Orange Valley Solar Energy Facility and Associated Infrastructure, Northern Cape Province

Scoping Report

Report Prepared for

South Africa Mainstream Renewable Power Developments (Pty) Ltd

Report Number 583169/06A

DFFE Reference Number: 2022-10-0021 (Pre-Application)

Report Prepared by

srk consulting

June 2023

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South Africa Mainstream Renewable Power Developments (Pty) Ltd

DFFE Reference Number: 2022-10-0021 (Pre-Application)

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Profile and Expertise of EAPs

SRK Consulting (South Africa) Pty Ltd (SRK) has been appointed by South Africa Mainstream Renewable Power Developments (Pty) Ltd (Mainstream) to undertake the Environmental Impact Assessment (EIA) and Basic Assessment (BA) processes required in terms of the National Environmental Management Act 107 of 1998 (NEMA) for the Hanover Cluster of Renewable Energy Projects.

SRK Consulting was established in 1974 and comprises over 1 600 professional staff worldwide, offering wide-ranging expertise in the natural resources and environmental sectors. SRK's Cape Town Environmental, Social and Governance (ESG) department has a proven track record of managing large, complex environmental and engineering projects in the Western Cape, Africa and internationally. SRK has rigorous quality assurance standards and is ISO 9001 certified.

As required by NEMA, the qualifications and experience of the key independent Environmental Assessment Practitioners (EAPs) undertaking the EIA are detailed below and Curriculum Vitae provided in Appendix A.

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Chris Dalgliesh is a Partner and Principal Environmental Consultant with over 35 years' experience, primarily in Southern Africa, West Africa, South America, the Middle East and Asia. Chris has worked on a wide range of projects, notably in the natural resources, Oil & Gas, waste, infrastructure and industrial sectors. He has directed and managed numerous Environmental and Social Impact Assessments (ESIAs), in accordance with international standards (e.g. IFC). He regularly provides high level review of ESIAs, frequently directs Environmental and Social Due Diligence studies, and leads E&S reviews on behalf of financial institutions. He also has a depth of experience in Strategic Environmental Assessment (SEA) and Resource Economics.
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Neither SRK nor any of the authors of this Report have any material present or contingent interest in the outcome of this Report, nor do they have any pecuniary or other interest that could be reasonably regarded as being capable of affecting their independence or that of SRK.

SRK has no beneficial interest in the outcome of the assessment which is capable of affecting its independence.

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Orange Valley SEF Scoping Report: EAP Affirmation

Section 16 (1) (b) (iv), Appendix 1 Section 3 (1) (r), Appendix 2 Sections 2 (i) and (j) and Appendix 3 Section 3 (s) of the Environmental Impact Assessment (EIA) Regulations, 2014 (promulgated in terms of the National Environmental Management Act 107 of 1998 (NEMA), require an undertaking under oath or affirmation by the Environmental Assessment Practitioner (EAP) in relation to:

- The correctness of the information provided in the report;
- The inclusion of comments and inputs from stakeholders and interested and affected parties;
- Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties; and
- The level of agreement between the EAP and interested and affected parties on the Plan of Study for undertaking the environmental impact assessment.

SRK and the EAPs managing this project hereby affirm that:

- To the best of our knowledge the information provided in the report is correct, and no attempt has been made to manipulate information to achieve a particular outcome. Some information, especially pertaining to the project description, was provided by the applicant and/or their sub-contractors. In this respect, SRK's standard disclaimer (inserted in this report) pertaining to information provided by third parties applies.
- If applicable, information and responses provided by the EAP to interested and affected parties are clearly presented in the report. Where responses are provided by the applicant (not the EAP), these are clearly indicated.
- With respect to EIA Reports, SRK will take account of interested and affected parties' comments on the Plan of Study and, insofar as comments are relevant and practicable, accommodate these during the Impact Assessment Phase of the EIA process.

Note: An Affirmation signed in the presence of a Commissioner of Oaths is also included in Appendix A.

Sharon Jones

Name

SRK Consulting - Certified Electronic Signature

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583169/45083/Report

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Signature

8 June 2023

Date

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Acronyms and Abbreviations

AC	Alternating Current
AoI	Area of Influence
BA	Basic Assessment
BESS	Battery Energy Storage Systems
BPEO	Best Practicable Environmental Option
CapEx	Capital expenditure
CBA	Critical Biodiversity Area
CCW	Counter clockwise
CIA	Cumulative Impact Assessment
CR	Critically Endangered
CSI	Corporate Social Investment
CW	Clockwise
DC	Direct Current
DALRRD	Department of Agriculture, Land Reform and Rural Development
DD	Data Deficient
DEA	(Former) National Department of Environmental Affairs
DEA&DP	Western Cape Department of Environmental Affairs and Development Planning
DFFE	National Department of Forestry, Fisheries and the Environment
DWS	Department of Water and Sanitation
DMRE	Department of Mineral Resources and Energy
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMF	Environmental Management Framework
EMPr	Environmental Management Programme
EN	Endangered
EPC	Engineering, Procurement and Construction
ESA	Ecological Support Area
FEPA	Freshwater Ecosystem Priority Area
GA	General Authorisation
GDP	Gross Domestic Product
GDPR	Regional Gross Domestic Product
GHG	Greenhouse Gas
GHI	Global Horizontal Irradiation
GN	Government Notice
HIA	Heritage Impact Assessment
IAPs	Interested and Affected Parties
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
IPP	Independent Power Producer
IRP	Integrated Resources Plan 2010-2030

IUCN	International Union for Conservation of Nature
IRP	Integrated Resource Plan
KPA	Key Performance Areas
LC	Least Concern
LiDAR	Light Detection and Ranging
LM	Local Municipality
LN	Listing Notice
LT	Least Threatened
LSA	Late Stone Age
Mainstream	South Africa Mainstream Renewable Power Developments (Pty) Ltd
MSA	Middle Stone Age
MTS	Main Transmission Substation
Mya	Million years ago
NCHRA	Northern Cape Heritage Resources Authority
NCNCA	Northern Cape Nature Conservation Act 9 of 2009
NEMA	National Environmental Management Act 107 of 1998
NEM:BA	National Environmental Management: Biodiversity Act 10 of 2004
NERSA	National Energy Regulator of South Africa
NFEPA	National Freshwater Ecosystem Priority Area
NGO	Non-Governmental Organisation
NHRA	National Heritage Resources Act 25 of 1999
NID	Heritage Notification of Intent to Develop
NPAES	National Protected Areas Expansion Strategy
NT	Near Threatened
NWA	National Water Act 36 of 1998
OpEx	Operation expenditure
PES	Present Ecological State
PGDS	Provincial Growth and Development Strategy
PIA	Palaeontological Impact Assessment
PKSDM	Pixley ka Seme District Municipality
POPIA	Protection of Personal Information Act 4 of 2013
PPA	Power Purchasing Agreement
PSDF	Provincial Spatial Development Framework
PV	Photovoltaic
REIPPPP	Renewable Energy Independent Power Producers Procurement Programme
RFB	Redox Flow Battery
RFP	Request for Proposals
S&EIR	Scoping and Environmental Impact Reporting
SABAP2	Southern African Bird Atlas Project 2
SAHRA	South African National Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SALA	Subdivision of Agricultural Land Act 70 of 1970
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency Limited

SANS	South African National Standards
SAWEA	South African Wind Energy Association
SCC	Species of Conservation Concern
Screening Tool	National Web Based Environmental Screening Tool
SDF	Spatial Development Framework
SDG	Sustainable Development Goal
SEA	Strategic Environmental Assessment
SEF	Solar Energy Facility
SEI	Site Ecological Importance
SIP	Strategic Integrated Project
SoW	Scope of Work
SOP	Standard Operating Procedure
SPC	Spatial Planning Category
SPLUMA	Spatial Planning and Land Use Management Act 16 of 2013
SRK	SRK Consulting (South Africa) (Pty) Ltd
SSVR	Site Sensitivity Verification Report
StatsSA	Statistics South Africa
ToR	Terms of Reference
TOPS	Threatened or Protected Species
UN	United Nations
VECs	Valued Environmental and Social Components
VRB	Vanadium Redox Batteries
VU	Vulnerable
WEF	Wind Energy Facility
WUA	Water Use Authorisation
WUL	Water Use Licence
WULA	Water Use Licence Application

Units

°C	Degrees Celsius
CO_2-e	CO_2 equivalent
GWh	Gigawatt hour
ha	Hectare
km	Kilometre
km^2	Square kilometre
km/h	Kilometres per hour
kV	kilovolt
kWh	kilowatt hour
L	Litres
m	Metre
m^2	Square metre
m^3	Cubic metre
mm	Millimetre
Mt	Megatonne
MW	Megawatt
t	tonne
TWh	Terawatt hour

Chemical Compounds

CO^2	Carbon dioxide
$CO_{2\text{-}e}$	CO2 equivalent
Li-ion	Lithium-Ion
NaNiCl	Sodium Nickle Chloride / Zebra
NaS	Sodium Sulfur
NiCad	Nickel Cadium
Pb	Lead Acid

Glossary

Aquifer	An underground body of permeable rock or unconsolidated materials (gravel, sand or silt) which can contain or transmit groundwater.
Avifauna	The collective birds of a given region.
Baseline	Information gathered at the beginning of a study which describes the environment prior to development of a project and against which predicted changes (impacts) are measured.
Biodiversity	The diversity, or variety, of plants, animals and other living things in a particular area or region. It encompasses habitat diversity, species diversity and genetic diversity
Biostratigraphy	The branch of stratigraphy which focuses on correlating and assigning relative ages of rock strata by using the fossil assemblages contained within them.
Community	Those people who may be impacted upon by the construction and operation of the project. This includes neighbouring landowners, local communities and other occasional users of the area
Construction Phase	The stage of project development comprising site preparation as well as all construction activities associated with the development.
Consultation	A process for the exchange of views, concerns and proposals about a project through meaningful discussions and the open sharing of information.
Critical Biodiversity Area	Areas of the landscape that must be conserved in a natural or near-natural state in order for the continued existence and functioning of species and ecosystems and the delivery of ecosystem services.
Cumulative Impacts	Direct and indirect impacts that act together with current or future potential impacts of other activities or proposed activities in the area/region that affect the same resources and/or receptors.
Development Area	The area within the project property(ies) within which the renewable energy project is planned to be located. This area has been selected as a practicable option for the facility, considering technical preference and constraints.
Development Envelope	An area identified for development considering and avoiding identified environmental constraints present within the development area.
Development Footprint	Any evidence of physical alteration as a result of undertaking of any activity associated with the development.
Ecology	The study of the interrelationships of organisms with and within their physical surroundings
Ecosystem	The interconnected assemblage of all living organisms that occupy a given area and the physical environment with which they interact.
Endemic / Endemism	Species unique (native or restricted) to a defined geographic location, i.e. ecological state of a species being unique to a defined geographic location.
Environment	The external circumstances, conditions and objects that affect the existence of an individual, organism or group. These circumstances include biophysical, social, economic, historical and cultural aspects.

Environmental Authorisation	Permission granted by the competent authority for the applicant to undertake listed activities in terms of the NEMA EIA Regulations, 2014.
Environmental Impact Assessment	A process of evaluating the environmental and socio-economic consequences of a proposed course of action or project.
Environmental Impact Assessment Report	The report produced to relay the information gathered and assessments undertaken during the Environmental Impact Assessment.
Environmental Management Programme	A description of the means (the environmental specification) to achieve environmental objectives and targets during all stages of a specific proposed activity.
Ephemeral	A water body that does not flow or contain water year-round, in response to seasonal rainfall and run-off.
Fauna	The collective animals of a particular region, habitat or geological period.
Feasibility Study	The determination of the technical and financial viability of a proposed project.
Fossil	Rare objects that are preserved due to unusual circumstances.
Flora	The collective plants of a particular region, habitat or geological period.
Geohydrology	The study of the character, source and mode of occurrence of groundwater
Heritage Resources	Refers to something tangible or intangible, e.g. a building, an area, a ritual, etc. that forms part of a community's cultural legacy or tradition and is passed down from preceding generations and has cultural significance.
Herpetofauna	Amphibians and reptiles of a particular region, habitat or geological period.
Housekeeping	Maintaining the working environment in a tidy manner.
Hydrology	The scientific study of the movement, distribution, and quality of water on Earth, including the water cycle, water resources and environmental watershed sustainability.
Impact	A change to the existing environment, either adverse or beneficial, that is directly or indirectly due to the development of the project and its associated activities.
Independent EAP	An independent person with the appropriate qualifications and experience appointed by the Applicant to manage the Environmental Impact Assessment process on behalf of the Applicant.
Integrated Environmental Management	The practice of incorporating environmental management into all stages of a project's life cycle, namely planning, design, implementation, management and review.
Mesic	An environment or habitat containing a moderate amount of moisture.
Mitigation measures	Design or management measures that are intended to avoid and / or minimise or enhance an impact, depending on the desired effect. These measures are ideally incorporated into a design at an early stage.

Non-volant Mammals	Mammals that cannot fly.
Operational Phase	The stage of the works following the Construction Phase, during which the development will function or be used as anticipated in the Environmental Authorisation.
Orthic Topsoil	Mineral horizon occurring at the surface that has been subjected to mineral weathering and biological activity.
Pedocutanic	A moderately to strongly structured subsurface horizon with higher clay content.
Preferred Bidder	The Firm / Joint Venture / Consortium that has participated in a Government / Private sector Request for Proposals (RFP) and is notified of its provisional appointment in meeting the requirements set out in the RFP.
Project Area	The Project Site (see below) and surrounds.
Project Site	The total extent of the land parcels on which the development is proposed.
Resilient System	An ecosystem or habitat that resists damage and recovers quickly.
Scoping	A procedure to consult with stakeholders to determine issues and concerns and for determining the extent of and approach to an EIA and EMPr (one of the phases in an EIA and EMPr). This process results in the development of a scope of work for the EIA, EMPr and specialist studies.
Screening Tool	The National Web Based Environmental Screening Tool used to identify environmental sensitivity ratings to a specific identified site for a number of environmental themes.
Sense of Place	The identity of a place related to uniqueness and/or distinctiveness. Sometimes referred to as genius loci meaning 'spirit of the place'.
Specialist study	A study into a particular aspect of the environment, undertaken by an expert in that discipline.
Stakeholders	All parties affected by and/or able to influence a project, often those in a position of authority and/or representing others.
Sustainable development	Sustainable development is generally defined as development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. NEMA defines sustainable development as the integration of social, economic and environmental factors into planning, implementation and decision-making so as to ensure that development serves present and future generations.
Waterbody	A body of water forming a physiographical feature, for example the sea.
Watercourse	A natural freshwater feature, including pans.

1 Introduction

1.1 Background and Introduction

South Africa Mainstream Renewable Power Developments (Pty) Ltd (Mainstream) proposes to develop the Hanover Cluster (the Cluster) of 11 renewable energy facilities comprising seven Solar Energy Facilities (SEFs), four Wind Energy Facilities (WEFs), 12 Battery Energy Storage Systems (BESS), and 12 substations (11 on-site substations and one Main Transmission Substation [MTS]). The associated infrastructure comprises access roads and grid connections to evacuate energy from each SEF and WEF to the national grid.

The Cluster is located ~ 15 km west of the town of Hanover, in the Pixley ka Seme District Municipality (PKSDM), Northern Cape Province. The Cluster extends across 21 farms and has a total development area of ~27 918 ha (279 km^2) (see Figure 1-1).

The National Environmental Management Act 107 of 1998 (NEMA), and the Environmental Impact Assessment (EIA) Regulations, 2014 (promulgated in terms of NEMA) warrant that listed activities require Environmental Authorisation (EA) from the competent authority, in this case the National Department of Forestry, Fisheries and the Environment (DFFE)[1]. A Scoping and Environmental Impact Reporting (S&EIR, also referred to as an EIA) process is required to support an application for EA for Orange Valley SEF (the project – see Figure 1-2).

SRK has been appointed by Mainstream to undertake the S&EIR and Basic Assessment (BA) processes for components of the Cluster that have been grouped into 23 projects.

Separate EAs are sought for the individual projects in the Hanover Cluster:

- 7 x SEFs, each including 33 kV powerlines, BESS and an on-site substation;
- 4 x WEFs, each including 33 kV powerlines, BESS and an on-site substation;
- 11 x 132 kV powerlines connecting each on-site substation to the MTS; and
- 1 x MTS, BESS and two alternative 400 kV lines that will tie into existing 400 kV powerlines.

This Scoping Report relates to the Orange Valley SEF and associated infrastructure (see Figure 1-1 and Figure 1-2) (the project).

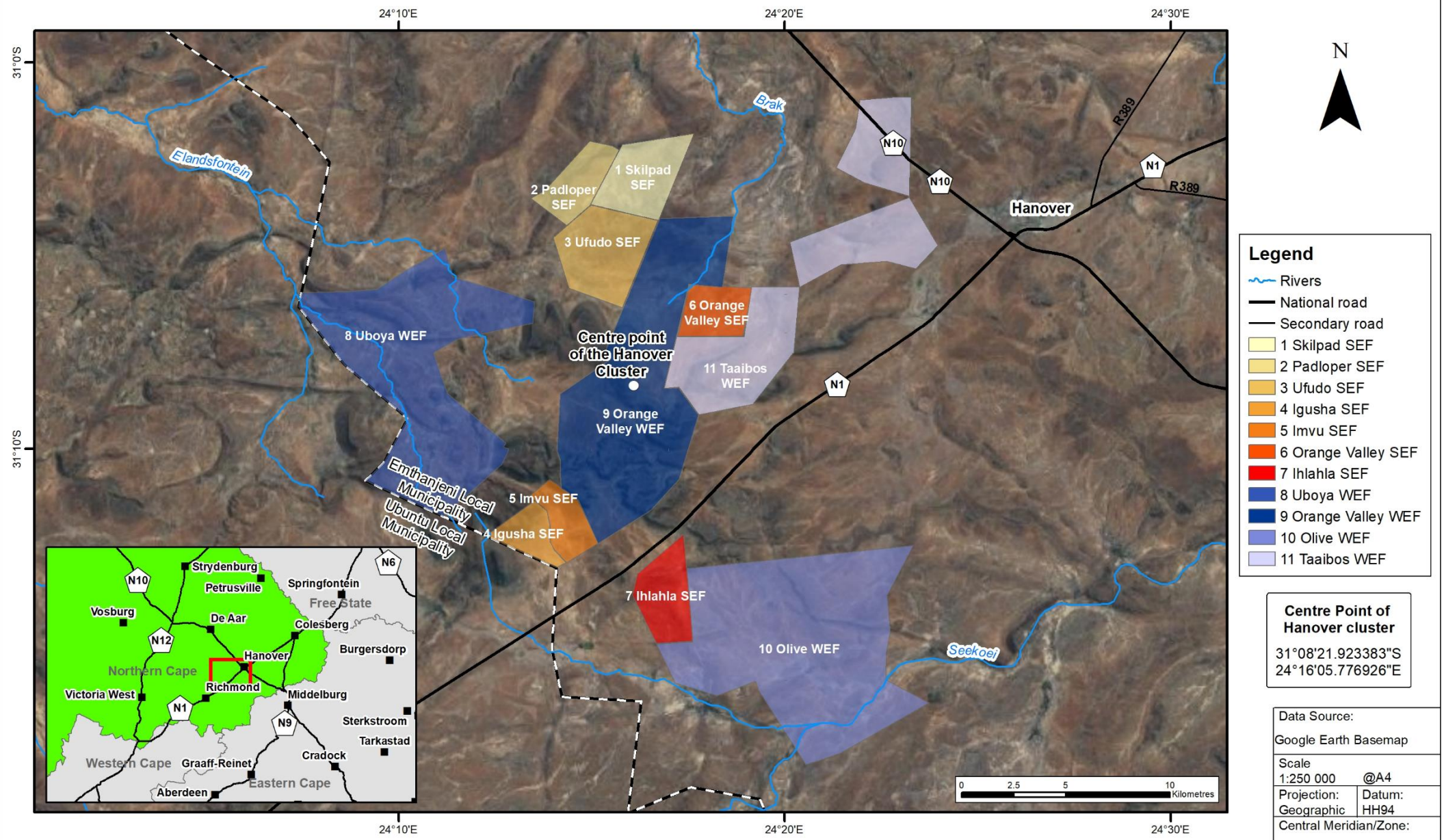
1.2 Purpose of the Report

This document is intended to guide the EIA process and specialist studies by:

- Providing an overview of the legal requirements with regard to the proposed project, the baseline environment, the proposed project description and anticipated environmental and social issues and impacts that will be further investigated in the EIA; and
- Setting out the scope of the EIA process and the Terms of Reference (ToR) for specialist studies and outlining the approach and methodologies to be used in the EIA process, e.g. the proposed impact rating methodology.

This report will be submitted to DFFE for their acceptance.

[1] In terms of Government Notice 779 of 2016, the Minister of (former) Environmental Affairs is the competent authority for projects which relate to the Integrated Resource Plan 2010 – 2030.



Data Source:	Google Earth Basemap
Scale	1:250 000 @A4
Projection: Geographic	Datum: HH94
Central Meridian/Zone:	
Date:	10/10/2022
Compiled by:	LOUA
Project No.	583169
Fig No.	1-1

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HANOVER RENEWABLE ENERGY CLUSTER

LOCALITY MAP

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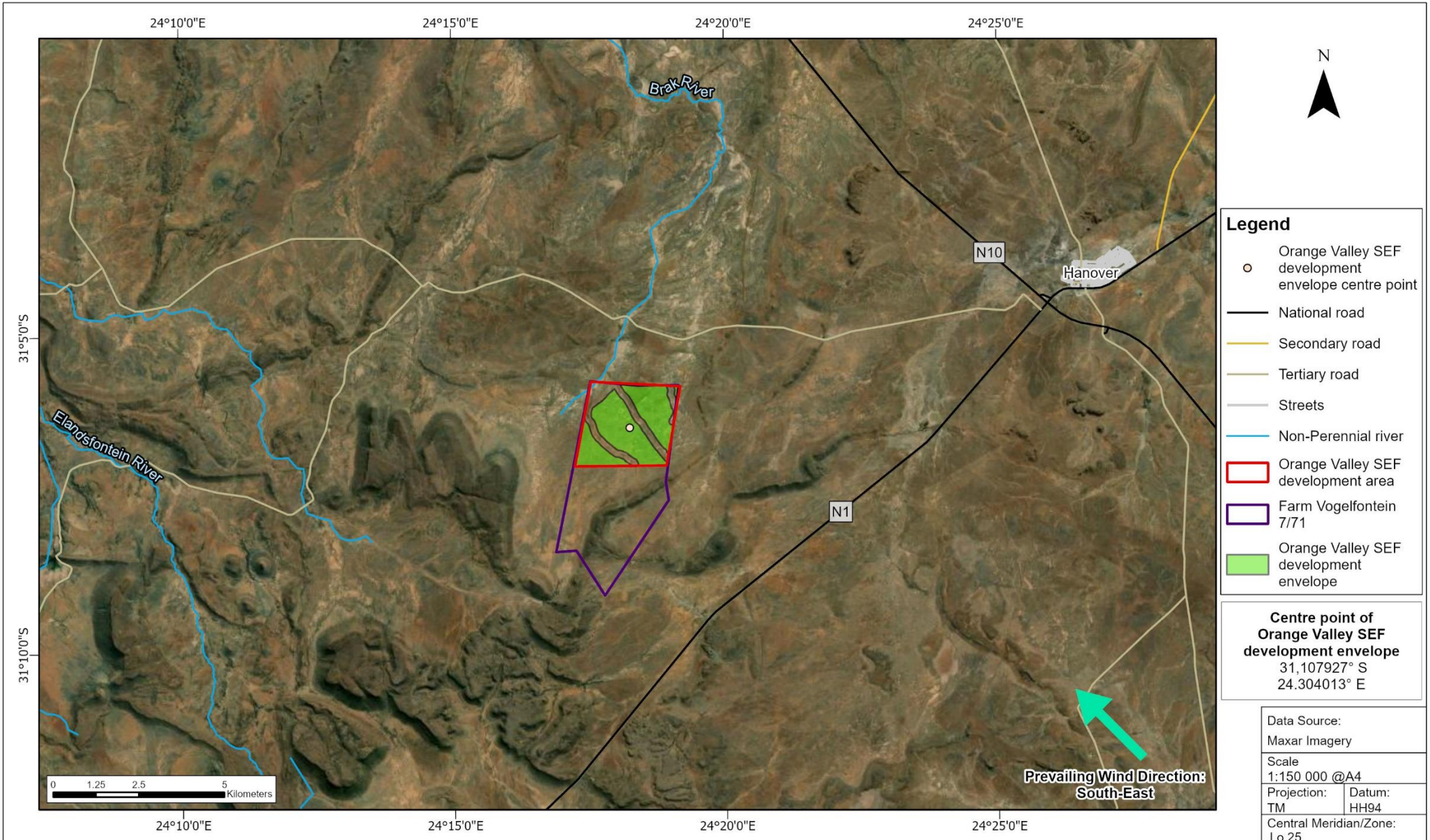

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HANOVER RENEWABLE ENERGY CLUSTER

ORANGE VALLEY SEF DEVELOPMENT AREA AND ENVELOPE

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Project No.	Fig No.
583169	1-2

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Revision: A Date: 07 06 2023

1.3 Scope of Work

Mainstream requires that an EIA process be conducted and the associated reports produced and submitted to the competent authority (in this case DFFE), to inform DFFE's decision whether to issue the necessary environmental authorization for the project.

In broad terms the Scope of Works (SoW) includes:

- Conducting an S&EIR process compliant with the EIA Regulations, 2014 for the project;
- Submitting applications through the EIA process for:
    - EA in terms of NEMA; and
    - Heritage approval in terms of the National Heritage Resources Act 25 of 1999 (NHRA);
- Conducting the associated stakeholder engagement (public participation) process, including consultation with relevant authorities, in compliance with the requirements of the EIA Regulations, 2014 and other applicable legislation; and
- Compiling an Environmental Management Programme (EMPr) for the project.

The components of the project considered and assessed by the EIA process include (Figure 1-3):

- Photovoltaic (PV) arrays with a maximum export capacity of 150 MW;
- 33/132 kV on-site substation comprising:
    - Independent Power Producer (IPP) portion ("side") of the 33/132 kV on-site substation including the BESS; and
    - 132 kV switching-station portion of the on-site substation;
- A 33 kV overhead powerline(s) / underground cabling between the SEF and IPP-side of the 33/ 132 kV on-site substation; and
- Internal ancillary infrastructure and structures including roads, invertor substations and service infrastructure.

Excluded from the SoW are (see Figure 1-3):

- 132 kV powerlines connecting the on-site substations to the MTS;
- The MTS; and
- 400 kV powerlines connecting the MTS to existing powerlines located to the east or west of the project (via a tie-in).

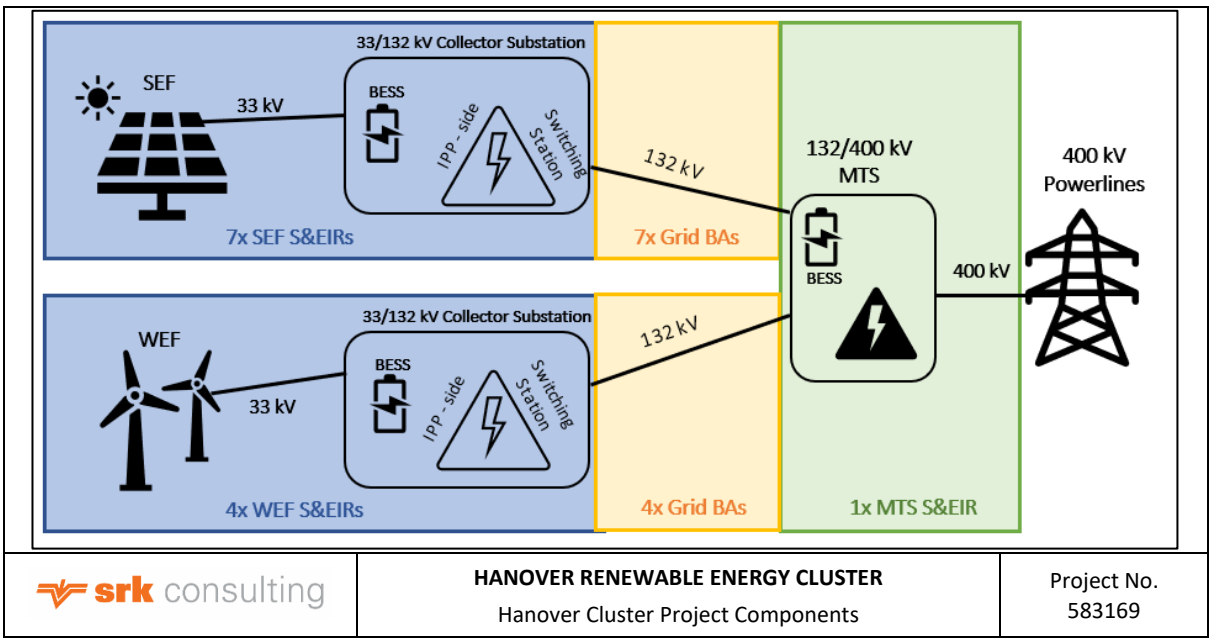

Figure 1-3: Hanover Cluster project components

1.4 Structure of this Report

This report describes the proposed activity and its context, details the stakeholder engagement process, presents the results of the Scoping Phase and sets out the Plan of Study for the Impact Assessment Phase. The report has been prepared in accordance with Section 21 of the EIA Regulations, 2014 and consists of the following sections:

Section 1: Introduction

Provides an introduction and background to the proposed project and outlines the purpose of this document and the assumptions and limitation applicable to the study.

Section 2: Governance Framework and Environmental Process

Provides a brief summary and interpretation of the relevant legislation as well as pertinent strategic planning documents, and outlines the approach to the environmental process.

Section 3: Project Description

Describes the location and current status of the site and provides a brief summary of the surrounding land uses as well as background to and a motivation for the proposed project.

Section 4: Description of the Affected Environment

Briefly describes the biophysical and socio-economic characteristics of the affected environment that will be considered in the assessment of potential project impacts.

Section 5: Stakeholder Engagement

Details the stakeholder engagement activities conducted and planned for the Scoping Phase.

Section 6: Potential Environmental and Social Impacts

Identifies the potential impacts associated with the proposed project that will require investigation during the Impact Assessment Phase.

Section 7: Plan of Study for the EIA

Presents the proposed approach to the Impact Assessment Phase, outlines the methodology that will be adopted to assess the potential impacts during the Impact Assessment Phase, identifies the

specialist studies that are required and proposes the preliminary ToR for these studies, as well as the scope of the high level Cumulative Impact Assessment (CIA).

Section 8: Conclusions and Recommendations

Summarises the key findings of the Scoping Phase and outlines the way forward in the Impact Assessment Phase.

1.5 Content of Report

The EIA Regulations, 2014 (GN R982, which came into effect on 8 December 2014, as amended by GN R326 of 2017, Appendix 2), prescribe the required content in a Scoping Report. These requirements and the sections of this Scoping Report in which they have been addressed, are summarised in Table 1-1.

