.
- Increased risks to livestock and farming infrastructure associated with the construction related activities and presence of construction workers on the site.
- Increased risk of grass fires associated with construction related activities.
- Noise, dust, and safety impacts associated with construction related activities and vehicles.
- Impact on productive farmland.

Operation

Potential positive impacts

- The establishment of renewable energy infrastructure.
- Creation of employment, business opportunities, skills development and training.
- Generation of additional income for the landowner.
- Benefits associated with the establishment of a Community Trust.
- Create opportunity for improved security.

Potential negative impacts

- The visual impacts and associated impact on sense of place.
- Potential impact on property values.
- Potential impact on tourism.

These impacts are discussed in detail, and mitigation measures given in Chapter 9 of this report.

Key issues are the following:

- The findings of the SIA concluded that the development of the proposed Vlakfontein Solar PV1 will create employment and business opportunities for locals during both the construction and operational phases of the project.
- The establishment of Community Trusts associated with the proposed Vlakfontein Solar PV1 facility will benefit the local community in the area..
- The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the negative environmental and socio-economic impacts associated a coal-based energy economy and the challenges created by climate change, represents a significant positive social benefit for society as a whole.
- The findings of the SIA also indicate that the Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) has resulted in significant socio-economic benefits, both at a national level and at a local, community level. These benefits are linked to foreign Direct Investment, local employment and procurement and investment in local community initiatives.
- The site is also located within the Klerksdorp REDZ. The area has therefore been identified as suitable for the establishment of renewable energy facilities.
- The owner indicated that there were no concerns with the proposed layout. Only portions of the relevant properties are considered suitable for cropping. The loss of cropped areas can be accommodated within their larger operation.

The following recommendations are made to address the potential negative impacts:

- The final design and layout should ensure that the loss of productive farmland is avoided and/or minimised.

- Damage to local farm roads caused by construction traffic must be repaired on an on-going basis throughout and on completion of the construction phase.
- The proponent should prepare a Stakeholder Engagement Plan (SEP) and Community Health, Safety and Security Plan (CHSSP) prior to commencement of construction phase.

CONCLUSION OF THE SOCIAL IMPACT ASSESSMENT

The establishment of the Vlakfontein Solar PV1 is supported by the findings of the SIA. The enhancement measures listed in the report should be implemented in order to maximise the potential benefits. The findings of the SIA also indicated that all of the potential negative impacts can also be effectively mitigated.

6.5.2 Visual Impact Assessment

A Visual Impact Assessment, dated July 2022, was compiled by VRM Africa, represented by Mr Steve Stead and is attached under Appendix F. A concise summary thereof follows below.

Visually, the regional landscape has a high absorption capacity: there are many visually intrusive artificial features present in the general locality which will serve to detract and diminish the visual impact presented by the new PV installations and supporting infrastructure. These include numerous powerlines, converging on a large regional Mercury Substation, mining features (mine dump) and agro-industrial features, such as centre pivot irrigation schemes. While the reflective nature of the PV panels may draw attention to the installations, visual intensity from receptors located over 6km from the site will further be diminished by hazy atmospheric conditions which tend to prevail during the highveld winters.

Opportunities relating to the **Vlakfontein Solar PV1**:

- Background view of the mining related landforms where the landscape is partially degraded from the infrastructure and power lines.
- Partially undulating terrain reduces intervisibility.
- No receptors of tourist-related nature within the project ZVI.
- A single farm-related receptor with some buffering from the PV landscape change.
- Potential for reduction in higher levels of visual intrusion with mitigation.

Constraints addressed by the proposed mitigation measures include the following:

- Existing rural sense of place has Medium to High levels of Scenic Quality in areas not visually exposed to the Mercury Substation.
- Proximity to drainage lines and wetlands that add to the local sense of place.
- High Visual Exposure to the farm road receptors.

IMPACTS IDENTIFIED DURING THE VISUAL IMPACT STUDIES

Construction Phase

- Partial loss of rural sense of place.
- Windblown dust generated from vegetation removal, as well as dust from moving vehicles.
- Potential soil erosion from temporary access roads and laydown areas.
- Windblown litter from the laydown and construction sites.
- Lights at night for security detracting from the current, semi-dark rural sense of place.

Operational Phase

- Given the long term operation of the PV facility, the PV panels will become a fixture in the landscape, changing the local sense of place to that of a semi-industrial landscape context, within a partially degraded rural landscape setting

These impacts and proposed mitigation measures are discussed in detail in Chapter 9 of this report.

CONCLUSION OF THE VISUAL IMPACT ASSESSMENT

It is the recommendation that the proposed development should commence with mitigation for the following key reasons:

- The proposed development areas have background views of degraded mining landscapes or are within proximity of the Mercury Substation where the rural agricultural landscape is partially degraded.
- Receptors are few and have partial visual screening of the proposed landscape change.
- No tourist related activities are making use of the rural agricultural landscapes.

Proposed mitigation to ensure that the landscape change remains congruent with the rural agricultural landscape character includes the following:

- 30m development exclusion buffer of the farm roads as a non-development buffer.
- Retaining existing medium sized trees within the buffer.

6.6 Agricultural Agro-Ecosystem Specialist Assessment

An Agricultural Agro-Ecosystem Specialist Assessment, dated May 2022 was undertaken by Mr Johann Lanz and is attached as Appendix E(8). A summary thereof follows below.

In the case of the **Mercury Solar PV Cluster**, almost all of the land within the assessment area is rated as having a high agricultural sensitivity in the DFFE Screening Tool. It was therefore imperative to ground-truth and assess these ratings and to put the proposed development proposal in context with the importance of conservation of agricultural resources.

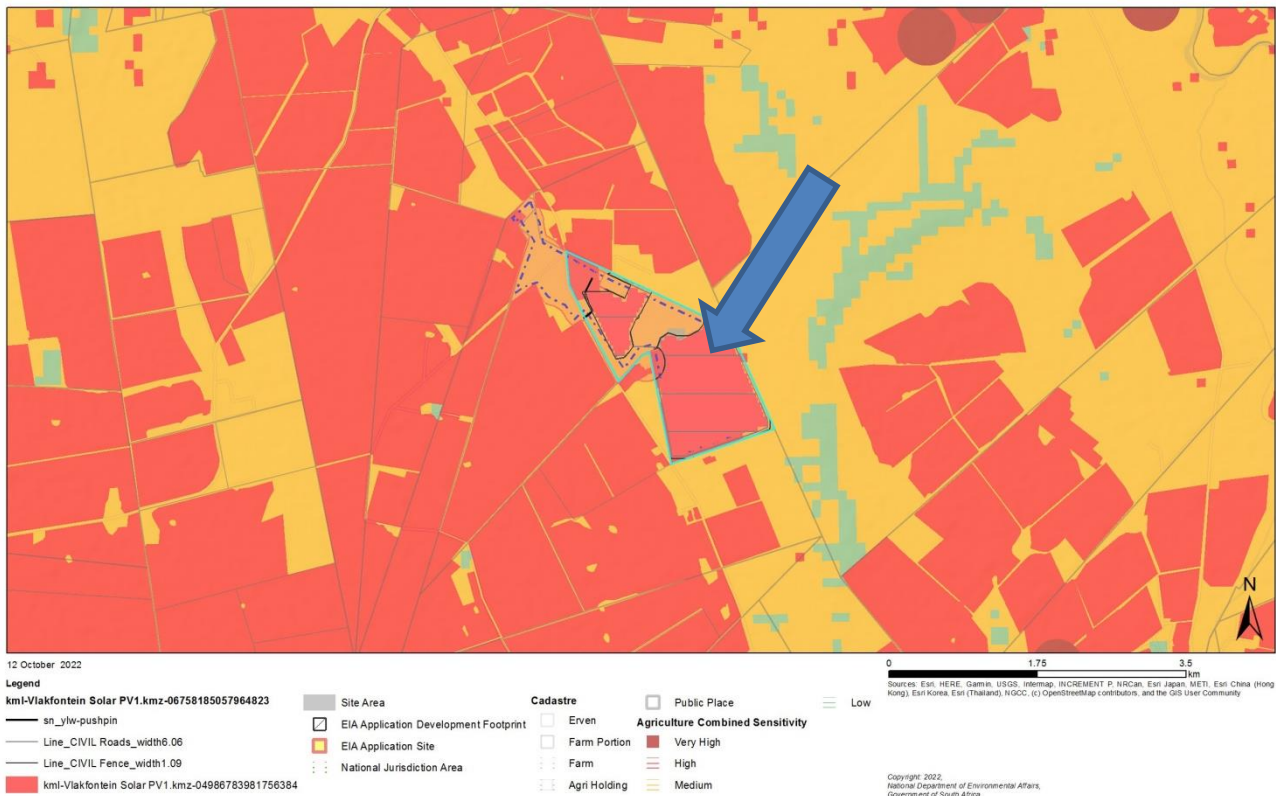


Figure 13 Agricultural Sensitivities Potential of Vlakfontein Solar PV1 according to the DFFE Screening Tool Report

Key: Red= Very high; Orange= Medium

During ground-truthing and further investigations, as described in significant detail in the Basic Screening Assessment Report in Appendix B(2), the initially proposed Mercury Solar PV Cluster was significantly downscaled to the currently proposed 5x solar PV facilities to exclude high potential land from development.

The entire Mercury Solar PV Cluster development area as is currently proposed has been deliberately laid out on the poorer soils that are limited in their suitability for crop production. Soils in these areas proposed for the solar development farms, especially in the Zaaiplaats and Kleinfontein PV areas are predominantly limited in depth by poor drainage that causes saturation in underlying horizons and thereby limits root development and depth. Many of these soils are also depth-limited by a distinct transition to a dense, underlying clay horizon in the subsoil. Furthermore the leached E horizons that are present as a result of the drainage limitations, have low water and nutrient holding capacity and can also have low pH. Crops on these soils are at risk of water logging in wet seasons and suffering from drought in dry seasons because the poorly developed, shallow roots and the soil's low water holding capacity provide an insufficient moisture reservoir to carry the plants through the season. Soils with depth limitations due to cemented, hard plinthic horizons (Glencoe soil form) or underlying rock (Mispah and Glenrosa soil forms) also occur within the investigated area.

With regards to the Vlakfontein Solar PV1, none of the proposed development site is currently or has recently been cropped. Farming experience showed that it was too marginal for viable crop production. Soils are limited by shallow depths to underlying bedrock in places and by very low water and nutrient holding capacity across the site.

IMPACTS IDENTIFIED IN THE AGRICULTURAL AGRO-ECONOMIC SPECIALIST ASSESSMENT

Negative Impacts

- Loss of agricultural potential by occupation of land
- Loss of agricultural potential by soil degradation

Positive impact

- Enhanced agricultural potential through increased financial security for farming operations
- Enhanced agricultural potential through improved security against stock theft and other crime

The following standard, best practice mitigation measures are recommended for controlling soil degradation at each project site.

- Implement an effective system of storm water run-off control, where it is required -that is at any points where run-off water might accumulate. The system must effectively collect and safely disseminate any run-off water from all accumulation points and it must prevent any potential down slope erosion.
- Any occurrences of erosion must be attended to immediately and the integrity of the erosion control system at that point must be amended to prevent further erosion from occurring there.
- Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize disturbed soil against erosion, and to reduce dust formation.
- If an activity will mechanically disturb the soil below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface, and then stabilized by facilitating vegetation cover.

These impacts and proposed mitigation measures are discussed in detail in Chapter 9 of this report.

CONCLUSION OF THE AGRICULTURAL AGRO-ECONOMIC SPECIALIST ASSESSMENT

The conclusion of this Agricultural Agro-Economic Specialist Assessment is that the proposed development offers a win-win scenario: it will cause very little loss of future agricultural production potential and the development of renewable energy facilities is possible. This is substantiated by the following points:

- The only agricultural land that will be used by the developments have limited agricultural production potential. The layout of each facility has deliberately avoided all higher agricultural potential land within the wider assessed area. It will only utilise land that was identified as having insufficient land capability for viable and sustainable crop production and is therefore only good enough for grazing. There is not a scarcity of such agricultural land in South Africa and it is therefore considered to be below the threshold for being prioritised for conservation as agricultural production land.
- The proposed developments offer positive impact on agriculture by way of improved financial security for farming operations, as well as security benefits against stock theft and other crime.
- The PV panels will not totally exclude agricultural production. The area can still be used to graze sheep that will, in addition, be protected against stock theft within the security area of each facility.
- The loss of agricultural potential by occupation of land is not permanent. The land will become fully available again for agricultural production once the proposed activity ceases.
- The proposed development pose a low risk in terms of causing soil degradation, which can be adequately and fairly easily managed by standard, best practice mitigation management actions.
- The proposed developments are within a REDZ, which is an area that has specifically been designated within South Africa for the prioritisation of renewable energy development. The designation

of the REDZ has taken into account the country's need to balance renewable energy development against the need to ensure the conservation of land required for agricultural production and national food security.

- The proposed developments will also have the wider societal benefits of generating additional income and employment in the local economy.
- In addition, it will contribute to the country's need for energy generation, particularly renewable energy that has lower environmental and agricultural impact, on a national scale, than existing, coal powered energy generation.

Due to the above factors, the impact of the proposed developments on the agricultural production capability of the site is assessed as being acceptable. Therefore, from an agricultural impact point of view, it is recommended that the **Vlakfontein Solar PV1** development be approved on condition that the recommended measures are implemented.

6.7 Combined Environmental Sensitivity Map

Refer to the *Environmental Sensitivity Map* on the next page, and also attached as Appendix B(5). The following environmental sensitivities are evident from this Combined Environmental Sensitivity Map:

- A combined delineated aquatic area with buffer zone, biodiversity terrestrial, avi-fauna and bat sensitivity area with relevant buffer zones had been identified and is excluded from the development footprint area.
- Four depressions/degraded wetlands had been identified but were confirmed by the aquatic ecologist as having a low sensitivity and can be demolished for the purpose of the PV area.
- The visual impact specialist requires a 30m non-development buffer off Vermaasdrift Road.
- The heritage specialist requires a 200m buffer circle around the existing farmstead to be excluded from the development footprint area. It was also recommended that tree avenues located along roads and farm boundaries be retained as far as possible.
- The layout has also been guided by best practice and acceptable solar PV engineering principles.

Vlakfontein Solar PV1: Project Layout with Combined Environmental Sensitivity Map

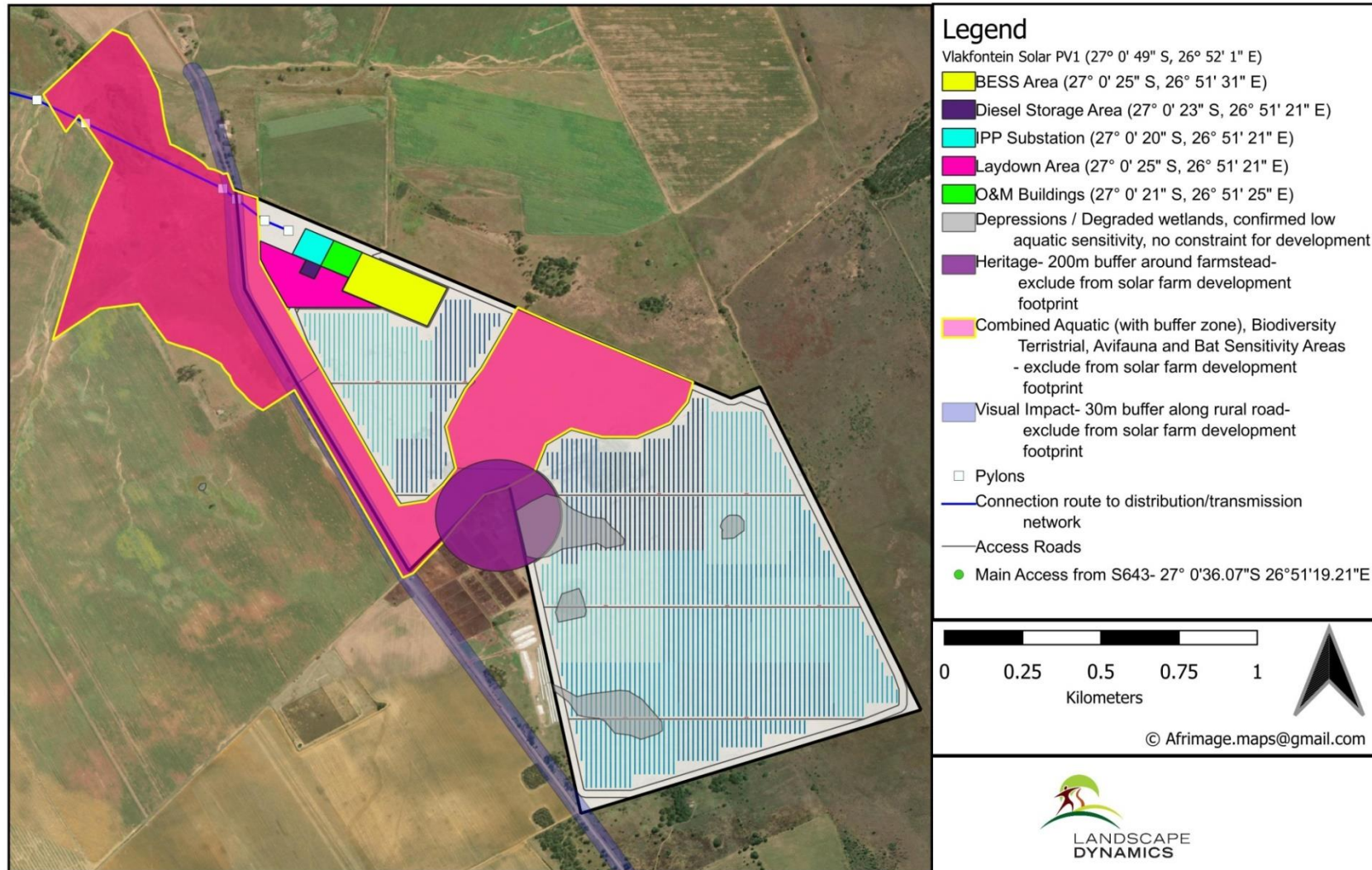


Figure 14 Combined Environmental Sensitivity Map

CHAPTER 7: PROJECT TEAM REPORTS

7.1 High Level Safety, Health & Environmental Risk Assessment

A high level Safety, Health & Environmental Risk Assessment was undertaken by ISHECON, Chemical Process Safety Engineers, represented by Ms Debbie Mitchell and is attached under Appendix G. A summary thereof follows below.

EIA applications for Battery Energy Storage Systems (BESS), either on their own or as part of a power generation application, should include a high-level risk assessment of the battery storage facility considering all applicable risks (e.g., fire, explosion, contamination, end-of life disposal etc).

The high-level Safety Health & Environmental Risk Assessment focussed on the proposed Solid-State Lithium (SSL) BESS systems that will be used in this solar PV development.

This assessment of risk comprises:

- Identification of the likely hazards and hazardous events related to the construction, operation and decommissioning of the installation using a checklist approach.
- Estimation of the likelihood/probability of these hazardous events occurring
- Estimation of the consequences of these hazardous events.
- Estimation of the risk and comparison against certain acceptability criteria.

A Safety & Health Risk Assessment is focussed on hazards arising from the operation and their impact on humans, either employees or members of the public outside the site. By definition, the nature of the chemical and machine hazards is negative, i.e., adverse impact on health and safety. Some of the impacts are immediate and direct such as effects of fires and explosions or exposure to high concentrations of chemicals (in health and safety it is being referred to as acute impacts). Other impacts are longer term such as repeated exposure to low concentrations of harmful chemicals, noise etc. (in health and safety it is being referred to as chronic impacts).

For the BESS, both Solid State Batteries (SSB) and Redox Flow Batteries (RFB) were initially considered. RFB technology was found to be less preferable, for various reasons including economic as well as logistical concerns regarding storage of electrolytes and possible triggers of storing of dangerous goods. Therefore the preferred Battery technology is SSB. The solid-state BESS will make use of either Lithium-Ion or Sodium-Ion chemistries as follows:

- Lithium-ion batteries (LFP/NMC or others, and Lithium capacitors/Electrochemical capacitors (LiC)) (Li-Ion); and/or
- Sodium-ion (e.g. Sodium Sulphur batteries (NaS)).

This study focused on the hazards of the AC coupled system where risks are concentrated and will use lithium-ion as the basis since it is the preferred alternative.

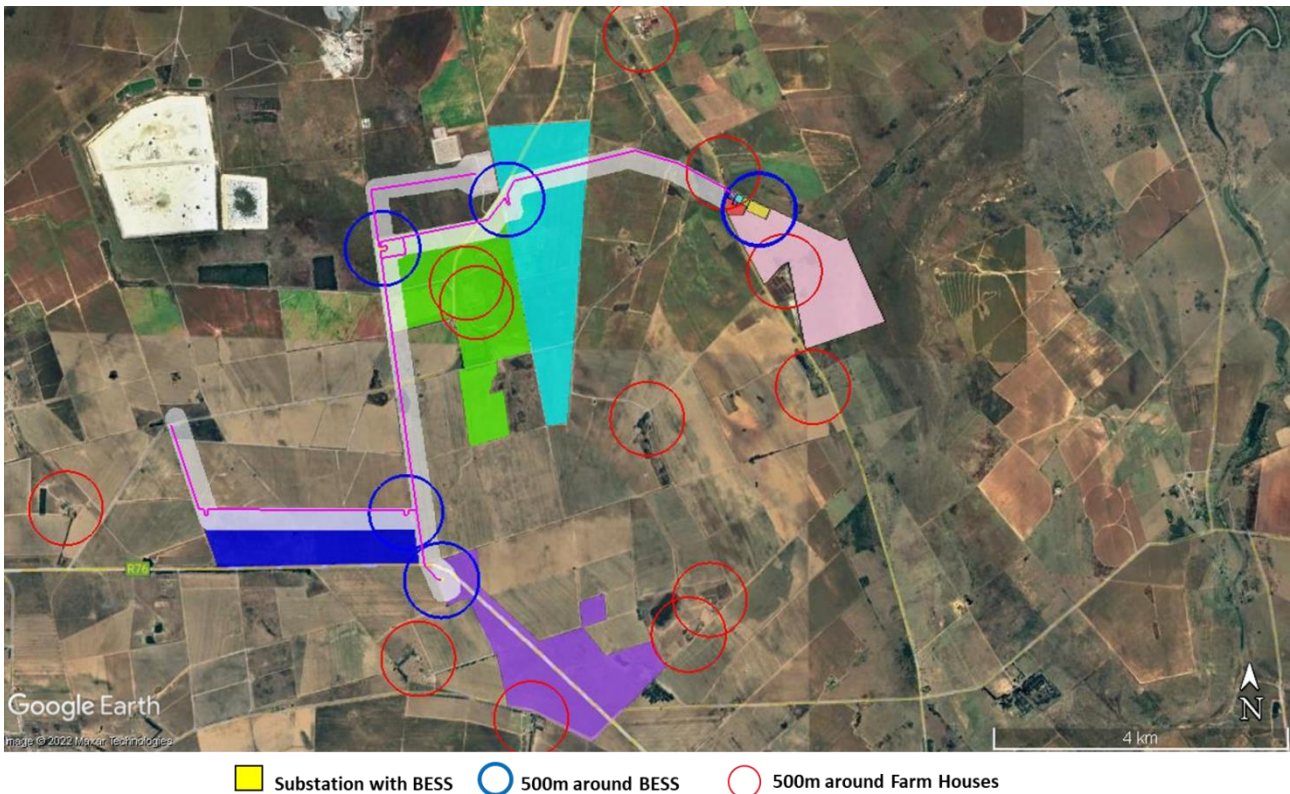


Figure 15: 500m circles around farmsteads in relation to the location of the substation / centralised BESS

A 500m buffer surrounding the farmsteads is proposed and no BESS is allowed within this buffer area.

