Hormah Solar PV1

Portion 2 of the Farm Hormah No 276
Viljoenskroon, Free State Province

Draft Basic Assessment Report

March 2023

LANDSCAPE DYNAMICS

Western Cape Province- Cape Town Office
3 Palomino Close, Somerset West, 7130
021 855 0912 / 082 888 4060
info@landscapedynamics.co.za
susanna@landscapedynamics.co.za

Representation Offices
Limpopo Province
Mpumalanga Province
Kwazulu-Natal Province
Northern Cape Province

Gauteng Province- Pretoria (Head) Office
91 Wenning Street, Groenkloof, Pretoria, 0181
PO Box 947, Groenkloof, Pretoria, 0027
012 460 6043 / 082 566 4530
info@landscapedynamics.co.za
annelize@landscapedynamics.co.za

Project Detail

Project Name	Hormah Solar PV1
DFFE Reference Number	To be provided
Report Status	Draft Basic Assessment Report
Date of Report	March 2023
Purpose of Report	Public review and comment Review and comment from the Competent Authority Distribution for a 30-day commenting period

Contact

Applicant	Hormah Solar PV1 (Pty) Ltd - Top Floor Golf Park 4, Raapenberg Rd, Mowbray, 7700 - PO Box 548, Howard Place, Western Cape, 7450 - Director - Solar & Energy Storage Projects: Mr Warren Morse - 021 685 3240 / warren@mulilo.com

Environmental Assessment Practitioners	Landscape Dynamics Environmental Consultants (Pty) Ltd - Susanna Nel (082 888 4060) - Annelize Erasmus (082 566 4530) - info@landscapedynamics.co.za

List of Content

List of Tables

List of Figures

APPENDICES

Appendix A: Project Maps & Layouts

(A1) Locality Map
(A2) Hormah PV 1 Site Map and Project Components
(A3) Mercury Solar PV Cluster
(A4) Properties Map
(A5) Google Earth Project Components Map (electronic)

Appendix B: Environmental Sensitivity Maps

(B1) Environmental Sensitivities based on specialist studies
(not applicable to the Hormah PV1 facility)
(B2) SANBI Maps: CBAs and ESAs (Hormah PV facility and the Mercury Solar PV Cluster)

Appendix C: REDZ and STC

(C1) Renewable Energy Development Zones (REDZ)
(C2) Strategic Transmission Corridors (STC)

Appendix D: Photo Report

(D1) Photos of the study area

Appendix E: Screening

(E1) DFFE Screening Tool Report

Appendix F: Specialist Reports

(F1) Terrestrial Biodiversity (fauna & flora) Assessment
(F2) Aquatic Specialist Impact Assessment
(F3) Avifaunal Compliance Statement
(F4) Bat Assessment
(F5) Heritage Impact Assessment
(F6) Social Impact Assessment
(F7) Visual Impact Assessment
(F8) Agricultural Agro-Ecosystem Specialist Assessment

Appendix G: Engineering Reports

(G1) High Level Safety and Health Risk Assessment
(G2) Traffic and Transportation Impact Assessment
(G3) RFI Assessment

Addendum H: Public Participation Programme

(H1) Public Participation Plan as submitted to DFFE and approval thereof
(H2) Register of Interested & Affected Parties
(H3) Minutes of meetings held with the directly affected landowners of the Mercury Cluster
(H4) Onsite Advertisement and Proof of Placement
(H5) Newspaper Advertisement and Proof of Placement

(H6) Background Information Document
(H7) Proof of Distribution of Background Information Document
(H8) Written comment received on the Background Information Document
(H9) Proof of Distribution of Draft Basic Assessment Report (to be included in the Final BAR)
(H10) Written Correspondence on Draft Basic Assessment Report (to be included in the Final BAR)
(H11) Comment & Responses Report

Appendix I: Environmental Management Programme

(I1) Environmental Management Programme
(I2) EMP Generic published by DEFF 22 March 2019 (IPP substation)
(I3) Signed Generic EMPr (IPP substation)

Appendix J: Additional Information

(J1) Landscape Dynamics Company Profile and condensed CVs of EAPs
(J2) Certified Affirmation by EAP
(J3) Specialists' Declaration of Independence
(J4) Landowner Consent
(J5) Motivation Report for an Application for a Change in Landuse to DALRRD
(J6) No Objection Letter from DALRRD

List of Abbreviations

BAR Basic Assessment Report
BESS Battery Energy Storage System
BID Background Information Document
CBA Critical Biodiversity Area
dBAR Draft Basic Assessment Report
DFFE National Department of Forestry, Fisheries & the Environment
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
Eskom SOC South Africa's Electricity Supply Commission (State Owned Company)
EWT Endangered Wildlife Trust
fBAR Final Basic Assessment Report
GNR Government Notice Regulation
ha Hectare(s)
HIA Heritage Impact Assessment
IAPs Interested and Affected Parties
ICNIRP International Commission for Non-Ionising Radiation Protection
IDP Integrated Development Plan
IPPPP Independent Power Producer Procurement Programme
IEM Integrated Environmental Management
IEP Integrated Energy Plan
IPP Independent Power Producer
ISEP Integrated Strategic Electricity Planning
kW Kilowatt (1kW= 1 000W)
m^3 Cubic metres
Mamsl Metres above mean sea level
MTS Main Transmission Substation
MVA Mega Volt Ampére
MW Megawatt (1MW=1 000kW)
NERSA National Energy Regulator of South Africa
NDP Network Development Plan
PIA Palaeontological Impact Assessment
PPP Public Participation Process/Programme
PV Photovoltaic (solar panels)
REIPPPP Renewable Energy Independent Power Producer Procurement 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
SDF Spatial Development Framework
SS Substation
ToR Terms of Reference
TRF Transnet Freight Rail
TS Traction Station / Traction Substation
WULA Water Use License Application

LEGISLATION

NEMA National Environmental Management Act, 1998 (Act 107 of 1998)
NEMAQA National Environmental Management Air Quality Act, 2004 (Act 39 of 2004)
NEMPAA National Environmental Management: Protected Areas Act, 2003 (Act No 57 of 2003)
NEMWA National Environmental Management Waste Act, 2008 (Act 59 of 2008)
NWA National Water Act, 1998 (Act 36 of 1998)

EXECUTIVE SUMMARY

INTRODUCTION AND PURPOSE OF THE PROJECT

Hormah Solar PV1 (Pty) Ltd ('the Applicant") has appointed *Landscape Dynamics Environmental Consultants (Pty) Ltd* to apply for Environmental Authorisation for this *Hormah Solar PV1 (120MW)* project with the Department of Forestry, Fisheries & Environment (DFFE), which is the Competent Authority for this project.

LOCALITY

The development site is situated north of the R76 close to the town of Viljoenskroon in the Free State Province. It falls within the jurisdiction of the Moqhaka Local Municipality (MLM) in the Fezile Dabi District Municipality.

PROJECT DESCRIPTION

The Hormah PV facility will have a contracted capacity of up to 120MW with a development footprint of approximately 198 hectares in size.

Infrastructure associated with the Solar PV Facility will include the following:

Infrastructure	Specifications
Solar PV Array	The Solar PV Array includes the following components: • Bifacial PV Modules • Mounting structures using single axis tracking technology • Inverters • Transformers • Cabling between panels
Development footprint	198 hectares
Onsite 132kV IPP	The IPP Substation includes the following components: • HV Step-up transformer • MV Interconnection building • Total area approximately 100m x 100m (1 ha)
Access and internal roads	• Access is required for the purpose of the Hormah Solar PV1 directly off R76, approximately 8m wide.

	• Existing internal farm roads to be utilised where possible, re-graveling of roads to take place if required by the provincial roads authority. • All internal roads will be up to 6m wide.
Battery Energy Storage System (BESS)	• Solid State Batteries (SSB) is the preferred battery technology • The SSB will make use of Lithium-Ion chemistries. • The BESS containers are centralised into one area. • It will be constructed on approximately 4.5 ha.
Storage of Dangerous Goods	• 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: ▪ 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	• 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.
Laydown area	• A temporary construction site area of approximately 4ha adjacent to the BESS area will be required.

	• All temporary infrastructure will be rehabilitated following the completion of the construction phase, where it is not required for the operation phase.

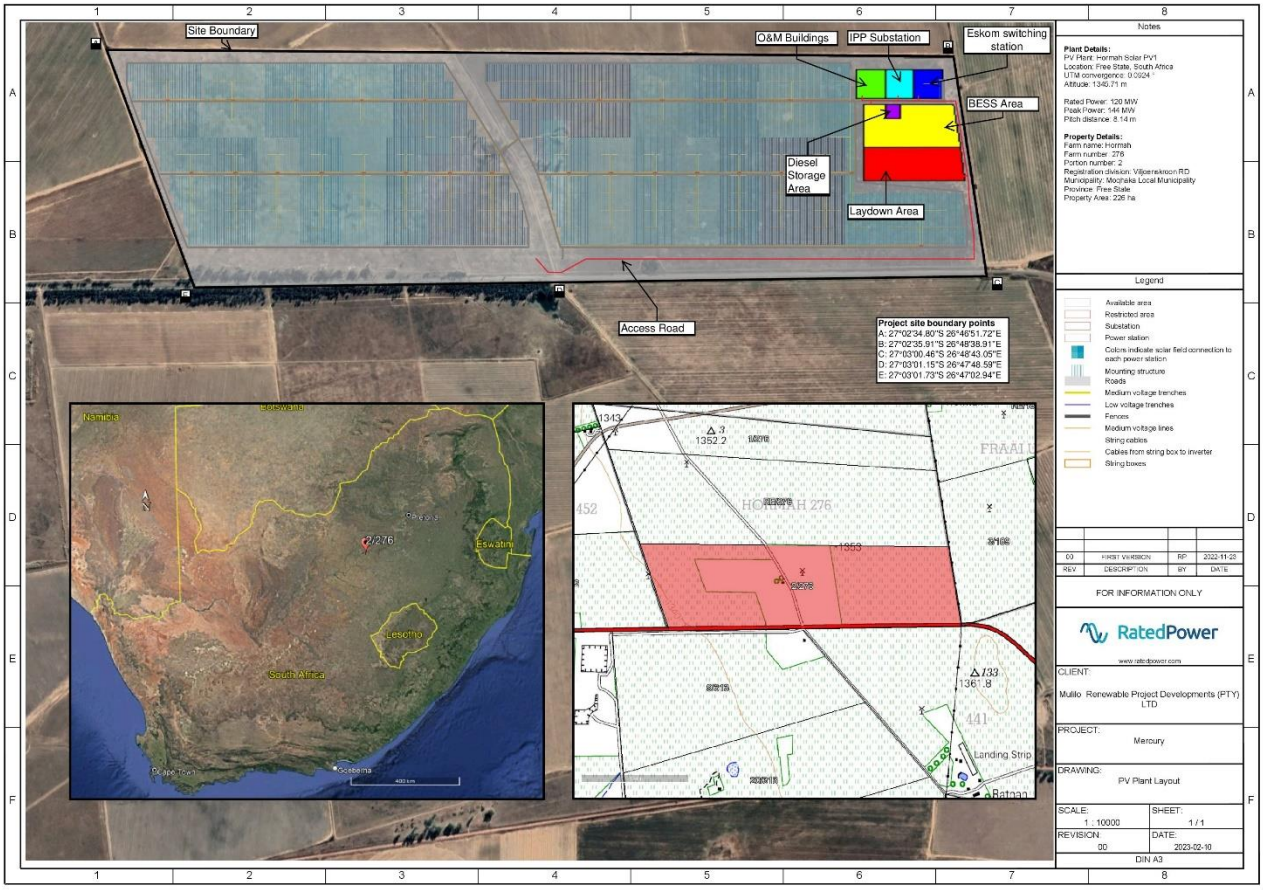
Note

Electrical infrastructure, which includes an onsite 132kV Eskom switching station and a 132kV power line connecting the Hormah PV facility to the Mercury MTS, would be developed by the IPP under a self-build agreement with Eskom. *It is important to note that this infrastructure will be applied for in a separate application, as it is to be handed over to Eskom after construction.*

Note the Eskom switching station is proposed to be directly adjacent to the IPP substation but the Eskom switching station and power line as mentioned above is specifically excluded from this map to prevent any confusion.

Map indicating the project components of the proposed Hormah Solar PV facility

(also refer to Appendix A for a copy of the map)



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

- Nr 11: Development of facilities for the distribution of electricity
- Nr 24: The development of a road wider than 8m
- Nr 27: Removal of more than 1 hectare of indigenous vegetation
- Nr 28: Development on agricultural land bigger than 1 hectare
- Nr 56: The widening of a road by more than 6m

Listing Notice 2

- Nr 1: The generation of electricity from a renewable resource of more than 20MW
- Nr 15: Removal of more than 20 hectares of indigenous vegetation

Note

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 (REDZ) as well as a Strategic Transmission Corridor (STC) which means that a Basic Assessment process has to be undertaken regardless if Listing Notice 2 is being triggered.

Listing Notice 3

- Nr 4: Construction of a road wider than 4m within 5km from a protected area
- Nr 10: Storage of dangerous goods of less than 80m^3 within 5km from a protected area and within 100m from a wetland
- Nr 12: Removal of more than 300m^2 of indigenous vegetation within 100m from a wetland
- Nr 18: The widening of a road more than 4m within 5km from a protected area and within 100m from a wetland

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 Hormah PV site, the following applies:

- It will be required to apply for a GA because the Hormah PV site is within 500m from a wetland, and Section 21(c) and 21(i) of the NWA are applicable.

Please note that application for a GA / WUL will only be made once Preferred Bidder status for this project has been awarded.

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:

- any development or other activity which will change the character of a site exceeding 5000m^2 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.

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

The Hormah PV site falls within the Klerksdorp REDZ as well as the Central STC.

DFFE SCREENING TOOL

The DFFE Screening Tool was compiled and site verification was conducted by Landscape Dynamics as well as the appointed specialists. It was concluded that the following specialist studies will be required:

- Fauna & Flora Impact Assessment
- Freshwater Impact Assessment
- Avifauna Impact Assessment
- Cultural Heritage Impact Assessment
- Visual Impact Assessment
- Bat Desktop Study
- Social Impact Assessment
- Agricultural Impact Assessment

NEED & DESIRABILITY

The need for this project relates directly to the need for energy security and renewable energy projects in South Africa. The proposed Hormah solar PV 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.

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 Hormah solar PV facility as proposed is in line and in support of applicable legislation on a national, provincial as well as local level.

ALTERNATIVES

Alternatives for this project relates to the site selection process of the Mercury Cluster. 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 will play a major role in the number of sites to be available for development. The number of sites was then downscaled to seven and a screening assessment was undertaken to determine the feasibility of these 7x sites.

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 alternative assessment concluded that the preferred number and size of the PV facilities within the Mercury Cluster as assessed and presented in this report are the result of in-depth specialist and engineering studies combined with technical and financial constraints as provided by the Applicant. The EAPs are confident that the preferred site alternatives are the most acceptable and viable alternative for the Mercury Solar PV Cluster.

The Hormah solar PV facility (the subject of this report) has no environmental attributes (biophysical or cultural/heritage) that need to be protected and excluded from development. The layout will therefore be solely guided by best practice and acceptable solar PV engineering principles.

SPECIALIST STUDIES

Terrestrial Ecological Specialist Assessment

A Terrestrial Ecological Specialist Assessment was undertaken and concluded as follows:

- The Hormah PV site is completely transformed with no natural vegetation resembling the original vegetation present in the area and as a result has a **low ecological sensitivity**.

Aquatic Specialist Impact Assessment

An Aquatic Specialist Impact Assessment was undertaken and concluded that there are no watercourses on site.

Avifauna Specialist Impact Assessment

An Avifauna Compliance Statement and Impact Assessment was undertaken and concluded that no avifauna sensitivities, such as pans and wetlands, are present on the Hormah PV facility. The site is classified as having a Low sensitivity for avifauna.

Bat Screening Assessment

The entire Hormah PV site has been rated as having a Low sensitivity for bats with some small areas having a Medium sensitivity (tree clumps).

Heritage Impact Assessment

A Heritage (including Archaeology and Palaeontology) Impact Assessment was undertaken and concluded that no heritage, archaeological or palaeontological findings that require specific mitigation was identified and the Hormah site has a Low sensitivity to heritage resources.

A Social Impact Assessment

A Social Impact Assessment (SIA) was undertaken and it concluded as follows:

- The findings of the SIA indicate that the development of the Hormah PV facility will create employment and business opportunities for locals during both the construction and operational phase of the project. The enhancement measures listed in the report should be implemented in order to maximise the potential benefits. All of the potential negative impacts can be effectively mitigated.
- The establishment of a Community Trust will also benefit the local community in the area. The significance of this impact is rated as High Positive.

Visual Impact Assessment

A Visual Impact Assessment was undertaken and it concluded as follows:

- It is the recommendation that the proposed development should commence *with* mitigation for the following key reasons:
    - Power lines are scattered throughout the area due to the close vicinity of the Mercury MTS to the north of the Hormah PV site (±5km north of the site).

- 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.

- While landscape resources are not significant such that a fatal flaw is proposed, risks to landscape integrity of a rural agrarian 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 narrow farm roads. The overall significance of the visual change of the landscape is rated as being Low.

Agricultural Impact 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 development has limited agricultural production potential.
- The amount of agricultural land loss for the Hormah PV development is within the allowable development limits prescribed by the agricultural protocol.
- The proposed development offers positive impact on agriculture by way of improved financial security for future farming operations, as well as security benefits against stock theft and other crime.
- The PV panels will not totally exclude agricultural production. The area can still be used to graze sheep that will, in addition, be protected against stock theft within the security area of the facility.
- The loss of agricultural potential by occupation of land is not permanent. The land will become fully available again for agricultural production once the proposed activity ceases.
- The proposed development poses a low risk in terms of causing soil degradation, which can be adequately and fairly easily managed by standard, best practice mitigation management actions.
- The proposed development is within a REDZ, which is an area that has specifically been designated 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 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.

Because of the above factors, 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 as proposed be approved.

ENGINEERING REPORTS

High Level Safety, Health & Environmental Risk Assessment

A High Level Safety, Health & Environmental Risk Assessment was undertaken for the BESS component of the PV facility and it concluded that the BESS will have an acceptable risk after the application of recommended mitigation measures, which are included EMPr.

Traffic & Transport Management Plan

A Traffic & Transport Management Plan (TMP) was undertaken and it concluded as follows:

- The construction phase traffic will be temporary and impacts are considered to have a low with mitigation measures.
- During operation, it is expected that staff trips and trips for maintenance requirements to the facility will occur, however only 10 daily trips is expected.
- Noise and dust pollution will be higher during the construction phase, but this is short term.
- The main access road to the facility as well as the proposed access point will be the R76. The access road and proposed access point are deemed feasible from a traffic and transportation engineering perspective.
- The development is supported from a transport perspective provided that the recommendations and mitigations contained in this report are adhered to.

Radio Frequency Interference (RFI) Assessment

A Radio Frequency Interference (RFI) Assessment was undertaken and it concluded as follows:

- Both areas identified by the DFFE Screening Tool were identified to be more than 7km away from the proposed PV site:
  - Kopanang Gold Plant is 9.68 km away from Hormah PV1
  - The second EMI sensitive area is situated on open farmland

The Hormah PV site does not have a direct line of sight to Kopanang gold plant and is further away than the required clearance zone. Pathloss over the distance between the Hormah PV site and the Kopanang Gold Plant is high enough for the PV facility to have no significant RFI or EMI impact on the electrical infrastructure at Kopanang Gold Plant.

The EMI sensitive receivers at the Kopanang Gold Plant will not be desensitised by the Hormah PV site.

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

PUBLIC PARTICIPATION PROCESS FOLLOWED

The Public Participation Process (PPP) is being 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):

- Focus group meetings were held with the various directly affected landowners of the 5x solar PV facilities within the Mercury PV Cluster on 18 November 2021.
- Three A2 laminated onsite notifications were placed on 22 March 2022 at the following places:
  - The south-eastern corner of the Hormah PV site along the R76
  - 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 – 30 April 2022).

Distribution of Draft BAR

- The Draft Basic Assessment Report (BAR) (this document) is being 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 is being distributed for a 30-day (plus holidays) commenting period.
  - 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 is available on the Landscape Dynamics website (www.landscapedynamics.co.za) – detailed instructions on how to access these documents were provided in the said email.
  - A copy of the Draft BAR was made available at the Nostalgia Spa, Guesthouse & Gallery, Engelbrecht Street 62, Viljoenskroon (082 460 8627) - the availability of the hard copy of the Draft BAR at this location was mentioned in the abovementioned emails.
  - 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 will be included in the Final BAR. The Final BAR will be distributed for a further 30-day commenting *if* substantial changes to the BAR have been made that may impact on the rights of the IAPs. The Final BAR will be submitted to DFFE for their consideration for Environmental Authorisation

All reasonable steps were taken to inform the identified IAPs of the Mercury Solar PV Cluster development proposal. At this stage all comment could be satisfactorily addressed. No objection to the development proposal was received.

IMPACT ASSESSMENT

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

Expected Negative Impacts

Planning and Design Phase

- Site Selection: Impact on environmental features (fauna, flora, bats, avifauna, aquatic heritage)
- Site Selection: Impact on farm workers
- Impact on avifauna
- Impact on visual resources
- Damage to adjacent farmlands due to flooding

Construction Phase

- Impact on fauna & flora
- Impact on avifauna
- Impact on bats
- Impact on freshwater features
- Risk of groundwater pollution
- Risk of erosion
- Impact on cultural landscape, archaeological and paleontological resources
- Impact on visual resources
- Agriculture
    - Damage to farmlands
    - Loss of agricultural potential by soil degradation
- Social impacts (negative)
    - Impact of construction workers on local communities
    - Influx of job seekers
    - Impact of an uncontrolled labour force
    - Risk to safety, livestock, and farm infrastructure
    - Increased risk of grass fires due to construction activities and influx of workers
    - Impacts associated with construction related activities such as noise and dust)
- Social impacts (positive)
    - Creation of employment and business opportunities
- Traffic impact

Post- Construction / Operational Phase

- Impacts of improper site clearance after construction
- Impacts associated with lack of rehabilitation
- Impacts on fauna & flora
- Impacts on avifauna

- Impacts on bats
- Impact on freshwater features
- Storm water management and erosion
- Impact on visual resources
- Agricultural impacts
    - Loss of agricultural potential by occupation of land
- Social impacts (negative)
    - Impact on property values
    - Impact on local tourism operations
- Social impacts (positive)
    - Implementation of clean, renewable energy infrastructure
    - Creation of employment and business opportunities and support for local economic development
    - Establishment of a Community Trust
    - Income generation for affected landowners
    - Opportunity to improve security
    - Increased financial security
    - Improved security
- Traffic impact

Summary of the impact assessment tables

Design and Pre-construction Phase

Impact Description	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Site Selection: Impact on environmental features	Site	Long	Possible	High	High	Low
Site Selection: Impact on farm workers (job losses)	Local	Medium	Unlikely	High	None	None
Impact on avifauna	Site	Long	Possible	High	Low	Low
Impact on visual resources	Local	Permanent	Probable	High	High	Low
Flooding of adjacent farmlands	Regional	Long	Possible	High	High	Low

Construction Phase

Impact Description	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Impact on fauna and flora	Site	Short	Probable	Medium	Low	Very Low
Birds: disturbance	Site	Short	Probable	High	High	Low
Birds: habitat transformation	Site	Short	Probable	High	High	Low
Impact on bats	Local	Short	Possible	High	Low	Low

Impact on freshwater features	Site	Short	Unlikely	High	Low	None
Risk of groundwater pollution	Site	Short	Probable	High	High	Low
Risk of erosion	Site	Short	Possible	High	Moderate	Low
Cultural, Archaeology and Palaeontology	Site	Permanent	Possible	Irreversible	Moderate	Low
Impact on visual resources	Site	Short	Probable	High	High	Medium
Damage to farmlands	Local	Medium	Probable	High	Moderate	Low
Impact of construction workers on local communities	Local	Short	Probable	No in case of HIV and AIDS	Moderate	Low to none
Influx of job seekers	Local	Permanent	Probable	No in case of HIV and AIDS	Low	Low
Risk to safety, livestock and farm infrastructure	Local	Short	Probable	High	Moderate	Low
Increased risk of grass fires	Local	Short	Probable	High	Moderate	Low
Noise, dust, damage to roads	Local	Short	Probable	High	Moderate	Low
Creation of employment and business opportunities	Local	Short	Highly Probable	N/a	Medium positive	Medium positive
Traffic impact	Local	Short	Probable	High	Moderate	Low

Operational phase

Impact Description	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Improper site clearance after construction	Site	Short	Probable	High	High	Low
Lack of rehabilitation	Site	Short	Probable	High	High	Low
Impacts on fauna and flora	Site	Medium	Unlikely	Medium	Moderate	Low
Impacts on avifauna	Site	Long	Possible	High	Low	None
Impacts on bats	Local	Short	Possible	High	Low	Low
Impact on freshwater features	Site	Short	Possible	High	Low	None
Storm water management and erosion	Site	Medium	Probable	High	High	Low
Impact on visual resources	Local	Long	Probable	High	Moderate	Low
Loss agricultural potential by occupation of land	Site	Long	Definite	High	Low	Low
Impact on property values	Local	Long	Probable	High	Moderate	Low
Impact on local tourism operations	Local	Long	Probable	High	Low	Low
Implementation of renewable energy facilities	National	Long	Highly probable	Positive impact will be reversed if facility is decommissioned	High Positive	High Positive

Creation of employment and business opportunities	Regional	Long	Probable	If the project doesn't go ahead this positive impact will not be realised	Low positive	Medium positive
Establishment of a Community Trust	Regional	Low	Probable	If the project doesn't go ahead this positive impact will not be realised	Moderate Positive	High positive
Income generation for landowner	Local	Long	Probable	If the project doesn't go ahead this positive impact will not be realised	Low Positive	Medium positive
Opportunity to improve security	Local	Long	Probable	If the project doesn't go ahead this positive impact will not be realised	Moderate positive	High positive
Increased financial security	Site	Long	Possible	High	Positive	Positive
Traffic congestion	Local	Short	Probable	High	Moderate	Low

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.
- The proposed solar PV facility will be able to evacuate the solar generated electricity which will contribute towards improving South Africa's energy security and assist in alleviating load shedding.
- 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. 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 Hormah PV facility would be approximately 20 and the majority of low and semi-skilled beneficiaries are likely to be HD 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.

ENVIRONMENTAL MANAGEMENT PROGRAMME

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 this draft Basic Assessment Report.

RECOMMENDATION BY THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

These recommendations will be finalised in the Final BAR, but at this stage it is recommended that the following be included in the Environmental Authorisation:

The Environmental Management Programme ***must be approved*** and the implementation thereof should be a condition of authorisation.

- It is however recommended that the following plans be compiled and included as part of the EMPr before construction commences. Approval of these plans by the DFFE at that time is NOT required:
    - Storm Water Management Plan
    - Alien Invasive Management Plan
    - Rehabilitation Plan / Habitat Restoration Plan
    - The following plans would need to be compiled to manage the BESS
        - Emergency Response Plan
        - End-of-Life Plan

- The following plans would need to be compiled to manage the social impact of the proposed Hormah solar PV facility:
  - Skills Development and Training Programme
  - Code of Conduct for contractors and construction workers
  - Stakeholder Engagement Plan
  - Community Health, Safety and Security Plan
  - Monitoring Forum
  - Community Trust

CONCLUSION

The project can be summarised as follows:

- *Environmental Considerations*
  No environmental features that need to be excluded from the development were identified on the Hormah PV site. However, a buffer along the access roads is being proposed and will be implemented to protect the visual resources of the area.

  All identified impacts were assessed before and after mitigation have been applied. While some potential impacts had a moderate or high significance rating prior to mitigation, all identified impacts (except for the visual intrusion during the construction phase) can be mitigated to acceptable levels (i.e. Low or Very Low significance).

- *Technical considerations*
  All technical requirements and constraints have been addressed in the proposed layout and no further changes to the layout are deemed to be necessary.

- *Mitigation*
  All the mitigation measures are deemed feasible and realistic to implement, and are included in the EMPr, which means that the Applicant is legally bound to follow the recommendations should EA be granted. The EAPs are confident that all potentially negative impact associated with the project can be mitigated to acceptable levels.

****

CHAPTER 1: INTRODUCTION

1.1 Background

Hormah Solar PV1 (Pty) Ltd ('the Applicant") has appointed *Landscape Dynamics Environmental Consultants (Pty) Ltd* to apply for Environmental Authorisation for this *Mercury Cluster: Hormah Solar PV1 (120MW)* project with the Department of Forestry, Fisheries & Environment (DFFE), which is the Competent Authority for this project (refer to paragraph 1.1.2 below for more detail regarding the Competent Authority).

1.1.1 Locality

The development site is situated north of the R76 close to the town of Viljoenskroon in the Free State Province. It falls within the jurisdiction of the Moqhaka Local Municipality (MLM) in the Fezile Dabi District Municipality.

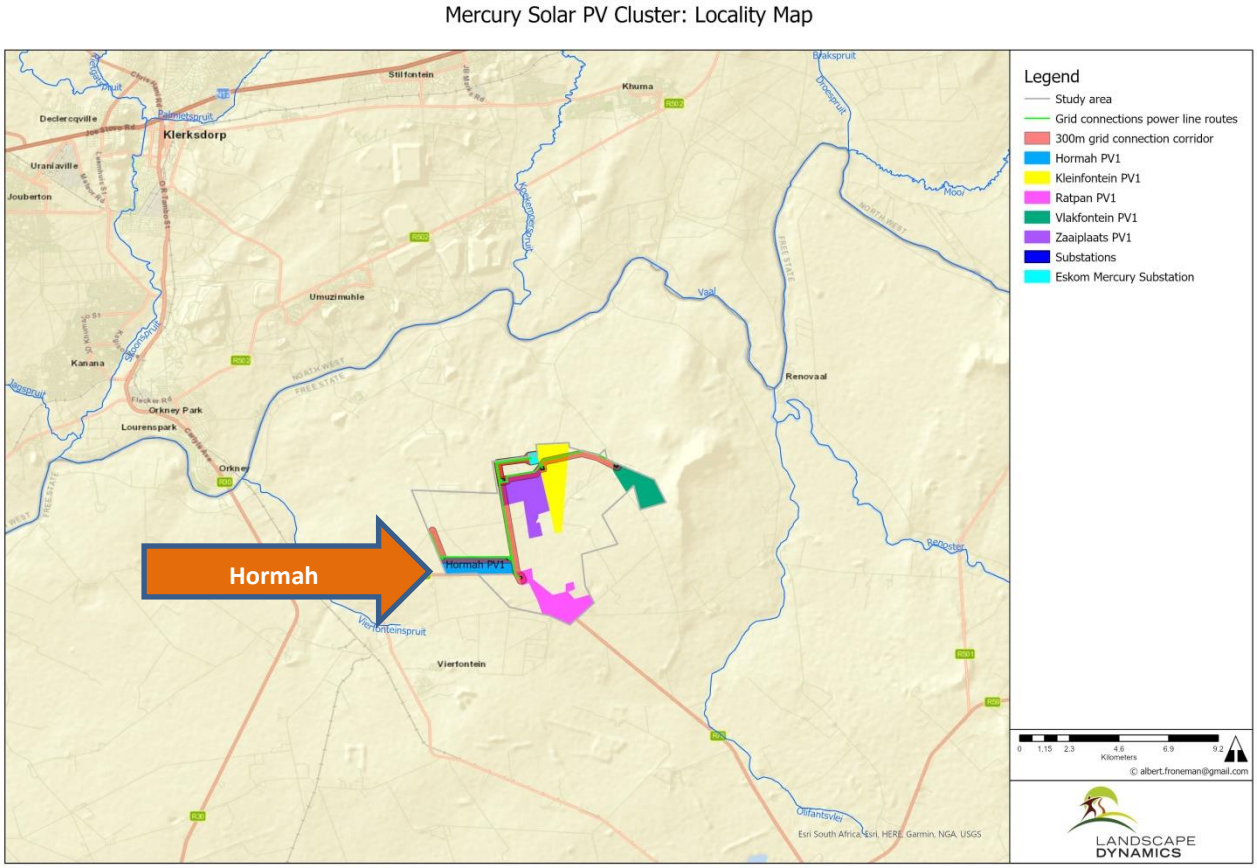


Figure 1: Locality Map – Mercury Solar PV Cluster

1.1.2 The Mercury Solar PV Cluster

An area of approximately 4 580 hectares were investigated at the onset of the project. It was determined via a thorough screening process that application for environmental authorisation will be made for five solar PV facilities and its associated infrastructure as well as five grid connections. The power lines will connect to the Eskom Mercury Substation, thereby feeding the solar generated electricity into the national grid.

Table 1: The Mercury Solar PV Cluster

Name of PV facility	MW	Area investigated for development	Development Footprint	Farm Name
Ratpan PV1	Up to 120MW	293 hectares	193 hectares	Remainder of Ratpan No 441
Hormah PV1	**Up to 120MW**	**227 hectares**	**198 hectares**	**Portion 2 of the Farm Hormah No 276**
Zaaiplaats PV1	Up to 120MW	356 hectares	281 hectares	Remainder of the Farm Zaaiplaats No 190 Remainder of Farm Fraai Uitzicht No 189 Portion 2 of Farm Fraai Uitzicht No 189
Kleinfontein PV1	Up to 120MW	354 hectares	290 hectares	Portion 1 of Farm Kleinfontein No 369
Vlakfontein PV1	Up to 100MW	211 hectares	151 hectares	Portion 1 of Farm Jackalsfontein No 443 A Portion of Vlakfontein Nr 15

Each Photovoltaic (PV) solar facility will be treated as a standalone application and five applications for Environmental Authorisations will therefore be made. The electrical grid infrastructure (switching station and power line that will be handed over to Eskom after construction) 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*. The IPP substation however forms part of the project components of the Ratpan PV facility and will be dealt with under this application.

A map of the Mercury Solar PV Cluster is provided on the following page and is also attached under Appendix A.

The HORMAH Solar PV1 facility is the subject of this particular BAR and EA application

Merecury Solar PV Cluster

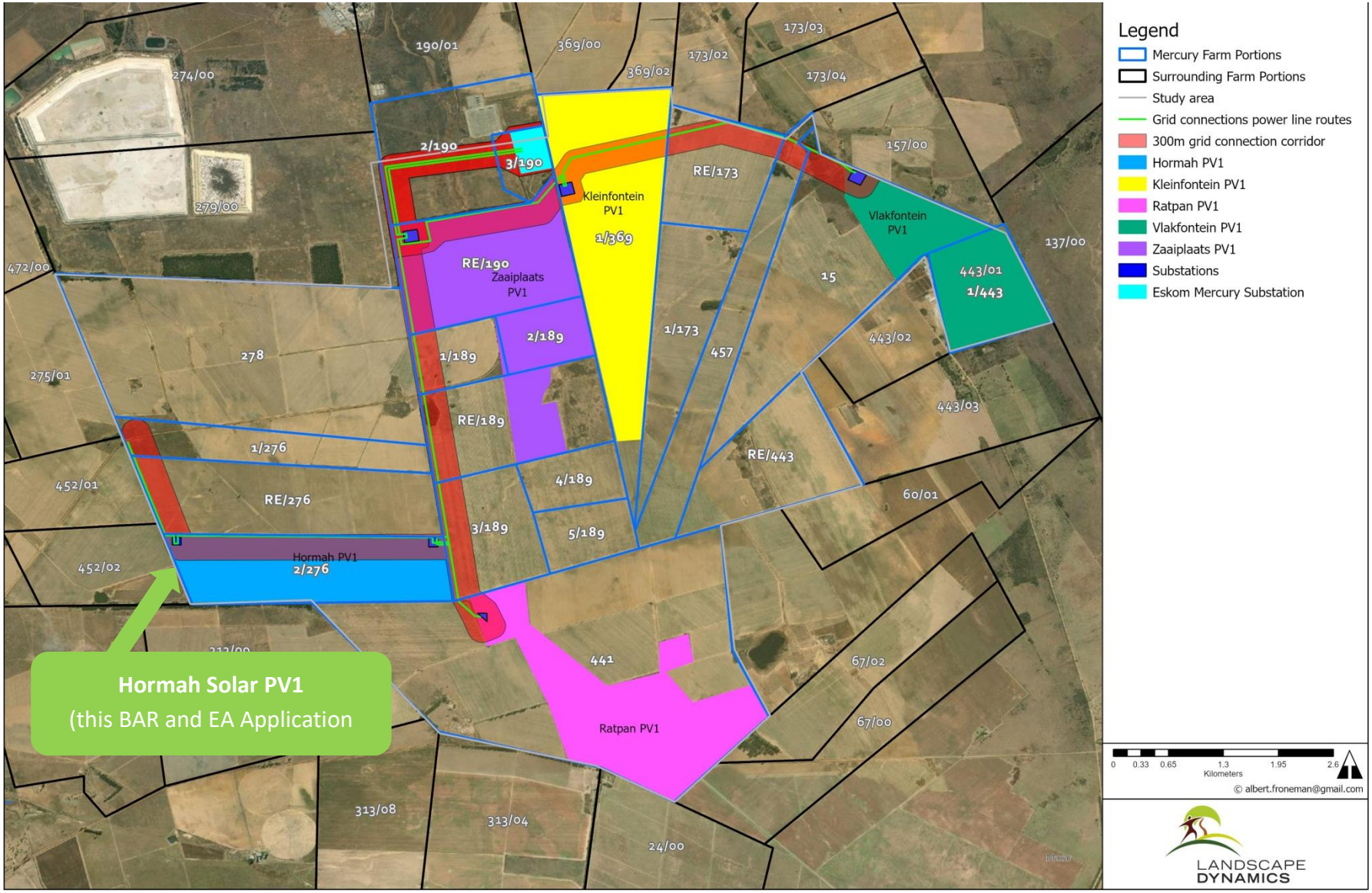


Figure 2: The Mercury Solar PV Cluster

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. The maps below are also provided under Addendum C.