Table 1-1: Required contents of a Scoping Report

GN 982, App 2 Ref.:	Requirement	Section Ref.:
(2) (a)	Details of:	
(2) (a) (i)	The EAP who prepared the report	ii
(2) (a) (ii)	The expertise of the EAP, including a Curriculum vitae	Appendix A
(2) (b)	Location of the activity, including:	
(2) (b) (i)	21 digit Surveyor General code of the properties	3
(2) (b) (ii)	Physical address and farm name (where available)	3
(2) (b) (iii)	The coordinates of the boundary of the property/ properties (Where (2) (b) (i) and (2) (b) (ii) are not available)	N/A
(2) (c)	A plan indicating the location of the proposed activity/ activities and associated infrastructure, or:	3.1
(2) (c) (i)	For linear activities: a description and coordinates of the corridor in which the proposed activity/ activities is to be undertaken	3.4.1
(2) (c) (ii)	On land where the property has not been defined, the coordinates within which the activity is to be undertaken	3.4.1
(2) (d)	A description of the scope of the proposed activity, including	
(2) (d) (i)	All listed and specified activities triggered	2.1.1.1
(2) (d) (ii)	A description of activities to be undertaken, including associated infrastructure	3
(2) (e)	A description of the policy and legislative context	2
(2) (f)	Motivation for need and desirability for the proposed development	3
(2) (h)	A full description of the process followed to reach the proposed preferred activity, site and location within the site, including	
(2) (h) (i)	Details of all alternatives considered	3.2
(2) (h) (ii)	Details of public participation process undertaken, including copies of the supporting documents and inputs	5
(2) (h) (iii)	A summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them	*To be provided in Final Scoping Report/ EIA Report*
(2) (h) (iv)	The environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	4
(2) (h) (v)	The impacts and risks identified, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts can be reversed, may cause irreplaceable loss of resources, and can be avoided, managed or mitigated	6

GN 982, App 2 Ref.:	Requirement	Section Ref.:
(2) (h) (vi)	The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks	7.9
(2) (h) (vii)	Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected, focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	6
(2) (h) (viii)	Possible mitigation measures that could be applied and level of residual risk	6
(2) (h) (ix)	Outcome of the site selection matrix	N/A
(2) (h) (x)	If no alternative development locations for the activity were investigated, the motivation for not considering such	3.6
(2) (h) (xi)	A concluding statement indicating the preferred alternative development location within the approved site	3.6
(2) (i)	A plan of study for the EIA, including:	
(2) (i)	A description of the alternatives to be considered and assessed including the option of not proceeding	3.6 and 7.4.1
(2) (i) (ii)	A description of the aspects to be assessed as part of the environmental impact assessment process	6
(2) (i) (iii)	Aspects to be assessed by specialists	7.3
(2) (i) (iv)	A description of the proposed method of assessing the environmental aspects, including a description of the proposed method of assessing the environmental aspects including aspects to be assessed by specialists.	7
(2) (i) (v)	A description of the proposed method of assessing duration and significance	
(2) (i) (vi)	An indication of the stages at which the competent authority will be consulted	
(2) (i) (vii)	Particulars of the public participation process that will be conducted during the environmental impact assessment process	
(2) (i) (viii)	A description of the tasks that will be undertaken as part of the environmental impact assessment process	
(2) (i) (x)	Identify suitable measures to avoid, reverse, mitigate or manage identified impacts and to determine the extent of the residual risks that need to be managed and monitored	6
(2) (j)	Undertaking under oath or affirmation by the EAP in relation to:	iii
(2) (j) (i)	The correctness of the information provided in the report	
(2) (j) (ii)	The inclusion of comments and inputs from stakeholders and interested and affected parties	
(2) (j) (iii)	Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties	
(2) (k)	An undertaking under oath or affirmation by the EAP in relation to the level of agreement between the EAP and interested and affected parties on the plan of study for undertaking the environmental impact assessment	iii
(2) (l)	Any specific information required by the competent authority	*To be confirmed*

1.6 Assumptions and Limitations

As is standard practice, this Scoping Report is based on a number of assumptions and is subject to certain limitations. These are as follows:

- It is assumed that information provided by Mainstream and other consultants and specialists is accurate;
- This assessment assumes that the PV infrastructure, the substation and construction activities will be located within the development envelope (see Figure 1-2), however, where required, sections of the access roads and powerlines may be outside the development envelope;

- A more detailed project description will be presented in the EIA Report; and
- Detailed assessment of the potential positive and negative environmental impacts of the proposed development will only be undertaken during the Impact Assessment Phase.

Notwithstanding the above, SRK is confident that these assumptions and limitations do not compromise the overall findings of this report.

2 Governance Framework and Environmental Process

2.1 South African Legislation

There are a number of regulatory requirements at local, provincial and national level with which the project must conform. Key environmental legal requirements include the following:

- National Environmental Management Act 107 of 1998 (NEMA) (as amended);
  - EIA Regulations, 2014, promulgated in terms of NEMA;
  - National Web Based Environmental Screening Tool;
  - Procedures for the Assessment and Minimum Criteria for Reporting;
  - Procedures relating to Integrated Resource Plan Projects;
- National Environmental Management: Biodiversity Act 10 of 2004 (NEM:BA);
- National Water Act 36 of 1998 (NWA);
  - Regulation Regarding the Procedural Requirements for Water Use Licence Applications and Appeals, 2017;
- National Heritage Resources Act 25 of 1999 (NHRA);
- Subdivision of Agricultural Land Act 70 of 1970 (SALA); and
- Northern Cape Nature Conservation Act 9 of 2009 (NCNCA).

A brief summary of SRK's understanding of the relevant Acts and Regulations that are applicable to this study is provided below. Note that other legislative requirements may also pertain to the project. As such, the summary provided below is not intended to be definitive or exhaustive, and serves only to highlight key environmental legislation and obligations.

2.1.1 National Environmental Management Act 107 of 1998 (as amended)

NEMA establishes a set of principles which all authorities have to consider when exercising their powers. These include the following:

- Development must be sustainable;
- Pollution must be avoided or minimised and remedied;
- Waste must be avoided or minimised, reused or recycled;
- Negative impacts must be minimised; and
- Responsibility for the environmental consequences of a policy, project, product or service applies throughout its life cycle.

Section 28(1) states that "every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring". If such degradation/pollution cannot be prevented, then appropriate measures must be taken to minimise or rectify such pollution. These measures may include:

- Assessing the impact on the environment;
- Informing and educating employees about the environmental risks of their work and ways of minimising these risks;
- Ceasing, modifying or controlling actions which cause pollution/degradation;

- Containing pollutants or preventing movement of pollutants;
- Eliminating the source of pollution; and
- Remedying the effects of the pollution.

Legal requirements for this project:

Mainstream has a responsibility to ensure that the proposed activities and the S&EIR process conforms to the principles of NEMA. In terms of Section 28 of NEMA, the proponent is obliged to take actions to prevent pollution or degradation of the environment, and to ensure that the environmental impacts associated with the project are considered, and mitigated where possible.

2.1.1.1 EIA Regulations, 2014

Sections 24 and 44 of NEMA make provision for the promulgation of regulations that identify activities which may not commence without an EA issued by the competent authority (DFFE). In this context, the EIA Regulations, 2014[2], promulgated in terms of NEMA, govern the process, methodologies and requirements for the undertaking of EIAs in support of EA applications. Listing Notices 1-3 in terms of NEMA list activities that require EA ("NEMA listed activities").

The EIA Regulations, 2014 lay out two alternative authorisation processes. Depending on the type of activity that is proposed, either a BA process or a S&EIR process is required to obtain EA. Listing Notice 1[3] lists activities that require a BA process, while Listing Notice 2[4] lists activities that require S&EIR. Listing Notice 3[5] lists activities in certain sensitive geographic areas that require a BA process.

The regulations for both processes – BA and S&EIR – stipulate that:

- Public participation must be undertaken as part of the assessment process;
- The assessment must be conducted by an independent EAP;
- The relevant authorities must respond to applications and submissions within stipulated time frames;
- Decisions taken by the authorities can be appealed by the proponent or any other Interested and Affected Party (IAP); and
- A draft EMPr must be compiled and released for public comment.

GN R982 of 2014 (Appendix 1-5) sets out the procedures to be followed and content of reports compiled during the BA and S&EIR processes.

The NEMA National Appeal Regulations[6] make provision for appeal against any decision issued by the relevant authorities. In terms of the Regulations, an appeal must be lodged with the relevant authority in writing within 20 days of the date on which notification of the decision (EA) was sent to the applicant or IAP (as applicable). The applicant, the decision-maker, Interested and Affected Parties (IAPs) and organs of state must submit their Responding Statement, if any, to the appeal authority and the appellant within 20 days from the date of receipt of the appeal submission.

[2] GN R982 of 2014, as amended by GN 1816 of 2022
[3] GN R983 of 2014, as amended by GN 517 of 2021
[4] GN R984 of 2014, as amended by GN 517 of 2021
[5] GN R985 of 2014, as amended by GN 517 of 2021
[6] GN R993 of 2014, as amended by GN R205 of 2015.

The proposed project includes activities that are listed in terms of the EIA Regulations, 2014. The applicable listed activities have been abbreviated in Table 2-1 below, with an explanation of the relevance/applicability to the project.

Table 2-1: NEMA listed activities (2014) applicable to the project

No.	Listed activity	Applicability
Listing Notice 1 (GN R983)		
11	The development of facilities or infrastructure for the transmission and distribution of electricity- (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.	This project includes the development of an on-site substation. The on-site substation will comprise: • IPP portion / yard (33 kV portion of the shared 33/132 kV on-site substation [and a BESS]); and • Switching station portion (132kv portion of the shared 33/132 kV on-site substation) including associated equipment and infrastructure. This infrastructure will be located outside an urban area, and powerlines will not exceed 275kV.
14	The development and related operations of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.	The project includes the development of a BESS within the on-site substation footprint. The storage capacity and type of technology for the proposed BESS will be determined during the detailed engineering design phase, but the BESS will most likely comprise an array of containers, outdoor cabinets and/or storage tanks storing electrolytes. No stand-alone facilities for the storage of dangerous goods external to the BESS will be constructed as part of the proposed development.
19	The infilling or depositing of any material of more than 10 m^3 into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 m^3 from a watercourse.	During the detailed design phase the positioning of the proposed infrastructure will be finalised and will avoid watercourses where possible. Construction of some structures, such as internal roads, within some watercourses may be unavoidable, in which case more than 10 m^3 of soil, sand, pebbles or rock will need to be removed from the watercourse.
24	The development of a road - (ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres.	Access and internal roads up to 12 m wide will be constructed where required, largely outside of existing road reserves. These roads will be utilised for access and maintenance of the PV arrays and modules.
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: (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare.	The ~470 ha project development envelope, located outside of an urban area, is zoned for agriculture and currently used for grazing.

No.	Listed activity	Applicability
56.	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre- (ii) where no reserve exists, where the existing road is wider than 8 metres.	The proposed project is located outside an urban area and may require the widening of existing roads (for which there is no road reserve) up to 12 m. Existing internal roads may require widening by more than 6 m or lengthening by more than 1 km.
Listing Notice 2 (GN R984)		
1	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output of 20 megawatts or more.	The Orange Valley SEF will have a maximum generation capacity of up to 150 MW.
15	The clearance of an area of 20 hectares or more of indigenous vegetation.	More than 20 ha of indigenous vegetation will be cleared to construct the SEF, on-site substation, BESS and associated infrastructure.
Listing Notice 3 (GN R985)		
4	The development of a road wider than 4 metres with a reserve less than 13,5 metres. Northern Cape (ii) Outside urban areas: (ee) Critical Biodiversity Areas as identified in systematic biodiversity plans adopted by the Competent Authority.	Access and internal roads will be developed and will have a width of up to 12 m, where required. These roads will be outside an urban area. The main access road to the Orange Valley SEF development area may traverse a Critical Biodiversity Area (CBA).
12	The clearance of an area of 300 square metres or more of indigenous vegetation. Northern Cape (ii) Within a Critical Biodiversity Area identified in bioregional plans.	The proposed project will involve the clearance of 300 m^2 or more of indigenous vegetation within a CBA, for the PV array, on-site substation, BESS, internal roads and other associated infrastructure.
14	The development of- (ii) infrastructure or structures with a physical footprint of 10 square metres or more where such development occurs- (a) within a watercourse; (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; Northern Cape (ii) Outside urban area (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.	The project will likely entail the development of roads and other infrastructure with a physical footprint of 10 m^2 or more within (across) a watercourse or within 32 m of the edge of a watercourse. Although the layout of the development will aim to avoid the identified watercourses as far as possible, some internal and access roads may traverse surface water features and be constructed within a CBA or ESA.
18.	The widening of a road by more than 4 metres; or the lengthening of a road by more than 1 kilometre. Northern Cape (ii) Outside urban areas:	The proposed project may require the widening of existing roads by more than 4 m within CBAs and / or within 100 m of a watercourse.

No.	Listed activity	Applicability
	(ee) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (ii) Areas within a watercourse or wetland; or within 100 m from the edge of a watercourse or wetland.	

Legal requirements for this project:

The proponent is obliged to apply for EA for these listed activities and to undertake a S&EIR process in support of the application, in accordance with the procedure stipulated in the EIA Regulations, 2014.

2.1.1.2 National Web Based Environmental Screening Tool

In terms of Regulation 16(1)(b)(v) of the NEMA EIA Regulation, 2014, an application for EA must include "the report generated by the national web based environmental screening tool" (Screening Tool). On 20 March 2020, notice was given that that the submission of such a report is compulsory for all applications submitted after 4 October 2019 (GN R 960 of 2019).

The Screening Tool is based on broad scale national environmental sensitivity data and identifies specialist studies that may be required for the EIA. It is the responsibility of the EAP to confirm whether these specialist studies will be conducted or provide a motivation as to why the specialist studies will not be conducted as part of the EIA process.

The Screening Tool Report has informed the identification of specialist studies required for the EIA, and where applicable, motivation as to why certain specialist studies have not been scoped are provided in the Site Sensitivity Verification Report (SSVR) attached as Appendix B.

Legal requirements for this project:

The Screening Tool Report has informed the identification of specialist studies required for the EIA. The Screening Tool Report and a SSVR confirming the site sensitivities and thus the specialist studies proposed to inform the EIA process were submitted to DFFE with the EA Application form and are also attached as Appendix B.

2.1.1.3 Procedures for the Assessment and Minimum Criteria for Reporting

In terms of the Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes when Applying for EA (GN R320 and GN R1150 of 2020):

- The EAP and / or specialist(s) must verify (update) the findings of the Screening Tool based on desktop sources and a site inspection and compile a Verification Report;
- Where the Screening Tool indicates that a site is sensitive for an "Identified Environmental Theme", a specialist assessment (for more sensitive sites) or Compliance Statement (for less sensitive sites) must be undertaken, depending on the verified sensitivity of the site;
- Specialists must ensure compliance with the Protocols for the assessment and minimum report content requirements of environmental impacts published in GN320 of 2020 and GN 1150 of 2020 for the various identified environmental themes; and
- Should the Screening Tool (or EAP) identify site sensitivities for disciplines which are not "Identified Environmental Themes" and specialist assessment is required, specialist reporting must comply with the requirements of Appendix 6 of the EIA Regulations, 2014.

Legal requirements for this project:

Content of specialist reports must comply with the relevant protocols for the assessment and minimum report content requirements of environmental impacts or Appendix 6 of the EIA Regulations, 2014. Evidence of compliance is provided in each specialist report.

2.1.1.4 Procedures Relating to Integrated Resource Plan Projects

According to GN 779 of 2016 (*Identification of the Minister as Competent Authority for the Consideration of Processing of Environmental Authorisations and Amendments Thereto for Activities Related to the Integrated Resource Plan 2010-2030*), the Minister of Environmental Affairs (i.e. DFFE) is the competent authority for activities which are identified as activities in terms of Section 24(2)(a) of the Integrated Resources Plan 2010-2030 (IRP) and any updates thereto.

Legal requirements for this project:

The competent authority for the EA application is DFFE, as renewable energy projects are activities identified in the IRP (see Section 2.2.1).

2.1.2 National Environmental Management: Biodiversity Act 10 of 2004

The purpose of the NEM:BA is to provide for the management and conservation of South Africa's biodiversity and the protection of species and ecosystems that warrant national protection. The NEM:BA makes provision for the publication of bioregional plans and the listing of ecosystems and species that are threatened or in need of protection. Threatened or Protected Species Regulations (2007), Guidelines for the determination of bioregions and the preparation and publication of bioregional plans (2009) and a National List of Ecosystems that are Threatened and in Need of Protection (2011) have been promulgated in terms of NEM:BA.

A published bioregional plan is a spatial plan indicating terrestrial and aquatic features in the landscape that are critical for conserving biodiversity and maintaining ecosystem functioning. These areas are referred to as Critical Biodiversity Areas (CBAs) in terms of NEM:BA. Bioregional plans provide guidelines for avoiding the loss or degradation of natural habitat in CBAs with the aim of informing, EIAs and land-use planning (including Environmental Management Frameworks [EMFs], Spatial Development Frameworks [SDFs], and Integrated Development Plans [IDPs]).

Permits to carry out a restricted activity involving listed threatened or protected species or alien species may only be issued after an assessment of risks and potential impacts on biodiversity has been undertaken.

Legal requirements for this project:

The Northern Cape Critical Biodiversity Areas (CBA) map was approved and adopted by the Head of the Department of Agriculture, Environmental Affairs, Rural Development and Land Reform on 21 June 2017 as an instrument informing decisions and priorities on biodiversity. Impacts of the project on the biodiversity of the area and, in particular, the CBAs and Ecological Support Areas (ESAs), will need to be assessed.

2.1.3 National Water Act 36 of 1998

Water use in South Africa is controlled by the NWA. The executive authority is the Department of Water and Sanitation (DWS). The NWA recognises that water is a scarce and unevenly distributed national resource in South Africa. Its provisions are aimed at achieving sustainable and equitable use of water to the benefit of all users and to ensure protection of the aquatic ecosystems associated with

South Africa's water resources. The provisions of the Act are aimed at discouraging pollution and wastage of water resources.

In terms of the Act, a land user, occupier or owner of land where an activity that causes or has the potential to cause pollution of a water resource has a duty to take measures to prevent pollution from occurring. If these measures are not taken, the responsible authority may do whatever is necessary to prevent the pollution or remedy its effects, and to recover all reasonable costs from the responsible party.

Section 21 of the NWA specifies a number of water uses, including:

(c) impeding or diverting the flow of water in a watercourse; and

(i) altering the bed, banks, course or characteristics of a watercourse.

These water uses require authorisation in terms of Section 22 (1) of the Act, unless they are listed in Schedule 1 of the NWA, are an existing lawful use, fall under a General Authorisation (GA) issued in terms of Section 39 or if the responsible authority waives the need for a licence.

Legal requirements for this project:

The proposed project activities are likely to trigger water uses in terms of section 21 (c) and (i) of the NWA. It is thus expected that a Water Use Licence (WUL) or GA will be required from the competent authority, in this case DWS. If required, Mainstream will make application in terms of the NWA if the project is awarded Preferred Bidder status.

2.1.3.1 Regulation Regarding the Procedural Requirements for Water Use Licence Applications and Appeals, 2017

The Procedural Requirements for Water Use Licence Applications (WULAs) and Appeals (Regulation 267, which came into effect on 24 March 2017), promulgated in terms of the NWA, prescribes the procedures and requirements for WULAs as contemplated in Section 41 of the NWA; as well as an appeal in terms of Section 41(6) of the NWA.

More specifically, the Regulations provide clarity on:

- Authority decision making timeframes;
- Pre-application requirements;
- Consolidation of multiple WULAs into a single application ;
- Technical report content requirements;
- Financial surety following issuing of Water Use Authorisation (e.g. WULA); and
- Procedure for public participation in terms of Section 41(4) of NWA.

In terms of Section 41 (6) of the NWA, an appeal can be lodged against any decision issued by the responsible authority. In terms of the Regulations, an appeal must be lodged with the relevant authority in writing within 30 days of the date on which notification of the decision was received.

Legal requirements for this project:

Mainstream is obliged to apply for Water Use Authorisation (WUA) for Section (c) and (i) water uses in terms of the NWA and to undertake a WULA process in accordance with the procedure stipulated in Regulation 267 under NWA.

2.1.4 National Heritage Resources Act 25 of 1999

The protection and management of South Africa's heritage resources are controlled by the NHRA. The enforcing authority for this act is the South African National Heritage Resources Agency (SAHRA). In the Northern Cape, SAHRA has delegated this authority to the Northern Cape Heritage Resources Authority (NCHRA) with respect to archaeological and palaeontological resources but has retained responsibility with respect to the built environment. In terms of the Act, historically important features such as graves, trees, archaeological artefacts/sites and fossil beds are protected. Similarly, culturally significant symbols, spaces and landscapes are also afforded protection.

Section 38 of the NHRA requires that any person who intends to undertake certain categories of development must notify SAHRA and NCHRA at the very earliest stage of initiating such a development and must furnish details of the location, nature and extent of the proposed development. SAHRA has designed the South African Heritage Resources Information System (SAHRIS) database to assist the developer in providing the necessary information to enable SAHRA to decide whether a Heritage Impact Assessment (HIA) will be required.

Section 38 also makes provision for the assessment of heritage impacts as part of an EIA process and indicates that, if such an assessment is deemed adequate, a separate HIA is not required. However, Section 38 (8) requires that the consenting authority (in this case the DFFE) ensures that the evaluation of impacts on the heritage resources fulfils the requirements of the relevant heritage resources authority, and that the comments and recommendations of the heritage resources authority are taken into account prior to the granting of the consent.

Section 38(1) of the NHRA specifies activities that trigger the need for the proponent to notify the heritage resources authority of the proposed development, in order for heritage resources authority to determine the need for further Heritage Assessment. The proposed Orange Valley SEF and associated infrastructure trigger a number of these activities, including:

(a) Construction of a road, wall, power line, canal or other similar form of linear development or barrier over 300 m in length;

(c) Any development or activity that will change the character of a site (i) exceeding 5 000 m^2 in extent, (ii) involving three or more existing erven or subdivisions thereof; and

(d) Rezoning of a site exceeding 10 000 m^2 in extent.

Legal requirements for this project:

The proposed project will include construction of roads and powerlines over 300 m, will lead to a change in character and require rezoning of a portion of the property to Special Zoning.

The proponent is required to notify SAHRA and NCHRA of the proposed activities and undertake any assessments deemed necessary by either of these authorities. The assessment of heritage, archaeological and paleontological impacts will be undertaken as part of the EIA process in terms of NEMA.

2.1.5 Subdivision of Agricultural Land Act 70 of 1970

The SALA regulates the subdivision and rezoning of agricultural land[7] and its use for any purpose other than agriculture. The Act has two main goals, namely:

[7] Agricultural land as defined in the Act excludes land situated in the area of jurisdiction of, amongst others, a municipal council, city council or town council.

- To disallow the change in land-use of high potential agricultural land; and
- To keep viable farm units intact.

Written consent must be obtained from the Minister of Agriculture, Land Reform and Rural Development (DALRRD) for the rezoning, subdivision or use for any other purpose of agricultural land.

Legal requirements for this project:

The proposed development involves the subdivision of agricultural land. As such, approval for the proposed development must be obtained by DALRRD in terms of this Act. Application for such authorisation falls outside of the scope of the S&EIR. The DALRRD will however be consulted during the stakeholder engagement process.

2.1.6 Northern Cape Nature Conservation Act 9 of 2009

The NCNCA aims to improve the sustainable use of wild animals, aquatic biota and plants and the protection and conservation thereof, as well as stipulates the offences and penalties or permits and authorisations that can be issued in terms of the Act. The NCNCA also aims to meet the requirements of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), an international agreement which South Africa actively participates in.

The following six schedules list particular species referred to in the Act:

- Schedule 1 - Specially protected species;
- Schedule 2 - Protected species;
- Schedule 3 - Common indigenous species;
- Schedule 4 - Damage causing animal species;
- Schedule 5 - Pet species; and
- Schedule 6 - Invasive species.

Legal requirement for this project

Four species of protected flora listed in the NCNCA were identified in the Orange Valley SEF development area. If the project receives EA, a permit in terms of the NCNCA will be required to translocate these species to a nearby natural habitat.

2.2 Planning Policy Framework

This section discusses a number of key formal planning policies relevant to the project. The policies and plans briefly discussed below include regional and local development and spatial plans, including the:

- IRP for Electricity 2010 – 2030;
- Strategic Integrated Projects (SIPs);
- Northern Cape Provincial Growth and Development Strategy (PGDS) (2011);
- Northern Cape Provincial Spatial Development Framework (PSDF);
- IDPs for District and Local Municipalities, which formulate the specific needs in, and desirable developments for, municipalities;
- SDFs for the District and Local Municipalities, which translate the aims of the IDP into a spatial dimension and, together with the IDP, aim to give effect to the national imperative to increase

economic growth and promote social inclusion whilst ensuring that such growth is environmentally sustainable (DEA&DP, 2009).

2.2.1 Integrated Resource Plan for Electricity 2010 – 2030

The IRP was promulgated in March 2011 and updated in 2019. It determines South Africa's long term electricity demand and the type, cost, timing and generating capacity required to meet this demand. The IRP set targets for additional generation capacity of ~40 000 MW to meet future electricity demand and secure reserves, and provides input into economic, environmental and social policy development and funding.

The IRP further identifies the preferred generation technologies required to meet the expected demand up to 2030, incorporating objectives such as reduced greenhouse gas (GHG) emissions, reduced water consumption, affordable electricity, diversified electricity generation sources and localised and regional development. The envisaged energy mix includes coal, nuclear, natural gas, renewable energy and hydropower sources. Energy (battery) storage is deemed important in the South African context where the power system does not have the requisite storage capacity or flexibility required for the large increase in renewable energy.

By 2019, ~18 000 MW of new generation capacity had been committed (commissioned, procured or officially announced by the Minister of Energy), including ~6 500 MW procured under the Renewable Energy Independent Power Producers Procurement Programme (REIPPPP), 9 600 MW by the Medupi and Kusile coal power plants and 1 005 MW from gas turbines (DoE, 2019).

The 2019 IRP envisages the installation of a further 6 000 MW of solar and 14 400 MW of wind energy between 2022 and 2030, taking solar and wind energy to 10.5% and 22.5% of total installed capacity and 6.3% and 17.8% of generated electricity in South Africa, respectively. This is to be achieved through annual installation of 1 000 MW PV in most years until 2030[8] and 1 600 MW wind energy each year until 2030. The IRP also envisages the installation of 2 088 MW additional energy storage capacity (see Figure 2-1) (DoE, 2019).

[8] In July 2022, the South African President announced that amount of new renewable energy generation capacity that would be procured through REIPPPP Bid Window 6 would be doubled to 5 200 MW (Hall, 2022).

	Coal	Coal (Decommissioning)	Nuclear	Hydro	Storage	PV	Wind	CSP	Gas & Diesel	Other (Distributed Generation, CoGen, Biomass, Landfill)
Current Base	37 149		1 860	2 100	2 912	1 474	1 980	300	3 830	499
2019	2 155	-2 373					244	300		Allocation to the extent of the short term capacity and energy gap.
2020	1 433	-557				114	300			
2021	1 433	-1 603				300	818			
2022	711	-844			513	400 1000	1600			
2023	750	-555				1000	1600			500
2024			1860				1600		1000	500
2025						1000	1600			500
2026		-1219					1600			500
2027	750	-837					1 600		2000	500
2028		-475				1000	1 600			500
2029		-1664			1575	1000	1 600			500
2030		-1050		2 500		1 000	1 600			500
TOTAL INSTALLED CAPACITY by 2030 (MW)	33364		1860	4600	5000	8288	17742	600	6380	
% Total Installed Capacity (% of MW)	43		2.36	5.84	6.35	10.52	22.53	0.76	8.1	
% Annual Energy Contribution (% of MWh)	58.8		4.5	8.4	1.2*	6.3	17.8	0.6	1.3	

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

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Figure 2-1: Emerging long-term plan in 2019 IRP

Source: (DoE, 2019)

2.2.2 Strategic Integrated Projects

Eighteen SIPs have been developed and approved in terms of the National Infrastructure Plan (2012) to support economic development and address service delivery in South Africa. Each SIP comprises a large number of specific infrastructure components and programmes.

The National Infrastructure Plan (2012) identifies three energy SIPs (South African Government, n.d.):

- SIP 8: Green energy in support of the South African economy
    - Support sustainable green energy initiatives on a national scale through a diverse range of clean energy options as envisaged in the Integrated Resource Plan (IRP2010); and
    - Support bio-fuel production facilities.
- SIP 9: Electricity generation to support socio-economic development
    - Accelerate the construction of new electricity generation capacity in accordance with the IRP2010 to meet the needs of the economy and address historical imbalances; and
    - Monitor implementation of major projects such as new power stations: Medupi, Kusile and Ingula.

- SIP 10: Electricity transmission and distribution for all

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

On 23 June 2022 Mr. M Essop of DFFE confirmed to SRK that any renewable energy and associated infrastructure project is only classified as a SIP after it has been awarded Preferred Bidder status as part of the Department of Mineral Resources and Energy (DMRE) REIPPP.

2.2.3 Northern Cape Provincial Growth and Development Strategy (2011)

The Northern Cape PGDS is a guiding tool for future development in the Northern Cape and identifies poverty as the most significant challenge facing the province. Long- term sustainable economic growth and development is recognised as a priority to ensure that challenges associated with poverty are addressed. The PGDS aims to guide and coordinate the allocation of government resources and private sector investment to facilitate sustainable development.

The PGDS defines a vision for the Northern Cape: *'building a prosperous, sustainable growing provincial economy to eradicate poverty and improve development for a caring society'*. The overarching objective of the PGDS is to ensure the integration of development processes and, in particular, to facilitate sustainable development throughout the province.

The PGDS makes provision for new provincial priorities, including:

- Developing comprehensive rural development programmes to reduce poverty in rural communities throughout the province;
- Protecting the environment;
- Considering alternative energy sources; and
- Improving the health profile of the province.

2.2.4 Northern Cape Provincial Spatial Development Framework

The PSDF is a spatial planning document that guides district and local spatial initiatives such as IDPs and SDFs. The PSDF is based on the principles of the PGDS and one of its overarching functions is to serve as a spatial land-use directive which aims to promote environmental, economic, and social sustainability through sustainable development.

The PSDF identifies a number of Spatial Planning Categories (SPCs). These SPCs were formulated in terms of bioregional planning principles and collectively illustrate the desired matrix of land- use throughout the province. The SPCs provide a framework to guide decision making regarding land use at all levels of planning and define the spatial vision for the Northern Cape: *a consistently structured matrix of sustainable land-use zones that collectively support dynamic local economies rooted in key economic sectors, particularly mining, agriculture, tourism and energy.*

Key strategic interventions identified in the PSDF includes *inter alia*:

- Create work opportunities through innovative use of resources and sustainable development;
- Develop vibrant, equitable and sustainable rural communities;
- Promote the use of alternative energy in the Northern Cape;
- Protect biodiversity as an imperative for environmental sustainability; and

- Reduce greenhouse gas emissions, climate change impact and improve air/ atmospheric quality.

Energy-related objectives identified in the PSDF are to:

- Promote the development of renewable energy supply schemes; and
- Develop and institute new innovative energy technologies to improve access to reliable, sustainable and affordable energy services that realise sustainable economic growth and development.

2.2.5 Pixley ka Seme District Municipality Integrated Development Plan (2022 – 2027)

The vision of the PKSDM is to '*sustainably develop [the] district for future generations*', through the principle of '*Putting People First*'.

The PKSDM IDP is aligned with various international, national and provincial plans, including the Sustainable Development Goals (SDGs – see Section 2.3) and the PGDS. Two key strategic objectives of the PKSDM IDP are to monitor and support local municipalities to enhance service delivery and to promote economic growth in the district. The PKSDM is characterised by:

- High unemployment, poverty and social grant dependence rates;
- Low levels of economic development;
- High levels of poverty and low levels of education; and
- Various environmental challenges (including climate change and energy crises).

Farming, tourism, commercial and industrial development and renewable energy projects are identified as opportunities in the District Municipality. The IDP further highlights the need for investment in renewable energy projects in the PKSDM to alleviate some of the challenges faced by communities.

2.2.6 Pixley ka Seme District Municipality Spatial Development Framework / Land Development Plan (2013 – 2018)

The PKSDM's SDF aims to guide spatial planning and land development in the PKSDM and local municipalities in order to address spatial, environmental and economic issues in the district. According to the SDF, the PKSDM aims for:

- Effective and efficient service delivery;
- Optimal human and natural resource development;
- Local economic growth and development, job creation and poverty alleviation; and
- A safe, secure and community friendly environment.

A renewable energy hub has been proposed for the Northern Cape (from the west coast to the De Aar region). Development opportunities for renewable facilities have been identified within the renewable energy hub, with potential sites indicated in yellow in Figure 2-2. To achieve the PSDF strategy relating to renewable energy, the SDF proposes the use of wind, solar and hydropower as alternative energy sources to be harnessed in support of the proposed renewable energy hub.