Key findings are as follows:

General

- At a large facility, without installation of the state-of-the-art battery technology that includes protective features, there can be significant risks to employees and first responders. The latest battery designs include many preventative and mitigative measures to reduce these risks to tolerable levels. State-of-the-art technology should be used, i.e., not old technology as it presents higher risks.
- The design should be subject to a full Hazard and Operability Study (HAZOP) prior to commencement of procurement. A HAZOP is a detailed technical systematic study that looks at the intricacies of the design, the control system, the emergency system etc. and how these may fail under abnormal operating conditions. Additional safeguards may be suggested by the team doing the study.

Lithium-Ion Or Sodium-Ion Solid State Containerized Batteries

- With solid-state batteries, the most significant hazard is the possibility of thermal runaway and the generation of toxic and flammable gases. There have been numerous such incidents around the world with batteries at all scales and modern technology providers include many preventative and mitigative features in their designs. This type of event also generates heat which may possibly propagate the thermal runaway event to neighbouring batteries if suitable state of the art technology is not employed.
- The flammable gases generated may ignite leading to a fire which accelerates the runaway process and may spread the fire to other parts of the installation.
- If the flammable gases accumulate within the container before they ignite, they may eventually ignite with explosive force. This type of event is unusual but has happened with an older technology container installed at McMicken in the USA in 2019.

- Due to a variety of causes, thermal runaway could happen at any point during transport to the facility, during construction or operation / maintenance at the facility or during decommissioning and safe-making for disposal.
- Due to the containerized approach as well as the usual good practice of separation between containers, which should be applied on this project, and therefore the likely restriction of events to one container at a time, the main risks are close to the containers i.e., to transport drivers, employees at the facilities and first responders to incidents.
- In terms of a worst conceivable case container fires, the significant impact zone is likely to be limited to within 10m of the container and mild impacts to 20m. Based on the current proposed layouts, impacts at the closest isolated farmhouses are not expected.
- In terms of a worst conceivable case explosion, the significant impact zone is likely to be limited to within 10m of the container and minor impacts such as debris within 50m. Based on the current proposed layouts, impacts at the closest isolated farmhouses are not expected.
- In terms of a worst reasonably conceivable toxic smoke scenario, provided the units are placed suitably far apart to prevent propagation from one unit to another and large external fires are prevented, the amount of material burning should be limited to one container at any one time. In this case, beyond the immediate vicinity of the fire, the concentrations of harmful gases within the smoke should be low.
- The proposed BESS installation at the Vlaktefontein Solar PV1 will not impact on any occupied farmhouses or dwellings.

Recommendations

- There are numerous different battery technologies but using one consistent battery technology system for all the BESS installations associated with the Mercury PV facilities would allow for easy of training, maintenance, emergency response and could significantly reduce risks in a remote location.
- State-of-the-art battery technology should be used with all the necessary protective features e.g. draining of cells during shutdown and standby-mode, full BMS with deviation monitoring and trips, leak detection systems.
- Neither sodium-ion or lithium-ion solid state battery technology type presents any safety or health fatal flaws, so either type could be used.
- Technical and systems suggestions for managing and reducing risks had been provided. These requirements must be included in the design.
- The overall design should be subject to a full Hazop prior to finalization of the design.
- Prior to bringing any solid-state battery containers into the country, an Emergency Response Plan should be in place that would be applicable for the full route from the ship to the site. This plan would include details of the most appropriate emergency response to fires both while the units are in transit and once they are installed and operating.
- An End-of-Life plan should be in place for the handling, repurposing or disposal of dysfunctional, severely damaged batteries, module and containers.
- The site layout and spacing between solid-state containers should be such that it mitigates the risk of a fire or explosion event spreading from one container to another.
- Under certain weather conditions, the noxious smoke from a fire in a solid-state battery container could travel some distance from the unit. The smoke will most likely be acrid and could cause irritation, coughing, distress etc. Close to the source of the smoke, the concentration of toxic gases may be high enough to cause irreversible harmful effects. Location of the facilities needs to ensure a suitable separation distance from public facilities/residences etc.
- Where there is a choice of alternative locations for the BESS, those that are further from water courses would be preferred. Solid-state systems may experience fires that may result in loss of containment of liquids or the use of large amounts of fire water which could be contaminated. One would not want these run-offs to enter water course / sources directly.

- The buffer distance between water bodies / boreholes etc and the facilities containing chemicals should be set in consultation with a water specialist and is therefore not specified in this SHE RA.
- Any bulk diesel storage for generators / vehicles should be fully bunded and the generators designed with the OHS Act noise limitations in mind.
- Finally, it is suggested once the technology has been chosen and more details of the actual design are available, that the Safety & Health Risk Assessment be updated.

CONCLUSIONS OF THE HIGH LEVEL SAFETY, HEALTH & ENVIRONMENTAL RISK ASSESSMENT

The key findings are as follows:

- This risk assessment has found that with suitable preventative and mitigation measures in place, none of the identified potential risks are excessively high, i.e., from a SHE perspective no fatal flaws were found with the proposed Solid-state BESS installations for the Mercury Solar Cluster Project.
- At a large facility, without installation of the state-of-the art battery technology that includes protective features, there can be significant risks to employees and first responders. The latest battery designs include many preventative and mitigation measures to reduce these risks to tolerable levels. State-of-the-art technology should be used, i.e., not old technology as it presents higher risks.
- The design should be subject to a full Hazard and Operability Study (HAZOP) prior to commencement of procurement. A HAZOP is a detailed technical systematic study that looks at the intricacies of the design, the control system, the emergency system etc. and how these may fail under abnormal operating conditions. Additional safeguards may be suggested by the team doing the study.

The risk assessment has found that with suitable preventative and mitigation measures in place, none of the identified potential risks are excessively high, i.e., from a SHE perspective no fatal flaws were found with the proposed Lithium-ion or Sodium-Ion Solid-state BESS installation at the Vlakfontein Solar PV1 facility which forms part of the Mercury Solar PV Cluster.

7.2 Traffic & Transport Management Plan

A Traffic & Transport Management Plan (TMP) was undertaken by JG Afrika Traffic Engineers, represented by Mr Adrian Johnson and is attached under Appendix G. A summary thereof follows below.

- The construction phase traffic, although significant, will be temporary and impacts are considered to have a medium significance without mitigation measures and low with mitigation measures.
- During operation, it is expected that staff trips and trips for maintenance requirements to the facility will occur. Approximately 30 full-time workers will be stationed on site.
- The number of water delivery vehicles transporting water could be reduced by providing boreholes and/or water storage tanks on site and staggering deliveries outside peak hours. However, it is estimated that water will only be delivered to site a maximum of four times a year.
- The potential mitigation measures mentioned in the construction phase are:
 - Dust suppression
 - Component delivery to/ removal from the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.
 - The use of mobile batch plants and quarries near the site would decrease the impact on the surrounding road network, if available and feasible.
 - Staff and general trips should occur outside of peak traffic periods.
 - A “dry run” of the preferred route.
 - Design and maintenance of internal roads.

- If required, any low hanging overhead lines (lower than 5.1m) e.g., Eskom and Telkom lines, along the proposed routes will have to be moved to accommodate the abnormal load vehicles.
- The construction and decommissioning phases of a development are the significant traffic generators and therefore noise and dust pollution will be higher during these phases. The duration of the phases is short term, i.e., the impact of the traffic on the surrounding road network is temporary and the facility, when operational, will not add any significant traffic to the surrounding road network.
- The main access point to the substation area (including the BESS, diesel storage and laydown area) to the facility will be from the Vermaasdrift Road (S643)

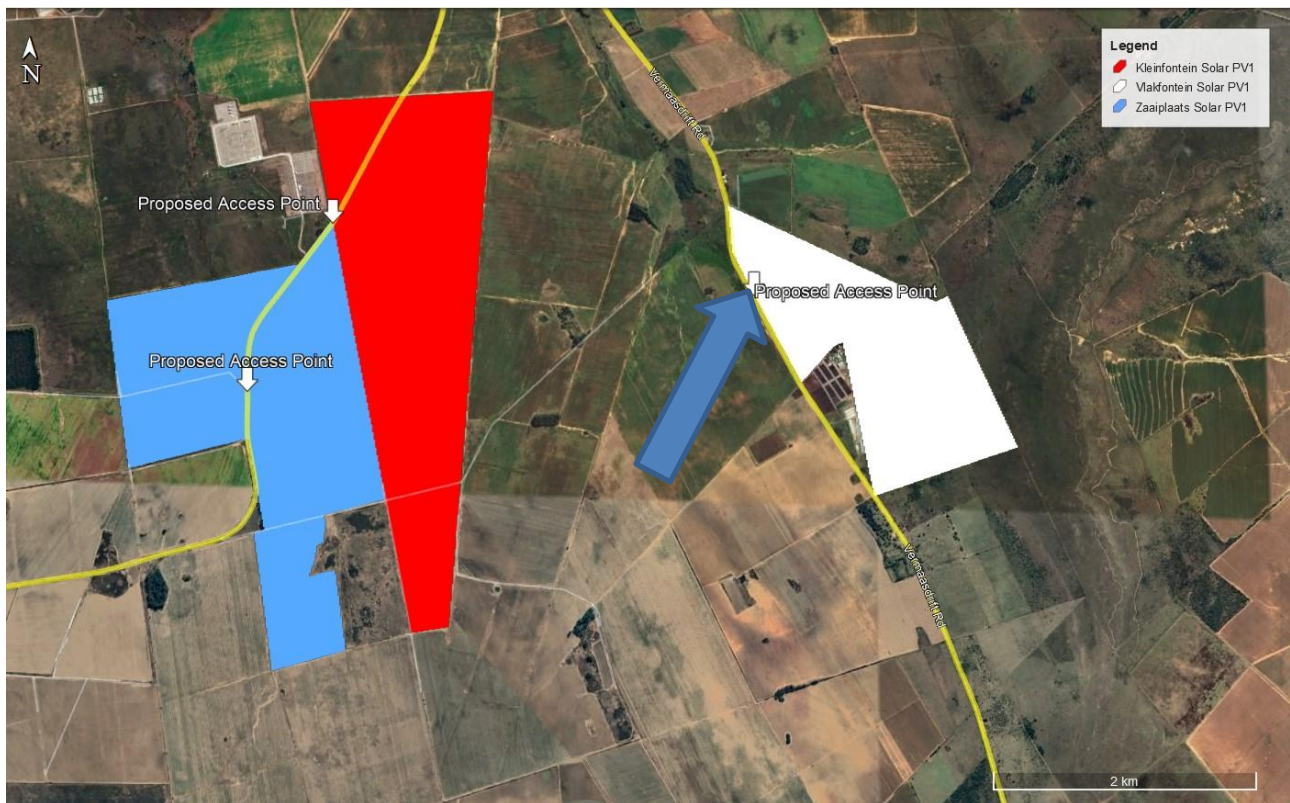


Figure 16: Access Point to the Vlakfontein Solar PV1 site indicated by a blue arrow

This main access point is deemed acceptable from a traffic and transport engineering perspective. The Directorate Road Asset Management (Department of Police, Roads & Transport, Free State Province) supports the Mercury Cluster Solar PV Project (and the use of the provincial gravel roads) subject to certain conditions.

The proposed access road and access point to the site will need to be able to accommodate the construction and abnormal load vehicles. Generally, the road width at the access point needs to be a minimum of 8m and the access roads a minimum of 5m. The radius at the access points and intersection leading to the site needs to be large enough to allow for all construction vehicles to turn safely. It is recommended that the access point be surfaced and the internal access roads on site remain gravel.

The internal road geometric design and layout need to be established at detailed design stage. Existing structures and services, such as drainage structures, signage, street lighting and pipelines will need to be evaluated if impacting on the roads. It needs to be ensured that any gravel sections remain in good condition and will need to be maintained during the additional loading of the construction phase and then reinstated after construction is completed. The gravel roads will require grading with a grader to obtain a flat even surface.

Applicable Legislation and Permit Requirements

The required approvals and permits must be obtained either by the suppliers and/or the Developer as per the following key legal requirements prior to commencement of the relevant activities:

- Abnormal load permits, (Section 81 of the National Road Traffic Act, Act 93 of 1996 and National Road Traffic Regulations, 2000)
- Port permit (Guidelines for Agreements, Licenses and Permits in terms of the National Ports Act No. 12 of 2005), and
- Authorisation from Road Authorities to modify the road reserve to accommodate turning movements of abnormal loads at intersections.

IMPACTS IDENTIFIED IN THE TRAFFIC & TRANSPORTATION MANAGEMENT PLAN

Construction Phase

- Traffic congestion due to an increase in traffic caused by the transportation of components, equipment, material and staff to site
- The increase in construction traffic on roads will cause congestion which leads to an increase in dust and noise pollution.

Operational Phase

- Traffic congestion due to an increase in traffic caused by staff trips, water deliveries and trips for maintenance requirements.
- The increase in traffic on roads will cause congestion which leads to an increase in dust and noise pollution.

These impacts and proposed mitigation measures are discussed in detail in Chapter 9 of this report.

CONCLUSION OF THE TRAFFIC AND TRANSPORT MANAGEMENT PLAN

The following main conclusions were made:

- The construction phase traffic, although significant, will be temporary and impacts are considered to have a medium significance without mitigation measures and low with mitigation measures.
- The Directorate Road Asset Management (Department of Police, Roads & Transport, Free State Province) supports the Mercury Cluster Solar PV Project subject to certain conditions.
- The impacts associated with the Vlakfontein Solar PV1 facility are acceptable with the implementation of the recommended mitigation measures as provided by the traffic engineers and the relevant roads authorities.

The **Vlakfontein Solar PV1** facility is recommended for authorisation from a traffic impact perspective.

7.3 RFI Assessment

A Radio Frequency Interference (RFI) Assessment was undertaken by Interference Testing and Consultancy Services (Pty) Ltd, represented by Mr Callie Fouché, and is attached under Appendix G. A summary thereof follows below.

The RFI that a new PV facility will have on existing electrical equipment must be evaluated. RFI from a PV facility is generally emitted from the inverters, as solar panels do not emit any radio frequency (RF). The effects of PV facility inverters are thus the focus of this study. RFI and Electromagnetic Interference (EMI) can influence sensitive facilities such as airports, RF high sites, railway line control equipment, cell phone towers, EMI sensitive equipment in the area, etc. If a PV facility influences existing infrastructure, EMI mitigation will have to be implemented.

According to the DFFE Screening Tool, there are two medium sensitivity areas located closer than 8km from the Mercury Solar PV Cluster. This implied that there is a possibility that the proposed PV facility could interfere with existing electrical equipment or electrical infrastructure.

The two medium sensitive areas are

- In the north-western direction the area has been identified as Kopanang Gold Plant; and
- In the north-eastern direction an area has been identified but there is no visible infrastructure that can be sensitive to EMI (only farmland).

A typical solar PV facility consists of PV panels, sun tracking systems, batteries, inverters, and cabling. In this case the inverters and the possibility of a sun tracking system will be the highest generators of unwanted Radio Frequency (RF) signals. The inverter is used to convert the DC power produced by the PV modules to AC power.

A tracker system intends to face the PV panels towards the sun throughout the day by tracking the sun position in an East-West direction. The motors used in the tracking system can be a source of unwanted RF signals. A tracker system usually consists of the following components:

- Drive unit for solar tracking (motor and motor controller);
- Internal communication system;
- Site wide communications.

The following steps can be considered when designing a new PV facility to minimise the amount of RFI or EMI that can be emitted:

- Properly ground the PV modules to reduce common mode impedance;
- Shield the DC cabling to ensure a good connection to ground;
- Only use inverters with an approved CE mark;
- Ensure that there is proper electrical bonding on the PV modules as well as the mounting structure of the modules.

The purpose of electrical bonding is to provide structural homogeneity with respect to the flow of electrical currents, including high frequency currents for proper operation of filters and fault current paths. Bonding prevents or safely discharges static charges. Sufficient bonding ensures a good ground connection. A good ground connection of equipment will prevent unintentional transmissions to occur.

The clearance zone around a PV facility is the separation distance needed, between the edge of the PV facility (source) to a specific EMI sensitive location or infrastructure (victim), for the PV facility to have no RFI on existing electrical infrastructure. The recommended clearance zones are listed below.

EMI sensitive location	Distance Between the edge of a PV plant and an EMI sensitive location in meter
Existing Radar equipment	152.4 m
Navigational and communication equipment	45.72 m
Equipment sensitive to EMI	45.72 m
Airfield/Airport Radar system	76.20 m

CONCLUSION OF THE RFI ASSESSMENT

- Both Electro-Magnetic Interference (EMI) sensitive receiver sites identified by the DFFE screening tool were identified to be more than 7km away from the closest proposed PV project (Zaaipaats Solar PV1) of the proposed Mercury Solar PV Cluster. No other EMI sensitive receivers inside the clearance zone could be identified using Google Maps.
- Vlakfontein Solar PV1 development site has a direct line of sight to the Kopanong Gold Plant but at a distance of 12,8km.
- Pathloss over this distance is high enough for the PV facility to have no significant RFI or EMI impact on the electrical infrastructure at Kopanong Gold Plant.
- There should be no interference from the PV plant to the surrounding medium RFI sensitive areas assuming that the PV plant inverters comply to *CISPR 11 Class A Specifications*, as a technology partner has not yet been selected to provide actual EMC data.

No other EMI sensitive receivers inside the clearance zone were identified. No mitigation is recommended.

7.4 Application for Change of Land Use

A Motivation Report for the Application for a Change in Land Use for Renewable Energy Purposes of the Vlakfontein Solar PV1 Facility was prepared by INDEX Social Consulting Services, represented by Ms Marchelle Terblanche. It is included as Appendix F(4)(a).

The aim of the motivational report and application to the Department of Agriculture, Land Reform & Rural Development (DALRRD) was to obtain a “No Objection” letter from DALRRD issued to Vlakfontein Solar PV1 (Pty) Ltd, for the change in land use for the purpose of the Vlakfontein Solar PV1 facility and associated infrastructure with a generating capacity of up to 100 MW situated on agricultural land.

Site-specific motivation included the following:

- There is no evidence of recent attempts at establishing crops on the Vlakfontein site. Only evidence of historically abandoned cropped areas can be seen.
- The cropping potential of the proposed site is limited by the combination of a somewhat marginal climate (annual rainfall of 503 to 535 mm per annum) and soils with poor drainage, limited depth, and limited water and nutrient holding capacity (see Section 8.1). Crop production on these soils is therefore high risk and no longer considered economically viable.
- There is no irrigation available anywhere across the site.
- The long-term grazing capacity of the farm is high at 7 hectares per large stock unit.
- The agricultural enterprises employ a low number of farm workers (approximately 7) across their entire enterprise. Because of the large size of the total farm operations, the loss of marginal parts of these operations is unlikely to have any impact on agricultural employment. The impact on agricultural

employment will be offset by the employment opportunities created by the construction and operation of the Vlakfontein PV Solar Facility.

A “No Objection Letter” for the proposed **Vlakfontein Solar PV1** facility has been obtained from the DARLLD. It is included s Appendix F(4)(b).

7.5 Storm Water Management Plan

A detail Stormwater Management Plan (SWMP) must be compiled during the design phase of the project to address all the project components associated with this application.

- The SWMP must ensure the following :
 - Compliance with applicable regulations
 - Implementation of appropriate design measures that will allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows.
 - Drainage measures must promote the dissipation of stormwater run-off.
 - Prevent off-site migration of contaminated storm water or increased soil erosion.
 - Contaminated stormwater must be separated from general stormwater. The stormwater management plan must specifically ensure that contaminated water from the vehicle servicing area and diesel storage facility is separated from the general stormwater. Untreated contaminated water may not be allowed to be disposed of onto adjacent land.
 - Allowance must be made in the design to approximately equal the concentration time under natural conditions to minimise the flow impact downstream.
 - The on-site systems must be carefully designed using contour following canals and storm water canals, in order to follow natural flow patterns in such a way that :
 - Erosion is prevented.
 - Infrastructural damage is prevented.
 - To limit future maintenance cost, the on-site drainage canal slope and profile must be designed in such a way that neither erosion of the trenches nor the deposit of material occurs.
 - It is recommended that only the essential portion of land be cleared of vegetation. Vegetation, even though sparse, serves a very important function to limit erosion through the dissipation of energy as physical objects in the flow path, and by their roots binding the soil.

CHAPTER 8: PUBLIC PARTICIPATION

8.1 Objectives of the Public Participation Programme

The main aim of public participation is to ensure transparency throughout the EIA process. The objectives of public participation in this EIA are the following:

- To identify all potentially directly and indirectly affected stakeholders, government departments, municipalities and landowners;
- To communicate the proposed project in an objective manner with the aim to obtain informed input;
- To assist the Interested & Affected Parties (IAPs) with the identification of issues of concern, and providing suggestions for enhanced benefits and alternatives;
- To obtain the local knowledge and experience of IAPs;
- To ensure that all reasonable alternatives are identified for assessment;
- To communicate the proceedings and findings of the specialist studies;
- To ensure that informed comment is possible; and
- To ensure that all concerns, comment and objections raised are appropriately and satisfactorily documented and addressed.

8.2 Public Participation Process Followed

All applicable public participation documentation is attached under Appendix G of this Final BAR.

The PPP was confirmed with DFFE by DFEE on 26 October 2021 and confirmed during the Pre-Application Meeting held with the DFFE on 5 April 2022.

The Public Participation Programme (PPP) that is followed is described below. The PPP is being conducted in terms of the Sections 39, 40, 41, 42, 43 & 44 of the NEMA EIA Regulations 2014, as amended.