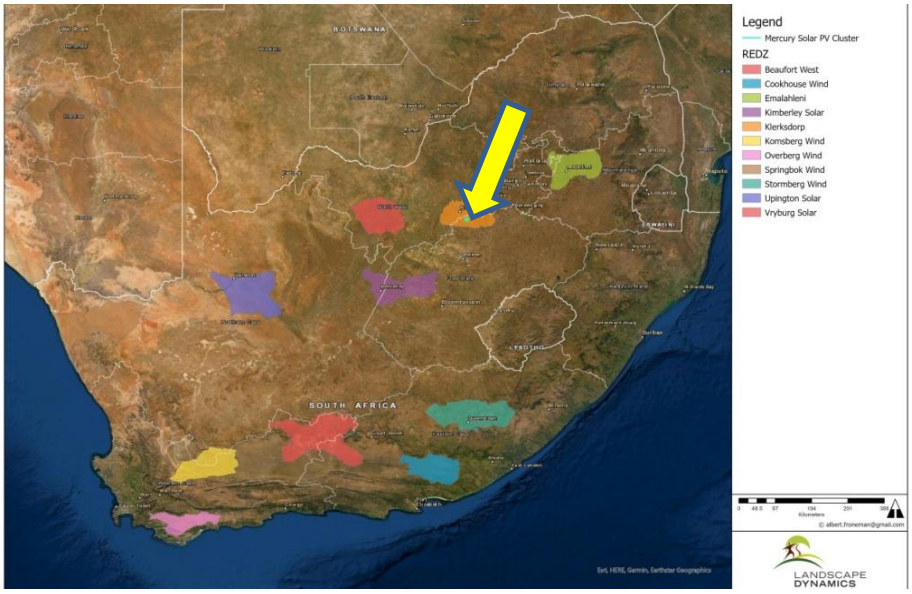
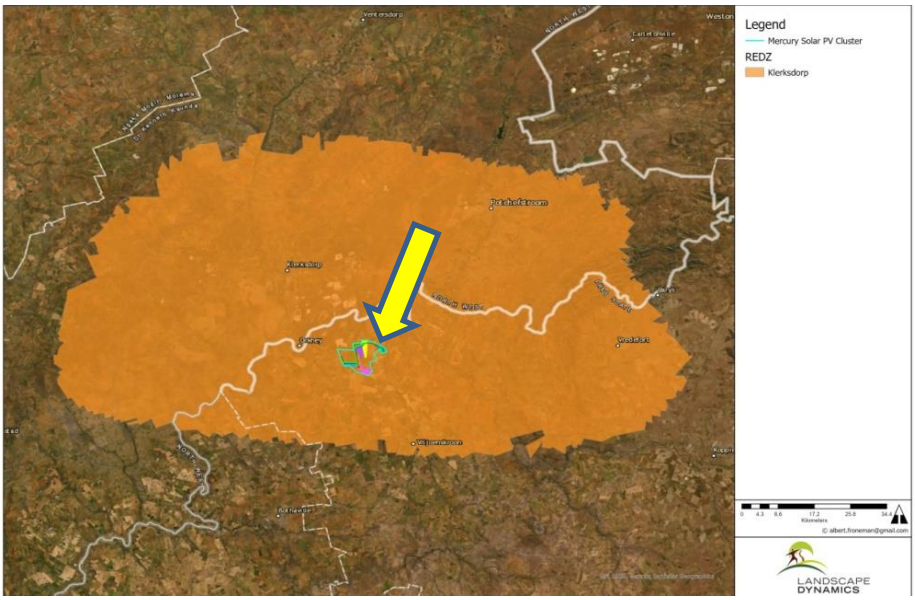


Figure 3: Renewable Energy Development Zones



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 Ratpan PV 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 Ratpan PV facility and will be dealt with under this application. The maps below are also provided under Addendum C.

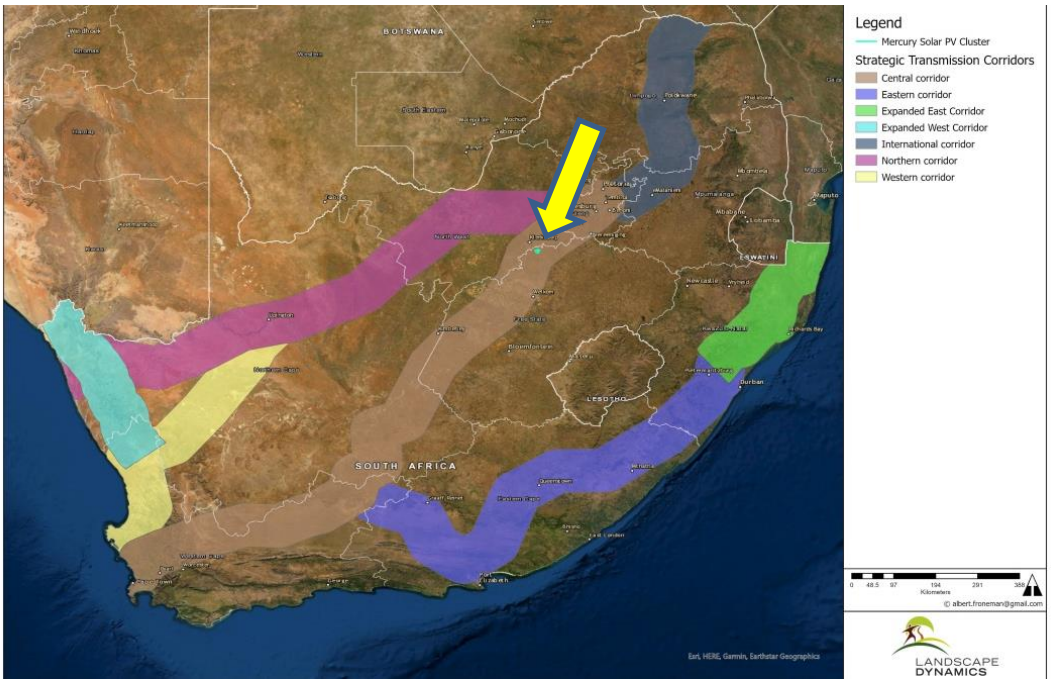
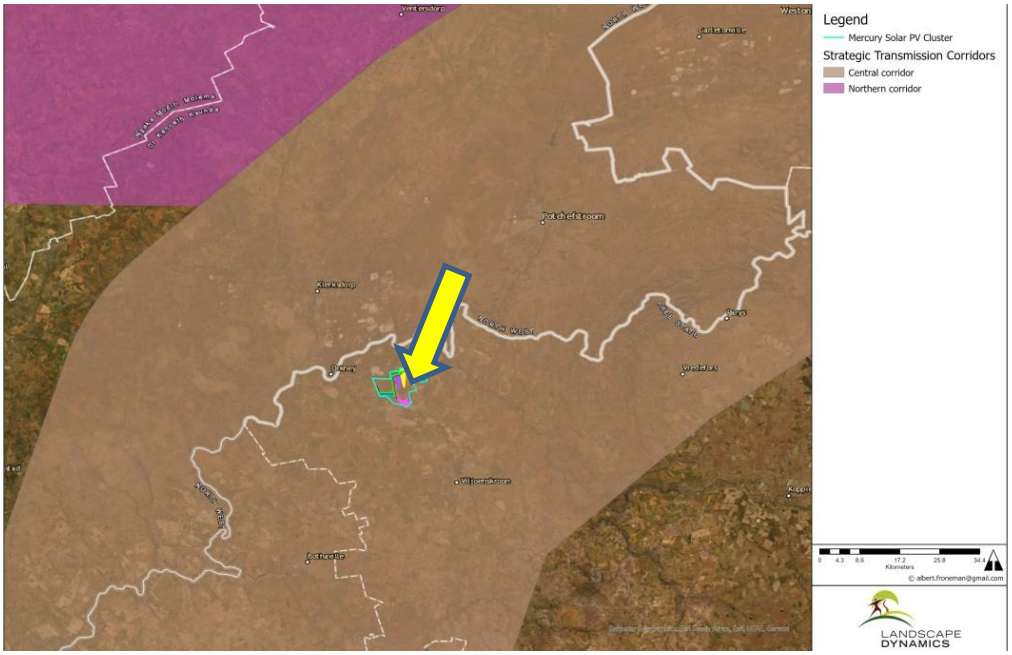


Figure 4: Strategic Transmission Corridors



1.1.5 Competent Authority

The following information was obtained from a document named "EXPLANATORY DOCUMENT FOR GOVERNMENT NOTICE NO. 779 PUBLISHED IN GOVERNMENT GAZETTE NO. 40110 DATED 1 JULY 2016". This notice was published to clarify the concern regarding who the competent authority is for Environmental Authorisation (EA) applications for renewable energy projects.

In December 2009 at the United Nations Framework Convention on Climate Change (UNFCCC), the then President committed South Africa to take nationally appropriate Carbon Dioxide mitigation action to reduce emissions. This commitment was made in line with the Articles of the UNFCCC and is being implemented, among others, through the Department of Energy's (DoE) Integrated Resource Plan (IRP) 2010 – 2030.

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

In light of the above, it is imperative to clarify that the Minister is the competent authority for applications for EA 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.

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 sub-section 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.

The Mercury Solar PV Cluster

It is the intention of the Applicant to bid the Hormah solar PV facility 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 and the Department of Forestry, Fisheries & the Environment is therefore the Competent Authority for this project.

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

Table 2: Basic Assessment process followed

Screening

- Purpose: Demarcating obvious no-go areas in order to inform the total Mercury Cluster development proposal
- Key specialists (avifauna, aquatic, fauna & flora, agriculture)
- Site visit
- Compiled Initial Sensitivity Maps and Screening Reports
- Development proposal decreased from the original 7x PV facilities to 5x facilities

Background Information Document & Public Participation

- Purpose: obtaining public and government input /concerns/objections at start of project
- Compiled Background Information Document
- Distributed for a 30-day commenting period to all on IAP Register

Public Participation

- Purpose: public participation in line with NEMA Regulations and obtaining public input/objections/concerns
- Onsite notifications
- Newspaper advertisements

Specialist Studies

- Desktop assessments
- Site investigations
- Impact Assessment Reports / Statement Letters

Draft Basic Assessment Report and Public participation

- Purpose: project detail, alternative assessment, responses to public input, impact assessment
- Compiled Draft Basic Assessment Report
- Distributed for a 30-day commenting period

We are here

Final Basic Assessment Report

- Purpose: Respond to public comment on the dBAR, incorporate comment into development proposal, finalise development proposal and layout
- fBAR may be distributed for a 30-day commenting period if substantial changes to the dBAR were made

Submission of Final Basic Assessment Report to DFFE

- Purpose: DFFE review for refusal / granting of Environmenta Authorisation

Informing IAPs of the Environmental Authorisation

- Informing IAPs of the EA and their right to appeal
- 20-day appeal period

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.

Table 3: Content of the Basic Assessment Report

Regulation Requirement	Section in BAR where addressed
(a) details of (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: (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 (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— (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— (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
(h) a full description of the process followed to reach the proposed preferred alternative within the site, including	Chapter 5
(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;	Chapter 8, Paragraph 8.2
(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;	Chapter 8, Paragraph 8.3 and 8.4
(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Chapter 5
(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—	Chapter 9
(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;	Chapter 9, Paragraph 9.3.1
(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;	Chapter 9, Paragraph 9.2 and 9.3
(viii) the possible mitigation measures that could be applied and level of residual risk;	Chapter 9, Paragraph 9.3.2
(ix) the outcome of the site selection matrix;	Chapter 9, Paragraph 9.5.1
(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and	Chapter 9.5
(xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity;	
(i) a full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including—	Chapter 9, Paragraph 9.1
(i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and	Chapter 9, Paragraph 9.2

(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;	Chapter 9, Paragraph 9.3
(j) an assessment of each identified potentially significant impact and risk, including— (i) cumulative impacts; (ii) the nature, significance and consequences of the impact and risk; (iii) the extent and duration of the impact and risk; (iv) the probability of the impact and risk occurring; (v) the degree to which the impact and risk can be reversed; (vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and (vii) the degree to which the impact and risk can be avoided, managed or mitigated;	Chapter 9, Paragraph 9.3
(k) where applicable, a summary of the findings and impact management measures identified in any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final report;	Chapter 6 Appendix F
(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 J
(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

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 24 years of professional services supplied.

The operating base for Landscape Dynamics is the entire South Africa; with local representation in Gauteng, the North West Province, Mpumalanga, Western Cape, Northern Cape and Limpopo.

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

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 F):

Table 4: Project Team

Environmental Assessment Practitioners

Company name	Contact person(s)	Responsibility
Landscape Dynamics Environmental Consultants	Ms Susanna Nel Ms Annelize Erasmus	○ EIA process ○ EIA Project Management ○ EAPs ○ Public Participation Programme

Specialists

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
Afrimage Photography	Mr Albert Froneman	Mapping and GIS support

Engineers (technical input)

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

Note
The specialists as mentioned above are considered 'specialists' as per the EIA Regulations and they comply with all the required specifications. However, the engineers as mentioned above constitutes technical studies and the requirements as stipulated in "Appendix 6 – Specialist reports" do not apply to these professionals.

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, Hormah Solar PV1 (Pty) Ltd:

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

1.5 Working Programme

Table 5: Working programme

Activity	Month
Site Visit by Landscape Dynamics and specialists	November 2021
Screening Report completed	December 2021
Public Participation & advertising	
• Placement of newspaper ads	March 2022
• Placement of onsite ads	March 2022
• Distribution of Background Information Document (30 day commenting period plus holidays)	March 2022
Specialist studies completed	April 2022

Draft BAR	
• Draft BAR sent to IAPs (30 day commenting period plus holidays)	28 February 2023
• Submission of Draft BAR and Application Form to DFFE	28 February 2023
Submission of Final BAR to DFFE	2 May 2023
Date EA received (57 days decision making time frame)	30 June 2023
Notification to all I&AP's of EA and right to appeal	7 July 2023
20 days appeal period ended	30 July 2023

CHAPTER 2: LEGAL REQUIREMENT

The consideration of proposed developments in context of relevant legislation, the various spatial planning tools and policy applicable to the study area forms an integral part of the present environmental processes. The "need and desirability" will be determined by considering the broader community's needs and interests as reflected in a credible municipal Integrated Development Plan, Spatial Development Framework and Environmental Management Framework for the area, and as determined by the EIA.

It is essential that national policies and strategies support growth in the economy. It is also essential and that these policies takes cognisance of strategic concerns such as climate change, food security, as well as the sustainability in supply of natural resources and the status of our ecosystem services.

In other words, to achieve our Constitutional goal of a better quality of life for all now and in the future, through equitable access to resources and shared prosperity, it is essential that society improves on the efficiency and responsibility with which we use resources, and improve on the level of integration of social, economic, ecological and governance systems.

The paragraphs below clearly 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:

Table 6: NEMA listed activities

Listing Notice 1 (GN R327)		
11	The development of facilities or infrastructure for the transmission and distribution of electricity outside urban areas or industrial complexes with a capacity of more than 33kV but less than 275 kilovolts	A 132kV IPP substation will be constructed. This substation will not be handed over to Eskom after construction and forms part of the project components of this solar PV facility.

24	The development of a road— (i) 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 (ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding a road— a) which is identified and included in activity 27 in Listing Notice 2 of 2014; b) where the entire road falls within an urban area; or c) which is 1 kilometre or shorter.	Access and internal roads of approximately 8m wide would be constructed
27	The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for— (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan	More than 1 hectare of indigenous vegetation could be cleared for the construction of the PV facility and associated infrastructure.
28	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development: (i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or (ii) **will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;** excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.	The up to 120MW solar PV facility will be constructed on land bigger than 1 hectare and on land previously used for agriculture.
56	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre— (i) where the existing reserve is wider than	The access road would be widened by 6 metres or more

	13,5 meters; or (ii) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas.	

Listing Notice 2 (GN R325)		
1	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs — (a) within an urban area; or (b) on existing infrastructure.	An up to 120MW solar PV facility will be constructed outside of an urban area.
15	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for (ii) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan	Indigenous vegetation of more than 20 hectares could be removed within the total project area.

Government Gazette 41445, Notice Number 114 of 16 February 2018

Even though Listing Notice 2 calls for a full Scoping and EIA to be undertaken, the project site falls within a Renewable Energy Development Zone which means that a Basic Assessment process has to be undertaken regardless if Listing Notice 2 is being triggered.

Listing Notice 3 (GN R324)		
4	The development of a road wider than 4 metres with a reserve less than 13,5 metres. b. Free State i. Outside urban areas: (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	Roads wider than 4m will be developed and, according to the Protected Areas Register (DFFE data base) the Mispah Game Farm (Nature Reserve) is situated approximately 4.7km north of the Hormah PV site.

	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 ii. Inside urban areas: (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.	
10	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. b. Free State i. Outside urban areas: (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	Storage of dangerous goods with a combined capacity not exceeding 80m^3 will be required. According to the Protected Areas Register (DFFE data base) the Mispah Game Farm (Nature Reserve) is situated approximately 4.7km north of the Hormah PV site.

	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; (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; (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose.	
12	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. b. Free State 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; ii. Within critical biodiversity areas identified in bioregional plans. iv. Areas within a watercourse or wetland; or **within 100 metres from the edge of a watercourse or wetland.**	More than 300m^2 of indigenous vegetation would be removed within 100m from the edge of a watercourse. Note that this watercourse (a wetland) is situated adjacent to the south-eastern corner of the Hormah PV site.
18	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre. **b. Free State** i. Outside urban areas:	Existing access roads would be widened by more than 4 meters within 100m from a watercourse. Note that this watercourse (a wetland) is situated adjacent to the south-eastern corner of the Hormah PV

	(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 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.	site. According to the Protected Areas Register (DFFE data base) the Mispah Game Farm (Nature Reserve) is situated approximately 4.7km north of the Hormah PV site.

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.

NEMA principles serve as:

- A general framework for environmental planning;
- Guidelines according to which the state must exercise its environmental functions; and
- A guide to the interpretation of NEMA itself and of any other law relating to the environment.

NEMA principles are the following:

- Environmental management must put people and their needs first;
- Development must be socially, environmentally and economically sustainable;
- There should be equal access to environmental resources, benefits and services to meet basic human needs;
- Government should promote public participation when making decisions about the environment;
- Communities must be given environmental education;
- Workers have the right to refuse to do work that is harmful to their health or to the environment;
- Decisions must be taken in an open and transparent manner and there must be access to information;
- The role of youth and women in environmental management must be recognised;
- The person or company who pollutes the environment must pay to clean it up;
- The environment is held in trust by the state for the benefit of all South Africans; and
- The utmost caution should be used when permission for new developments is granted.

Chapter 2 of NEMA

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.

Section 23 of NEMA

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) Impacts have been described, assessed and mitigation measures have been supplied in order to ensure that all identified impacts are mitigated to acceptable levels. Alternatives have been thoroughly assessed and the best possible solution represents this development proposal.
c) The development proposal 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 were followed during the public participation programme were based on the NEMA EIA Regulations, December 2014, as amended in April 2017.
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 mitigation measures as supplied in this report together with the measures as per the Environmental Management Programme are deemed to be the best way to manage anticipated impacts.

By providing electricity whilst not impacting negatively on the environment, this project would 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 Hormah PV site, the following applies:

- The south-eastern corner of the site is approximately 300m from the edge of a depression wetland.
- There are agricultural fields as well as a tarred road (the R76) between the Hormah PV site and the wetland and the impact on the wetland will be minimal/none.
- It will however be required to apply for a GA because the Hormah PV site is within 500m from a wetland, in other words it falls within the regulated area as per the NWA.

Additional water use activities that may occur would be associated with groundwater abstraction, should that need to take place or the use of conservancy tanks within the site. The threshold for the storage of domestic and biodegradable industrial wastewater for the purpose of disposal is 10 000m^3 per property. The General Authorisations for groundwater abstraction within Quaternary Catchment C24B and C70K are both limited to 45m^3/ha for the extent of the associated property.

Please note that application for a GA / WUL will 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:

- any development or other activity which will change the character of a site exceeding 5000m^2 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 was made early 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.

In the case of the Hormah Solar PV1 project, the above-mentioned application was submitted to DALRRD. The application was made by Ms Marchelle Terblanche and a copy thereof is attached under Appendix J. The No Objection Letter was received from DALRRD and is attached under Appendix J.

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. **Note that SALA approval is not required if the lease is over the entire farm portion**.

It is important to note that SALA approval is not applicable to the Hormah solar PV1 facility because the lease will be over the entire farm.

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 Hormah solar PV 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.

Table 7: Potential impacts of solar energy facilities and applicability

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 CSP project
Land Use Transformation (fuel growth and production)	Not applicable, but 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 I) addresses hazardous waste
Electromagnetic Interference	Chapter 7, paragraph 7.5
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
Sterilisation of mineral resources	The Department of Mineral Resources is registered IAP and has the opportunity to comment on this development proposal

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 EMPr. 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 EMPr.

Legislation

The NEMA listed activities and other applicable legislation are all addressed in this chapter of the 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. Please 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.

Please refer 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

Biodiversity refers to the variety of different species in a region and the variety of ecosystems and functions such as energy flow and matter cycling needed for the survival of those species. Conservation could be defined as the practical application of ecology and refers to the mechanisms and tools needed to achieve conservation goals, such as the protection of biodiversity.

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.

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.

According to the National Freshwater Ecosystem Priority Areas (NFEPA) report most of the main rivers present in the MLM area are Class-C rivers, which are 'moderately modified', with two rivers classified as Class-D, which are 'largely modified'. There are seven NFEPAs that should be managed in order to assist in the rehabilitation and improvement of these rivers. No fish sanctuaries have been identified for the area.

Protection of the FEPAs does not mean that it should be fenced off from human use, but rather that they should be supported by good planning, decision-making and management to ensure that human use does not significantly impact on the condition of the functioning of its ecosystems.

According to the National Wetlands Inventory, there are close to 3 300 wetlands in the MLM. These wetlands are mostly depression, channelled valley bottom, unchannelled valley-bottom, seep and flat wetlands. A few valley-head seep and floodplain wetlands are also present. Furthermore, a number of wetland clusters occur that will be regarded as sensitive to disturbance.
Wetlands play a very important role in the regulation of water and often possess unique habitat features that attract specialised species. Wetlands are the most threatened of all South Africa's ecosystems and are in dire need of protection. Buffers should be created around these features must be considered as sensitive to any development activities and treated with great care.

A thorough Fauna & Flora Impact Assessment and Aquatic Impact Assessment were conducted for the proposed PV facility and it concluded that

- There are no watercourses on site that needs to be protected
- The entire site was cultivated and is at present used for grazing purposes. There is no indigenous vegetation on site and it does not form part of any threatened or endangered ecosystems. The Hormah PV site has been totally transformed due to cultivation and as a result this vegetation unit has a *low conservation value and ecosystem functioning*.

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 will also be made to DALRRD for a No Objection letter, thereby obtaining confirmation that the land in question may be used for purposes other than agriculture.

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 Hormah PV solar 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 Hormah PV 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 development of the proposed PV Solar Facility is 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 development process was spearheaded by the then Department of Economic Development, Tourism and Environmental Affairs.

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 solar PV 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.

The Hormah solar PV facility as proposed is in line and in support of applicable legislation on a national, provincial as well as local level.

CHAPTER 3: PROJECT INFORMATION

3.1 Project Description

The Hormah PV facility will have a contracted capacity of up to 120MW with a development footprint of approximately 198 hectares in size. Infrastructure associated with the Solar PV Facility will include the following:

Table 8: Project description

Infrastructure	Specifications
Solar PV Array	The Solar PV Array includes the following components: • Bifacial PV Modules • Mounting structures using single axis tracking technology • Inverters • Transformers • Cabling between panels
Development footprint	198 hectares
Onsite 132kV IPP	The IPP Substation includes the following components: • HV Step-up transformer • MV Interconnection building • Total area approximately 100m x 100m (1 ha)
Access and internal roads	• Access is required for the purpose of the Hormah Solar PV1 directly off R76, approximately 8m wide. • Existing internal farm roads to be utilised where possible, re-graveling of roads to take place if required by the provincial roads authority. • All internal roads will be up to 6m wide.
Battery Energy Storage System (BESS)	• Solid State Batteries (SSB) is the preferred battery technology • The SSB will make use of Lithium-Ion chemistries. • The BESS containers are centralised into one area. • It will be constructed on approximately 4.5 ha.

Storage of Dangerous Goods	• 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: • 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	• 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.
Laydown area	• A temporary construction site area of approximately 4ha adjacent to the BESS area will be required. • All temporary infrastructure will be rehabilitated following the completion of the construction phase, where it is not required for the operation phase.

Note

Electrical infrastructure, which includes an onsite 132kV Eskom switching station and a 132kV power line connecting the Hormah PV facility to the Mercury MTS, would be developed by the IPP under a self-build agreement with Eskom. *It is important to note that this infrastructure will be applied for in a separate application, as it is to be handed over to Eskom after construction.* Note the Eskom switching station will be directly adjacent to the IPP substation but the Eskom switching station and power line as mentioned above is specifically excluded from this map to prevent any confusion.

Map indicating the project components of the proposed Hormah Solar PV facility

(also refer to Appendix A for a copy of the map)

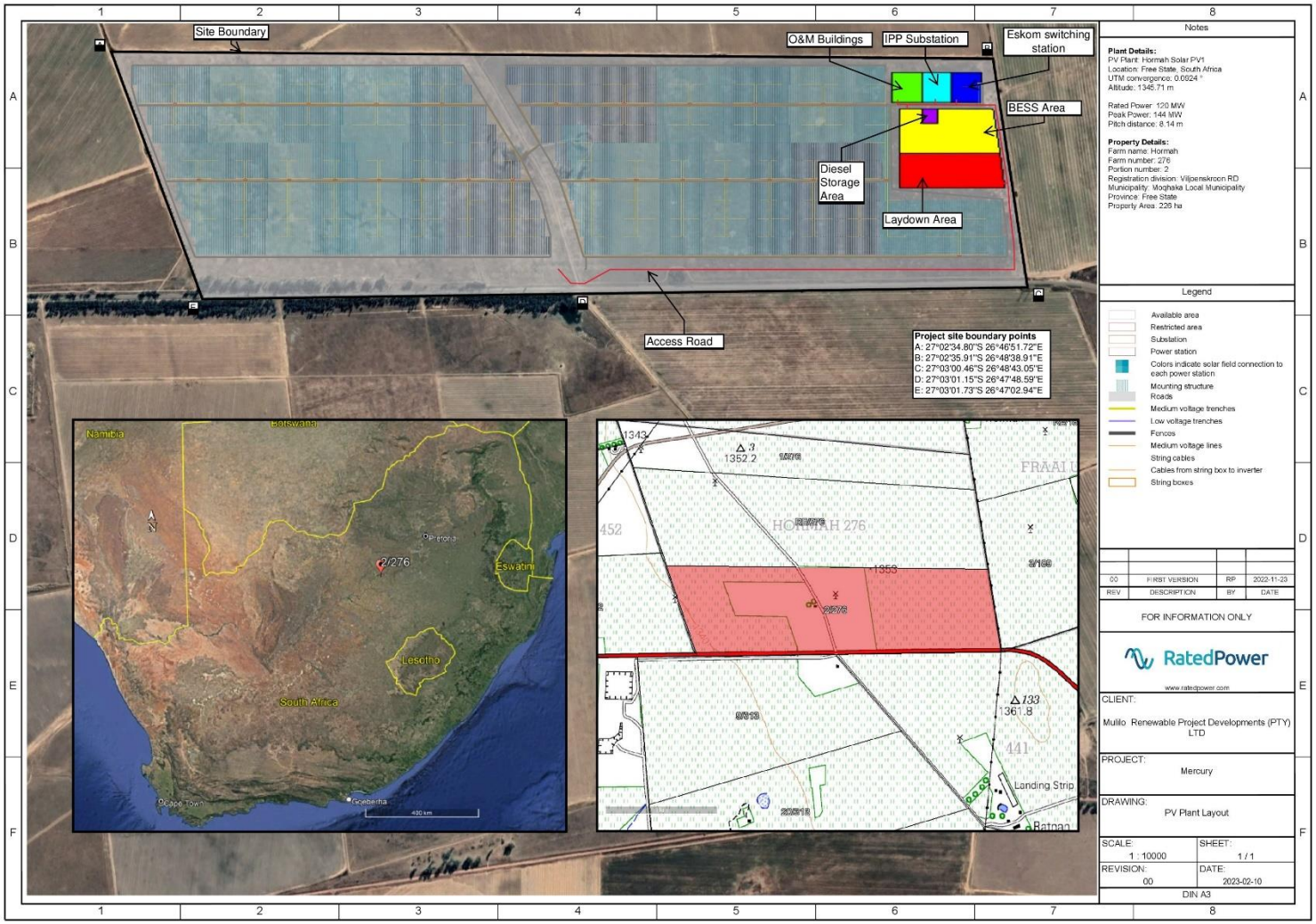


Figure 5: Final project components

3.2 Coordinates

3.2.1 Hormah PV Development Site

Table 9: Coordinates of the Hormah PV site

North-western corner	27° 2'35.51"S and 26°46'55.02"E
North-eastern corner	27° 2'36.56"S and 26°48'37.00"E
South-eastern corner	27° 2'59.13"S and 26°48'42.18"E
South-western corner	27° 2'59.77"S and 26°47'30.65"E

3.2.2 IPP Substation

Table 10: Coordinates of the IPP Substation

North-western corner	27° 2'37.34"S and 26°48'30.30"E
North-eastern corner	27° 2'37.32"S and 26°48'33.87"E
South-eastern corner	27° 2'40.52"S and 26°48'33.95"E
South-western corner	27° 2'40.57"S and 26°48'30.26"E

3.2.3 Operations & Maintenance Buildings

Table 11: Coordinates of the Operations & Maintenance Buildings

North-western corner	27° 2'37.36"S and 26°48'26.65"E
North-eastern corner	27° 2'37.34"S and 26°48'30.30"E
South-eastern corner	27° 2'40.57"S and 26°48'30.26"E
South-western corner	27° 2'40.57"S and 26°48'30.26"E

3.2.4 BESS Area

Table 12: Coordinates of the BESS Area

North-western corner	27° 2'41.24"S and 26°48'27.46"E

North-eastern corner	27° 2'41.22"S and 26°48'38.87"E
South-eastern corner	27° 2'46.02"S and 26°48'39.76"E
South-western corner	27° 2'46.04"S and 26°48'27.52"E

3.2.5 Diesel storage

Table 13: Coordinates of the diesel storage area

North-western corner	27° 2'41.18"S and 26°48'30.29"E
North-eastern corner	27° 2'41.16"S and 26°48'32.07"E
South-eastern corner	27° 2'42.82"S and 26°48'32.07"E
South-western corner	27° 2'42.81"S and 26°48'30.28"E

3.2.6 Laydown area

Table 14: Coordinates of the laydown area

North-western corner	27° 2'46.04"S and 26°48'27.52"E
North-eastern corner	27° 2'46.02"S and 26°48'39.76"E
South-eastern corner	27° 2'49.76"S and 26°48'27.52"E
South-western corner	27° 2'49.74"S and 26°48'40.28"E

3.2.7 Main internal access road

Table 15: Coordinates of the main internal access road

Entrance of the R76	27° 3'0.57"S and 26°47'48.54"E
Turning point at the south eastern corner of the PV site	27° 2'58.68"S and 26°48'40.86"E
End point at the O&M buildings	27° 2'40.81"S and 26°48'26.32"E

3.3 Farm and portion number & Surveyor General 21 Digit Code

Key to the SG 21 Digit Codes

Major region				Minor region				Farm / Erf number								Portion number				
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

The project is situated on **Portion 2 of the Farm Hormah No 276** with SG21 Digit Code as follows:

F	0	3	6	0	0	0	0	0	0	0	0	0	2	7	6	0	0	0	0	2

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 Hormah solar PV 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 Mercury Cluster: Hormah Solar PV project 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 Hormah Solar PV 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 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: • *Fauna & Flora specialist* • *Aquatic specialist* • *Ornithologist* • *Bat specialist* • *Heritage consultant* • *Socio-economic specialist* • *Visual specialist* • *Agricultural specialist* • *Engineering reports were compiled to address and mitigate storm water, traffic as well as RFI and a high-level risk assessment were undertaken 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 I) 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 ECO 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. 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.

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 site selection process and alternative development sites are being discussed below.

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

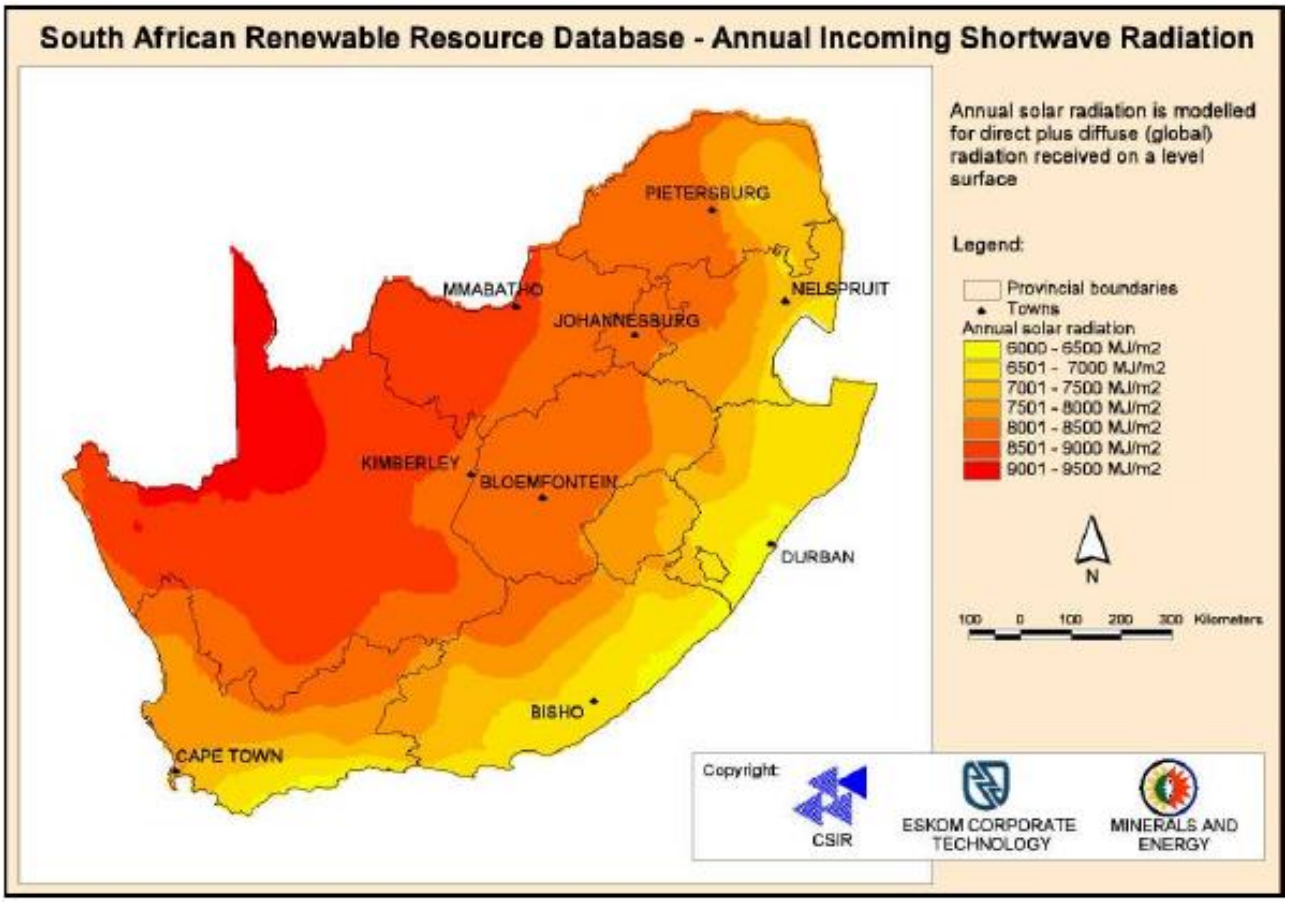
Taking the above into account, a site assessment area of approximate 4 580 hectares was selected within which further investigations took place. These specific points are discussed below to determine the fit of the development proposal in relation to these factors.

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/m^2 (16 and 23 MJ/m^2). 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/m^2 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 are accessible via the R76 in the south, Vermaasdrift Road in the east, unnamed gravel roads as well as an established network of existing farm roads, which can be upgraded to required standards.

Access to the Eskom grid

The proposed solar development 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 proposed solar facility is approximately 5km away from the Eskom Mercury Main Transmission Substation which means the project will be viable when the construction costs are being 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 landowners of the proposed solar facilities have all confirmed their willingness to lease the land for development, which is evident in the consent forms signed and attached under Appendix J.

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 proposed site 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 proposed solar facility 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.

Detail environmental studies were done for the proposed solar PV facilities and the development layouts were guided by the results of these studies. No environmental constraints were however identified on the Hormah PV site and the entire site is suitable for development.

Current land use and available land

The entire assessment area is used for agriculture and almost the entire site is rated as having a high agricultural potential in the DFFE Screening Tool, dated 29 April 2022 (refer to Chapter 6, paragraph 6.2). A Screening Assessment was undertaken at the onset of the study to ground-truth the findings of the Screening Tool and to determine developable land which may be approved by DALRRD for solar development. The Agricultural Screening report is attached under Appendix E and is summarised below.

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 aim of the assessment was therefore to assess and categorise, into different levels, the risk of being denied agricultural approval for solar PV development across the different parts of the available site.

In terms of the allowable development limits, solar is not permissible on almost the entire Mercury site. There is therefore a risk associated with achieving agricultural approval for solar development on any part of the site. However, some parts of the site carry a lower risk than other parts of the site. This assessment has categorised the risk into four categories as presented in the table below.

Table 16: Categories of risk associated with achieving agricultural approval across the site

Risk category	Characteristics of land	Description of risk
1	Land which has not been used for crop production for an extended period of time and should therefore no longer be classified as cultivated land or allocated high agricultural sensitivity because of it. The fact that cultivation has been discontinued or was never done suggests the land has limitations that make it too marginal for economically viable crop production.	DALRRD is fairly likely to grant agricultural approval.
2	Land which is currently producing crop yields that are very marginal for economic viability.	DALRRD may grant agricultural approval
3	Land which is currently producing crop yields that are somewhat marginal for economic viability.	DALRRD may grant agricultural approval
4	Land which is currently producing crop yields that are completely economically viable.	DALRRD is highly unlikely to grant agricultural approval.