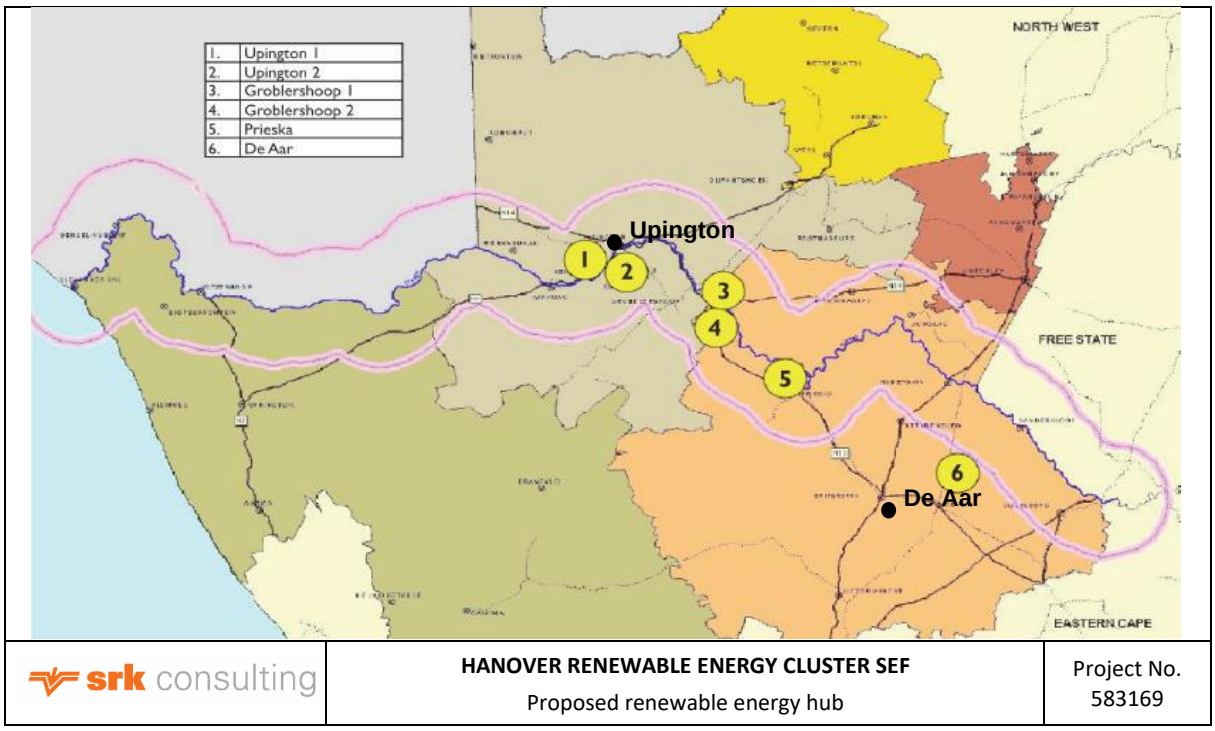


Figure 2-2: Renewable energy hub

Source: (PKSDM, 2014)
Notes: Yellow sites – potential sites for the renewable energy hub; purple outline – 50 km radius from the Orange River.

2.2.7 Emthanjeni Local Municipality Integrated Development Plan (2022-2027)

The Emthanjeni Local Municipality (LM) IDP places particular focus on community empowerment through service delivery (ELM, 2022), with Key Performance Areas (KPAs) including basic service delivery, municipal financial viability and management, institutional development and municipal transformation, local economic development, good governance and public participation, safety and security and social development. The vision for the Emthanjeni LM is: '*a centre for development and service excellence focussed on economic development in pursuit of a better life for all'.* The Emthanjeni LM IDP identifies a number of sectors with economic growth and development potential, including the renewable energy hub in De Aar.

The IDP sets out objectives to achieve the KPAs, including improving access to water, sanitation, energy, transport, safety and waste services. The IDP also highlights the need to consider solar energy as an alternative energy source and the potential impacts of climate change on the municipality.

2.3 International Standards and Guidelines

2.3.1 United Nations Sustainable Development Goals

Seventeen Sustainable Development Goals (SDGs) (see Figure 2-3) were adopted by the United Nations (UN) in 2015 as a universal call to action to end poverty, protect the planet and ensure that by 2030 all people enjoy peace and prosperity. The 17 SDGs are interrelated and integrated—they recognize that action in one area will affect outcomes in others, and that development must balance social, economic and environmental sustainability. Signatories committed to prioritise progress for those who are furthest behind (UNDP, 2022).

Figure 2-3: UN Sustainable Development Goals

The UN SDGs are a useful tool to benchmark the socio-economic conditions in a project area. SDGs deemed most relevant to the local project area have informed the selection of quantifiable indictors, as listed in Table 2-2. These are applied to the project area (see Figure 1-2).

Table 2-2: SDGs most relevant or measurable for the project area

SDG		Relevance	Baseline indicator
1	No poverty	Poverty remains a pertinent issue across many areas in South Africa	% households with income of more than R19 600/year
3	Good health and well-being	Access to health care is highly variable across South Africa, and many people continue to live with potentially debilitating diseases such as HIV/AIDS and TB	% population living without AIDS
4	Quality education	Education levels are highly variable across South Africa and an important indicator of economic success	% adults who completed Grade 12 and higher
6	Clean water and sanitation	Access to water and sanitation is critical to well-being and health, and increasingly threatened by poor management and climatic variability due to climate change	% population with piped water in their dwelling or yard % population with access to a flush or chemical toilet
7	Affordable and clean energy	Access to energy is variable but critical to well-being and educational and economic success	% population with access to electricity
8	Decent work and economic growth	Unemployment remains a significant challenge in South Africa	% of labour force employed
9	Industry, innovation and infrastructure	Innovative solutions and access to infrastructure are important determinants for economic success and ability for growth	% households with access to internet
10	Reduced inequalities	South Africa is one of the most unequal societies	Gini coefficient score
11	Sustainable cities and communities	Formal housing and municipal services are critical to community well-being and health	% population in formal housing % population with waste removal

SDG		Relevance	Baseline indicator
16	Peace, justice and strong institutions	Crime is a significant challenge across South Africa, depressing well-being and socio-economic development	Overall Crime Index

2.4 Environmental Assessment Process

The general approach to this study is guided by the principles contained in Section 2 of NEMA and those of Integrated Environmental Management (IEM).

NEMA lists a number of principles that apply to the actions of organs of state and that also serve as reference for the interpretation of environmental legislation and administration of environmental processes. The principles most relevant to environmental assessment processes and projects for which authorisation is required are summarised below.

Principles relevant to the EIA process:

- Adopt a risk-averse and cautious approach;
- Anticipate and prevent or minimise negative impacts;
- Pursue integrated environmental management;
- Involve stakeholders in the process; and
- Consider the social, economic and environmental impacts of activities.

Principles relevant to the project:

- Place people and their needs at the forefront of concern and serve their needs equitably;
- Ensure development is sustainable, minimises disturbance of ecosystems and landscapes, pollution and waste, achieves responsible use of non-renewable resources and sustainable exploitation of renewable resources;
- Assume responsibility for project impacts throughout its life cycle; and
- Polluter bears remediation costs.

This S&EIR process complies with these principles through its adherence to the EIA Regulations, 2014, and associated guidelines, which set out clear requirements for, *inter alia,* impact assessment and stakeholder involvement (see below), and through the assessment of impacts and identification of mitigation measures during the Impact Assessment Phase.

In accordance with the IEM Information Series (DEAT, 2004), an open, transparent approach, which encourages accountable decision-making, has been adopted.

The underpinning principles of IEM require:

- Informed decision making;
- Accountability for information on which decisions are made;
- A broad interpretation of the term “environment”;
- An open participatory approach in the planning of proposals;
- Consultation with interested and affected parties;
- Due consideration of alternatives;
- An attempt to mitigate negative impacts and enhance positive impacts of proposals;
- An attempt to ensure that the social costs of development proposals are outweighed by the social benefits;
- Democratic regard for individual rights and obligations;
- Compliance with these principles during all stages of the planning, implementation and decommissioning of proposals; and
- The opportunity for public and specialist input in the decision-making process.

Although various environmental authorisations, permits or licences are required before the proposed project may proceed, the regulatory authorities are committed to the principle of cooperative governance and in order to give effect to this principle, a single S&EIR process is required to inform all applications. To this end, a single EIA Report will be compiled and will be submitted to the DFFE in support of the application for EA of NEMA listed activities.

Supplementary applications will be made as required for the remaining authorisations.

The study will also be guided by the requirements of the EIA Regulations, 2014 (see Section 2.1.1.1), which are more specific in their focus and define the detailed approach to the S&EIR process, as well as relevant guidelines published by the (then) Department of Environment Affairs (DEA) and the Western Cape Department of Environmental Affairs and Development Planning (DEA&DP[9]), including:

- DEA&DP’s EIA Guideline and Information Document Series (DEA&DP, 2013), which includes guidelines on Generic ToR for EAPs and Project Schedules, Public Participation, Alternatives, Need and Desirability, Exemption Applications and Appeals;
- DEA’s Public Participation Guideline in terms of NEMA EIA Regulations (DEA, 2017a); and
- DEA’s Guideline on Need and Desirability (DEA, 2017b).

The competent authority for this project is DFFE. Supplementary applications will be made as required for the remaining authorisations.

2.4.1 Submission of Applications

Various environmental authorisations, permits or licences are required before the proposed project may proceed. Some application forms must be submitted at the outset of the S&EIR process (e.g. in terms of the EIA Regulations and NHRA) while licences in terms of the NWA are only issued after EA

[9] As no specific guidelines are available from Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform, reference is made to DEA and DEA&DP guidelines.

and, for the Hanover Cluster, will only be submitted by Mainstream once Preferred Bidder status is awarded. The required authorisations and their status are listed in Table 2-3.

Table 2-3: Environmental Authorisations, permits and licences required for the project

Application	Authority	Status
EA	DFFE	Application was submitted to the DFFE on 19June 2023 in compliance with Section 16 of the EIA Regulations, 2014. Reference number 2022-10-0021 was issued by DFFE for the Pre-application meeting for the entire Hanover Cluster.
Heritage Application	SAHRA and NCHRA	Application was submitted via the SAHRIS and **Case ID. 21378** was allocated to the project.
WUL	DWS	Application will be submitted by Mainstream at a later stage.

2.4.2 S&EIR Process and Phasing

The S&EIR process consists of three phases, namely the Pre-Application Phase, Scoping Phase *(the current phase)* and an Impact Assessment Phase (see Figure 2-4 below).

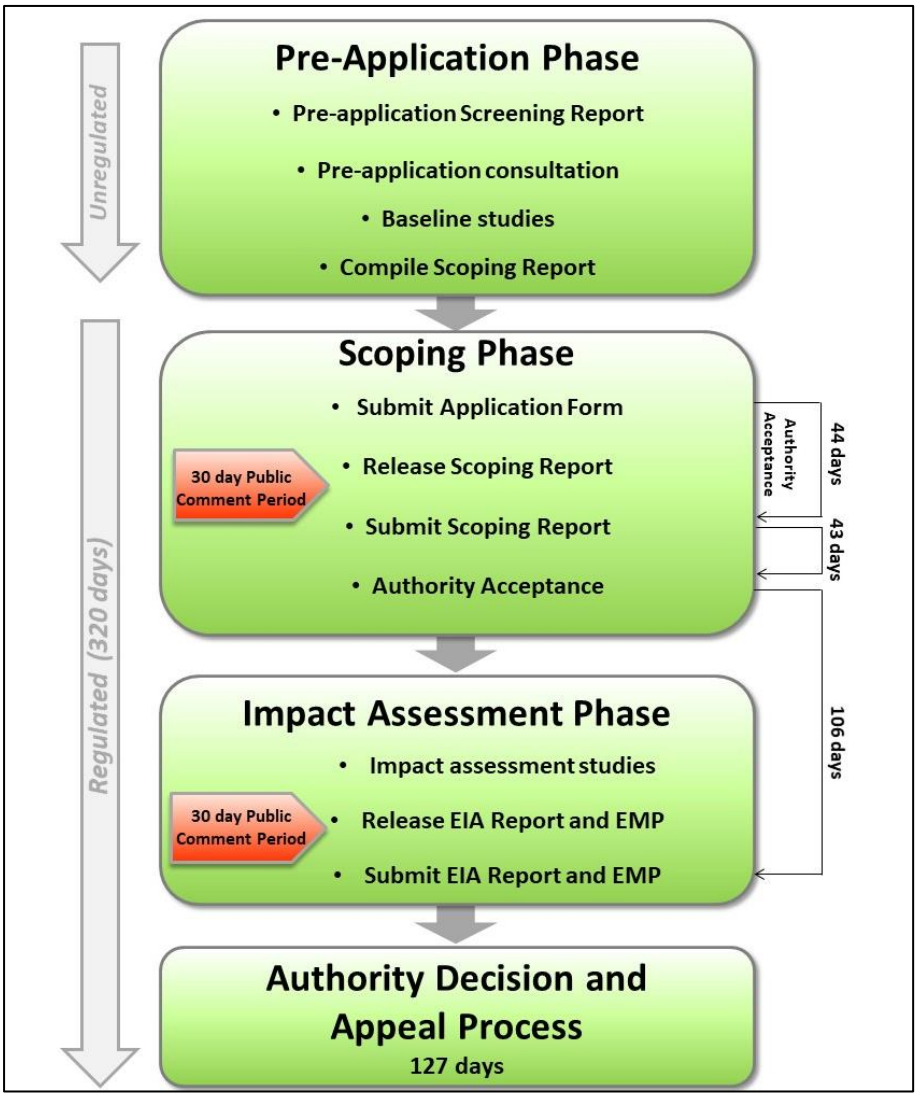


Figure 2-4: S&EIR Process

The objectives of the Pre-Application Phase are to:

- Identify appropriate specialist studies using the national screening tool prescribed by Regulation 16(1)(b)(v) of the NEMA EIA Regulation, 2014;
- Identify stakeholders, including neighbouring landowners/ residents and authorities;
- Compile a draft Scoping Report describing the affected environment and present an analysis of the potential environmental issues and benefits arising from the proposed project that may require further investigation in the Impact Assessment Phase;
- Develop ToR for specialist studies to be undertaken in the Impact Assessment Phase;

The objectives of the Scoping Phase are to:

- Inform stakeholders of the proposed activity, feasible alternatives and the S&EIR process;
- Provide stakeholders with the opportunity to participate effectively in the process and identify any issues and concerns associated with the proposed activity, review specialist study ToR and the Plan of Study for EIA; and
- Submit a Scoping Report to the relevant authorities (in this case, DFFE, SAHRA, NCHRA and DWS).

The aims of the Impact Assessment Phase are to:

- Inform and obtain contributions from stakeholders, including relevant authorities, the public and local communities and address their relevant issues and concerns;
- Build capacity amongst stakeholders during the S&EIR process so that they may actively and meaningfully participate;
- Document and contextualise the biophysical baseline conditions of the study area and the socio-economic conditions of affected communities;
- Assess in detail the potential environmental and socio-economic impacts of the project;
- Identify environmental and social mitigation measures to avoid and/or address the impacts assessed; and
- Develop and/or amend environmental and social management plans based on the mitigation measures developed in the EIA Report and EMPr.

3 Project Description

3.1 Solar Energy Facilities: An Introduction

A SEF, also known as a solar farm or PV solar power plant, is a large-scale, grid-connected PV power system. It supplies power to utilities (e.g. Eskom), or large private or public off-takers (e.g. industrial or municipal customers).

Most **PV panels** are made from semiconductor materials, usually some form of silicon. When photons from sunlight hit the semiconductor material, free electrons are generated which flow through the material to produce a direct current (DC). This is known as the photoelectric effect[10].

PV panels produce the photoelectric effect directly, without intermediary processes or devices (for example, they do not use a liquid heat-carrying agent, like water, which is used in solar thermal plants). PV panels do not concentrate energy, they simply convert photons into electricity which is then transmitted elsewhere (McFadden, 2021).

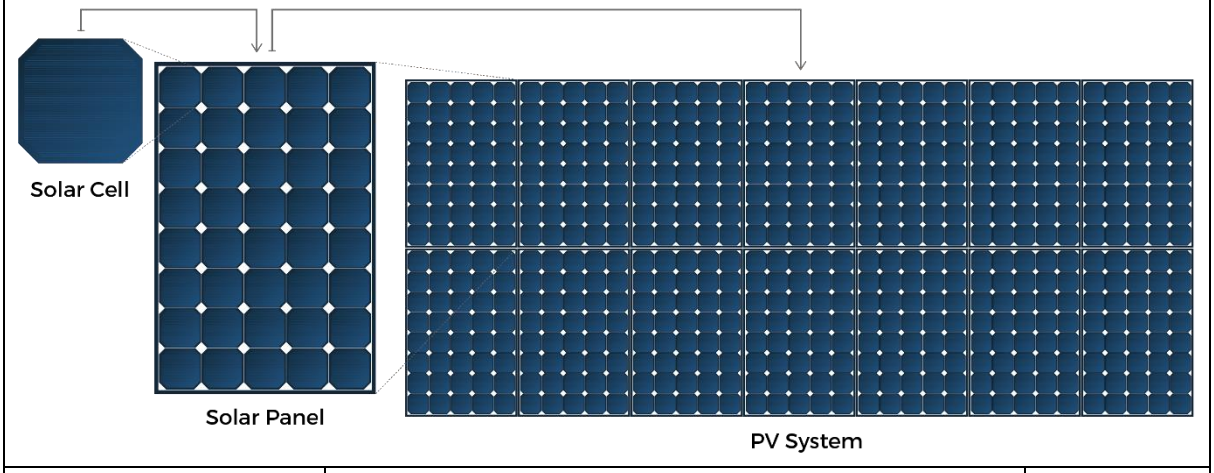
PV cells are grouped into PV modules[11] (see Figure 3-1), which are then assembled into PV panels. The collection of multiple PV panels is connected in series to generate electricity at the requisite voltage and current required and thus form PV arrays. Panels or arrays are mounted onto fixed tilt, single axis or dual axis solar tracker support structures.

Generated DC power may be stored in electro-chemical **batteries** for later use. It needs to be converted to alternating current (AC) by an **inverter** before it can be fed into the electrical grid. A three phase step up **transformer** (see Figure 3-2) increases (or steps up) the voltage to 33kV prior to evacuation to the substation and MTS (for further voltage increase), electrical grid and onward transmission.

The performance of a PV plant depends on the climatic conditions, equipment used and system configuration. The primary energy input is the electromagnetic radiation emitted by the sun. A key determinant of the output is the conversion efficiency of the solar modules, which depends on the type of solar cell used. Current modules have a significantly reduced degradation rate and retain ~88% of their output performance after 25 years. The accumulation of dust or organic material on the solar panels that blocks incident sunlight can be a significant loss factor (Wikipedia, 2021a), (PVeducation.com, n.d.).

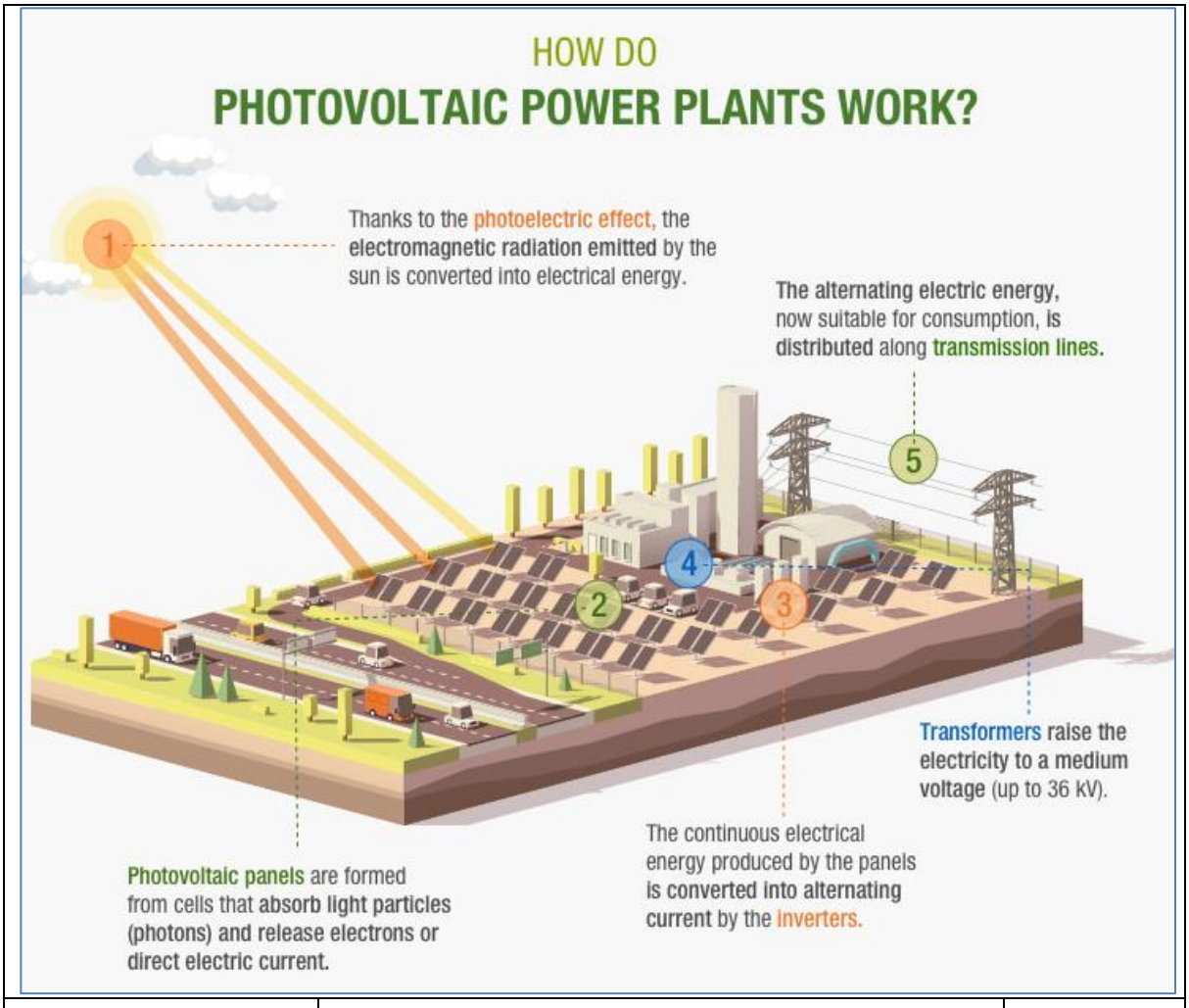
[10] The classic structure of photovoltaic cells is based on two layers, one negatively (N) and the other positively (P) charged. The two layers of silicon dioxide and aluminium create a circuit, while the anti-reflective surface is responsible for facilitating the absorption of sunlight (Enelgreenpower.com, n.d.).

[11] Photovoltaic modules are made up of many individual, interconnected photovoltaic cells. To ensure the modules are tilted correctly and facing the sun, they are housed in support structures. Every module has two output terminals that collect the generated current and transfer it to the management systems at a solar power station.



srk consulting	**HANOVER RENEWABLE ENERGY CLUSTER** PV cells, panels and systems	Project No. 583169

Figure 3-1: PV cells, panels and systems



srk consulting	**HANOVER RENEWABLE ENERGY CLUSTER** Schematic of SEF operation	Project No. 583169

Figure 3-2: Schematic of SEF operation

Source: (Iberdrola, 2022)

3.2 Regional Renewable Energy Sector

The Northern Cape Province is one of the top three provinces with the highest potential for renewable energy projects in South Africa, due to high solar (see Figure 3-3) and wind energy (see Figure 3-4) resources. In 2020, the Northern Cape generated ~1 300 MW of renewable power, the highest provincial contribution in South Africa (Figure 3-5).

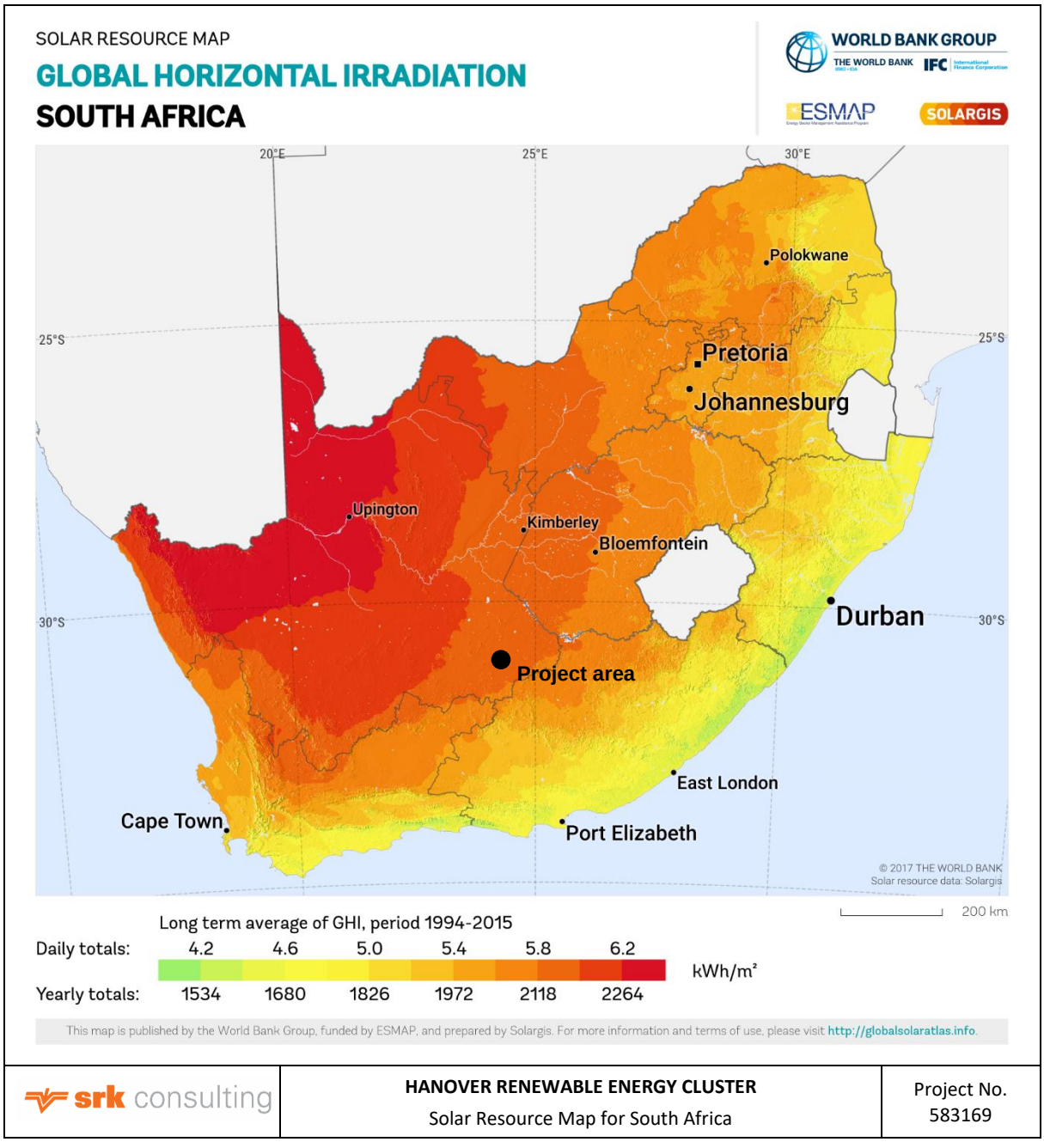
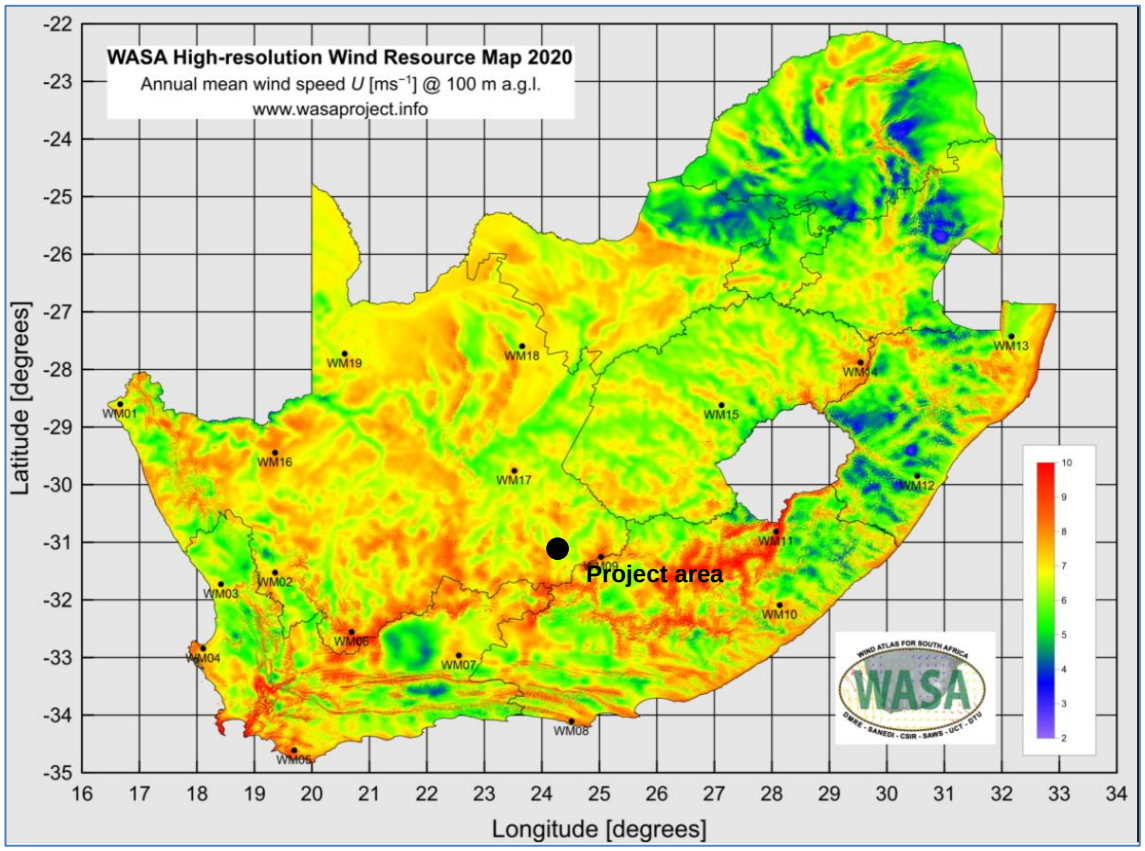


Figure 3-3: Solar resource map for South Africa

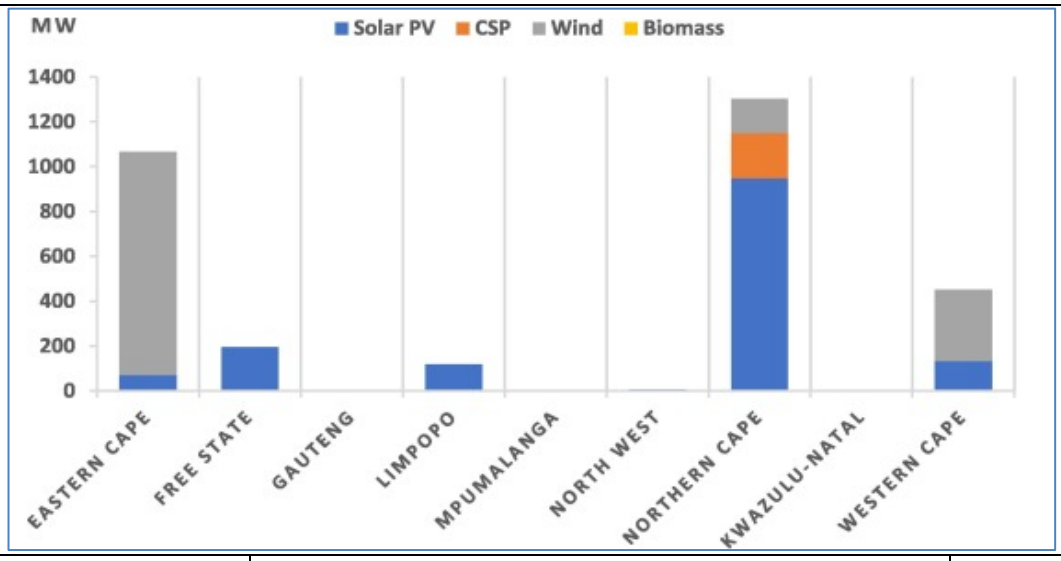
Source: (Solargis, 2023)



srk consulting	HANOVER RENEWABLE ENERGY CLUSTER Solar Resource Map for South Africa	Project No. 583169