- **IAP Register: Landowner, Government Departments, Municipalities and other IAPs**

An Interested & Affected Party (IAP) register was compiled which includes the directly affected landowners, adjacent landowners, municipalities, government departments and other applicable organisations. This register is being updated throughout the EIA process.

- **Focus Group Meetings with Directly Affected Landowners**

Focus Group Meetings were held on 18 November 2021 on site with the directly affected landowners. The purpose of the meetings was to obtain the following information:

- Confirm the areas of land on their properties which they want to make available for solar farm development
- Obtain their opinion in terms of agricultural potential of the land
- Confirm restrictions in terms of agricultural development on specific portions of land.

- **Initial Advertising & Communication**

During this initial advertising the newspaper advertisements, onsite notices and Background Information Document (BID) advertised the entire Mercury Solar PV Cluster (5x solar PV facilities as well as the associated grid connections).

Onsite notification

Three A2 laminated onsite notices were placed on 22 March 2022 at the following places:

- Along the S729 (from which road the facility will be accessed) that connects the R76 and the S643
- The Mercury Main Transmission Substation
- The gate of the Viljoenskroon Post Office

Newspaper advertisement

Newspaper advertisements were placed in

- The Citizen (national newspaper) on 30 March 2022
- The Vrystaat Kroon (local newspaper) on 30 March 22

Background Information Document

A BID was distributed to everyone on the IAP Register for a 30-day commenting period (31 March – 4 May 2022).

- **Distribution of the Draft BAR**

The Draft BAR was distributed as follows:

- All IAPs identified in the IAP Register received notification via email that the Draft BAR is available for comment (proof thereof will be provided in the Final BAR).
- The Draft BAR was distributed for a 30-day (excluding public holidays). The commenting period commenced on 4 April 2023 and ended on 10 May 2023.
- All IAPs received an email with the Executive Summary and Draft BAR as an attachment. A link to the Draft BAR and all the Appendices were available on the Landscape Dynamics website (www.landscapedynamics.co.za) – detailed instructions on how to access these documents were provided in the said e-mail.
- A hard copy of the Draft BAR was made available at the Nostalgia Coffee Shop in Viljoenskroon - the availability of the hard copy of the Draft BAR at this location was mentioned in the abovementioned e-mail.
- The Application Form together with the Draft BAR was submitted to DFFE for comment via their online system.

- **Submission of Final BAR**

Comment received on the Draft BAR has been included in the Final BAR. The Final BAR will not be distributed for a further 30-day commenting because no substantial changes to the BAR have been made that could impact on the rights of any of the IAPs.

The Final BAR has now been submitted to DFFE for their consideration for Environmental Authorisation.

8.3 Comment & Responses Report

All comments and responses received regarding this project are confirmed and addressed in the comprehensive **Comments & Responses Report (CRR)** included as Appendix under the following headings:

- Communication during the Focus Group Meetings
- Communication resulting from the Initial Advertising Period
- Communication resulting from the Distribution of the Draft BAR

8.4 Conclusion of the Public Participation Programme

The main objective of the Public Participation Programme undertaken for this project was to identify viable development sites that is not only acceptable from an ecological point of view, but also from a landowner and public and government perspective.

All reasonable steps were taken to inform the identified IAPs of the Mercury Solar PV Cluster development proposal. The EAP is confident that all comment received was addressed satisfactorily. No objection to the development proposal was received. All indications are that the project is not unwanted in the area.

CHAPTER 9: IMPACTS, IMPACT ASSESSMENT AND MITIGATION

9.1 Methods Used to Identify Impacts

Environmental issues and impacts have been identified through the following means:

- Evaluation and consideration of relevant existing environmental data and information;
- Information as obtained from the specialists and engineers appointed for this project;
- Correspondence with Interested and Affected Parties, including directly affected and adjacent landowners, general stakeholders and relevant authorities;
- Consultation with the EIA Project Team, supported by the Mulilo Project Team; and
- The general knowledge and extensive experience of the Environmental Consultants in the field of Environmental Impact Assessments.

9.2 List of Impacts Associated with the Development

9.2.1 *Expected Negative Impacts*

Design & Pre-Construction Phase

- Risk of failure of structures during design phase
- Risk of failure of structures
- Impact on visual and heritage resources
- Risk of erosion
- Impact on terrestrial and aquatic biodiversity
- Impact on avifauna
- Human safety & environmental health impact resulting from the BESS

Construction Phase

- Impact on agricultural land
- Impact on terrestrial biodiversity
- Impact on aquatic habitat
- Impact on avifauna
- Impact on heritage, archaeology and palaeontology resources
- Risk of groundwater pollution
- Risk of erosion
- Social impact
- Traffic impact
- Human safety & environmental health impact resulting from the BESS

Post- Construction / Operational Phase

- Impact on agriculture
- Continuous impact on natural habitat
- Impact on aquatic environment

- Impact on avifauna
- Risk of erosion
- Continuous risk for groundwater pollution
- Impact on visual resources
- Social Impact
- Traffic Impact
- Human safety & environmental health impact resulting from the BESS

9.2.2 *Expected Positive Impacts*

- The establishment of renewable energy infrastructure should be viewed, firstly within the context of the South Africa's current reliance on coal powered energy to meet the majority of its energy needs, and secondly, within the context of the success of the REIPPPP. South Africa has one of the most carbon-intensive economies in the world, thus making the greening of the electricity mix a national imperative. The REIPPPP had contributed significantly towards meeting South Africa's emission targets and, at the same time, supporting energy security, economic stability, and environmental sustainability.
- The proposed solar PV facility will be able to evacuate the solar generated electricity and all the advantages of additional, clean, renewable electrical supply to the national Eskom grid will be realised. This will also assist in alleviating load shedding.
- The Vlakfontein Solar PV1 will contribute to address the current load-shedding problems that severely impact on the economy of the country.
- Creation of employment and business opportunities and the opportunity for skills development and on-site training during the construction phase:
 - The construction phase is expected to extend over a period of ± 18 months and create approximately 250-300 employment opportunities, depending on the final design for the entire Mercury Cluster Solar Project. The total wage bill for the construction phase is estimated to be in the region of R30 million (2022 Rand value). A percentage of the wage bill will also be spent in the local economy which will create opportunities for local businesses in the area.
 - The majority of the employment opportunities, specifically the low and semi-skilled opportunities, are likely to be available to local residents and the majority of the beneficiaries are likely to be historically disadvantaged (HD) members of the community. This would represent a significant positive social benefit in an area with limited employment opportunities.
 - The total number of permanent employment opportunities associated with the Vlakfontein Solar PV1 facility would be approximately 20 and the majority of low and semi-skilled beneficiaries are likely to be members of the community.
- Procurement during the operational phase will also create opportunities for the local economy and businesses.
- The establishment of a community benefit structure (typically, a Community Trust) also creates an opportunity to support local economic development in the area. The requirement for the project to allocate funds to socio-economic contributions (through structures such as Community Trusts) provides an opportunity to advance local community projects, which is guaranteed for a ± 20 -30 year period (the project lifespan).
- The income from the PV facility received by the landowner reduces the risks to the farmer's livelihood posed by droughts and fluctuating market prices for farming outputs and inputs, such as fuel, feed etc. The additional income would therefore improve economic security of farming operations, which in turn would improve job security for farm workers and benefit the local economy.
- The provision of security for the proposed PV facility can create an opportunity to improve security for local landowners in the area.

9.2.3 Cumulative impact

Cumulative impacts of a development may become significant if seen in context with impacts that emanates from other developments within the macro area. The cumulative impact of a development is the impact that development will have when its impact is added to the incremental impacts of other past, present or reasonably foreseeable future activities that will affect the same environment. It is important to note that the cumulative impact assessment for a particular project is not the same as an assessment of the impact of all surrounding projects. The cumulative assessment for this project is an assessment only of the impacts associated with this project, but seen in the context of all surrounding impacts. It is concerned with this project's contribution to the overall impact, within the context of the overall impact.

The cumulative impact for each negative impact associated with the different specialist fields is assessed in the Impact Assessment Tables under paragraph 9.3 below. In all instances, the cumulative impact has been rated as being of a low significance after mitigation has been applied.

The most important concept related to a cumulative impact is that of an acceptable level of change to an environment. A cumulative impact only becomes relevant when the impact of the proposed development will lead directly to the sum of impacts of all developments causing an acceptable level of change to be exceeded in the surrounding area. If the impact of the development being assessed does not cause that level to be exceeded, then the cumulative impact associated with that development is not significant.

The renewable energy developments within a 30km radius of the proposed development site are shown on the maps below and were used when the cumulative impact was assessed. These maps were obtained from

- DFFE website on 27 April 2023
(https://egis.environment.gov.za/data_egis/data_download/current#)
- The DFFE Screening Tool Report on 31 August 2022

Important to factor into the cumulative assessment is the fact that the site is located within the Klerksdorp REDZ, an area that was identified as suitable for the establishment of large scale renewable energy facilities. Cumulative impact, even to some degree, is therefore expected and acceptable.

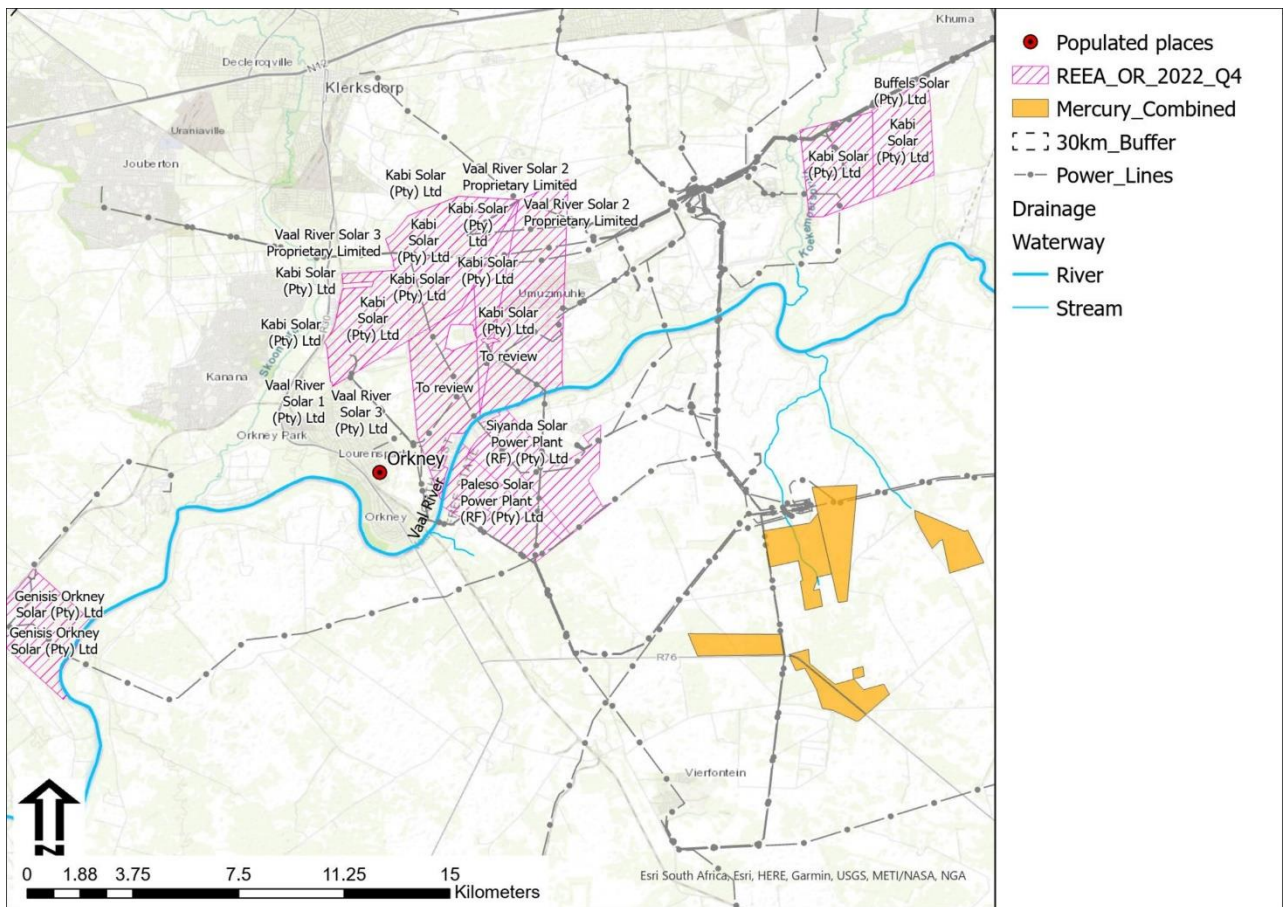
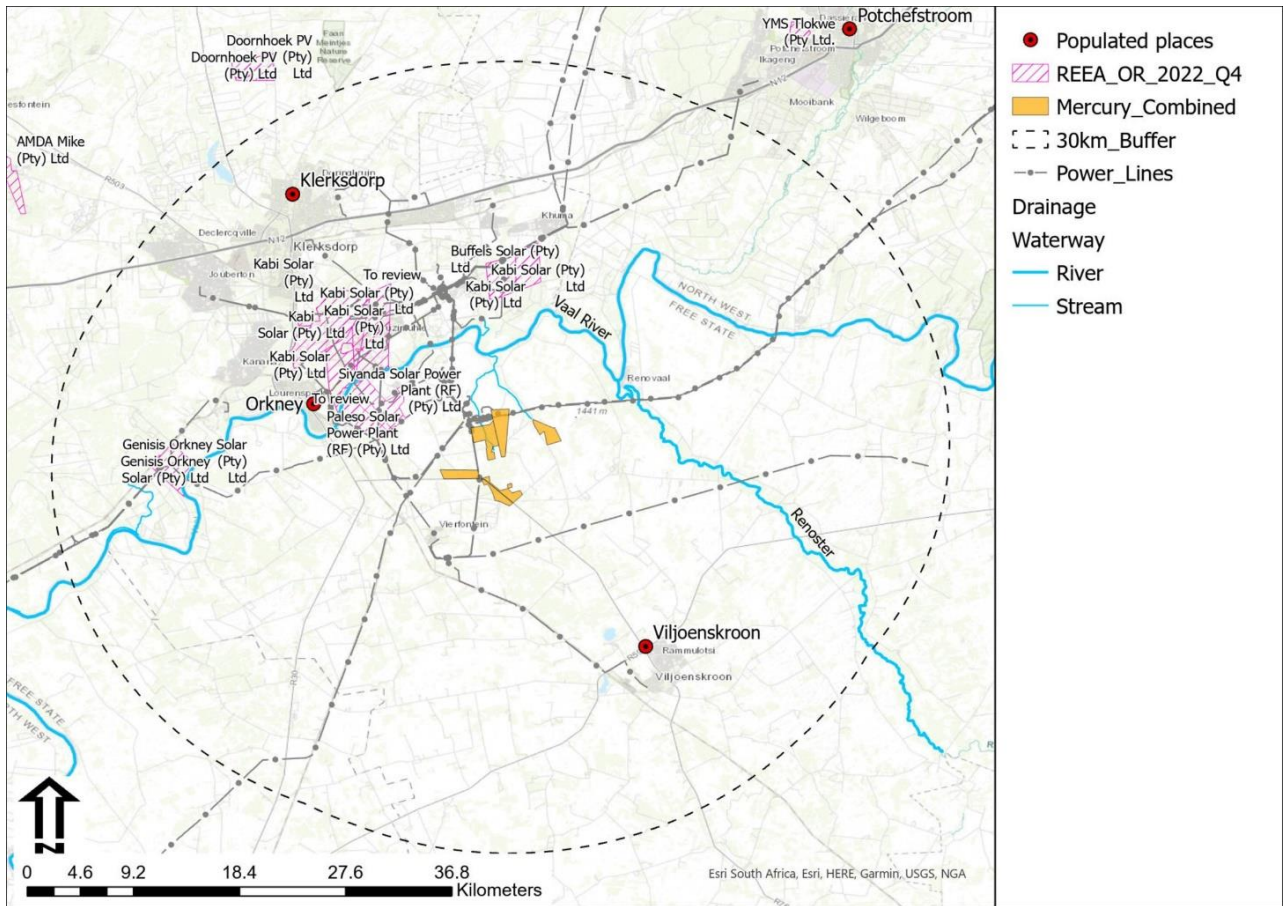


Figure 17 Cumulative impact maps obtained from the DFFE website

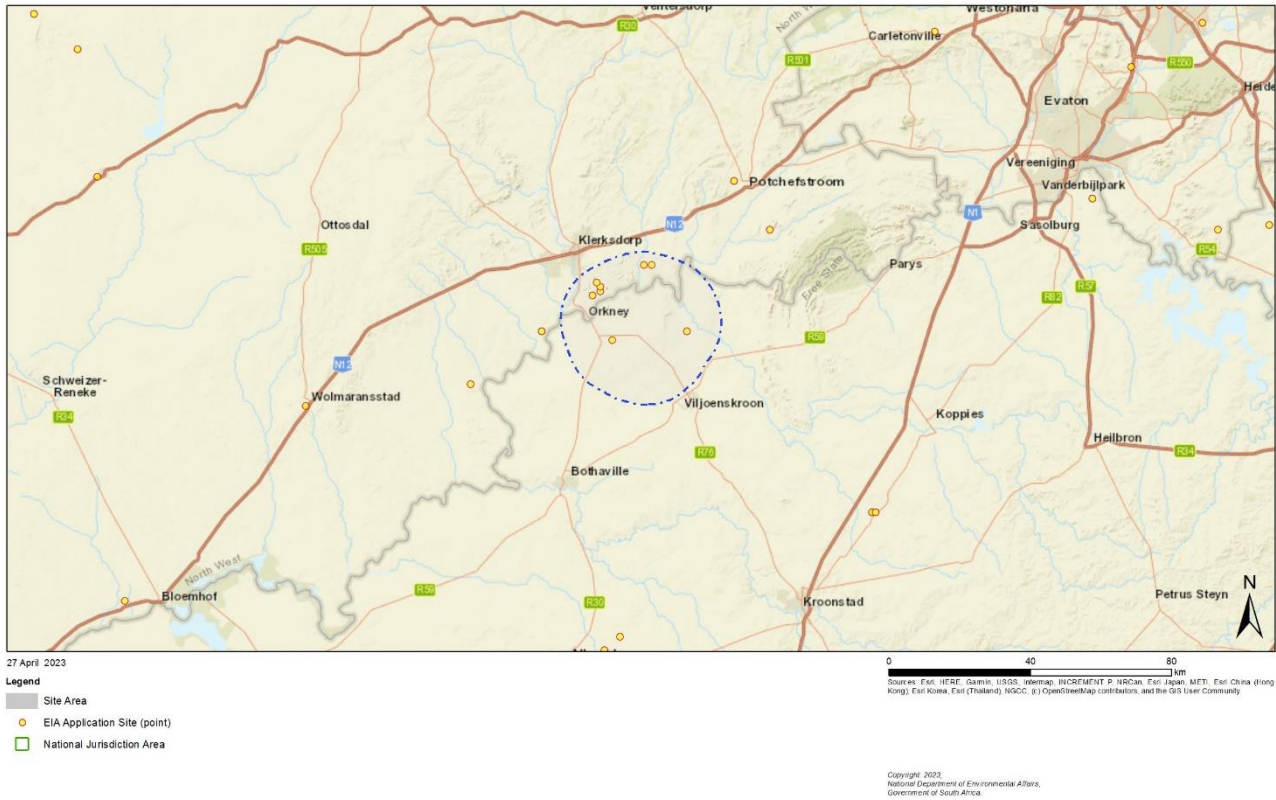


Figure 18 Cumulative impact map obtained from the Screening Tool

Concise summaries of the cumulative impact description in the specialists' reports (attached under Appendix F) are provided below.

Terrestrial Biodiversity (fauna and flora) Cumulative Impact

Of the approximately 1 444 ha studied for this project a total area of 1 357 ha (94%) was found to be agricultural, degraded or transformed meaning only small areas (Vegetation Units 1, 2, 5 & 6) comprising approximately 87 ha (0.03% of the 30km radius area) were found to provide habitat for indigenous plant and animal species.

The proposed development pose a low risk in terms of causing terrestrial (fauna & flora) degradation, which can be adequately and fairly easily managed by standard best practice mitigation management actions included in this report.

The cumulative impact of loss of future natural ecosystems and their associated fauna is regarded as being minimal and being within an acceptable level of change. The proposed development is therefore acceptable in terms of cumulative impact.

Aquatic Cumulative Impact

The potential cumulative aquatic ecosystem impacts of the proposed development relate to the combined impact of that development with the incremental impacts of other past, present or reasonably foreseeable future activities on the same aquatic ecosystems (i.e. a small unnamed, non-perennial tributary of the Vaal River and several seeps and depression wetland areas). These aquatic ecosystems are in a moderately modified ecological condition with a moderate ecological importance and ecological sensitivities as a result of the current activities and their cumulative impact on them. The proposed activities associated with the project have been mitigated (excluded from the development area) to ensure that there is no further degradation of these aquatic ecosystems and that the Recommended Ecological Condition (REC) is achievable.

There would be no net loss of aquatic habitat or functionality as a result of the cumulative impact associated with this project. In terms of the renewable energy projects in a 30km radius, none of these activities would impact further on the mentioned aquatic ecosystems than those activities assessed in this report as they are located far from these aquatic ecosystems and would also not result in any net loss of these aquatic ecosystems. Due to all of the considerations discussed above, the cumulative impact on aquatic ecosystem habitat, integrity and functionality in the area will not have an unacceptable negative impact. The proposed project is therefore acceptable in terms of its associated cumulative impact, and therefore from this perspective, there is no reason why it should not be approved.

Heritage Cumulative Impact

In REDZ areas, there is a reasonable expectation that the cultural landscape of an area will be changed to be dominated, or at least heavily altered, by renewable energy development.

In terms of cumulative impacts to heritage resources, impacts to archaeological and palaeontological resources are sufficiently dealt with on a case by case basis. The primary concern from a cumulative impact perspective would be to the cultural landscape. The cultural landscape is defined as the interaction between people and the places that they have occupied and impacted. In some places in South Africa, the cultural landscape can be more than 1 million years old where we find evidence of Early Stone Age archaeology (up to 2 million years old), Middle Stone Age archaeology (up to 200 000 years old), Later Stone Age archaeology (up to 20 000 years old), evidence of indigenous herder populations (up to 2000 years old) as well as evidence of colonial frontier settlement (up to 300 years old) and more recent agricultural layers. Modern interventions into such landscapes, such as renewable energy development, constitute an additional layer onto the cultural landscape which must be acceptable in REDZ areas. The primary risk in terms of negative impact to the cultural landscape resulting from renewable energy development lies in the eradication of older layers that make up the cultural landscape. There are various ways that such impact can be mitigated.