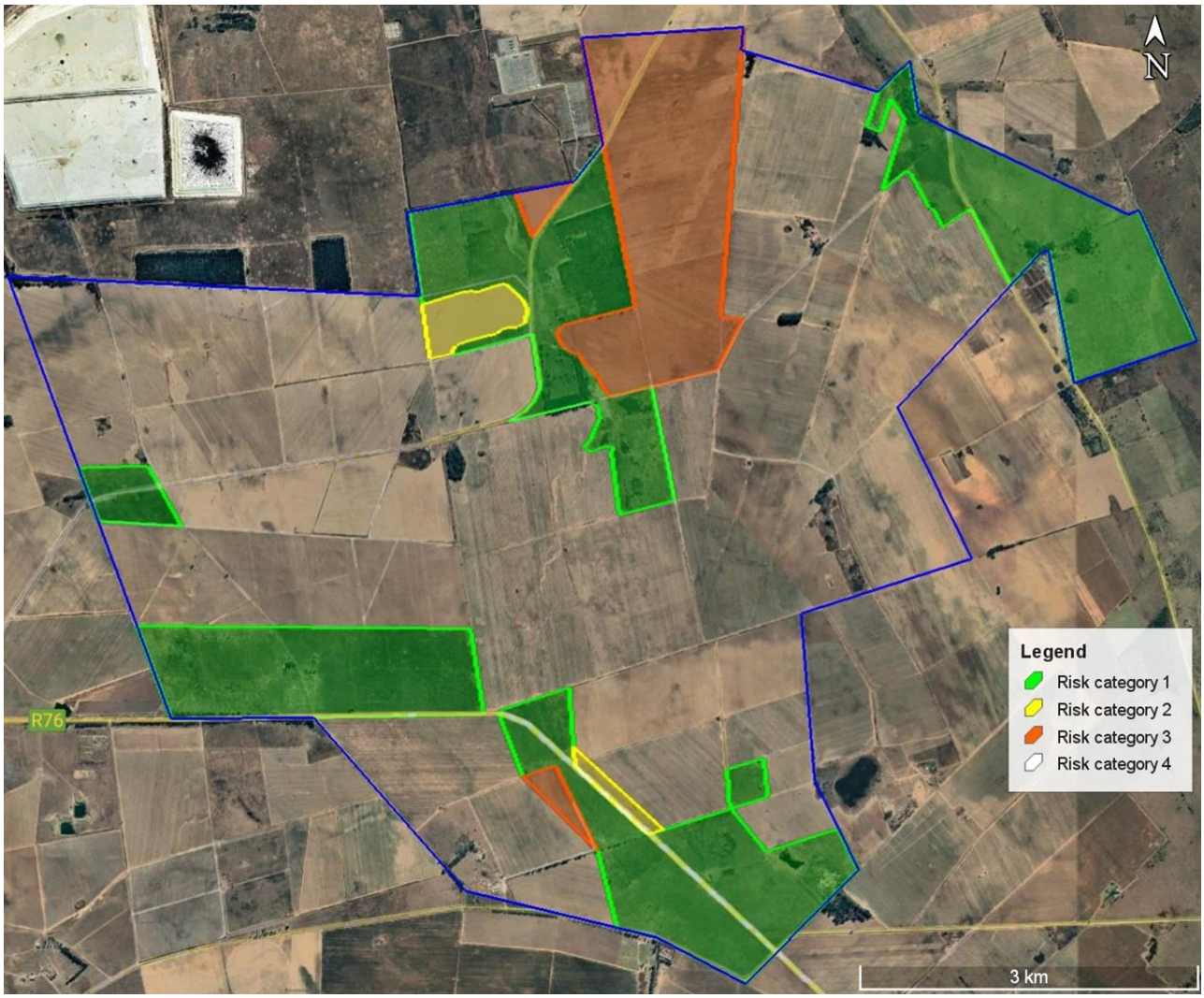


Figure 6: Categories of risk associated with achieving agricultural approval: Mercury Cluster

As can be seen from the map above, the proposed Mercury Cluster will consist of 4x Risk Category sites (DALRRD is fairly likely to grant agricultural approval) and 1x Risk Category 3 site (DALRRD may grant agricultural approval) sites. The Risk Category 4 sites, which consist of the unmarked areas on the map above, have been excluded from development.

This approach ensures that the need for development is balanced against the conservation of agricultural resources required for agricultural production and national food security.

The changes made due to the agricultural assessment are given in the table below.

ORIGINAL VS CURRENT SITE DEVELOPMENT PROPOSAL

The client originally planned to construct at least 10x solar PV facilities within the identified assessment area. However, as described above, it quickly became clear that the high agricultural potential of the study area will play a major role in the number of sites to be available for development. The number of sites was then downscaled to seven and a screening assessment was undertaken to determine the feasibility of these 7x sites (refer to the map below). The Agricultural Screening Assessment is discussed in detail above.

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 as shown in the map below.

The Screening/Feasibility Assessment, inclusive of specialist reports, is attached under Appendix E.

Table 17: Changes made to proposed development sites based on screening assessment

Solar PV site	**7x solar PV facilities** Approximate size available for development	**5x solar PV facilities** New approximate size available for development
Ratpan	Ratpan PV1 (245 hectares) Ratpan PV2 (334 hectares) Total = 579 hectares	291 hectares
Hormah	227 hectares	227 hectares
Zaaiplaats	301 hectares	356 hectares
Kleinfontein	307 hectares	354 hectares
Vlakfontein	241 hectares	213 hectares
Biesiesfontein	263 hectares	-
Totals	**1 918 hectares**	**1441 hectares**

- Ratpan PV1 (245 hectares) and Ratpan PV2 (334 hectares) were combined into one facility and the size was reduced from 579 hectares to 293 hectares
- The size of the Hormah facility remained unchanged

- The Zaaiplaats facility was increased with 55 hectares
- The Kleinfontein facility was increased with 57 hectares
- The Vlakfontein site decreased in size from 241 hectares to 211 hectares
- The Biesiesfontein facility was scrapped in its totality – 263 hectares

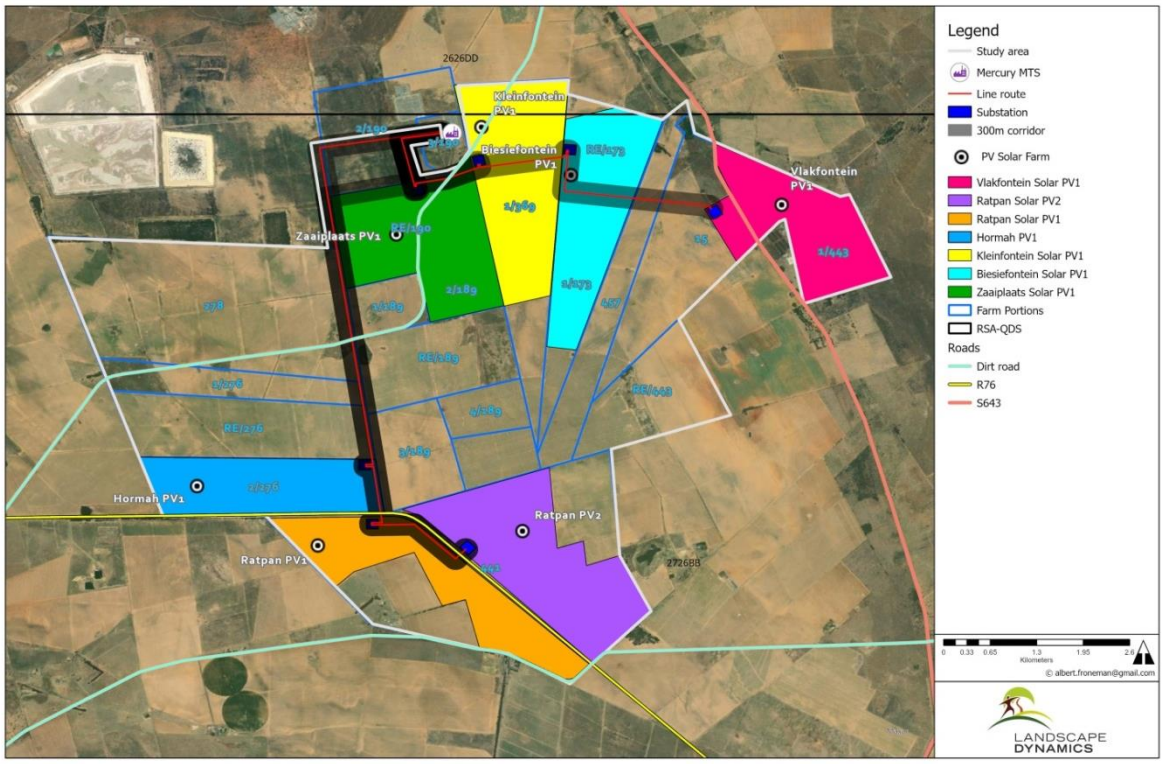


Figure 7: The seven solar PV facilities

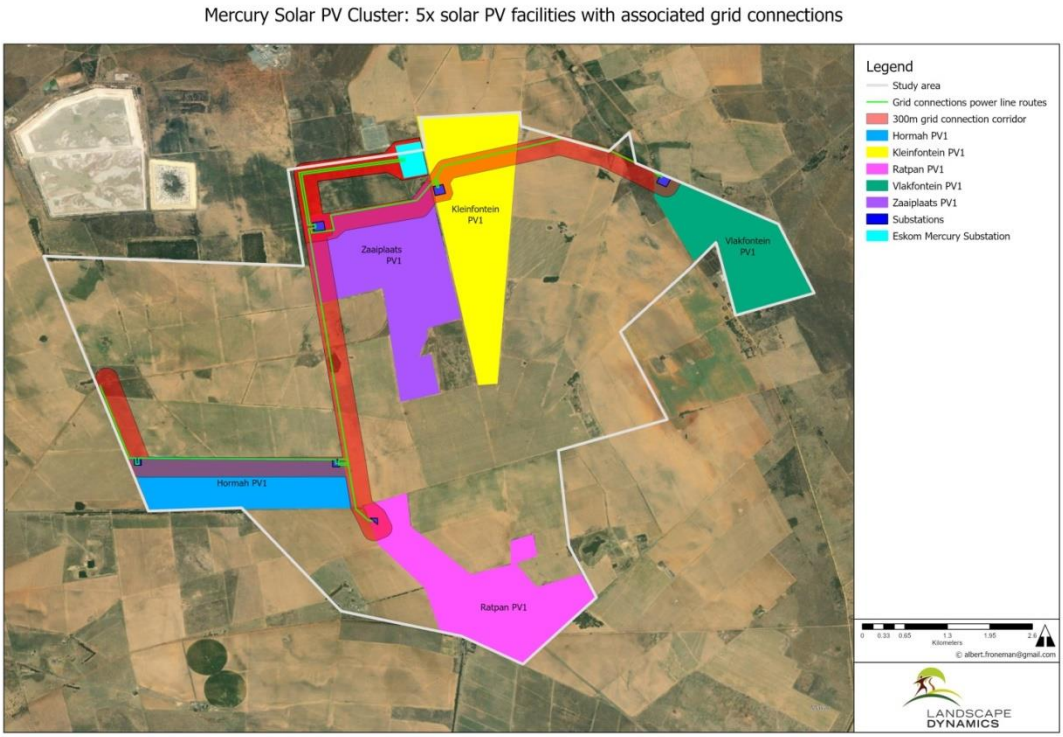


Figure 8: The five solar PV facilities (the Mercury Solar PV Cluster)

Individual sites

Application for environmental authorisation will be made for each of the five sites and each PV facility site will therefore be discussed in a separate report.

THE HORMAH SOLAR PV FACILITY (THIS REPORT)

The site layout is, amongst other, determined by the environmental attributes of the site. The proposed Hormah PV facility has no environmental attributes (biophysical or cultural/heritage) that need to be protected and excluded from development.

The layout will therefore be solely guided by best practice and acceptable solar PV engineering principles and will not be further discussed.

5.2 Preferred Alternative

The Hormah PV facility will have a contracted capacity of up to 120MW with a development footprint of approximately 198 hectares in size.

Infrastructure associated with the Solar PV Facility will include the following:

Table 18: Preferred Alternative

Infrastructure	Specifications
Solar PV Array	The Solar PV Array includes the following components: • Bifacial PV Modules • Mounting structures using single axis tracking technology • Inverters • Transformers • Cabling between panels
Development footprint	198 hectares
Onsite 132kV IPP	The IPP Substation includes the following components: • HV Step-up transformer • MV Interconnection building • Total area approximately 100m x 100m (1 ha)
Access and internal roads	• Access is required for the purpose of the Hormah Solar PV1 directly off R76, approximately 8m wide. • Existing internal farm roads to be utilised where possible, re-graveling of roads to take place if required by the provincial roads authority.

	• All internal roads will be up to 6m wide.
Battery Energy Storage System (BESS)	• Solid State Batteries (SSB) is the preferred battery technology • The SSB will make use of Lithium-Ion chemistries. • The BESS containers are centralised into one area. • It will be constructed on approximately 4.5 ha.
Storage of Dangerous Goods	• 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: • 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	• 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.
Laydown area	• A temporary construction site area of approximately 4ha adjacent to the BESS area will be required. • All temporary infrastructure will be rehabilitated following the completion of the construction phase, where it is not required for the operation phase.

Note
Electrical infrastructure, which includes an onsite 132kV Eskom switching station and a 132kV power line connecting the Hormah PV facility to the Mercury MTS, would be developed by the IPP under a self-build agreement with Eskom. *It is important to note that this infrastructure will be applied for in a separate application, as it is to be handed over to Eskom after construction.*

5.3 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 Hormah solar PV 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 Moqhaka 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.

5.4 Conclusion of Alternatives

The site selection assessment process clearly indicates that alternative solar PV facility sites for the Mercury Solar PV Cluster, which includes the Hormah solar PV1 facility, were thoroughly assessed.

It concluded that the preferred number and size of the PV facilities within the Mercury Cluster as

assessed and presented in this report are the result of in-depth specialist and engineering studies combined with technical and financial constraints as provided by the Applicant. The EAPs are confident that the preferred site alternatives are the most acceptable and viable alternative for Mercury Solar PV Cluster which includes the Hormah solar PV1 facility.

It concluded that the preferred number and size of the PV facilities within the Mercury Cluster as assessed and presented in this report are the result of in-depth specialist and engineering studies combined with technical and financial constraints as provided by the Applicant. The EAPs are confident that the preferred site alternatives are the most acceptable and viable alternative for Mercury Solar PV Cluster.

The Hormah solar PV facility (the subject of this report) has no environmental attributes (biophysical or cultural/heritage) that need to be protected and excluded from development. The layout will therefore be solely guided by best practice and acceptable solar PV engineering principles and will not be further discussed.

CHAPTER 6: RECEIVING ENVIRONMENT & SPECIALIST STUDIES

6.1 General Description of the Study Area

6.1.1 General description

General and surrounding landuse

The study site is located in the Free State Province south of the Vaal River, is approximately 22km southeast of Klerksdorp and ±18km north of the small town of Viljoenskroon. The areas mostly comprise agricultural and old cultivated fields with a few remaining natural vegetation patches. The Northern Free State is a major producer of staple crops and livestock. Farming activities within the study area are typically based on a mix of dryland cropping and raising livestock, mainly beef cattle. The Hormah PV facility is prone to water logging and is not considered suitable for cropping and is used exclusively for grazing.

No structures are located on the Hormah farm and no accommodation is available on site - most farm labour (when needed) is transported in from Viljoenskroon on a daily basis.

Mining is evident within the macro area with the Harmony Moab Khotsong's mine ±4km to the north of the Hormah PV site and the Vierfontein mine ±5km south of the Hormah PV site. The Harmony Moab Khotsong's mining operation is ±2.5km west of the Mercury Substation. Associated mining infrastructure, slimes dams and overburden dumps are located within ±3.5km of the proposed PV facility. The areas rural sense of place has therefore been impacted by the existing mining operations and existing electrical infrastructure.

There are three private nature reserves within the macro area: the Viljoenskroon Nature Reserve (Declared a Private Nature Reserve in 1996) is ±20km southeast of Hormah, the Mahemsvlei Private Nature Reserve (Declared a Private Nature Reserve in 1994) is ±22km from the Hormah site and the Mispah Game Farm, ±4.5km north of the Hormah site. These reserves are registered on the DFFE Protected Areas database but further information about these reserves couldn't be found and it is not known if the land is being managed as nature reserves or not.

Topography

The site assessment area is relatively flat with only slight slopes towards the northern parts of the assessment area.

Climate, Hydrology and Geohydrology

The average temperatures vary from 9.3^{0}C in June/July to 22.4^{0}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).

A minor intergranular and fractured aquatic feature occurs in the area that has low yields of less than 0.5 l/s. The groundwater table is generally about 20 m below ground level. The water quality is relatively poor, with electrical conductivities of between 150 and 370 mS/m. The aquifer has a medium to high susceptibility to contamination from anthropogenic activities. The site is not in a Strategic Water Source Area for surface or groundwater.

Geology and Soils

The area is underlain with deep alluvial sands, boulder gravel, scree and soil. Ferricrete occurs in the wetland areas and results in perched systems with inundation occurring as a result of summer rainfall events.

6.1.2 Other renewable energy projects

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 11 renewable energy facilities have historically been proposed or are currently being proposed within a 35km radius of the site. These include two cluster developments currently being proposed (different applications), viz. Mercury Solar PV Cluster (the subject of this report) and Red Rocket's Dominion Cluster, located 5km west of Klerksdorp.

Table 19: Historic and current renewable energy applications within 35km of the Mercury Cluster

The table below was obtained from the Social Impact Assessment Report attached under Appendix F

	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	???	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 Includes Hormah PV1	Solar PV	540	Various	In process
11	Unknown	Solar PV	50	Afropause 538	BAR 2011

6.2 DFFE Screening Tool – Determining Specialist Input

The DFFE Screening Tool Report, dated 29 April 2022, is attached under Addendum E.

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.

These identified sensitivities are indicative only and must be verified on site by a suitably qualified person (the EAP or a specialist) before the need of the recommended specialist assessments can be confirmed.

The following table is applicable to the Hormah Solar PV facility:

Table 20: Sensitivities identified in the Screening Tool

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			

Specialist assessments identified

Based on the selected classification and the environmental sensitivities of the proposed development footprint, a list of specialist assessments have been identified by the Screening Tool for inclusion in the assessment report. It is the responsibility of the EAP to confirm this list and to motivate the reason for not including any of the identified specialist studies where applicable including the provision of photographic evidence of the site situation.

The 13x Impact Assessments as mentioned below were identified in the Screening Tool Report. A

motivation is provided, where applicable, next to each study as to why the recommendation is not required. A photo report of the site is attached under Appendix D.

All specialist studies as undertaken were done according to the applicable Protocol as stipulated in the Screening Tool Report.

Table 21: Specialist assessments identified in the Screening Tool

Impact Assessment	Motivation
Agricultural Impact Assessment	An *Agricultural Impact Assessment* was done and is summarised in Chapter 6 and included under Appendix F of this Report.
Landscape / Visual Impact Assessment	A *Visual Impact Assessment* was done and is summarised in Chapter 6 and included under Appendix F of this Report.
Archaeological and Cultural Heritage Impact Assessment	An *Archaeological Impact Assessment* was done and is summarised in Chapter 6 and included under Appendix F of this Report.
Palaeontology Impact Assessment	A *Palaeontological Impact Assessment* was done and is summarised in Chapter 6 and included under Appendix F of this Report.
Terrestrial Biodiversity Impact Assessment	A *Terrestrial Ecological Assessment* was done and is summarised in Chapter 6 and included under Appendix F of this Report.
Aquatic Biodiversity Impact Assessment	An *Aquatic Impact Assessment* was done and is summarised in Chapter 6 and included under Appendix F of this Report.
Civil Aviation Assessment	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, which indicates that further studies are not required. The SA Defence Force was however contacted for comment and further actions will be based on their comment.
RFI Assessment	An *RFI Assessment* was done and is summarised in Chapter 6 and included under Appendix F of this Report.

Geotechnical Assessment	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 and recommendations into account. The EAP can therefore with confidence state that a geotechnical study during the EIA stages of the project will not impact on the viability of the project and is therefore not required as part of the studies for Environmental Authorisation.
Socio-economic Impact Assessment	A *Socio-economic Impact Assessment* was done and is summarised in Chapter 6 and included under Appendix F of this Report.
Plant Species Assessment	This component is addressed under the *Terrestrial Ecological Assessment* as mentioned above.
Animal Species Assessment	This component is addressed under the *Terrestrial Ecological Assessment* as mentioned above.

The specialist studies as mentioned in the table above are summarised below.

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 F. 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

Vegetation Type

The vegetation of the study area belongs to the endangered Vaal-Vet Sandy Grassland vegetation type (Gh 10) (Mucina & Rutherford 2006).

Vegetation Units

The study area (the entire Mercury Cluster) comprises seven vegetation units namely:

1. *Eragrostis curvula-Cynodon dactylon* grassland
2. Wetland areas
3. *Eucalyptus camaldulensis* woodland
4. Cultivated fields
5. Seasonal stream
6. *Digitaria eriantha-Eragrostis curvula* grassland
7. *Seriphium plumosum* shrubland

The vegetation unit for the entire Hormah PV site was identified as Nr 4: Cultivated Fields

The Cultivated Fields is the largest unit within the Mercury Cluster assessment area. This unit comprises current cultivated fields that are planted with maize crops while the other sections comprise old, cultivated fields that have been left fallow. As a result, these areas are in an early secondary successional phase dominated by a large number of pioneer weedy species that covers approximately 90% of the assessment area. There are no natural vegetation left on the Hormah PV site and no indigenous vegetation will be removed. These areas have been transformed due to cultivation and as a result this vegetation unit has a low conservation value and ecosystem functioning.

Ecosystem classification

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 entire Hormah PV site is listed as 'degraded' (grey in the map below). Also refer to Appendix B for a copy of this map.

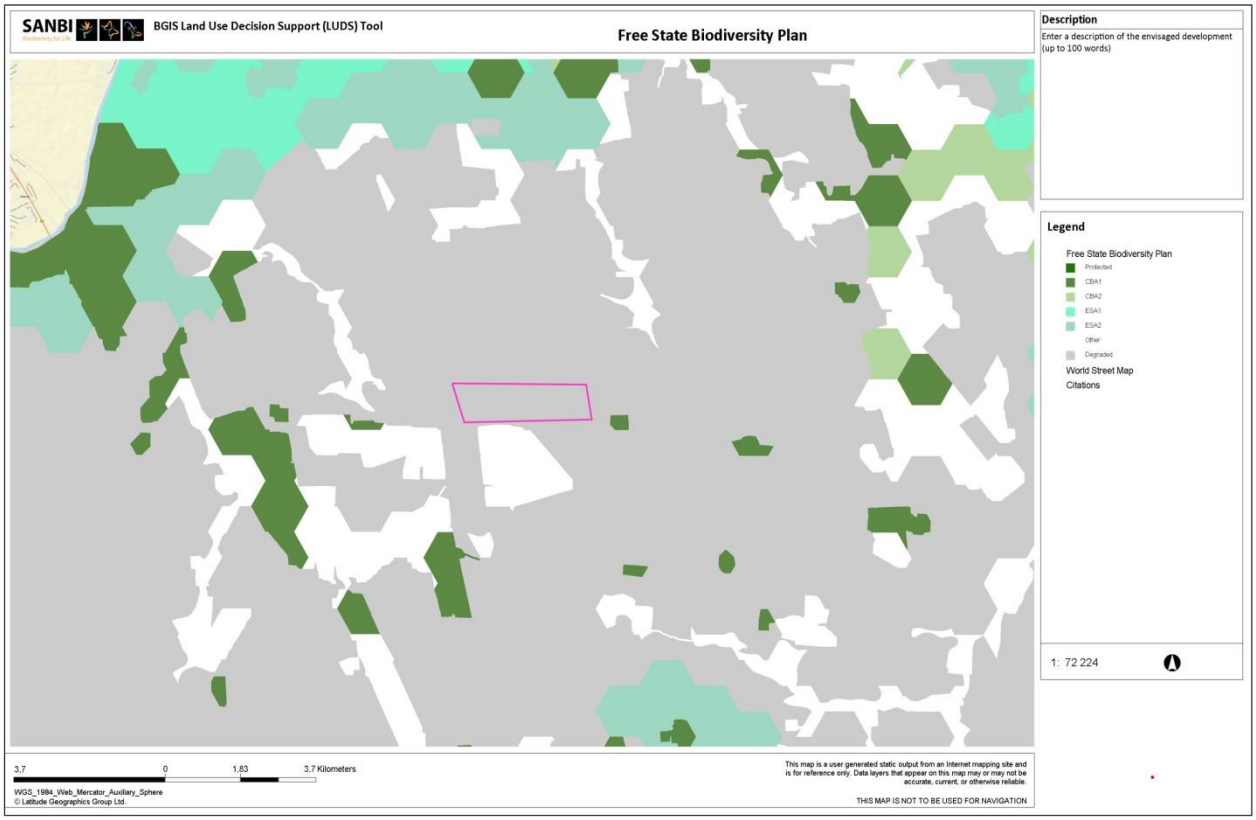


Figure 9: CBAs and ESAs – Hormah solar PV facility

Connectivity

Ecological connectivity is not applicable to the Hormah PV site.

Red data species

There are no red data species on the Hormah PV site.

Alien plant species

Cirsium vulgare (Savi) Ten was identified within Vegetation Unit 4.

Site Ecological Importance

The Hormah PV site has a Very Low ecological importance.

FAUNA

The faunal survey focused on the current status of threatened animal species occurring, or likely to occur within the proposed Mercury 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 assessment area 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 (*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 are 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.

There is no suitable breeding habitat for the threatened Giant Bullfrog in the wider area or on the Hormah PV site.

Reptiles

Human presence (livestock grazing, pathways, roads) coupled with extensive habitat destruction and disturbances caused alterations to the original reptilian fauna. Geckos, skinks and snakes are expected to occur within the area.

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. Small mammal species such as duiker, mongoose, hare, rodent and squirrels will occur within the assessment area.

Some areas within the macro area however offer marginally suitable habitat for some threatened species but this habitat is not present on the Hormah PV site.

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

The Hormah PV site is completely transformed with no natural vegetation resembling the original vegetation present in the area and as a result has a **low ecological sensitivity**.

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 F. A summary thereof follows below.

Aquatic Habitats and Biota within the Mercury Solar PV Cluster assessment area

The freshwater features in the wider study area consist primarily of a small unnamed, non-perennial tributary of the Vaal River in the north and several seep and depression wetland areas. The watercourses and wetland areas are relatively disturbed and are in general surrounded by agricultural 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.

There is no aquatic habitat on the Hormah PV site.

Aquatic Biodiversity Sensitivity and Conservation Importance

The DFFE Screening Tool (downloaded in May 2022) identified the site as having a low aquatic sensitivity and this was confirmed during the site investigations. There are no aquatic features on the Hormah site.

Aquatic Ecological Integrity

The wetland areas within the wider study area can be classified as Dry Highveld Grassland pans. There are no watercourses / wetlands on the Hormah PV site but wetlands are present to the south-east of and further to the north of the site.

Wetland integrity

There is no aquatic habitat on the Hormah PV site.

Wetland Ecological Importance and Sensitivity and Ecosystem Services

There is no aquatic habitat on the Hormah PV site.

Recommended Ecological Condition of Aquatic Ecosystems

There is no aquatic habitat on the Hormah PV site.

Aquatic Sensitivity Map

There are wetlands that need to be protected on the adjacent proposed Ratpan PV site. Please note that the delineated buffers fall outside of the borders of the Hormah PV facility and will not be impacted by this development. The buffer is 100m wide and the edge of the buffer is approximately 140m from the border of the Hormah PV site – there is also a tarred road (the R76) between the wetland, its buffers and the closest border of the Hormah PV site. The Hormah solar PV facility will not impact on this wetland feature.

Figure 10: Aquatic Sensitivity Map

AQUATIC IMPACTS IDENTIFIED

There are no aquatic features on the Hormah PV site and the adjacent depression wetland will not be impacted on by the development. General impacts and mitigation measures to protect water sources in the wider area are however provided in Chapter 9 of this report.

LEGISLATIVE AND AUTHORISATION REQUIREMENTS: 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 Hormah PV site, the following applies:

- The south-eastern corner of the site is approximately 300m from the edge of a depression wetland within the adjacent Ratpan PV1 site.
- There are agricultural fields as well as a tarred road (the R76) between the Hormah site and the wetland and the impact on the wetland will be minimal/none.
- It will however be required to apply for a GA because the Hormah PV site is within 500m from a wetland, in other words it falls within the regulated area as per the NWA.

Additional water use activities that may occur would be associated with groundwater abstraction, should that need to take place or the use of conservancy tanks within the site. 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 Quaternary Catchment C24B and C70K are both limited to 45 m3/ha for the extent of the associated property.

Please note that application for a GA / WUL will only be made once Preferred Bidder status for this project has been awarded.

CONCLUSION OF THE AQUATIC IMPACT ASSESSMENT

There are no aquatic features within the borders of the Hormah PV site and there should therefore be no reason why the proposed PV facilities and their associated activities cannot be approved from an aquatic ecosystem point of view.

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 F. A summary thereof follows below.

General Baseline Environmental Description

Important Bird Areas (IBAs)

The Suikerbosrand Nature Reserve IBA SA022 is the closest IBA and is located approximately 123km 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 ±3km north of Hormah. 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 assessment area:

- Disturbed grassland
- Wetlands, drainage lines and pans (not on Hormah)
- High voltage lines
- Agriculture (crops and cultivated grazing)
- Alien trees

Southern African Bird Atlas 2

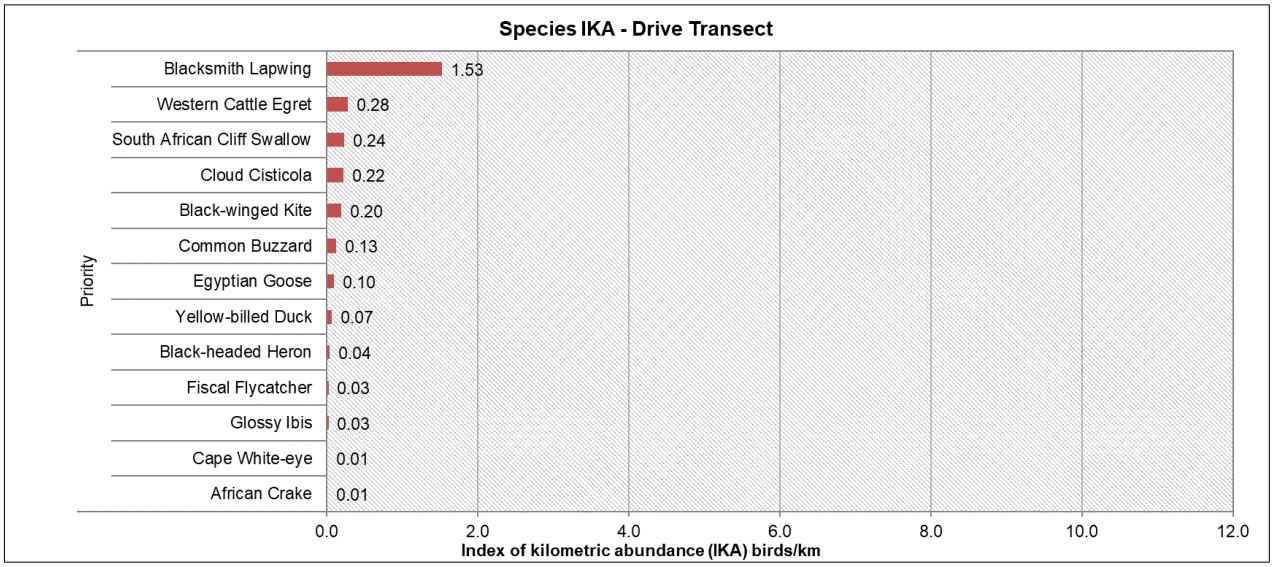
A total of 246 species could potentially occur within the broader area where the total assessment area is located. Of these, 91 are classified as priority species. Of the 91 priority species, 51 have a medium to high probability of occurring in the total assessment area. Of the 51 priority species with a medium to high probability of occurrence, 22 were recorded during site surveys. **No species of conservation concern (SCC) were recorded during site surveys**.

PRE-CONSTRUCTION SURVEYS

On-site surveys were conducted at the total assessment area from 08 – 10 January 2022 during the high (wet) season. Surveys were conducted according to a Regime 1 site (low sensitivity) as defined in the best practice guidelines for avifaunal impact studies at solar developments, compiled by Bird Life South Africa in 2017 (Jenkins *et al.* 2017). A total of 84 species were recorded, of which 13 (15%) were priority species. A total of 2 445 birds were recorded.

The abundance of priority species (Index of Kilometric Abundance i.e. birds/km = IKA) recorded during the drive and walk transects is displayed in the table below.

Table 22: The abundance of priority species recorded during transect counts



The overall abundance of priority species at the total assessment area and immediate environment was moderate, with an average of 2.9 birds/km recorded during drive transect counts. However, no species of conservation concern (SCC) were recorded during site surveys.

Figure 11: Priority species recorded during surveys within the Mercury Cluster and wider area

Identification of Environmental Sensitivities

No avifauna sensitivities, such as pans and wetlands, are present on the Hormah PV site.

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

Operational Phase

- Collisions with the solar panels

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

CONCLUSION OF AVIFAUNA IMPACT ASSESSMENT

The site and immediate environment is classified as Low to Medium sensitivity for terrestrial animals according to the Terrestrial Animal Species Theme in the DFFE Screening Tool. The medium sensitivity classification is not linked to avifauna. The site contains no confirmed habitat for species of conservation concern as defined in the DFFE Screening Tool Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020). 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 investigations.

It is recommended that the Hormah PV1 solar facility is authorised, on condition that the proposed mitigation measures 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 under Appendix F. 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.

Bat considerations

Low Bat Species Richness

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.

Low Bat Activity

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.

Limited Bat Roosting Habitat

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).

All buildings should be regarded as conservation important or sensitive for bats. The same applies to indigenous and alien tree clumps, which could support roosting of the potentially occurring Molossid or free-tailed bats.

Bat Foraging Habitats

Of the eight bat species known to occur in the area, two are clutter foragers, four are clutter-edge foragers, and two are open-air foragers. Indigenous and alien trees and tree clumps represent important foraging habitat especially for clutter and clutter-edge foraging species such as the Cape Serotine Bat (*Laephotis capensis*) and the Geoffroy's Horseshoe Bat (*Rhinolophus clivosus*). To preserve the availability of foraging habitat and prey for these bats, indigenous trees should remain undisturbed.

Considering that the 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. Note however that there are no

water resources on the Hormah site.

Important Bat Ecosystem Services

The Free State province is a major producer of South Africa's maize, sorghum, potatoes, wheat, soy beans, groundnuts, sunflowers, and wool. Insectivorous bats often feed on insects and arthropods that are considered agricultural pests or disease-carriers. Along with pest control, bats are responsible for pollination and seed dispersal in many environments. Bats, therefore, provide useful ecosystem services to areas of anthropogenic and biodiversity importance. In South Africa, several studies have focused on the economic benefit bats have in agricultural environments, highlighting the importance of these animals in areas such as Viljoenskroon and surrounds.

Bat Sensitive Areas

The Venterskroon and Rooipoort caves were rated with High sensitivity and assigned 0-20km High sensitive (no-go) buffers as these caves provide important roosting habitat for several bat species. However, the proposed assessment area does not infringe on these buffers and, therefore, is not expected to have a significant impact on the bats that utilise these caves.

Table 23: Relative sensitivity/conservation importance of different local habitat features and buffers for bats

HIGH
Each "watercourse wetland corridor" mapped by BlueScience (2022), which include the remaining uncultivated extent of onsite seasonal streams, headwater seeps, and a 100 m buffer around these, as well as associated wetland vegetation mapped as "vegetation unit 5" by EnviroGuard (2022). Bat movement and foraging will potentially be concentrated along these corridors.
Wetland "depression clusters" with or without a 100 m buffer as mapped by BlueScience (2022), as well as associated wetland vegetation mapped as "vegetation unit 2" by EnviroGuard (2022). Bat foraging will potentially be concentrated along these wetland clusters.
Water reservoirs and significant furrows with channelled water, which likely provide important sources of open drinking water for bats, and a 50 m buffer around these.
Buildings (including ruins), which may provide roosting habitat for bats, and a 50 m buffer around these
MEDIUM
Tree clumps, mapped by IWS and/or as "vegetation unit 3" by EnviroGuard (2022), which may provide roosting and foraging habitat for bats
LOW-MEDIUM
Small, scattered wetlands, disturbed by cultivation - mapped by BlueScience (2022)
Weed-dominated grassy fallow fields mapped as "vegetation unit 1," "vegetation unit 6," and "vegetation unit 7" by EnviroGuard (2022) where, relative to cultivated fields, a slightly greater diversity of plants may support a greater diversity of insect prey for bats.
LOW
Cultivated fields and other remaining disturbed areas

The entire Hormah PV site has been rated as having a **Low sensitivity** for bats with some small areas having a Medium sensitivity (tree clumps).

Figure 12: Bat sensitivity map

BAT IMPACTS IDENTIFIED

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.

CONCLUSION OF THE BAT SCREENING ASSESSMENT

The proposed 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, 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, or probably mitigated as proposed, during construction and operation of the facility, the development is 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:

BUILT ENVIRONMENT & CULTURAL LANDSCAPES

The broader cultural landscape of the Mercury Cluster assessment area was assessed for cultural heritage significance, and found to have the following elements that contribute to the cultural value of the wider area:

- Dispersed farm werfs often associated with clusters of trees (not present on the Hormah PV site)
- Remnant areas of tree plantation (not present on the Hormah PV site)
- Avenues of trees along roads, farm boundaries and access routes

Some negative impact to this sense of place is anticipated however, this impact can be mitigated as per the recommendations of the Visual Impact Assessment as well as others mentioned in the HIA. Recommended mitigation is included in the EMPr.

ARCHAEOLOGY

The project area was comprehensively surveyed for heritage resources and only one, *out of context*, artefact was found on the Hormah PV site – mitigation is not required.

Table 24: Archaeological artefacts identified

Period	Description	Co-ordinates	Grading	Mitigation
ESA-MSA	Isolated artefact, a hammerstone, out of context	27.03037 26.79516	NCW	No mitigation required

PALAEONTOLOGY

It is extremely unlikely that any fossils would be preserved in the overlying deep soils and sands of the Quaternary. If fossils are found by the contractor, environmental officer, or other responsible person once construction has commenced the Chance Fossil Finds procedure as provided in the EMPr should be followed.

The impact on the palaeontological heritage is extremely low and specific mitigation is not proposed. The Chance Fossil Finds procedure is however included in the EMPr.

HERITAGE IMPACTS IDENTIFIED

It is possible that cultural landscape-, archaeological and palaeontological resources may be impacted by the proposed development and standard mitigation measures are provided in Chapter 9 of this report.

CONCLUSION OF HERITAGE IMPACT ASSESSMENT

No heritage, archaeological or palaeontological findings that require specific mitigation was identified and the project should, from a heritage perspective, proceed.

6.5 Social Environment

6.5.1 Social Impact Assessment

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

ASSESSMENT OF POLICY AND PLANNING 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 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.

TOURISM

The Vaal River is the only major tourism anchor in the local area, with a number of resorts located along its banks with the nearest facility being ±11km to the north of the Mercury Cluster. The Wilde Voël Private Nature area is located ±8km to the north of the site. Other accommodation facilities in the broader area cater mainly to essential travel. No significant scenic resources are located in the study area. This is linked to the predominance of transformed landscapes (mining, seasonal monoculture cropping) and the relatively flat landscape (limited sight distances).