Figure 3-4: Wind atlas for South Africa

Source: (WASA, 2020)



srk consulting	HANOVER RENEWABLE ENERGY CLUSTER Distribution of renewable energy production in South Africa	Project No. 583169

Figure 3-5: Distribution of renewable energy production in South Africa (2020)

Source: (Akinbami, Oke, & Bodunrin, 2021)

Despite not being located within a REDZ, the towns of De Aar and Noupoort, to the north and south of Hanover respectively, have become nodes of renewable energy facilities. Within ~100 km radius of

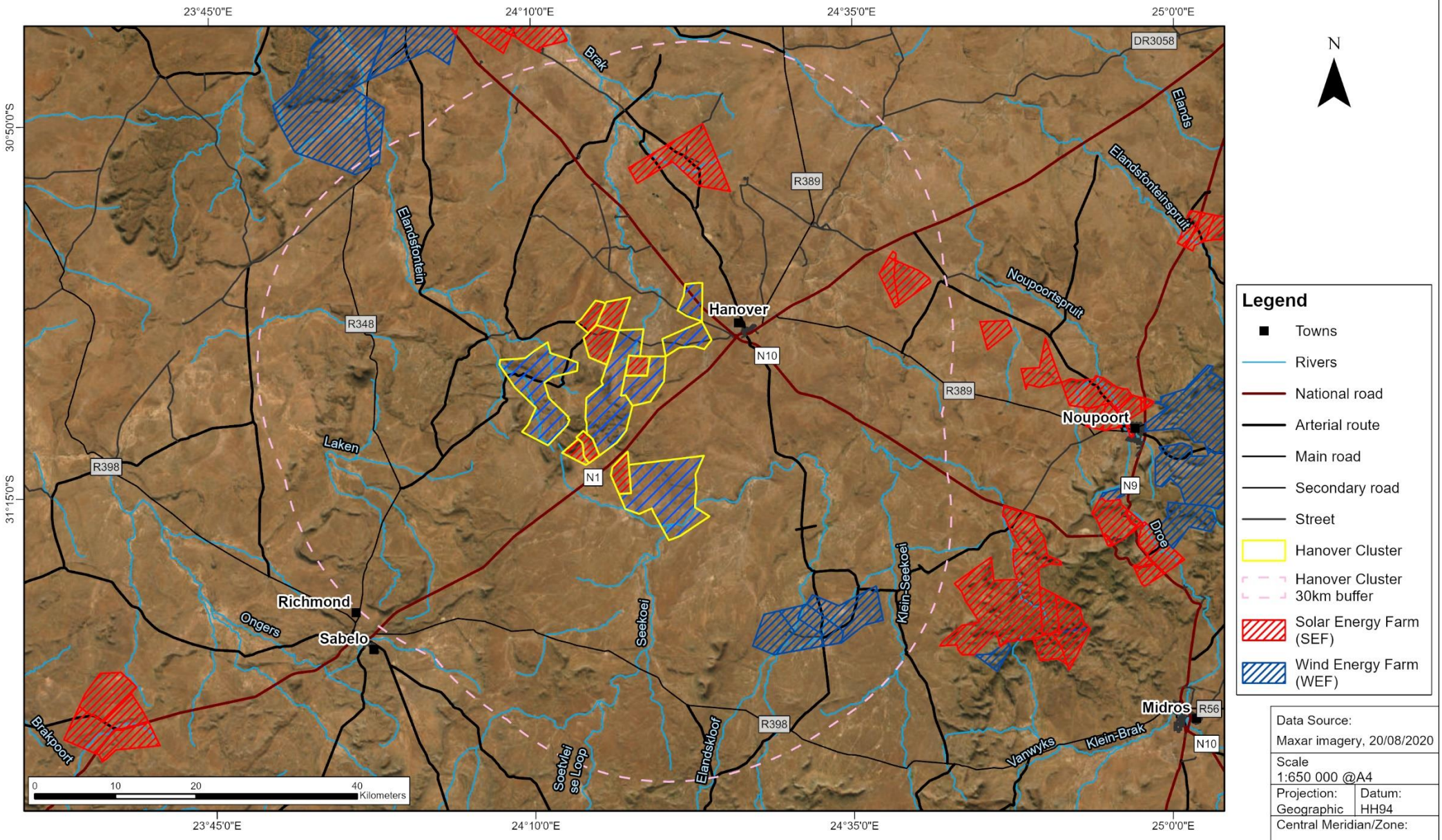
the Hanover Cluster there are eight WEFs, 56 SEFs EAs and one combined WEF and SEF EA registered as approved on the DFFE Renewable Energy Environmental Authorisation database published in Q4 of 2022. Two renewable energy projects were awarded in the Northern Cape during the 2021 REIPPPP Bid Window 5: Graspan Solar (75 MW) near Ritchie and Du Plessis Dam Solar (75 MW) near De Aar.

Within 30 km of the Hanover Cluster there are three approved SEF EAs and on WEF EA registered on DFFE Renewable Energy Environmental Authorisation database published in Q4 of 2022 (Table 3-1 and Figure 3-6).

Table 3-1: Renewable energy projects under consideration in the project area

Project	DFFE Reference	Capacity	EA Status	Estimated extent
Scatec SEF, Farm Rooilyf 4/389	12/12/20/2258/4	Unknown	Approved	~4 553 ha
Scatec SEF	12/12/20/2258/2	Unknown	Approved	~732 ha
Scatec SEF	12/12/20/2258/3	Unknown	Approved	~1 388 ha
Mulilo WEF, De Aar	12/12/20/1651	100 MW	Approved	~ 34 022 ha
				~40 695 ha

Source: (DFFE, 2022)



Data Source:	Maxar imagery, 20/08/2020
Scale	1:650 000 @A4
Projection: Geographic	Datum: HH94
Central Meridian/Zone:	

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HANOVER PV AND WEF

HANOVER CLUSTER CUMULATIVE MAP

Date:	Compiled by:
11/11/2022	BRCH
Project No.	Fig No.
583169	3-6

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3.3 Hanover Cluster Overview

The project forms part of the proposed, larger Hanover Cluster of renewable energy facilities, comprising seven SEFs, four WEFs, as well as grid connections, BESS and ancillary infrastructure (see Figure 1-1). ***Separate EA applications will be submitted for the individual SEFs and WEFs and grid connections through separate EIA or BA processes*** (see Figure 1-3). The total proposed generation capacity of the Cluster is 1 910 MW (see Table 3-2).

Ancillary infrastructure includes BESS, internal access roads (5 – 12 m wide), eleven 33/132 kV on-site substations (each with a 25 ha footprint), one 132/400 kV MTS (~25 ha footprint), eleven 132 kV powerlines (32 m servitude) to connect the on-site substations to the MTS and two 400 kV powerlines alternatives (32 m servitude) connecting the MTS to Eskom's grid (Figure 1-3).

The Cluster is located ~15 km north-west of the town of Hanover, in the Northern Cape, north of the Beaufort West Renewable Energy Development Zone (REDZ), as well as north and west of the Central Transmission Corridor. The projects extend across numerous farms and the total development area is ~28 000 ha (see Figure 1-1 and Table 3-2).

Table 3-2: Hanover Cluster details

Project Name	Farm Portions	Generation Capacity (MW)	Development Area[12] (ha)	Development Envelope[13] (ha)
Skilpad SEF	Vogelfontein 1/71	150	1 031	390
Padloper SEF	Vogelfontein 1/71 and 2/71	150	671	154
Ufudo SEF	Krab Fontein 1/70 and 2/70, Vogelfontein 1/71, 2/71, 4/71 and 5/71	150	1 358	331
Igusha SEF	Kommetjies Fontein RE/99	100	478	172
Imvu SEF	Kommetjies Fontein RE/99	100	548	233
Orange Valley SEF	***Vogelfontein 7/71***	***150***	***633***	***470***
Ihlahla SEF	Hongerfontein RE/102	150	861	509
Uboya WEF	Krab Fontein 70 and Kommetjies Fontein 99	240	5 469	TBC (5 469)
Orange Valley WEF	Kommetjies Fontein 2/99, Farm 100 100, Bontebok Outspan 96, Bonteboks Fontein 97 and Vogelfontein 7/71	240	5 589	TBC (5 589)
Olive WEF	Plooysfontein 93 and Hongerfontein 102	240	6 924	TBC (6 924)
Taaibos WEF	Vogelfontein 7/71 and 9/71, Uile Fontyn 7/72, 8/72, 17/72 and 19/72	240	4 356	TBC (4 356)
Total		**1 910**	**27 918**	**24 597**

A (smaller) development envelope has been identified within each development area, to avoiding environmentally sensitive features, where possible.

At this stage it not known which Independent Power Producer (IPPs) or facilities (projects) will be selected as Preferred Bidders through the REIPPPP bidding process and/or receive interest from private off-takers, and thus which components of the Hanover Cluster will be developed.

[12] The area within the project site within which the renewable energy project is planned to be located. This area has been selected as a practicable site for the facility, considering technical preference and constraints. The development envelope and footprint will comprise only a portion of the development area.

[13] The development envelope has been identified within each development area, avoiding areas of environmental sensitivity, where possible. Since the development footprint has not yet been defined, the entire development envelope will be considered in specialist assessments.

3.3.1 Solar Energy Facilities

The Hanover Cluster comprises seven proposed SEFs, each with a notional development envelope (footprint) ranging between ~ 170 ha and 509 ha (see Figure 1-1):

1. Skilpad SEF;
2. Padloper SEF;
3. Ufudo SEF;
4. Igusha SEF;
5. Imvu SEF;
6. Orange Valley SEF; and
7. Ihlahla SEF.

Each SEF comprises the following key components:

- PV arrays (tracking system alternatives are being considered) with a maximum export capacity of 150 MW;
- 33/132 kV on-site substation that will occupy up to 25 ha and comprise:
    - IPP portion (“side”) of the 33/132 kV on-site substation occupying up to 12.5 ha, of which the BESS will occupy up to 5 ha; and
    - 132 kV switching-station portion of the on-site substation occupying up to 12.5 ha.
- A 33 kV overhead powerline(s) / underground cabling between the SEF and IPP-side of the 33/132 kV on-site substation;
- Internal ancillary infrastructure and structures including:
    - Internal gravel roads with a width ranging between 5 m and 12 m;
    - Centralised inverter stations to convert DC to AC, and power transformers;
    - Fencing and lighting;
    - Material laydown areas (temporary for construction phase and permanent for operation phase);
    - Water supply and storage;
    - Telecommunication infrastructure;
    - Stormwater infrastructure;
    - Offices (including ablutions); and
    - Operational control centre and maintenance area.
- Internal cabling connecting panels, inverters and transformers; and
- Security guard house.

A comprehensive description of the proposed Orange Valley SEF, which is the subject of this EIA process, is provided in Sections 3.7 and 3.8.

3.4 Description of the Orange Valley SEF Project Area

3.4.1 Site Description

The Orange Valley SEF is located in the Emthanjeni LM, ~12 km west of the town of Hanover in the Northern Cape Province. The project development envelope is situated on Farm Vogelfontein 7/71 (Table 3-3 and Figure 1-2). The coordinates of the Orange Valley SEF are included in Appendix C.

Table 3-3: Property details

Farm Name and Number	Farm Vogelfontein 7/71
SG 21 Digit Code	C03000000000007100007
Physical Address	Vogelfontein 7/71, accessed via a farm road off N1.

Farm Vogelfontein 7/71 measures approximately 1 422 ha and is zoned for Agriculture. The property is currently used as grazing land for sheep, goats and cattle. The portion of the property on which the Orange Valley SEF is proposed would be rezoned to Special Zoning and leased from the property owner. No existing structures or roads are currently located on or traverse this land.

The development envelope comprises homogenous habitats including grassland plains and drainage areas. Protected flora species have been identified on the site. The site is relatively flat, conducive to the development of a SEF. The Brak River is directly to the north of the development area.

The project is set back ~4 km north-west of the N1 national road that connects Cape Town and Johannesburg, and ~9 km south-west of the N10 national road connecting De Aar to Gqeberha in the Eastern Cape (Figure 1-2). Both the N1 and the N10 are critical transport corridors with high vehicle volumes.

No previous applications for renewable energy projects on this property are registered on DFFE's *Database of Approved Renewable Energy Applications*.

3.4.2 Surrounding Land Use

The Project Area is located in the semi-arid Great Karoo, where agriculture and – further north - mining are the key economic sectors. The climate and vegetation of the Great Karoo limit the potential for cultivation and the area is predominantly utilised for sheep and cattle farming.

Apart from the nodes of urban development (Hanover ~10km to the east, De Aar ~ 45km to the north-west and Richmond ~50 km to the south-west), the area largely comprises extensive farms, mainly given over to grazing, guesthouses and lodges, a network of gravel farm roads, and the N1 and N10 transport corridors.

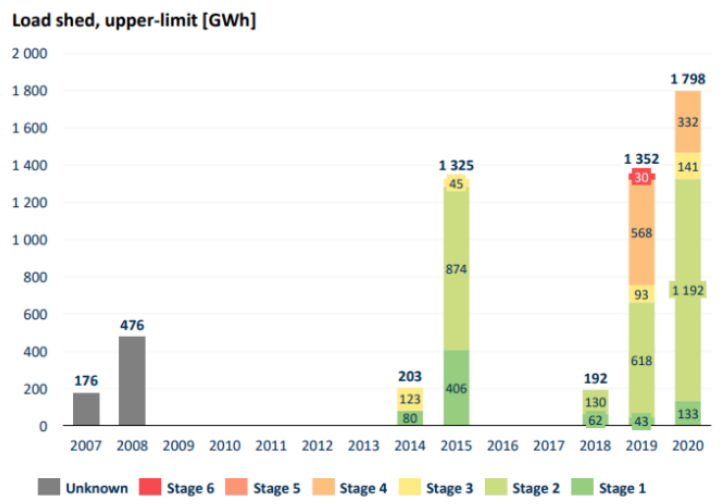
3.5 Proponent's Project Motivation

3.5.1 Motivation for Renewable Energy Generation in South Africa

3.5.1.1 Increasing Power Generation to Reduce Loadshedding Impacts on Economic Production and Quality of Life

South Africa has been forced to implement periodic loadshedding due to insufficient power production in seven of the 14 years between 2007 and 2020 (see Figure 3-7). Loadshedding continued in 2021 and into 2022, which is predicted to be another record year for loadshedding as the supply gap widens further (BusinessTech, 2022). Loadshedding is a result of declining electricity production (see Figure 3-8), which increased renewable energy production could only partly compensate for (see Figure 3-9). However, Figure 3-8 and Figure 3-9 illustrate that renewable energy, which can be commissioned in a relatively short period, has an important role to play to address South Africa's energy shortage.

Loadshedding has significant consequences for economic production, business operation and quality of life. The South African Wind Energy Association (SAWEA, (2019) estimates that loadshedding costs the South African economy R90/kWh, and that the operation of diesel-powered Open Cycle Gas Turbines to generate additional emergency power costs ~R3/kWh. The Council for Scientific and Industrial Research (CSIR) (2020) similarly estimates an economic impact of R45 – R90/kWh for loadshedding. Loadshedding of 1 352 GWh in 2019 had an impact on the economy of ~R 60 to 120 billion.

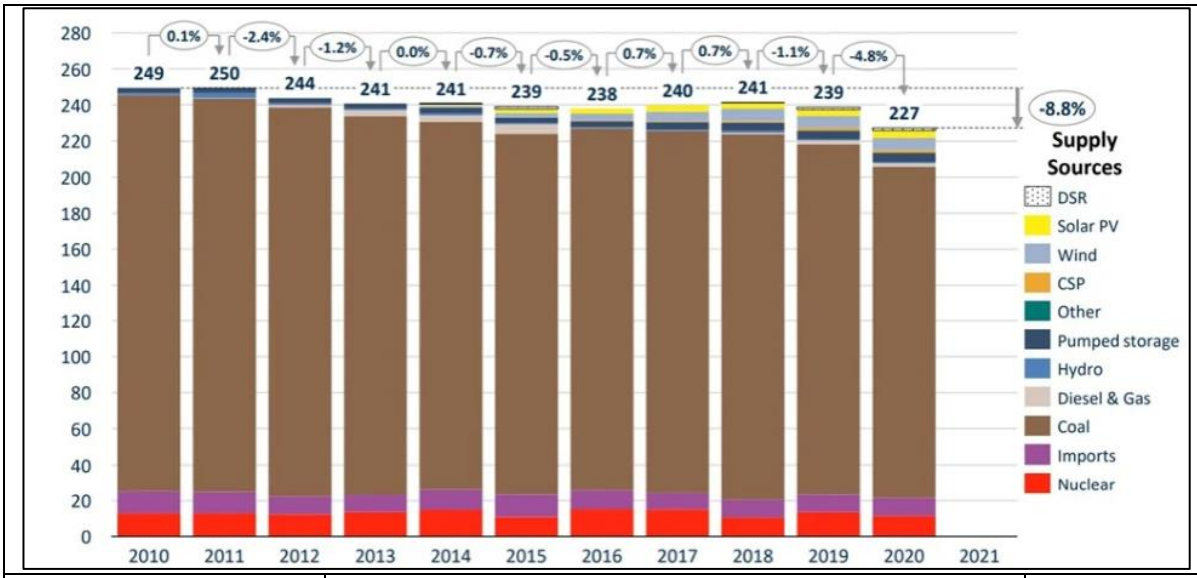


Year	Duration of outages (hours)	Energy shed (GWh)	Est. econ. Impact (ZAR-bln)
2007	-	176	8-15
2008	-	476	21-42
....	....	....	....
2014	121	203	9-18
2015	852	1325	58-116
2016	-	-	-
2017	-	-	-
2018	127	192	8-17
2019	530	1352	59-118
2020	859	1798	

srk consulting	**HANOVER RENEWABLE ENERGY CLUSTER SEF** History of loadshedding in South Africa	Project No. 583169

Figure 3-7: History of loadshedding in South Africa

Source: (BusinessTech, 2021a), (CSIR, 2020)



srk consulting	**HANOVER RENEWABLE ENERGY CLUSTER SEF** Annual electricity production in South Africa (TWh)	Project No. 583169

Figure 3-8: Annual electricity production in South Africa (TWh)

Source: CSIR cited in (Business Insider SA, 2021a)

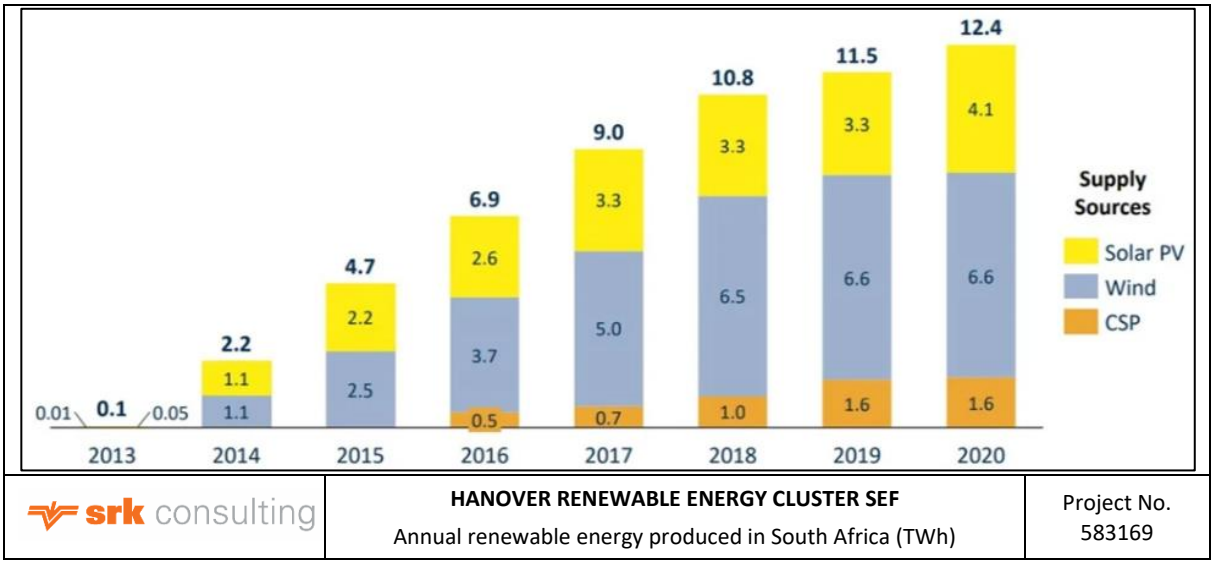


Figure 3-9: Annual renewable energy produced in South Africa (TWh)

Source: CSIR cited in (Business Insider SA, 2021a)

The REIPPPP was established at the end of 2010 as one of the South African Government's urgent interventions to enhance electrical power generation capacity in the country. Administered by the Department of Mineral Resources and Energy (DMRE), the programme seeks to secure electricity from renewable and non-renewable energy sources, via private sector investment, whilst contributing to broader national development objectives (DMRE, 2021). In July 2022 it was announced that the originally anticipated generation capacity to be procured in Bid Window 6 would be doubled to ramp up electricity generation in South Africa (Hall, 2022), however only appointed 860 MW of the 4200 MW anticipated (DMRE, 2022).

An August 2021 amendment to the Electricity Regulation Act 4 of 2006 exempts embedded electricity generation projects between 1 MW and 100 MW from the previous requirement of applying for a generation licence, requiring them only to register with the National Energy Regulator of South Africa (NERSA). In February 2022 private electricity trading company Enpower Trading was issued a licence that allows it to transport energy from IPPs to private end-users in any location across the municipal and national electricity grid by 'wheeling' the energy across the national and municipal grid networks. These developments are expected to further drive availability of and demand for independently - produced renewable energy in South Africa and increase in the number of South African IPPs (Business Essentials, 2022) independently of the REIPPPP.

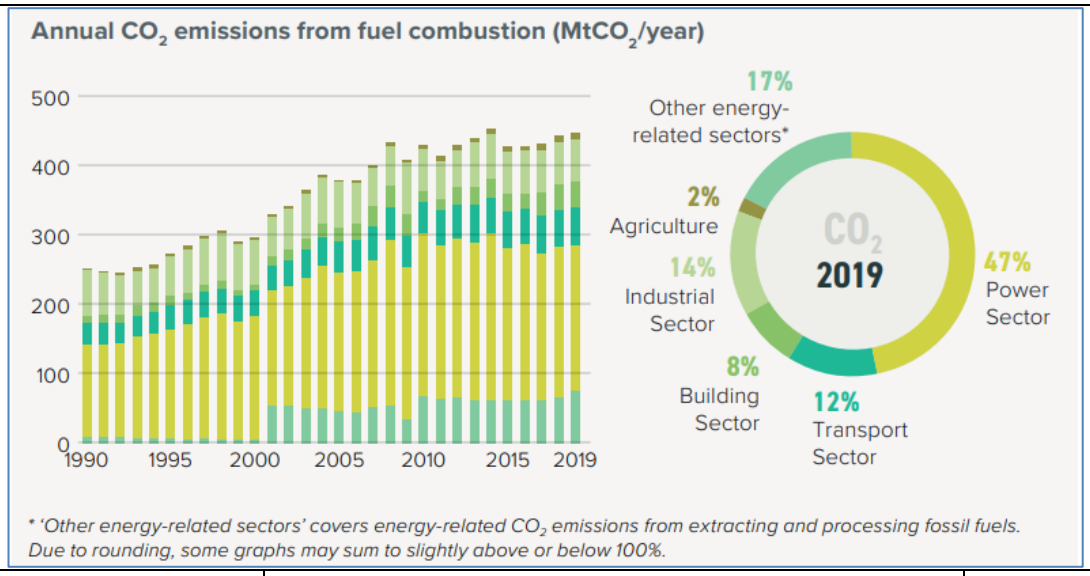
3.5.1.2 Increasing Renewable Power Generation to Reduce Carbon Emissions from Energy Production

Once operational, PV plants produce electricity that is largely free of CO_2 emissions[14]. PV plants are thus considered important in the transition to a low-carbon economy to address climate change, especially where they replace (current or future) electricity that generates high CO_2-e emissions, such as in South Africa where electricity is primarily produced by coal fired power plants.

In 2019, electricity generated by Eskom produced ~212 Mt CO_2-e (EcoMetrix Africa, 2020), ~44% of South Africa's total emissions from fuel combustion (Our World in Data, n.d.) (see Figure 3-6).

[14] It is noted that the manufacturing, transportation and installation of renewable energy plant components result in CO_2 equivalent (CO_2-e) Greenhouse Gas (GHG) emissions. Volumes depend on the source and recycling content of materials (particularly concrete and steel for WEFs and glass, steel and concrete for PV plants), type of energy used for manufacturing and distance over which materials are transported (IRENA, 2019).

Renewables generated 6.5% of power in South Africa in 2019, including 1.6% from solar facilities. That represents a 158% increase from 2014 to 2019, but is still low, and the level of power generated from coal has hardly decreased at 88% of the power mix (see Figure 3-11) (Climate Transparency, 2020).



srk consulting	**HANOVER RENEWABLE ENERGY CLUSTER SEF** Annual CO_2 emissions from fuel combustion in South Africa (million tons / year)	Project No. 583169

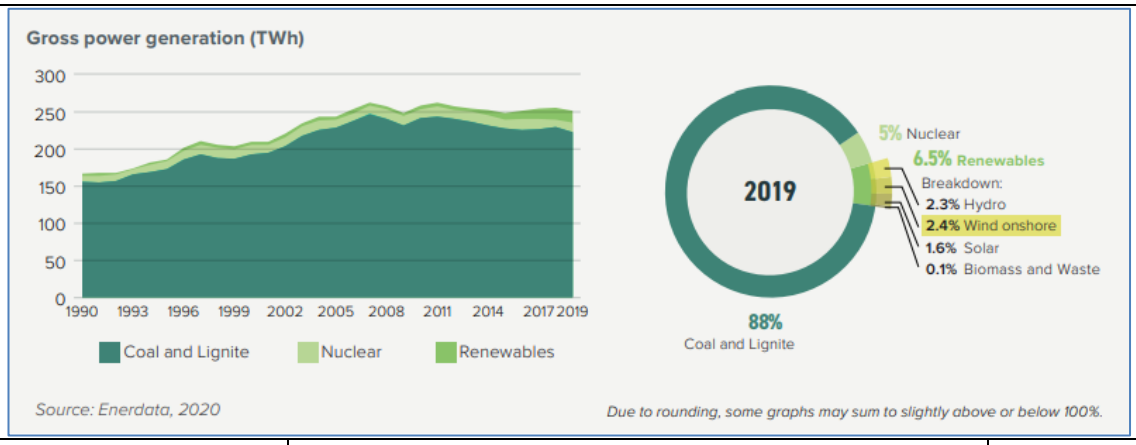
Figure 3-10: Annual CO_2 emissions from fuel combustion in South Africa (million tons / year)

Source: (Climate Transparency, 2020)

The emissions intensity of the South African power sector and the energy intensity of its economy are both nearly double the G20[15] average (see Figure 3-12), while at the same time South Africa's share of renewable energy in power generation (6.5%) is low compared to the G20 average (27%) (Climate Transparency, 2020). In combination this provides for a concerning picture regarding South African GHG emissions, which are high relative to comparative countries. Renewable energy projects were thus identified in South Africa's IRP as an important component of South Africa's energy mix going forward (see Section 2.2.1).

By generating renewable energy, the project contributes not only to improving South Africa's energy security but also to lowering the carbon intensity of South African energy production, by supplementing coal power generation supply from Eskom with wind, solar, biomass and small hydro energy.

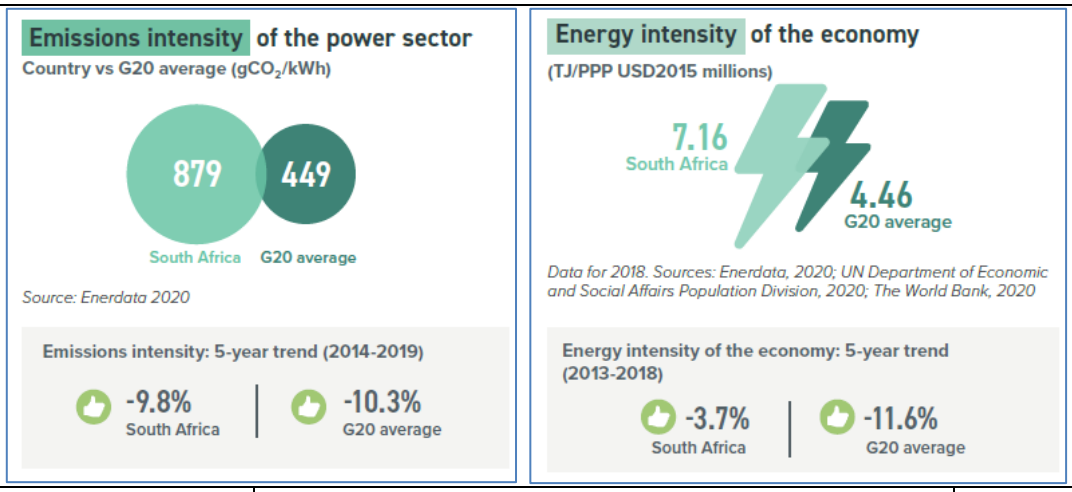
[15] The G20 comprises Argentina, Australia, Brazil, Canada, China, France, Germany, Japan, India, Indonesia, Italy, Mexico, Russia, South Africa, Saudi Arabia, South Korea, Turkey, the United Kingdom, the United States, and the European Union. Its members account for more than 80% of world GDP, 75% of global trade and 60% of the population of the planet (DFAT, n.d.).



srk consulting	**HANOVER RENEWABLE ENERGY CLUSTER SEF** Gross power generation by source in South Africa	Project No. 583169

Figure 3-11: Gross power generation by source in South Africa

Source: (Climate Transparency, 2020)



srk consulting	**HANOVER RENEWABLE ENERGY CLUSTER SEF** Power sector emissions intensity and economy energy intensity in South Africa	Project No. 583169

Figure 3-12: Power sector emissions intensity and economy energy intensity in South Africa

Source: (Climate Transparency, 2020)

3.5.2 Motivation for the Hanover Cluster and Orange Valley SEF project

Mainstream intends generating renewable electricity at the proposed Hanover Cluster, including Orange Valley SEF, to either feed into the Eskom grid through an award in a future REIPPPP bid window or agreements with private end-users. The proposed grid connection infrastructure is required to step up and transmit power from the SEF facilities to the MTS (and from there to the Eskom grid for onward transmission).

As noted in Section 3.5.1.1, reducing the risk of loadshedding through the provision of additional energy represents a benefit to the South African economy. The 150 MW Orange Valley SEF project is forecast to generate ~322 GWh of electricity per year[16]. Based on the values estimated by SAWEA (2019), the economic value of reduced load shedding associated with the total power produced by the

[16] Anticipated power output was not provided, and depends on various factors, such as the panel technology and solar irradiation. Productions rates vary across PV plants, but on average, in the United States, 1 MW of solar panels will generate 2 146 MWh of energy per annum (FreeingEnergy.com, 2023). Therefore, the output of a 150 MW SEF in South African can be conservatively estimated as ~321 900 MWh / 321.9 GWh per annum.

project could amount to R29 billion, or a R966 million saving in diesel used to generate emergency power[17] , per annum.

Eskom has cited an immediate power gap of 4 000 to 6 000 MW (Business Day, 2022), of which the project installed capacity represents 2.5% to 3.75% - though it is noted that energy demand and supply are highly complex, and that PV plants are not on-demand facilities that always produce a predictable, dispatchable power output (installation of a BESS will increase the reliability of energy supply from the project).