In terms of impacts to heritage resources, it is preferred that this kind of infrastructure development is concentrated in one location and is not sprawled across an otherwise agricultural landscape. The proposed development is therefore unlikely to result in unacceptable risk or loss, nor will the proposed development result in a complete change to the sense of place of the area or result in an unacceptable increase in impact due to its location as one of many renewable energy facilities in this area.

The landscape within which the project is located, is not worthy of formal protection as a heritage resource and has the capacity to accommodate such development from a heritage perspective.

Social Cumulative Impact

Cumulative impact on services

- The establishment of the proposed renewable energy facilities may place pressure on local services, specifically medical, education and accommodation. This pressure will be associated with the potential influx of workers to the area associated with the construction and operational phases of renewable energy projects.
- The potential impact on local services can however be mitigated by employing local community members. With effective mitigation the impact is rated as Low.
- This impact should also be viewed within the context of the potential positive cumulative impacts for the local economy associated with the establishment of renewable energy as an economic driver in the area.

Cumulative impact on local economy

- The establishment of the renewable energy projects in the area has the potential to create a number of socio-economic opportunities which, in turn, will result in a positive social benefit. The positive cumulative impacts include creation of employment, skills development and training opportunities, creation of downstream business opportunities.
- The Community Trusts associated with each project will also create significant socio-economic benefits. These benefits should also be viewed within the context of the limited economic opportunities in the area and the impact of the decline in the mining sector in recent years. This benefit is rated as High Positive with enhancement.

Visual Cumulative Impact

The regional mapping depicts that numerous solar PV projects are proposed within the 30km buffer to the north and northwest of the projects. While this intensity of development could influence the local landscape character, there are two factors that mitigate the negative inter-visibility effects.

- The first factor pertains to distance, where the closest project is six kilometres distant from the other projects in the north and northwest of the 30km radius. This places the other projects outside of the Foreground/ Mid Ground where landscape changes are most likely to influence the landscape character.
- The second factor pertains to the existing land use in the vicinity of the proposed Vaal River/ Kabi Solar cluster, where they are all in very close proximity to existing mine landscapes where the landscape character is already degraded.

There are also sufficient spaces between the five Mercury Solar PV projects where local vegetation and topographic screening would also reduce inter-visibility, and the local landscape is also degraded to some degree in the vicinity of the Mercury Substation and background views of the north-western mine dumps.

While the dark colour and semi-industrial nature of the PV panels may draw attention to the installations, visual intensity from receptors located over 6km from the site will further be diminished by hazy atmospheric conditions which tend to dominate during the highveld winters.

In conclusion, the potential for negative cumulative visual effects such that landscape resources around the proposed development would be degraded, is rated as Medium to Low.

Agricultural Cumulative Assessment

The cumulative impact is affecting an agricultural environment that has been declared a REDZ precisely because it is an environment that can accommodate numerous renewable energy developments without exceeding acceptable levels of agricultural land loss. This is primarily because farms in the area have a proportion of their surface area covered by lower potential soils that are unsuitable for crop production and can therefore be utilised for solar development without significantly lowering the future production potential of the farmland.

In quantifying the cumulative impact, the area of land taken out of agricultural production (mostly grazing) as a result of the renewable energy developments will amount to a total of approximately 2,850 hectares. As a proportion of the total area within a 30km radius (approximately 282,700 ha), this amounts to only 1.01% of the surface area. That is within an acceptable limit in terms of loss of land that is only suitable as grazing land, of which there is no particular scarcity in the country. This is particularly so when considered within the context of the following point. That is within an acceptable limit in terms of loss of land that is only suitable as grazing land, of which there is no particular scarcity in the country.

In order for South Africa to achieve its renewable energy generation goals, agriculturally zoned land will need to be used for renewable energy generation. It is far more preferable to incur a cumulative loss of lower potential agricultural land in a region which has been designated as a REDZ, than to lose agricultural land that has a higher potential, and that is much scarcer, to renewable energy development elsewhere in the country.

All the applications of the Mercury Solar PV Cluster has the same agricultural impacts in a very similar agricultural environment. The proposed development pose a low risk in terms of causing soil degradation, which can be adequately and fairly easily managed by standard best practice mitigation management actions included in the EMPr. If the risk for each individual development is low, then the cumulative risk is also low.

In conclusion, the cumulative impact of loss of future agricultural production potential will not have an unacceptable negative impact on the agricultural environment in the area. The proposed development is therefore acceptable in terms of cumulative impact.

CONCLUSION OF CUMULATIVE ENVIRONMENTAL IMPACT ASSESSMENT

Summary Table of the Cumulative Impact Assessment

Summary Table of the Cumulative Environmental Impact Assessment

Cumulative Impact: Design and Pre-construction Phase

Impact Description	Cumulative impact after mitigation
Site Selection: Impact on environmental features	Low
Site Selection: Impact on farm workers (job losses)	Low/None
Impact on avifauna	Low
Impact on visual resources	Low
Flooding of adjacent farmlands	Low

Cumulative Impact: Construction Phase

Impact Description	Significance after mitigation
Impact on fauna and flora	Low
Birds: disturbance	Low
Birds: habitat transformation	Low
Impact on bats	Low
Impact on freshwater features	None
Risk of groundwater pollution	Low
Risk of erosion	Low
Cultural, Archaeology and Palaeontology	Low
Impact on visual resources	Medium
Damage to farmlands	Low
Impact of construction workers on local communities	Low to none
Influx of job seekers	Low
Risk to safety, livestock and farm infrastructure	Low
Increased risk of grass fires	Low
Noise, dust, damage to roads	Low
Creation of employment and business opportunities	Medium positive
Traffic impact	Low

Cumulative Impact: Operational phase

Impact Description	Significance after mitigation
Improper site clearance after construction	Low
Lack of rehabilitation	Low
Impacts on fauna and flora	Low
Impacts on avifauna	None
Impacts on bats	Low
Impact on freshwater features	Low/None
Storm water management and erosion	Low
Impact on visual resources	Low
Loss agricultural potential by occupation of land	Low
Impact on property values	Low
Impact on local tourism operations	Low
Implementation of renewable energy facilities	High Positive
Creation of employment and business opportunities	High positive

Establishment of a Community Trust	High positive
Income generation for landowner	High positive
Opportunity to improve security	High positive
Increased financial security for farming practises	High Positive
Traffic congestion	Low

The negative biophysical, heritage, visual and agricultural cumulative impact of the proposed solar PV development is rated as Low and any cumulative impact that may occur is rated as being acceptable, especially when seen in context of the proposed development site situated in a REDZ.

The social cumulative effect is rated as High/Very High **positive** due to the potential to create a number of socio-economic opportunities for the local municipality, which, in turn, will result in a positive social benefit. The positive cumulative impacts include creation of employment, skills development and training opportunities and creation of downstream business opportunities. These benefits should also be viewed within the context of the limited economic opportunities in the area and the impact of the decline in the mining sector in recent years. This impact is rated as being highly positive.

Based on the above, there is no reason, from a cumulative impact viewpoint, that the proposed Vlakfontein Solar PV1 should not be authorised.

9.3 Environmental Impact Assessment

The Environmental Impact Assessment Tables include descriptions of expected impacts on the different environmental components as well as proposed mitigation measures / management actions to minimise those impacts to acceptable levels. These mitigation measures are also included in the EMP.

9.3.1 Methodology Used in Ranking of Impacts

Impacts are evaluated and assessed in terms of the following criteria:

Extent of impact	Explanation of extent
Site	Impacts limited to construction site and direct surrounding area
Local	Impacts affecting environmental elements within the local area / district
Regional	Impacts affecting environmental elements within the province
National	Impacts affecting environmental elements on a national level

Duration of impact	Explanation of duration
Short term	0 - 5 years. The impact is reversible in less than 5 years.
Medium term	5 - 15 years. The impact is reversible in less than 15 years.
Long term	>15 years, but where the impacts will cease if the project is decommissioned
Permanent	The impact will continue indefinitely and is irreversible.

Probability of impact	Explanation of Probability
Unlikely	The chance of the impact occurring is extremely low
Possible	The impact may occur
Probable	The impact will very likely occur
Definite	Impact will certainly occur

Reversibility of impact	Explanation of Reversibility Ratings
Low	The affected environment will not be able to recover from the impact - permanently modified
Medium	The affected environment will only recover from the impact with significant intervention
High	The affected environmental will be able to recover from the impact

Significance of impact	Explanation of Significance
None	There is no impact at all
Low	Impact is negligible or is of a low order and is likely to have little real effect
Moderate	Impact is real but not substantial
High	Impact is substantial
Very high	Impact is very high and can therefore influence the viability of the project

9.3.2 Impact Assessment Tables

The impact assessment tables are provided in the pages below.

DESIGN AND PRE-CONSTRUCTION PHASE

IMPACT ON AGRICULTURAL POTENTIAL LAND DURING THE DESIGN PHASE

Impact Description

The impact on agricultural potential land should be considered in context with the following:

- The only agricultural land that will be used by the developments has limited agricultural production potential. The layout of the facility has deliberately avoided all higher potential land within the wider assessed area. It will only utilise land that was identified as having insufficient land capability for viable and sustainable crop production and is therefore only good enough for grazing. There is not a scarcity of such agricultural land in South Africa and it is therefore considered to be below the threshold for being prioritised for conservation as agricultural production land.
- The proposed developments offer positive impact on agriculture by way of improved financial security for farming operations, as well as security benefits against stock theft and other crime.
- The PV panels will not totally exclude agricultural production. The area can still be used to graze sheep that will, in addition, be protected against stock theft within the security area of each facility.
- The loss of agricultural potential by occupation of land is not permanent. The land will become fully available again for agricultural production once the proposed activity ceases.
- The proposed development poses a low risk in terms of causing soil degradation, which can be adequately and fairly easily managed by standard, best practice mitigation management actions.
- The proposed developments are within a REDZ, which is an area that has specifically been designated within South Africa for the prioritisation of renewable energy development. The designation of the REDZ has taken into account the country's need to balance renewable energy development against the need to ensure the conservation of land required for agricultural production and national food security.
- The proposed development will also have the wider societal benefits of generating additional income and employment in the local economy.
- It will contribute to the country's need for energy generation, particularly renewable energy that has lower environmental and agricultural impact, on a national scale, than existing, coal powered energy generation.

Cumulative impact description

- The trend and development of solar farms in the macro areas is already evident in the numerous applications for solar farms in the macro area currently with the DFFE or already authorised. The precedent has already been created as a result from the existing energy crisis in the country and the potential of the macro area for solar farm development.

Mitigation

- Only land where no high agricultural potential exists must be used for the purpose of solar farm development.

- A “No Objection” letter was obtained from DALRRD for the Vlaktefontein Solar PV1 (Pty) Ltd, for the Change in Land Use for the purpose of renewable energy infrastructure (Solar PV farm) and purposes incidental thereto.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Development of a solar farm on land with agricultural potential land	Site	Long Term	Definite	High	Low	Low

Impact on Irreplaceable Resources (after mitigation)	Yes	No
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Cumulative impact rating (after mitigation) If high, please explain	Low	Medium	High
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RISK OF FAILURE OF STRUCTURES DURING DESIGN PHASE

Impact Description

Poor design and non-compliance with relevant legal requirement will result in structural failures and subsequent leaks with resultant negative impact that include:

- electrocution of personnel
- veld fires
- damage to property
- groundwater pollution

This impact is associated with the substation; the BESS; the diesel storage facility as well as the construction of new roads and road upgrades if and where applicable.

Cumulative impact description

- Impact will be severe if any personnel member is electrocuted as a result of negligence and/or structural failure.
- Impact could be significant since it could extend to adjacent properties (i.e. veld fires) and could cause damage to other solar facilities and farm structures and the macro area in terms of disruption of electricity supply.
- Failure of the diesel tank installation and the BESS will cause groundwater pollution.

Mitigation

- Continuous communication should take place with Eskom to ensure compliance with their most recent policies, design standards and specifications. The following Eskom policies must be adhered to and compliance must form part of the conditions of the EMPr :
 - Renewable Energy Generation Plant Setbacks to Eskom Infrastructure, dated 15 September 2020
 - Standard Eskom requirements for work in or near Eskom servitudes
 - LES and SE inputs for new substations to IPP requirement, dated 3 March 2022
- A Safety Officer must be appointed to ensure compliance with the Occupational Health and Safety Act, No 181 of 1993, as amended (Responsibilities must include the provision of Personal Protective Equipment, the undertaking of safety inspections, safety awareness training, etc.)
- A Fire Management Plan must be compiled.

Diesel Storage Facility (Design considerations)-

- Compliance with SANS 10089-1:2008; Part 1: Storage and distribution of petroleum products in above-ground installations must be done.
- Provision must be made for a thick reinforced concrete spillage containment slab laid to fall to a catch pit connected to an oil/grease separator
- The storage tank must be fully contained within the bunded area to contain spillage of hydrocarbons and contaminated rainwater and prevent the ingress of hydrocarbon spillages and contaminated rainwater into the ground or surface water.
- Spillages from the tank bund must be retained and released in a controlled manner to an oil separator.

- Allowance must be made for the removal of hazardous substances to an appropriate waste facility.
- Spillages of hydrocarbons and contaminated water must be collected from the following areas :
 - Diesel tank bunded area
 - Product receiving station and receiving pipelines
 - Vehicle servicing area
- Hydrocarbon (oil, diesel, petrol) waste as well as hydrocarbon containing material must be regarded as hazardous waste and separated from general waste.
- All hazardous substances at the site must be adequately stored and accurately identified, recorded and labelled prior to removal to a registered hazardous waste facility.

BESS

- State-of-the-art technology should be used, i.e., not old technology as it presents higher risks.
- The design should be subject to a full Hazard and Operability Study (HAZOP) prior to commencement of procurement. HAZOP is a detailed technical systematic study that looks at the intricacies of the design, the control system, the emergency system etc. and how these may fail under abnormal operating conditions. Additional safeguards may be suggested by the team doing the study.

Geotechnical Studies

A geotechnical study must be undertaken to confirm the geotechnical constraints associated with the site. Appropriate specifications in terms of materials and foundations must be provided to inform the detail design of all the facilities and road upgrades. Specific requirement in terms of foundations must be supplied.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Risk of failure of structures	Local	Short Term	Possible	High	Medium to Very High	Low

Impact on Irreplaceable Resources (<i>after mitigation</i>) If yes, please explain	Yes	NO
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Cumulative impact rating (<i>after mitigation</i>) If high, please explain	LOW	Medium	High
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IMPACT ON HERITAGE AND VISUAL RESOURCES DURING THE DESIGN PHASE

Impact Description

Visual Impact

- The proposed development construction would result in a partial loss of rural sense of place from the removal of vegetation, the movement of large earth moving machinery and the construction vehicles.
- Windblown dust generated from vegetation removal, as well as dust from moving vehicles.
- Potential soil erosion from temporary access roads and laydown areas.
- Windblown litter from the laydown and construction sites.
- Lights at night for security detracting from the current, semi-dark rural sense of place.

Consider in context with the following:

Visually, the regional landscape has a high absorption capacity. There are many visually intrusive artificial features present in the macro areas which will serve to detract and diminish the visual impact presented by the new PV installations and supporting infrastructure. These include numerous powerlines, converging on a large regional Mercury Transmission Substation, mining features (mine dump) and agro-industrial features. While the reflective nature of the PV panels may draw attention to the installations, visual intensity from receptors located over 6km from the site will further be diminished by hazy atmospheric conditions which tend to prevail during the highveld winters.

Heritage Impact

- No archaeological sites had been identified.

Cumulative impact description

- Degradation of landscape resources that currently have some visual appeal where not exposed to the surrounding mining landscapes.
- Change in land use from rural agricultural to that of a semi-industrial landscape.

Mitigation

Visual

- Retaining of a 30m buffer on the rural roads as a No-go development area. The exception is the areas within 1.2km of the Mercury Substation where no setback buffer is required as the landscape character is already degraded.
- Retaining existing medium-sized trees within the setback buffer.
- The PV area fencing should be placed around the development area and not extend to the road. The buffer area should be retained for agricultural land uses to reduce grass growth that could become a dry season fire risk.
- Exclusion of wetland and drainage lines (and associated areas).
- Exclusion of development of steep slopes greater than 1:10m where applicable.
- The buildings should be painted a grey-brown colour.
- Fencing around the laydown and office complex areas should be simple, diamond shaped (to catch wind-blown litter) and appear transparent from a distance. The fences should be checked monthly for the collection of litter caught on the fence.
- Fencing should be located around the PV panels and appear transparent at a distance and not extended to the road areas.
- Lighting needs to be restrained and should be limited to strategic nodes/ office areas. Fencing should have not security lights at night.
- No overhead lighting should be utilised.
- Signage from the roads needs to be understated.

Heritage

- It was recommended that tree avenues located along roads, access routes and farm boundaries be retained as far as possible.
- A portion of the tree plantation located within 200m of the marked farm homestead should also be retained in order to shield the existing homestead from the PV facilities and retain some sense of place.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Loss of landscape Character	Site	Short Term	Probable	High	High	Medium
Visual intrusion from Key Observation Points	Site	Short Term	Possible	High	High	Medium

Impact on Irreplaceable Resources (after mitigation) If yes, please explain	Yes	NO
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Cumulative impact rating (after mitigation) If high, please explain	LOW	Medium	High
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RISK OF EROSION TO BE ADDRESSED DURING THE DESIGN PHASE

Impact Description

- It is necessary to ensure that measures are in place to prevent uncontrolled stormwater with subsequent erosion causing damage to PV, electrical infrastructure and roads and a loss of soil.
- Appropriate onsite drainage is required in context with the following:
 - High value of BESS, PV panels, roads, ect..
 - The severe consequences in not reaching operational targets and the potential of contractual penalties and loss of income.
 - The strategic importance of power supply into the ESKOM distribution network.

- Poor stormwater planning where trucks are serviced and diesel is stored could result in groundwater contamination.

Cumulative impact description

The development footprint of approximately 284ha is significant in size; however, consideration must be taken of the fact that the site is not directly affected by a wetland or river and the slope is generally flat. The cumulative impact is therefore expected to be of medium/low significance.

Mitigation

General mitigation measures

- A detail Stormwater Management Plan (SWMP) must be compiled to address all the project components associated with this application.
- The SWMP must ensure the following :
 - Compliance with applicable regulations
 - Implementation of appropriate design measures that will allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows.
 - Drainage measures must promote the dissipation of stormwater run-off.
 - Prevent off-site migration of contaminated storm water or increased soil erosion.
 - Contaminated stormwater must be separated from general stormwater. The stormwater management plan must specifically ensure that contaminated water from the vehicle servicing area and diesel storage facility is separated from the general stormwater. Untreated contaminated water may not be allowed to be disposed of onto adjacent land.
 - Allowance must be made in the design to approximately equal the concentration time under natural conditions to minimise the flow impact downstream.
 - The on-site systems must be carefully designed using contour following canals and storm water canals, in order to follow natural flow patterns in such a way that :
 - Erosion is prevented.
 - Infrastructural damage is prevented.
 - To limit future maintenance cost, the on-site drainage canal slope and profile must be designed in such a way that neither erosion of the trenches nor the deposit of material occurs.
 - It is recommended that only the essential portion of land be cleared of vegetation. Vegetation, even though sparse, serves a very important function to limit erosion through the dissipation of energy as physical objects in the flow path, and by their roots binding the soil.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Risk of erosion	Site	Short term	Possible	High	Moderate	Low

Impact on Irreplaceable Resources (<i>after mitigation</i>) If yes, please explain	Yes	NO
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Cumulative impact rating (<i>after mitigation</i>) If high, please explain	NONE	Medium	High
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IMPACT ON TERRESTRIAL AND AQUATIC BIODIVERSITY DURING THE DESIGN PHASE

Impact Description

In order to ensure that the proposed project is developed in an environmental sustainable manner, it is necessary to identify means to implement the EMPr, provide guidelines/specifications in terms of the design and compile relevant managements plan(s). etc. These measures must be implemented prior to commencement of construction to ensure effective implementation of the Environmental Authorisation and the EMPr.

Site clearing and preparation

Certain areas of the site will need to be cleared of vegetation and some areas may need to be levelled. Envisaged impacts:

Loss of plant species
Loss of rare/medicinal species
Loss of animal species
Loss of biodiversity
Increased soil erosion
Alien plant invasion

Wetland/Seasonal stream area degradation

- Soil compaction, erosion and sedimentation for the river and riparian area
- Soil and water pollution for the stream and riparian area
- Spread and establishment of alien invasive species in the stream and riparian area

Cumulative impact description

Based on the proposed development as well as the known developments planned in the region the cumulative impact on biodiversity (as listed above) should be negligible if all mitigation as recommended is implemented.

Mitigation

Project Site Layout

The project site layout as proposed which was guided by the Combined Environmental Sensitivity Map (included as Appendix B(4) of the BAR) may not be amended without appropriate consideration of relevant environmental sensitivities and relevant approvals. This map clearly confirms the No Go areas in terms of the delineated watercourse with buffer zone and the heritage and visual constraints.

Demarcation of areas

- Clear demarcation must take place by method to be determined between the ECO and the Contractor of the outside boundaries of the delineated watercourse. These areas should be fenced off prior to construction and zoned as a no-go area. Fences must not restrict the dispersal or exploratory movements of remaining faunal species. Palisade fencing with a minimum of 15cm gap is recommended adjacent to the conserved wetlands and buffer zones as well as along the seasonal stream and buffer zone.
- The entire area to be developed must be clearly demarcated prior to initial site clearance and to prevent construction personnel from leaving the demarcated area

Planning for the construction period

- To minimise the effect on the vegetation, insects, small mammals, and environment it is recommended that the construction be done within the winter period as far as possible, when most plants are dormant and animals less active.
- Where vegetation of areas not to be developed needs to be "opened" to gain access it is recommended that the herbaceous species are cut short rather than removing them.
- Vegetation clearance should be restricted to the approved development areas allowing remaining animals the opportunity to move away from the disturbance. The Environmental Control Officer (ECO) should recommend, and the ECO should monitor these areas.
- Any disturbed or eroded areas within the PV sites should be appropriately revegetated.
- No hazardous materials should be stored within the demarcated buffer of the wetland area as per the Aquatic Impact Assessment.
- Provision of adequate toilet facilities must be implemented to prevent the possible contamination of ground (borehole) and surface water in the area.
- No cleaning of equipment should be done within the demarcated buffer zones as per the Aquatic Impact Assessment. This includes the establishment of temporary and permanent offices and ablution facilities
- All vehicles and equipment should be regularly inspected for leaks. Re-fuelling must take place on a sealed surface area outside of the demarcated buffers as per the Aquatic Impact Assessment of the watercourses to prevent ingress of hydrocarbons into topsoil.
- No dumping or storage of waste should take place within the watercourse areas.