SOCIAL RECEPTORS

Potentially sensitive social receptors in significant proximity to the Mercury Cluster are limited. This is linked to the sparse settlement pattern in general, and the absence of dwellings on most properties in the close vicinity of the proposed PV sites. The land uses to the north 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.

CREATION OF LOCAL EMPLOYMENT, TRAINING, AND BUSINESS OPPORTUNITIES

On average, the construction phase for a ±100MW PV facility is expected to extend over a period of ±18 months and create approximately 250-300 employment opportunities, depending on the final design. Of this total ±60% will be available to low-skilled workers (construction labourers, security staff etc.), 25% to semi-skilled workers (drivers, equipment operators etc.) and 15% to skilled personnel (engineers, land surveyors, project managers etc.). 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.

The majority of the employment opportunities, specifically the low and semi-skilled opportunities, are likely to be available to local residents in the area, specifically residents from Klerksdorp and Orkney. 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. However, in the absence of specific commitments from the developer to employ local contractors the potential for meaningful skills to local employment targets the benefits for members from the local communities may be limited. In addition, the low education and skills levels in the area may also hamper potential opportunities for local communities.

The potential benefits for local communities are confirmed by the findings of the Overview of the IPPPP undertaken by the Department of Energy, National Treasury and DBSA (June 2020). The review found that by the end of June 2020 the construction phase of the 68 renewable energy projects that had been successfully completed had created 33 449 job years[1] of employment, compared to the anticipated 23 619. This was 42% more than planned.

In terms of benefits for local communities, significantly more people from local communities were employed during construction than initially planned. For active projects, the expectation for local community participation was 13 284 job years. To date 22 935 job years have been realised (i.e. 73% more than initially planned), with 23 projects still in, or entering, construction. The number of black SA citizens employed during construction also exceeded the planned numbers by 53%.

Black South African citizens, youths and rural or local communities have been the major beneficiaries during the construction phases, as they respectively represent 81%, 43% and 49% of total job opportunities created by IPPs to date. However, woman and disabled people could still be significantly empowered as they represent a mere 10% and 0.4% of total jobs created to date, respectively. Nonetheless, the fact that the REIPPPP has raised employment opportunities for black South African citizens and local communities beyond planned targets indicates the importance of the programme to employment equity and the drive towards more equal societies.

The capital expenditure associated with the construction phase for a single solar PV facility would be in the region of R2 billion (2022 Rand value). The total number of employment opportunities associated with the Hormah PV facility would be ±270 with a total wage bill of R30 million.

ESTABLISHMENT OF A COMMUNITY TRUST

An important focus of the REIPPPP is to ensure that the build programme secures sustainable value for the country and enables local communities to benefit directly from the investments attracted into the area. In this regard IPPs are required to contribute a percentage of projected revenues accrued over the 20+ year project operational life toward Socio-economic Development (SED) initiatives. These contributions are linked to Community Trusts and accrue over the 20+ year project

[1] The equivalent of a full-time employment opportunity for one person for one year

operation life and are used to invest in housing and infrastructure as well as healthcare, education, and skills development.

Community Trusts provide an opportunity to generate a steady revenue stream that is guaranteed for a 20+ year period. This revenue can be used to fund development initiatives in the area and support the local community. The long-term duration of the revenue stream also allows local municipalities and communities to undertake long term planning for the area. The revenue from the proposed PV facility can be used to support a number of social and economic initiatives in the area, including:

- Creation of jobs
- Education
- Support for and provision of basic services
- School feeding schemes
- Training and skills development
- Support for SMMEs

SED opportunities will be created by the construction of the proposed PV facility.

Socio-Economic Development contributions

The SED contributions associated with the 68 IPPs has to date amounted to R1.2 billion, with a total contribution of R23.1 billion (across seven bid windows) committed to SED initiatives. Assuming an even, annual revenue spread, the average contribution per year would be R1.2 billion. Of the total commitment, R18.8 billion is specifically allocated for local communities where the IPPs operate. With every new IPP on the grid, revenues and the respective SED contributions will increase.

Enterprise development contributions

The target for IPPs to spend on enterprise development is 0.6% of revenues over the 20+ year project operational life. Enterprise development contributions committed for BW1 to BW4, 1S2 and 2S2 amount to R7.2 billion. Of the total commitment, R5.6 billion is specifically committed directly within the local communities where the IPPs operate, contributing significantly to local enterprise development. Up until the end of June 2020 a total of R384.2 million had already been made to the local communities located in the vicinity of the 68 operating IPPs.

The case for renewable energy is enhanced by the positive effect on rural or regional development. Renewable energy projects located in rural areas create an opportunity to benefit the local and regional economy through the creation of jobs and tax revenues. Renewable energy sites can be highly suited to rural locations with otherwise poor potential to attract local inward investment thus able to target particularly vulnerable areas.

It is clear that the establishment of Community Trusts associated with renewable energy projects create significant benefits for local rural communities. However, Community Trusts can also be mismanaged. This is an issue that will need to be addressed when setting up the Trust.

IMPACTS IDENTIFIED DURING THE SOCIAL IMPACT ASSESSMENT

CONSTRUCTION PHASE IMPACTS

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.

OPERATIONAL PHASE IMPACTS

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.

CONCLUSION OF THE SOCIAL IMPACT ASSESSMENT

The findings of the SIA indicate that the development of the Hormah PV facility will create employment and business opportunities for locals during both the construction and operational phase of the project. The enhancement measures listed in the report should be implemented in order to maximise the potential benefits. All of the potential negative impacts can be effectively mitigated.

The establishment of a Community Trust will also benefit the local community in the area. The significance of this impact is rated as High Positive.

The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the negative environmental and socio-economic impacts associated with 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 REIPPPP has resulted in significant socio-economic benefits, both at a national and 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 establishment of the Hormah soar PV facility is therefore supported by the findings of the SIA. The mitigation and enhancement measures listed should be implemented in order to avoid and or minimise the potential negative impacts and maximise the potential benefits associated with the proposed development.

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.

The site investigation flagged landscape features and receptors that should be taken into consideration during the early stages of the development. The following landscape value issues were flagged:

- Wetland features within the surrounding area.
- Partially degraded rural agricultural landscapes due to proximity to large Eskom substations, multiple power lines as well as mining landscapes (mainly in the northern part of the Mercury Solar PV Cluster).
- Rural agrarian landscapes with Medium Scenic Quality where not exposed to the landscape-detracting visual elements related to mining and substations.

LANDSCAPE POLICY FIT

Policy fit refers to the degree to which the proposed landscape modifications align with international, national, provincial and local planning and policy. In terms of international best practice, the proposed landscape modification would not trigger any best practice guidelines as there are no significant cultural/ landscape resources on the site or immediate surrounds.

In terms of the local planning, there is a clear emphasis in support of renewable energy that aligns with the project planning. There is also a focus on tourism and growth of tourist related resources. As there are no significant landscape resources being utilised for tourism within the project zone of visual influence, the expected visual/ landscape policy fit of the landscape change is rated Medium

to High (positive).

LANDSCAPE THEMES

The following landscape themes were identified within the project vicinity:

- Eskom Mercury Substation (close to the northern section of the Mercury Cluster) and multiple power lines.
- A low hill to the east but essentially flat or moderately undulating terrain.
- Vaal River landscape resources.
- Mining landscapes to the northwest.
- Agrarian maize land uses with associated cultural landscape heritage.

TOURISM

The nearest nature conservation area is the Mispah Game Farm, approximately 3km north of Hormah. The Bushybend Private Nature Reserve (PNR) is approximately 17km north-northeast from Hormah. The Mahemsvlei Private Nature Reserve is located 12km to the southeast, with partial visual incidence to the project viewshed. The vlei area on the adjacent proposed Ratpan PV site, that constitutes the actual landscape resource, is not located within the project viewshed. However, the distance and higher VAC levels of the rural agricultural landscape on relatively flat terrain, essentially exclude this nature related landscape from the project ZVI.

ZONE OF VISUAL INFLUENCE

The visible extent, or viewshed, is "the outer boundary defining a view catchment area, usually along crests and ridgelines". No significant landform features were identified on the site. As the proposed development area are located on a regionally elevated area (without ridgeline prominence), the viewshed extends over a wide area.

There are no significant roads within the project Zone of Visual Influence (ZVI) with R76 the main road between the small towns of Vijoenskraal and Orkney. The Eskom Mercury Substation is immediately adjacent to the project area to the north and as a result numerous power line corridors are routed through the landscape.

RECEPTORS AND KEY OBSERVATION POINTS

Key Observation Points (KOPs) are the people (receptors) located in strategic locations surrounding the property that make consistent use of the views associated with the site where the landscape modifications are proposed. A number of potentially sensitive receptors are located within the high frequency viewshed and within 6km of the site, notably: a short stretch of the R76 Highway; two gravel district roads and a single residential farmstead.

Refer to the map below for receptors that have been identified as KOPs which should be used as locations to assess the suitability of the landscape change.

ABSORPTION CAPACITY

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.

PHYSIOGRAPHIC RATING UNITS

The Physiographic Rating Units are the areas within the proposed development area that reflect specific physical and graphic elements that define a particular landscape character. These unique landscapes are rated to assess the scenic quality and receptor sensitivity to landscape change, which is then used to define a Visual Resource Management Class for each of the site's unique landscape/s. The exception is Class I, which is determined based on national and international policy / best practice and landscape significance and as such are not rated for scenic quality and receptor sensitivity to landscape change. The Hormah PV site is rated as Class III

SCENIC QUALITY ASSESSMENT

The scenic quality of the proposed development site is rated Medium to High as landform includes interesting undulations but not visually dominating scenic elements. Landscape Scarcity is rated Low for the entire area as, even though it is interesting within its setting, it is common within the region. Adjacent landscape is rated Medium for the areas with clearer views of the northern mining landscapes, while the rural agrarian landscape does have value. Cultural modification is indicated as neutral as the existing manmade modifications in the landscape neither add nor detract from the visual harmony. The agrarian cultural landscape does have value and mitigation would be required to retain this sense of place.

The scenic quality of the proposed development site is rated Medium to Low

- Landform is rated medium to low for the category that includes 'Sensitivity buffers and local topographic areas and steep slopes', and low for the undulating grasslands and cultivated lands which have few or no interesting features.
- Vegetation for the entire area is rated as low-medium as it occupies mainly highly transformed grasslands which are either under cultivation or heavily degraded by grazing.
- Scenic Quality for water is rated Medium across the entire area as there are a number of drainage lines and associated wetland features, although these do not dominate the landscape as there is no large open water features.
- Colour in the landscape is mainly provided by the patchwork of cultivated lands, natural vegetation, and is rated medium for the whole area - although there is some variety, colour is not a dominant scenic element.
- Landscape Scarcity is rated low for the entire area as, even though it is interesting within its setting, it is common within the region.
- Adjacent landscape is rated Medium to Low for the whole area as while the rural agrarian landscape does have value, the proximity to the substation and mining landscapes does

degrade the overall scenic quality.

- Cultural modification is indicated as neutral as the existing manmade modifications in the landscape neither add nor detract from the visual harmony.

Receptor Sensitivity Assessment

Receptor sensitivity to landscape changes is rated Medium for the sensitivity buffers and local topographic areas, and Low for the undulating grasslands and cultivated lands.

- Initial assessment anticipates a moderate concern for the sensitive buffers and topographically prominent areas and a low level of concern for the undulating grasslands /cultivated lands.
- As the area is predominantly rural agricultural in nature, maintenance of the visual quality is rated medium for the sensitive buffers and low for the grasslands and cultivated lands.
- There is likely to be a low level of concern from most of the public users for maintaining the visual quality. The maintenance of visual quality to sustain adjacent land use objectives is moderate, as the area is located within an agricultural land use and also in close proximity to mining landscapes.
- The area also falls within a REDZ area, and there are no tourist related activities making use of the landscape resources.
- The Vaal River receptors are in background distance zones and valley located with no clear views to the proposed development site.

VISUAL RESOURCE MANAGEMENT (VRM) CLASSES

Four classes that represent the relative value of the visual resources of an area are as follows:

- **Classes I and II** are the most valued
- **Class III** represent a moderate value
- **Class IV** is of least value

Class I

Class I is assigned when legislation restricts development in certain areas. The visual objective is to preserve the existing character of the landscape, the level of change to the characteristic landscape should be very low and must not attract attention.

Class II

The Class II objective is to retain the existing character of the landscape and the level of change to the characteristic landscape should be low. The proposed development may be seen but should not attract the attention of the casual observer, and should repeat the basic elements of form, line, colour and texture found in the predominant natural features of the characteristic landscape. The following Class II resources were identified

- Farm road buffer (50m)
- R76 District Road buffer (100m)

The recommendation is that these areas are excluded from development to reduce visual intrusion and allow for partial retention of the rural agricultural sense of place of these rural agricultural

routes.

Class III

The Class III objective is to partially retain the existing character of the landscape, where the level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer, and changes should repeat the basic elements found in the predominant natural features of the characteristic landscape. The following landscape was defined as having Class III Visual Objectives where development would be most suitable:

- Undulating grasslands / cultivated lands

With Medium Scenic Quality ratings and Low Receptor Sensitivity likely, the resulting Visual Inventory rating is Class IV. However, as this is not an industrial type location, and where the surrounding rural agricultural landscape has landscape value, the Class IV was assigned as Visual Resource Management Class III. This change is also motivated based on the need to retain rural landscape integrity, but also recognising that these areas are within the Klerksdorp REDZ where renewable energy projects are promoted.

Class IV

As the area is zoned agricultural and located adjacent to an area that does have scenic value and could carry tourist receptors in the area region, no Class IV areas were defined.

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:

- Power lines are scattered throughout the area due to the close vicinity of the Mercury MTS to the north of the Hormah PV site (±5km north of the site).

- 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.

While landscape resources are not significant such that a fatal flaw is proposed, risks to landscape integrity of a rural agrarian 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 narrow farm roads. The overall significance of the visual change of the landscape is rated as being Low.

6.6 Agricultural Agro-Ecosystem Specialist Assessment

An Agricultural Agro-Ecosystem Specialist Assessment, dated May 2022) was undertaken by Johann Lanz and is attached under Appendix F. A summary thereof follows below.

The purpose of an Agricultural Assessment is to ensure that South Africa balances the need for development against the need to ensure the conservation of the natural agricultural resources, including land, required for agricultural production and national food security.

An agricultural impact is a change to the future production potential of land. Whether a development should receive agricultural approval or not should be evaluated by asking the question: Does the extent of the loss of future agricultural production potential that will result from this development, justify keeping the land solely for agricultural production and therefore not approving the development?

South Africa needs agricultural production for food security. It also urgently needs renewable energy development. In order to achieve its renewable energy generation goals, agriculturally zoned land will inevitably need to be used for renewable energy generation.

The ideal, win-win scenario for both agricultural production and for electricity generation in South Africa is for renewable energy facilities to be integrated with agricultural production in a way that provides benefits to agriculture and leads to very little loss of future agricultural production potential. In this scenario, renewable energy development does not pose a threat to agricultural production or to the agricultural economy of rural areas.

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 groundtruth and assess these ratings and to put the proposed development proposal in context with the importance of conservation of agricultural resources.

The development proposal was subsequently downscaled to five solar PV facilities (the Mercury Solar PV Cluster as shown in Chapter 1 of this report) in order to exclude high potential land from development.

CROP PRODUCTION ON THE HORMAH PV SITE

The farm was last cropped more than 17 years ago. It was abandoned as cropland because it was found to be too marginal for viable crop production. If it had not been too marginal it would have continued to be successfully cropped like the other hundreds of hectares that are still cropped in the surrounding area by the family enterprise that own this land and many more farms in the area. The investigation of auger samples indicated that the soils are limited by poor drainage, low water and nutrient holding capacity in the upper soil horizons and depth limitations due to cemented hardpans in the subsoil. Soils are of the Longlands and Wasbank soil forms.

LAND USE

The site is located in a grain farming agricultural region, but the soils vary in their suitability for crop production. Crops in the area include maize, sunflowers and soya beans. Farmers generally utilise all suitable soil as cropland. Only soil that is not suitable for crop production is used for grazing, as is the case of the Hormah land.

AGRICULTURAL POTENTIAL AND PRODUCTIVITY

The cropping potential of the proposed site is limited by the combination of a somewhat marginal climate (annual rainfall of 496 to 520 mm per annum) and soils with poor drainage, limited depth, and limited water and nutrient holding capacity. Crop production on these soils is therefore high risk and no longer considered economically viable. The long-term grazing capacity of the farm is high at 7 hectares per large stock unit.

LONG TERM PROJECT BENEFITS VERSUS AGRICULTURAL BENEFITS

The proposed PV facility will generate a greater per hectare income for the farming enterprise than the existing agricultural production will earn. It will also generate additional income and employment in the local economy. In addition, it will contribute to the country's urgent need for energy generation, particularly renewable energy that has lower environmental and agricultural impact, on a national scale, than existing, coal powered energy generation.

ALLOWABLE DEVELOPMENT LIMITS

The agricultural protocol requires confirmation of whether the development footprint is in line with the allowable development limits or not, and requires motivation to support any deviation from the limits.

Table 25: Allowable development limits for renewable energy facilities on agricultural land

Allowable footprint category	Agricultural sensitivity on screening tool	Allowable footprint (ha/MW)	Definition of category
1	Very high	0.00	Land capability of 11-15; or irrigated land; or dryland horticulture or viticulture
2	High	0.20	Land capability of 8-10 on existing fields

3	High	0.25	Land capability of 6-7 on existing fields
4	High	0.30	Land capability of 1-5 on existing fields
5	High	0.35	Land capability of 9-10 outside of existing fields
	Medium		Land capability of 8 outside of existing fields
6	Medium	2.50	Land capability of 6-7 outside of existing fields
	Low		Land capability of 1-5 outside of existing fields

The entire Hormah development is on land that is not cropped and that has been shown to be unsuitable for crop production and therefore not deserving of a land capability of more than 7. The allowable development limit on such land is 2.5ha per MW. The capacity of the facility is 120MW and the agricultural footprint is 181 hectares. It can therefore be confirmed that the agricultural footprint of this development is within the allowable limit.

THE 10% RULE

The so-called 10% rule that has been used by DALRRD is not considered to be useful or constructive for assessing the agricultural approval of this project. The rule is likely to simply hinder solar energy development without serving any benefit to agriculture.

In order to limit the potential threat that solar energy development in rural areas could pose to agricultural production and to the agricultural economy of those rural areas, DALRRD created the so-called 10% rule to inform the decision of whether a solar energy development on agricultural land should be approved or not. This rule states that a solar energy facility may not utilise more than 10% of the surface area of a farm. Its aim was to ensure that each farm unit remained predominantly agricultural rather than certain farms abandoning agricultural production in favour of renewable energy generation.

The rule was established when solar energy development was new and unknown. However, it is now evident that solar energy development is less of a threat to agricultural production and the agricultural economy than it was initially feared that it might be. Solar energy development has demonstrated benefits for agriculture and has potential to be integrated into the rural agricultural economy. It is a source of much needed income injections into rural areas. The 10% rule is now considered unnecessary and impractical. It is likely to simply hinder solar energy development without serving any benefit to agriculture. It is far more constructive and effective to focus on integrating renewable energy with agricultural production in a way that provides benefits to agriculture and focuses on minimising loss of future agricultural production potential. This can be done by using only the production potential of land as the deciding factor for solar energy approval.

The problem with the 10% rule and only utilising up to 10% of each farm is that it forces solar facilities to be spread across the landscape in a way that is impractical and financially non-viable and creates a much larger environmental footprint in the landscape. Furthermore it does not actually make any difference to the loss of agricultural production potential or to the impact on the

agricultural economy of the area.

It is important to recognise that there is no real need to limit the amount of land occupied by solar energy facilities. Solar energy will never occupy more than a tiny proportion of the land. The total extent of South Africa's intended solar development for the foreseeable future was calculated to only occupy 0.4% of the surface area of the 8 original renewable energy development zones (REDZ) (DEA, 2015). This was if all the country's solar development was located only in those 8 REDZ, which it is not. An additional REDZ have been proclaimed since then and much of the country's solar development is occurring outside the REDZ. This means that for the foreseeable future, solar energy will only ever occupy much less than 0.4% of land in an area. If it will only ever occupy such a small proportion of the land, it cannot replace agriculture in the rural economy and it serves no purpose to limit solar facilities to 10% of each farm. From an agricultural production and food security point of view there is only a need to preserve scarce arable land for crop production and therefore to limit solar development to land that is of insufficient land capability to support viable crop production.

Early solar development in the country was located predominantly in arid, low potential agricultural environments with large farm sizes, such as the Northern Cape. In such environments the 10% rule is achievable, even if not desirable. However, because solar development has now used up the available grid capacity in the Northern Cape, it needs to move to more intensively farmed areas in the North West, Free State and Mpumulanga provinces. Farms are much smaller in these areas and 10% of a farm is often an unfeasibly small area for solar development. In such agricultural environments, some soils are suitable for crop production and others are not. The important thing in these environments is that land that has potential for viable crop production is not sacrificed for solar development. The focus in terms of locating solar facilities should be to avoid land that has potential for viable crop production, and thereby minimise the loss of agricultural production potential. As long as that is done, it does not matter what percentage of an individual farm is used. The 10% rule is unnecessary. Solar energy development is integrated with agricultural production, it will not replace agriculture from the land and therefore does not pose a threat to agricultural production or to the agricultural economy of rural areas.

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

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 development has limited agricultural production potential. 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 amount of agricultural land loss for the Hormah PV development is within the allowable development limits prescribed by the agricultural protocol. These limits reflect the national need to conserve valuable agricultural land and therefore to steer, particularly renewable energy developments, onto land with lower agricultural production potential.
- The proposed development offers positive impact on agriculture by way of improved financial security for farming operations, as well as security benefits against stock theft and other crime.
- The PV panels will not totally exclude agricultural production. The area can still be used to graze sheep that will, in addition, be protected against stock theft within the security area of the facility.
- The loss of agricultural potential by occupation of land is not permanent. The land will become fully available again for agricultural production once the proposed activity ceases.
- The proposed development poses a low risk in terms of causing soil degradation, which can be adequately and fairly easily managed by standard, best practice mitigation management actions.
- The proposed development is 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 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. In addition, it will contribute to the country's urgent need for energy generation, particularly renewable energy that has lower environmental and agricultural impact, on a national scale, than existing, coal powered energy generation.

Because of the above factors, 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 as proposed be approved.

6.7 Environmental Sensitivity Maps

Refer to the *Environmental Sensitivity Map* and the *Critical Biodiversity Areas Map* on the following pages (also attached under Appendix B).

6.7.1 Environmental sensitivities based on specialist studies

No environmental sensitivities that can be seen as a constraint (such as wetlands and botanical sensitive areas) have been identified on the Hormah PV site. However, a buffer along the access roads is being proposed and will be implemented to protect the visual resources of the area:

- A buffer of 25m to the north of the R76
- A buffer of 30m (15m on both sides of the existing internal roads)

These buffers are reflected in the Project Components Layout Map (attached under Appendix A)

6.7.2 CBAs and ESAs

The entire Mercury Solar PV Cluster, Hormah PV site as well as the surrounding area is identified as being "Degraded" (red areas). This map is also attached under Appendix B.

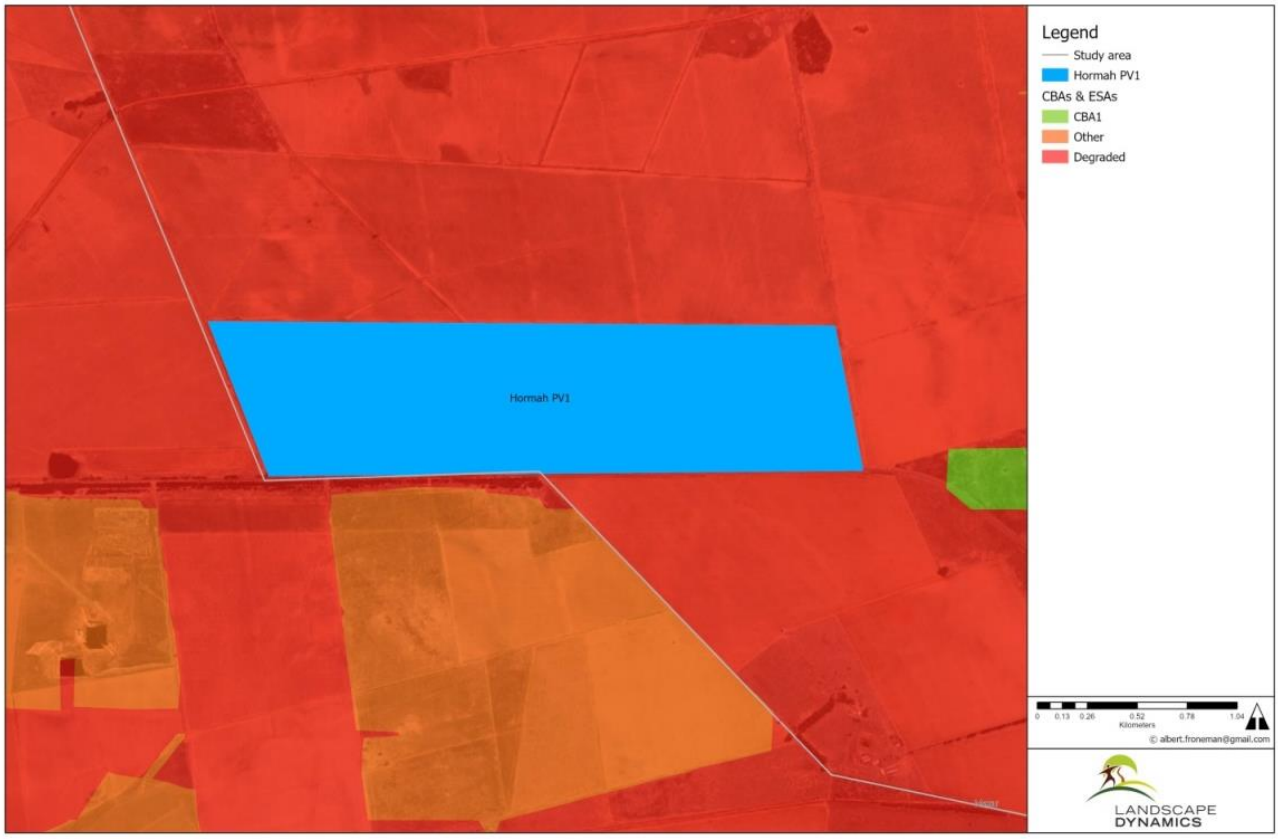
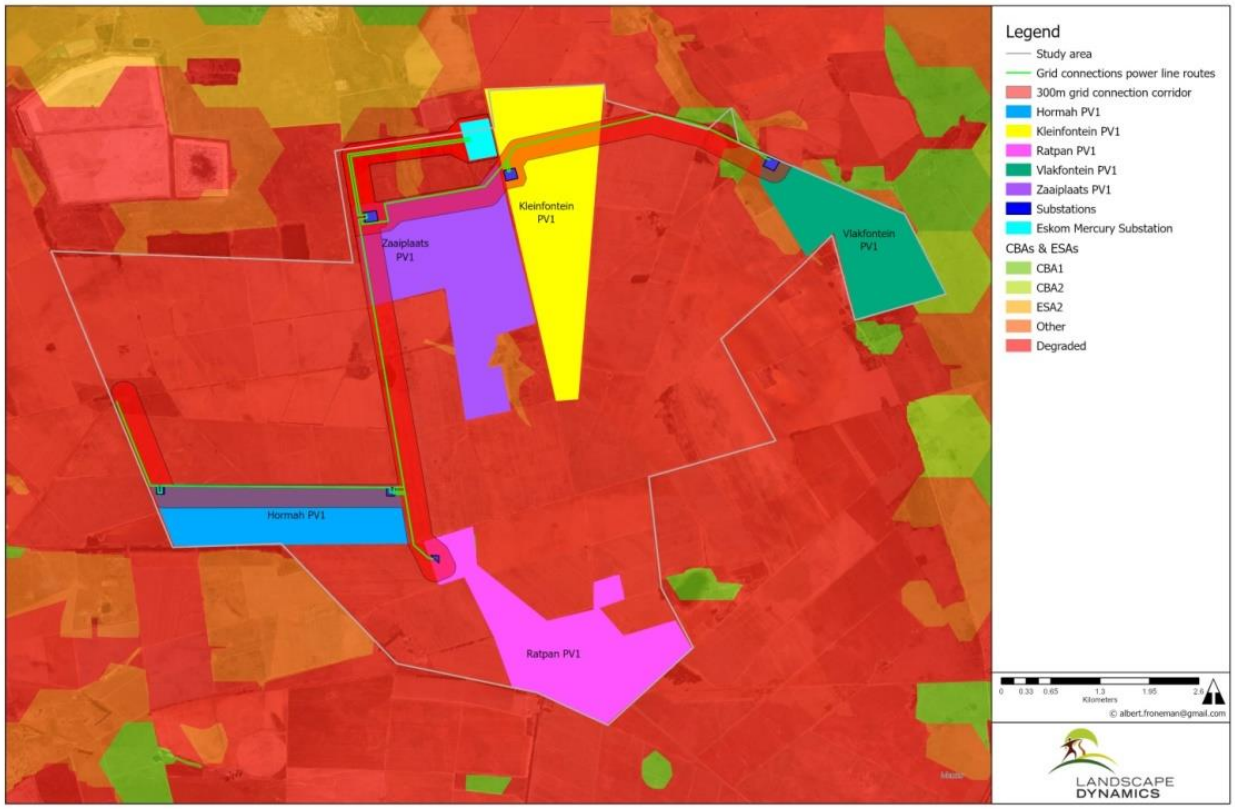


Figure 13: Critical Biodiversity Areas and Ecological Support Areas

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



CHAPTER 7: ENGINEERING 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 short 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 focusses 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 and 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).

BUFFER ZONES

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

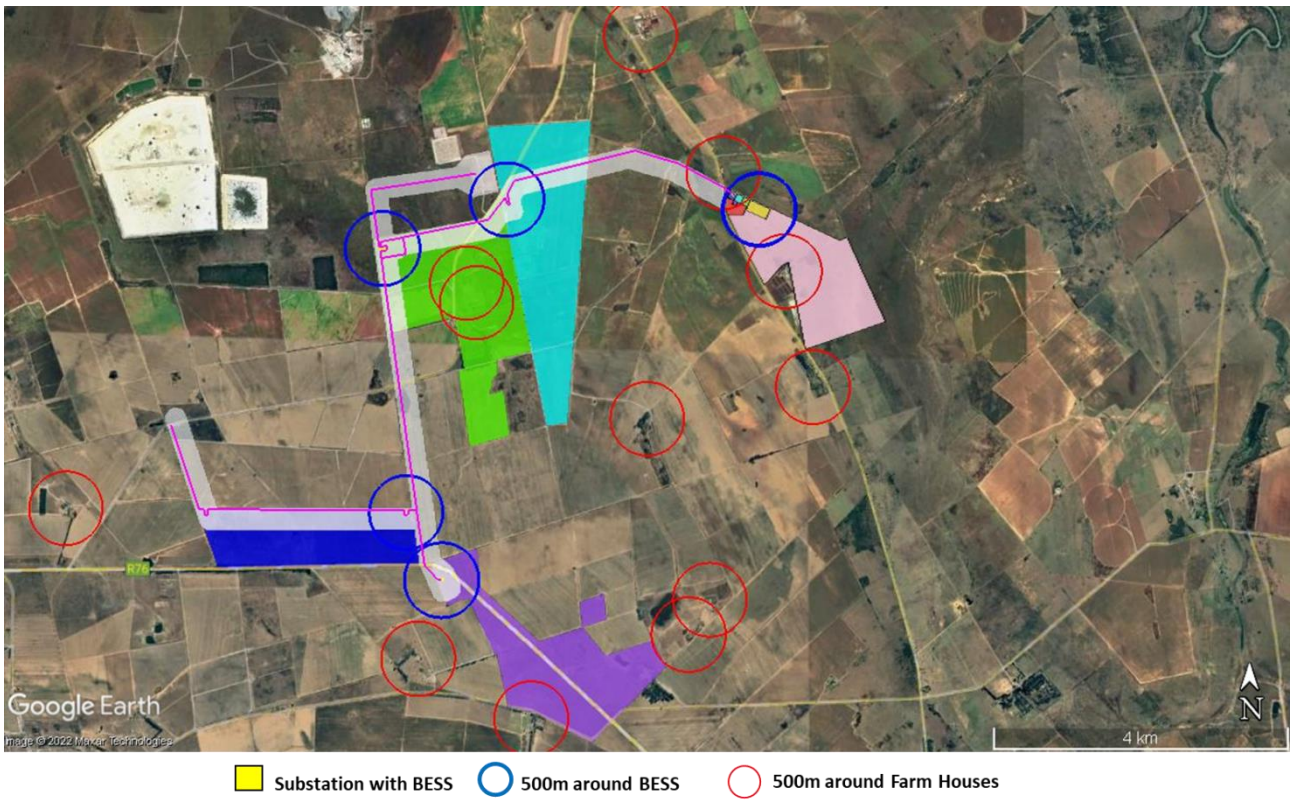
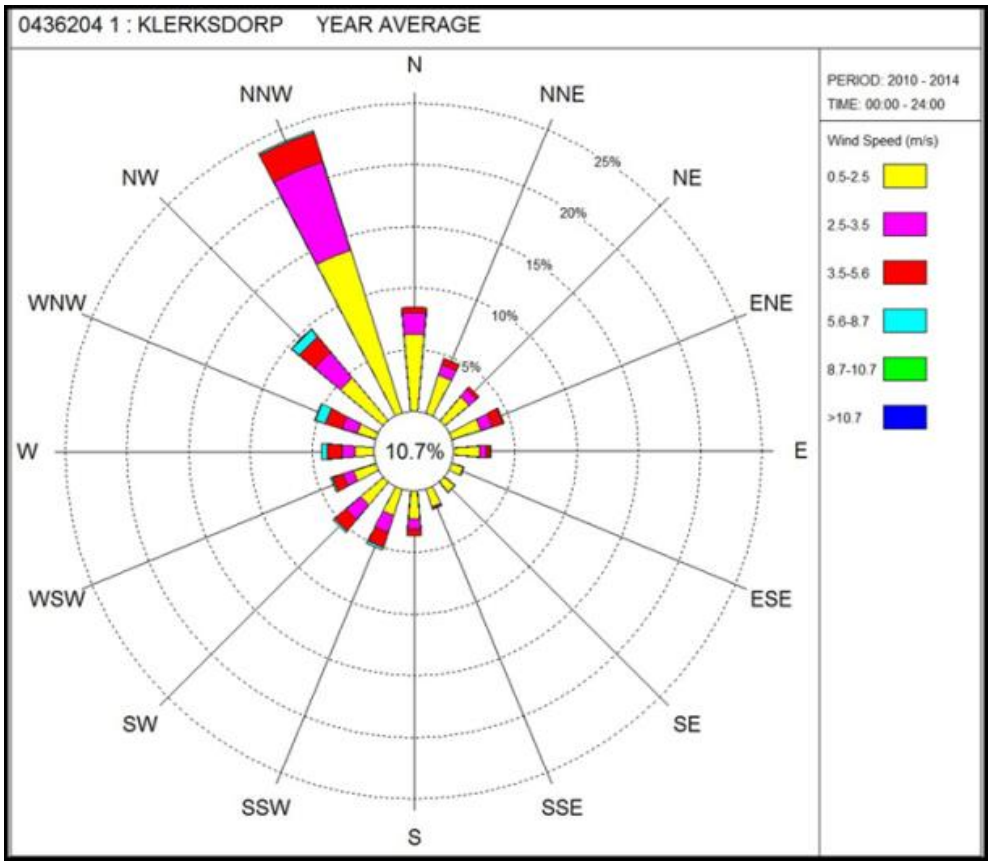


Figure 14: 500m circles around farmsteads in relation to the location of the substation / centralised BESS

DOMINANT WIND DIRECTION



The dominant wind direction blows from the northwest, north-northwest and north across the assessment area towards the farmlands to the south and southeast. Winds seldom blow from the east, south or west.

Figure 15: Wind rose indicating the general wind conditions for the area

PLANT AND PROCESSES

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)).

In addition there are two electrical coupling options:

- DC coupling where the battery units are distributed throughout the PV field and/or
- AC coupled where the BESS containers are centralized into one area.

This study focuses 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 (differences with sodium-sulphur will be highlighted were necessary).

PROPOSED DESIGN SOLID STATE BATTERIES

A Solid-State Battery system consists of multiple battery cells that are assembled together to form modules. Each cell contains a positive electrode, a negative electrode and an electrolyte. The BESS will comprise of multiple battery units or modules housed in shipping containers and/or an applicable housing structure which is delivered pre-assembled to the project site. Containers are usually raised slightly off the ground and laid out in rows. They can be stacked if required although this may increase the risk of events in one container spreading to another container.

Supplementary infrastructure and equipment may include substations, power cables, transformers, power converters, substation buildings & offices, HV/MV switch gear, inverters and temperature control equipment that may be positioned between the battery containers. The SS batteries that are being considered are Lithium-ion or Sodium-ion systems.