Eskom expects to retire 10 000 MW of installed thermal power generation capacity by 2030 and needs to add 40 000 to 50 000 MW of new capacity by 2037 to replace retired units and provide for South Africa's growing energy demand (Business Day, 2022) (and see Section 2.2.1). Installing alternative power sources as part of the energy mix will be critical.

The production of renewable power by the Hanover Cluster and proposed Orange Valley SEF will reduce the carbon intensity of South Africa's energy production.

Mainstream considers the Hanover Cluster and proposed Orange Valley SEF project site to be suitable for the development of a SEF and evacuation to the grid for the following reasons:

- *Resource availability*: The Global Horizontal Irradiation (GHI) in the project site is ~ 2 170 kWh/ m^2/annum which is above the threshold deemed sufficient for efficient PV power generation (see Figure 3-3);
- *Site extent and sensitivity*: The identified project site is sufficiently large to accommodate a 150 MW PV facility while avoiding known environmentally sensitive areas;
- *Topography*: The project site is largely flat and suitable for the installation of PV arrays;
- *Landowner support*: The project site is owned a single landowner who has concluded an agreement with Mainstream and supports the development. Positioning of the proposed SEF has been determined in consultation with the affected landowner;
- *Site access*: The project site can be readily accessed from the N1, which minimises construction of access roads and facilitates the transportation of heavy machinery and project components during construction; and
- *Grid access*: The project site is located between Eskom's Droerivier / Hydra 400 kV and Hydra / Poseidon 400 kV powerlines, facilitating easy evacuation of power generated to the Eskom grid. While insufficient grid capacity is an increasing concern, the Hydra supply area has available transformer and substation transfer capacity at all substations (see Figure 3-13) (Eskom, 2022). The local grid can thus accommodate and transmit power generated at the Hanover Cluster.

[17] 321 900 000 kWh x R90/kWh loadshedding impact = ~R29 billion; 321 900 000 kWh x R3/kWh diesel cost for power generation = ~R966 million.

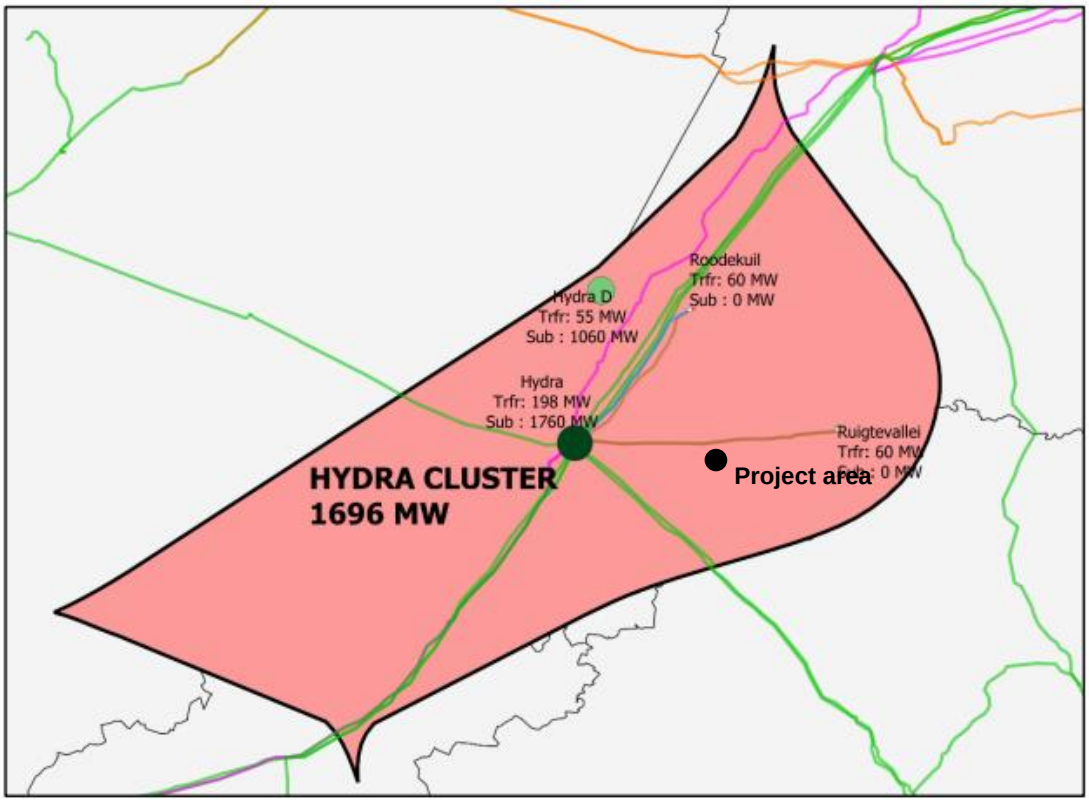


Figure 3-13: Hydra Cluster substation and transformer capacity

Source: (Eskom, 2022)
Note: "Trfr" indicates the available transformer capacity at each substation. "Sub" indicates the available capacity at each substation.

3.6 Project Alternatives

Appendix 2 Sections 2 (1) (h) (i) and (x) and Appendix 3 Sections 3 (1) (h) (i) and (ix) of the EIA Regulations, 2014 require that S&EIR processes must identify and describe alternatives to the proposed activity that were considered, or motivation for not considering alternatives. Different types or categories of alternatives can be identified, e.g. location alternatives, type of activity, design or layout alternatives, technology alternatives and operational alternatives.

Not all categories of alternatives are applicable to this project, as discussed below and summarised in Table 3-4.

Table 3-4: Alternatives considered

Alternative type	Alternatives considered	Reference	Assessed in the S&EIR
Location	Project location	3.6.1	Yes
	Alternative location		No
Layout	Covering entire development area		No
	Reduced development envelope based on environmental sensitivities		Yes
Activity	Activity as described in Scoping Report	3	Yes
	No-go alternative	3.6.5	Yes
Technology	Monocrystalline Modules	3.7.2.1	Yes

Alternative type	Alternatives considered	Reference	Assessed in the S&EIR
Cell technology	Polycrystalline Modules		Yes
	Thin Film Modules		Yes
Panel technology	Monofacial panels	3.7.2.2	Yes
	Bifacial panels		Yes
Panel mounting technology	Fixed axis	3.7.1	No
	Single axis tracking		Yes
	Dual axis tracking		No
BESS technology	Solid State Batteries	3.7.3.2	Yes
	Redox Flow Batteries		Yes

3.6.1 Location Alternatives

Mainstream undertook an internal constraint mapping exercise to identify the most suitable development area for the Orange Valley SEF (and the Hanover Cluster), i.e. the location with least environmental and social impact. The following criteria were considered:

- Avoidance of environmentally sensitive areas, e.g. CBAs, national parks and watercourses;
- Avoidance of socially sensitive areas, e.g. inhabited areas, and cultivated land;
- Support of and approval by affected landowners;
- Suitable terrain for the establishment of PV arrays, requiring a minimum of earthworks;
- Sufficient available area to site the cluster of projects;
- Good accessibility from existing roads;
- Proximity of tie-in points to the Eskom grid; and
- Availability of grid (transmission) capacity in the region.

The identified development area (Figure 1-2) largely satisfies the above criteria, which makes the identified site ideally suited for the development of an SEF. As such, no alternative locations or sites are assessed for the Orange Valley SEF.

3.6.2 Layout Alternatives

The development area was refined to exclude areas identified by specialists as being particularly sensitive to development (No-Go areas, likely to result in impacts of very high significance and which could not be mitigated) based on desktop and site evaluations of the receiving environment.

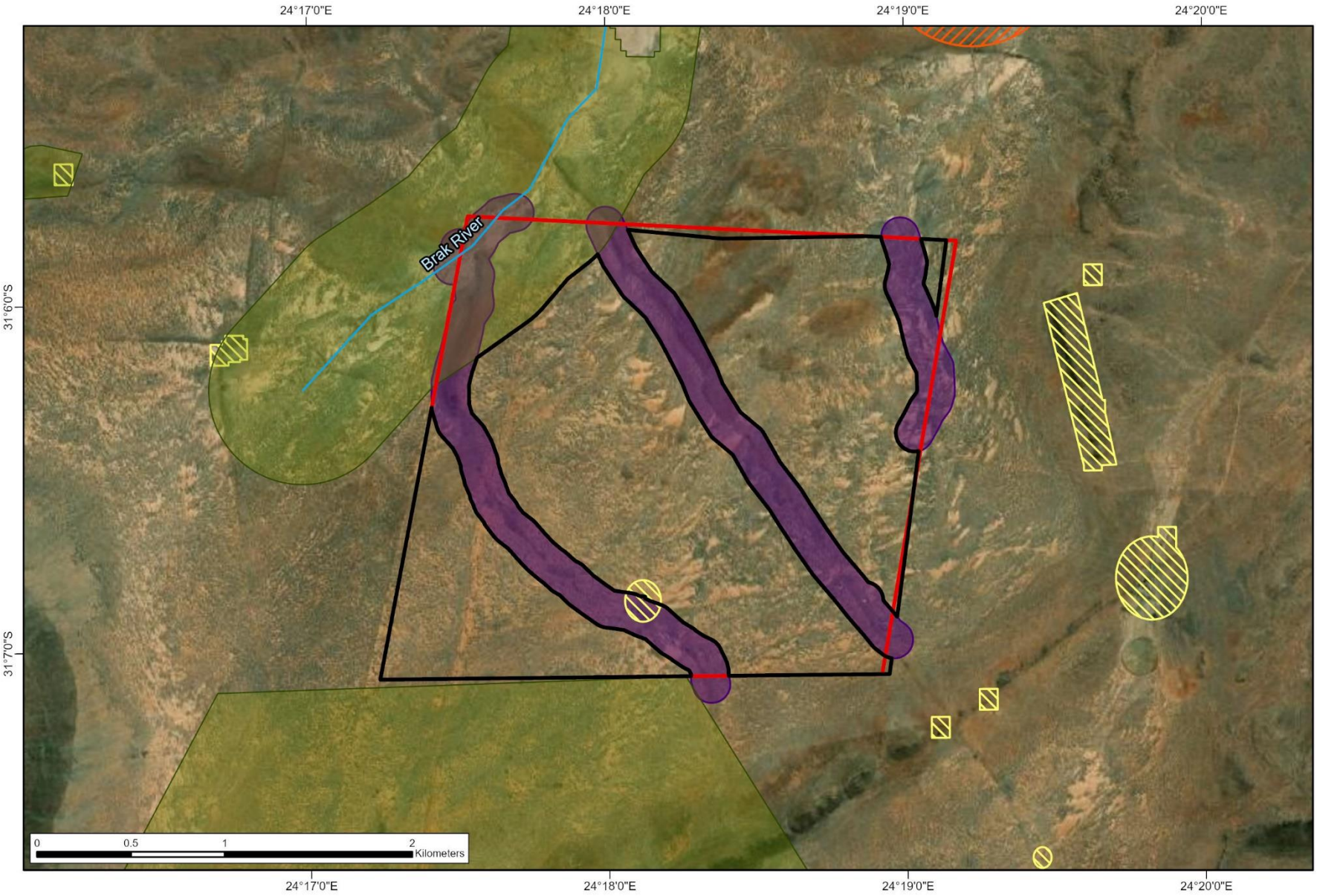
Features within the Hanover Cluster considered to be No-Go areas, and associated buffers, are summarised in Table 3-5. Those features occurring within the Orange Valley SEF development area are italicised in Table 3-5 and depicted in Figure 3-14.

Refinement of the development area to exclude these features informed the identification of the (reduced) development envelope.

Table 3-5: Sensitive environmental features and buffers

Aspect	Sensitive Environmental Features		Buffer Assigned
Terrestrial Biodiversity	Floral Species of Conservation Concern (SCC)		200 m
	CBA 1		-
	Rocky Slopes and Outcrops		-
Avifauna	Raptor's nests'	Jackal Buzzard Nests	500 m

Aspect	Sensitive Environmental Features	Buffer Assigned
	Verreaux's Eagle	1 000m
	Riverine and Wetland Habitat (including dams)	*100 m*
Heritage	Farm Complexes	500 m
	Historical Kraal / Hut	*50 – 200 m*
	Graded sites	50 m
	Farmsteads	500 m
	Historical Boundary Wall	20 m
	Dolerite Dykes	-
Visual	Farmsteads	500 m
	Roads	200 m



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Scale	1:30 000 @A4
Projection: Geographic	Datum: HH94
Central Meridian/Zone:	
Date: 12/05/2023	Compiled by: BRCH
Project No. 583169	Fig No. 3-14

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HANOVER RENEWABLE ENERGY CLUSTER

REFINEMENT OF ORANGE VALLEY SEF DEVELOPMENT AREA

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Revision: A Date: 30 05 2023

3.6.3 Activity Alternatives

Mainstream proposes to development facilities to generate renewable energy, allowing for evacuation of up to 150 MW per SEF and up to 950 MW from the seven SEF projects in the Hanover Cluster. It is not Mainstream's intention to utilise the property for any other activity. As such, there are no reasonable activity alternatives.

3.6.4 Technology Alternatives

3.6.4.1 Cell Technology

Three cell technology alternatives are considered and described in Section 3.7.2:

- Monocrystalline Modules;
- Polycrystalline Modules; and
- Thin Film Modules.

3.6.4.2 Panel Technology

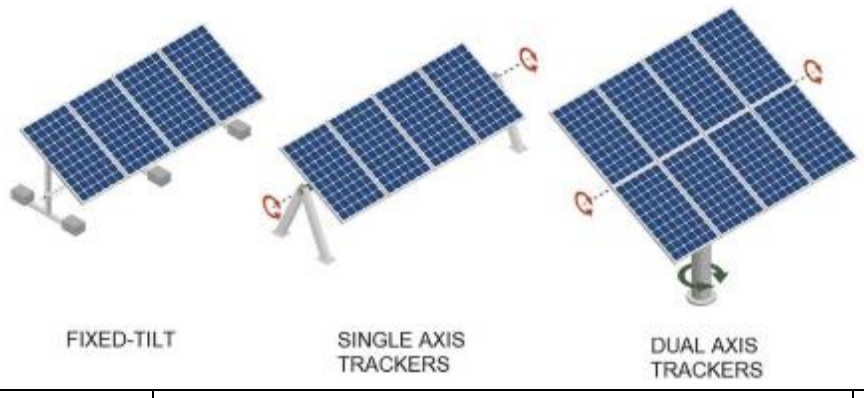
Two panel technology alternatives are considered and described in Section 3.7.2:

- Monofacial panels; and
- Bifacial panels.

3.6.4.3 Panel Mounting Technology

Mainstream considered various mounting technologies during the pre-feasibility stage:

- *Fixed axis*: A fixed-tilt system positions the panels at a "fixed" tilt and orientation (see Figure 3-15). This reduces the accuracy of solar panel placement and energy output;
- *Single axis tracking*: This system has a single degree of flexibility that serves as an axis of rotation and is usually aligned north-south (see Figure 3-15). It allows the panels to track the daily movement of sun from east to west, but does not correct for seasonal elevation of the sun. This system is cheaper, more reliable and has a longer lifespan than a dual axis system. It can increase energy production by ~25% to 35% compared to fixed axis systems (SolarReviews, 2022), (energysage, n.d.), but energy production is lower than for dual axis systems; and
- *Dual axis tracking*: This system allows for movement along two axes (see Figure 3-15), which offers a wider range of motion and thus increase the accuracy in directional positioning of solar panels. It allows the panels to follow the sun daily from east to west and additionally corrects for seasonal north-south sun movement (elevation of the sun in the sky). The dual axis system thereby allows for ~40% higher energy output than for fixed axis systems (SolarReviews, 2022), (energysage, n.d.). However, the system is mechanically complex and more susceptible to break down, has a lower lifespan and is unreliable during cloudy or overcast weather.



srk consulting	HANOVER RENEWABLE ENERGY CLUSTER Panel Tracking Technologies	Project No. 583169

Figure 3-15: Panel tracking technologies

Source: (RenewSys, 2021)

Advantages and disadvantages of each mounting technology are summarised in Table 3-6. Based on an analysis of advantages and disadvantages, Mainstream selected single axis tracking which is the only mounting technology alternative considered in the EIA (see Section 3.7.1).

Table 3-6: Advantages and disadvantages of mounting technologies

Technology	Advantages	Disadvantages
Fixed axis	• High reliability • Low maintenance • Cheaper installation	• Lower energy output
Single axis tracking	• Higher energy output than fixed axis • High reliability • Low maintenance • Cheaper installation than dual axis • Longer life span than dual axis	• Lower energy output than dual axis
Dual axis tracking	• Higher energy output than single axis	• More susceptible to breakdown • Lower lifespan than single axis • More expensive than single axis • Unreliable during cloudy weather

3.6.4.4 BESS Technology

Mainstream is considering two battery technology alternatives which are described in Section 3.7.3.2:

- Solid state batteries; and
- Redox flow batteries (RFB).

Advantages and disadvantages of each technology are summarised in Table 3-7. The preferred BESS technology will be selected during the detailed design phase. The EIA considers both solid state and redox flow batteries to afford Mainstream flexibility (see Section 3.7.3.2).

Table 3-7: Advantages and disadvantages of battery technologies

Technology	Advantages	Disadvantages
Solid state	• High efficiency • Relatively high energy density • Fast response to unpredictable variations in demand and generation • Low maintenance • Relatively long lifecycle (~10-15 years)	• Fire risk due to thermal runaway • High cost due to limited abundance in lithium • Risk of annual degradation • Battery protection is required

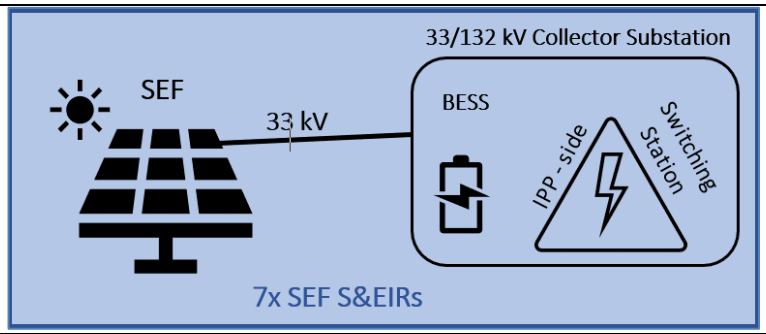
Technology	Advantages	Disadvantages
	• Ability to offset grid fluctuations • Ease and flexibility of production and sizing • Low occurrence of short circuits • High stability (as no liquids and volatile substances are used) • No risk of spills (as batteries contain no liquids) • Currently the most widely used BESS technology • Li-ion battery systems arrive fully encased (rather than being installed on site)	• Power and energy capacity directly coupled (expensive to scale)
Redox flow	• Fast response to unpredictable variations in demand and generation • Long life cycle (~20 years) • Almost unlimited energy capacity • No capacity degradation over time • Electrolyte is inherently safe and non-flammable • Independently tuneable power rating and energy capacity	• Scarce and expensive components • Lower efficiency • Lower energy density than solid state batteries • Storage of electrolyte chemicals in tanks (storage of hazardous goods) requires additional approvals • Storage of electrolyte chemicals in tanks increases the risk of spills • Larger footprint (unless containers are stacked) • Currently not market competitive • Battery systems are installed on site (increasing the risk of accidents)

3.6.5 The No-Go Alternative

In addition to the alternatives described above, the No-Go alternative will be considered in the EIA in accordance with the requirements of the EIA Regulations, 2014. The No-Go alternative implies that the project does not go ahead, i.e. that no renewable energy will be generated on the site, and that current activities (notably grazing) will continue, and/or that other activities not requiring authorisation may be pursued.

3.7 Orange Valley SEF Infrastructure and Construction Activities

The Orange Valley SEF includes the key components listed in Table 3-8, described in the sections below and shown in the schematic in Figure 3-16.



srk consulting	HANOVER RENEWABLE ENERGY CLUSTER SEF Hanover SEF Project Components	Project No. 583169

Figure 3-16: Hanover SEF project components

This infrastructure will be positioned in the Orange Valley SEF development envelope indicated in Figure 3-14, however a detailed development layout has not yet been determined. For the purposes

of the EIA, it is assumed that the entire development envelope will be disturbed, an area of approximately 470 ha.

Table 3-8: Overview of Orange Valley SEF key components

Aspect	Components	Approx. footprint
Orange Valley SEF	• Solar panel arrays with monofacial or bifacial modules • Single axis mounting system • Underground cabling / overhead transmission lines (up to 33 kV) between panels and arrays • Inverters and transformers	~430 ha
Electrical infrastructure	• 33/132 kV Orange Valley on-site substation	25 ha
	• BESS	Up to 5 ha (of the 25 ha)
	• 33 kV overhead transmission lines / underground cabling from the Orange Valley SEF and BESS to the Orange Valley on-site substation	
Building infrastructure	• Offices • Operational control centre • Operation and maintenance area, warehouse and workshop • Ablution facilities	~0.4 ha
Ancillary infrastructure	• Access roads and internal gravel roads • Fencing and lighting • Lightning protection • Construction camp and laydown area • Telecommunication infrastructure • Stormwater infrastructure • Sewage infrastructure • Water pipelines • Guard house	~15 ha
TOTAL FOOTPRINT		**470 ha**

3.7.1 Project Layout and Mounting Technology

The preliminary layout and design of the Orange Valley SEF are described below. A final layout will be determined during detailed design by an Engineering, Procurement, and Construction (EPC) Contractor once the project has been awarded REIPPPP Preferred Bidder status or reached agreement with private end-users.

PV arrays will be installed in north-south aligned rows over most of the development envelope (see Figure 3-14). Spacing between PV arrays is up to 12 m where internal roads are required.

PV modules will be mounted on a single axis tracking system (see 3.6.4.3) in accordance with the following specifications:

- Tracking Axis: horizontal;
- Tracking Axis Tilt (tilt of torque tube): assumed tilt is 0°;
- Maximum rotation (tracking) angle of PV modules relative to the mid (horizontal) position on the torque tube: Negative (Counter clockwise – CCW) 90° to positive (clockwise – CW) 90°;
- Resting / stow angle of PV module: 0° (horizontal); and
- Height of the centre of the PV panels above ground: 4 m.

Cables between panels will be placed underground where possible and suspended between panels where necessary. The capacity of internal cabling between inverters and the on-site substation will not exceed 33kV.

3.7.2 PV Panels

The Orange Valley SEF will comprise approximately 250 000 – 350 000 PV panels mounted in parallel rows, occupying most of the site. The final number of PV panels, and aspects related to required inverters and transformers, such as number and capacity, will be finalised during detailed design prior to construction, but do not materially affect project layout or project impacts.

3.7.2.1 Solar Cell Technology

Three cell technology alternatives will be considered during detailed design, as described below:

- *Monocrystalline modules* are made from pure silicon crystal ingots melted down and drawn out into a solid silicon crystal from which the solar cells are cut. The cells are rigid and mounted on a rigid frame. The modules are covered in glass to protect the cells from damage. Monocrystalline modules are highly efficient (~20% efficiency rating (McFadden, 2021)) but expensive;
- *Polycrystalline modules* are made from silicon that contains impurities. It is melted down and cut into wafers which make up the blocks in a module. The cells are rigid and mounted on a rigid frame. The modules are covered in glass to protect the cells from damage. Polycrystalline modules are cheaper to produce but less efficient than monocrystalline modules (~15% efficiency rating (McFadden, 2021)); and
- *Thin-film modules* are cells manufactured from a chemical ink compound that has similar properties to silicon cells. The ink compound is printed onto a sheet metal to form the base of the module. This sheet is heated to turn it into a semiconductor. A layer of glass is added to cover the cell surface, which allows thin-film modules to match the lifespan of silicon modules. Thin-film modules are cheaper than silicon-based modules, but slightly less efficient.

While more polycrystalline modules are required to generate the same energy output than monocrystalline modules, the choice of cell technology does not materially affect the project layout or impacts and these will not be comparatively assessed. For the assessment it is conservatively assumed that the Orange Valley SEF will occupy the entire development envelope.

3.7.2.2 Solar Panel Technology

Two further panel technology alternatives will also be considered during detailed design, as described below (Figure 3-17):

- *Monofacial panels* have PV cells on one side (on top) of the solar panel that collect direct sunlight. They do not require reflective surfaces or special mounting equipment; and
- *Bifacial panels* have solar cells on both sides of the solar panel (on top and underneath the panel). The cells on top of the panel gather direct sunlight, while the cells on the bottom collect reflected light. For bifacial panels to work best, they need a reflective substrate, greater spacing and special frame and mounting structures. Since both sides of the panel can produce electricity, the efficiency of bifacial panels is somewhat higher (between ~5% and ~35% more efficient than monofacial panels, depending on diffuse light energy, reflectivity of the substrate, tilt and row spacing) (Go Solar, 2021) (Pickerel, 2018).

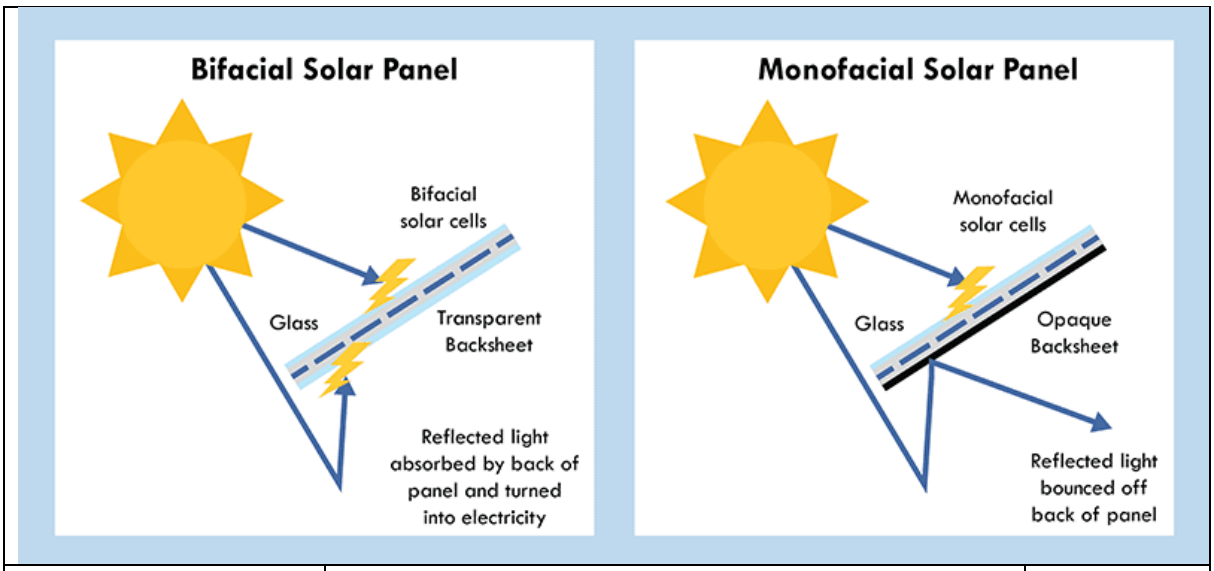


Figure 3-17: Illustration of bifacial versus monofacial solar panels

Source: (Wolf, 2021)

The choice of panel technology can affect the footprint of the PV array, as PV facility using monofacial panels requires a bigger footprint to produce the same energy than a facility using bifacial panels.

For the assessment it is conservatively assumed that the Orange Valley SEF will occupy up to 470 ha (i.e. monofacial panels are used). Both alternatives are assessed in terms of ground preparation and installation (see Section 3.7.8).

3.7.3 BESS

3.7.3.1 Background

A (simple) battery is a device that is able to store electrical energy in the form of chemical energy and convert that energy into electricity.

There are three main components of a battery: two terminals made of different chemicals (typically metals), the anode and the cathode; and the electrolyte, which separates these terminals. The electrolyte is a chemical medium that allows the flow of electrical charge between the cathode and anode. When a device (or, the electrical grid) is connected to a battery, chemical reactions occur on the electrodes that create a flow of electrical energy to the device (or the electrical grid).

During a discharge of electricity, the chemical on the anode releases electrons to the negative terminal and ions in the electrolyte through an oxidation reaction. At the positive terminal, the cathode accepts electrons, completing the circuit for the flow of electrons. The function of the electrolyte is to put the different chemicals of the anode and cathode into contact with one another in a way that the chemical potential can equilibrate from one terminal to the other, converting stored chemical energy into useful electrical energy (Bates, 2012).

3.7.3.2 Proposed BESS

A BESS (Figure 3-18) may be constructed for the Orange Valley SEF to store energy generated by the SEF. A BESS thus makes energy supply from the Orange Valley SEF more efficient, available and reliable.

The BESS will have a footprint of up to 5 ha, mostly comprising an assemblage of numerous container-sized battery modules. It will be located adjacent to the Orange Valley SEF substation and/or office building. Micro-siting of the BESS within the assessed Orange Valley SEF substation will take place during detailed design and in accordance with the outcome of the site sensitivity assessment.

srk consulting	**HANOVER RENEWABLE ENERGY CLUSTER SEF** Battery Energy Storage System	Project No. 583169

Figure 3-18: Battery energy storage system

Source: (MFAME, 2022)

Mainstream is considering two battery technology alternatives:

- *Solid State Batteries* (see Figure 3-19) typically consist of a graphite anode, metal-oxide cathode, and an electrolyte gel packaged in a flat pouch or rolled up in a cylindrical shape. Solid-state battery electrolytes typically consist of Lead Acid (Pb), Nickel Cadium (NiCad), Lithium-Ion (Li-ion), Sodium Sulfur (NaS) or Sodium Nickle Chloride / Zebra (NaNiCl). Sealed thermal management systems within the batteries contain coolants and refrigerants (ethylene glycol and tetrafluoroethane); and
- *Redox Flow Batteries* contain a battery cell with flowable electrolyte pumped between storage tanks (see Figure 3-20). Electrolyte is pumped through the cell for charging or discharging and is stored in separate tanks for longer duration storage. The electrolyte storage tanks and cells are installed in a specially prepared shipping container (see Figure 3-20). The containers typically have secondary and tertiary containment for the electrolyte fluid (Platte River Power Authority, 2017).

srk consulting	HANOVER RENEWABLE ENERGY CLUSTER SEF Solid state battery module (left) and system (right)	Project No. 583169

Figure 3-19: Solid state battery module (left) and system (right)

Source: Engadget.com

Solid State BESS

Mainstream's preference would be to use *solid state* Lithium-ion batteries. Solid state battery cells are integrated into battery modules, which are installed in standard racks similar to those used for telecommunication equipment (see Figure 3-19). Typically, the racks are then installed in a specially prepared shipping container to function as an integrated battery system.

Containers will be placed on raised concrete plinths and may be stacked on top of each other to a maximum height of approximately 15 m. Each container has a footprint of ~60 m^2 and is ~4 m high. Additional equipment, e.g. inverters and temperature control equipment, may be positioned between the battery containers. Sufficient spacing between each container must be ensured to adhere to safety requirements (see Figure 3-19).The chemical composition of the batteries (in the BESS) can be hazardous (typically comprised of a blend of one or more of the hazardous substances listed in SANS 10234), and the batteries will therefore be housed in intermodal containers (or similar) in a bunded area.

The Lithium-ion battery systems will arrive fully encased (and are thus not assembled on site) and have a number of design features that mitigate key risks of solid state batteries:

- Design features that mitigate the risk of fire or structural damage of batteries due to external temperature variations include the following:
    - Insulated containers;
    - Centrally monitored Heating, Ventilation and Air-Conditioning system;
    - Multiple sensors to measure temperature of battery cells and air;
    - Automated shut down mechanism if temperature gets too high;
    - Dousing and sealing mechanism for fire suppression and containment; and
    - Battery management system to prevent overuse and maintain good battery condition; and
- Design features that mitigate the risk of fire due to volatility of the battery system and battery chemicals include the following:
    - Fire detection and suppressant system;
    - Gas level monitoring;
    - Heat sensors;

- Battery condition monitoring;
- Dousing mechanism for emergency cooling and fire suppression;
- Density limits in containers; and
- Spacing requirements between containers (~2.4 m).