Water Use Authorisation

- The PV components and associated infrastructure will be constructed immediately adjacent to the delineated watercourses (within 500m from a wetland), which pose a risk of changing the bed, banks or characteristics of the watercourses or impeding or diverting flow in the watercourses. Also, an existing access road crossing a watercourse area will be upgraded and developed. Water Use Authorisation is therefore required.
- A preliminary risk assessment was compiled as per DWS requirement and it was concluded that, provided the recommended

mitigation measures are implemented, the risk of the activities degrading the adjacent aquatic features will be low; therefore the water use activities would fall within the ambit of General Authorisations for Section 21 (c) and (i) water use activities. This must be obtained prior to commencement of construction.

Appointment of Contractors

The EA, Generic EMPR and the Site Specific EMPR must form part of the tender documents.

Appointment of an Environmental Control Officer

- To be responsible to monitor that all requirements in terms of the Site-Specific and Generic EMPR are implemented during the construction phase.
- The ECO must confirm that all requirement as per the Environmental Authorisation is adhered to, i.e. actions required prior to commencement of construction.
- To ensure Environmental Awareness Training takes place.

Alien Invasive Management

Appoint an ecologist to compile an Alien Invasive Management Plan for implementation during the construction and the operation phases of the project.

Habitat Restoration/Rehabilitation Plan

Appoint an ecologist to compile a Habitat Restoration/Rehabilitation Plan for implementation before the end of the construction phase, prior to the operational phase.

Disturbed areas around the wetlands as well as the proposed buffer zones must be re-vegetated with an indigenous (to the area) grass seed mixture.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Loss of plant and animal species	Site	Medium term	Probable	Medium	Moderate	Low
Wetland degradation	Local	Medium term	Probable	Low	High	Low

Impact on Irreplaceable Resources (after mitigation) If yes, please explain	Yes	NO
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Cumulative impact rating (after mitigation) If high, please explain	NONE	Medium	High
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IMPACT ON AVIFAUNA TO BE ADDRESSED DURING THE DESIGN PHASE

Impact Description

Entrapment of birds in the perimeter fences could lead to mortality.

Cumulative impact description

There are currently three approved renewable energy projects within a 30km radius around the proposed Mercury Solar PV Cluster. Mortality due to entrapment in fences is a possibility at all the existing and planned renewable energy facilities. However, the cumulative impact on species of conservation concern is expected to be low, given the highly transformed habitat and location of all the projects.

Mitigation

- If possible, use a single perimeter fence to prevent birds from getting trapped between fences.
- Increase the spacing between at least the top two wires to a minimum of 30cm and ensure they are correctly tensioned

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Entrapment of birds in perimeter fences	Site	Long term	Possible	High	Low	Low

Impact on Irreplaceable Resources (after mitigation). If yes, please explain	Yes	NO
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Cumulative impact rating (after mitigation) If high, please explain	NONE	Medium	High
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HUMAN SAFETY & ENVIRONMENTAL HEALTH IMPACT RESULTING FROM THE BESS DURING DESIGN AND PLANNING

Impact Description

- A High Level Safety Health and Environment Risk Assessment was prepared for the Mercury Cluster Solar PV by iSHEcon Chemical Process Safety Engineers.
- Risk is made up of two components:
 - The probability of a certain hazardous event or incident occurring.
 - The severity of the consequences of that hazardous event / incident.
- The assessment of risk comprises:
 - Identification of the likely hazards and hazardous events related to the operation of the installation.
 - Estimation of the likelihood/probability of these hazardous events occurring.
 - Estimation of the consequences of these hazardous events.
 - Estimation of the risk and comparison against certain acceptability criteria.
- This risk assessment has found that with suitable preventative and mitigative measures in place, none of the identified potential risks are excessively high, i.e., from a SHE perspective no fatal flaws were found with the proposed Lithium-ion or Sodium-Ion Solid-state BESS installations at the Mercury Solar PV Cluster near Viljoenskroon.
- At a large facility, without installation of the state-of-the-art battery technology that includes protective features, there can be significant risks to employees and first responders. The latest battery designs include many preventative and mitigative measures to reduce these risks to tolerable levels.

Mitigation

Detailed and technical mitigation measures have been compiled in compliance with the Occupational Health and Safety Act, 1993 (Act No 85 of 1993). The design engineers must ensure that all these relevant requirements are met. Below is a summary of the key issues.

General

The findings and requirements of the High Level Safety Health and Environment Risk Assessment prepared for the Mercury Cluster Solar PV by iSHEcon Chemical Process Safety Engineers must be implemented during all phases of the project development.

The following recommendations have been made:

- There are numerous different battery technologies but using one consistent battery technology system for all the BESS installations associated with the Mercury PV facilities would allow for easy of training, maintenance, emergency response and could significantly reduce risks in a remote location.
- State-of-the-art battery technology should be used with all the necessary protective features e.g. draining of cells during shutdown and standby-mode, full BMS with deviation monitoring and trips, leak detection systems.
- Neither sodium-ion or lithium-ion solid state battery technology type presents any safety or health fatal flaws, so either type could be used.
- Ensure the mitigative measures are included in the design.
- The overall design should be subject to a full Hazop prior to finalization of the design.
- Prior to bringing any solid-state battery containers into the country:
 - An Emergency Response Plan should be in place that would be applicable for the full route from the ship to the site. This plan would include details of the most appropriate emergency response to fires both while the

- units are in transit and once they are installed and operating.
- An End-of-Life plan should be in place for the handling, repurposing or disposal of dysfunctional, severely damaged batteries, module and containers.
- The site layout and spacing between solid-state containers should be such that it mitigates the risk of a fire or explosion event spreading from one container to another.
- Under certain weather conditions, the noxious smoke from a fire in a solid-state battery container could travel some distance from the unit. The smoke will most likely be acrid and could cause irritation, coughing, distress etc. Close to the source of the smoke, the concentration of toxic gases may be high enough to cause irreversible harmful effects. Location of the facilities needs to ensure a suitable separation distance from public facilities/residences etc.
- All the current proposed BESS locations are over 500m from isolated farmhouses.
- Where there is a choice of alternative locations for the BESS, those that are further from water courses would be preferred. Solid-state systems may experience fires that may result in loss of containment of liquids or the use of large amounts of fire water which could be contaminated. One would not want these run-offs to enter water courses directly. The buffer distance between water bodies and the facilities containing chemicals should be set in consultation with a water specialist and is therefore not specified in this SHE RA. However, the current separation of over 300m seems reasonable.
- Any bulk diesel storage for generators / vehicles should be fully bunded and the generators designed with the OHS Act noise limitations in mind.
- It is recommended that once the technology has been chosen and more details of the actual design are available, that this risk assessment be updated.

Impact Assessment –

The risk assessment was done in significant extent and appropriate detail in the risk assessment report. The impact assessment for the purpose of the Basic Assessment Report was slightly different assessed and is summarised below. The risk assessment has found that with suitable preventative and mitigative measures in place, none of the identified potential risks are excessively high. Detail of the impact is described under the Construction and Operational Phases. Overall impact is provided below.

Name of Impact	Ease of mitigation	Significance before mitigation	Significance after mitigation
Overall impact of the BESS on the environment	Ranging from complex to easy	Ranging from High to Low	Ranging from Low to Very Low

CONSTRUCTION PHASE

IMPACT ON AGRICULTURAL LAND DURING CONSTRUCTION

Impact Description

- Loss of agricultural potential by occupation of land:
Agricultural land directly occupied by the development infrastructure will become unavailable for agricultural use, with consequent potential loss of agricultural productivity for the duration of the project lifetime. This impact is relevant only in the construction phase. No further loss of agricultural land use occurs in subsequent phases.
- Loss of agricultural potential by soil degradation:
This impact only occurs during the construction and decommissioning phases, but only becomes relevant once the land is returned to agricultural land use after decommissioning. Soil can be degraded by impacts in three different ways: erosion; topsoil loss; and contamination. Erosion can occur as a result of the alteration of the land surface run-off characteristics, which can be caused by construction related land surface disturbance, vegetation removal, and the establishment of hard surface areas including roads. Loss of topsoil can result from poor topsoil management during construction related excavations. Hydrocarbon spillages from construction activities can contaminate soil. Soil degradation will reduce the ability of the soil to support vegetation growth.

Cumulative impact description

- Loss of agricultural potential by occupation of land

- Loss of agricultural potential by soil degradation

Mitigation

Loss of agricultural potential by occupation of land

None possible

Loss of agricultural potential by soil degradation

- Stormwater management control measures to be implemented.
- Maintain vegetation strips where possible.
- Strip, stockpile en re-spread topsoil

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Loss of agricultural potential by occupation of land	Site	Long Term	Definite	High	Low	Low
Soil Degradation	Site	Long Term	Possible	Medium	Low	None

Impact on Irreplaceable Resources (after mitigation)	Yes	No
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Cumulative impact rating (after mitigation) If high, please explain	Low	Medium	High
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IMPACT ON TERRESTRIAL BIODIVERSITY DURING THE CONSTRUCTION PHASE

Impact description

Loss of Fauna & Flora

Envisaged impacts:

- Vegetation clearance/habitat destruction
- Soil erosion and pollution
- Spread and establishment of alien invasive plant species
- Negative effect of human activities on fauna and road mortalities
- Loss of biodiversity

Degradation of watercourse areas

- Envisaged impacts:
- Erosion of streambank
- Loss of wetland habitat
- Soil & water pollution

Cumulative impact description

- Based on the proposed development the cumulative impact on biodiversity would be negligible if all mitigation as recommended is implemented.
- Based on the proposed development the cumulative impact on watercourses during the construction phase of the area would be negligible if all mitigation as recommended below is implemented.

Mitigation

- All temporary stockpile areas, litter and dumped material and rubble must be removed and disposed of at a licensed land fill facility. Proof of safe disposal must be obtained and kept on record for monitoring purposes.
- The careful position of soil piles, and runoff control, during all phases of development, and planting of some vegetative cover after completion (indigenous groundcover, grasses etc.) will limit the extent of erosion occurring on the site.
- Undeveloped areas that were degraded due to human activities must be rehabilitated using indigenous to the area vegetation.

- Hazardous chemicals must be stored on an impervious surface accompanied by Safety Data Sheets (SDS) and protected from the elements. These chemicals must be strictly controlled, and records kept of when it was used and by whom
- Limit human activity in the no-developed areas as well as the completed areas to the minimum required for ongoing operation
- Any alien plant observed should be reported to the environmental manager and should be removed as soon as possible.
- Regular monitoring (monthly) for damage to the environment as well as establishment of alien plant species must be conducted.
- No development should be allowed in the delineate watercourse with buffer area. Drainage must be controlled to ensure that runoff from the site will not culminate in off-site pollution or result in rill and gully erosion or any erosion of the watercourses
- Ensure that all hazardous storage containers and storage areas comply with the relevant SABS standards to prevent leakage
- The release of storm water must be designed such that the force of the water is reduced to prevent unnecessary erosion
- No dumping of waste should take place within the watercourse areas. If any spills occur, they should be cleaned up immediately.
- Adequate toilet facilities must be provided for all staff to prevent pollution of the environment
- No person/s must be allowed within the fenced-off watercourse areas unless for rehabilitation or alien plant removal.
- Implementation of the conditions of the Water Use Authorisation must take place

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Loss of fauna & flora	Site	Medium Term	Probable	Medium	Moderate	Low
Watercourse degradation	Local	Long term	Possible	Low	High	Low

Impact on Irreplaceable Resources (after mitigation)
If yes, please explain

Yes

NO

Cumulative impact rating (after mitigation)
If high, please explain

LOW

Medium

High

IMPACT ON AQUATIC HABITAT DURING CONSTRUCTION

Impact Description

Disturbance to aquatic habitat and impact on water quality

Cumulative impact description

Aquatic ecosystem deterioration

Mitigation

- The recommended buffers between the delineated aquatic ecosystems and all the proposed project activities should be maintained.
- If the construction and operation of the PV modules does not require modification to the topography, topsoils or removal of indigenous grassland such that wetland functionality within these degraded wetland areas could be retained, the modules could be placed within the wetland areas mapped as being of low sensitivity.
- Clearing of indigenous vegetation should not take place within the aquatic features and the recommended buffers.
- The existing road infrastructure should be utilised as far as possible to minimise the overall disturbance.
- During the construction phase, site management must be undertaken at the laydown and construction sites. This should specifically address on-site stormwater management and prevention of pollution measures from any potential pollution sources during construction activities such as hydrocarbon spills.
- Any stormwater that does arise within the construction sites must be handled appropriately to trap sediments and reduce flow velocities.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Disturbance of aquatic habitat and water quality	Site	Short term	Possible	High	High	Low

Impact on Irreplaceable Resources (<i>after mitigation</i>) If yes, please explain	Yes	NO
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Cumulative impact rating (<i>after mitigation</i>) If high, please explain	LOW	Medium	High
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IMPACT ON AVIFAUNA TO BE ADDRESSED DURING THE CONSTRUCTION PHASE

Impact Description

- Displacement of priority species due to disturbance and habitat destruction (vegetation clearance) associated with construction of the PV facility and associated infrastructure.
- Displacement of priority species due to habitat transformation (vegetation clearance and the presence of the solar panels) associated with construction of the PV plant and associated infrastructure.

Note the following:

- Of importance in the assessment area of the Vlaktefontein Solar PV1 is the drainage line associated with a wetland. Wetlands are important refuges for a number of priority species, including the Marsh Owl that often breeds in the tall rank grassland around wetlands.
- The resources are not irreplaceable. There are no species of conservation concern at the PV site.
- The PV site is highly transformed, which makes it generally unsuitable for species of conservation concern.

Cumulative impact description

There are currently three approved renewable energy projects within a 30km radius around the proposed Mercury Solar Cluster, namely the 75MW Buffels Solar PV 1 Solar Energy Project, the 100MW Orkney PV Solar Energy Project and 132kV powerline, and the Kabi Vaalkop Photovoltaic Facility, Substation and Powerlines. Displacement due to disturbance associated with the construction of the PV facilities is a possibility at all the planned renewable energy facilities. However, the cumulative impact on species of conservation concern is expected to be low, given the highly transformed habitat and location of all the projects.

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.
- A 50m buffer zone must be maintained around the drainage line running through the centre of the PV site.
- Rehabilitation of vegetation must take place under the guidance of a vegetation specialist after the conclusion of the construction phase.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Displacement of Priority Species due to disturbance	Site	Short term	Probable	High	High	Moderate
Displacement of Priority Species due to habitat transformation	Site	Short term	Probable	High	High	Moderate

Impact on Irreplaceable Resources (<i>after mitigation</i>). If yes, please explain	Yes	NO
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Cumulative impact rating (<i>after mitigation</i>) If high, please explain	LOW	Medium	High
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IMPACT ON HERITAGE, ARCHAEOLOGY AND PALAEOLOGY RESOURCES DURING CONSTRUCTION

Impact Description

- Heritage: It is possible that cultural landscape resources may be impacted by the proposed development.
- Archaeology: It is possible that significant archaeological resources may be impacted by the proposed development
- Palaeontology: Based on experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the overlying deep soils and sands of the Quaternary. There is a very small chance that fossils may occur in the shales below ground of the early Permian Vryheid Formation.

Cumulative impact description

Destruction or negative impact to significant cultural landscape heritage

Mitigation

Heritage

Retention of the tree avenues located along roads, access routes and farm boundaries where possible. Implementation of the mitigation measures outlined in the VIA

Archaeology

- Should any archaeological resources or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The South African Heritage Resources Agency (SAHRA) must be contacted immediately in order to determine an appropriate way forward. Based on the nature of the project area, especially in the northern part of the site, surface activities may impact upon the fossil heritage in the development footprint.

Palaeontology

Since there is a small chance that fossils may be discovered and/or disturbed, a Fossil Chance Find Protocol is recommended. The following Chance Fossil Finds Procedure must be implemented during the course of construction activities:

- When excavations begin underground rocks are exposed, the rocks must be given a cursory inspection by the ECO (or other designated person). Any fossiliferous material (plants, insects, bone, coal, tracks, plant impressions) should be put aside in

a suitably protected place. This way the project activities will not be interrupted.

- Photographs of similar fossils are provided as an appendix of the EMPR to assist in recognising the fossil plants, vertebrates, invertebrates or trace fossils in the shales and mudstones.
- Photographs of the putative fossils must be sent to a palaeontologist for a preliminary assessment.
- If the above-mentioned palaeontologist found any possible fossil material, a qualified palaeontologist 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.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Heritage: Disturbance to cultural landscape which consists of tree avenues along existing roads	Site	Permanent	Possible	Irreversible	Moderate	Low
Archaeology: Potential identification of archaeological resources	Site	Permanent	Possible	Irreversible	Moderate	Low
Palaeontology: Potential discovery of palaeontological resources	Site	Permanent	Possible	Irreversible	Moderate	Low

Impact on Irreplaceable Resources (after mitigation)

If yes, please explain

Artefacts cannot be repaired or replaced but their loss is inconsequential in heritage terms.

YES

NO

Cumulative impact rating (after mitigation)

If high, please explain

LOW

Medium

High

RISK OF GROUNDWATER POLLUTION DURING CONSTRUCTION

Impact Description

- The risk for groundwater pollution during the construction period is generally associated with oil spills resulting from construction vehicles and placement of engineering structure.
- Poor waste management could result in unnecessary impact on groundwater and natural habitat.
- Should ineffective construction techniques and methods be used, it could lead the structural failure with associated risk to the environment.
- Increased risk for soil, groundwater and surface water pollution results mostly from poor waste management.
- Increased risk for spillages – associated with construction activities, maintenance and repair of vehicles, etc.

Cumulative impact description

Not applicable

Mitigation

Strict measures must be implemented :

- Emergency incident reporting and remedial measures must be in place.
- Adequate oil containment precautions must be taken.
- A bio-remediation contractor must be appointed to rehabilitate large oil spills. The regional officer of the Department of Water & Sanitation will advise in this regard.
- Small oil spills must be cleaned immediately with an oil spill kit.
- Proper maintenance procedures for vehicles and equipment must be followed.
- Servicing of vehicles may only take place in designated areas, in this case on a concrete surface within the switching station site.
- Drip trays should be used during the servicing of vehicles. The content thereof must be disposed in accordance with relevant hazardous material disposal requirement.
- Measures to contain accidental spills must be readily available on site (spill kits).
- All hazardous substance spills must be reported to the Contractor and the ECO, recorded and investigated.

Waste Management Procedures must include the following:-

- General household waste (i.e. strict control over labourers; no burning or burying of waste; provision of dustbin and garbage bags; regular removal preferably by municipal waste removal; etc.)
- Construction waste (i.e. stringent daily clean-up and either disposal at registered waste site or preferably sold for recycling purposes)
- Sewage waste (labourers to be provided with proper ablution facilities- chemical toilets must be provided and serviced by a reputable outside company; no effluent to be dumped on adjacent land). Written proof of servicing of the chemical toilets must be obtained and kept on site in the ECO file.
- Hazardous waste (i.e. oil contaminated waste to be moved to registered hazardous waste landfill site; adequate storage and labelling of hazardous materials on site). Stormwater should not be discharged into the working areas and it should be ensured that stormwater leaving the footprint of the proposed development areas is not contaminated by any substance, whether that substance is solid, liquid, vapour or any combination thereof. Way slips or written proof of disposal at an appropriately registered waste facility must be obtained and kept on site in die ECO File.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Risk of groundwater pollution	Local	Medium	Possible	High	Moderate	Low

Impact on Irreplaceable Resources (after mitigation) If yes, please explain	Yes	NO
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Cumulative impact rating (after mitigation) If high, please explain	LOW	Medium	High
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RISK OF EROSION DURING CONSTRUCTION

Impact Description

- Potential soil erosion from temporary access roads and laydown areas.
- To cause the loss of soil by erosion is an offence under the Soil Conservation Act, Act No 76 of 1969.
- The impact will occur where large areas of land are exposed and where stormwater is allowed to cascade freely across the site.
- Construction vehicles and insufficient construction roads could also result in erosion.

Cumulative impact description

Erosion may spread, however the application of mitigation measures will minimise this impact to acceptable levels.

Mitigation

- The specifications of the Stormwater Management Plan must be implemented.
- It is recommended that access and service roads, as well as stormwater systems are constructed at the commencement of the construction phase to ensure that suitable stormwater management measures are in place at the least additional cost.
- These permanent routes must be used also for construction purposes. In order to preserve the natural state of the surface and vegetation as far as practically possible, off-road driving should be restricted to the absolute essential.

- Space for lay-down areas for construction material and for construction facilities is restricted on site. The flowing should however be taken into account:
 - Temporary or permanent soil stockpiles should be placed in such a way to minimize the impact on surface flow.
 - High resolution site survey data must be used to design stormwater ditches to direct surface flood water past any stockpiles.
- Site clearing should be limited to the essential.
- Construction waste must be collected and stored safely for disposal in accordance with the relevant waste regulations, protocols, and product specifications.
- Care must be taken not to leave any waste on site that can lead to future contamination of the site or the downstream area.
- Training with regards to stormwater management of construction personnel must be undertaken as part of their induction.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Increased risk of erosion	Local	Medium	Possible	High	Moderate	Low

Impact on Irreplaceable Resources (after mitigation) If yes, please explain	Yes	NO
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Cumulative impact rating (after mitigation) If high, please explain	LOW	Medium	High
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SOCIAL IMPACT DURING THE CONSTRUCTION PHASE

Impact Description

Presence of construction workers and potential impacts on family structures and social networks

The presence of construction workers poses a potential risk to family structures and social networks. While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on local communities. The most significant negative impact is associated with the disruption of existing family structures and social networks. This risk is linked to potentially risky behaviour, mainly of male construction workers, including:

- An increase in alcohol and drug use.
- An increase in crime levels.
- The loss of girlfriends and/or wives to construction workers.
- An increase in teenage and unwanted pregnancies.
- An increase in prostitution.
- An increase in sexually transmitted diseases (STDs), including HIV.
- Increased exposure to COVID-19.

Due to the location of the proposed site no workers will be accommodated on site. Based on experience with other renewable energy projects, local farmers are not in favour of a construction workers being accommodated on the site due to potential safety and security risks they pose.

The majority of non-local construction workers are likely to be accommodated in Klerksdorp and Orkney. As indicated above, the majority of low skilled and semi-skilled work opportunities can be taken up by members from the local community. Employing members from the local community to fill these job categories will reduce the risk and mitigate the potential impacts on the local communities. Where possible these workers should be sourced from the surrounding towns of Klerksdorp and Orkney. These workers will be from the local community and form part of the local family and social network and, as such, the potential impact will be reduced.