Figure 16: Images of typical centralized AC coupled BESS systems servicing solar power farms

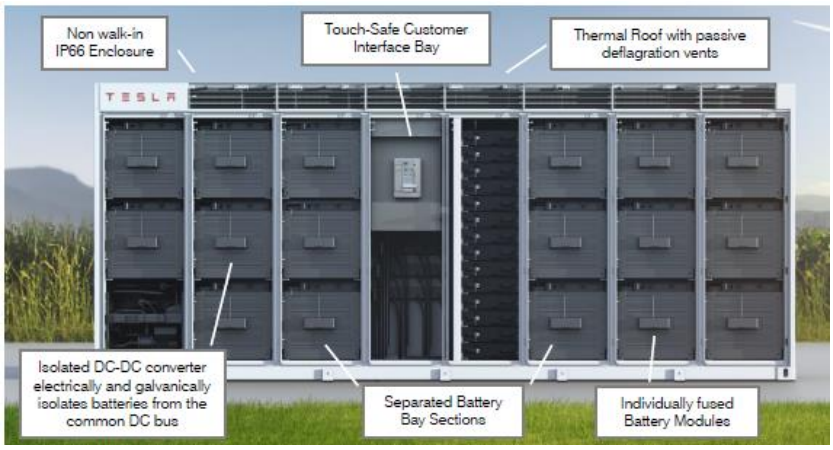


Figure 17: Typical battery modules in a BESS facility

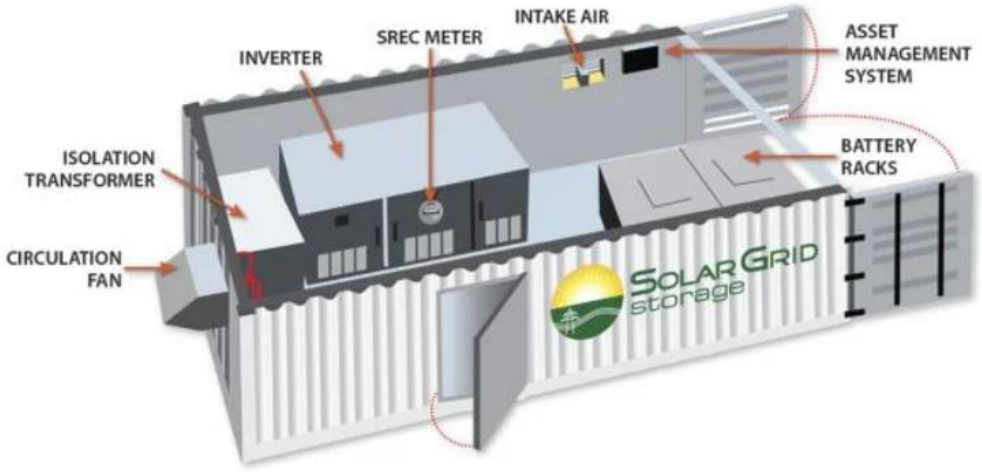


Figure 18: Typical battery modules in a BESS facility with separated sections

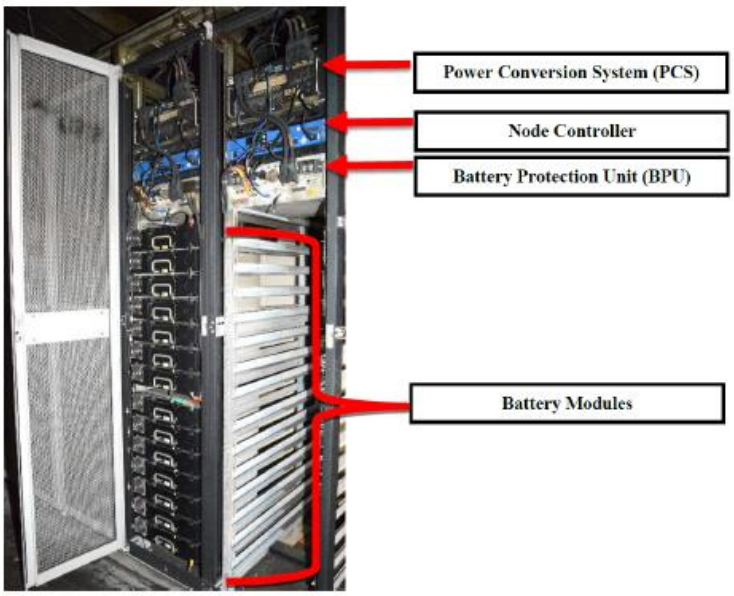


Figure 19: Typical battery modules in a BESS with the power conversion systems with the batteries

Table 26: Construction Phase: Main processes/activities and some details of likely elements

MAIN PROCESSES	DETAILS
Construction machines e.g., cranes, graders, cement trucks, diesel and oil storage	Graders to clear ground make roads, diggers for trenches foundations, cement mixers for civil works, cranes to place containers, diesel bowser for fuel for machines, oil for machines
Materials for the construction of any buildings, e.g. at the substation Equipment items for installations within the supporting infrastructure	Building materials such as bricks, cement, re-bar, I-beams, roof sheeting etc. Electrical equipment such as transformers, pylons, cabling.
Equipment items for containerized installation e.g., lithium battery containers	Battery containers Electrical equipment such as transformers, pylons, cabling.
Waste e.g., packaging materials, paint	Connections, transformers, switches etc will likely have protective coverings (Plastic, paper, cable ties etc) to remove during installation, paint waste (cans, brushes, solvents), building rubble
Construction camp	Temporary offices, accommodation, ablutions

Table 27: Operational Phase: Main processes/activities and some details of likely elements

MAIN PROCESSES	DETAILS
Chemical electrolyte and electrode materials in the battery cell	Will most likely be solid state lithium-ion batteries but could be sodium-sulphur solid state batteries.
Battery cells, modules and racks typically in shipping containers	The facilities are designed for up to 120MW and eight hours storage (960 MWh) having typically ~ 100 containers (For example, each Tesla Megapack has up to 3 megawatt hours (MWhs) of storage and 1.5 MW of inverter capacity)
Electronic equipment in container	Battery management system for monitoring of the batteries and control of the loading and unloading cycles
Electrical equipment in container or separate container	Power conversion system, connections, switches, cabling
Mechanical equipment in container(s)	Air conditioners, fans, filters, coolant
Electrical equipment outside the containers	Network interconnection equipment, switchgear, transformers
Site office and workshop	Including potable water, 220V power, kitchen, sewage, tools and parts store etc
Support services	Dirt roads, access control fences, lights inside the container and outside for general access lighting, fire suppression/fighting systems, grass cutting, communication systems
Waste	Broken parts, storm water run-off, hot air from battery and PCS cooling systems

Solid State Lithium-ion or Sodium-Ion (Sodium-Sulphur) chemical waste	Batteries, air filters, transformer oils, coolants, contaminated soil
Electronic waste	Circuit boards, HMI screens
Building rubble - non-hazardous waste	Steel, copper, cement, equipment and structures
Battery Containers	Shipping containers

HAZARD IDENTIFICATION: SOLID STATE BATTERY CHEMICAL HAZARDS

Batteries in general

The battery type being considered for this project is solid state lithium-ion or sodium-ion batteries.

Lithium-ion batteries will be used in the Mercury Cluster BESS facilities. Should sodium-based batteries be used, the hazards are likely to be similar at a high level but different in their details and therefore the risk assessment may need to be reviewed once a type has been chosen. The discussion below focusses on lithium but where the solidum-sulphur issues are different they are highlighted, for example the toxic smoke from a fire may contain sulphur dioxide as opposed to hydrogen fluoride.

Secondary, rechargeable lithium batteries as used in bulk BESS's, use cathodes that contain lithium in the crystal structure of the cathode coating and/or lithium salts in an electrolyte that is in the battery. These are called lithium-ion batteries. Lithium-ion batteries operate at room temperature and have significant limitations outside the $0 – 50^0$Crange. The exact lithium-ion composition of the batteries can vary with suppliers. In addition, the technology allows for many combinations of chemistry to suit the particular application.

Battery chemistry

The lithium in the batteries is usually in the form of lithium salts dissolved in an electrolyte solution that is absorbed within the electrodes and/or lithium plated onto the surface of the electrode. These are referred to as solid state batteries because electrolyte liquid is not freely available in a form that can easily leak or be extracted.

Some sodium-ion batteries such as sodium-sulphur batteries operate at high temperature, $300 – 350^0$C as they have a molten sulphur component. Other low temperature sodium-ion batteries may be a relatively new technology and there is limited information about sodium-based batteries.

Hazard - Thermal decomposition

Upon heating of the contents of a battery due to shorting, contaminants, external heat or exposure to water and reaction heat, the lithium salts in batteries begin to break down exothermically to release either oxygen (oxidants) that enhances combustion, possibly leading to explosion, or fumes such as hydrogen fluoride or chlorine that are toxic.

These exothermic break-down reactions are self-sustaining above a certain temperature (typically 70^0C) and can lead to thermal run away. In this process the battery gets hotter and hotter, the decomposition reactions happen faster and faster and excessive hot fumes are generated in the battery. Eventually the pressure in the battery builds up to the point where those gases need to vented, usually via the weakest point in the system. These vented fumes can be flammable due to vaporisation of the electrolyte and can ignite as a flash fire or fire ball (if large amounts) leading to the fire spreading to any surrounding combustible materials, e.g., plastic insulation on cables, the electrolyte, the electrodes and possibly even the plastic parts of the battery casing etc. If the vented flammable vapours do not ignite immediately, they can accumulate within the surrounding structures. If this flammable mixture is ignited later, e.g., due to a spark, this can lead to a violent explosion of the module, cabinet, room, container etc.

In addition to being flammable the vented gases will contain toxic components. These could include:

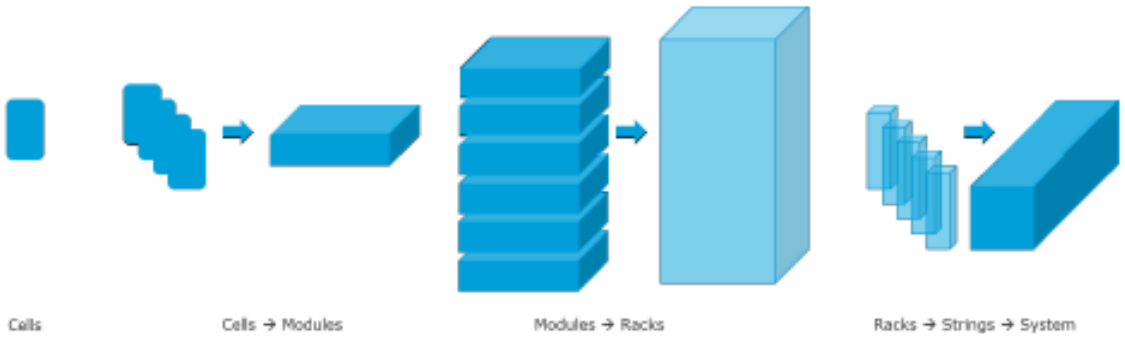
- the products of combustion such as carbon dioxide/monoxide, hydrogen cyanide
- VOCs like benzene and ethylene,
- decomposition products such as hydrogen fluoride, hydrogen chloride, phosphorous pentafluoride, phosphoryl fluoride and oxides of aluminium, cobalt, copper etc.

The temperature in the batteries and of these vented gases can be extremely high, e.g., > 600^0C.

In the situation where oxygen is released internally as part of the decomposition (e.g., lithium perchlorate) the oxygen is available to react with the combustible electrolyte and if all this happens extremely fast in a self-sustaining manner within the confines of the device, an explosion of the device can result.

Hazard - Propagation

A BESS is composed of individual batteries which are combined into different size packs such as modules, racks, as illustrated on the diagram below.



The very high temperature generated by one battery cell in thermal run away could lead to overheating of adjacent cells. This cell in turn then starts thermal decomposition and so the process propagates through the entire system, as illustrated on the diagram below.

In order to prevent propagation, there are separation requirements between cells, modules etc. Separation could be with physical space or insulating materials etc.

Hazard - Electrolyte leaks

Although extremely unlikely due to the structure of the batteries, should electrolyte liquid leak out of the batteries, it can be potentially flammable as well as corrosive etc. If ignited as fire, or explosion, the smoke would contain toxic components. If unignited it can still be extremely harmful especially if its decomposition products include hydrofluoric acid.

OTHER CHEMICALS OR HAZARDS

The BESS is composed not only of the batteries. There are electrical connections, switches, power converters, cooling systems etc.

Cooling Systems

Due to the need to keep the batteries within a specified temperature range most of the containerised modular system have built-in air-conditioning systems.

Fire suppression systems

Although these are only effective for some fire scenarios, some of the solid-state containerised systems come fitted with "Clean agent" fire suppressant systems. These are pressurised containers of powder/gases that are released into the container to snuff a fire and do not leave a residue on the equipment.

Some containers have water sprinkler systems installed to quench thermal run-away reactions.

On any chemical plant there is always the risk of fires with electrical equipment and other materials used on site. Fire systems would typically consist of local strategically placed extinguishers as well as a fire water hose/hydrant system.

In general fire fighters may respond with water cannons/hydrants, foam systems etc. Such responses may generate large amount of contaminated and hazardous water runoff. A system to contain as much of this as possible should be in place.

General electrical and electronic equipment

Whatever the configuration of the battery containers there will be electrical and electronic equipment in the battery compartment as well as outside. In some installations the main electrical equipment such as the power conversion system is in a separate compartment separated by a fire wall. In others it can be in a separate container.

Wherever there is electrical equipment there is a possibility of shorting, overheating and fire.

IMPACT ASSESSMENT TABLES

The tables below contain all the recommended preventative and mitigation measures necessary to ensure risks are not unacceptably high.

Table 28: Construction phase: BESS impact and mitigation tables

Receptor / Impact	Description	Preventative and Mitigation Measures	Ease of Mitigation	Significance without mitigation	Significance with mitigation
Human Health - chronic exposure to toxic chemical or biological agents	Causes - Construction materials such as cement, paints, solvents, welding fumes, truck fumes etc. Consequences - Employee / contractor illness.	• The construction phase will be managed according to all the requirements of the Occupational Health and Safety Act 85 of 1993 specifically the Construction Regulations. • SHEQ policy in place. • A detailed construction risk assessment prior to work. • SHE procedure in place. • PPE to be specified. • SHE appointees in place. • Contractor's safety files in place and up to date. • All necessary health controls/ practices to be in place, e.g. ventilation of welding and painting areas. • SHE monitoring and reporting programs in place. • Emergency response plan to be in place prior to beginning construction and to include aspects such as appointment of emergency controller, provision of first aid, first responder contact numbers.	Moderate	Moderate	Low
Human Health - exposure to noise	Causes - Drilling, piling, generators, air compressors. Consequences - Adverse impact on hearing of workers. Possible nuisance factor in near-by	• The construction phase will be the noisy phase of the project. • No extreme construction envisaged, normal road, industrial building type construction similar to what would take place in an industrial area. • Health risk assessment to determine if equipment continuous noise exceeds 85dB at workstation and 61dB at boundary of the site • Employees to be provided with hearing protection if working near equipment that exceeds the noise limits. • Due to rural nature of site, construction is unlikely to continue at after sunset.	Easy	Moderate	Low

Receptor / Impact	Description	Preventative and Mitigation Measures	Ease of Mitigation	Significance without mitigation	Significance with mitigation
Human Health - exposure to temperature extremes and/or humidity	Causes - Heat during the day. Cold in winter. Consequence - Heat stroke. Hypothermia.	• Construction site facilities to comply with Occupational Health and Safety Act 85 of 1993 specifically the thermal, humidity, lighting and ventilation requirements of the Environmental Regulations for Workplaces. • Adequate potable water to be provided during all phases of the project. Bore hole, bowser and tank or small water treatment plant may be required to provide potable water for the plants during all phases of the project.	Easy	Low	Very Low
Human Health - exposure to psychological stress	Causes - Large projects bring many contractor workers into a small, isolated community. Consequences – Lack of sufficient accommodation, entertainment etc. Increase in alcohol abuse, violence	• Depending on size of contract and scope, project may need to provide regular/periodic transport to town and nearby cities. • Local community involvement and as far as possible preferably use of local persons as contract workers on the project.	Easy	Low	Very Low
Human Health - exposure to ergonomic stress	Causes - Lifting heavy equipment. Awkward angles during construction. Consequences - Back and other injuries.	• Training in lifting techniques. • Ensure that despite the relatively isolated location all the necessary equipment is available (and well maintained) during construction. Otherwise, employees may revert to unsafe practices. Isolated location, maintenance of construction equipment to ensure safe operation is critical. Ensure this is in place prior to project beginning. • Development of local service providers. • First aid provision on site.	Moderate	Low	Low

Receptor / Impact	Description	Preventative and Mitigation Measures	Ease of Mitigation	Significance without mitigation	Significance with mitigation
Human and Equipment Safety - exposure to fire radiation	Causes – Involvement in an external fire. Fire involving fuels used in construction vehicles or vehicles themselves (e.g., tyre fire). Fire due to uncontrolled welding or other hot-work Consequences - Injuries due to radiation especially amongst first responders and bystanders. Fatalities unlikely from the heat radiation as not highly flammable nor massive fire.	• Fuels stored on site in dedicated, demarcated and bunded areas. • Suitable fire-fighting equipment on site near source of fuel, e.g. diesel tank, generators, mess, living quarters, workshops etc • Emergency plan to be in place prior to commencement of construction. • Fuel spill containment procedures and equipment to be in place. • Hot-work permit and management system to be in place.	Complex	Moderate	Low
Human and Equipment Safety - exposure to fire radiation	Causes - Solid state battery containers damaged on route e.g., dropped in port (drops do happen about 1/2000	• Solid state battery design includes abuse tests such as drop test, impact, rapid discharge etc. Propagation tests for systems, e.g., heat insulating materials between cells/modules. Factory acceptance test prior to prior to leaving manufacture. Batteries are usually stored at 50% charge to prolong life but may be shipped fully discharged. This level of detail should be understood so as to assess the risk during transport and storage.	Complex	Moderate	Low

Receptor / Impact	Description	Preventative and Mitigation Measures	Ease of Mitigation	Significance without mitigation	Significance with mitigation
	containers) and importing possibly approximately 100 containers for each BESS site. With this it is possible, although unlikely, that one will be dropped, traffic accident on-route. Involvement in an external fire e.g., at the port or on route. Consequences – Injuries due to radiation especially amongst first responders and bystanders. Fatalities unlikely from the heat radiation as not highly flammable nor massive fire (refer to noxious smoke in APPENDIX A below for the major impact).	• The applicants should ensure suitably competent transport companies are appointed. The company responsible for transportation should ensure: o Compliance with National Road Traffic Act regulation 8 – dangerous goods. o Port Authorities should be alerted to the overall project and the hazardous nature of the contents of battery containers being imported. Note. If, as per one of the typical suppliers (Tesla) indications, the containers are classified as IMDG Class 9 – the containers will not receive any special care in the ports and may be stored next to flammables. Port emergency response in particular need training on mitigating battery hazards. • Data indicates installed facility events are 0.001/year. Transport of 100 units per installation assumed to take 4 weeks each so f= 0.008 once in 125 years so likelihood is very low. • Prior to bringing any containers into the country a full Emergency response plan should be in place for the full route from the ship to the site. Drivers trained in the hazards of containerized batteries. Emergency plan to determine and address: o What gases would be released in a fire and are there inhalation hazards o Extinguishing has two important elements, put out fire and to provide cooling. Different approaches may be needed for small fire – e.g., put out, and for large fires e.g., cool with copious quantities of water. Note inert gases and foam may put out the initial fire but fail to control thermal runaway or to cool the batteries resulting in reignition. o What initial fire extinguishing medium should be used? o Are there any secondary gases or residues from use of extinguishers? o If water is appropriate, may need outside connections to inside sprinklers? o First responders need to know what media to use, especially if water totally unsuitable and if there are no connection points for water etc. o Must the container be left unopened or opened? o PPE to be specified including possible exposure to chemicals and fumes as well as radiate heat.			

Receptor / Impact	Description	Preventative and Mitigation Measures	Ease of Mitigation	Significance without mitigation	Significance with mitigation
		○ Containment of residues/water/damaged equipment. ○ Suitable safe making a disposal plan considering after the event, how do responders deal with partially charged damage units, contaminated surfaces (e.g., HF residues).			
Human and Equipment Safety - exposure to explosion over pressures	Causes - With solid state lithium containers, flammable gases generated by thermal run away reach explosive limits. Ignition on hot surfaces, static. Consequences - Potential fatalities amongst first responders. Damage to container, transport truck or other nearby items, e.g., other container in the port.	• During transport this is only likely to happen due to possible inappropriate emergency response, e.g., opening containers when they may be the type that should be left to burn out. • For simplicity one transport route would be preferable. The route needs to be assessed in terms of responding local services, rest places for drivers, refuelling if required, break down services available etc. • Once an import route has been chosen, e.g. Cape Town port and up the N1 and N10 or Port of Saldanha and along the N14 etc, then the appointed transport company should ensure key emergency services on route could be given awareness training in battery fire/accident response. Emergency response planning and training referred to above may be important for key locations such as the Du Toitskloof tunnel.	N/A	Moderate	Low

Receptor / Impact	Description	Preventative and Mitigation Measures	Ease of Mitigation	Significance without mitigation	Significance with mitigation
Human and Equipment Safety - exposure to acute toxic chemical and biological agents	Causes Human pathogens and diseases, sewage, food waste. Snakes, insects, wild and domesticated animals and harmful plants. Consequences - Illness and at worst without mitigation, possibly extending to fatalities. Effects can vary from discomfort to fatalities for venomous snakes or bee swarms etc	• All necessary good hygiene practices to be in place, e.g. provision of toilets, eating areas, infectious disease controls. • Policies and practice for dealing with known vectors of disease such as Aids, TB, COVID 19 and others. • Prior to construction determine the dangerous species in the area and what responses are needed to bites/exposure/attacks. • Awareness training for persons on site, safety induction to include animal hazards. • First aid and emergency response to consider the necessary anti-venom, anti-histamines, topical medicines etc. • Due to isolated locations some distance from town, the ability to treat with anti-venom and extreme allergic reactions on site is critical to mitigate the impacts	Complex	Moderate	Low

Receptor / Impact	Description	Preventative and Mitigation Measures	Ease of Mitigation	Significance without mitigation	Significance with mitigation
Human and Equipment Safety - exposure to acute toxic chemical and biological agents	Causes - Damaged solid-state batteries release fumes, leak electrolyte, are completely broken exposing hazardous chemicals. Thermal runaway and hazardous fumes released. Consequences - Impacts can vary from mild skin irritation from exposure to small leaks to serious corrosive burns or lung damage.	• Appointed transport company to ensure transport in accordance with Regulation 8 of the National Road Traffic Act 93 of 1996, Dangerous Goods. Not permitted to transport prescribed goods in manner not consistent with the prescriptions, e.g., consignor and consignee responsibilities. Prescription found in SANS 10228/29 and international codes for battery transport etc. • Transport in sealed packages that are kept upright, protected from movement damage etc. • Also packaged to ensure no short-circuiting during transport. • Transport to prevent excessive vibration considerations as battery internal may be damaged leading to thermal run-away during commissioning. • Pre-assembled containers will most likely be supplied. These will be fitted with the necessary protective measures by the supplier considering marine and road transport as well as lifting, setting down etc. • Route selection to consider possible incidents along the way and suitable response, e.g. satellite tracking, mobile communication, 24/7 helpline response. • Standard dangerous goods requirements for Hazmat labels, Trem cards, driver trained in the hazards of the load. • Likelihood similar to fire above.	Complex	Moderate	Low

Receptor / Impact	Description	Preventative and Mitigation Measures	Ease of Mitigation	Significance without mitigation	Significance with mitigation
Human and Equipment Safety - exposure to violent release of kinetic or potential energy	Causes - Construction moving equipment, heavy loaded, elevated loads, working at heights Consequences - Injury or possibly fatality. Damage to equipment. Delays in starting the project, financial losses	• The construction phase will be managed according to all the requirements of the Occupational Health and Safety Act 85 of 1993 specifically the Construction Regulations. • SHEQ policy in place. • A detailed construction risk assessment prior to work. • SHE procedure in place. • PPE to be specified. • SHE appointees in place. • Contractors safety files in place and up to date. • SHE monitoring and reporting programs in place. • Standard construction site rules regarding traffic, reversing sirens, rigging controls, cordoning off excavations etc. • Civil and building structures to National Building Regulations and building Standards Act 103 of 1977 SANS 10400 and other relevant codes. • Other constructions such as roads, sewers etc also to relevant SANS standards. • All normal procedures for working at heights, hot work permits, confined space entry, cordon off excavations etc to be in place before construction begins. • Emergency response plan to be in place before construction begins.	Complex	High	Low
Human and Equipment Safety - exposure to electromagnetic waves	Causes - Use of electrical machines, generators etc. Hot dry area static generation is highly likely. Lightning strike. Consequences - Electrocution.	• Standard maintenance of condition of electrical equipment and safe operating instructions. • Ability to shut off power to systems in use on site. • If persons are decanting fuels or dealing with other highly flammable materials care should be taken regarding possible static discharge, installations to be suitably designed and maintained. • Lightning strike rate in the study area is moderately high. • Outside work must be stopped during thunderstorms.	Complex	Moderate	Low

Receptor / Impact	Description	Preventative and Mitigation Measures	Ease of Mitigation	Significance without mitigation	Significance with mitigation
	Ignition and burns. Injury and death. Damage electrical equipment.	• Lighting conductors may be required for the final installation, to be confirmed during design phase.			
Environment - emissions to air	Causes - Dust from construction and generally hot dry area. Consequences - Adverse impact on employee health.	• May need to use dampening on roads etc. as per normal construction practices. • May need PPE (dust masks) for specific construction workers.	Easy	Low	Very Low
Environment - emissions to water	Causes - Diesel for equipment, paints and solvents. Transformer oil spills. Sewage and kitchen/mess area wastewater. Consequences - Environmental damage, particularly to the surface and underground water in the area.	• Normal construction site practices for preventing and containing fuels/paint/oil etc spills. • Bunding under any temporary tanks, curbing under truck offloading areas and sealed surfaces (e.g., concrete) under truck parking area is particularly important. • Spill clean-up procedures to be in place before commencing construction. • Sewage and any kitchen liquids - containment and suitable treatment/disposal	Moderate	Low	Low

Receptor / Impact	Description	Preventative and Mitigation Measures	Ease of Mitigation	Significance without mitigation	Significance with mitigation
Environment - emissions to earth	Causes - Mess area and other solid waste. Consequences - Environmental damage.	• There will be packaging materials that will need to be disposed of after the entire system is connected and commissioned as well as after regular maintenance. • There will need to be waste segregation (e.g., electronic equipment, chemicals) and management on the site.	Easy	Low	Low
Environment - waste of resources e.g., water, power etc	Causes - Water usage not controlled. Battery containers damaged. Consequences - Delays.	• Water usage to be monitored on site during construction. • Handling protocols to be provided by battery supplier. • End of Life plan needs to be in place before any battery containers enter the country as there may be damaged battery unit from day 1. • Water management plan and spill containment plans to be in place.	Easy	Low	Very Low
Public - Aesthetics	Causes - Bright surfaces reflecting light. Tall structures in a flat area. Consequences - Irritation.	• Limited height for electrical infrastructure. • Visual impact assessment to include BESS installation when design details become available. • Battery containers single storey as physical space is not a constraint that would require stacking of containers. • Containers likely to be painted white, not left as reflective steel.	Moderate	Moderate	Low
Investors - Financial	Causes - Defective technology. Extreme project delays.	• Design by experienced contractors using internationally recognized and proven technology. • Project management with deviation monitoring. Project insurance for construction phase.	Moderate	Moderate	Low

Receptor / Impact	Description	Preventative and Mitigation Measures	Ease of Mitigation	Significance without mitigation	Significance with mitigation
	Consequences - Financial loss				
Employees and investors - Security	Causes - On route, potential hi-jacking of valuable but hazardous load. On site, theft of construction equipment and battery installation facilities. Civil unrest or violent strike by employees. Consequences - Theft. Injury to burglars. Damage to equipment possibly setting off thermal runaway.	• Fencing around electrical infrastructure to SANS standard and Eskom Guidelines. • The hazardous nature of the electrical and battery equipment should be clearly indicated – e.g., Skull and Cross Bones or other signs. • Isolated location both helps and hinders security. • Night lighting to be provided both indoors and outdoors where necessary.	Complex	Moderate	Low
Emergencies	Causes - Fires, explosions, toxic smoke, large spills, traffic accidents, equipment/structural collapse.	• All safety measures listed above. • Small events not handled correctly and escalate into larger events. • Emergency procedures need to be practiced prior to commencement of construction. • If batteries are stored at 50% charge, thermal run away can happen while in storage on site waiting for installation. In addition, if involved in an external fire thermal run away can happen even with uncharged batteries. Except during shipping, ideally the units	Complex	Moderate	Low

Receptor / Impact	Description	Preventative and Mitigation Measures	Ease of Mitigation	Significance without mitigation	Significance with mitigation
	Inadequate emergency response to small event leads to escalation. Consequences - Injuries turn to fatalities, small losses become extended down time.	should not be stored any closer to each other than they would be in the final installation so that propagation is prevented, i.e. laydown area needs to be considered. The company in charge of the containers at each stage in the transport process needs to be very clear so that responsibility for the integrity of the load and protection of the persons involved in transfer and coordination of emergency response on-route. E.g., if purchased from Tesla where does hand over occur to the South African contractor / owner, at the factory door in USA, at the port in RSA, at the site fence. For example, who will be accountable if there's thermal runway event on a truck with a container that stops in a small town for driver refreshments			
Investors - Legal	Causes Battery field is evolving quickly with new guides, codes and regulations happening at the same time as evolving technology. Consequences - Unknown hazards manifest due to using "cheaper supplier or less developed technology".	• Use only internationally reputable battery suppliers who comply with all known regulations/guideline at the time of purchasing. • Ensure only latest state of the art battery system are used.	Moderate	Moderate	Low

The above risk assessment shows that provided the preventative and mitigation measures are incorporated, the construction phase of the project does not present any high risks or any fatal flaws.

Table 29: Operational phase: BESS impact and mitigation tables

From the details of accidents that have happened both with BESS installations and chemical plants 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.

Receptor	Description	Preventative and Mitigation Measures	Ease of Mitigation	Significance before mitigation	Significance after mitigation
Human Health - chronic exposure to toxic chemical or biological agents	Causes - Operation and maintenance materials spare parts, paints, solvents, welding fumes, diesel fuel, transformers oils, lubricating oils and greases etc. Consequences - Occupational illness.	• The operation and maintenance phase will be managed according to all the requirements of the Occupational Health and Safety Act 85 of 1993. • SHEQ policy in place. • A detailed risk assessment of all normal operating and maintenance activities on site to be compiled, and form the basis of operating instructions, prior to commencing commissioning. • SHE procedure in place, e.g., PPE specified, management of change, integrity monitoring. • SHE appointees in place. • Training of staff in general hazards on site. • All necessary health controls/ practices to be in place, e.g. ventilation of confined areas, occupational health monitoring if required and reporting programs in place. • Emergency response plan for full operation and maintenance phase to be in place prior to beginning commissioning and to include aspects such as: o appointment of emergency controller, o emergency isolation systems for electricity, o emergency isolation and containment systems for electrolyte, o provision of PPE for hazardous materials response, o provision of emergency facilities for staff at the main office building, provision of first aid facilities, o first responder contact numbers etc.	Easy	Moderate	Low

Receptor	Description	Preventative and Mitigation Measures	Ease of Mitigation	Significance before mitigation	Significance after mitigation
Human Health - chronic exposure to toxic chemical or biological agents	Causes - Compromised battery compartments vapours accumulate in the containers, solids/liquids on surfaces. Maintenance of battery components, corrosive and mildly toxic liquid on surfaces. Consequences - Dermatitis, skin /eye/lung irritation.	• Solids state batteries sealed, individual batteries in modules which are also sealed, pre-packed in the container. • Maintenance procedures will be in place should equipment need to be opened, e.g. pumps drained and decontaminated prior to repair in workshop etc. • PPE will be specified for handling battery parts and other equipment on site. • Training of staff in hazards of chemicals on site. • Possible detectors with local alarms if regulated occupational exposure limits are exceeded etc prior to entry for inspection of battery containers. • Labelling of all equipment. • Confined space entry procedures if entering tanks and possibly battery containers? • There needs to be careful thought given to procedures to be adopted before entering into the plant or a container under normal circumstances (confined space) but particularly after a BMS shut down where there may be flammable or toxic gases present, a fire etc. Any situation could await those entering. • Safety Data Sheets (SDSs) to be available on site. • Operating manuals to be provided including start-up, shut-down, steady state, monitoring requirements. • Maintenance manuals with make safe, decontamination and repair procedures. • Proposed maintenance schedules daily, weekly, monthly, annual etc. • Provided portable equipment for calibration and for testing/verification of defective equipment, e.g. volt/current meters, infrared camera	Complex	Moderate	Low
Human Health - exposure to noise	Causes - Moving parts inside containers, buildings, pumps, compressors, cooling systems, diesel generators etc.	• Design to ensure continuous noise does not exceed 85dB in the plant or at any other location on site or 61 dB at the site boundary, e.g., emergency generator, air compressor etc. • Employees to be provided with hearing protection if working near equipment that exceeds the noise limits.	Easy	Moderate	Low

Receptor	Description	Preventative and Mitigation Measures	Ease of Mitigation	Significance before mitigation	Significance after mitigation
	Consequences - Adverse impact on hearing of workers. Nuisance factor at near -by residences or other activities.				
Human Health - exposure to temperature extremes and/or humidity	Causes - Heat during the day. Batteries generate heat within enclosed building / containers. Cold in winter. Night work requires lighting. Consequences - Heat stroke. Hypothermia.	• Building and container facilities to comply with Occupational Health and Safety Act 85 of 1993 specifically the thermal, humidity, lighting and ventilation requirements of the • Environmental Regulations for Workplaces. • Battery life optimal at temperature also optimal for humans. • Lighting to be provided inside the building, inside the containers, possibly linked to the door opening and outdoors where necessary. • Adequate potable water to be provided during all phases of the project. • Suitable lighting to be provided including emergency lighting for safe building exit in the event of power failure. • PPE for operations and maintenance staff to be suitable for the weather conditions.	Easy	Low	Very Low
Human Health - exposure to psychological stress	Causes - Isolated workstation and monotonous repetitive work. Consequences - Low performance, system productivity suffers.	• Staff rotation to other activities within the site may be necessary. • Performance monitoring of inspections / maintenance tasks in particular will be necessary.	Easy	Low	Very Low

Receptor	Description	Preventative and Mitigation Measures	Ease of Mitigation	Significance before mitigation	Significance after mitigation
Human Health - exposure to ergonomic stress	Causes - Lifting heavy equipment. Awkward angles during maintenance, stretching reaching to high level and bending to low level. Working at height if equipment located on top of roofs or elevated electrical equipment (e.g., pylons). Consequences - Back and other injuries.	• Training in lifting techniques. • Training in working at heights. • If equipment is at height, ensure suitable safe (electrically and physically) ladders / harnesses etc. are available. • Working at height procedure to be in place.	Easy	Moderate	Low

Receptor	Description	Preventative and Mitigation Measures	Ease of Mitigation	Significance before mitigation	Significance after mitigation
Human and Equipment Safety - exposure to fire radiation	Causes – Involvement in an external fire e.g., veld fire, maintenance vehicle fire, diesel generator fire, electrical systems fire. Manufacturing defects or damage to battery leading to shorting and heating. High humidity condensation of water or ingress of water or flooding leading to shorting. Dust accumulation on electrical parts leading to overheating. Excessive electrical loads - surges Operator abuse BMS failure or software failure. Incorrect extinguishing medium, escalate the	• Grass cutting and fire breaks around the BESS installations to prevent veld fires, i.e., ensure suitable separation between BEES and any crops grown in the area. No combustible materials to be stored in or near the batteries or electrical infrastructure. • Separation of site diesel tank, gen-set, transformers from BESS and vice versa. • Design codes from USA and standards of practice UL9540, NFPA 855 and DNV GL RP 43. Detailed FMEA/Hazop/Bowtie to done during design at the component level and system levels. Safety integrity level rating of equipment (failure probably) with suitable redundancy if required. Site Acceptance Testing as part of commissioning of each unit and the overall system. Abuse tests conducted by supplier. • BMS should be checking individual cell voltage as well as stack, module, container, system voltages/current etc. BMS tripping the cell and possibly the stack/ building unit or module/rack/container, if variations in voltage. Diagnostics easily accessible. • Diagnostics able to distinguish cell from stack or cell from module faults. Protective systems are only as good as their reliability and functionality testing is important, e.g., testing that all battery plant trips actually work. Fire resistant barrier between the batteries and the PCS side if in the same container, or separate containers. • Suitable ingress protection level provided for electrical equipment, e.g., IP55 - 66. If air cooling into container, suitable dust filters to be provided. Smoke detectors linked to BMS and alerts in the main control room. • Effects of battery aging to be considered. Solid state battery life starts to be impacted above 40 deg C and significant impacts above 50 deg C with thermal run away starting at 65-70 deg C. BMS trips system at 50 deg C. Temperature monitoring to be in place. • Regular infrared scanning. Data needs to be stored for trend analysis. • Data indicates an event frequency of 0.001 per installation and with 100 units this would mean an event once 10 years. Low probability. Most events will be small not resulting in injuries, but this is possible if the event is not controlled. • Emergency plan from transport and construction phase to be extended to operational phase and to include the hazards of the electrically live system. Procedure to address solid state container fires - extinguishing, ventilating, entering as appropriate or not.	Complex	High	Low

Receptor	Description	Preventative and Mitigation Measures	Ease of Mitigation	Significance before mitigation	Significance after mitigation
	fire. Consequences - Contaminated run off. Radiation burns unlikely to be severe as no highly flammable materials on site. No affected bystanders. Damaged equipment. Fire spreads to other units or offsite if grass/vegetation not controlled.	• PPE for container firefighting include fire retardant, chemically resistant, nitrile gloves, antistatic acid resistant boots, fill face shields, BA sets. • A planned fire response to prevent escalation to an explosion is critical. A planned fire response to prevent escalation to an environmental event is critical. • Suitable fire extinguishing medium, and cooling mediums and adequate supply of both is critical. Water supply may be an issue. • Consider fire water for cooling adjacent equipment – BESS units. • Can use fogging nozzles to direct smoke. • Clean up after event Lingering HF and other toxic residues in the soil and on adjacent structures. • IR scanning to determine if batteries are still smouldering / are sufficient cooled to handle. Very NB batteries thought to be extinguished can re-ignite days/weeks later. • Some emergency response plans suggest after batteries are removed; they still be submerged in outdoor water troughs. To be confirmed during design. • Smoke or gas detector systems that are not part of the original battery container package, need to be linked to the main control panel for the entire system so that issues can be detected and responded to rapidly			
Human and Equipment Safety - exposure to fire radiation	Causes - Power Conversion System (PCS – DC to AC) cooling failure electrical fire. Consequences - Fire starts in PCS or another section or room and spreads to battery area.	• Modern lithium container design put the PCS in another part of the container with a fire rated wall separating it from the battery. Alternately the PCS is another container altogether. • Failure of cooling on PCS or fires on other electrical equipment such as cooling system pump motors etc, and failure to trip the entire system and raise the alert.	Moderate	High	Low

Receptor	Description	Preventative and Mitigation Measures	Ease of Mitigation	Significance before mitigation	Significance after mitigation
Human and Equipment Safety - exposure to explosion over pressures	Cause 1 - Transformer shorting / overheating / explosion. Cause 2 - Flammable gases generated by thermal run away reach explosive limits. Ignition on hot surfaces, static. Lithium Cobalt Oxide generates O2 during decomposition – escalation. Consequences - Potential fatalities amongst first responders. Damage to container or other nearby items, e.g., another container.	• Electrical equipment will be specified to suit application. • Emergency response plan and employee training referred to above is critical. • This is only really likely do happen due to possible inappropriate emergency response, e.g. opening containers when they may be the type that should be left to burn out. • Modern state of the art containers have ventilation systems for vapours. • Undertake a hazardous area classification of the inside of the container to confirm the rating of electrical equipment. Might be zone 2 due to possible leaks of electrolyte or generation of flammable gases under thermal run away. Emergency response plan and employee training referred to above is critical • Suitable training of selected emergency responders who may be called out to the facilities is critical.	Moderate	Moderate	Low