Redox Flow BESS

RFBs are charged and discharged by means of an oxidation – reduction reaction of ions. These batteries have an excellent long service life, with almost no degradation of electrodes or electrolytes, and are considered safe as they are free of combustible materials and can be operated under normal temperatures.

The advantages of RFBs include the long lifespan of the system, which can last for up to 20 years, with an unlimited number of charge, and discharge cycles available without any degradation. Furthermore, the electrolytes can be used semi permanently. The RFBs are versatile, allow flexible design and enable a single system to address both short and long periods of output variation, enabling cost-effective power generation. In addition, the batteries can operate under normal temperatures and are composed of non-combustible or flame-retardant materials. Thus, the possibility of a fire with an RFB is extremely low.

Disadvantages of RFBs relate to the complexity of the system as it requires pumps, sensors, flow and power management and secondary containment vessels. Furthermore, RFBs have a low energy density compared with other types of batteries.

Several types of RFBs are available and include Vanadium redox batteries (VRB) and the Zinc-Bromine (Zn-Br) batteries.

Vanadium redox batteries comprise an assembly of power cells in which two electrolytes are separated by a membrane. Due to the aqueous electrolytes within the VRB systems, the risk of fire or the harmful release of gases into the environment is significantly reduced; nevertheless, these systems are located within secondary containment berms ~2.5 m high to contain spills or leaks during operation. Small amounts of hydrogen are produced during charging which can pose a safety risk due to explosive reaction with atmospheric oxygen.

Zinc-Bromine batteries contain two aqueous electrolytes of reactive components: zinc and bromine. The highly toxic solutions stored in two tanks and are pumped through the reactor stack and back into the tank when charging. Zinc-Bromine redox flow is a potentially cheaper, more efficient technology with a longer lifespan, however the formation of build up of metal on the anode which can lead to shorts and impact on the efficiency of the battery (Xu, Fan, Li, Wang, & Lund, 2020).

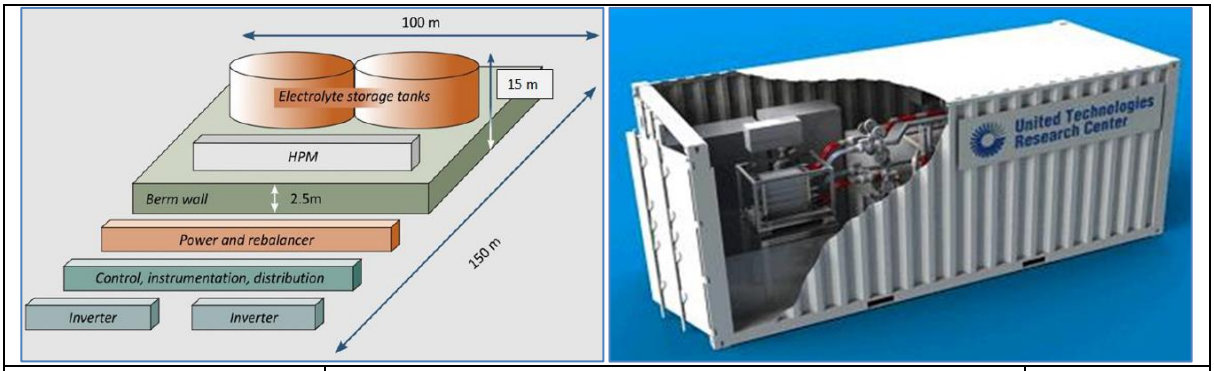


Figure 3-20: Redox Flow battery schematic

3.7.4 Internal Powerlines

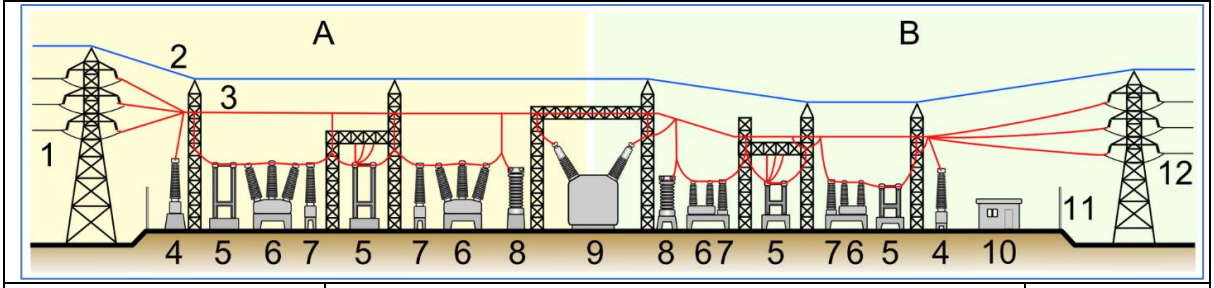
A 33 kV powerline(s) will be installed underground and/or overhead on support structures (pylons / monopoles) between the Orange Valley SEF and the on-site substation.

Final powerline routing and design, including the number of support structures and their type, height and precise location (micro-siting), will be completed during detailed design based on environmental, geotechnical and civil engineering considerations.

3.7.5 On-site Substation

3.7.5.1 Background

A substation is a part of an electrical generation, transmission and distribution system. Substations transform voltage from low to high, or the reverse, or perform any of several other important functions. Between the generating station and consumer, electric power may flow through several substations to deliver electricity at the required voltage. A substation typically includes transformers to change voltage levels from low distribution voltages to high transmission voltages and, and/or is constructed at the interconnection of two different transmission voltages (see Figure 3-21).



srk consulting	HANOVER RENEWABLE ENERGY CLUSTER SEF Schematic of a substation	Project No. 583169

Figure 3-21: Schematic of a substation

Source: By Shigeru23 - Own work, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=14896493

Notes: Elements of a substation include 1. Primary power lines, 2. Ground wire, 3. Overhead lines, 4. Transformer for measurement of electric voltage, 5. Disconnect switch, 6. Circuit breaker, 7. Current transformer, 8. Lightning arrester, 9. Main transformer, 10. Control building, 11. Security fence, 12. Secondary power lines

In projects with spatially dispersed generation sources, such as a WEF or SEF, an on-site substation may be required. It resembles a distribution substation with power flow from many wind turbines, SEFs or inverters up into the transmission grid. The on-site substation (and MTS)[18] steps up voltage to a transmission voltage for the grid (Wikipedia, 2021b).

3.7.5.2 Proposed Substation

The on-site substation will occupy up to 25 ha and will comprise two portions:

- the 12.5 ha IPP portion / yard (33 kV portion of the 33/132 kV substation and the BESS occupying ~5 ha); and
- the 12.5 ha switching station portion (132 kV portion of the 33/132 kV substation).

The 12.5 ha IPP-side of the Orange Valley SEF on-site substation will receive incoming power from the SEF at 33 kV and step up outgoing electricity to 132 kV, which is converted from DC to AC. The

[18] The MTS is excluded from this EA application.

~5 ha BESS will be located within the footprint of the IPP-side of the on-site substation. The substation will be owned and operated by the IPP.

The 12.5 ha switching station portion of the on-site substation will step up electricity to 132 kV and transmit electricity to the MTS. The switching station portion of the on-site substation will also include associated equipment, infrastructure and buildings. The substation will be owned and operated by Eskom.

3.7.6 Access Roads

Project components and construction equipment, such as excavators, trucks, graders, compaction equipment etc., will be transported to site by truck. Some heavy equipment will likely be defined as abnormal loads in terms of the Road Traffic Act 29 of 1989.

The Orange Valley SEF will make use of existing access roads wherever possible. The N1 (between Johannesburg and Cape Town) and N10 connecting De Aar to Gqeberha in the Eastern Cape provide convenient and suitable access to the site.

Internal roads are required along the facility boundary and within the facility to allow access to installations. Existing service 'farm' roads will be used as far as possible. Where new access roads are required, access road not wider than 12 m will be constructed to the project site. Access roads between solar arrays will have a width of between 4 m and 12 m, including drainage ditches.

Vegetation will be cleared, the road will be graded and a suitable road surface material (e.g. gravel) will be used. The thickness and type of the road surface material will be dictated by *in situ* testing to assess if the material is suitable for compaction, or whether additional structural layers are required. Road surface material will be sourced from commercial sources. Typically, internal roads are built with a minimum of 400 mm depth of sub-grade preparation and an aggregate base layer of up to 150 mm thick (KMA, 2016), but is vary in for example flood prone areas.

3.7.7 Laydown Area and Ancillary Facilities

Provision has been made for construction camp(s) and laydown area(s) within the IPP portion of the on-site substation, which occupies an area of up to 12.5 ha[19]. The laydown will be used for the storage of project components, building materials and equipment. If necessary, a temporary concrete batching plant will be installed to produce concrete for foundations and/or platforms. Other options include mobile batching plants that allow *in situ* batching of concrete. Aggregate, cement and sand will be imported to the site from commercial sources.

Support structures and infrastructure to be installed during construction to support the operation of the Orange Valley SEF include offices, operational control centre, operation and maintenance area / warehouse / workshop and ablution facilities, most of which will be located near the on-site substation.

Fuel (petrol and diesel) will be trucked to site by the Contractor and temporarily stored on site during the construction phase, in tanks and bowsers in bunded areas. The fuel tanks and bowsers will be removed from the site upon completion of the construction phase.

A fence will be erected around the perimeter of the Orange Valley SEF. A guard house will be constructed to control site access. Telecommunication facilities will be installed to ensure connectivity on site.

[19] The exact location(s) within the development envelope will be determined during the pre-construction phase, based on a survey conducted at the time.

3.7.8 Ground Preparation and Installation

In preparation for construction, a Light Detection and Ranging (LiDAR) survey will be conducted across the site to identify areas of elevation. Areas of elevation will be levelled and used elsewhere on the site for infill, if necessary.

Vegetation within the development envelope will be maintained where possible. Where necessary, vegetation will be cleared for:

- PV array foundations;
- BESS platform;
- Transmission line support structure (pylons / monopoles) foundations and/or underground cabling;
- IPP-side substation foundations;
- Access roads;
- Laydown area; and
- Building and support infrastructure footprints.

Mainstream intends to retain vegetation beneath the panels.

Stripped topsoil will be stockpiled, used as fill material to level certain features, removed from site and/or spread across the site.

Vegetation in and near the transmission line servitude and substation will be trimmed, and shrubs and trees will be removed to ensure sufficient overhead clearance between vegetation and the transmission line. For both monofacial or bifacial PV panels, ground cover will be retained and any obstructing shrubs or trees will be removed.

Other notable site preparation activities include the following:

- Support poles will be installed on which to mount PV arrays. Depending on the geotechnical conditions, screw pile, helical pile, micro-pile or drilled post/pile methods may be used. Structures (tables) on which PV modules are mounted will be attached (bracketed) to the support poles;
- Trenches will be dug for underground cabling. Foundations for the inverters and transformers will be prepared;
- Support structure (pylon) foundations for overhead transmission lines will be excavated and constructed. Structures will be assembled and erected on site, followed by the stringing of cables;
- For the substation, trenching and ground grid conduit installation will be followed by casting of concrete foundations. Thereafter, substation equipment will be assembled and installed. Gravel will be placed around the substation area, and a fence erected; and
- For the BESS, a foundation will be constructed, on which assembled battery units will be placed and connected to the project infrastructure.

3.7.9 Stormwater Management

Stormwater measures will be implemented on site to divert stormwater from potentially contaminated areas such as fuel storage, waste storage and BESS containers, and to prevent accidental leaks / spillages from entering the natural environment.

Measures will be implemented to ensure that stormwater originating from upgradient (stormwater that could flow across the site from external areas) is diverted around potentially contaminating areas.

Also, clearly visible signage indicating emergency numbers if stormwater (or any other environmental) issues are identified, will be erected.

3.7.10 Water Use and Supply

Water will be required during construction for:

- Domestic use (ablutions, drinking): ~225 m^3 / month or ~2 700 m^3 / annum;
- Civil works (compaction of fill material, cement batching etc): ~400 m^3 in total during construction; and
- Dust suppression on roads: ~15 l / m^2, as and when needed depending on conditions.

Water will be sourced from authorised service providers and/or existing boreholes and/or abstracted from surface water sources, which will be determined during detailed design. Temporary water pipelines will be installed during construction to supply the construction camp and ancillary facilities[20].

Measures to reduce water use and prevent water pollution will be implemented and specified in the EMPr.

3.7.11 Waste and Wastewater Management

The waste hierarchy and waste management procedures will be implemented during construction to prevent, minimise or recycle waste (where possible) (Figure 3-22).

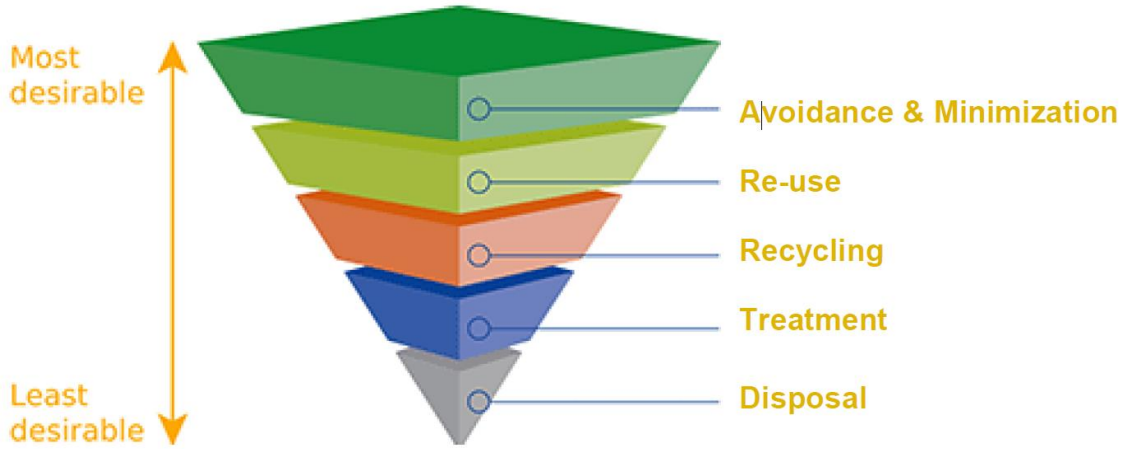


Figure 3-22: Waste management hierarchy

Solid waste produced during the construction phase will include:

- Packaging material for the PV panels, notably:
  - Cardboard waste, which may be compressed in a compactor to facilitate storage and transport off site;
  - Rubber caps placed on PV panels to provide protection during transport;
  - Wooden pallets on which PV panels are shipped;

[20] A Water Use Authorisation, if required, will be pursued once the project has been awarded preferential bidder status and final design is underway.

- Plastic wrap;

- Typical construction rubble (rock, sand, soil and concrete);
- General waste; and
- Contaminated waste such as dirty / used oil and grease and contaminated materials and soil.

Waste management during construction will be the responsibility of the contractor.

All construction waste will be removed from work areas and disposed of at licensed (municipal) waste disposal facilities. Where possible, options to reuse or recycle waste materials will be favoured over disposal. Hazardous waste will be disposed of at a licensed hazardous waste disposal facility and waste disposal manifests will be available to the competent authority upon request.

The total volume of waste that will be generated cannot be estimated at this stage, but is not expected to be significant nor compromise local waste management handling and disposal capacity. At this stage it is proposed to temporarily store less than 100 m^3 general and less than 80 m^3 hazardous waste on site at any one moment[21].

Wastewater produced during the construction phase comprises contaminated runoff, wash water and domestic wastewater. Wastewater will be captured in either septic or conservancy tanks and disposed of at a suitable facility.

3.7.12 Workforce

Construction of a 150 MW PV facility generates ~ 446 jobs (~134 skilled and ~312 unskilled) over the construction period.

Construction will primarily be undertaken by an EPC Contractor. Local sub-contractors will be appointed where possible.

No labourers will be accommodated (reside) on site.

The Department of Mineral Resources and Energy (DMRE) typically sets out specific economic development targets or focus areas in its REIPPPP Bid Window Request for Proposal, which are either compulsory and/or influence the functionality score of a project bid. These differ over time, and requirements that may be applicable to the Orange Valley SEF are not yet known. Relevant focus areas and targets stipulated in Bid Window 6 (May – August 2022) included the following (DMRE, 2022):

- Job creation - emphasises jobs for South African citizens, black people (including black women and black youth) and citizens from local communities;
- Management Control - focuses on the involvement of black people (in particular black women) in Board Directorship, executive management and senior management roles of the Project Company;
- Skill Development - focuses on the contributions made by the Project Company to improve the skills of employees, learners at higher education institutions and disabled persons;
- Enterprise and Supplier Development - focuses on the development of emerging enterprises, including emerging enterprises located in local communities, and on procuring from black enterprises and enterprises owned by black women.

[21] Deviations from this may require approval in terms of the National Environmental Waste Act 59 of 2008 (NEM:WA).

As of mid-2021 IPPs can also sell independently-generated electricity to private end-users; such agreements are not subject to the REIPPPP requirements.

3.7.13 Capital Expenditure

Anticipated capital expenditure (CapEx) for the Orange Valley SEF is ~R1.1 billion. Installation of a BESS would further increase CapEx, depending on the capacity of the storage system and timing of installation[22].

Approximately 45% of SEF CapEx and 15% of BESS CapEx will be expended in South Africa. The proportion of CapEx that will be spent in local areas (in the Northern Cape) will be determined at detailed design stage.

The DMRE typically sets out specific economic development targets or focus areas in its REIPPPP Bid Window Request for Proposal, which are either compulsory and/or influence the functionality score of a project bid. These differ over time, and requirements that may be applicable to the Orange Valley SEF are not yet known. Relevant focus areas and targets stipulated in Bid Window 6 (April – August 2022) included the following (DMRE, 2022):

- Local content - requires compliance with local content designations under South African procurement law, and that a certain percentage of the total value of the Project be spent on South African goods and services. Bid Window 6 required at least 40% of local content during construction and 45% operation, in addition to the use of designated components as determined by the Department of Trade, Industry and Competition; and
- Enterprise and Supplier Development - which focuses on the development of emerging enterprises, including emerging enterprises located in local communities; and on procuring from black enterprises and enterprises owned by black women.

As of mid-2021 IPPs can also sell independently-generated electricity to private end-users; such agreements are not subject to the REIPPPP requirements.

3.7.14 Community and Social Investment

The DMRE typically sets out specific economic development targets or focus areas in its REIPPPP Bid Window Request for Proposal, which are either compulsory and/or influence the functionality score of a project bid. These differ over time, and requirements that may be applicable to the Orange Valley SEF are not yet known. Relevant focus areas and targets stipulated in Bid Window 6 (April – August 2022) included the following (DMRE, 2021):

- Ownership - requires minimum 49% ownership by South African entities and 2.5% ownership by local communities in the Project Company, and 30% ownership by black people including, for the first time, 10% ownership by black women in the Project Company and in the contractors responsible for construction and operations (Mantashe, 2021);
- Enterprise and Supplier Development - focuses on the development of emerging enterprises, including emerging enterprises located in local communities, and on procuring from black enterprises and enterprises owned by black women;
- Socio-economic development - which aims to address socio-economic needs including those of local communities.

[22] The estimated battery cost for a lithium-ion system is ~ R6 m – R8 m / MWh. A 500 MWh BESS would cost the equivalent of ~R3 bn – R4 bn. Although a 500 MWh BESS can be accommodated within the 5 ha proposed, a BESS of this capacity will not necessarily be built.

As of mid-2021 IPPs can also sell independently-generated electricity to private end-users; such agreements are not subject to the REIPPPP requirements.

3.7.15 Construction Timelines

The project requires EA from DFFE, Preferred Bidder status awarded by the DMRE and/or another Power Purchasing Agreement (PPA) entered into and a generation licence issued by the NERSA.

Preferred Bidders typically have a limited period (7 months in REIPPPP Bid Window 6) to negotiate and finalise all other contractual arrangements and project documents and reach Commercial Close. Projects must be capable of achieving the Commercial Operation Date within 24 months of Commercial Close. This includes the project's construction and commissioning timetable, as well as the time for grid connection as estimated by the Grid Provider (DMRE, 2021).

The anticipated duration of the construction phase for the Orange Valley SEF is 18 – 24 Months. Construction may however take place incrementally over a period of up to 10 years.

The majority of the construction activities are expected to occur during normal working hours (07h00 - 18h00). Construction activities will largely be limited to Mondays to Saturdays. Construction activities will only be allowed on Sundays where unavoidable, and if the contractor is able to provide the engineer with adequate motivation.

3.8 Orange Valley SEF Operation and Maintenance Activities

Following the completion of the construction phase, the Orange Valley SEF, on-site substation and BESS will be commissioned into operation.

3.8.1 Energy Generation and Transmission

The Orange Valley SEF will generate power from sunlight (see Section 3.1). The electricity generated will feed directly into the national grid (via the on-site substation and MTS [subject to a separate EA application and S&EIR process]); some may be stored on site in the BESS and despatched to the grid on demand.

3.8.2 Maintenance

The accumulation of dust on the panels affects the productivity of the proposed PV facility (see Section 3.1), and panels thus require regular cleaning. Up to four panel cleaning cycles per annum are currently envisaged; however, the cleaning regime will be revised based on site conditions. Panels will be washed with clean water, i.e. no chemicals will be used.

Livestock will be generally kept away from PV areas, but grazing under panels can be considered where appropriate, in part to reduce the impact associated with the loss of grazing land.

Maintenance of the IPP-side of Orange Valley substation, powerlines and BESS requires periodic, planned inspection and, if necessary, repair and replacement of equipment and structures. Maintenance typically includes visual and physical inspections and monitoring of data collected by on-site meters and sensors.

Internal roads and other infrastructure will be maintained as and when required. Vegetation will be trimmed and cleared to maintain access and meet legal overhead clearance requirements.

Periodic and emergency repairs may be required. Replacement components will be delivered to site by truck and installed with appropriate equipment (e.g. mobile cranes).

3.8.3 Stormwater Management

Stormwater measures will be implemented on site to divert stormwater away from potentially contaminated areas such as BESS containers, and divert accidental leaks / spillages away from the natural environment.

Measures will be implemented to ensure that stormwater originating from upgradient (stormwater that could flow across the site from external areas) is diverted around potentially contaminating areas. Also, clearly visible signage indicating emergency numbers if stormwater (or any other environmental) issues are identified, will be erected.

3.8.4 Water Use and Supply

Water will be required on site during operation for:

- PV panel cleaning: up to ~18 000 m^3 / annum;
- Domestic use (ablutions, drinking): ~20 m^3 / month or 240 m^3 / annum; and
- Dust suppression: ~15 l / m^2, as and when needed depending on conditions.

No additional water is required for the BESS and substation during operations.

Water will be sourced from authorised service providers and/or existing boreholes and/or abstracted from surface water sources.

3.8.5 Waste Management

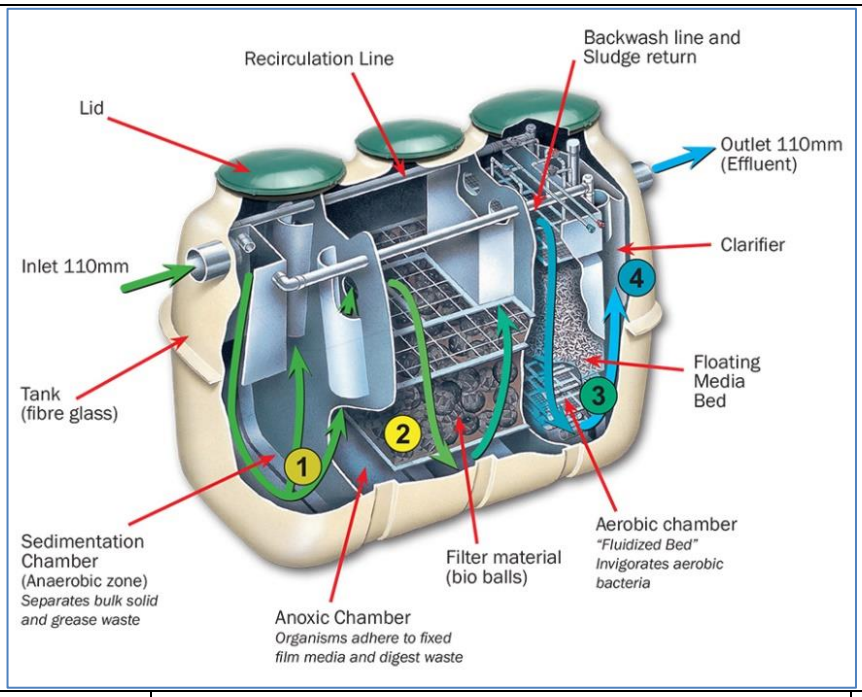
The waste hierarchy and waste management procedures will be implemented during operation to prevent, minimise or recycle waste (where possible).

Solid waste produced during the operation phase will include small volumes of domestic waste, packaging from replacement equipment, discarded components and vegetation cuttings. The volume of waste that will be generated cannot be estimated at this stage, but is not expected to be significant or place strain on local waste management and disposal facilities.

No waste will be generated during normal operations of the BESS. However, battery cells may need to be replaced. The supplier will be responsible for removing the battery cells from site during the guarantee period and ensuring that battery cells are properly disposed of in accordance with legal requirements.

Waste management during operation will be the responsibility of the PV facility operator. All waste generated during maintenance and operation activities will be disposed of at appropriate licensed waste disposal facilities.

Wastewater produced during the operation phase comprises contaminated runoff, panel wash water and domestic wastewater. Wastewater will be stored in septic tanks and/or conservancy tanks and disposed of at a suitable facility. Wastewater may also be treated in a mobile wastewater treatment unit (e.g. Clarus Fusion) designed to ensure effluent quality meets or exceeds DWS standards (see Figure 3-23). Treated water can then be used for irrigation.



srk consulting	HANOVER RENEWABLE ENERGY CLUSTER SEF Schematic of a wastewater treatment unit	Project No. 583169

Figure 3-23: Schematic of a wastewater treatment unit

Source: (Maskam Water, n.d.)

3.8.6 Workforce

The operation of a 150 MW PV facility will create ~9 permanent jobs over the 20-year life span of the facility. Of these, ~3 are skilled and ~6 are unskilled.

Most employees are anticipated to reside in the Local and District Municipalities. No labourers will be accommodated onsite.

The DMRE economic development targets described in Section 3.7.12 would also apply during the operation phase.

3.8.7 Operational Expenditure

Anticipated operation expenditure (OpEx) for the Orange Valley SEF is R600 million over the 20-year lifetime of the facility, or R32 million per year (at 2022 prices). Operation of a BESS would further increase OpEx.

The proportion of local procurement and expenditure has not yet determined, but DMRE economic development targets described in Section 3.7.13 would also apply during the operation phase.

3.8.8 Community and Corporate Social Investment

Mainstream's Corporate Social Investment (CSI) has not been defined, but it is expected that ~1% of revenue will be spent in local communities and /or through targeted CSI during operations. The DMRE economic development targets described in Section 3.7.14 would also apply during the operation phase.

3.8.9 Project Lifetime

The anticipated lifetime of the Orange Valley SEF is 20 years minimum, with the potential option to upgrade technology to extend the lifetime of the project.

3.9 Analysis of Need and Desirability of the Project

Best practice as well as the EIA Regulations, 2014 (Appendix 3 Section 3 [f]) requires that the need and desirability of a project (including viable alternatives) are considered and evaluated against the tenets of sustainability. This requires an analysis of the effect of the project on *social, economic and ecological* systems; and places emphasis on consideration of a project's *justification* not only in terms of financial viability (which is often implicit in a [private] proponent's intention to implement the project), but also in terms of the specific needs and interests of the community and the opportunity cost of development (DEA&DP, 2013).

The principles in NEMA (see Section 2.1.1) serve as a guide for the interpretation of the issue of "need", but do not conceive "need" as synonymous with the "general purpose and requirements" of the project. The latter might relate to the applicant's project motivation, while the "need" relates to the interests and needs of the broader public. In this regard, an important NEMA principle is that environmental management must ensure that 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" (DEA, 2014).

There are various proxies for assessing the need and desirability of a project, notably national and regional planning documents which enunciate the strategic needs and desires of broader society and communities: project alignment with these documents must therefore be considered and reported on in the EIA process. With the use of these documents or - where these planning documents are not available - using best judgment, the EAPs (and specialists) must consider the project's strategic context, or justification, in terms of the needs and interests of the broader community (DEA&DP, 2013).

The consideration of need and desirability in EIA decision-making therefore requires the consideration of the strategic context of the project along with broader societal needs and the public interest (DEA, 2014). However, it is important to note that projects which deviate from strategic plans are not necessarily undesirable. The DEA notes that more important are the social, economic and ecological impacts of the deviation, and "the burden of proof falls on the applicant (and the EAP) to show why the impacts…might be justifiable" (DEA, 2014).

3.9.1 Alignment with Policy and Planning Documents

The project aligns well with key planning documents (see Section 2.2), as it is aligned with and directly responds to South African strategy on growing renewable energy (as expressed in the IRP and SIPs). Provincial policy also supports expansion of renewable energy. The project generally aligns with the key planning documents for the District and Local Municipality on promoting renewable energy developments and economic growth.

The majority of the development envelope lies in a CBA 2 with the remaining portion of the development area in an ESA (Figure 4-10). CBAs are key to meeting biodiversity targets and are highly sensitive areas to consider in biodiversity planning. As such, CBAs must be maintained in good ecological condition (natural or near natural state). ESA are considered less sensitive areas, but nevertheless play an important role in supporting the ecological functioning of the CBAs and should be retained in at least a semi-natural state. In principle, the SANBI Technical Guidelines (2017) on CBA and ESAs discourage renewable energy (SEFs) in both CBAs and ESAs; however, based on a site investigation the ecological specialist has indicated that impacts can be mitigated so that the project is acceptable.

Table 3-9: Analysis of project consistency with relevant plans and policies

Policy	Compliance	Comments
National		
IRP for Electricity 2010 – 2030 (Section 2.2.1)	Compliant	The project contributes toward the original IRP goal of procuring ~1 000 MW per annum from new SEFs between 2022 and 2030, and increasing battery energy storage to improve the percentage of energy generated from these facilities relative to the percentage of installed capacity.
SIP (Section 2.2.2)	Compliant	The project is compliant with SIP 8, as it relates to the industrial-scale generation of sustainable green energy and SIP 9, as it provides new energy generation capacity. M Essop of DFFE confirmed on 23 June 2022 that the project is only classified as a SIP after it has been awarded Preferred Bidder status if it is part of a DMRE REIPPPP Bid.
Provincial		
Northern Cape Provincial Growth and Development Strategy (2011) (Section 2.2.3)	Compliant	The project contributes to the PGDS priorities by developing an alternative energy source, sustainable development and potential positive employment and community health benefits.
Northern Cape Provincial SDF (Section 2.2.4)	Compliant	The project contributes to the PSDF by addressing the PGDS priorities.
Local		
PKSDM IDP (2022-2027) (Section 2.2.5)	Compliant	The PKSDM IDP identifies renewable energy projects opportunities to alleviate some of the challenges face by the communities in the District.
PKSDM SDF/ Land Development Plan (2013-2018) (Section 2.2.6)	Partially Compliant	The SDF and Land Development Plan encourages the development of renewable facilities, particularly within the renewable energy hub identified. This project is not located within the renewable energy hub.
Emthanjeni LM IDP (2022-2027) (Section 2.2.7)	Partially Compliant	The Emthanjeni LM IDP identifes the renewable energy hub in De Aar as a key sector for economy growth and development potential. The IDP also highlights the need to consider solar energy as an alternative energy source.

3.9.2 Socio-Economic Need and Desirability

At a local level, the economic baseline has identified a need for economic growth and employment generation in the project region, arising from a struggling economy in the wake of the COVID-19 pandemic and evidenced in high poverty (see Section 4.2). The project could generate significant long-term investment in the local and regional economy, some employment, local development through CSI and – if implemented in line with past REIPPP requirements – considerable community income through partial ownership in the project (if managed well). From this perspective, the project is highly desirable.

At a national level, there is a clear need to produce more power (to reduce loadshedding impacts on economic production and quality of life) and cleaner power (to reduce GHG emissions as part of a transition to a low-carbon economy to address climate change). The project would contribute to both objectives by producing up to 150 MW of renewable energy. From this perspective, the project is also highly desirable.