The findings of the SIA indicate that unemployment levels in the area are high. The creation employment opportunities for low and semi-skilled workers from the area would therefore represent a positive socio-economic benefit. While the risks associated with construction workers at a community level will be low, at an individual and family level they may be significant, especially in the case of contracting a sexually transmitted disease or an unplanned pregnancy. This has been borne out from the experiences with other solar energy projects in the Northern Cape Province, for example projects located near Poffadder. However, given the nature of construction projects it is not possible to totally avoid these potential impacts at an individual or family level.

Potential Influx of job seekers

Large construction projects tend to attract people to the area in the hope that they will secure a job, even if it is a temporary job. These job seekers can in turn become “economically stranded” in the area or decide to stay on irrespective of finding a job or not. As in the case of construction workers employed on the project, the actual presence of job seekers in the area does not in itself constitute a social impact. However, the manner in which they conduct themselves can impact on the local community. The main areas of concern associated with the influx of job seekers include:

- Impacts on existing social networks and community structures.
- Competition for housing, specifically low-cost housing.
- Competition for scarce jobs.
- Increase in incidences of crime. The concern is that these job seekers may not leave town immediately and, in some cases, may stay indefinitely

However, the influx of job seekers is however typically associated with large construction projects that extend over a number of years. The proposed project does not represent a large construction project. The potential for the influx of job seekers is therefore likely to be low. The potential impacts associated with the influx of job seekers are therefore likely to be low.

Risk to safety, livestock, and farm infrastructure

The presence on and movement of construction workers on and off the site poses a potential safety threat to local farmers and farm workers in the vicinity of the site. In addition, farm infrastructure, such as fences and gates, may be damaged and stock losses may also result from gates being left open and/or fences being damaged. Stock theft linked directly or indirectly to the presence of construction workers on the site also poses a risk to farming activities.

The risk to farming operations and increased risk of crime was raised as a key issue by the local landowners. The presence of construction workers on the site increases the exposure of farming operations and livestock to the outside world, which, in turn, increased the potential risk of stock theft and crime. The safety and security risks associated with construction phase would be higher if all of the PV SEFs associated with the Northern Cluster are constructed concurrently. This is directly linked to the increase in the number of construction workers in the area.

The potential risks (safety, livestock, and farm infrastructure) can be effectively mitigated by careful planning and managing the movement of construction on the site workers during the construction phase. Mitigation measures to address these risks are outlined below.

Increased risk of veld fires

The presence of construction workers and construction-related activities on the site poses an increased risk of grass fires that could, in turn pose, a threat to livestock, crops, and farm infrastructure. Grass fires were identified as a concern and pose a threat to livestock and farming operations. The potential risk of grass fires is heightened by the windy conditions in the area, specifically during the dry, windy winter months from May to October. The risk of grass fires would be higher if all of the PV SEFs associated with the Northern Cluster are constructed concurrently. This is directly linked to the increase in construction related activities and number of construction workers on site.

In terms of potential mitigation measures the option of constructing a firebreak around the perimeter of the site prior to the commencement of the construction phase should be investigated. In addition, a fire-fighting vehicle should be present on the site during the construction phase.

Noise, dust, and safety impacts associated with construction related activities and vehicles.

Construction activities, including the movement of heavy construction vehicles, have the potential to create noise, dust, and safety impacts and damage roads, specifically unsurfaced farm roads. Damage caused by movement of heavy construction vehicles along local roads, specifically the S729 and Vermaasdrift Road, and impact on access to the silos at Vierfontein and Viljoenskroon, specifically during harvesting period of May to July, were raised as key concerns. The roads are in a poor condition following the recent heavy rains. The risk of damage to roads and impacts associated with construction related activities would be higher if all of the PV SEFs associated with the Northern Cluster are constructed concurrently.

The preparation of the site and associated levelling and clearing of vegetation will expose the soil to wind and result in dust. The dust impacts will be exacerbated during windy periods.

Impact on productive farmland

Good quality agricultural land is a scarce and finite resource. The loss of high-quality agricultural land should therefore be avoided and or minimised by careful planning in the final layout of the proposed PV SEF facilities. The final disturbance footprint can be reduced by careful site design and management of operation. The impact on farmland associated with the construction phase can also be mitigated by minimising the footprint of the construction related activities and ensuring that disturbed areas are fully rehabilitated on completion of the construction phase.

The landowner indicated that there were no concerns with the proposed layout. Only portions of the relevant properties are considered suitable for cropping. The loss of cropped areas can be accommodated within their larger operation.

The farm house on Zaaiplaats 190/RE is occupied by a farm manager, who will be relocated. The farm labourer dwellings on the property are leased out to Harmony Moab and this agreement will be cancelled. Illegal dwellers had been removed.

Cumulative impact description

The site is located within the Klerksdorp REDZ. The potential for cumulative impacts associated with combined visibility (whether two or more solar facilities will be visible from one location) and sequential visibility (e.g., the effect of seeing two or more solar facilities along a single journey), therefore exists. However, the area has been identified as suitable for the establishment of large scale renewable energy facilities. The cumulative impact on the areas sense of place associated with the northern part of the Mercury PV Solar Cluster is therefore rated as Low Negative.

Impacts on family and community relations that may, in some cases, persist for a long period of time. Also, in cases where unplanned / unwanted pregnancies occur or members of the community are infected by an STD, specifically HIV and or AIDS, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community.

Overall loss of farmland could affect the livelihoods of the affected farmers, their families, and the workers on the farms and their families. However, disturbed areas can be rehabilitated.

If damage to local farm roads is not repaired then this will affect the farming activities in the area and result in higher maintenance costs for vehicles of local farmers and other road users, and also impair access to silos. The costs will be borne by road users who were not responsible for the damage. Dust impacts to crops could also impact on quality.

Mitigation

Presence of construction workers and potential impacts on family structures and social networks

- The proponent should prepare a Stakeholder Engagement Plan (SEP) and Community Health, Safety and Security Plan (CHSSP) prior to commencement of construction phase.
- Where possible, the proponent should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically for semi and low-skilled job categories.
- The proponent should consider the option of establishing a Monitoring Forum (MF) in order to monitor the construction phase and the implementation of the recommended mitigation measures. The MF should be established before the construction phase commences, and should include key stakeholders, including representatives from local communities, local MLM Councillor, farmers, and the contractor(s). The MF should also be briefed on the potential risks to the local community associated with construction workers.
- The proponent and the contractor(s) should, in consultation with representatives from the MF, develop a code of conduct for the construction phase. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be dismissed. All dismissals must comply with the South African labour legislation.
- The proponent and the contractor should implement an HIV/AIDS and COVID-19 awareness programme for all construction workers at the outset of the construction phase.
- The construction area should be fenced off before construction commences and no workers should be permitted to leave the fenced off area.
- The contractor should provide transport for workers to and from the site on a daily basis. This will enable the contractor to effectively manage and monitor the movement of construction workers on and off the site.
- Where necessary, the contractors should make the necessary arrangements to enable low and semi-skilled workers from outside the area to return home over weekends and/ or on a regular basis. This would reduce the risk posed to local family structures and social networks.
- The contractor must ensure that all construction workers from outside the area are transported back to their place of residence within 2 days for their contract coming to an end.
- It is recommended that no construction workers, with the exception of security personnel, should be permitted to stay overnight on the site.

Potential Influx of job seekers

It is impossible to stop people from coming to the area in search of a job. However, as indicated above, the proponent should ensure that the employment criteria favour local residents in the area. In addition:

- The proponent, in consultation with the MLM and CoMLM, should investigate the option of establishing a MF to monitor and identify potential problems that may arise due to the influx of job seekers to the area. The MF should also include the other proponents of solar energy projects in the area.
- The proponent should implement a "locals first" policy, specifically with regard to unskilled and low skilled opportunities.
- The proponent should implement a policy that no employment will be available at the gate.

Risk to safety, livestock, and farm infrastructure

- The proponent should prepare a Stakeholder Engagement Plan (SEP) and Community Health, Safety and Security Plan (CHSSP) prior to commencement of construction phase.
- The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase will be compensated for. The agreement should be signed before the construction phase

commences.

- Traffic and activities should be strictly contained within designated areas.
- Strict traffic speed limits must be enforced on the farm.
- All farm gates must be closed after passing through.
- Contractors appointed by the proponent should provide daily transport for low and semi-skilled workers to and from the site. This would reduce the potential risk of trespassing on the remainder of the farm and adjacent properties.
- The proponent should consider the option of establishing a MF (see above) that includes local farmers and develop a Code of Conduct (CoC) for construction workers. This committee should be established prior to commencement of the construction phase. The Code of Conduct should be signed by the proponent and the contractors before the contractors move onto site.
- The proponent should hold contractors liable for compensating farmers and communities in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between the proponent, the contractors, and neighbouring landowners. The agreement should also cover losses and costs associated with fires caused by construction workers or construction related activities (see below).
- The Environmental Management Plan (EMP) must outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested.
- Contractors appointed by the proponent must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.
- Contractors appointed by the proponent must ensure that construction workers who are found guilty of stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation.
- It is recommended that no construction workers, with the exception of security personnel, should be permitted to stay overnight on the site.

Increased risk of veld fires

- The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc., during the construction phase will be compensated for. The agreement should be signed before the construction phase commences.
- The option of establishing a fire-break around the perimeter of the site prior to the commencement of the construction phase should be investigated.
- Contractor should ensure that open fires on the site for cooking or heating are not allowed except in designated areas.
- Smoking on site should be confined to designated areas.
- Contractor to ensure that construction related activities that pose a potential fire risk, such as welding, are effectively managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy winter months.
- Contractor should provide adequate fire-fighting equipment on-site, including a fire fighting vehicle.
- Contractor to provide fire-fighting training to selected construction staff. No construction staff, with the exception of security staff, to be accommodated on site overnight.
- As per the conditions of the Code of Conduct, in the advent of a fire being caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the fire-fighting costs borne by farmers and local authorities.

Noise, dust, and safety impacts associated with construction related activities and vehicles.

- The movement of heavy vehicles associated with the construction phase should be timed to avoid times of the week, such as weekends, when the volume of traffic travelling along the local roads in the area may be higher.
- Damage to S729 and Vermaasdrift Road, and other local farm roads that may be impacted, should be repaired throughout the construction period.
- Construction related activities and movement of traffic should ensure that access to silos at Vierfontein and Viljoenskroon, specifically during harvesting period of May to July, is not impaired.
- Construction operations should be planned to minimise the total area cleared at any given time.
- Construction operations that have the potential to generate significant dust impacts, such as site clearance etc, should be timed to avoid harvesting times.
- Cleared areas should be rehabilitated once the construction phase has been completed.
- Dust suppression measures must be implemented on un-surfaced roads, such as wetting on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.
- All vehicles must be road-worthy, and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits.

Impact on productive farmland

- The loss of high-quality agricultural land should be avoided and or minimised by careful planning in the final layout of the

proposed PV SEF facilities. The recommendations of the agricultural / soil assessment should be implemented.

- The site for the proposed SEF should be fenced off prior to commencement of construction activities.
- The footprint associated with the construction related activities (access roads, construction platforms, workshop etc.) should be minimised.
- An Environmental Control Officer (ECO) should be appointed to monitor the establishment phase of the construction phase.
- All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase.
- The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. The specifications for the rehabilitation programme should be drawn up by the Environmental Consultants appointed to manage the EIA.
- The implementation of the Rehabilitation Programme should be monitored by the ECO.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Presence of construction workers and potential impacts on family structures and social networks	Local	Short term	Probable	No in case of HIV & Aids	Medium	Low
Influx of job seekers	Local	Permanent	Probable	No in case of HIV & Aids	Low	Low
Risk to safety, livestock, and farm infrastructure	Local	Short Term	Probable	Yes	Medium	Low
Increased risk of veld fires	Local	Short Term	Probable	High (if compensations is paid for losses)	Medium	Low
Presence of construction workers and potential impacts on family structures and social networks	Local	Short Term	Probable	Yes	Medium	Low
Impact of construction activities and vehicles	Local	Short Term	Probable	Yes	Medium	Low
Loss of farmland	Local	Long Term	Probable	Yes	Medium	Low

Impact on Irreplaceable Resources (after mitigation). If yes, please explain	Yes	NO
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Cumulative impact rating (after mitigation) If high, please explain	LOW & NONE	Medium	High
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IMPACT ON TRAFFIC DURING CONSTRUCTION

Impact Description

Traffic congestion due to an increase in traffic caused by the transportation of components, equipment, material and staff to site.

Cumulative impact description

The increase in construction traffic on roads will cause congestion which leads to an increase in dust and noise pollution.

Mitigation

- Stagger component delivery to site.
- Reduce the construction period.
- The use of mobile batch plants and quarries in close proximity to the site, if available and feasible.
- Staff and general trips should occur outside of peak traffic periods.
- Consider scheduling shift changes to occur outside peak hours to concentrate staff trips in off peak periods
- Regular maintenance of gravel roads by the Contractor during the construction phase and by Client/Facility Manager during operation phase.

- Dust Suppression of gravel roads during the construction phase, as required.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Traffic Congestion	Local	Short term	Probable	High	Moderate	Low

Impact on Irreplaceable Resources (after mitigation)	Yes	No
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Cumulative impact rating (after mitigation) If high, please explain	Low	Medium	High
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IMPACT ON HUMAN SAFETY & ENVIRONMENTAL HEALTH RESULTING FROM THE BESS DURING CONSTRUCTION

Impact Description

Human Health

- Chronic exposure to toxic chemical or biological agents due to construction material, cement, paint truck fumes, etc.
- Exposure to noise (i.e. drilling, piling, generators, air compressors, etc.)
- Exposure to temperature extremes and/or humidity (i.e. heat during the day and cold in winter)
- Human Health - exposure to psychological stress (i.e. large projects bring many contractors into a small isolated community)
- Exposure to ergonomic stress (i.e. lifting of heavy equipment, working at awkward angles and at height, etc.)

Human and Equipment Safety

- Exposure to fire radiation from external fires (i.e. fire involving fuels used in vehicles, uncontrolled welding, etc.)
- Exposure to fire radiation due to damage to solid state battery containers
- Exposure to explosion over pressures (i.e. with solid state lithium containers, flammable gases generated by thermal run away reach explosive limits. Ignition on hot surfaces, static.)
- Exposure to acute toxic chemical and biological agents due to human pathogens, diseases, etc
- Exposure to acute toxic chemical and biological agents due to damage of batteries
- Exposure to violent release of kinetic or potential energy (i.e. resulting from moving of equipment, working at heights, etc)
- Exposure to electromagnetic waves (i.e. use of electrical machines, lightning strike, electrocution)

Environment

- Emissions to air (dust from construction in a generally hot and dry air)
- Emissions to water (i.e. caused by diesel for equipment, paints and solvents, oil spills, etc.)
- Emissions to earth (i.e. mess area and solid waste disposal)
- Environment - waste of resources e.g., water, power etc. (i.e. water usage not controlled)

Public – Aesthetics (visual impact of bright surfaces and tall structures in a flat area)

Investors – financial (defective technology and extreme project delays)

Employees and investors- security (potential hi-jacking on route or theft on site, etc.)

Emergencies (i.e. fire explosions, toxic smoke, large spills, traffic accidents, etc.)

Investors – Legal (i.e. quick evolving of battery field, new codes and regulations, unknown hazards)

Mitigation

Detailed and technical mitigation measures have been compiled in compliance with the Occupational Health and Safety Act, 1993 (Act No 85 of 1993). The design engineers must ensure that all these relevant requirements are met. Below is a summary of the key issues.

General

The findings and requirements of the High Level Safety Health and Environment Risk Assessment prepared for the Mercury Cluster Solar PV by iSHEcon Chemical Process Safety Engineers must be implemented during all phases of the project development.

The following recommendations have been made:

- There are numerous different battery technologies but using one consistent battery technology system for all the BESS installations associated with the Mercury PV facilities would allow for easy of training, maintenance, emergency response and could significantly reduce risks in a remote location.
- State-of-the-art battery technology should be used with all the necessary protective features e.g. draining of cells during shutdown and standby-mode, full BMS with deviation monitoring and trips, leak detection systems.
- Neither sodium-ion or lithium-ion solid state battery technology type presents any safety or health fatal flaws, so either type could be used.
- Ensure preventative and mitigative measures provide by the specialist are included in the design.
- The overall design should be subject to a full Hazop prior to finalization of the design.
- Prior to bringing any solid-state battery containers into the country:
 - An Emergency Response Plan should be in place that would be applicable for the full route from the ship to the site. This plan would include details of the most appropriate emergency response to fires both while the units are in transit and once they are installed and operating.
 - An End-of-Life plan should be in place for the handling, repurposing or disposal of dysfunctional, severely damaged batteries, module and containers.
- The site layout and spacing between solid-state containers should be such that it mitigates the risk of a fire or explosion event spreading from one container to another.
- Under certain weather conditions, the noxious smoke from a fire in a solid-state battery container could travel some distance from the unit. The smoke will most likely be acrid and could cause irritation, coughing, distress etc. Close to the source of the smoke, the concentration of toxic gases may be high enough to cause irreversible harmful effects. Location of the facilities needs to ensure a suitable separation distance from public facilities/residences etc.
- All the current proposed BESS locations are over 500m from isolated farmhouses.
- Where there is a choice of alternative locations for the BESS, those that are further from water courses would be preferred. Solid-state systems may experience fires that may result in loss of containment of liquids or the use of large amounts of fire water which could be contaminated. One would not want these run-offs to enter water courses directly. The buffer distance between water bodies and the facilities containing chemicals should be set in consultation with a water specialist and is therefore not specified in this SHE RA. However, the current separation of over 300m seems reasonable.
- Any bulk diesel storage for generators / vehicles should be fully bunded and the generators designed with the OHS Act noise limitations in mind.
- It is recommended that once the technology has been chosen and more details of the actual design are available, that this risk assessment be updated.

Impact Assessment - The risk assessment was done in significant extent and appropriate detail in the risk assessment report. The impact assessment for the purpose of the Basic Assessment Report was slightly different assessed and is summarised below.

Name of Impact	Ease of mitigation	Significance before mitigation	Significance after mitigation
Human Health - chronic exposure to toxic chemical or biological agents	Moderate	Moderate	Low
Human Health - exposure to noise	Easy	Moderate	Low
Human Health - exposure to temperature extremes and/or humidity	Easy	Low	Very Low
Human Health - exposure to psychological stress	Easy	Low	Very Low
Human Health - exposure to ergonomic stress	Moderate	Low	Low
Human and Equipment Safety - exposure to fire radiation	Complex	Moderate	Low
Human and Equipment Safety - exposure due to damage to containers	Complex	Moderate	Low
Human and Equipment Safety - exposure to explosion over pressures	N/a	Moderate	Low
Human and Equipment Safety - exposure to acute toxic chemical and biological agents	Complex	Moderate	Low
Human and Equipment Safety - exposure to acute toxic chemical and biological agents due to damaged batteries	Complex	Moderate	Low
Human and Equipment Safety - exposure to violent release of kinetic or potential energy	Complex	High	Low
Human and Equipment Safety - exposure to	Complex	Moderate	Low

electromagnetic waves			
Environment - emissions to air	Easy	Low	Very Low
Environment - emissions to water	Moderate	Low	Low
Environment - emissions to earth	Easy	Low	Low
Environment - waste of resources e.g., water, power etc	Easy	Low	Very Low
Public – Aesthetics	Moderate	Moderate	Low
Investors – Financial	Moderate	Moderate	Low
Employees and investors - Security	Complex	Moderate	Low
Emergencies	Complex	Moderate	Low
Investors - Legal	Moderate	Moderate	Low

POST-CONSTRUCTION & OPERATIONAL PHASE

IMPACT ON AGRICULTURE DURING THE OPERATIONAL PHASE

Impact Description

Increased financial security

Enhanced agricultural potential through increased financial security for farming operations -Reliable income will be generated by the farming enterprises through the lease of the land to each energy facility. This is likely to increase their cash flow and financial security and could improve farming operations and productivity through increased investment into farming.

Improved security against stock theft and other crime

Improved security against stock theft and other crime due to the presence of security infrastructure and personal at each facility.

Cumulative impact description

- Enhanced agricultural potential through increased financial security for farming operations.
- Improved security against stock theft and other crime

Mitigation

None possible.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Increased financial security	Site	Long Term	Possible	High	Low	Low
Improved security against stock theft and other crime	Site	Long Term	Possible	High	Low	Low

Impact on Irreplaceable Resources (after mitigation)

If yes, please explain

Yes

NO

Cumulative impact rating (after mitigation) If high, please explain	LOW	Medium	High
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IMPACT ON TERRESTRIAL HABITAT DURING OPERATION

Impact Description

- Loss of Fauna & Flora
- Envisaged impacts:
- Habitat destruction caused by clearance of vegetation
- Soil and water pollution
- Spread and establishment of alien invasive species
- Negative effect of human activities on fauna and road mortalities
- Negative effect of fences on dispersal movements of fauna
- Negative effect of light pollution on nocturnal fauna.

Cumulative impact description

Based on the implementation of the recommended mitigation measures, it is not thought that the continued maintenance of the sites would have an negative cumulative effect on biodiversity..

Mitigation

- All temporary stockpile areas, litter and dumped material and rubble must be removed and discarded in an environmentally friendly way
- Undeveloped areas that were degraded due to human activities must be rehabilitated with indigenous vegetation.
- Hazardous chemicals must be stored on an impervious surface and protected from the elements. These chemicals must be strictly controlled, and records kept of when it was used and by whom.
- Palisade fencing with adequate gaps (>15cm) is recommended for the conserved private open space around the seasonally inundated seepage wetlands and seasonal stream on the site.
- During the post-construction phase, artificial lighting must be restricted to security areas and not directed towards the conserved areas (seasonally inundated seepage wetlands and seasonal stream) in order to minimize the potential negative effects of the lights on the natural nocturnal activities.
- Regular monitoring must be undertaken to determine and degradation of the vegetation and or animal habitat.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Degradation of Ecosystem	Site	Medium	Unlikely	Medium	Moderate	Low

Impact on Irreplaceable Resources (after mitigation) If yes, please explain	Yes	NO
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Cumulative impact rating (after mitigation) If high, please explain	LOW	Medium	High
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IMPACT ON AQUATIC HABITAT DURING THE OPERATION PHASE

Impact Description

Degradation of the ecological condition of aquatic ecosystems; modification of flow and water quality; erosion; and alien vegetation invasion in aquatic features

Cumulative impact description

Aquatic ecosystem deterioration

Mitigation

- Alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants or eroded. Observed invasive alien plant growth should be cleared from the sites regularly according to measures as laid out in the EMP for the project.
- Stormwater runoff infrastructure must be designed to mitigate both the flow and water quality impacts of any stormwater leaving developed areas. The runoff should rather be dissipated over a broad area covered by natural vegetation or managed using appropriate shaping with berms, channels and swales.
- Should any erosion features develop, they should be stabilised as soon as possible.
- Any water supply, sanitation services as well as solid waste management services required for the sites should preferably be provided by an off-site service provider.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Degradation of ecological condition; modification of flow and water quality; erosion; and alien vegetation invasion	Site	Short term	Possible	High	High	Low

Impact on Irreplaceable Resources (after mitigation) If yes, please explain	Yes	NO
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Cumulative impact rating (after mitigation) If high, please explain	LOW	Medium	High
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IMPACT ON AVIFAUNA TO BE ADDRESSED DURING THE OPERATIONAL PHASE

Impact Description

Mortality of priority species due to collisions with the solar panels.