Receptor	Description	Preventative and Mitigation Measures	Ease of Mitigation	Significance before mitigation	Significance after mitigation
Human and Equipment Safety - exposure to acute toxic chemical and biological agents	Causes Human pathogens and diseases, sewage, food waste. Snakes, insects, wild and domesticated animals and harmful plants. Consequences - Illness and at worst without mitigation, possibly extending to fatalities. Effects can vary from discomfort to fatalities for venomous snakes or bee swarms etc	• All necessary good hygiene practices to be in place, e.g. provision of toilets, eating areas, infectious disease controls. • Policies and practice for dealing with known vectors of disease such as Aids, TB, COVID 19 and others. • Awareness training for persons on site, safety induction to include animal hazards. • First aid and emergency response to consider the necessary anti-venom, anti-histamines, topical medicines etc. • Due to isolated locations some distance from town, the ability to treat with anti-venom and extreme allergic reactions on site is critical to mitigate the impacts	Moderate	Low	Low

Receptor	Description	Preventative and Mitigation Measures	Ease of Mitigation	Significance before mitigation	Significance after mitigation
Human and Equipment Safety - exposure to acute toxic chemical and biological agents	Causes - Damaged batteries components, leak electrolyte, are completely broken exposing hazardous chemicals. Hazardous fumes released on thermal run away see fire above. Consequences - Impacts can vary from mild skin irritation from exposure to small leaks to serious corrosive burns for large exposure. In the case of toxic fumes / smoke, serious lung damage.	• Acid resistant PPE (e.g., overalls, gloves, eyeglasses) to be specified for all operations in electrolyte areas. • PPE to be increased (e.g. full-face shield, aprons, chemical suits) for operations that involve opening equipment and potential exposure, e.g. sampling, maintenance. • All operators/maintenance staff trained in the hazards of chemicals on site. • Batteries contained, modules contained and all inside a container that acts as bund. • Refer to fire above as all the protective measures apply to prevent toxic smoke. • Fumes tend to be directed upwards by the structure of the container. • Refer to fire above as all the measures apply to mitigate toxic smoke. • 24/7 helpline response. • Standard dangerous goods requirements for Hazmat labels. • All operators/maintenance staff trained in the hazards.	Moderate	Moderate	Low

Receptor	Description	Preventative and Mitigation Measures	Ease of Mitigation	Significance before mitigation	Significance after mitigation
Human and Equipment Safety - exposure to violent release of kinetic or potential energy	Causes - Moving equipment, pumps, heavy equipment at elevation, nip points, working at heights. Traffic accidents. Earthquake / tremor. Consequences - Injury. Fatality in unlikely worst case, e.g., traffic accidents or fall from heights. Damage to equipment, spills, environment pollution	• Apart from pumps, no major moving parts during operation. • Maintenance equipment to be serviced and personnel suitably trained in the use thereof. • Normally just small vehicles on site, bakkies, grass cutting, cherry-pickers etc. Possibly large cranes if large equipment or elevated structure removed/replaced. • Traffic signs, rules etc in place on site. • All normal working at heights, hot work permits, confined space entry, cordon off unsafe areas/works etc to be in place. • Emergency response plan. • Civil design to take seismic activity into account.	Moderate	Moderate	Low

Receptor	Description	Preventative and Mitigation Measures	Ease of Mitigation	Significance before mitigation	Significance after mitigation
Human and Equipment Safety - exposure to electromagnetic waves	Causes - Use of electrical machines, generators etc. Hot dry area static generation is highly likely. Lightning strike. Consequences - Electrocution. Ignition and burns. Injury and death. Damage electrical equipment.	• Codes and guidelines for electrical insulation. • PPE to suit. • Low voltage equipment (e.g., batteries) separated from high voltage (e.g., transmission to grid). • Trained personnel – IEE 1657 – 2018. • Eskom Operating Regulations for high voltage systems including access control, permit to work, safe work procedures, live work, abnormal and emergency situations, keeping records. • Electromagnetic fields, impact on other equipment e.g., testing devices, mobile phones – malfunction, permanent damage. • Software also needs maintenance, patches, updates. • Consider suitably located Emergency stop buttons for the plant and the other equipment on site. • PPE to consider static accumulation for entering the plant, and particularly the battery containers especially after a high temperature shut down where there could possibly be flammable materials. • The procedures for responding to alarm and auto shut down on containers, needs to consider that there may be a dangerous environment inside and how to protect personnel who may enter to respond. • Lightning strike rate in proposed development area is moderately high. • All outside work must be stopped during thunder storms. • Lighting conductors may be required for the installation, to be confirmed during design	Complex	Moderate	Low
Environment - emissions to air	Not expected on a normal basis. Refrigerant may be an asphyxiant if accidentally released	• Especially after any warning alarms have gone off, but possibly even normally the container could be treated as entering a confined space and similar procedures could be in place, e.g., do not enter alone, gas testing prior to entering, ensure adequate ventilation	Easy	Low	Very Low

Receptor	Description	Preventative and Mitigation Measures	Ease of Mitigation	Significance before mitigation	Significance after mitigation
	indoors it can accumulate and displace oxygen.				
Environment - emissions to water	Causes - Cooling water blow-down. Laboratory waste (if included in the design). Maintenance waste, e.g., oils. Spills from batteries, coolant system, diesel trucks, transformers. Parked vehicles – oil drips. Fire water runoff control. Kitchen waste and sewage. Refrigerant release. Consequences - Pollution if not contained. Excessive disposal costs if emissions not limited.	• Bunding under any outdoors tanks, curbing under truck offloading areas and sealed surfaces (e.g. concrete) under truck parking area is particularly important. • Sewage and any kitchen liquids - containment and suitable treatment/disposal. • Procedures for dealing with damaged/leaking equipment as well as clean-up of spills. • Normal site practices for preventing and containing diesel/paint etc spills. • Waste management plan to be in place e.g. liquid waste treatment or suitable removal and disposal will be provided. • Spill clean-up procedures to be in place before bringing container on site, including spill kits – non-combustible materials, hazmat disposal.	Moderate	Low	Low

Receptor	Description	Preventative and Mitigation Measures	Ease of Mitigation	Significance before mitigation	Significance after mitigation
Environment - emissions to earth	Causes - Mess area and other solid waste. Disposal of solid-state batteries. Consequences - Environmental damage.	• There will be packaging materials that will need to be disposed of after regular maintenance. • There will need to be waste segregation (e.g., electronic equipment, chemicals) and management on the site.	Easy	Low	Very Low
Environment - waste of resources e.g., water, power etc	Causes - Similar to construction phase. Disposal of batteries or components. Disposal of containers. Water usage not controlled. Consequences - Delays. Excessive costs and disposal of large volumes of hazardous waste.	• Water usage to be monitored on site. • Handling protocols to be provided by supplier of batteries. • Water management plan and spill containment plans to be in place (as per stipulations in the EMPr) • Investigate end of Life plan for solid state batteries - reuse / recovery / reconditioning. • Similarly, for decommissioned containers – reuse / recovery / repurpose	Easy	Low	Very Low
Public - Aesthetics	Causes - Bright surfaces reflecting light.	• Limited height for electrical infrastructure. • Sheeting likely to be painted, not left as reflective steel. • Confirm height limitations for electrical infrastructure, in terms of visual aspects. Visual impact assessment to include BESS installation when design details become available.	Easy	Moderate	Low

Receptor	Description	Preventative and Mitigation Measures	Ease of Mitigation	Significance before mitigation	Significance after mitigation
	Tall structures in a flat area. Consequences - Irritation.	• Containers single storey as physical space is not a constraint that would require stacking of containers. • Containers likely to be painted white, not left as reflective steel.			
Investors - Financial	Causes - Defective technology. Extreme project delays. Consequences - Financial loss	• Design by experienced contractors using internationally recognized and proven technology. • Project management with deviation monitoring. Project insurance for construction phase. • Project insurance.	Easy	Moderate	Low
Employees and investors - Security	Causes - On route, potential hi-jacking of valuable but hazardous load. On site, theft of construction equipment and battery installation facilities. Civil unrest or violent strike by employees. Consequences - Theft. Injury to burglars. Damage to equipment possibly	• Fencing around electrical infrastructure to SANS standard and Eskom Guidelines. • Consider motion detection lights and CCTV. • The hazardous nature of the electrical and battery equipment should be clearly indicated – e.g., Skull and Cross Bones or other signs. • Isolated location both helps and hinders security. • Night lighting to be provided both indoors and outdoors where necessary.	Moderate	Moderate	Low

Receptor	Description	Preventative and Mitigation Measures	Ease of Mitigation	Significance before mitigation	Significance after mitigation
	setting off thermal runaway.				
Employees and investors - Security	Causes - Cyber security attacks aimed at the National Electricity Grid. Consequences - Ransom of the National Electricity Grid.	• Cyber security needs monitoring. • Remote access to system needs to be negotiated and controlled. • Password controls, levels of authority etc. Protection of the National Electricity Grid from Cyber-attacks accessing through the BESS. • Cyber emergency procedures – should be in place prior to commissioning.	Complex	Moderate	Low
Emergencies	Causes - Fires, explosions, toxic smoke, large spills, traffic accidents, equipment/structural collapse. Inadequate emergency response to small event leads to escalation. Consequences - Injuries turn to fatalities, small losses become extended down time.	• All safety measures listed above. • Small events not handled correctly and escalate into larger events. Emergency procedures need to be practiced prior to commencement of operations. • Escape door open outwards, doors hooked open when persons inside. • More than one exit from buildings. • Storage of spare batteries (e.g., in stores on site or elsewhere) also needs to consider possible thermal run away.	Complex	Moderate	Low

Receptor	Description	Preventative and Mitigation Measures	Ease of Mitigation	Significance before mitigation	Significance after mitigation
Investors - Legal	Causes Battery field is evolving quickly with new guides, codes and regulations happening at the same time as evolving technology. Consequences - Unknown hazards manifest due to using "cheaper supplier or less developed technology".	• Use only internationally reputable battery suppliers who comply with all known regulations/guideline at the time of purchasing. • Ensure only latest state of the art battery system are used.	Moderate	Moderate	Low

The above risk assessment shows that, provided the preventative and mitigation measures are incorporated, the operational phase of the project does not present any high risks or any fatal flaws.

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

GENERAL

- 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 at the Mercury Solar PV Cluster.
- 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.

SOLID STATE CONTAINERISED BATTERIES

- With solid-state batteries, the most significant hazard with battery units 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 mitigation 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 (although unlikely).
- 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 containerised 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 with 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. All the alternative BESS installation's locations are over 500m from any occupied farmhouse. Therefore, the risks posed by BESS to the closest isolated farmhouses are negligible.
- Plans should be in place to limit public traffic on the R76 road in the event of a fire.

RECOMMENDATIONS

The following recommendations have been made (and are included in the EMPr):

- There are numerous different battery technologies but using one consistent battery technology system for all the BESS installations associated with the Mercury Solar PV Cluster 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.
- The use of solid-state battery technology of either lithium-ion or sodium-ion does not present any safety or health fatal flaws.
- Technical and systems suggestions for managing and reducing risks have been given and are also included in the EMPr and should be included in the design.
- The overall design should be subject to a full HAZOP prior to finalisation 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 above stipulations have been included in the EMPr.
- 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.
    - The proposed BESS locations are over 500m from isolated farmhouses.
    - The BESS facility is immediately adjacent a public road (R76). There should be plans

in place to stop traffic on this road in the event of a BESS fire and toxic smoke possibly extending over the road.

- 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.
- Finally, it is suggested once the technology has been chosen and more details of the actual design are available, that this risk assessment could be updated.

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 following two main transportation activities will be investigated:

- Abnormal load vehicles transporting components to the site; and
- The transportation of construction materials, equipment and people to and from the site/facility.

This report will aim to provide the following objectives:

- Assess activities related to traffic movement for the construction and operation (maintenance) phases of the facility;
- Recommend a preliminary route for the transportation of the components to the proposed site;
- Recommend a preliminary transportation route for the transportation of materials, equipment and people to site; and
- Recommend alternative or secondary routes where possible.

A TMP aims to ensure that the trips generated by the construction and operational activities associated with the facility are mitigated as far as possible. The TMP is a dynamic document that is updated when changes are made to the project that will affect the traffic on the surrounding road network and the transportation requirements of the project. During the construction phase, the Contractor is the custodian of the plan. The requirements of the TMP shall apply to all construction personnel and subcontractors appointed to provide vehicles, machinery or drivers. The Contractor is expected to review the TMP every four months or immediately after an incident, when corrective measures will be incorporated into the Plan.

The Facility Manager becomes the custodian of the plan when the operational phase commences. A designated employee will ensure that the plan is enforced and will make sure that the TMP is available to all relevant personnel and external maintenance/repair teams. The Facility Manager (or equivalent designation) is expected to review the TMP annually or immediately after an incident, when corrective measures will be incorporated into the Plan.

PROJECT ASPECTS RELEVANT TO THE TMP

Abnormal Load Considerations

It is expected that certain components, such as the transformer, will be transported with an abnormal load vehicle. Abnormal permits are required for vehicles exceeding the following permissible maximum dimensions on road freight transport in terms of the Road Traffic Act (Act No. 93 of 1996) and the National Road Traffic Regulations, 2000:

- Length of 22m for an interlink, 18.5m for truck and trailer and 13.5m for a single unit truck;
- Width of 2.6m;
- Height of 4.3m measured from the ground;
- Possible height of load being 2.7m;
- Weight of gross vehicle mass of 56t resulting in a payload of approximately 30t;
- Axle unit limitations are 18t for dual and 24t for triple-axle units; and
- Axle load limitations are 7.7t on the front axle and 9t on the single or rear axles.

Any dimension / mass outside the above will be classified as an abnormal load and will necessitate an application to the Department of Transport and Public Works for a permit that will give authorisation for the conveyance of said load. A permit is required for each Province that the haulage route traverses.

Further Guideline Documentation

The Technical Recommendations for Highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outlines the rules and conditions that apply to the transport of abnormal loads and vehicles on public roads. Within the guidelines, the detailed procedures to be followed in applying for exemption permits are described and discussed. Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges and culverts.

The general conditions, limitations and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power / mass ratio, mass distribution and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the Road Traffic Act and the relevant regulations.

Permitting – General Rules

The limits recommended in TRH 11 are intended to serve as a guide to the Permit Issuing Authorities. It must be noted that each Administration has the right to refuse a permit application or to modify the conditions under which a permit is granted. It is understood that:

a) A permit is issued at the sole discretion of the Issuing Authority. The permit may be refused because of the condition of the road, the culverts and bridges, the nature of other traffic on the road, abnormally heavy traffic during certain periods or for any other reason.
b) A permit can be withdrawn if the vehicle upon inspection is found in any way not fit to be operated.
c) During certain periods, such as school holidays or long weekends an embargo may be placed on the issuing or permits. Embargo lists are compiled annually and are obtainable from the Issuing Authorities.

Load Limitations

The maximum load that a road vehicle or combination of vehicles will be allowed to carry legally under permit on a public road is limited by:

- the capacity of the vehicles as rated by the manufacturer;
- the load which may be carried by the tyres;
- the damaging effect on pavements;
- the structural capacity on bridges and culverts;
- the power of the prime mover(s);
- the load imposed by the driving axles; and
- the load imposed by the steering axles.

Dimensional Limitations

A load of abnormal dimensions may cause an obstruction and danger to other traffic. For this reason, all loads must, as far as possible, conform to the legal dimensions. Permits will only be considered for indivisible loads, i.e. loads that cannot, without disproportionate effort, expense or risk of damage, be divided into two or more loads for the purpose of transport on public roads. For each of the characteristics below there is a legally permissible limit and what is allowed under permit:

- Width; Height; Length; Front Overhang; Rear Overhang; Front Load Projection; Rear Load Projection; Wheelbase; Turning Radius; and Stability of Loaded Vehicles.

Transporting other Plant, Material and Equipment

In addition to transporting the specialised equipment, the normal Civil Engineering construction materials, plant and equipment will need to be transported to the site (e.g. sand, stone, cement, gravel, water, compaction equipment, concrete mixers, etc.). Other components, such as electrical cables and substation transformers, will also be transported to site during construction. The transport of these items will generally be conducted with normal heavy loads vehicles, except for the transformers which require an abnormal load vehicle.

VEHICLES THAT WILL ACCESS THE SITE DURING CONSTRUCTION

It is anticipated that the following vehicles will access the site during construction:

- Conventional trucks within the freight limitations to transport building material to the site;
- 40ft container trucks transporting solar panels, frames and the inverter, which are within freight limitations;
- Flatbed trucks (Superlinks) transporting the solar panels and frames, which are within the freight limitations;
- LDV (Light Differential Vehicle)-type vehicles transporting workers from surrounding areas to site;
- Drilling machines and other required construction machinery being transported by conventional trucks or via self-drive to site; and
- The transformer and possibly the containers/tanks for the BESS will be transported as abnormal loads.

NATIONAL ROUTE TO SITE FOR IMPORTED COMPONENTS

Any components imported to South Africa are recommended to be shipped via the Port of Richards Bay, being the closest feasible port to the site. The distance from the Port of Richards Bay to the site is approximately 720km.

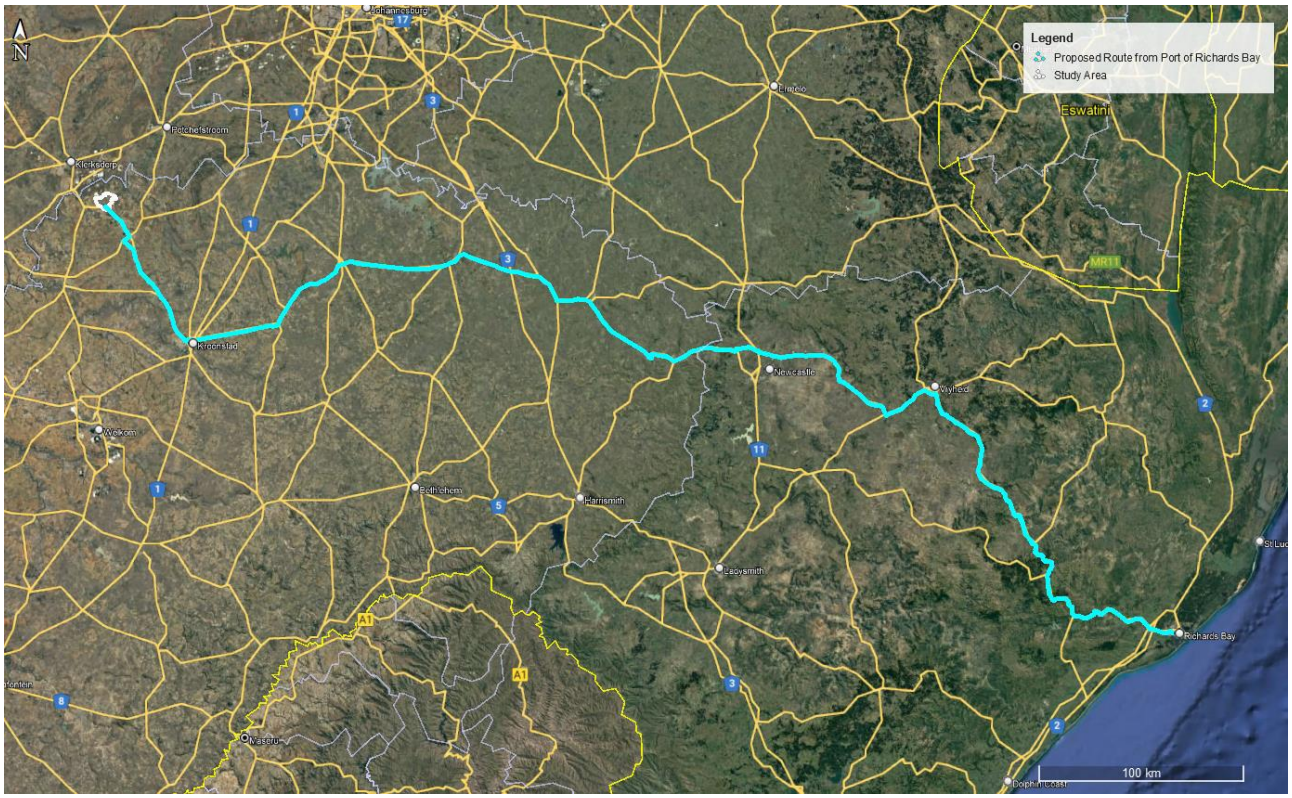


Figure 20: National haulage route from the Port of Richards Bay to the proposed site

PROPOSED ACCESS ROAD TO THE SITE

The main access road to the Hormah PV site will be the R76, as shown below.

Figure 21: Access Road to the Hormah PV site

The proposed access point to the Hormah Solar PV1 facility will be on the R76, which is an existing farm access, with clear sight lines, and as such access spacing restrictions are not envisaged.

The access point as shown above is deemed acceptable from a traffic and transport engineering perspective.

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.

INTERNAL ROADS

The internal road geometric design and layout will 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.

ROUTE FOR COMPONENTS MANUFACTURED WITHIN SOUTH AFRICA

It is anticipated that elements manufactured within South Africa will be transported to the site from the Cape Town, Johannesburg and/or Pinetown/Durban areas. It is furthermore assumed that the

transformer, which will be transported with an abnormal load vehicle, will be transported from the Johannesburg area and therefore it needs to be ensured that the route from the manufacturer to the site doesn't have load limitations for abnormal vehicles.
PV panels are manufactured in South Africa in the Pinetown (Durban), Johannesburg and Cape Town areas. As the distance from Pinetown is deemed very far taking the number of panels that are planned for the site into account, only the Johannesburg and Cape Town areas have been considered.

It is critical to ensure that the abnormal load vehicle will be able to move safely and without obstruction along the preferred routes. The preferred route should be surveyed to identify problem areas, e.g., intersections with limited turning radii and sections of the road with sharp horizontal curves or steep gradients that may require modification. After the road modifications have been implemented, it is recommended to undertake a "dry run" with the largest abnormal load vehicle, prior to the transportation of any components, to ensure that the delivery will occur without disruptions. It needs to be ensured that the gravel sections of the haulage routes remain in good condition and will need to be maintained during the additional loading of the construction phase and reinstated after construction is completed. It should be noted that any low hanging overhead lines (lower than 5.1m), e.g., Eskom and Telkom lines, would have to be moved temporarily or raised to accommodate the abnormal load vehicles.

The Directorate Road Asset Management (Department of Police, Roads & Transport, Free State Province) supports the proposed solar facility (and the use of the provincial gravel roads) subject to certain conditions shown in Annexure B of the TMP (attached in Appendix G). The comment received from this Department is also discussed under Chapter 8 of this report.

Route from Durban to the Site – Normal loads

Solar PV components could possibly be manufactured in Durban and transported to site via road. Normal loads will transport elements via various national highways from Durban and Pinetown to the site. No road limitations are envisaged along the route for normal load freight. The distance from Durban to the site is approximately 613km.

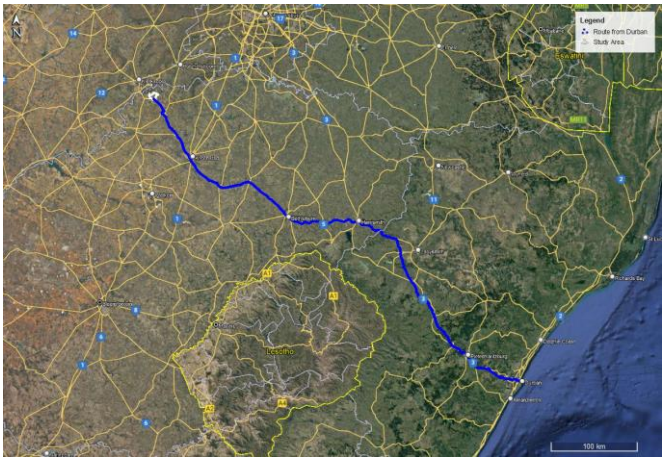


Figure 22: Route from Durban to the site

Route from Johannesburg to the Site – Normal loads

Normal loads will transport elements via the N1 highway from Johannesburg to the site. The distance from Johannesburg to the site is 192km and no road limitations are envisaged along the route for normal load freight as it will mainly follow national and provincial roads.

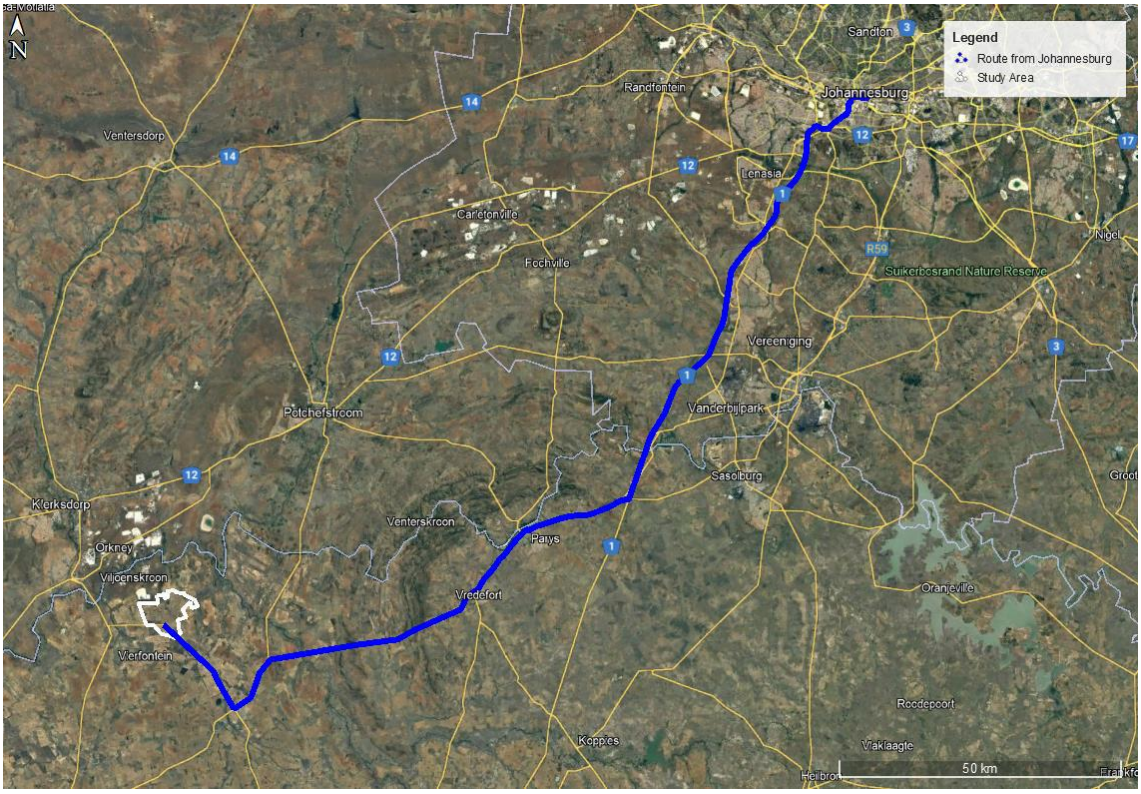


Figure 23: Route from Johannesburg to the site

Route from Johannesburg Area to Site – Abnormal Load

It is assumed that the transformer will be manufactured locally and be transported from the Johannesburg area to site. As the transformer will be transported with an abnormal load vehicle the route planning needs a more detailed investigation of the feasible routes, taking into account any limitations due to existing road structures. Furthermore, a load of abnormal dimensions may cause an obstruction and danger to other traffic and therefore the transformer needs to be transported as far as possible on roads that are wide enough for general traffic to pass. It is expected that the transformer can be transported to site via the same route used for normal loads.

There are several bridges and culverts along this route, which need to be confirmed for load bearing and height clearances. There will be several turns along the way and small towns to pass through. According to the desktop study, all turning movements along the route are manageable for the abnormal vehicle.

Route from Cape Town to the Site – Normal loads

The PV panels might be manufactured in the Cape Town area and transported to site. Normal loads will transport elements via the N1 highway from Cape Town to the site. The distance from Cape Town to the site is 1 270km and no road limitations are envisaged along the route for normal load freight.

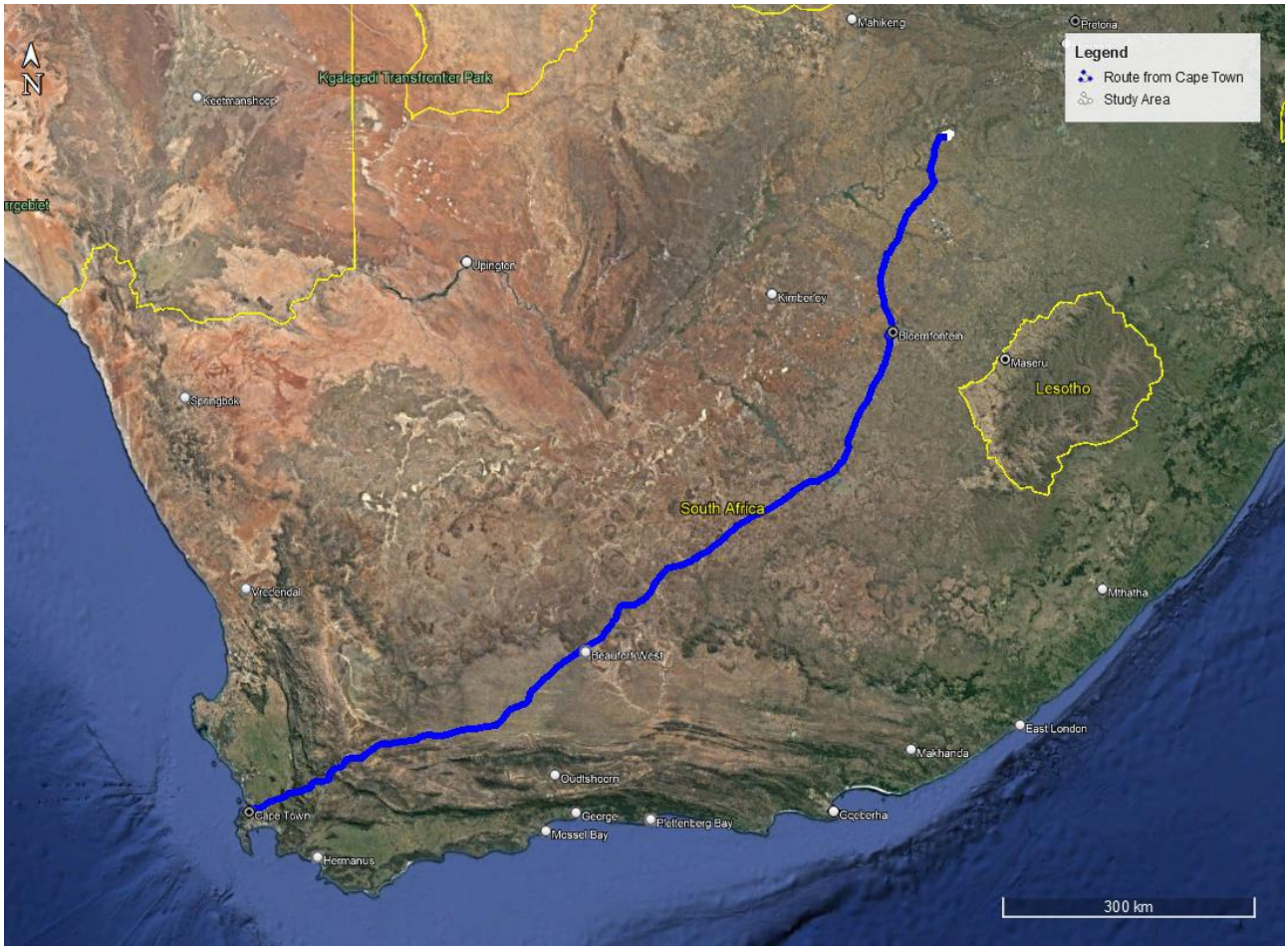


Figure 24: Route from Cape Town to the site

Main Route for the Transportation of Materials, Plant and People

It is envisaged that the majority of materials, plant and labour will be sourced from towns within a 50km radius of the proposed site and transported to the site via the R76 (during off peak hours only).

Should concrete batch plants (if required) or quarries not be available in the surrounding areas, mobile concrete batch plants and temporary construction material stockpile yards could be commissioned on vacant land near the proposed site. Delivery of materials to the mobile batch plant and the stockpile yard could be staggered to minimise traffic disruptions.

APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

Key legal requirements pertaining to the transport requirements for the proposed development are:

- 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.

ESTIMATE TRIPS GENERATED DURING THE CONSTRUCTION PHASE

The number of heavy vehicles per 7MW installation is estimated to range between 200 and 300 trips depending on the site conditions and requirements. For the 120MW, the total trips can therefore be estimated to be between 3 429 and 5 143 heavy vehicle trips, which will generally be made over a 12-month construction period. Choosing the worst-case scenario of 5 143 heavy vehicles over a 12-month period travelling on an average of 22 working days per month, the resulting daily number of vehicle trips is 20. In a rural environment, traffic during the peak hour accounts for roughly 20-40% of the average daily traffic i.e., 20-40% of the daily 20 vehicle trips generated by the facility will travel during the peak hour. This amounts to between 4 and 8 trips. The impact on general traffic on the R76 is therefore deemed nominal.

If the panels are imported instead of manufactured within South Africa, the respective shipping company will be able to indicate how the panels can be packed (for example using 2MW packages and 40ft containers). These can then be stored at the port and repacked onto flatbed trucks.

It is assumed that during the peak of the construction period, 200 employees will be active on site. Staff trips are assumed to be:

Table 30: Estimation of daily staff trips

Vehicle Type	Number of vehicles	Number of Employees
Car	10	15 (assuming 1.5 occupants)
Bakkie	20	30 (assuming 1.5 occupants)
Taxi – 15 seats	5	75
Bus – 80 seats	1	80
Total	**36**	**200**

It is difficult to accurately estimate the construction traffic for the transportation of materials as it depends on the type of vehicles, tempo of the construction, source/location of construction material etc. However, it is assumed that at the peak of construction, approximately 150 construction vehicle trips will access the site per day.

The total estimated daily site trips are shown in the table below.

Table 31: Estimation of daily site trips

Activity	Number of trips
Staff trips	36
Component delivery	20
Construction trips	150
Total	**206**

The impact on general traffic on the R76 is therefore deemed nominal as the 206 trips will be distributed across a 9 hr working day. The majority of the trips will occur outside the peak hours.

As components and other elements will be stored on site and on the laydown areas, many internal trips will occur on site during construction, i.e., dumpers will bring small equipment from laydown / storage area to site, cranes will lift structures / equipment to final locations, flat-bed trucks will be used to transfer equipment from laydown area to the construction site and telehandlers and cherry pickers will be used to support the work at heights. These trips are internal to the construction site and will not have an impact on the traffic on the surrounding road network.

The significance of the transport impact without mitigation measures during the construction phase can be rated as medium. However, considering that this is temporary and short term in nature, the impact can be mitigated to an acceptable level.

ESTIMATE TRIPS GENERATED DURING THE OPERATIONAL PHASE

Water is required to clean the solar panels. Should municipal water not be available, water will have to be transported to the site. The following assumptions have been made to estimate the resulting trips generated:

- 5 000 litre bowsers to be used for transporting the water
- Approximately 5 litres of water needed per panel

The total number of panels is estimated to be approximately 375 000. The total number of trips would be 375 for the 375 000 panels. Given the high number of vehicle trips, boreholes and on-site water storage tanks should be investigated to reduce this number of trips. Panels are generally cleaned up to four times a year. To further limit the impact of water related trips on the external roads, it is recommended to schedule these trips outside of peak traffic periods and to spread the cleaning of the panels over a week.

Traffic during the operational phase will be low (less than 10 trips) as trips will only be for occasional maintenance requirements and staff trips (assumed at 30 permanent staff).
The operational trips generated will be acceptable and will have a low to medium impact on the external road network.

IMPACTS IDENTIFIED IN THE TRAFFIC & TRANSPORTATION MANAGEMENT PLAN

Construction Phase

- Construction related traffic
- The construction traffic would also lead to noise and dust pollution.
- This phase also includes the construction of roads, excavations, trenching and ancillary construction works that will temporarily generate the most traffic.

Operational Phase

- During operation, it is expected that staff and security will visit the facility.
- Maintenance vehicles are expected on site at times.
- Should municipal water not be available, water will have to be transported to the site.

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

CONCLUSION OF THE TRAFFIC MANAGEMENT PLAN

- 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, however only 10 daily trips is expected.
- 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 construction phase of a development is the significant traffic generator and therefore noise and dust pollution will be higher during this phase. The duration of the phase is however 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 road to the facility will be the R76 and the proposed access point to the Hormah PV site will also be located on the R76. The access road and proposed access point are deemed feasible from a traffic and transportation 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 development is supported from a transport perspective provided that the recommendations and mitigations contained in this report are adhered to.
- The traffic impacts associated with the Hormah Solar PV1 facility are acceptable with the implementation of the recommended mitigation measures and can therefore be authorised.

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.

Background

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.

Screening Tool

According to the DFFE Screening Tool, there are two medium sensitivity areas located closer than 8km from the proposed solar PV plant site. This means that there is a possibility that the proposed PV facility will 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).

Unwanted RF signals

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.

Cabling on the DC side can act as an unintentional antenna radiating between 30MHz – 300kHz, assuming the typical length will be between 10 to 100 meters.

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.

Good practise RFI mitigation methods

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.

Clearance Zone

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. It is assumed that the inverters that will be used comply to CISPR11 Class A specification (57 dBµV/m @ 3m). The recommended clearance zones are listed below.

Table 32: RFI Clearance Zone Distances

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

Coverage map and typical sensitivities

The coverage map below shows the worst-case signal strength transmitted from Hormah PV1 (Tx) and received at Kopanang Gold Plant (Rx). The signal strength at Kopanang is -158.1 dBm.