3.9.3 Ecological Need and Desirability

It is essential that the implementation of social and economic policies take cognisance of strategic *ecological* concerns such as climate change, food security, as well as the sustainability in supply of natural resources and the status of ecosystem services. Sustainable development is the process followed to achieve the goal of sustainability (DEA, 2014).

Sustainable development implies that a project should not compromise natural systems. In this regard, the Best Practicable Environmental Option (BPEO) is that which provides the most benefit and causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term.

NEMA and the EIA Regulations, 2014 call for a hierarchical approach to the selection of development options, as well as impact management, which includes the investigation of alternatives to avoid, reduce (mitigate and manage) and/or remediate (rehabilitate and restore) negative (ecological) impacts (DEA, 2014).

The project is anticipated to have negative ecological impacts, notably on flora and fauna including avifauna, due to the project's location on a site that is largely undeveloped and remains in a natural ecological state with near natural habitats (as noted in Section 4.1) Specialist investigations indicate that ecological impacts such as bird displacement during the construction and operational phases and habitat degradation can be mitigated to an acceptable level and will be confirmed in the EIA Report.

In this context the avifauna specialist notes that human-induced climate change is recognised as a fundamental driver of biological processes and patterns. Historic climate change is known to have caused shifts in the geographic ranges of many plants and animals, and future climate change is expected to result in even greater redistributions of species (National Audubon Society, 2015).

South Africa is among the top 10 developing countries required to significantly reduce their carbon emissions (Seymore, Inglesi-Lotz, & Blignaut, 2014), and the introduction of low-carbon technologies into South Africa's power generation portfolio will greatly assist with achieving this important objective (Walwyn & Brent, 2015). Given that South Africa receives among the highest levels of solar radiation on earth (Fluri, 2009) (Munzhedi, Munzhedi, & Sebitosi, 2009), solar power generation should feature prominently in future efforts to convert to a more sustainable energy mix, also from an ecological impact perspective. However, while the expansion of solar power generation is undoubtedly a positive development in the longer term, in that it will help reduce the effect of climate change and thus habitat transformation, it must also be acknowledged that renewable energy facilities in themselves have some potential for negative ecological impacts.

The project is thus in principle ecologically desirable, and was deemed acceptable on the project site.

3.9.4 Summary of Need and Desirability

In summary:

- The project complies with and responds directly to a number of social and economic principles and policies laid out in the planning framework by providing additional and renewable low-emission electricity to the national grid;
- The project responds directly to an identified social and economic need to stimulate and provide jobs in the local economy, and to provide alternative income to communities challenged by the general economic downturn;
- While ecological desirability is one aspect of site identification, other aspects must be satisfied to ensure that the project is (technically) sustainable. This is the case for this project:

  - Support of and approval by affected landowners;
  - Suitable terrain for the establishment of PV arrays, requiring a minimum of earthworks;
  - Sufficient available area to site the cluster of projects;
  - Good accessibility from existing roads;
  - Proximity of tie-in points to the Eskom grid; and
  - Availability of grid (transmission) capacity in the region.

- Social, economic and ecological factors are considered and assessed during the Scoping and EIA process, to ensure that the development is sustainable. Mitigation measures will be recommended in the EIA to prevent, minimise (and optimise) impacts and to secure stakeholders' environmental rights. An EMPr will be drafted and must be implemented to ensure that potential environmental pollution and degradation can be minimised, if not prevented; and
- The project will generate impacts, both negative and positive and these should be considered in evaluating the desirability of the Project. Impacts can be managed.

4 Description of the Affected Environment

This chapter presents an overview of the biophysical and socio-economic environment in which the proposed project is located, to:

- Understand the general sensitivity of and pressures on the affected environment;
- Inform the identification of potential issues and impacts associated with the proposed project, which will be assessed during the Impact Assessment Phase;
- Identify gaps in available information to inform specialist study requirements; and
- Start conceptualising practical mitigation measures.

The components of the baseline provided in Sections 4.1.2 to 4.3.5 have been generated based on those provided by specialists appointed to undertake baseline and impact assessments for the proposed project. The specialist baseline and impact studies undertaken for the S&EIA process are listed in Table 4-1.

Table 4-1: Specialist baseline studies undertaken for the S&EIA

Specialist Study	Specialists	Organisation
Land Capability and Agricultural Potential Compliance Statement	Andrew Husted Dr Matthew Mamera	The Biodiversity Company
Terrestrial & Aquatic Biodiversity	Andrew Husted Dr Mahomed Desai Martinus Erasmus Michael Ryan	The Biodiversity Company
Avifauna	Chris van Rooyen	Chris van Rooyen Consulting
Socio-Economic	Sue Reuther	SRK / SLR
Archaeology, Palaeontology and Heritage	Jaco van der Walt Prof. Marion Bamford	Beyond Heritage
Visual	Kelly Armstrong	SRK

Where site specific information is not available, information is reported at a regional scale, generally the Emthanjeni LM or PKSDM area. More detailed baseline information will be presented in the EIA Report, based on detailed investigations conducted for specialist studies that will inform the Impact Assessment (see Section 7.3).

4.1 Biophysical Environment

4.1.1 Climate

The Hanover Cluster is situated within the BSk (Arid-Steppe-Cold) and BWk (Arid-Desert-Cold) bioclimatic zones as classified by the Köppen Climate Classification system. The region experiences warm summers and very cold winters and is subject to periodic droughts. Temperatures in the region range between an average monthly maximum of 24°C to an average monthly minimum of 8°C. June and July are the coldest months while the hottest average temperatures occur in December (Figure 4-1).

The PKSDM is located in a summer rainfall region with mean monthly rainfall ranging between ~10 mm and ~50 mm (Figure 4-2). Rain occurs predominantly in the form of summer thunderstorms and 60% of the average annual rainfall occurs between December and February (ELM, 2022).

Wind direction is varied throughout the year but is most often from the north. Wind speeds range from ~18 km/h in November to ~14 km/h in April (WeatherSpark, 2023).

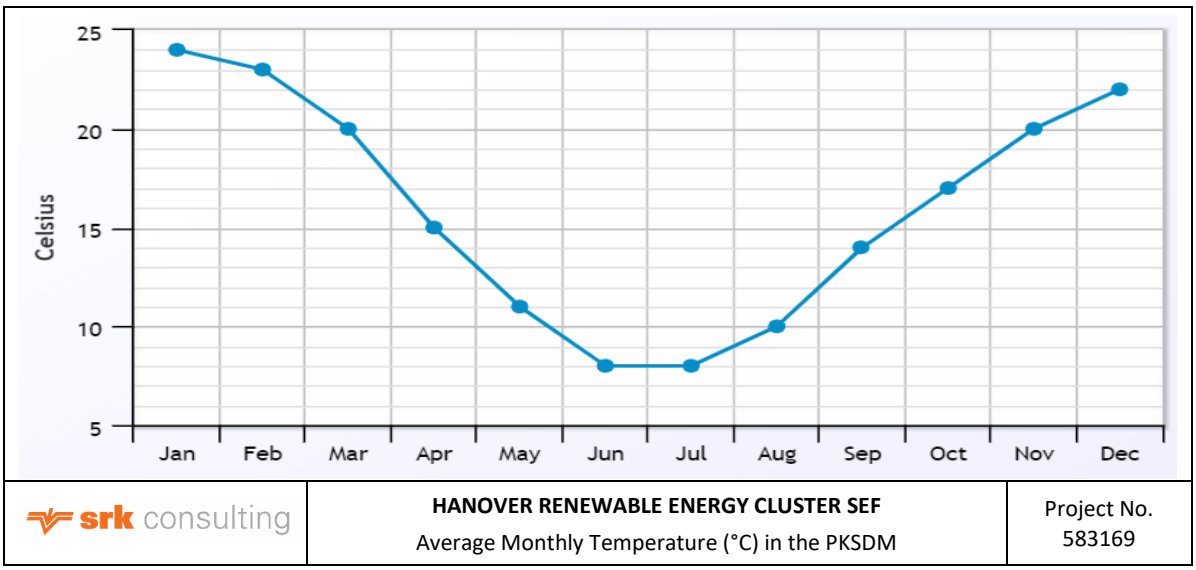


Figure 4-1: Average monthly temperature (°C) in the PKSDM

Source: (weatherbase.com, 2023)

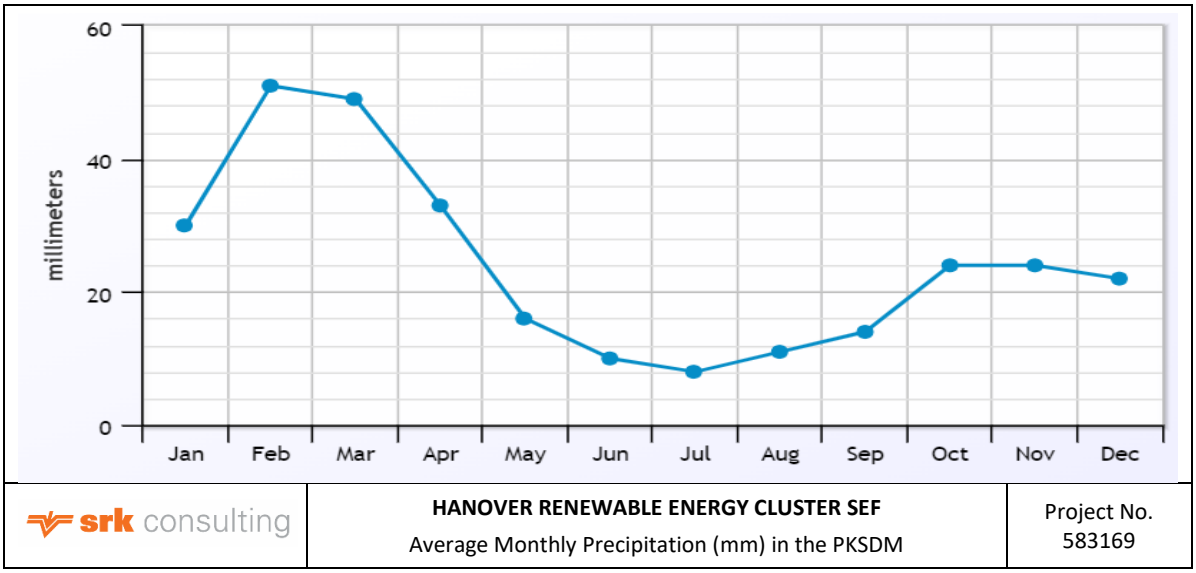


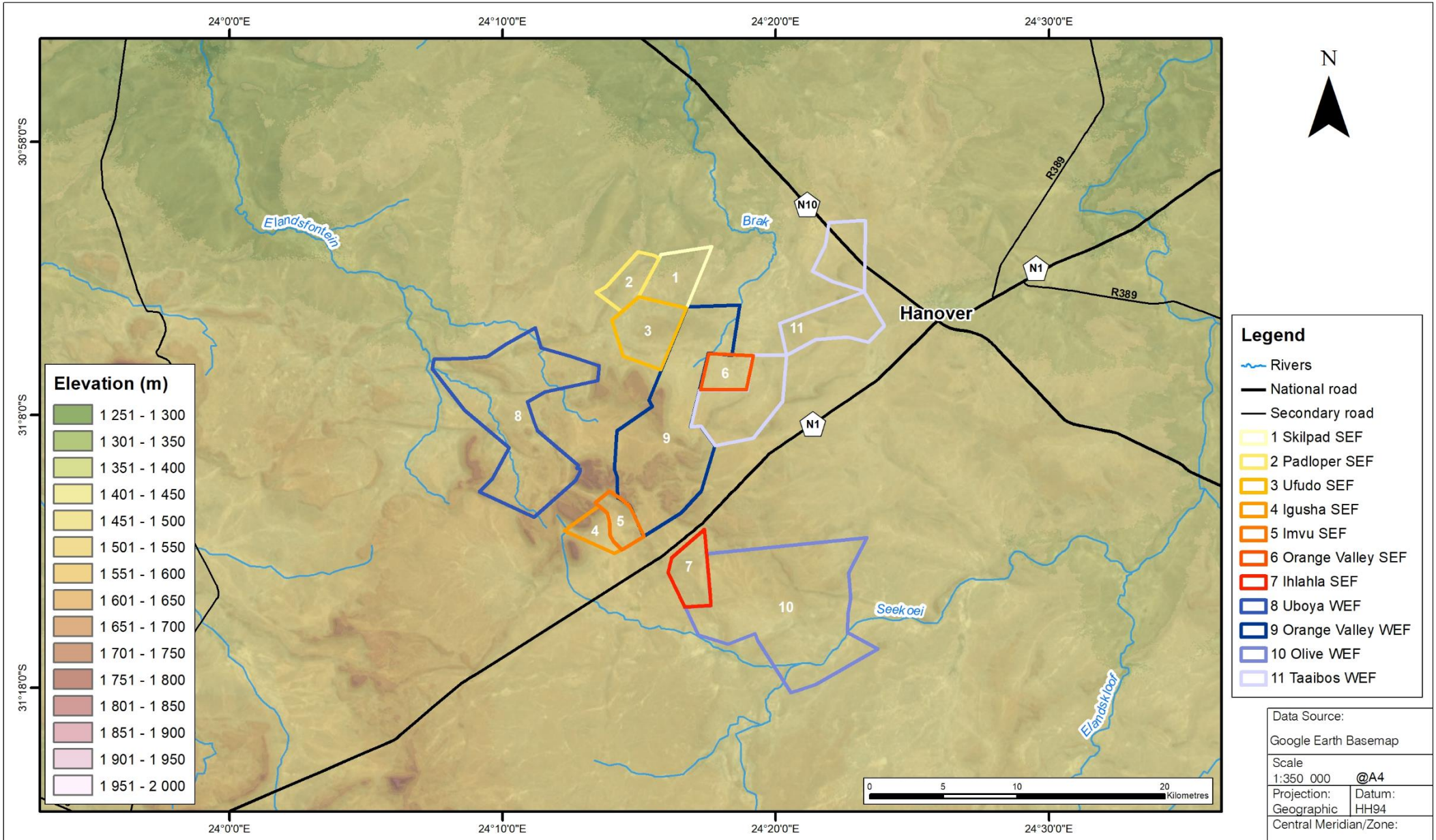
Figure 4-2: Average monthly precipitation (mm) in the PKSDM

Source: (weatherbase.com, 2023)

4.1.2 Topography

The Hanover Cluster is situated in the Great Karoo which forms part of South Africa's central plateau. The project area is underlain by the Karoo Supergroup largely consisting of sedimentary rock, but in places is capped by dolerite sills creating koppies, ridges and flat-topped mesas and buttes characteristic of the Karoo landscape and evident within the project area.

The landscape is dominated by extensive, deeply weathered middle slopes, extensive foot slopes and well-defined valley floors. Most of the development envelopes comprising the Hanover Cluster are largely nestled between the koppies and flat-topped mesas characteristic of the region. A range of koppies flank the N1, and (the small) portions of the Cluster south of the N1 and the east of the N10 are situated on relatively flat terrain. The Cluster ranges in altitude from ~1 380 m above mean sea level (amsl) to ~1 575 m amsl with many of the SEF projects positioned on the lower lying plains (Figure 4-3). Elevation increases rapidly to a range of mountains in the south-east, 45 km from the Cluster. A network of ephemeral rivers drains from the areas of relief into the Elandsfontein, Brak and Seekoei Rivers (SRK Consulting, 2023).



Data Source:	Google Earth Basemap
Scale	1:350 000 @A4
Projection:	Geographic
Datum:	HH94
Central Meridian/Zone:	

srk consulting

HANOVER RENEWABLE ENERGY CLUSTER

TOPOGRAPHY MAP

Date:	Compiled by:
12/10/2022	LEKT
Project No.	Fig No.
583169	4-3

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Rev: B Date: 13 10 2022

4.1.2.1 Orange Valley SEF Topography

The Orange Valley SEF development envelope is generally flat. Beyond the development envelope to the south the elevation rises by ~100 m to a small ridge line. A large mesa is located to the west of the development envelope. The Brak River has its source to the west of the development envelope and runs parallel to the north-western boundary of the development envelope (SRK Consulting, 2023).

Most of the development area is characterised by gentle slopes with slope percentages between 0% and 10%, with some patches sloping more steeply (10% to 18%) (The Biodiversity Company, 2023a). The development area has non-uniform topography (see Figure 4-4) with elevation ranging between 1 427 and 1 449 m amsl.

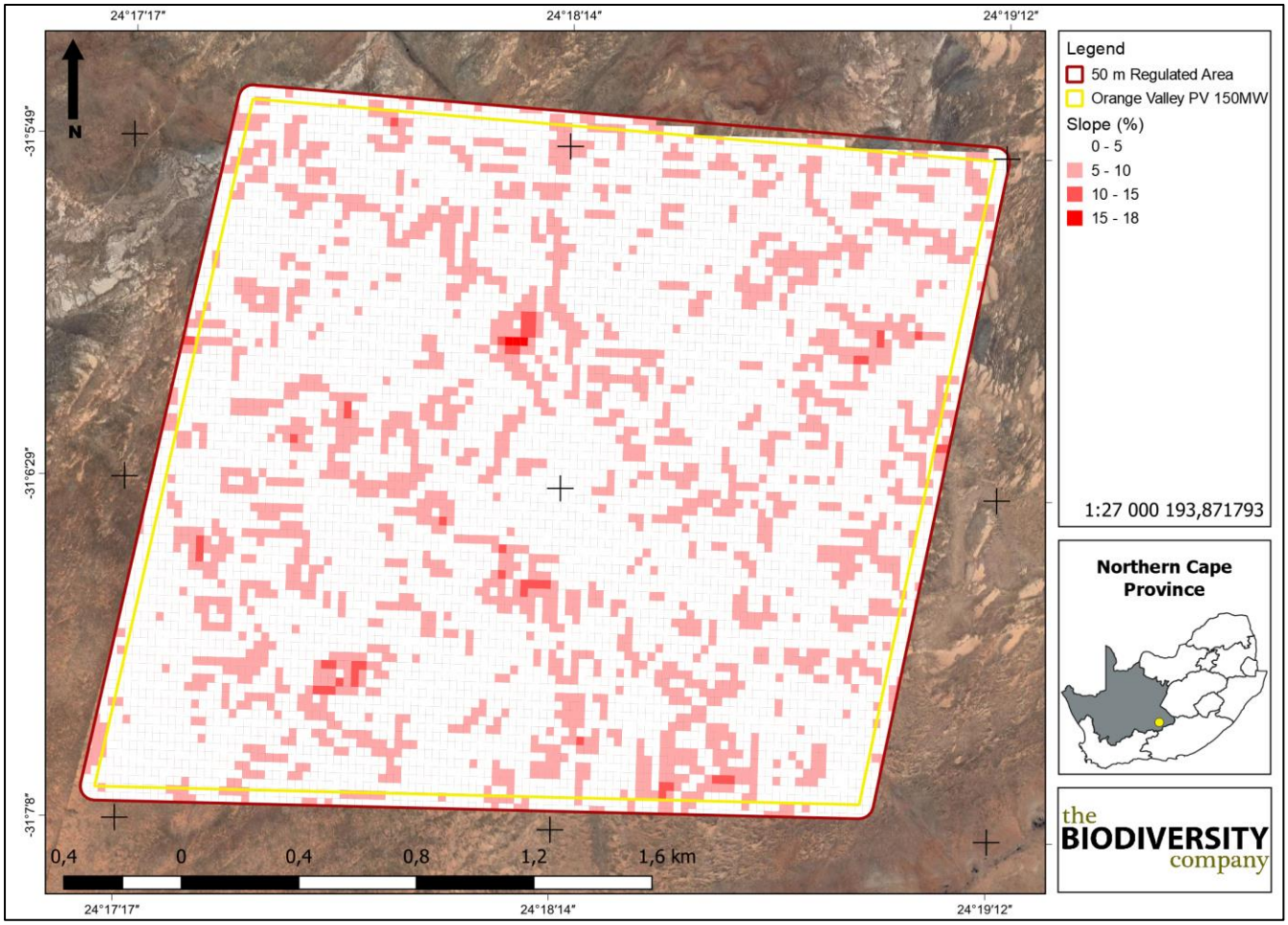


Figure 4-4: Slope percentage for the Orange Valley SEF development area

4.1.3 Geology

Figure 4-5 illustrates the geology of the Hanover Cluster project area. The Karoo is underlain by multiple shale and mudstone strata. The Dwyka formation makes up the basal rocks of the Karoo sequence and are a glacial deposit laid down during the Permo-Carboniferous glaciation. An Ecca formation was deposited thereafter. Ecca shales form the base of many of the large flat plains of the Upper Karoo (Truswell, 1977; Tankard, et al., 1982).

Dolerite intrusions are present throughout the shales of the Karoo, forming vertical dykes and horizontal sills following the bedding planes of the shales. Dolerite intrusions tend to form the relief in the area and give rise to a very characteristic topography of the Karoo with its mesas, hillocks and sharp ridges. Smaller dykes appear as long lines or circular exposures of dark weathered boulders and rocks (ACO Associates cc, 2023)

The Hanover Cluster project area is underlain by significant geological units. Extensive portions of the area are underlain by Permian aged sedimentary rocks of the Adelaide Subgroup of the Beaufort Group and by dolerite of the Karoo Supergroup (Figure 4-5) (ACO Associates cc, 2023).

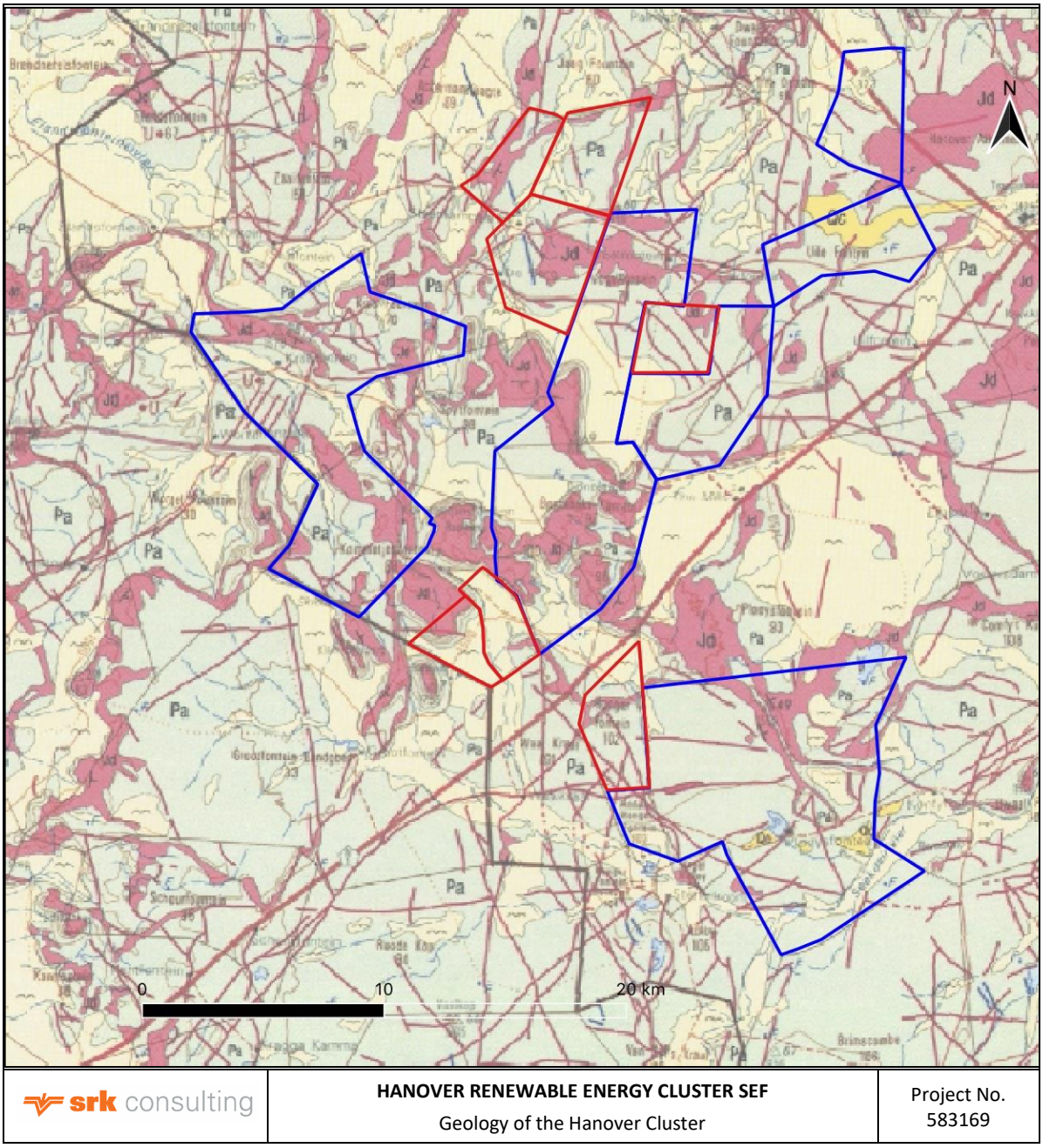


Figure 4-5: Geology of the Hanover Cluster (blue and red polygons)

Source: Geological Chart 3124 Middelburg

Limited portions of the project area are underlain by Quaternary aged calcrete and large parts of the region are covered in relatively thick (2 m) Quaternary colluvial sediments. Their composition and origin can be very mixed (ACO Associates cc, 2023).

The Adelaide Subgroup, which extends throughout the southern Karoo Basin, is the lowest subgroup of the Beaufort Group and consists of a variety of rock types including fine-grained sandstone, siltstone and mudstone (ACO Associates cc, 2023)

In the western part of the basin, the Adelaide Subgroup comprises the Abrahamskraal and Teekloof formations, with the former characterised by the presence of a number of cherty beds and less red

mudstone relative to the overlying Teekloof Formation (SACS, 1980). In the eastern areas it comprises the Abrahamskraal, Middleton and Balfour formations (Smith R. M., Biostratigraphy of the Cistecephalus Assemblage Zone, 2020). The depositional environment of the Adelaide Subgroup formations is interpreted as a high sinuosity meandering river environment controlled by the northward warping of the foreland Karoo Basin (ACO Associates cc, 2023).

The Hanover Cluster project area straddles the boundary between the two regions, where the transition from the western subdivision of the Adelaide Subgroup to the eastern subdivision is prominent and the consensus is that the dominant lithological unit of the region is the Balfour Formation. This stratigraphic setting places the region at Hanover in the *Daptocephalus* Assemblage zone (Smith, Rubidge, Day, & Botha, 2020).

4.1.3.1 Orange Valley SEF Geology

The Orange Valley SEF development area is predominantly underlain by Permian aged rocks Adelaide Subgroup of the Beaufort Group. Quaternary aged sediments occur in the south-west of the development envelope. Jurassic aged dolerite hills are present in the north-east of development envelope and the site is criss-crossed by dolerite dykes. The expansive plain comprising the Orange Valley SEF development envelope is underlain by highly fractured green-grey and red coloured mudstone with thinly bedded fine- to medium-grained yellowish sandstone that is mostly covered in relatively thin (300 mm) colluvium and/or aeolian sand (Groenewald, 2023).

Sandstone bodies are relatively thin (1,5 m) lenticular structures with well-defined sharp basal contacts with underlying mudstone (Groenewald, 2023).

With the exception of the dolerite intrusion in the north-east and the three dolerite dykes that run across the development envelope, the Orange Valley SEF development envelope is relatively flat and featureless and largely mantled in Quaternary sands of varying depth (ACO Associates cc, 2023).

4.1.4 Soil and Land Capability

The Hanover Cluster is characterised by the Ae 139, Da 05, and Fb 159 land types. The Ae land types are characterised with Hutton, Oakleaf and Mispah soil form. It consists of red to yellow apedal soils which are freely drained. The soils tend to have a high base status and are deeper than 300 mm. The Da 05 land types mostly have Swartland soil forms with the occurrence of other soils and rocky areas. In these landscapes, prismacutanic and pedocutanic diagnostic horizons are dominant. The Fb 159 land type commonly has Mispah and Oakleaf soil forms with other soils and rocky areas also being present. Lime is generally present within the entire landscape. The Ae 139 and Da 05 land types has terrain units mostly dominated with mid-slope to valley bottoms. The upper mid-slope is absent in this land type. The Fb 159 land type is dominated with mid-slopes with expected steeper slopes. In this terrain, gentle landscapes are found from the lower mid-slope to the valley bottom (The Biodiversity Company, 2023a).

Land capability and agricultural potential are determined based on a combination of soil, terrain and climate. Land capability is defined by the most intensive long-term sustainable use of land under rain-fed conditions.

Land capability is divided into eight classes, further divided into three capability groups. Table 4-2 shows how the land classes and groups are arranged in order of decreasing capability and ranges of use. The risk of land use for production purposes increases from class I to class VIII due to decreases in the land potential of the area (Smith, 2006).

Table 4-2: Land capability class and intensity of use (Smith, 2006)

Land Capability Class	Increased Intensity of Use									Land Capability Groups
I	W	F	LG	MG	IG	LC	MC	IC	VIC	Arable Land
II	W	F	LG	MG	IG	LC	MC	IC		
III	W	F	LG	MG	IG	LC	MC			
IV	W	F	LG	MG	IG	LC				
V	W	F	LG	MG						Grazing Land
VI	W	F	LG	MG						
VII	W	F	LG							
VIII	W									Wildlife
–W - Wildlife		**–G - Moderate Grazing**			**–C - Moderate Cultivation**					
F- Forestry		**–G - Intensive Grazing**			**–C - Intensive Cultivation**					
–G - Light Grazing		**–C - Light Cultivation**			**V–C - Very Intensive Cultivation**					

The land potential classes are determined by combining the land capability results and the climate capability of a region as shown in Table 4-3. Climate capability class 1 (C1) has no to slight limitations for agricultural production. The local climate in this class is favourable for good yields for a wide range of adapted crops throughout the year. The most agriculturally restrictive climate capability class (8) has very severe limitations for crop production and choice of crops due to heat and moisture stress. Suitable crops are at high risk of yield loss in this climate capability class. The final land potential results are then described in Table 4-4.

Table 4-3: The combination table for land potential classification

Land capability class	Climate capability class							
	C1	C2	C3	C4	C5	C6	C7	C8
I	L1	L1	L2	L2	L3	L3	L4	L4
II	L1	L2	L2	L3	L3	L4	L4	L5
III	L2	L2	L3	L3	L4	L4	L5	L6
IV	L2	L3	L3	L4	L4	L5	L5	L6
V	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei
VI	L4	L4	L5	L5	L5	L6	L6	L7
VII	L5	L5	L6	L6	L7	L7	L7	L8
VIII	L6	L6	L7	L7	L8	L8	L8	L8

Table 4-4: Land potential classes

Land potential	Description of land potential class
L1	Very high potential: No limitations. Appropriate contour protection must be implemented and inspected.
L2	High potential: Very infrequent and/or minor limitations due to soil, slope, temperatures or rainfall. Appropriate contour protection must be implemented and inspected.
L3	Good potential: Infrequent and/or moderate limitations due to soil, slope, temperatures or rainfall. Appropriate contour protection must be implemented and inspected.
L4	Moderate potential: Moderately regular and/or severe to moderate limitations due to soil, slope, temperatures or rainfall. Appropriate permission is required before ploughing virgin land.
L5	Restricted potential: Regular and/or severe to moderate limitations due to soil, slope, temperatures or rainfall.
L6	Very restricted potential: Regular and/or severe limitations due to soil, slope, temperatures or rainfall. Non-arable
L7	Low potential: Severe limitations due to soil, slope, temperatures or rainfall. Non-arable
L8	Very low potential: Very severe limitations due to soil, slope, temperatures or rainfall. Non-arable

4.1.4.1 Orange Valley SEF Soil and Land Capability

The most sensitive soil form within the Orange Valley SEF development area is the Caroline soil form (The Biodiversity Company, 2023a). This soil form consists of an orthic topsoil horizon on top of a yellow-brown apedal subsurface horizon underlain by hard rock. Other associated soils also occurring in the project area include the Swartland and Mispah soil forms: the former consists of an orthic topsoil with a pedocutania horizon underlain with lithic horizon; the latter consists of an orthic topsoil on top of a hard rock substratum (The Biodiversity Company, 2023a).