Note:

- The resources are not irreplaceable. There are no species of conservation concern at the PV site.
- The PV site is highly transformed, which makes it generally unsuitable for species of conservation concern.
- The impact is likely to be insignificant to start with.

Cumulative impact description

There are currently numerous approved renewable energy projects within a 30km radius around the proposed Mercury Solar Cluster, including the 75MW Buffels Solar PV 1 Solar Energy Project, the 100MW Orkney PV Solar Energy Project and 132kV powerline, and the Kabi Vaalkop Photovoltaic Facility, Substation and Powerlines. Mortality due to collisions with the solar panels is a possibility at all the planned renewable energy facilities. However, the cumulative impact on species of conservation concern is expected to be low, given the highly transformed habitat and location of all the projects

Mitigation

No mitigation is required

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Mortality of priority species due to collisions with the solar panels.	Site	Long term	Possible	High	Low	N/a

Impact on Irreplaceable Resources (after mitigation). If yes, please explain	Yes	NO
Cumulative impact rating (after mitigation) If high, please explain	LOW	Medium High

RISK OF EROSION DURING THE OPERATIONAL PHASE

Impact Description

Diligence in stormwater management is essential and a full-time task, even during dry periods. Any lack of care may lead to the slow degrading of the site, rendering it susceptible to severe damage in the event of unexpected flooding, and subsequent potential damage to equipment on site due to gradual erosion due to normal rainfall events, or by unexpected huge damage due to random extreme flood events.

Cumulative impact description

The development footprint is small relatively small compared to the renewable energy projects in the macro area and the cumulative impact is therefore expected to be of low/negligible significance.

Mitigation

- Training with regards to stormwater management of site personnel must be undertaken as part of their induction. Refreshment training must be undertaken periodically.
- Regular conditional inspections of all storm water infrastructure are required.
- Inspection data must be recorded and accumulated for tracking purposes. Regular reporting should be a scheduled management task.
- Any item that may be found to be out of order, for instance accumulation of settled sand in a trench, or erosion, must be addressed and corrected without delay to keep the storm water system in a good and fully functional condition. Record must be kept on all repairs.
- Specific attention must be given to inspection during and after any rain and/or flood event to kerb any damage that may occur.
- The conditions of the Water Use Authorisation obtained during the Design & Pre-Construction Phase in terms of monitoring, maintenance, repair and reporting must be complied with. It is essential to make this a key responsibility of the relevant management manager.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Risk of Erosion	Local	Medium	Likely	High	High	Low

Impact on Irreplaceable Resources (after mitigation) If yes, please explain	Yes	NO
Cumulative impact rating (after mitigation) If high, please explain	LOW	Medium High

CONTINUOUS RISK FOR GROUNDWATER POLLUTION DURING THE OPERATIONAL PHASE

Impact Description

Spillages could occur with increased risk for groundwater pollution. This could typically happen during the transfer of petroleum product from road tanker to the storage tanks or during the servicing of maintenance and inspection vehicles. Leaks could occur with resultant pollution of groundwater. This would typically occur if structural failure happens or if appropriate waste management procedures are not followed.

Cumulative impact description

Impact is localised and no cumulative impact is expected.

Mitigation

- Prevent impact rather than manage impact:
 - Permanent staff as well as maintenance and inspection personnel must be appropriately trained in terms of waste management, specifically with regards to hazardous waste, inclusive of risk associated with the diesel storage facility, vehicle maintenance, etc. Appropriate Personal Protective Equipment (PPE) must at all times be provided.
 - Spillages of hydrocarbons and contaminated water must be collected from the following areas :
 - Diesel tank bunded area
 - Product receiving station and receiving pipelines.
 - Vehicle servicing area
 - The storage tank must be fully contained within the bunded area to contain spillage of hydrocarbons and contaminated rainwater and prevent the ingress of hydrocarbon spillages and contaminated rainwater into the ground or surface water.
 - Spillages from the tank bund must be retained and released in a controlled manner to an oil separator from where it could be temporarily stored and
 - Provision must be made for a thick reinforced concrete spillage containment slab laid to fall to a catch pit connected to an oil/grease separator.
 - Proper maintenance procedures for vehicles and equipment must be followed.
 - Servicing of vehicles may only take place in designated areas, in this case on a concrete surface within the switching station site.
 - Drip trays should be used during the servicing of vehicles. The content thereof must be disposed in accordance with relevant hazardous material disposal requirement.
 - As part of routine maintenance, the Applicant must undertake regular engineering inspections of the tank, tank valves and pumps to ensure that there are no leaks.
- Hydrocarbon (oil, diesel, petrol) waste as well as hydrocarbon containing material must be regarded as hazardous waste and separated from general waste.
- All hazardous substances at the site must be adequately stored and accurately identified, recorded and labelled prior to removal to a registered hazardous waste facility.
- Provide measures for emergency incident reporting and remedial measures and personnel must be appropriately trained.
- A bio-remediation contractor must be appointed to rehabilitate large oil spills. The regional officer of the Department of Water & Sanitation will advise in this regard.
- Small oil spills must be cleaned immediately with an oil spill kit. Measures to contain accidental spills must always be readily available on site (spill kits).
- All hazardous substance spills must be reported to the Contractor and the ECO, recorded and investigated.
- Follow acceptable maintenance and operational practises to ensure consistent, effective and safe performance of the infrastructure
- Also refer to the *Generic EMP*.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Risk for Groundwater pollution	Site	Short term	Possible	High	Moderate	None

Impact on Irreplaceable Resources (<i>after</i> mitigation) If yes, please explain	Yes	NO
Cumulative impact rating (<i>after</i> mitigation) If high, please explain	LOW	Medium High

IMPACT ON VISUAL RESOURCES DURING THE OPERATIONAL PHASE

Impact Description

Long term operation of the PV project that will last for approximately 20 years. Given the long time periods, the PV panels will become a fixture in the landscape, changing the local sense of place to that of a semi-industrial landscape context, within a partially degraded rural landscape setting.

Consider in context with the following:

- Partial degradation of landscape resources due to the close proximity of the sites to the Mercury Substation as well as clear, Medium Exposure views of the northern mining landscapes.
- No tourist related activities in the ZVI making use of the landscape resources.

Cumulative impact description

The establishment of the area as a renewable energy node, could attract other renewable energy developers to the region, resulting in a more established renewable energy landscape, creating larger massing effect from inter-visibility and essentially resulting in a loss of the existing rural agrarian sense of place.

Mitigation

- Continued establishment of windbreaks (10m spacing between trees) along the roads at strategic locations where existing tree vegetation along the farm roads is limited.
- Continuation of soil erosion and wind-blown dust management.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Loss of landscape Character	Site	Long Term	Probable	High	Moderate	Low
Visual intrusion from Key Observation Points	Site	Long Term	Probable	High	Moderate	Low

Impact on Irreplaceable Resources (<i>after mitigation</i>) If yes, please explain	Yes	NO
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Cumulative impact rating (<i>after mitigation</i>) If high, please explain	LOW	Medium	High
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SOCIAL IMPACT DURING THE OPERATIONAL PHASE

Impact Description

The visual impacts and associated impact on sense of place

- Three mining areas, including the Vaal Reefs mine, and the associated mining infrastructure, slimes dams and overburden dumps are located within 6-10 km of the proposed SEFs. A large slimes dam associated with the mining operations is located 2 km and 3.5km to the west and north west of the Northern and Southern Cluster respectively. The visual character of the areas has also been affected by the Mercury Substation and associated transmission lines. The areas rural sense of place has therefore been impacted by the existing mining operations and transmission infrastructure. The potential impact of the proposed SEFs on the areas rural sense of place and adjacent land uses is therefore likely to be limited. This was confirmed by the feedback from the local landowners interviewed, none of whom raised concerns about potential visual impact on sense of place.
- In addition, the site is located within the Klerksdorp REDZ. The area has therefore been identified as suitable for the establishment of renewable energy facilities.

Potential impact on property values

As indicated above, the areas rural sense of place has been impacted by the existing mining operations and transmission infrastructure. The potential impact of the proposed SEFs on property values is therefore likely to be negligible. This was confirmed by the feedback from the local landowners interviewed, none of whom raised concerns about the potential impact on property values.

Potential impact on tourism

As indicated above, the areas rural sense of place has been impacted by the existing mining operations and transmission infrastructure. The potential for the proposed SEFs to impact on tourism sector and the perception of visitors to the area is therefore likely to be negligible.

Mitigation

The visual impacts and associated impact on sense of place.

The recommendations contained in the Visual Impact Assessment undertaken for this project and included in the paragraph above should also be implemented.

Potential impact on property values

The recommendations contained in the Agricultural Impact Assessment and the Visual Impact Assessment addressed in paragraphs above should be implemented.

Potential impact on tourism

The recommendations contained in the Visual Impact Assessment undertaken for this project and included in the paragraph above should also be implemented.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
The visual impacts and associated impact on sense of place	Local	Long Term	Probable	Yes	Low	Low
Potential impact on property values	Local	Long Term	Probable	Yes	Low	Low
Potential impact on tourism	Local	Long Term	Probable	Yes	Medium	Low

Impact on Irreplaceable Resources (after mitigation). If yes, please explain	Yes	NO
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Cumulative impact rating (after mitigation) If high, please explain	LOW & NONE	Medium	High
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TRAFFIC IMPACT DURING OPERATION

Impact Description

Traffic congestion due to an increase in traffic caused by staff trips, water deliveries and trips for maintenance requirements.

Cumulative impact description

The increase in traffic on roads will cause congestion which leads to an increase in dust and noise pollution.

Mitigation

- Water deliveries, staff trips and trips for maintenance requirements could be staggered or scheduled to occur outside of peak traffic periods.
- Consider scheduling shift changes to occur outside peak hours to concentrate staff trips in off peak periods.
- The provision of water tanks and/or use of boreholes.
- Spread the cleaning of the panels over a week.
- Using a larger water bowser.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Traffic Congestion	Local	Short Term	Probable	High	Moderate	Low

Impact on Irreplaceable Resources (after mitigation)	Yes	No
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Cumulative impact rating (after mitigation) If high, please explain	Low	Medium	High
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HUMAN SAFETY & ENVIRONMENTAL HEALTH IMPACT RESULTING FROM THE BESS DURING OPERATION

Impact Description

Human Health

- Chronic exposure to toxic chemical or biological agents due to operation and maintenance failures
- Chronic exposure to toxic chemical or biological agents due to compromised battery compartments
- Exposure to noise (i.e. moving part inside containers, buildings, cooling systems, etc.)
- Exposure to temperature extremes and/or humidity (i.e. heat during the day, batteries generated heat within enclosed buildings, etc.)
- Human Health - exposure to psychological stress (Exposure to psychological stress (i.e. isolated work station and monotonous repetitive work)
- Exposure to ergonomic stress (i.e. lifting of heavy equipment, working at awkward angles and at height, etc.)

Human and Equipment Safety

- Exposure to fire radiation from external fires
- Exposure to radiation due to electric fires of the Power Conversion System
- Exposure to explosion over pressures (i.e. transformer shorting and flammable gasses)
- Exposure to acute toxic chemical and biological agents due to human pathogens, diseases, etc.
- Exposure to acute toxic chemical and biological agents due to damage of battery components
- Exposure to violent release of kinetic or potential energy (i.e. resulting from moving of equipment, working at heights, etc)
- Exposure to electromagnetic waves (i.e. lightning strike, electrocution, ignition and burns)

Environment

- Emissions to air (not generally expected, but accidental release indoors of an asphyxiant may occur and this will replace oxygen)
- Emissions to water (i.e. cooling water blow-down, maintenance waste, spills, etc.)
- Emissions to earth (i.e. mess area and solid waste disposal)
- Environment - waste of resources e.g., water, power etc. (i.e. disposal of batteries and containers)

Public – Aesthetics (visual impact of bright surfaces and tall structures in a flat area)

Investors – financial (defective technology and extreme project delays)

Employees and investors- security (potential hi-jacking on route or theft on site, etc.)

Employees and investors- security (i.e. cyber security attacks aimed at national grid).

Emergencies (i.e. fire explosions, toxic smoke, large spills, traffic accidents, etc)

Investors – Legal (i.e. quick evolving of battery field, new codes and regulations, unknown hazards)

Mitigation

Detailed and technical mitigation measures have been compiled in compliance with the Occupational Health and Safety Act, 1993 (Act No 85 of 1993).

From the details of accidents that have happened with BESS installations in general, it is clear that many potential problems manifest during the commissioning phase when units are first powered up to test functionality. This phase is critical and all controls, procedures, mitigation measures etc that would be in place for full operation should be in place

before commissioning commences.

General

The findings and requirements of the High Level Safety Health and Environment Risk Assessment prepared for the Mercury Cluster Solar PV by iSHEcon Chemical Process Safety Engineers must be implemented during all phases of the project development.

The risk assessment was done in significant extent and appropriate detail in the risk assessment report. The impact assessment for the purpose of the Basic Assessment Report was slightly different assessed and is summarised below.

Impact Assessment -

Name of Impact	Ease of mitigation	Significance before mitigation	Significance after mitigation
Human Health - chronic exposure to toxic chemical or biological agents	Easy	Moderate	Low
Human Health due to compromised battery compartments	Complex	Moderate	Low
Human Health - exposure to noise	Easy	Moderate	Low
Human Health - exposure to temperature extremes and/or humidity	Easy	Low	Very Low
Human Health - exposure to psychological stress	Easy	Low	Very Low
Human Health - exposure to ergonomic stress	Easy	Moderate	Low
Human and Equipment Safety - exposure to fire radiation due to external fires	Complex	High	Low
Human and Equipment Safety - exposure to fire radiation due to cooling failure of the Power Conversion System	Moderate	High	Low
Human and Equipment Safety - exposure to explosion over pressures	Moderate	Moderate	Low
Human and Equipment Safety - exposure to acute toxic chemical and biological agents due to human pathogens diseases, etc.	Moderate	Low	Low
Human and Equipment Safety - exposure to acute toxic chemical and biological agents due to damaged battery components	Moderate	Moderate	Low
Human and Equipment Safety - exposure to violent release of kinetic or potential energy	Moderate	Moderate	Low
Human and Equipment Safety - exposure to electromagnetic waves	Complex	Moderate	Low
Environment - emissions to air	Easy	Low	Very Low
Environment - emissions to water	Moderate	Low	Low
Environment - emissions to earth	Easy	Low	Very Low
Environment - waste of resources e.g., water, power etc	Easy	Low	Very Low
Public – Aesthetics	Easy	Moderate	Low
Investors – Financial	Easy	Moderate	Low
Employees and investors- security (potential hi-jacking on route or theft on site, etc.)	Moderate	Moderate	Low
Employees and investors – Security (i.e cyber security attacks, etc)	Complex	Moderate	Low
Emergencies	Complex	Moderate	Low
Investors - Legal	Complex	Moderate	Low

9.4 Decommissioning Phase

In the case of the proposed PV facility a decommissioning phase is likely to involve the disassembly and replacement of the existing components with more modern technology. This is likely to take place in the 20 - 28 years post commissioning. The most likely negative impact that will be associated with the replacement of old with new technology is the waste generated by the removal of the old solar panels and its associated structures.

The final decommissioning phase will have similar impacts and mitigation than the construction phase as assessed in this report and it will be possible to mitigate impacts to acceptable levels.

The decommissioning phase is likely to create additional, construction type jobs, as opposed to the jobs losses typically associated with decommissioning. This will be a positive impact.

The decommissioning phase will be addressed in full at that time by hand of the then relevant legislation.

9.5 Conclusion of Impact Assessment

- As can be seen from the summary tables above, while some potential impacts had a high or moderate significance rating prior to mitigation, all identified impacts can be mitigated to acceptable levels (i.e. moderate to low significance).
- The impacts assessed include issues raised by the different specialists as well as other impacts as identified by the EAP.
- All natural, social and cultural functions and processes will be able to continue *after* mitigation measures have been applied.
- No substantial impact *after* mitigation has been applied is expected to occur.
- The impacts after mitigation has been applied can, in general, be seen as acceptable.
- All the mitigation measures are deemed feasible, and realistic to implement, and are included in the EMP, which means that the Applicant is legally bound to follow the recommendations should the EA be granted.
- It has been illustrated effectively with support from the specialists, that there is no reason, from a Cumulative Impact viewpoint either that the proposed Vlakfontein Solar PV1 should not be authorised.

CHAPTER 10: ENVIRONMENTAL MANAGEMENT PROGRAMME

The main objectives of the Environmental Management Programme (EMPr) are to identify actions and mitigation measures to minimise expected negative impact and enhance positive impact during all development phases (design/pre-construction, construction, and post-construction/operation) in terms of community issues, construction site preparation, construction workers, habitat protection, security, etc. Communication channels and contact details must also be provided.

According to the NEMA 2014 Regulations, as amended, Appendix 4, an EMPr must comply with section 24N of the Act and includes:

- (a) details of (i) the EAP who prepared the EMPr; and (ii) the expertise of that EAP to prepare an EMPr, including a curriculum vitae;
- (b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;
- (c) a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers;
- (d) a description of the impact management objectives, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including-
 - (i) planning and design;
 - (ii) pre-construction activities;
 - (iii) construction activities;
 - (iv) rehabilitation of the environment after construction and where applicable post closure; and
 - (v) where relevant, operation activities;
- (e) a description and identification of impact management outcomes required for the aspects contemplated in paragraph (d);
- (f) a description of proposed impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (d) and (e) will be achieved, and must, where applicable, include actions to
 - (i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;
 - (ii) comply with any prescribed environmental management standards or practices;
 - (iii) comply with any applicable provisions of the Act regarding closure, where applicable;
 - (iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;
- (g) the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);
- (h) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);
- (i) an indication of the persons who will be responsible for the implementation of the impact management actions;
- (j) the time periods within which the impact management actions contemplated in paragraph (f) must be

- implemented;
- (k) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);
 - (l) a program for reporting on compliance, taking into account the requirements as prescribed by the regulations;
 - (m) an environmental awareness plan describing the manner in which-
 - (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and
 - (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and
 - (n) any specific information that may be required by the competent authority.

Vlakfontein Solar PV1 EMPr

- The EMPr as provided under Appendix H has been compiled according to the above-mentioned stipulations.
- Mitigation as proposed by the specialists, and other, is all included in the EMPr.
- Management outcomes, identified impacts and mitigation/management actions will be monitored through the application of the EMPr throughout all phases of the development (planning and design, construction, post-construction as well as the operational phase).

CHAPTER 11: ENVIRONMENTAL IMPACT STATEMENT

Specialist studies, landowner negotiations, public participation and a thorough impact assessment were undertaken for this project and the following is applicable:

SPECIALIST STUDIES

Terrestrial Ecological Specialist Assessment

A Terrestrial Ecological Specialist Assessment was undertaken and concluded the following;

According to the DFFE Screening Tool, both the fauna and flora of the study site have an overall low sensitivity with smaller sections having a medium sensitivity. The terrestrial biodiversity is regarded as high because of the site being situated within an endangered ecosystem. However, due to the past and current agricultural activities the only area that can be regarded as having high biodiversity sensitivity is the watercourse which runs along the centre of the Vlakfontein Solar PV1 site. This watercourse has been delineated and is excluded from the development area.

It was concluded that the Vlakfontein Solar PV1 site would not have a significant negative impact on the environment provided that the mitigation measures as indicated in the specialist report are incorporated into the Environmental Management Programme and are implemented.

Aquatic Specialist Impact Assessment

The aquatic specialist impact assessment concluded the following:

- According to the Department of Forestry, Fisheries and the Environment (DFFE) Screening Tool, the bigger study area has overall a low aquatic biodiversity sensitivity.
- The aquatic features occurring within the wider study area comprise seasonal watercourses and wetlands that have been moderately modified and are of moderate ecological importance and sensitivity.
- The site lies south of the Vaal River within the Middle Vaal Management Area (Quaternary Catchment C24B).
- The aquatic features within the wider study area comprise two feeder streams of the unnamed tributary of the Vaal River and their associated seep and valley bottom wetland areas. The eastern stream largely occurs outside of the proposed development area for Vlakfontein Solar PV1 facility.
- The DFFE Screening Tool Report for the Vlakfontein Solar PV1 site identified the site as having a low aquatic sensitivity. However, an unnamed tributary of the Vaal River and its associated seep and valley bottom wetland areas passes through the centre of the project area. This watercourse has been delineated and is indicted with an appropriate buffer zone. This is considered to have a high ecological sensitivity area (contrary to the DFFE Screening Tool). The development footprint of the PV farm must exclude this area.
- If the construction and operation of the PV modules does not require modification to the topography, topsoil or removal of indigenous grassland such that wetland functionality within these degraded

wetland areas could be retained, the modules could be placed within the wetland areas mapped as being of low sensitivity.

- The PV components and associated infrastructure will be constructed immediately adjacent to the delineated watercourses (within 500m from a wetland), which pose a risk of changing the bed, banks or characteristics of the watercourses or impeding or diverting flow in the watercourses. Also, an existing access road crossing a watercourse area will be upgraded and developed. Water Use Authorisation is therefore required.
- A preliminary risk assessment was compiled as per DWS requirement and it was concluded that, provided the recommended mitigation measures are implemented, the risk of the activities degrading the adjacent aquatic features will be low; therefore the water use activities would fall within the ambit of General Authorisations for Section 21 (c) and (i) water use activities.
- Based on the findings of this aquatic biodiversity assessment report, there should be no reason why the proposed PV facilities and their associated activities, with the recommended mitigation, cannot be approved from an aquatic ecosystem point of view if mitigated as recommended.

Avifauna Specialist Impact Assessment

An Avifauna Compliance Statement was undertaken and concluded the following:

The total assessment area contains no confirmed habitat for Species of Conservation Concern (SCC) as defined in the protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020, namely listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable. The absence of SCC was confirmed during the site surveys. Based on these criteria, the whole of the Mercury Cluster Solar PV Project area is correctly classified as low sensitivity for avifauna. No fatal flaws were discovered during the investigations at any of the proposed PV sites.