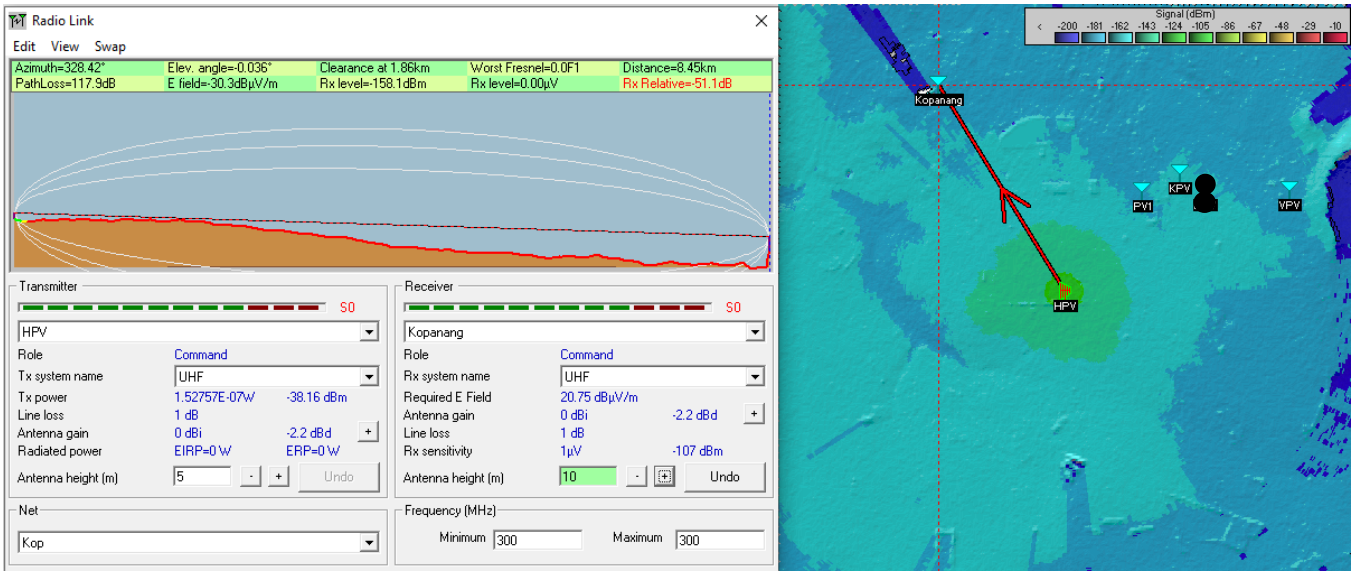


Figure 25: Signal strength coverage map between Hormah PV1 and Kopanang Gold Plant

Table 33: Possible EMI sensitive receivers with their respective sensitivities that can be used on site at Kopanang Gold Plant

Receiver	Sensitivity
LoRa	-130 dBm
Wifi (common 802.11g)	-85 dBm
GSM/LTE/GPRS	-102 dBm
UHF	-100 dBm
Bluetooth	-82 dBm

CONCLUSION OF THE RFI ASSESSMENT

Both areas identified by the DFFE Screening Tool were identified to be more than 7km away from the proposed PV site:

- Kopanang Gold Plant is 9.68 km away from Hormah PV1
- The second EMI sensitive area is situated on open farmland

The Hormah PV site does not have a direct line of sight to Kopanang gold plant and is further away than the required clearance zone. Pathloss over the distance between the Hormah PV site and the Kopanang Gold Plant is high enough for the PV facility to have no significant RFI or EMI impact on the electrical infrastructure at Kopanang Gold Plant.

The EMI sensitive receivers at the Kopanang Gold Plant will not be desensitised by the Hormah PV site.

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

CHAPTER 8: PUBLIC PARTICIPATION

8.1 Objectives of the Public Participation Programme

The main aim of public participation is to ensure transparency throughout the Basic Assessment 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 H.

The public participation programme (PPP) that is being 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. 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).

- ***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 with the various directly affected landowners of the 5x solar PV facilities within the Mercury PV Cluster on 18 November 2021. Minutes of these meetings are attached under Appendix H.

- ***Onsite notification***
  Three A2 laminated onsite notices were placed on 22 March 2022 at the following places:
  - The south-eastern corner of the Hormah PV site along the R76
  - 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 – 30 April 2022).

- ***Distribution of the Draft BAR***
  The Draft BAR (this document) is being 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 is being distributed for a 30-day (plus holidays) commenting period.
  - 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 is available on the Landscape Dynamics website (www.landscapedynamics.co.za) – detailed instructions on how to access these documents were provided in the said email.
  - A copy of the Draft BAR was made available at the Nostalgia Spa, Guesthouse & Gallery, Engelbrecht Street 62, Viljoenskroon (082 460 8627) - the availability of the hard copy of the Draft BAR at this location was mentioned in the abovementioned emails.
  - 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 will be included in the Final BAR. The Final BAR will be distributed for a further 30-day commenting *if* substantial changes to the BAR have been made that may impact on the rights of the IAPs.

  The Final BAR will be submitted to DFFE for their consideration for Environmental Authorisation.

8.3 Comment received during the Initial Advertising Period

A Background Information Document (BID) was distributed to all IAPs and a 30-day commenting period (31 March – 30 April 2022) applied.

Table 34: Comment received on the Background Information Document

South Africa Heritage Resource Agency: APM Assistant: Sityhilelo Ngcatsha **Response from Landscape Dynamics is provided in blue**
1. Archaeological sites spanning the Earlier, Middle and Later Stone Age have been found in the region despite the extensive agricultural transformation. Burial grounds were identified within the broader region, therefore, an archaeological field survey is recommended. The archaeological component of the HIA should follow the SAHRA 2007 Minimum Standards: Archaeological Component of Impact Assessment Report. 2. Given the identification of palaeontological sites near part of the study area and the indicators of fossil sensitivity identified during the Screening assessment, it is recommended that a palaeontologist conduct a field survey of the proposed solar PV areas. The report must comply with the 2012 Minimum Standards: Palaeontological Components of Heritage Impact Assessments. 3. Any other heritage resources as defined in section 3 of the NHRA that may be impacted, such as built structures over 60 years old, sites of cultural significance associated with oral histories, burial grounds and graves, graves of victims of conflict, and cultural landscapes or viewscapes must also be assessed. 4. The NEMA EIA documents and appendices must be submitted at the start of the public review periods in order for an informed comment to be issued that can be incorporated into the final reports for submission to the competent authority. 1. An archaeological field survey was undertaken and is discussed under Chapter 6 of this report and attached under Appendix F. Only one, *out of context*, artefact was found on the Hormah PV site and mitigation is not required. 2. A Palaeontology desktop assessment was undertaken and it concluded that the palaeontological heritage is extremely low and mitigation is not proposed. 3. A comprehensive HIA was undertaken and it concluded that no heritage, archaeological or palaeontological findings that require specific mitigation was identified and the project should, from a heritage perspective, proceed. 4. All NEMA documents will be submitted to SAHRA for their comment and record keeping as part of the public participation programme.

Department of Water & Sanitation: Office of the provincial head: Pule Joseph Lenong **Response from Landscape Dynamics is provided in blue**
1. The DWS confirmed receipt of the BID document and stated that it is receiving attention. 1. No further comment from DWS was received.

Department of Police, Roads & Transport: Assistant Director Land Acquisition: Mr Hannes Maree and Directorate Road Asset Management Systems: Mr JPW Maree

Response from Landscape Dynamics is provided in blue

1. The following provincial roads are being affected:
   - Vlakfontein Solar PV1
     - Secondary road S643 (statutory road reserve width of 25m)
     - Tertiary road T3762 (statutory road reserve width of 16m)
   - Kleinfontein Solar PV1
     - Tertiary roads T3762 and T4388 (statutory road reserve width of 16m)
   - Zaaiplaats Solar PV1
     - Secondary road S729 (statutory road reserve width of 25m)
   - Hormah Solar PV1
     - Primary road P15/2 (statutory road reserve width of 32m)
     - Secondary road S1294 (statutory road reserve width of 25m)
   - Ratpan Solar PV1
     - Primary road P15/2 (statutory road reserve width of 32m)
     - Secondary road S1294 (statutory road reserve width of 25m)

2. The Department supports the above-mentioned development subject to the following conditions:
   - 2.1 No structures may be erected within 95m, measured from the centre line of the provincial road without written approval for the relaxation of the building line (structures include any overhead power line that will be erected parallel with or across the alignment of a provincial road).
   - 2.2 The Department will only be able to consider and approve any specific access/es on receipt of a completed application and drawing that shows the geometric layout and exact locality of the access/es. An application form was attached. The application for access can be considered once a formal application has been submitted.
   - 2.3 The condition of the provincial gravel roads (secondary roads S642, S643, S729, S1294 and tertiary roads T3762 and T4388) is not in a good condition. The increase in traffic during the construction phase will require more intense routine maintenance and certain sections will have to be re-gravelled. Mulilo Renewable Project Developments (Pty) Ltd will therefore be required to carry out such maintenance at their expenditure.
   - 2.4 No provincial borrow pits may be utilised for construction of the development. The Department must be contacted to indicate the positions of the provincial borrow pits (there are no provincial borrow pits and on the properties affected by the Mercury Solar PV Cluster).

2.5 Applications for wayleave for any other operations, such as power lines, within the 95m measured form the centre line of the provincial roads, must be submitted on the similar application form as attached to their comment.

All of the above-mentioned conditions have been included in the EMPr.

SOLA Group: Jnr Project Developer Ms Abigail Forbes
Response from Landscape Dynamics is provided in blue

Ms Forbes requested to be registered as a stakeholder for the Mulilo Mercury Cluster PV Projects on the basis that SOLA is developing similar projects in the area. A kml of the development proposal was requested.

- Ms Forbes was added to the IAP register and the requested kml files were emailed.
- No further comment was received

Environamics: Senior EAP: Ms Lisa Opperman
Response from Landscape Dynamics is provided in blue

1. Ms Opperman requested to be registered as an IAP since they are the EAPs for the Phofu Solar Power Plant, which is just south of the proposed directly adjacent Ratpan PV1 facility.
2. The project information and access to any reports which have been released to the public to date were requested.

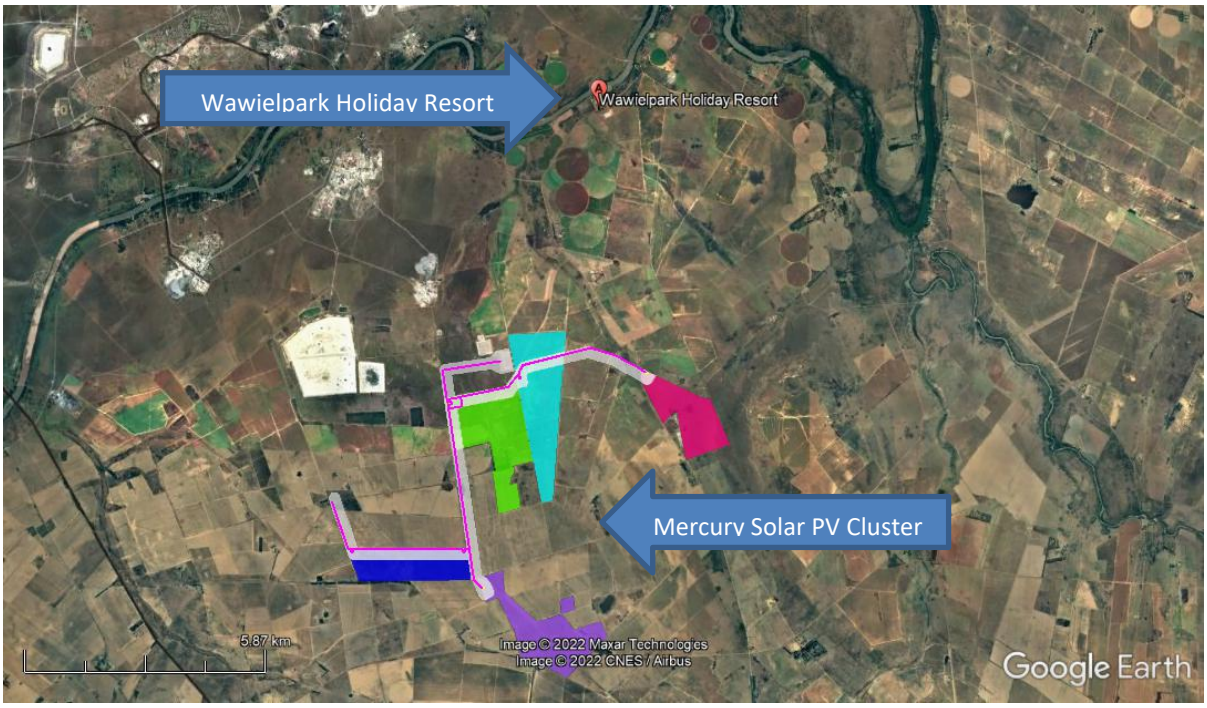
1. The IAP Register was updated with the contact details as requested.
2. The BID, which was the only documented distributed to date, was attached for their perusal and comment.
3. Landscape Dynamics requested to be added to the IAP Register for the Phofu Solar Power Plant project.

Adjacent landowner: The Remainder of the Farm Kleinfontein, No 369 and the Owner of Wawielpark Holiday Resort: Mr Hansie Muller. Comment written and submitted by Mr Hannes Ollewagen on behalf of Mr Hansie Muller.
Response from Landscape Dynamics is provided in blue

1. Mr Muller has in principle no objection to the development of solar PV facilities in the Viljoenkroon area.
2. It seems as if some of the proposed PV facilities are being planned on high quality crop land, which would most probably not being approved by the Department of Agricultural. Other solar developments in the area use grazing and not crop land for solar developments.

3. The Wawielpark Holiday Resort is situated to the north of the proposed Mercury solar PV Cluster and it should be determined what the impact of the developments will be on this holiday resort. The resort must be easily accessible at all times and construction of the solar PV facilities must not hinder access to this development at any time. Holiday resorts have suffered greatly during the last 2 years.

1. It is noted that Mr Muller has in principle no objection to the proposed solar PV development.
2. A comprehensive Agricultural Impact Assessment was undertaken for this project and the development proposal as submitted in the BID changed to specifically exclude high quality agricultural land. Further note that application has been made to the Department of Agriculture for No Objection letters, without which Environmental Authorisation will in all probability not being granted. High quality agricultural land will thus not be developed.
3. The Wawielpark Holiday Resort is approximately 6km away from the closest proposed solar PV facility. The resort is furthermore on the banks of the Vaal River and not in close proximity to the major routes that will be used during either the construction or operational period of the proposed solar PV facilities. A Traffic & Transport Management Plan was compiled by JG Afrika traffic engineers and it was concluded that, with the implementation of mitigation measures, the impact on the traffic during all phases of development will be low and acceptable. It is highly unlikely that access to the Wawielpark Holiday Resort will be hindered during all phases of the Mercury Solar PV Cluster development.



Harmony Gold Mining Company: Electrical Engineer – Renewable Energy: Mr Louis Botha
Response from Landscape Dynamics is provided in blue

1. Mr Botha requested to be registered as an IAP
2. The kml files of the proposed development was requested
3. Mr Botha phoned Landscape Dynamics and explained that a special procedure needs to be followed when power lines crosses land belonging to a mine.

1. Mr Botha and the Harmony mine is a registered IAP.
2. The requested kml files were emailed to Mr Botha
3. It is Landscape Dynamics' understanding that the following two properties may be affected (the white blocks on the map below):
    a. Remainder of the Farm, Moab, No 279
    b. The Farm Zaaiplaats, Portion 2, No 190

5. Landscape Dynamics requested Mr Botha in several emails to raise his concerns in writing or that a meeting with Mulilo can be arranged, but no further reply from Mr Botha was received.

Subsolar Energy (Pty) Ltd: Project Manager: Ms Hermien Slabbert
Response from Landscape Dynamics is provided in blue

Ms Slabbert requested to be added to the IAP register

- Subsolar was added to the IAP register as requested
- No further comment was received

8.4 Comment received on the Draft Basic Assessment Report

Comment received on the Draft BAR (this document) will be included in the Final BAR.

8.5 Conclusion of the Public Participation Programme

The main objective of the Public Participation Programme undertaken for this project is 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. At this stage all comment could be satisfactorily addressed. No objection to the development proposal was received.

Please note that the Final BAR will be distributed for a further 30-day commenting period *if* substantial changes to the BAR have been made that may impact on the rights of the IAPs. Alternatively, the Final BAR will be submitted to DFFE for approval/refusal without any further public input should the changes be non-substantial.

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

Planning and Design Phase

- Site Selection: Impact on environmental features (fauna, flora, bats, avifauna, aquatic heritage)
- Site Selection: Impact on farm workers
- Impact on avifauna
- Impact on visual resources
- Damage to adjacent farmlands due to flooding

Construction Phase

- Impact on fauna & flora
- Impact on avifauna
- Impact on bats
- Impact on freshwater features
- Risk of groundwater pollution
- Risk of erosion
- Impact on cultural landscape, archaeological and paleontological resources
- Impact on visual resources
- Agriculture
    - Damage to farmlands
    - Loss of agricultural potential by soil degradation

- Social impacts (negative)
    - Impact of construction workers on local communities
    - Influx of job seekers
    - Impact of an uncontrolled labour force
    - Risk to safety, livestock, and farm infrastructure
    - Increased risk of grass fires due to construction activities and influx of workers
    - Impacts associated with construction related activities such as noise and dust)
- Social impacts (positive)
    - Creation of employment and business opportunities
- Traffic impact

Post- Construction / Operational Phase

- Impacts of improper site clearance after construction
- Impacts associated with lack of rehabilitation
- Impacts on fauna & flora
- Impacts on avifauna
- Impacts on bats
- Impact on freshwater features
- Storm water management and erosion
- Impact on visual resources
- Agricultural impacts
    - Loss of agricultural potential by occupation of land
- Social impacts (negative)
    - Impact on property values
    - Impact on local tourism operations
- Social impacts (positive)
    - Implementation of clean, renewable energy infrastructure
    - Creation of employment and business opportunities and support for local economic development
    - Establishment of a Community Trust
    - Income generation for affected landowners
    - Opportunity to improve security
    - Increased financial security
    - Improved security
- Traffic impact

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.
- The proposed solar PV facility will be able to evacuate the solar generated electricity which will contribute towards improving South Africa's energy security.
- The proposed solar PV facility will be able to evacuate the solar generated electricity which will contribute towards improving South Africa's energy security and assist in alleviating load shedding.
- 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. 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 Hormah PV facility would be approximately 20 and the majority of low and semi-skilled beneficiaries are likely to be HD 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 for each negative impact is being 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 following could however be added:

- 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 and this impact can therefore be expected.
- The establishment of the proposed solar PV facility and the other renewable energy projects in the area 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 proposed in the area, including the proposed Mercury Cluster projects. The potential impact on local services associated can however be mitigated by employing local community members.
- These impacts should however 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.

The establishment of the Hormah PV facility and other renewable energy projects in the area also has 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.

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 EMPr.

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. Note that each impact table has been sorted on a separate page for ease of reading.

A summary of the tables is provided at the end of this chapter.

DESIGN AND PRE-CONSTRUCTION PHASE

Design Phase: Site Selection - Impacts on Fauna, Flora, Bats, Avifauna, Aquatic & Heritage

Impact Description

Environmentally insensitive site selection as well as insensitive infrastructure placement may have a severe negative impact on the natural environment and important and sensitive environmental features may be permanently lost.

Cumulative impact description

Insensitive placement of infrastructure may contribute to the environmental deterioration of the macro area. However, the detailed site selection process undertaken for the Mercury Solar PV Cluster ensured that the best possible sites were selected, presenting minimal disturbance combined with optimum economic feasibility. The cumulative impact for this component is therefore rated as low.

Mitigation

- Fauna, Flora-, Bat-, Avifauna-, Aquatic- and Heritage Impact Assessments were undertaken to determine any no-go and environmental sensitive areas as well as environmental constraints. The purpose is to avoid as far as possible sensitive plant communities, large / protected trees, bird nesting and bat roosting areas, water features as well as heritage sites.
- The final layout of the PV facility should avoid areas demarcated as having high sensitivity ratings and these areas should be protected from development. Please note that in the case of the Hormah PV1 facility, sensitive environmental features with a high sensitivity rating were not identified.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Site selection process: environmental features	Site	Long	Possible	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

Design Phase: Site Selection - Impact on farm workers

Impact Description

Farm workers may be displaced and job losses may occur if the solar PV development takes place on agricultural land. However, the Hormah PV site has not been cultivated for over 17 years and has been used for grazing purposes since that time. There are no accommodation facilities on the Hormah PV site:

- Farm workers will not be displaced by the proposed solar PV facility since labourers' accommodation will not be demolished.
- No farm workers will lose their jobs because of the proposed PV facility development

Cumulative impact description

When seen in context with the high unemployment rate of the Free State Province (estimated at 38.1%), any further job losses will be severe. However, job losses will not occur due to the development of the proposed Hormah PV facility.

Mitigation

None

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Impact on farm workers	Local	Medium	Unlikely	High	None	None

Impact on Irreplaceable Resources (*after* mitigation) If yes, please explain	Yes	**NO**

Cumulative impact rating (*after* mitigation) If high, please explain	**LOW / NONE**	Medium	High

Design Phase: Impact on visual resources

Impact Description

Insensitive design and placement of structures can alter the sense of place permanently and severely.

Cumulative impact description

The cumulative impact can be high if not mitigated properly.

Mitigation

- Design the PV project such that there is a 30m development exclusion buffer from all farm roads, a 50m development exclusion buffer from the R76 District Road and that the wetland and steep slopes areas (where applicable) are excluded from development.
- Placement of construction camps and laydowns should be at least 500m away from resident farm receptors and the R76 District Road.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Impact on visual resources	Local	Permanent	Probable	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

Design Phase: Impact on avifauna

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**

Cumulative impact rating (*after* mitigation) If high, please explain	**LOW**	Medium	High

Design Phase: Damage to adjacent farmlands due to flooding

Impact Description

The Social Impact Assessment states the following:

> "The affected property (Hormah 276/2) is not regarded as suitable for cultivation. However, the site is used for grazing and based on comments is prone to flooding. No dwellings are located on the property or in significant proximity. The owner indicated that he had not concerns with the proposed layout (John Gossayn, pers. comm). However, the owner of the adjacent property Barberspan 452/1 and 452/2 (located to the west) raised concerns linked to the risk of flooding for Barberspan which is located down gradient of the site. Barberspan 452/1 and 452/2 are considered high potential agricultural land and are extensively farmed. The concern is that site clearance during the construction phase and loss of vegetation associated with the shading effects from panels would increase the risk of flooding. Flooding would pose a risk to crops and compromise the long-term feasibility of using the affected portions of Barberspan for cropping. This in turn would impact on property values (Deon van Biljon – pers. comm)."

Cumulative impact description

The cumulative effect of loss of high potential farmland could be high negative if not properly mitigated.

Mitigation

- A Storm Water Management Plan (SWMP) must be prepared for the proposed Hormah PV site.
- The SWMP should specifically address the issue of flooding of the adjacent Barberspan,

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Damage to adjacent farmlands	Regional	Long	Possible	Yes	High	Low

Impact on Irreplaceable Resources (*after* mitigation) If yes, please explain • Loss of farmland, however, an effective SWMP can mitigate this impact	**YES**	NO

Cumulative impact rating (*after* mitigation) If high, please explain	**LOW**	Medium	High

CONSTRUCTION PHASE

Construction Phase: Impact on Fauna & Flora

Impact Description

Site clearing and preparation

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

Loss of Fauna & Flora

- 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

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

Site clearing and preparation

- The entire area to be developed must be clearly demarcated prior to initial site clearance and prevent construction personnel from leaving the demarcated area
- 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 monitor these areas.
- Any disturbed or eroded areas within the PV sites should be appropriately revegetated

Loss of Fauna & Flora

- 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.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Site clearing and preparation	Site	Short	Probable	Medium	Moderate	Low
Loss of fauna and flora	Site	Short	Probable	Medium	Moderate	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

Construction Phase: Impact on Avifauna

Impact Description

- Displacement of priority species due to **disturbance** associated with construction of the PV plant 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.

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 PV1 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.
- 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	Low
Displacement of priority species due to habitat transformation	Site	Short term	Probable	High	High	Low

Impact on Irreplaceable Resources (*after* mitigation) If yes, please explain The resources are not irreplaceable. There are no species of conservation concern at the PV site	Yes	**NO**

Cumulative impact rating (*after* mitigation) If high, please explain The PV site is highly transformed, which makes it generally unsuitable for species of conservation concern	**LOW**	Medium	High

Construction Phase: Impact on bats

Impact Description

Destruction or Disturbance of Bat Roosts

- During construction, operation, and decommissioning of the proposed infrastructure, bat roosts (roosting bats and/or roost sites) in buildings (including ruins), trees, and elsewhere could be disturbed or destroyed (e.g. from demolition activities, vegetation clearing, excavation works, and noise) if overlooked and/or not adequately avoided.

Destruction or Disturbance of Bat Foraging Habitat

- During construction and operation of the proposed infrastructure, bat foraging habitat including cultivated fields, weed-dominated grassy vegetation, trees, wetlands, and the seasonal streams (if applicable) will or may be destroyed or disturbed (e.g. from vegetation clearing, excavation works, construction of permanent infrastructure, and light pollution).

Cumulative impact description

Due to the general low sensitivity of the area for bats, the cumulative impact will be low.

Mitigation

The entire Hormah PV site has been rated as having a Low sensitivity to bats with some small areas having a Medium sensitivity rating (tree clumps) and the following mitigation is applicable:

- In Medium sensitive areas and elsewhere onsite, indigenous trees should remain undisturbed as far as possible.
- The infrastructure footprint should be minimised, and disturbed areas should be rehabilitated in all areas where development will take place.
- Light pollution should be minimised throughout the development footprint.
- Consideration should be given to burying power lines and other infrastructure where possible – provided this will not cause disturbance of streams, wetlands, and/or indigenous trees (if/where these occur).

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Impact on bats	Local	Short	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

Construction Phase: Impact on Freshwater Features

Impact Description

- Construction of the PV facility and associated infrastructure will require disturbance of the surface area and removal of vegetation cover for the preparation of the various project component footprints. The potential for these activities to impact on aquatic ecosystems is however very low because there are no aquatic features within the site and it is unlikely that the activities on the Hormah PV site will impact in any way on the wetlands on the adjacent proposed Ratpan PV site.
- A limited amount of water is utilised during construction. Concrete foundations will need to be constructed and a concrete batching area is required. A construction camp with a temporary laydown will also be setup. There is thus also the potential for some water quality impacts associated with the batching of concrete from hydrocarbon spills or associated with the other construction activities on site.
- Demand for water for construction could place stress on the existing available water resources. Water would be required for a 1–2-year period during the construction.

Cumulative impact description

Aquatic ecosystem deterioration is possible but unlikely.

Mitigation

- During the construction phase, site management must be undertaken at the laydown and construction sites. This should specifically address on-site storm water management and prevention of pollution measures from any potential pollution sources during construction activities such as hydrocarbon spills.
- Any storm water that does arise within the construction sites must be handled appropriately to trap sediments and reduce flow velocities.
- Given the limited water availability in the area, it is advised that water be obtained off-site for construction.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
General water quality impacts	Site	Short	Unlikely	High	Low	Low to None

Impact on Irreplaceable Resources (*after* mitigation) If yes, please explain	Yes	**NO**

Cumulative impact rating (*after* mitigation) If high, please explain	**LOW**	Medium	High

Construction Phase: Risk of groundwater pollution

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.

Cumulative impact description

- Medium (pollution may spread), however the application of mitigation measures will minimise this impact to acceptable levels.

Mitigation

Oil spills associated with construction activities

- Construction vehicles may only be serviced in a bunded area for emergency repairs only.
- 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).
- Storm water should not be discharged into the working areas and it should be ensured that storm water 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.
- Under no circumstances is contaminated water allowed to be released onto the land or any watercourse area.
- Procedures for pro-actives measures as well as incident reporting and corrective action during spillages and emergency situations are provided in the EMPr.

Construction techniques and methods of the Engineering Services Infrastructure

- Regular inspection of the construction site by the Project Engineer should take place to ensure that prescribed engineering specifications are followed.
- In order to prevent structural failure during the operational phase of the project (with subsequent risk to pollution of ground and surface water), the Project Engineer must inspect the foundation bedding of the pipelines (if applicable) before the pipes may be placed.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility	Significance	Significance

				of impact	without mitigation	after mitigation
Risk of groundwater pollution	Site	Short	Probable	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

Construction Phase: Risk of erosion

Impact Description

- The impact will occur where large areas of land are exposed and where storm water is allowed to cascade freely across the site.
- Construction vehicles and insufficient construction roads could also result in erosion.

Cumulative impact description

Medium (erosion may spread), however the application of mitigation measures will minimise this impact to acceptable levels.

Mitigation

- Access roads and site surfaces must be monitored for deterioration and possible erosion. Pro-active measures must be implemented to curb erosion and to rehabilitate eroded areas. All areas susceptible to erosion must be installed with temporary and permanent diversion channels and berms to prevent concentration of surface water and scouring of slopes and banks, thereby countering soil erosion.
- To reduce the risk of erosion, run-off over the exposed areas should be mitigated to reduce the rate and volume of run-off.
- Construction during the dry months of the year should be considered in order to overcome the problems caused by excessive moisture and prevent soil being washed away towards lower-lying areas.
- Rehabilitation and re-vegetation should preferably take place before commencement of the rainy season.
- Storm water control measures should be implemented especially around stockpiled soil, excavated areas, trenches etc. especially to avoid the export of soil into any water course.
- The storm water system must be constructed in such a way that the force of the water is broken to prevent any possibility of erosion taking place.
- Any erosion channels developed during the construction period or during site vegetation establishment period must be back-filled and compacted and the areas restored to a proper condition.
- The Contractor must at all times ensure that cleared areas are effectively stabilised to prevent and control erosion.
- Stockpiling of soils should take place as follows :-
    - Soil stockpiles must be protected from possible erosion, e.g. through covering of the stockpiles with tarpaulin and limiting the height and slope of the stockpile.
    - Soil stockpiles should not exceed 1m in height.
    - Soil stockpiles must be sufficiently away from drainage areas.
- Rehabilitation of any pipeline construction areas should take place as follows:-
    - All construction activities must be from sub-soil and must be replaced in the layers in which it was excavated (with the topsoil being the top-layer).
    - Excavations for trenches must be done portion by portion and covered as soon as a

section of the pipe had been laid.

- Shaping (to blend into the landscape) and stabilisation of slopes (where applicable) must be done via rock protection, topsoil redistribution, etc.

Impact Assessment

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

Construction Phase: Impact on Cultural landscape, Archaeological and Paleontological Resources

Impact Description

It is possible that cultural landscape-, archaeological and palaeontological resources may be impacted by the proposed development

- Cultural landscape consists of tree avenues along existing roads and around farm werfs
- Archaeological resources are known from the broader area and may be present within the cultivated fields
- According to the SAHRIS PalaeoSensitivity Map, the area proposed for development is underlain by sediments that have high and moderate palaeontological sensitivity.

Cumulative impact description

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, and Mercury Cluster's proximity to the existing Mercury Substation. Furthermore, this development is located within the Klerksdorp REDZ, an area that has been pre-identified as suitable for renewable energy development and as such, cumulative impact is expected in this area. The cumulative impact is rated as being Low.

Mitigation

Cultural landscape

- Retention of the tree avenues located along roads, access routes and farm boundaries where possible.
- Mitigation measures included in the VIA must be implemented.

Archaeology

- Should any buried 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.

Palaeontology

- The Chance Fossil Finds procedure as described in the EMPr must be implemented during the course of construction activities.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Cultural landscape	Site	Permanent	Possible	Irreversible	Moderate	Low
Archaeology	Site	Permanent	Possible	Irreversible	Moderate	Low
Palaeontology	Site	Permanent	Possible	Irreversible	Moderate	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

Construction Phase: Impact on visual resources

Impact Description

- The proposed 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.

Cumulative impact description

- Partial degradation of landscape resources that currently have some visual appeal where not exposed to background view of the northern mining landscapes.
- Partial change in land use from rural agricultural to that of a semi-industrial landscape.

Mitigation

Trees

- Medium-sized trees within the road buffers should be retained for visual screening, with further indigenous trees allowed to grow.
- Planting of medium-sized screening trees along the farm roads to assist in reducing the intensive, High Exposure views of the PV panels (10m spacing between trees is recommended).
- Site camps, BESS, generator units, etc. need to be screened by the planting of medium sized indigenous trees to allow for visual screening.

Buffers

- Retaining of a 30m buffer on the rural roads as a No-go development area.
- Retaining of a 50m buffer on either side of the R76 District Road as a No-go development area.
- In order to retain the functional rural agricultural sense of place of the region, the buffer areas around the PV site should be fenced off which could be used for cattle grazing to reduce the risk of fire.

Paint

- The buildings should be painted a grey-brown colour.

Fencing

- 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.

- The fencing around the PV area should be located around the PV panel areas and not extent to the road verge.

Dust

- Following the removal of the vegetation, windblown dust during construction should be monitored by the ECO to ensure that it does not become a nuisance factor to the local receptors. Should excessive dust be generated from the movement of vehicles on the roads such that the dust becomes visible to the immediate surrounds, dust-retardant measures should be implemented under direction from the ECO.

Lighting

- Lighting needs to be restrained and should be limited to strategic nodes/ office areas.
- Fencing should not have security lights at night.
- No overhead lighting should be utilised.

Signage

- Signage from the roads needs to be moderated and understated.

Impact Assessment

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

Impact on Irreplaceable Resources (*after* mitigation) If yes, please explain	Yes	**NO**

Cumulative impact rating (*after* mitigation) If high, please explain	Low	**MEDIUM**	High

Construction Phase: Damage to farmlands

Impact Description

The activities associated with the construction phase, such as establishment of access roads and the construction camp, movement of heavy vehicles and preparation of foundations for the solar facility and power lines will damage farmlands and result in a loss of farmlands for grazing.

Cumulative impact description

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.

Mitigation

The potential impacts associated with damage to, and loss of farmland can be effectively mitigated. The aspects that should be covered include:

- The loss of high-quality agricultural land should be avoided and or minimised by careful planning in the final layout of the proposed PV facilities. The recommendations of the agricultural / soil assessment should be implemented.
- The footprint associated with the construction related activities (access roads, construction platforms, workshop etc.) should be minimised.
- An 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 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
Damage to farmlands	Local	Medium	Probable	High (if land is rehabilitated)	Moderate	Low

Impact on Irreplaceable Resources (*after* mitigation) If yes, please explain • Loss of farmland, however, disturbed areas can be rehabilitated	**YES**	NO

Cumulative impact rating (*after* mitigation) If high, please explain	**LOW**	Medium	High

Construction Phase: Loss of agricultural potential by soil degradation

Impact Description

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

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 loss of agricultural land by soil degradation can be mitigated and the cumulative impact is therefore not significant.

Mitigation

- Storm water management and run-off control.
- Maintain vegetation cover wherever possible.
- Strip, stockpile and 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 soil degradation	Site	Long	Possible	Medium	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

Construction Phase: Impact of construction workers on local communities (social impact)

Impact Description

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.

Local farmers are in general not in favour of construction workers being accommodated on the site due to potential safety and security risks they pose.

Cumulative impact description

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.

Mitigation

- The proponent should prepare a Stakeholder Engagement Plan (SEP) and Community Health, Safety and Security Plan (CHSSP) prior to commencement of the 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 Moqhaka Local Municipality (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 contactor 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 over-night on the site.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Impact of construction workers on local communities	Local	Short term	Probable	No in case of HIV and AIDS	Moderate	Low

Impact on Irreplaceable Resources (*after* mitigation) If yes, please explain • Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	**YES**	NO

Cumulative impact rating (*after* mitigation) If high, please explain	**LOW**	Medium	High

Construction Phase: Influx of job seekers (social impact)

Impact Description

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.

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

Cumulative impact description

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.

Mitigation

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

- The proponent, in consultation with the MLM 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.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Influx of job seekers	Local	Permanent (for job seekers that may stay on in town)	Probable	No in case of HIV and AIDS	Low	Low

Impact on Irreplaceable Resources (*after* mitigation) If yes, please explain • Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	**YES**	NO

Cumulative impact rating (*after* mitigation) If high, please explain	**LOW**	Medium	High

Construction Phase: Impact of an uncontrolled labour force

Impact Description

- An influx of workers could result in an increased risk for crime and safety to the adjacent landowners.
- Uncontrolled labourers would cause disturbance to and destruction of natural habitat i.e. through placement of snares, cutting trees of firewood, etc.
- Damage to the farmers' property can have a severe economic as well as environmental impact.

Cumulative impact description

- When seen in context with other developments within the area, the cumulative impact may be severe. However, when mitigation measures have been applied the impact will be reduced to acceptable levels.

Mitigation

- Labourers should be trained in general principles of environmental management that includes the following :
  - Removal of agricultural products is prohibited.
  - No plants may be collected.
  - No firewood may be collected.
  - No open fires are to be made.
  - No wandering on adjacent properties is allowed.
  - No access to the watercourse areas is allowed.
  - No watercourse may be used for any purpose (i.e. drinking water, washing, laundry, etc.)
  - The veld may not be used for any toilet needs.
  - Secure accommodation facilities must be provided for guarding personnel (if applicable).
  - Supervision of labourers must at all times take place.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Uncontrolled labour force	Local	Short	Possible	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

Construction Phase: Risk to safety, livestock, and farm infrastructure (social impact)

Impact Description

The presence on and movement of construction workers on and off the site poses a potential safety threat to local famers 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 the construction phase would be higher if all of the PV facilities associated with the Southern Mercury 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.

Cumulative impact description

None, provided losses are compensated for.

Mitigation

- 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 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 loses and costs associated with fires caused by construction workers or construction related activities (see below).

- The EMPr 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 over-night on the site.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Risk to safety, livestock, and farm infrastructure	Local	Short	Probable	High (compensation paid for stock losses and damage to farm infrastructure etc.)	Moderate	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

Construction Phase: Increased risk of grass fires (social impact)

Impact Description

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 facilities are constructed concurrently. This is directly linked to the increase in construction related activities and number of construction workers on site.

Cumulative impact description

None, provided losses are compensated for

Mitigation

- The option of constructing a firebreak around the perimeter of the site prior to the commencement of the construction phase should be investigated.
- 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.
- The 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.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Increased risk of grass fires	Local	Short	Probable	High (compensation paid for stock and crop losses etc.)	Moderate	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

Construction Phase: Impacts associated with construction related activities (noise, dust, roads)

Impact Description

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 Viljoenskroon Road, S642 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 Mercury Southern 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.

Cumulative impact description

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 crop quality.

Mitigation

The potential impacts associated with heavy vehicles can be effectively mitigated:

- 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 the Viljoenskroon Road, S642 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 Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Noise, dust, damage to roads	Local	Short	Probable	High	Moderate	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

Construction Phase: Creation of employment, training and business opportunities (social impact)

Impact Description

Creation of employment and business opportunities during the construction phase

Cumulative impact description

Opportunity to up-grade and improve skills levels in the area is a high positive cumulative impact.