The wetlands and pans with are important refuges for a number of priority species that often breed in the tall rank grassland around wetlands. A large wetland present on the north-western border of the PV site. Aquatic delineations took place and potentially sensitive habitat with appropriate buffer zones has been excluded from the project development area.

It is recommended that the Vlakfontein Solar PV 1 be authorised from an avi-faunal point of view, on condition that the proposed mitigation measures as provided in the specialist report are strictly implemented.

Bat Screening Assessment

It was concluded that the proposed Mercury Solar PV Cluster Project will not cause significant impact to bat populations in the area. Although very little literature exists on the impacts of solar farms on bats, the specialists believe that any impacts to bats due to construction, operation, and decommissioning of the proposed infrastructure will be relatively low. The desktop study recommended that all 'High' sensitive areas are avoided during construction and operation of the facility.

Heritage Impact Assessment

A Heritage (including Archaeology and Palaeontology) Impact Assessment was undertaken and concluded the following for the Vlakfontein Solar PV1 site:

- No significant archaeological resources were noted within the Vlakfontein Solar PV1 development area.
- It was recommended that tree avenues located along roads, access routes and farm boundaries be retained as far as possible.
- A portion of the tree plantation located within 200m of the marked farm homestead should also be retained in order to shield the existing homestead from the PV facilities and retain some sense of place.
- The palaeontological study concluded that, based on experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the overlying deep soils and sands of the Quaternary which is relevant to the Vlakfontein Solar PV1 development area. The impact on the palaeontological heritage would be low, therefore, as far as the palaeontological is concerned, the projects should be authorised.
- General mitigatory measures such as procedures to follow in the event that heritage resources such as additional graves are discovered, as well as a Chance Fossil Finds Procedure are included in the Environmental Management Programme.

Social Impact Assessment

Key issues are the following:

- The findings of the SIA concluded that the development of the proposed Vlakfontein Solar PV1 will create employment and business opportunities for locals during both the construction and operational phases of the project.
- The establishment of a Community Trust associated with the proposed Vlakfontein Solar PV1 facility will benefit the local community in the area.
- The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the negative environmental and socio-economic impacts associated a coal-based energy economy and the challenges created by climate change, represents a significant positive social benefit for society as a whole.
- The findings of the SIA also indicate that the Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) has resulted in significant socio-economic benefits, both at a national level and at a local, community level. These benefits are linked to foreign Direct Investment, local employment and procurement and investment in local community initiatives.
- The site is also located within the Klerksdorp REDZ. The area has therefore been identified as suitable for the establishment of renewable energy facilities.
- The owner indicated that there that there are no concerns with the proposed project on his farmland.

Recommendations are made to address the potential negative impacts include the following:

- The final design and layout should ensure that the loss of productive farmland is avoided and or minimised.
- Damage to local farm roads caused by construction traffic must be repaired on an on-going basis throughout and on completion of the construction phase.
- The proponent should prepare a Stakeholder Engagement Plan (SEP) and Community Health, Safety and Security Plan (CHSSP) prior to commencement of construction phase.

The establishment of the Vlakfontein Solar PV1 is supported by the findings of the SIA. The enhancement measures listed in the report should be implemented in order to maximise the potential benefits. The findings of the SIA also indicated that all the potential negative impacts can be effectively mitigated.

Visual Impact Assessment

The Visual Impact Assessment can be summarised as follows:

Visually, the regional landscape has a high absorption capacity. There are many visually intrusive artificial features present in the macro areas which will serve to detract and diminish the visual impact presented by the new PV installations and supporting infrastructure. These include numerous powerlines, converging on a large regional Mercury Transmission Substation, mining features (mine dump) and agro-industrial features. While the reflective nature of the PV panels may draw attention to the installations, visual intensity from receptors located over 6km from the site will further be diminished by hazy atmospheric conditions which tend to prevail during the highveld winters.

The conclusion is that the proposed development could be authorised with mitigation. While landscape resources are not significant such that a fatal flaw is proposed, risks to landscape integrity of a rural area that has medium levels of scenic quality could take place. Mitigation would reduce the visual intrusion of the PV project and retain the rural sense of place along the farm roads partially retaining the existing character of the landscape, where the level of change to the characteristic landscape should be moderate. The inclusion of a 30m buffer zone from the Vermaasdrift Road has been integrated with the project layout.

Agricultural Impact Assessment

The assessment concluded the following ;

The proposed Vlakfontein Solar PV1 development site is currently (neither recently) been cropped. Farming experience showed that it was too marginal for viable crop production. Soils are limited by shallow depths to underlying bedrock in places and by very low water and nutrient holding capacity across the site.

The proposed development offers a win-win scenario. This is substantiated by the following points:

- The only agricultural land that will be used by the developments has limited agricultural production potential. The layout of the facility has deliberately avoided all higher potential land within the wider assessed area. It will only utilise land that was identified as having insufficient land capability for viable and sustainable crop production and is therefore only good enough for grazing. There is not a scarcity of such agricultural land in South Africa and it is therefore considered to be below the threshold for being prioritised for conservation as agricultural production land.
- The proposed developments offer positive impact on agriculture by way of improved financial security for farming operations, as well as security benefits against stock theft and other crime.
- The PV panels will not totally exclude agricultural production. The area can still be used to graze sheep that will, in addition, be protected against stock theft within the security area of each facility.
- The loss of agricultural potential by occupation of land is not permanent. The land will become fully available again for agricultural production once the proposed activity ceases.
- The proposed development poses a low risk in terms of causing soil degradation, which can be adequately and fairly easily managed by standard, best practice mitigation management actions.
- The proposed developments are within a REDZ, which is an area that has specifically been designated within South Africa for the prioritisation of renewable energy development. The designation of the REDZ has taken into account the country's need to balance renewable energy development against the need to ensure the conservation of land required for agricultural production and national food security.
- The proposed development will also have the wider societal benefits of generating additional income and employment in the local economy.

- It will contribute to the country's need for energy generation, particularly renewable energy that has lower environmental and agricultural impact, on a national scale, than existing, coal powered energy generation.

Due to the factors listed above, the impact of the proposed development on the agricultural production capability of the site is assessed as being acceptable. Therefore, from an agricultural impact point of view, it is recommended that the development be approved.

PUBLIC PARTICIPATION

The main objective of the Public Participation Programme undertaken for this project is to identify viable development sites that are not only acceptable from an ecological point of view, but also from a landowner, public and government perspective.

Significant steps were taken to identify all relevant stakeholders and obtain comment their comment on the proposed development. At this stage all comment could be satisfactorily addressed. No objection to the development proposal has yet been received.

The Final BAR was not distributed for a further 30-day commenting period because no substantial changes to the BAR have been made that may impact on the rights of IAPs.

The Final BAR has now been submitted to DFFE for approval/refusal.

IMPACT ASSESSMENT

Summary of the impact assessment tables

Design and Pre-construction Phase

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Development of a solar farm on land with agricultural potential land	Site	Long Term	Definite	High	Low	Low
Risk of failure of structures	Local	Short Term	Possible	High	Medium to Very High	Low
Loss of landscape Character	Site	Short Term	Probable	High	High	Medium
Visual intrusion from Key Observation Points	Site	Short Term	Possible	High	High	Medium
Risk of erosion	Site	Short term	Possible	High	Moderate	Low
Loss of plant and animal species	Site	Medium term	Probable	Medium	Moderate	Low
Wetland degradation	Local	Medium term	Probable	Low	High	Low
Entrapment of birds in perimeter fences	Site	Long term	Possible	High	Low	Low

Impact related to the Battery Energy Storage System (BESS)	Ease of mitigation	Significance before mitigation	Significance after mitigation
Overall impact of the BESS on the environment	Ranging from complex to easy	Ranging from High to Low	Ranging from Low to Very Low

Construction Phase

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Loss of agricultural potential by occupation of land	Site	Long Term	Definite	High	Low	Low
Soil Degradation	Site	Long Term	Possible	Medium	Low	None
Loss of fauna & flora	Site	Medium Term	Probable	Medium	Moderate	Low
Watercourse degradation	Local	Long term	Possible	Low	High	Low
Disturbance of aquatic habitat and water quality	Site	Short term	Possible	High	High	Low
Avifauna: Displacement of Priority Species due to disturbance	Site	Short term	Probable	High	High	Moderate
Avifauna :Displacement of Priority Species due to habitat transformation	Site	Short term	Probable	High	High	Moderate
Heritage: Disturbance to cultural landscape which consists of tree avenues along existing roads	Site	Permanent	Possible	Irreversible	Moderate	Low
Archaeology: Potential identification of archaeological resources	Site	Permanent	Possible	Irreversible	Moderate	Low
Palaeontology: Potential discovery of palaeontological resources	Site	Permanent	Possible	Irreversible	Moderate	Low
Risk of groundwater pollution	Local	Medium	Possible	High	Moderate	Low
Increased risk of erosion	Local	Medium	Possible	High	Moderate	Low
Presence of construction workers and potential impacts on family structures and social networks	Local	Short term	Probable	No in case of HIV & Aids	Medium	Low
Influx of job seekers	Local	Permanent	Probable	No in case of HIV & Aids	Low	Low
Risk to safety, livestock, and farm infrastructure	Local	Short Term	Probable	Yes	Medium	Low
Increased risk of veld fires	Local	Short Term	Probable	High (if compensations is paid for losses)	Medium	Low
Presence of construction workers and potential impacts on family structures and social networks	Local	Short Term	Probable	Yes	Medium	Low

Impact of construction activities and vehicles	Local	Short Term	Probable	Yes	Medium	Low
Loss of farmland	Local	Long Term	Probable	Yes	Medium	Low
Traffic Congestion	Local	Short term	Probable	High	Moderate	Low

Impact related to the Battery Energy Storage System (BESS)	Ease of mitigation	Significance before mitigation	Significance after mitigation
Human Health - chronic exposure to toxic chemical or biological agents	Moderate	Moderate	Low
Human Health - exposure to noise	Easy	Moderate	Low
Human Health - exposure to temperature extremes and/or humidity	Easy	Low	Very Low
Human Health - exposure to psychological stress	Easy	Low	Very Low
Human Health - exposure to ergonomic stress	Moderate	Low	Low
Human and Equipment Safety - exposure to fire radiation	Complex	Moderate	Low
Human and Equipment Safety - exposure due to damage to containers	Complex	Moderate	Low
Human and Equipment Safety - exposure to explosion over pressures	N/a	Moderate	Low
Human and Equipment Safety - exposure to acute toxic chemical and biological agents	Complex	Moderate	Low
Human and Equipment Safety - exposure to acute toxic chemical and biological agents due to damaged batteries	Complex	Moderate	Low
Human and Equipment Safety - exposure to violent release of kinetic or potential energy	Complex	High	Low
Human and Equipment Safety - exposure to electromagnetic waves	Complex	Moderate	Low
Environment - emissions to air	Easy	Low	Very Low
Environment - emissions to water	Moderate	Low	Low
Environment - emissions to earth	Easy	Low	Low
Environment - waste of resources e.g., water, power etc	Easy	Low	Very Low
Public – Aesthetics	Moderate	Moderate	Low
Investors – Financial	Moderate	Moderate	Low
Employees and investors - Security	Complex	Moderate	Low
Emergencies	Complex	Moderate	Low
Investors - Legal	Moderate	Moderate	Low

Operational phase

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Increased financial security	Site	Long Term	Possible	High	Low	Low
Improved security against stock theft and other crime	Site	Long Term	Possible	High	Low	Low
Degradation of Ecosystem	Site	Medium	Unlikely	Medium	Moderate	Low
Degradation of ecological condition; modification of flow and water quality; erosion; and alien vegetation invasion	Site	Short term	Possible	High	High	Low
Mortality of priority species due to collisions with the	Site	Long term	Possible	High	Low	N/a

solar panels.						
Risk of Erosion	Local	Medium	Likely	High	High	Low
Risk for Groundwater pollution	Site	Short term	Possible	High	Moderate	None
Loss of landscape Character	Site	Long Term	Probable	High	Moderate	Low
Visual intrusion from Key Observation Points	Site	Long Term	Probable	High	Moderate	Low
The visual impacts and associated impact on sense of place	Local	Long Term	Probable	Yes	Low	Low
Potential impact on property values	Local	Long Term	Probable	Yes	Low	Low
Potential impact on tourism	Local	Long Term	Probable	Yes	Medium	Low
Traffic Congestion	Local	Short Term	Probable	High	Moderate	Low

Impact related to the Battery Energy Storage System (BESS)	Ease of mitigation	Significance before mitigation	Significance after mitigation
Human Health - chronic exposure to toxic chemical or biological agents	Easy	Moderate	Low
Human Health due to compromised battery compartments	Complex	Moderate	Low
Human Health - exposure to noise	Easy	Moderate	Low
Human Health - exposure to temperature extremes and/or humidity	Easy	Low	Very Low
Human Health - exposure to psychological stress	Easy	Low	Very Low
Human Health - exposure to ergonomic stress	Easy	Moderate	Low
Human and Equipment Safety - exposure to fire radiation due to external fires	Complex	High	Low
Human and Equipment Safety - exposure to fire radiation due to cooling failure of the Power Conversion System	Moderate	High	Low
Human and Equipment Safety - exposure to explosion over pressures	Moderate	Moderate	Low
Human and Equipment Safety - exposure to acute toxic chemical and biological agents due to human pathogens diseases, etc.	Moderate	Low	Low
Human and Equipment Safety - exposure to acute toxic chemical and biological agents due to damaged battery components	Moderate	Moderate	Low
Human and Equipment Safety - exposure to violent release of kinetic or potential energy	Moderate	Moderate	Low
Human and Equipment Safety - exposure to electromagnetic waves	Complex	Moderate	Low
Environment - emissions to air	Easy	Low	Very Low
Environment - emissions to water	Moderate	Low	Low
Environment - emissions to earth	Easy	Low	Very Low
Environment - waste of resources e.g., water, power etc	Easy	Low	Very Low
Public – Aesthetics	Easy	Moderate	Low
Investors – Financial	Easy	Moderate	Low
Employees and investors- security (potential hi-jacking on route or theft on site, etc.)	Moderate	Moderate	Low
Employees and investors – Security (i.e cyber security attacks, etc)	Complex	Moderate	Low
Emergencies	Complex	Moderate	Low
Investors - Legal	Complex	Moderate	Low

Table 8 Summary of the Environmental Impact Assessment Tables

From the above summary tables, it is clear that all potentially negative impacts identified during the course of the study can be mitigated to acceptable levels. No fatal flaw was identified.

Cumulative Environmental Impact Assessment

Cumulative Impact: Design and Pre-construction Phase

Impact Description	Cumulative impact after mitigation
Site Selection: Impact on environmental features	Low
Site Selection: Impact on farm workers (job losses)	Low/None
Impact on avifauna	Low
Impact on visual resources	Low
Flooding of adjacent farmlands	Low

Cumulative Impact: Construction Phase

Impact Description	Significance after mitigation
Impact on fauna and flora	Low
Birds: disturbance	Low
Birds: habitat transformation	Low
Impact on bats	Low
Impact on freshwater features	None
Risk of groundwater pollution	Low
Risk of erosion	Low
Cultural, Archaeology and Palaeontology	Low
Impact on visual resources	Medium
Damage to farmlands	Low
Impact of construction workers on local communities	Low to none
Influx of job seekers	Low
Risk to safety, livestock and farm infrastructure	Low
Increased risk of grass fires	Low
Noise, dust, damage to roads	Low
Creation of employment and business opportunities	Medium positive
Traffic impact	Low

Cumulative Impact: Operational phase

Impact Description	Significance after mitigation
Improper site clearance after construction	Low
Lack of rehabilitation	Low
Impacts on fauna and flora	Low
Impacts on avifauna	None
Impacts on bats	Low
Impact on freshwater features	Low/None
Storm water management and erosion	Low
Impact on visual resources	Low
Loss agricultural potential by occupation of land	Low
Impact on property values	Low
Impact on local tourism operations	Low
Implementation of renewable energy facilities	High Positive
Creation of employment and business opportunities	High positive
Establishment of a Community Trust	High positive

Income generation for landowner	High positive
Opportunity to improve security	High positive
Increased financial security for farming practises	High Positive
Traffic congestion	Low

The negative biophysical, heritage, visual and agricultural cumulative impact of the proposed solar PV development is rated as Low and any cumulative impact that may occur is rated as being acceptable, especially when seen in context of the proposed development site situated in a REDZ.

The social cumulative effect is rated as **High/Very High positive** due to the potential to create a number of socio-economic opportunities for the local municipality, which, in turn, will result in a positive social benefit. The positive cumulative impacts include creation of employment, skills development and training opportunities and creation of downstream business opportunities. These benefits should also be viewed within the context of the limited economic opportunities in the area and the impact of the decline in the mining sector in recent years.

Based on the above, there is no reason, from a cumulative impact viewpoint, that the proposed Vlakfontein Solar PV1 should not be authorised.

Environmental constraints on the Vlakfontein Solar PV1 site

The layout of the **Vlakfontein Solar PV1** facility was influenced mainly by the following:

- The main access point is provided directly off Vermaasdrift Road (S643) and in compliance with the requirements of the relevant traffic authorities.
- A combined delineated aquatic area with buffer zone, biodiversity terrestrial, avi-fauna and bat sensitivity area with relevant buffer zones had been identified and is excluded from the development footprint area.
- Four depressions/degraded wetlands had been identified but was confirmed by the aquatic ecologist as having a low sensitivity and can be demolished for the purpose of the PV area.
- The visual impact specialist requires a 30m non-development buffer off Vermaasdrift Road.
- The heritage specialist requires a 200m buffer circle around the existing farmstead to be excluded from the development footprint area. It was also recommended that tree avenues located along roads and farm boundaries be retained as far as possible.
- The layout has also been guided by best practice and acceptable solar PV engineering principles.

The proposed layout as presented in this report accommodates all the environmental requirements above.

CONCLUSION OF ENVIRONMENTAL IMPACT STATEMENT

- The proposed **Vlakfontein Solar PV1** is planned in a legal, pro-active and structured manner taking all development components, potential and restrictions into account.
- All relevant legal requirement in terms of the Environmental Impact Assessment Regulations published in 2014 as amended, were complied with. This Basic Assessment Report includes all relevant proceedings, findings and recommendations which resulted from this study.
- The specialist input obtained is comprehensive and effective in providing an assessment of the status quo of the study area, identifying potentially sensitive areas and issues of concern as well as identifying impact that require re-consideration of alternatives.

- Significant and reasonable actions were taken to identify and notify all Interested & Affected Parties that include government departments, relevant authorities, general stakeholders and potentially affected landowners of the project. No objections had been received regarding this project.
- The proposed project components and layout as motivated and recommended for authorisation in this document will, after the application of mitigation measures, have a minimal and acceptable impact on the environment. This will be accomplished through the implementation of the mitigation measures specified in the Environmental Management Programme (EMPr) that is included as Appendix H of the Basic Assessment Report.
- The EAPs are confident that the project components and infrastructure presented is acceptable and viable.
- There is no reason from either a technical, environmental or social perspective why the **Vlakfontein Solar PV1** should not be authorised.

CHAPTER 12: CONCLUSION

12.1 Assumptions, Uncertainties, and Gaps in Knowledge

Assumptions

It is assumed that all documentation and information obtained from the different stakeholders, professional team members and specialists are accurate, unbiased and valid.

Uncertainties

The development proposal in relation to its environment was thoroughly investigated by various specialists and professionals and there are therefore no uncertainties with regards to the development as proposed.

Gaps in knowledge

Extensive relevant specialist and engineering studies were undertaken for this project and it is unlikely that any missing information could influence the outcome of this project.

12.2 Why the Activity Should, or Should Not be Authorised

The following motivation is supplied:

- All reasonable actions were taken to identify relevant environmental components.
- The specialist input obtained is comprehensive and effective in providing an assessment of the status quo of the study area, identifying potentially sensitive areas and issues of concern as well as identifying impact that require re-consideration of alternatives.
- Significant and reasonable actions were taken to identify and notify all IAPs that include government departments, relevant authorities, general stakeholders and potentially affected landowners of the project. Extensive and continuous communication with the IAPs took place through all phases of this Basic Assessment process.
- The BAR includes all proceedings, findings and recommendations which result from this study.
- All relevant legal requirement in terms of the Environmental Impact Assessment Regulations published in 2014, as amended were complied with.

No obvious reason as to why the project should not proceed had been identified during the comprehensive Basic Assessment process followed.

12.3 Environmental Authorisation

12.3.1 Period for which the EA is required

The EA must be valid for a period of 10 years.

12.3.2 Date on which the activity will be concluded

The Eskom Power Purchase Agreement (PPA) period is normally 20 years, but may be longer in the future and could be increased to 25 years. Construction will be approximately 2-3 years and decommissioning will take approximately 2 years.

The activity could therefore be concluded approximately 30 years after construction has commenced.

12.4 Recommendation by the Environmental Assessment Practitioner

The EAP recommends the Application for Environmental Authorisation for the **Vlakfontein Solar PV1** facility with project components as provided in Chapter 3 of the Basic Assessment Report for approval.

It is furthermore requested that the following be approved as part of the Environmental Authorisation:

- The Environmental Management Programme
- The site layout as provided in Appendix A(5) of this report.

It is requested that the EA be valid for a period of 10 years during which construction must commence.

It is also required that the following plans be compiled and included as a condition to fulfil during the Design and Pre-Construction phase, prior to commencement of construction.:

Engineering

- Storm Water Management Plan

Vegetation

- Alien Invasive Management Plan
- Rehabilitation Plan / Habitat Restoration Plan

Battery Energy Storage System

- Emergency Response Plan
- End-of-Life Plan
- A full Hazard and Operability Study (HAZOP)

Social Environment

- Skills Development and Training Programme
- Code of Conduct for contractors and construction workers
- Stakeholder Engagement Plan
- Community Health, Safety and Security Plan
- Establishment of a Monitoring Forum
- Establishment of a Community Trust

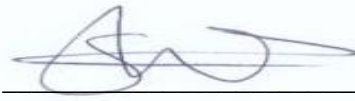
12.5 Affirmation by the Environmental Assessment Practitioner

We, Annelize Erasmus and Susanna Nel, herewith affirm the following:

- The information contained in this report is to the best of our knowledge and experience correct.
- All relevant comment and input provided by the stakeholders and IAPs are included and addressed in this BAR.
- Input and recommendations from the specialist reports are provided in and integrated with the BAR.
- All information made available by the EAP to IAPs and any responses thereto as well as comment and input from IAPs are provided in the BAR.



Annelize Erasmus
16 May 2023



Susanna Nel
16 May 2023

An Affirmation of the EAP was certified by a Commissioner of Oath and is attached as Appendix I(3).