Mitigation

In order to enhance the positive impact of local employment and business opportunities the following measures should be implemented:

Employment

- Where reasonable and practical, the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area.
- Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria.
- Before the construction phase commences the proponent should meet with representatives from the MLM to establish the existence of a skills database for the area. If such as database exists, it should be made available to the contractors appointed for the construction phase.
- The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase of the project.
- Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase.
- The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.

Business

- The proponent should liaise with the MLM and CoMLM with regards the establishment of a database of local companies, specifically BBBEE companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work.
- Where possible, the proponent should assist local BBBEE companies to complete and submit the required tender forms and associated information.

- The MLM, in conjunction with the local business sector and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project.

Note that while preference to local employees and companies is recommended, it is recognised that a competitive tender process may not guarantee the employment of local labour for the construction phase.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Creation of employment and business opportunities	Local	Short term	Highly probable	N/a	Moderate positive	Moderate positive

Impact on Irreplaceable Resources (*after* mitigation) If yes, please explain	Yes	**NO**

Cumulative impact rating (*after* mitigation) If high, please explain	**LOW**	Medium	High

Construction Phase: Traffic Impact

Impact Description

Traffic congestion and delays on the surrounding road network due to an increase in traffic caused by the transportation of components, equipment, material and staff to site could occur. An increase in associated noise and dust pollution is expected.

The estimate daily site total site trips during the construction period are estimated to be 206 trips:

- Staff trips: 36
- Component delivery 20
- Construction trips 150

The impact on general traffic on the R76 is therefore deemed nominal as the 206 trips will be distributed across a 9 hr working day and the majority of the trips will occur outside the peak hours.

Cumulative impact description

Potential traffic congestion and delays on the surrounding road network and associated noise and dust 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 should be considered.
- 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 entire construction phase is required.
- Dust suppression of gravel roads during the construction phase, should be applied as and when required.
- The TMP should be updated when changes are made to the project that will affect the traffic on the surrounding road network and the transportation requirements of the project.
- A designated personnel member of the Contractor's team must be the custodian of the plan and the custodian must ensure that all personnel and subcontractors are trained to ensure compliance.
- The requirements of the TMP shall apply to all construction personnel and subcontractors appointed to provide vehicles, machinery or drivers.
- The Contractor is expected to review the TMP every four months or immediately after an incident, when corrective measures will be incorporated into the Plan.

Accommodation of Traffic

- The Contractor is to submit a detailed Traffic Accommodation Plan to the Project Engineer for approval, for the R76 and access road sections.
- Specifications must be strictly in accordance with the South African Road Traffic Signs Manual and in accordance with the relevant specifications of the project documents.
- The Contractor must ensure that provision is made for access by emergency vehicles, where required.

Emergency Preparedness and Incident Management

- Local emergency services shall be consulted prior to the start of the project to ascertain the availability and capacity of emergency services to attend to road and construction accidents associated with the Project.
- All hazards shall immediately be reported to the Site Manager who shall take the appropriate measures to avoid the occurrence of an incident or accident.
- Relevant staff shall be required to undertake first aid training and all project vehicles shall carry first aid supplies which should be adequate to cater for the number of passengers carried on the vehicle in question.
- An on-site emergency procedure shall be made available and implemented when an incident occurs.
- If an accident occurs off-site, it shall immediately be reported to the relevant emergency services.
- Records of all accidents, incidents and near misses shall be kept on site and mitigation measures shall be investigated.

Transport Coordinator

- It is recommended that a transport coordinator (or similar designation) be appointed to ensure compliance of the TMP. The coordinator shall make all the necessary arrangements to maintain the required traffic measures for the duration of the construction period.

Licensing

- All construction vehicles shall have the necessary licences, a valid roadworthy certificate and shall comply with the relevant traffic and transport licencing requirements (such as abnormal loads or hazardous materials).
- All drivers of vehicles shall have the requisite licences to operate any vehicle (or machinery) operated by them on site or on any public roads. Drivers' licenses must be applicable to the specific vehicle/machinery that is being used.

Construction Staff

- Staff and general trips should occur outside of peak traffic periods as far as possible.
- Consider scheduling shift changes to occur outside peak hours to concentrate staff trips in off peak periods.
- All staff shall be transported safely to site in appropriate vehicles. Staff shall not be allowed to be transported to site on the back of open trucks. Passenger vehicles shall not exceed the carrying capacity of the vehicle.

- Collections/Drop-off points for staff shall be located at a safe distance from traffic and construction activities. Roads and areas used by construction vehicles shall, as far as possible be avoided by all personnel. Designated pedestrian pathways shall be demarcated where appropriate.
- All staff shall receive the appropriate site safety induction training. Drivers shall be adequately trained in the identification and avoidance of road hazards, vehicle maintenance and care and safety requirements. All staff shall be informed of the construction site risks and training shall include appropriate precautionary measures required to be undertaken to facilitate safe and efficient traffic management (e.g., understanding signage, crossing roadways and utilising designated pedestrian pathways, reporting incidents).

Inspection of all Routes

- A "dry-run" of all routes is to be undertaken to identify any areas to avoid or obstacles that might disrupt the movement of the construction vehicles. All issues affecting the movement of construction vehicles are to be addressed immediately by the Contractor and relevant stakeholders e.g., law enforcement, relevant roads department and authorities.

Component Delivery

- The delivery of components to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.

Maintenance of vehicles

- All vehicles and construction plant shall be regularly maintained, repaired when necessary and inspected on a regular basis to ensure that the vehicles are in good working order. Construction and passenger vehicles shall be monitored to ensure that vehicles are not overloaded.

Maintenance of roads

- The Contractor shall maintain the road used by construction vehicles, repairing any damage caused by construction traffic to the surrounding road network.
- Dust suppression of gravel roads during the construction phase, as required.
- Road verges at the site shall be regularly maintained to ensure that vegetation remains short and that the roads serve as an effective firebreak.
- Any internal gravel roads will require grading with a grader to obtain a flat even surface and the geometric design of these gravel roads needs to be confirmed at detailed design stage. This process is to be undertaken by a civil engineering consultant or a geometric design professional.

Signage

- Signage, in accordance with the South African Road Traffic Signs Manual (SARTSM), will be required to be conspicuously placed at appropriate locations along all access roads, the

internal roads to the site and public roads used by construction vehicles (in consultation with the relevant traffic authorities) to indicate the following:

- all road and pedestrian hazards;
- site access
- site offices
- wayfinding signs on internal roads e.g. parking, toilets, emergency assembly point
- crossing points;
- speed limits;
- turning traffic;
- dedicated routes for construction vehicles and staff;
- no-go areas; and
- any traffic control information which may be relevant to the construction activity at the time.
- It is recommended that flagmen be implemented when high volumes of construction traffic are expected to help direct the traffic, thus ensuring the safe movement of the vehicles and reducing the potential conflicts.

Speed limit

- All drivers operating vehicles shall comply with the posted speed limits (or the maximum allowable speed as per the permit for abnormal load vehicles) on public roads as well as a proposed 30km/h speed limit within the construction site and access roads.
- The failure to adhere to the prescribed speed limits is an offence and disciplinary action may be taken by the Contractor.

Abnormal Loads

- Abnormal permits are required for vehicles exceeding the permissible maximum dimensions on road freight transport in terms of the Road Traffic Act (Act No. 93 of 1996).
- Abnormal Loads may be required which will necessitate an application to the Department of Transport and Public Works for a permit that will give authorisation for the conveyance of said load. A permit is required for each Province that the haulage route traverses.

Preferred Abnormal load route

- The preferred route should be surveyed to identify problem areas, e.g., intersections with limited turning radii and sections of the road with sharp horizontal curves or steep gradients that may require modification.
- After the road modifications have been implemented, it is recommended to undertake a "dry-run" with the largest abnormal load vehicle, prior to the transportation of any components, to ensure that the delivery will occur without disruptions. This process is to be undertaken by the haulage company transporting the components and the Contractor, who will modify the road and intersections to accommodate abnormal vehicles. It needs to be ensured that gravel sections (if any) of the haulage routes remain in good condition and will need to be maintained during the additional loading of the construction phase and reinstated after construction is completed.

- 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.

Impact Assessment

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

POST-CONSTRUCTION / OPERATIONAL PHASE

Post-Construction: Impacts of improper site clearance after construction

Impact Description

Improper clean-up of temporary site camps and construction areas after construction activities have been completed may result in wind-blown litter through a wide area, contamination of water sources from especially old oil drip trays and toilets, pieces of steel and wire may hurt animals, etc.

Cumulative impact description

If the Hormah PV1 facility and the adjacent proposed Ratpan PV1 facility are being constructed at the same time the cumulative impact can be high if not properly mitigated.

Mitigation

- After construction all building material, signs of excess concrete, equipment, site offices, ablution facilities, building rubble, refuse and litter must be removed and cleaned up from the construction site by the contractor.
- Items that can be used again should be recycled. Unusable waste steel and aluminium will be sold to scrap dealers for recycling at the Eskom stores.
- Once construction is completed, the contractor has to obtain written consent from the applicant that the construction site, construction areas, access routes, etc. are sufficiently and adequately cleared.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Improper site clearance	Site	Short	Probable	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

Post-Construction: Impacts associated with lack of rehabilitation

Impact Description

Areas disturbed during construction such as temporary access roads, construction site camps, temporary laydown areas, etc. which have not been rehabilitated could lead to further environmental damage, especially erosion.

Cumulative impact description

If the Hormah PV1 facility and the adjacent proposed Ratpan PV1 facility are being constructed at the same time the cumulative impact can be high if not properly mitigated.

Mitigation

- A Rehabilitation Plan must be compiled by a competent ecologist / landscape architect and must be implemented as stipulated. Rehabilitation of certain areas may take place during construction and the bulk of the rehabilitation will be after construction ends.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Lack of rehabilitation	Site	Short	Probable	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

Post-Construction / Operational Phase: Impacts on Fauna & Flora

Impact Description

Loss of Fauna & Flora

- 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 a 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.
- During the post-construction phase, artificial lighting must be restricted to security areas in order to minimise 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**

Cumulative impact rating (*after* mitigation) If high, please explain	**LOW**	Medium	High

Operational Phase: Impacts on avifauna

Impact Description

Mortality of priority species due to collisions with the solar panel

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. 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	None

Impact on Irreplaceable Resources (*after* mitigation) If yes, please explain • The resources are not irreplaceable. • There are no species of conservation concern at the PV site.	Yes	**NO**

Cumulative impact rating (*after* mitigation) If high, please explain • The PV site is highly transformed, which makes it generally unsuitable for species of conservation concern. • The collision impact is likely to be insignificant to start with.	**LOW**	Medium	High

Operational phase: Impact on bats

Impact Description

Displacement of Bats from Habitat

- Bats can potentially be impacted by the indirect effects of solar mirrors, transmission and distribution lines, power line utility poles, and associated infrastructure. The impacts may include the introduction of barriers to movement, habitat fragmentation, site avoidance/abandonment, disturbance, loss of population vigour, behavioural modification, creation of sub-optimal or marginal habitats, loss of refugia, and competition for resources.

Bat Collisions with Infrastructure

- In terms of fatal impacts on bats, solar farms are generally regarded as having relatively low impacts. PV panels can be confused for water sources by bats. While this is somewhat concerning in areas where alternative water sources are not available, there is no evidence to suggest that this results in bat fatalities, as bats seem to merely land on the panels for a short period of time, and then fly off once they realise the panels are not bodies of water. The polarised light reflected off PV cells may result in the congregation of insects, which may attract insectivorous bats using the PV fields for foraging. Frugivorous bats may be impacted by power line collisions due to their larger size relative to the smaller insectivorous bats. However, as there are no known records of fruit bats in the immediate vicinity of the site, this is a minor concern for the Mercury Solar PV cluster.

Cumulative impact description

Due to the general low sensitivity of the area for bats, the cumulative impact will be low.

Mitigation

- Light pollution should be minimised throughout the development footprint.
- Consideration should be given to burying power lines and other infrastructure where possible – provided this will not cause disturbance of streams, wetlands, and/or indigenous trees (if/where these occur).

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Impact on bats	Local	Short	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

Operational Phase: Impact on Freshwater Features

Impact Description

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

- Water supply and sanitation services will be required during the operational phase. The water could potentially be provided from groundwater without any aquatic ecosystem impacts.
- The proposed PV facility will operate largely unattended and with low maintenance required for more than 20 years. The hard surfaces created by the developments may lead to increased runoff, in particular on surfaces with a steeper gradient. This may lead to increased erosion and sedimentation of the downslope areas. A localised long-term impact (more than 20 years) of low intensity could be expected that would have a very low overall significance post-mitigation in terms of its impact on the identified aquatic ecosystems in the area.
- The only potentially toxic or hazardous materials which would be present in relatively small amounts would be lubricating oils and hydraulic and insulating fluids. Therefore, contamination of surface or groundwater or soils is highly unlikely. There are low to no water consumption impacts associated with the operation of the proposed PV infrastructure.

Cumulative impact description

There are no water features, such as wetlands, rivers or streams on the Hormah PV site and the cumulative impact is none.

Mitigation

- The use of borehole water during the operational phase needs to be investigated; however, boreholes should not be sited within or immediately adjacent to wetlands (i.e. close to the wetland on the adjacent proposed Ratpan PV1 facility).
- 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 EMPr for the project.
- Storm water runoff infrastructure must be designed to mitigate both the flow and water quality impacts of any storm water leaving the developed areas. The runoff should be dissipated over a broad area covered by natural vegetation or managed using appropriate shaping with berms or channels and swales adjacent to hardened surfaces where necessary.
- 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 the ecological condition of aquatic ecosystems; modification of flow and water quality; erosion; and alien vegetation invasion in aquatic features	Site	Short	Possible	High	Low	None

Impact on Irreplaceable Resources (*after* mitigation) If yes, please explain	Yes	**NO**

Cumulative impact rating (*after* mitigation) If high, please explain	**LOW to NONE**	Medium	High

Operational Phase: Storm water management and Erosion

Impact Description

Storm water 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

Ineffective storm water management will have a negative impact on adjacent farmlands and may concern erosion and, when seen in context with the other PV facilities in the area the cumulative impact may be high if not properly mitigated.

Mitigation

- A storm water management plan is to be implemented during the operation of the facility. The plan must ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion. The plan must include the implementing 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.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Storm water management and erosion	Site	Medium	Probable	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

Operational Phase: Impact on visual resources

Impact Description

Given the long-time operational period 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.

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.
- Lights at night have the potential to significantly increase the visual exposure of the proposed project and general mitigation should be employed to reduce light pollution.
- The security fencing around the PV panels should not have security lighting.
- No overhead lighting can be used.
- Continued erosion control and management of dust.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Loss of landscape character	Local	Long	Probable	High	Moderate	Low
Visual intrusion from Key Observation Points	Local	Long	Probable	High	Moderate	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

Operational Phase: Loss of agricultural potential by occupation of land

Impact Description

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.

Cumulative impact description

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 loss of agricultural land by occupation is only during the lifetime of the project (20 – 30 years) and is not significant.

Mitigation

None possible

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Loss agricultural potential by occupation of land	Site	Long	Definite	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

Operational Phase: Impact on property values

Impact Description

The areas rural sense of place has been impacted by existing mining operations to the north and electrical infrastructure. The potential visual impact of the proposed PV facility on property values is therefore likely to be negligible. However, the loss of productive farmland and potential risk of flooding to Barberspan 452/1 and 452/2 located to the west of the Hormah PV site are a concern. These risks do have the potential to impact on property values.

Cumulative impact description

If the proposed development lowers the property value of the directly adjacent land, the value of the properties of the area may be affected.

Mitigation

- The loss of high-quality agricultural land should be avoided and or minimised by careful planning in the final layout of the proposed PV facilities. The recommendations of the agricultural / soil assessment should be implemented.
- A storm water management plan should be prepared for the proposed Hormah PV site and impact on the adjacent farmlands must be avoided.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Impact on property values	Local	Long	Probable	High	Moderate	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

Operational Phase: Impact on local tourism operations

Impact Description

The areas rural sense of place has been impacted by the existing mining operations to the north and electrical infrastructure. The potential for the proposed PV facility to impact on tourism sector and the perception of visitors to the area is therefore likely to be negligible.

Cumulative impact description

Potential impact on current rural sense of place

Mitigation

- The recommendations contained in the VIA should be implemented.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Impact on local tourism operations	Local	Long	Probable	High (PV facility can be removed)	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

Operational Phase: Implementation of clean, renewable energy infrastructure

Impact Description

South Africa has one of the most carbon-intensive economies in the world, thus making the greening of the electricity mix a national imperative. Within this context the study notes that the green economy could be an extremely important trigger and lever for enhancing a country's growth potential and redirecting its development trajectory in the 21st century.

Generation of electricity by means of a renewable resource provides an ideal means for reaching emission reduction targets in a relatively easy manner. In addition, and of specific relevance to South Africa, sun as energy source is not dependent on water (as compared to the massive water requirements of conventional power stations), poses limited pollution and health risks, specifically when compared to coal and nuclear energy plants.

Cumulative impact description

The cumulative impact is high positive:

- Overall reduction in CO_2 emission;
- Reduction in water consumption for energy generation; and
- Contribution to establishing an economically viable commercial renewables generation sector in the Free State and South Africa.

Mitigation

- Mitigation not required

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Implementation of renewable energy facilities	National	Long	Highly probable	Positive impact will be reversed if facility is decommissioned	High Positive	High Positive

Impact on Irreplaceable Resources (*after* mitigation) If yes, please explain	Yes	**NO**

Cumulative impact rating (*after* mitigation) If high, please explain	Low	Medium	**HIGH POSITIVE**

Operational Phase: Creation of employment and business opportunities and support for local economic development

Impact Description

A single PV facility could create ±20 permanent employment opportunities for over a 20+ year period. Additional temporary employment opportunities will also be created, linked to maintenance and cleaning of solar panels etc. Most of the employment opportunities associated with the operational phase is likely to benefit historically disadvantage members of the community. However, given that the solar energy sector in South Africa is relatively new, several of the skilled positions may need to be filled by people from other parts of South Africa.

It will also be possible to increase the number of local employment opportunities through the implementation of a skills development and training programme linked to the operational phase. Such a programme would support the strategic goals of promoting local employment and skills development contained in the MLM IDP.

Given the location of the proposed facility most of permanent staff is likely to reside in Klerksdorp and local towns in the area. In terms of accommodation options, a percentage of the non-local permanent employees may purchase houses, while others may decide to rent. Both options would represent a positive economic benefit for the region. A percentage of the monthly wage bill earned by permanent staff will be spent in the regional and local economy. This will benefit local businesses in the relevant towns. The benefits to the local economy will extend over the anticipated 20+ year operational lifespan of the project.

The local hospitality industry is also likely to benefit from the operational phase. These benefits are associated with site visits by company staff members and other professionals (engineers, technicians etc.) who are involved in the company and the project but who are not linked to the day-to-day operations.

Cumulative impact description

Creation of permanent employment and skills and development opportunities for members from the local community and creation of additional business and economic opportunities in the area is a high positive cumulative impact.

Mitigation

The positive impact can be enhanced by implementing the following enhancements:

- Implement a skills development and training programme aimed at maximising the number of employment opportunities for local community members.
- Maximise opportunities for local content, procurement, and community shareholding.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Creation of employment and business opportunities	Regional	Long	Probable	If the project doesn't go ahead this positive impact will not be realised	Low positive	Medium positive

Impact on Irreplaceable Resources (*after* mitigation) If yes, please explain	Yes	**NO**

Cumulative impact rating (*after* mitigation) If high, please explain	Low	Medium	**HIGH POSITIVE**

Operational Phase: Establishment of a Community Trust

Impact Description

The REIPPPP requires IPPs to contribute a percentage of projected revenues accrued over the 20+ year project operational life toward Socio-economic Development (SED) initiatives. These contributions are linked to Community Trusts and accrue over the operational life and are used to invest in housing and infrastructure as well as healthcare, education, and skills development. The revenue from the proposed PV facility can be used to support a number of social and economic initiatives in the area, including:

- Creation of jobs
- Education
- Support for and provision of basic services
- School feeding schemes
- Training and skills development
- Support for SMMEs

It is clear that the establishment of Community Trusts associated with renewable energy projects create significant benefits for local rural communities. However, Community Trusts can also be mismanaged. This is an issue that will need to be addressed when setting up the Trust.

Cumulative impact description

The cumulative impact is the promotion of social and economic development and improvement in the overall well-being of the community.

Mitigation

In order to maximise the benefits and minimise the potential for corruption and misappropriation of funds the following measures should be implemented:

- The MLM should liaise with the proponents of other renewable energy projects in the area to investigate how best the Community Trusts can be established and managed so as to promote and support local, socio-economic development in the region as a whole.
- The MLM should be consulted as to the structure and identification of potential trustees to sit on the Trust. The key departments in the MLM that should be consulted include the Municipal Managers Office, IDP Manager and LED Manager.
- Clear criteria for identifying and funding community projects and initiatives in the area should be identified. The criteria should be aimed at maximising the benefits for the community as a whole and not individuals within the community.
- Strict financial management controls, including annual audits, should be instituted to manage the funds generated for the Community Trust from the SEF plant.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Establishment of a Community Trust	Regional	Low	Probable	If the project doesn't go ahead this positive impact will not be realised	Moderate Positive	High positive

Impact on Irreplaceable Resources (*after* mitigation) If yes, please explain	Yes	**NO**

Cumulative impact rating (*after* mitigation) If high, please explain	Low	Medium	**HIGH POSITIVE**

Operational Phase: Income generation for affected landowners

Impact Description

The proponent will be required to enter into rental/lease agreements with the affected landowners for the use of the land for the establishment of the proposed PV facilities. The additional income will assist to reduce the risk to farm livelihoods posed by droughts and fluctuating market prices for livestock, maize, and farming inputs, such as fuel, feed etc. The creation of a guaranteed income over a 20+ year period significantly benefits the affected landowners. However, the income from the PV facility must compensate for the lost income generated by the current farming operations.

Cumulative impact description

Support for local agricultural sector and farming

Mitigation

Mitigation is not required.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Income generation for landowner	Local	Long	Probable	If the project doesn't go ahead this positive impact will not be realised	Low Positive	Medium positive

Impact on Irreplaceable Resources (*after* mitigation) If yes, please explain	Yes	**NO**

Cumulative impact rating (*after* mitigation) If high, please explain	Low	Medium	**HIGH POSITIVE**

Operational Phase: Opportunity to improve security

Impact Description

The establishment of the proposed PV facility will include the provision of security to protect the facility. This will create an opportunity to improve security in the area which would benefit local landowners. The presence of maintenance personnel on the site and travelling in the area will also create opportunities to monitor local conditions and work with local farming associations to address security and safety issues.

Cumulative impact description

Improve of security against stock theft and other crime will have a positive cumulative impact.

Mitigation

- The proponent should prepare a Community Health, Safety and Security Plan (CHSSP) prior to commencement of construction phase.
- The CHSSP should be prepared in consultation with local farmers in the area and discuss opportunities to coordinate security related activities.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Opportunity to improve security	Local	Long	Probable	If the project doesn't go ahead this positive impact will not be realised	Moderate positive	High positive

Impact on Irreplaceable Resources (*after* mitigation) If yes, please explain	Yes	**NO**

Cumulative impact rating (*after* mitigation) If high, please explain	Low	Medium	**HIGH POSITIVE**

Operational Phase: Increased financial security

Impact Description

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 the energy facility. This is likely to increase their cash flow and financial security and could improve farming operations and productivity through increased investment into farming.

Cumulative impact description

Enhanced agricultural potential through increased financial security for farming operations

Mitigation

None

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Increased financial security	Site	Long	Possible	High	Positive	Positive

Impact on Irreplaceable Resources (*after* mitigation) If yes, please explain	Yes	**NO**

Cumulative impact rating (*after* mitigation) If high, please explain	**LOW**	Medium	High

Operational Phase: Traffic impact

Impact Description

Potential traffic congestion and delays on the surrounding road network as well as an increase in noise pollution could be expected due to an increase in traffic caused by staff trips, water deliveries and trips for maintenance requirements.

Traffic during the operational phase will however be low (less than 10 trips per day) as trips will only be for occasional maintenance requirements and staff trips (assumed at 30 permanent staff).

The operational trips generated will be acceptable and will have a low to medium impact on the external road network.

Cumulative impact description

The increase in traffic on roads could cause congestion which could lead 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.

- *Traffic & Transport Management Plan*
    - A copy of the TMP must be kept at the facility and a designated employee will ensure that the plan is enforced and will make sure that the Plan is available to all relevant personnel and external maintenance/repair teams.
    - The Facility Manager (or equivalent designation) is expected to review the TMP annually or immediately after an incident, when corrective measures will be incorporated into the Plan.

- *Cleaning of panels*
    - Staff and general (maintenance) trips should occur outside of peak traffic periods as far as possible.
    - Should municipal water not be available, water will have to be transported to the site.
    - The provision of onsite water tanks will reduce traffic flow.
    - Water bowsers trips should occur outside of peak traffic periods as far as possible.
    - Using a larger water bowser will also reduce traffic flow.

- *Maintenance of roads*
    - Any gravel roads used by vehicles visiting the facility during the operational phase must be maintained and repaired when damaged, if and where required.
    - Dust suppression of any gravel roads during the operational phase must take place if and where required.

Impact Assessment

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

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 mitigated 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 thén relevant legislation.

9.5 Conclusion of Impact Assessment

9.5.1 Summary of Impact Assessment Tables

Table 35: Summary of Impact Assessment Tables

Design and Pre-construction Phase

Impact Description	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Site Selection: Impact on environmental features	Site	Long	Possible	High	High	Low
Site Selection: Impact on farm workers (job losses)	Local	Medium	Unlikely	High	None	None
Impact on avifauna	Site	Long	Possible	High	Low	Low
Impact on visual resources	Local	Permanent	Probable	High	High	Low
Flooding of adjacent farmlands	Regional	Long	Possible	High	High	Low

Construction Phase

Impact Description	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Impact on fauna and flora	Site	Short	Probable	Medium	Low	Very Low
Birds: disturbance	Site	Short	Probable	High	High	Low
Birds: habitat transformation	Site	Short	Probable	High	High	Low
Impact on bats	Local	Short	Possible	High	Low	Low
Impact on freshwater features	Site	Short	Unlikely	High	Low	None
Risk of groundwater pollution	Site	Short	Probable	High	High	Low
Risk of erosion	Site	Short	Possible	High	Moderate	Low
Cultural, Archaeology and Palaeontology	Site	Permanent	Possible	Irreversible	Moderate	Low
Impact on visual resources	Site	Short	Probable	High	High	Medium
Damage to farmlands	Local	Medium	Probable	High	Moderate	Low
Impact of construction workers on local communities	Local	Short	Probable	No in case of HIV and AIDS	Moderate	Low to none
Influx of job seekers	Local	Permanent	Probable	No in case of HIV and AIDS	Low	Low
Risk to safety, livestock and farm infrastructure	Local	Short	Probable	High	Moderate	Low
Increased risk of grass fires	Local	Short	Probable	High	Moderate	Low
Noise, dust, damage to roads	Local	Short	Probable	High	Moderate	Low
Creation of employment and business opportunities	Local	Short	Highly Probable	N/a	Medium positive	Medium positive
Traffic impact	Local	Short	Probable	High	Moderate	Low

Operational phase

Impact Description	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Improper site clearance after construction	Site	Short	Probable	High	High	Low
Lack of rehabilitation	Site	Short	Probable	High	High	Low
Impacts on fauna and flora	Site	Medium	Unlikely	Medium	Moderate	Low
Impacts on avifauna	Site	Long	Possible	High	Low	None
Impacts on bats	Local	Short	Possible	High	Low	Low
Impact on freshwater features	Site	Short	Possible	High	Low	None
Storm water management and erosion	Site	Medium	Probable	High	High	Low
Impact on visual resources	Local	Long	Probable	High	Moderate	Low
Loss agricultural potential by occupation of land	Site	Long	Definite	High	Low	Low
Impact on property values	Local	Long	Probable	High	Moderate	Low
Impact on local tourism operations	Local	Long	Probable	High	Low	Low
Implementation of renewable energy facilities	National	Long	Highly probable	Positive impact will be reversed if facility is decommissioned	High Positive	High Positive
Creation of employment and business opportunities	Regional	Long	Probable	If the project doesn't go ahead this positive impact will not be realised	Low positive	Medium positive
Establishment of a Community Trust	Regional	Low	Probable	If the project doesn't go ahead this positive impact will not be realised	Moderate Positive	High positive
Income generation for landowner	Local	Long	Probable	If the project doesn't go ahead this positive impact will not be realised	Low Positive	Medium positive
Opportunity to improve security	Local	Long	Probable	If the project doesn't go ahead this positive impact will not be realised	Moderate positive	High positive
Increased financial security	Site	Long	Possible	High	Positive	Positive
Traffic congestion	Local	Short	Probable	High	Moderate	Low

9.5.2 Conclusion

- As can be seen from the summary tables above, while some potential impacts had a moderate or high significance rating prior to mitigation, all permanent identified impacts can be mitigated to acceptable levels (i.e. Low significance).
- Apart from the visual resources, all temporary impacts during the construction period, which has a medium significance after mitigation, can be mitigated to acceptable levels.
- 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 EMPr, which means that the Applicant is legally bound to follow the recommendations should the EA be granted.

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.

Hormah solar PV EMPr

The EMPr as provided under Appendix I has been compiled according to the above-mentioned stipulations.

Mitigation as proposed by the specialists, and other, is all included in the EMPr.

Mitigation is provided in table format under the following headings:

Impact management outcome:		
Mitigation / Management actions	**Implementation** Responsible person	**Monitoring**

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

BIOPHYSICAL ENVIRONMENT

Terrestrial Biodiversity

The Hormah PV site falls within Vegetation Unit 4: Cultivated Fields which comprises of old, cultivated fields that have been left fallow. As a result, the site is in an early secondary successional phase dominated by a large number of pioneer weedy species that covers approximately 90% of the assessment area.

The Hormah PV site is completely transformed with no natural vegetation resembling the original vegetation present in the area. This site has been transformed due to cultivation and as a result has a **low conservation value, a low ecological sensitivity and a low ecosystem functioning**.

Freshwater features

There are no aquatic features on the Hormah PV site and the adjacent depression wetland will not be impacted on by the development.

Avifauna

The Hormah PV site contains no confirmed habitat for bird species of conservation concern listed as Critically Endangered, Endangered or Vulnerable. The study area is classified as having a **Low sensitivity for avifauna**.

Bats

The proposed Mercury Solar PV cluster will not cause significant impact to bat populations in the area. Any impacts to bats due to construction, operation, and decommissioning of the proposed infrastructure will be **relatively Low**.

CULTURAL / HISTORICAL ENVIRONMENT

Heritage, archaeology and palaeontology

No heritage, archaeological or palaeontological findings that require specific mitigation was identified and the area is in general rated as having a **Low sensitivity** for heritage resources.

SOCIAL ENVIRONMENT

Social environment

The development of the Hormah solar PV facility will create employment and business opportunities for locals during both the construction and operational phase of the project. All of the potential negative impacts can be effectively mitigated.

The establishment of a Community Trust will also benefit the local community in the area. The significance of this impact is rated as High Positive.

The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the negative environmental and socio-economic impacts associated with a coal-based energy economy and the challenges created by climate change, represents a significant positive social benefit for society as a whole. The REIPPPP has resulted in significant socio-economic benefits, both at a national and 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.

Visual resources

While landscape resources are not significant such that a fatal flaw is proposed, risks to landscape integrity of a rural agrarian area that has medium levels of scenic quality could take place. Visual 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. Mitigation would reduce the visual intrusion of the solar PV project and retain the rural sense of place along the narrow farm roads. The overall significance of the **visual change of the landscape is rated as being Low.**

AGRICULTURE

Agriculture

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 development has limited agricultural production potential.
- The amount of agricultural land loss for the Hormah PV development is within the allowable development limits prescribed by the agricultural protocol.
- The proposed development offers positive impact on agriculture by way of improved financial security for farming operations, as well as security benefits against stock theft and other crime.

- The PV panels will not totally exclude agricultural production. The area can still be used to graze sheep that will, in addition, be protected against stock theft within the security area of the facility.
- The loss of agricultural potential by occupation of land is not permanent. The land will become fully available again for agricultural production once the proposed activity ceases.
- The proposed development poses a low risk in terms of causing soil degradation, which can be adequately and fairly easily managed by standard, best practice mitigation management actions.
- The proposed development is within a REDZ, which is an area that has specifically been designated within South Africa for the prioritisation of renewable energy development.
- The proposed development will also have the wider societal benefits of generating additional income and employment in the local economy.

Because of the above factors, 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 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. At this stage all comment could be satisfactorily addressed. No objection to the development proposal was received.

Please note that the Final BAR will be distributed for a further 30-day commenting period *if* any substantial changes to the BAR have been made that may impact on the rights of IAPs. Alternatively, the Final BAR will be submitted to DFFE for approval/refusal without any further public input should the changes be non-substantial.

IMPACT ASSESSMENT

Summary of the impact assessment tables

Design and Pre-construction Phase

Impact Description	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Site Selection: Impact on environmental features	Site	Long	Possible	High	High	Low
Site Selection: Impact on farm workers (job losses)	Local	Medium	Unlikely	High	None	None

Impact on avifauna	Site	Long	Possible	High	Low	Low
Impact on visual resources	Local	Permanent	Probable	High	High	Low
Flooding of adjacent farmlands	Regional	Long	Possible	High	High	Low

Construction Phase

Impact Description	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Impact on fauna and flora	Site	Short	Probable	Medium	Low	Very Low
Birds: disturbance	Site	Short	Probable	High	High	Low
Birds: habitat transformation	Site	Short	Probable	High	High	Low
Impact on bats	Local	Short	Possible	High	Low	Low
Impact on freshwater features	Site	Short	Unlikely	High	Low	None
Risk of groundwater pollution	Site	Short	Probable	High	High	Low
Risk of erosion	Site	Short	Possible	High	Moderate	Low
Cultural, Archaeology and Palaeontology	Site	Permanent	Possible	Irreversible	Moderate	Low
Impact on visual resources	Site	Short	Probable	High	High	Medium
Damage to farmlands	Local	Medium	Probable	High	Moderate	Low
Impact of construction workers on local communities	Local	Short	Probable	No in case of HIV and AIDS	Moderate	Low to none
Influx of job seekers	Local	Permanent	Probable	No in case of HIV and AIDS	Low	Low
Risk to safety, livestock and farm infrastructure	Local	Short	Probable	High	Moderate	Low
Increased risk of grass fires	Local	Short	Probable	High	Moderate	Low
Noise, dust, damage to roads	Local	Short	Probable	High	Moderate	Low
Creation of employment and business opportunities	Local	Short	Highly Probable	N/a	Medium positive	Medium positive
Traffic impact	Local	Short	Probable	High	Moderate	Low

Operational phase

Impact Description	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Improper site clearance after construction	Site	Short	Probable	High	High	Low
Lack of rehabilitation	Site	Short	Probable	High	High	Low
Impacts on fauna and flora	Site	Medium	Unlikely	Medium	Moderate	Low
Impacts on avifauna	Site	Long	Possible	High	Low	None
Impacts on bats	Local	Short	Possible	High	Low	Low
Impact on freshwater features	Site	Short	Possible	High	Low	None
Storm water management and erosion	Site	Medium	Probable	High	High	Low

Impact on visual resources	Local	Long	Probable	High	Moderate	Low
Loss agricultural potential by occupation of land	Site	Long	Definite	High	Low	Low
Impact on property values	Local	Long	Probable	High	Moderate	Low
Impact on local tourism operations	Local	Long	Probable	High	Low	Low
Implementation of renewable energy facilities	National	Long	Highly probable	Positive impact will be reversed if facility is decommissioned	High Positive	High Positive
Creation of employment and business opportunities	Regional	Long	Probable	If the project doesn't go ahead this positive impact will not be realised	Low positive	Medium positive
Establishment of a Community Trust	Regional	Low	Probable	If the project doesn't go ahead this positive impact will not be realised	Moderate Positive	High positive
Income generation for landowner	Local	Long	Probable	If the project doesn't go ahead this positive impact will not be realised	Low Positive	Medium positive
Opportunity to improve security	Local	Long	Probable	If the project doesn't go ahead this positive impact will not be realised	Moderate positive	High positive
Increased financial security	Site	Long	Possible	High	Positive	Positive
Traffic congestion	Local	Short	Probable	High	Moderate	Low

Environmental constraints on the Hormah PV site

No environmental features that need to be excluded from the development were identified on the Hormah PV site.

Conclusion of Environmental Impact Statement

All identified impacts were assessed before and after mitigation have been applied. While some potential impacts had a moderate or high significance rating prior to mitigation, all identified impacts (except for the visual intrusion during the construction phase) can be mitigated to acceptable levels (i.e. Low or Very Low significance).

All the mitigation measures are deemed feasible and realistic to implement, and are included in the EMPr, which means that the Applicant is legally bound to follow the recommendations should EA be granted.

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

Final opinion in this regard will be provided in the Final BAR since public comment on the Draft BAR (this document) still needs to be obtained. However, the following applies to date:

- 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.

At this time, prior to receiving comments on the draft BAR, the EAP has identified, and foresees no reasons as to why the project should not proceed, although a final recommendation in this regard will be made in the Final BAR.

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 approximately 2 years.

The activity will therefore be concluded approximately 30 years after construction has commenced.

12.4 Recommendation by the Environmental Assessment Practitioner

These recommendations will be finalised in the Final BAR, but at this stage it is recommended that the following be included in the Environmental Authorisation:

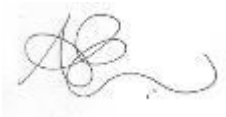
- The development layout as per the Layout Map in Appendix A *must be approved*.
- The Environmental Management Programme *must be approved* and the implementation thereof should be a condition of authorisation.
  - It is however recommended that the following plans be compiled and included as part of the EMPr before construction commences. Approval of these plans by the DFFE at that time is NOT required:
    - Storm Water Management Plan
    - Alien Invasive Management Plan
    - Rehabilitation Plan / Habitat Restoration Plan
    - The following plans would need to be compiled to manage the BESS
      - Emergency Response Plan
      - End-of-Life Plan
    - The following plans would need to be compiled to manage the social impact of the proposed Hormah solar PV facility:
      - Skills Development and Training Programme
      - Code of Conduct for contractors and construction workers
      - Stakeholder Engagement Plan
      - Community Health, Safety and Security Plan
      - Monitoring Forum
      - Community Trust

12.5 Affirmation by the Environmental Assessment Practitioner

We, Susanna Nel & Annelize Erasmus, 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.

Susanna Nel
DATE: 24 March 2023



Annelize Erasmus
DATE: 24 March 2023

A copy of this Affirmation was certified by SAPS and is attached under Appendix J.

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