Eight potential land capability classes are located within the Orange Valley SEF project area including;

- Land Capability 1 to 5 (Very Low to Low Sensitivity); and
- Land Capability 6 to 8 (Low to Moderate Sensitivity).

The land capability of the Orange Valley SEF development area is largely “Very Low” to “Low”, with some areas of “Moderate Low to Moderate” capability Figure 4-6. The area is categorised as having a “L6” land capability associated with non-arable soils. There will be no segregation of agricultural lands or crop fields with high potential from the proposed infrastructure (The Biodiversity Company, 2023a).

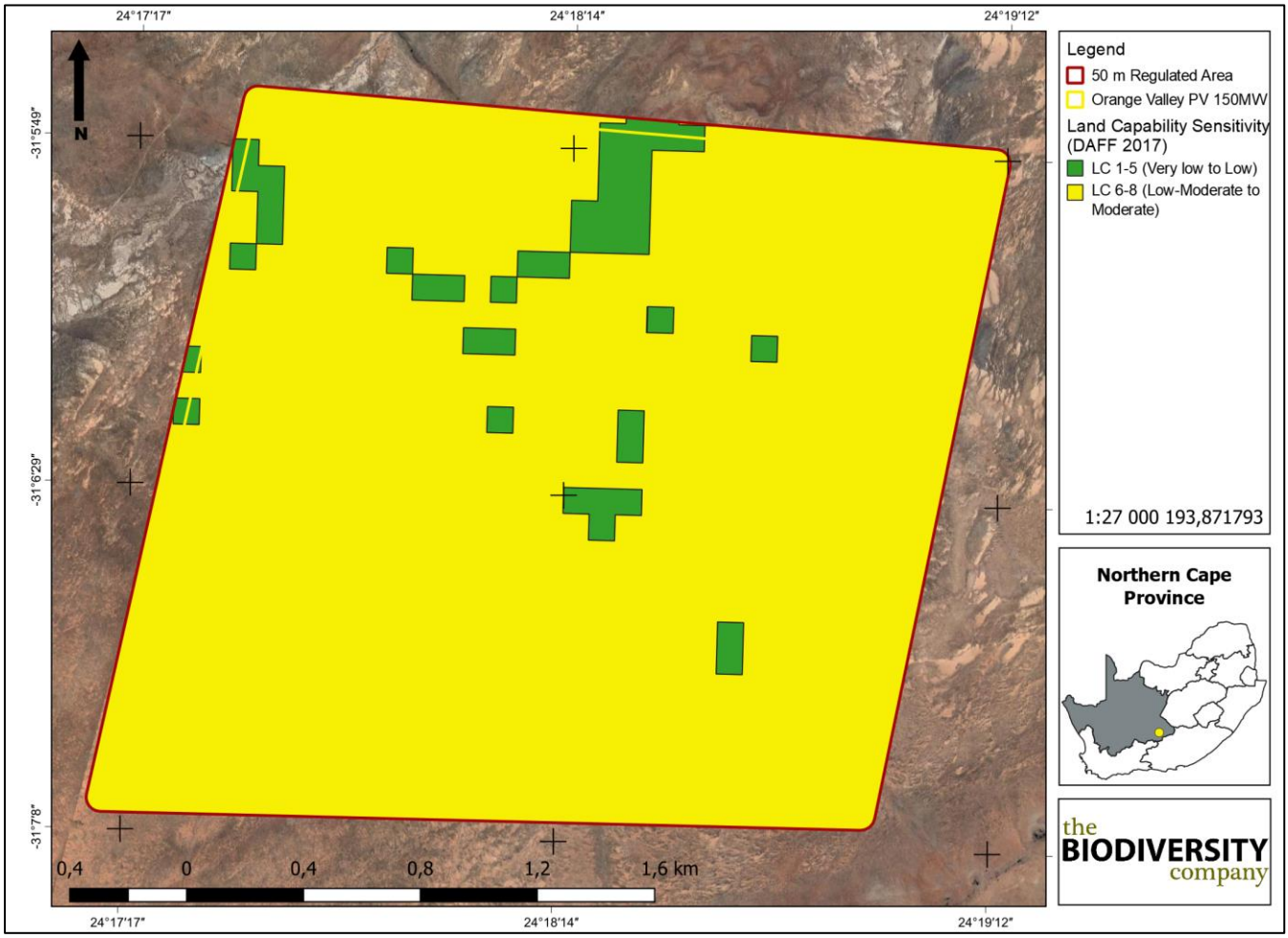


Figure 4-6: Land capability sensitivity of the Orange Valley SEF development area

4.1.5 Hydrology and Surface Water

The Hanover Cluster is located within the Orange River (Secondary Catchment D3) and Brak River (Secondary Catchment D6) catchments (Figure 4-7). No watercourses drain the area, however the Brak River drains the area to the south (SRK Consulting, 2023). Within the Brak River catchment portion, the adjacent Brak River mainstem and Elandsfontein River drain in a northerly and north-westerly direction, respectively. Within the Orange River portion, a tributary of the Seekoei River drains in a south-easterly direction (The Biodiversity Company, 2023b).

The Brak River is categorised as a Freshwater Ecosystem Priority Area (FEPA) according to the National Freshwater Ecosystem Priority Area (NFEPA) database. The Elandsfontein River is categorised as an Upstream Management Area according to the NFEPA database (The Biodiversity Company, 2023b).

According to the National Biodiversity Assessment (NBA) 2018, the Brak River is classified as an EN ecosystem and the reach of the Elandsfontein River close to the Hanover Cluster is classified as a LT ecosystem (Figure 4-7). The tributary of the Seekoei River through the Hanover Cluster is classified as LT. Wetlands within the Hanover cluster and surrounding landscape are classified as VU ecosystems (The Biodiversity Company, 2023b).

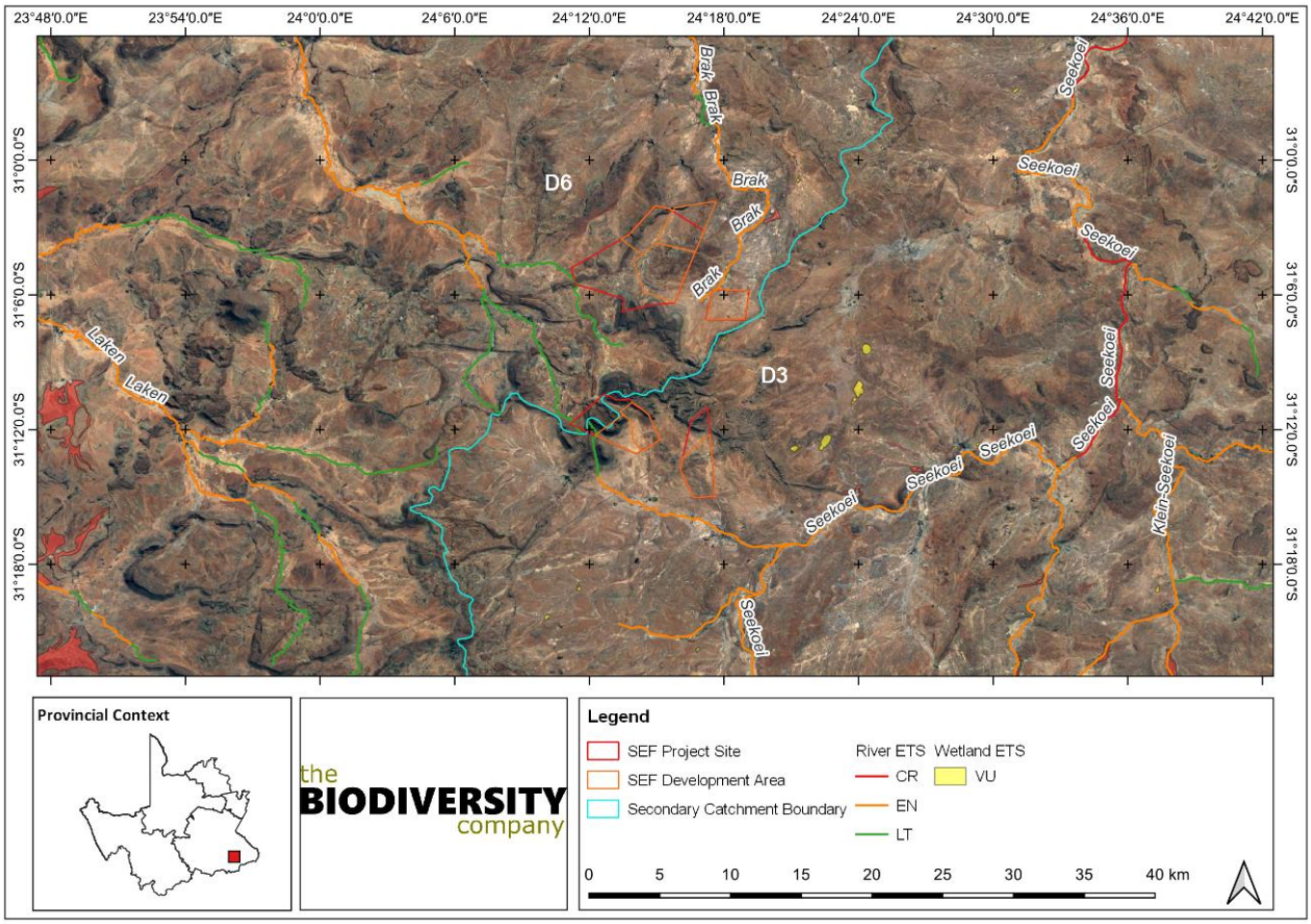


Figure 4-7: Hydrological setting of the Hanover Cluster SEF project sites and development areas

Riparian areas have high conservation value and are an important part of a catchment. They provide important habitat for wildlife and offer forage for domestic animals. Transpiration from the vegetation in the riparian areas play an important role in the water balance for the hydrological cycle, and is crucial for riverbank stability and to prevent erosion within the channel. These systems therefore form drainage areas which are important corridors for terrestrial biodiversity. They are also highly sensitive as they form crucial channels to contain and manage flood events. Drainage areas are therefore assigned a 50 m buffer for development (Figure 4-7) (The Biodiversity Company, 2023b).

4.1.5.1 Orange Valley SEF Hydrology and Surface Water

The Orange Valley SEF project area is located within the Brak River (Secondary Catchment D6) catchment (The Biodiversity Company, 2023b). No watercourses, wetlands or surface water was present on the Orange Valley SEF development area, however a drainage area was delineated (Figure 4-8) (The Biodiversity Company, 2023b). In arid regions, such as this, drainage areas do not always have clearly defined channels but rather evidence of surface flows which typically recharge groundwater systems. The flow events are expected to be infrequent due to the low gradient, sandy soils, low rainfall and high evaporation potential of the area.

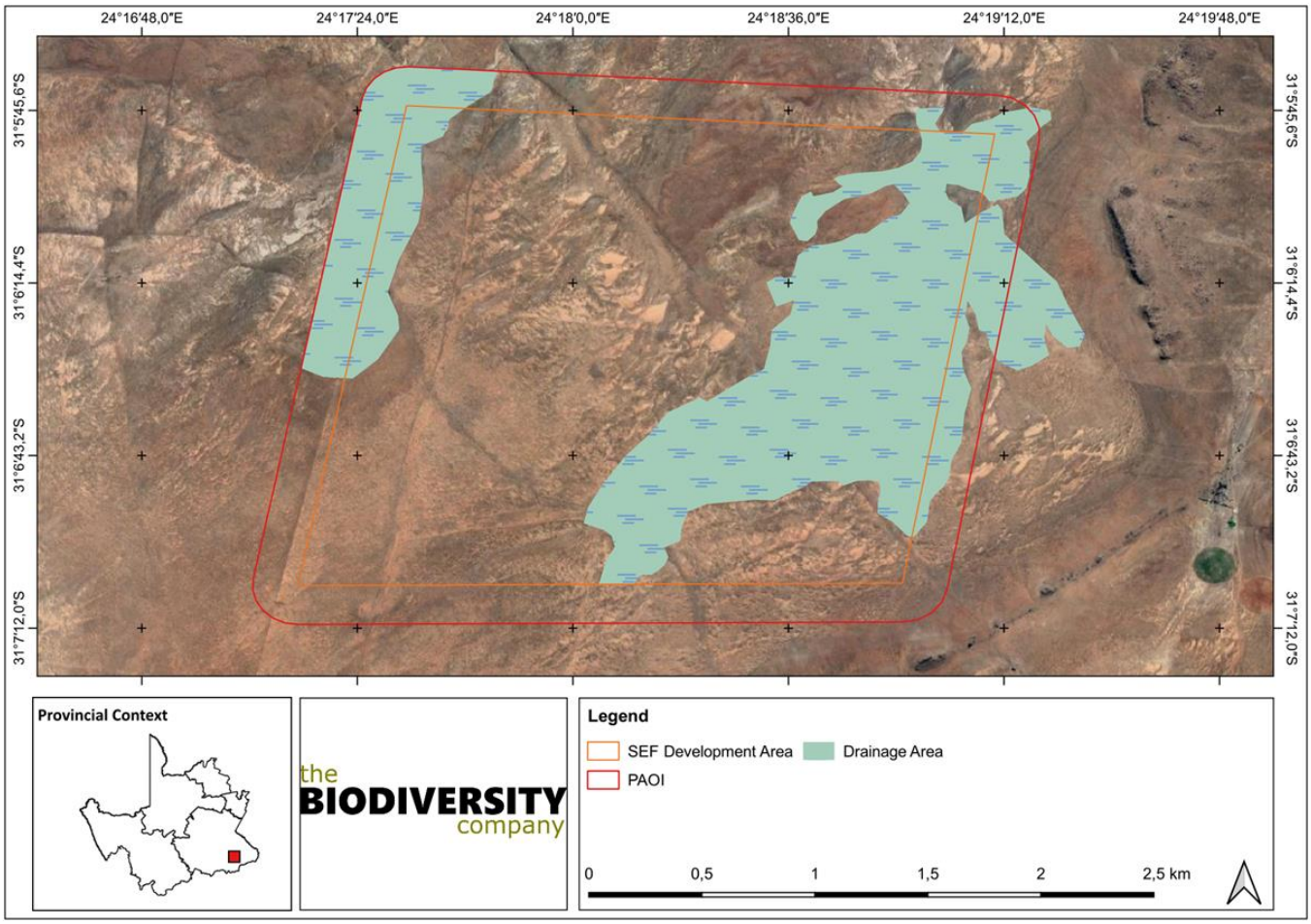


Figure 4-8: Riparian zones and associated 50 m buffers in the Orange Valley SEF development area

4.1.6 Vegetation

4.1.6.1 Biomes

The Hanover Cluster is situated within the Nama Karoo and Grassland Biomes. The Nama Karoo Biome is an arid biome with majority of the river systems being non-perennial. Apart from the Orange River and the few permanent streams in the southwest that originate in neighbouring higher-rainfall areas, the limited number of perennial streams that originate in the Nama-Karoo are restricted to the more mesic east. The Nama-Karoo Biome does not contain any centre of endemism. Despite relatively low floristic diversity, the Nama-Karoo vegetation has a high diversity of plant life forms, including co-occurring ephemerals, annuals, geophytes (bulbs), C3 and C4 grasses, succulents, deciduous and evergreen chamaephytes (woody plants) and trees (The Biodiversity Company, 2023b).

The Grassland Biome is centrally located in southern Africa, and adjoins all except the desert, fynbos and succulent Karoo biomes. It is found chiefly on the high central plateau of South Africa, and the inland areas of KwaZulu-Natal and the Eastern Cape. Grasslands are dominated by a single layer of grasses. The amount of cover depends on rainfall and the degree of grazing. Trees are typically absent, except in a few localised habitats. Geophytes are often abundant. Frost, fire and grazing maintain the grass dominance and prevent the establishment of trees (The Biodiversity Company, 2023b).

4.1.6.2 Vegetation Types

The Hanover Cluster intersects four distinct vegetation types, namely the Eastern Upper Karoo, Northern Upper Karoo, Upper Karoo Hardeveld and Besemkaree Koppies Shrubland. The spatial distribution of these vegetation types in relation to the Hanover Cluster is indicated in Figure 4-9 (The Biodiversity Company, 2023b).

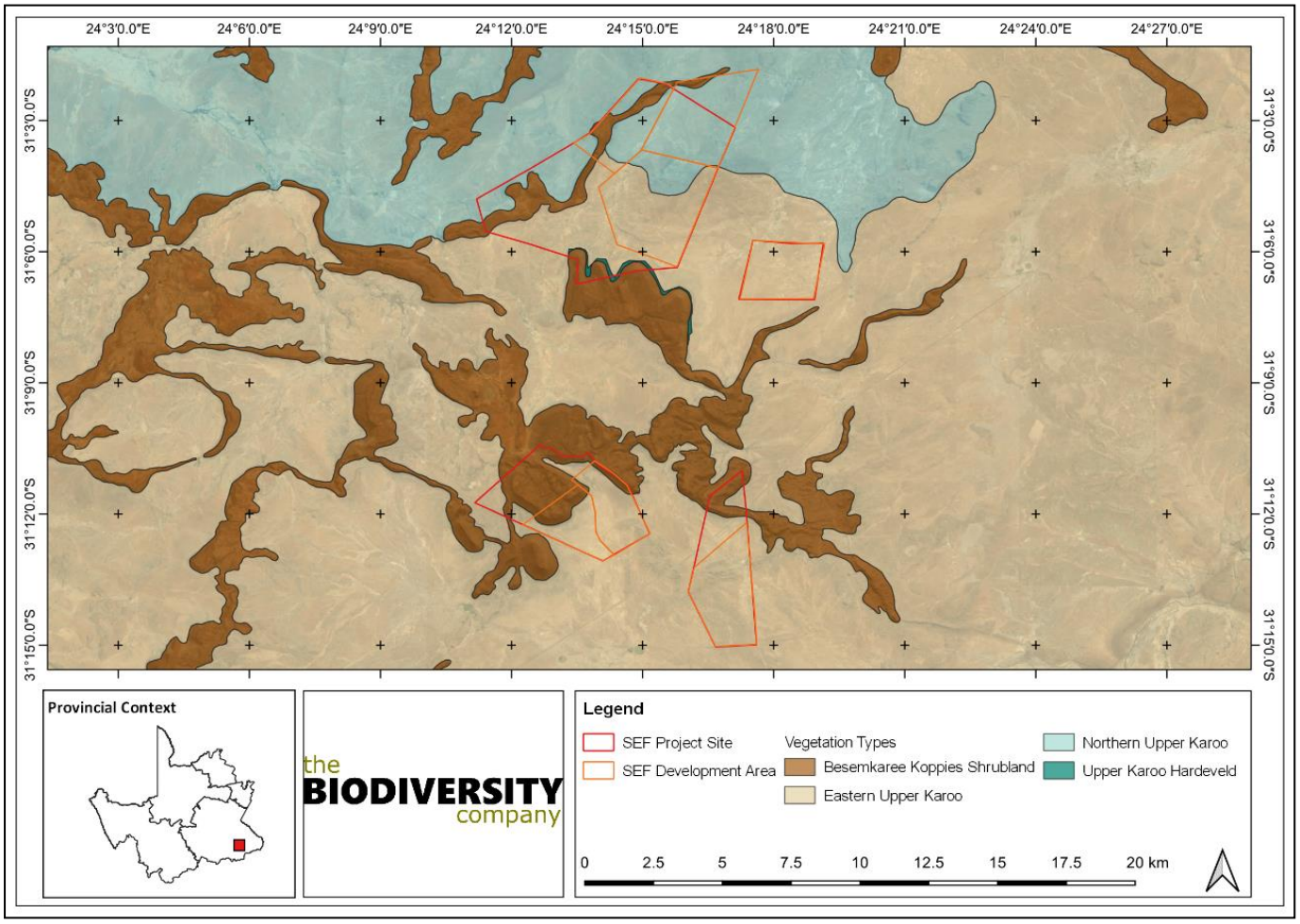


Figure 4-9: Vegetation types of the Hanover Cluster project area

The Eastern Upper Karoo is characterised by flats and gently sloping plains, dominated by dwarf microphyllous shrubs, with grasses of the genera *Aristida* and *Eragrostis*.

The Northern Upper Karoo's main vegetation feature is shrubland dominated by dwarf karoo shrubs, grasses and *Senegalia mellifera* subsp. *detinens* and some other low trees (especially on sandy soils in the northern parts and vicinity of the Orange River). Isolated hills of Upper Karoo Hardeveld and Vaalbos Rocky Shrubland are found within the Northern Upper Karoo.

The Upper Karoo Hardeveld's landscape features are characterised by steep slopes of koppies, buttes, mesas and parts of the Great Escarpment covered with large boulders and stones. Primitive, skeletal soils in rocky areas developed over sedimentary rocks such as mudstones and arenites of the Adelaide Subgroup of the Karoo Supergroup and to a lesser extent also the Ecca Group (Waterford and Volksrust Formations) as well as Jurassic dolerite sills and dykes and sub-summit positions of mesas and butts with dolerite boulder slopes.

The Besemkaree Koppies Shrubland contains vegetation and landscape features that are characterised by koppies, buttes and tafelbergs covered with two-layered karroid shrublands. The lower closed-canopy layer is dominated by dwarf small-leaved shrubs and, especially in precipitation-

rich years, also by abundant grasses, while the upper loose canopy layer is dominated by tall shrubs, including several *Rhus* species, *Euclea crispa* subsp. *ovata*, *Diospyros austro-africana* and *Olea europaea* subsp. *Africana* (The Biodiversity Company, 2023b).

A total of 448 species of indigenous plants are expected to occur within the proposed Hanover Cluster. Seven of these flora species are SCC (Table 4-5) (The Biodiversity Company, 2023b).

Table 4-5: Flora SCC expected to occur within the proposed Hanover Cluster

Family	Scientific Name	Conservation Status	Likelihood of Occurrence
Aizoaceae	*Hereroa concava*	Vulnerable (VU)	Confirmed
Aizoaceae	*Chasmatophyllum rouxii*	Data Deficient (DD)	High
Asteraceae	*Gnaphalium simii*	DD	High
Euphorbiaceae	*Euphorbia flanaganii*	VU	Low
Iridaceae	*Syringodea pulchella*	VU	Low
Iridaceae	*Moraea australis*	Near Threatened (NT)	Low
Poaceae	*Secale strictum subsp. africanum*	Critically Endangered (CR)	Low

4.1.6.2.1 Orange Valley SEF Vegetation

A total of four species, representing three families of protected flora were recorded within the Orange Valley SEF development area. These flora species are protected under the NCNCA. Two (50%) of these species are endemic to South Africa, with none regarded as SCC (The Biodiversity Company, 2023b).

No species of Alien Invasive Plants were observed within the Orange Valley SEF development area although they were observed in the surrounding areas. Disturbance of areas due to the activities of the proposed development may enable encroachment of the invasive species into these areas.

4.1.6.3 Conservation Status

Approximately half of the proposed Hanover Cluster overlaps with CBAs and the remaining half with ESAs (Figure 4-10). These areas have been designated as such due to overlap with the Platberg-Karoo Conservancy Important Bird and Biodiversity Area and with FEPA catchments. The Orange Valley SEF development area includes CBA1, CBA 2 and ESAs (Figure 4-10).

Based on the proportion of the original extent of each ecosystem type that remains in good ecological condition. The proposed Hanover Cluster and development envelopes overlaps with Least Concern (LC) ecosystems (The Biodiversity Company, 2023b).

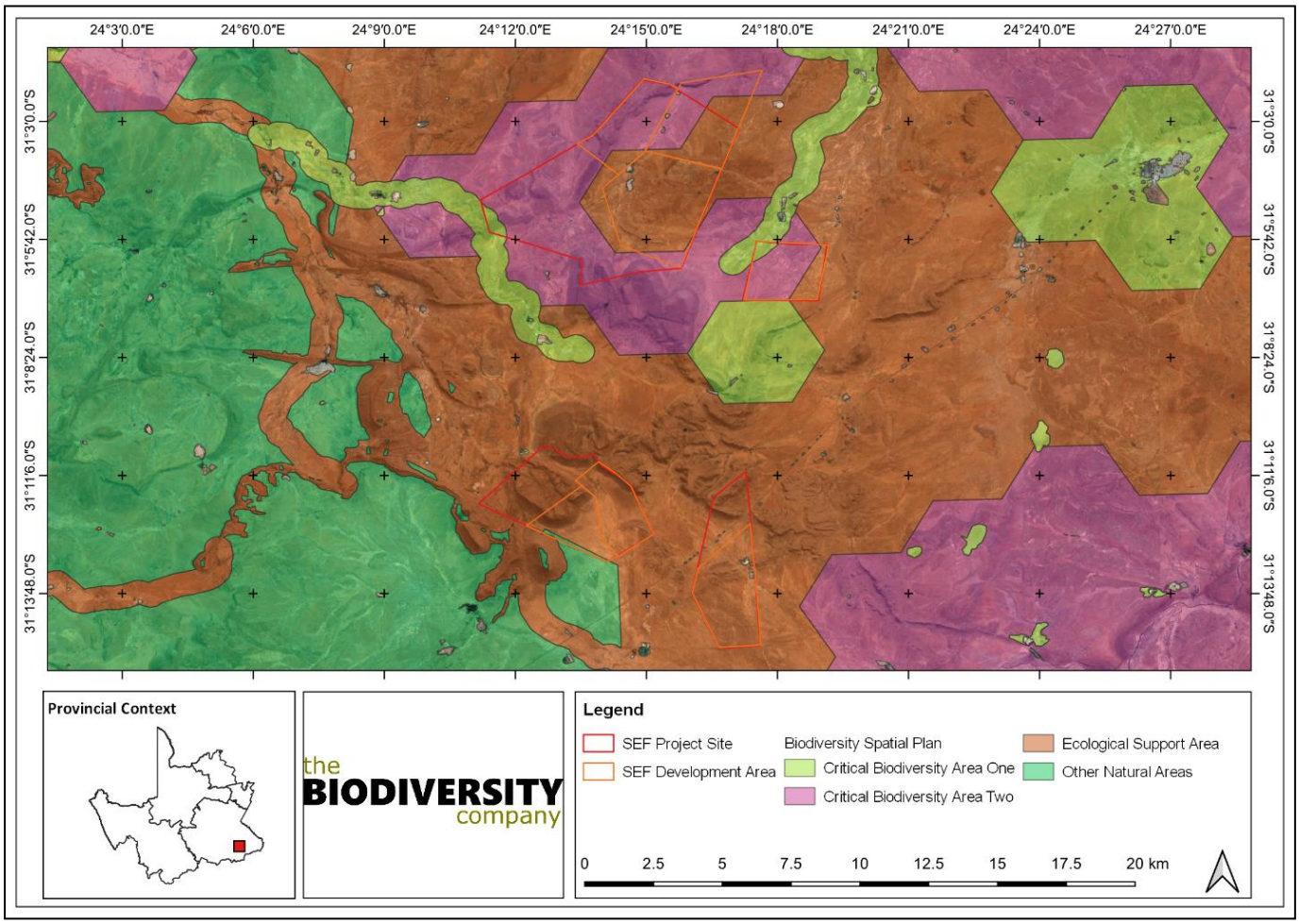


Figure 4-10: Hanover Cluster in relation to CBAs and ESAs

4.1.6.3.1 Ecosystem Protection Level

Ecosystem Protection Level is an indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems. According to the spatial dataset, the proposed Hanover Cluster and development areas are PP and NP ecosystems, with relevant vegetation times having limited to no representation in formally protected areas (The Biodiversity Company, 2023b).

4.1.6.3.2 Protected Areas

The Hanover Aardvark Nature Reserve is located approximately 27 km north-east of Orange Valley SEF (Figure 4-11). The nearest National Protected Areas Expansion Strategy (NPAES) Focus Area is located ~ 13 km to the east at its nearest point (The Biodiversity Company, 2023b).

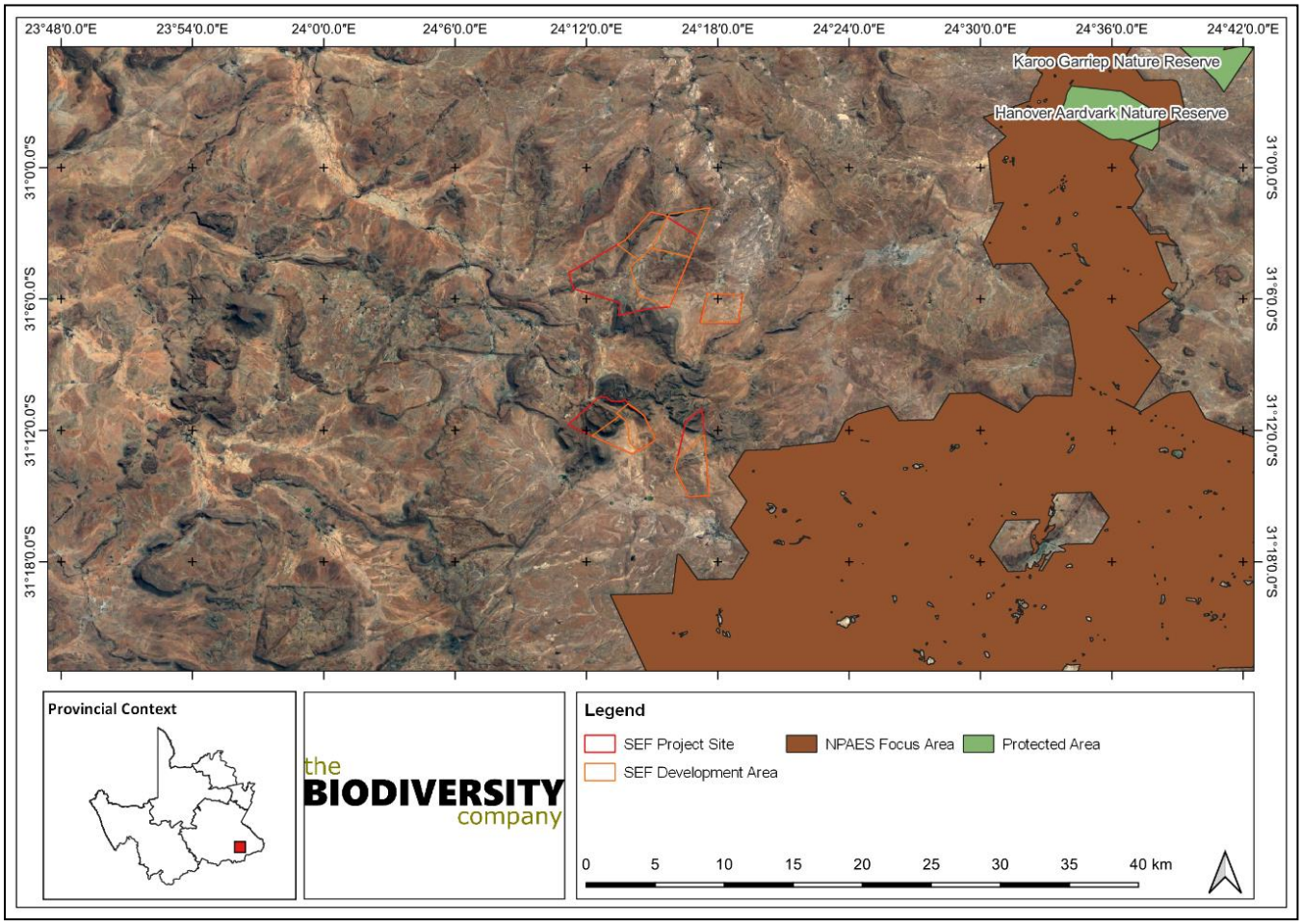


Figure 4-11:Orange Valley SEF in relation to Protected Areas and NPAES Focus Areas

4.1.7 Habitat Types

4.1.7.1 Orange Valley SEF Habitat Units

Two discrete habitat units were identified within the Orange Valley SEF development area, as depicted on Figure 4-12 and described in Table 4-6.

Habitats in the Orange Valley SEF development area (described below) were assigned a sensitivity rating (Site Ecological Importance [SEI]) informed by conservation importance, functional integrity and receptor resilience. The SEI of each habitat unit is depicted in Figure 4-13.

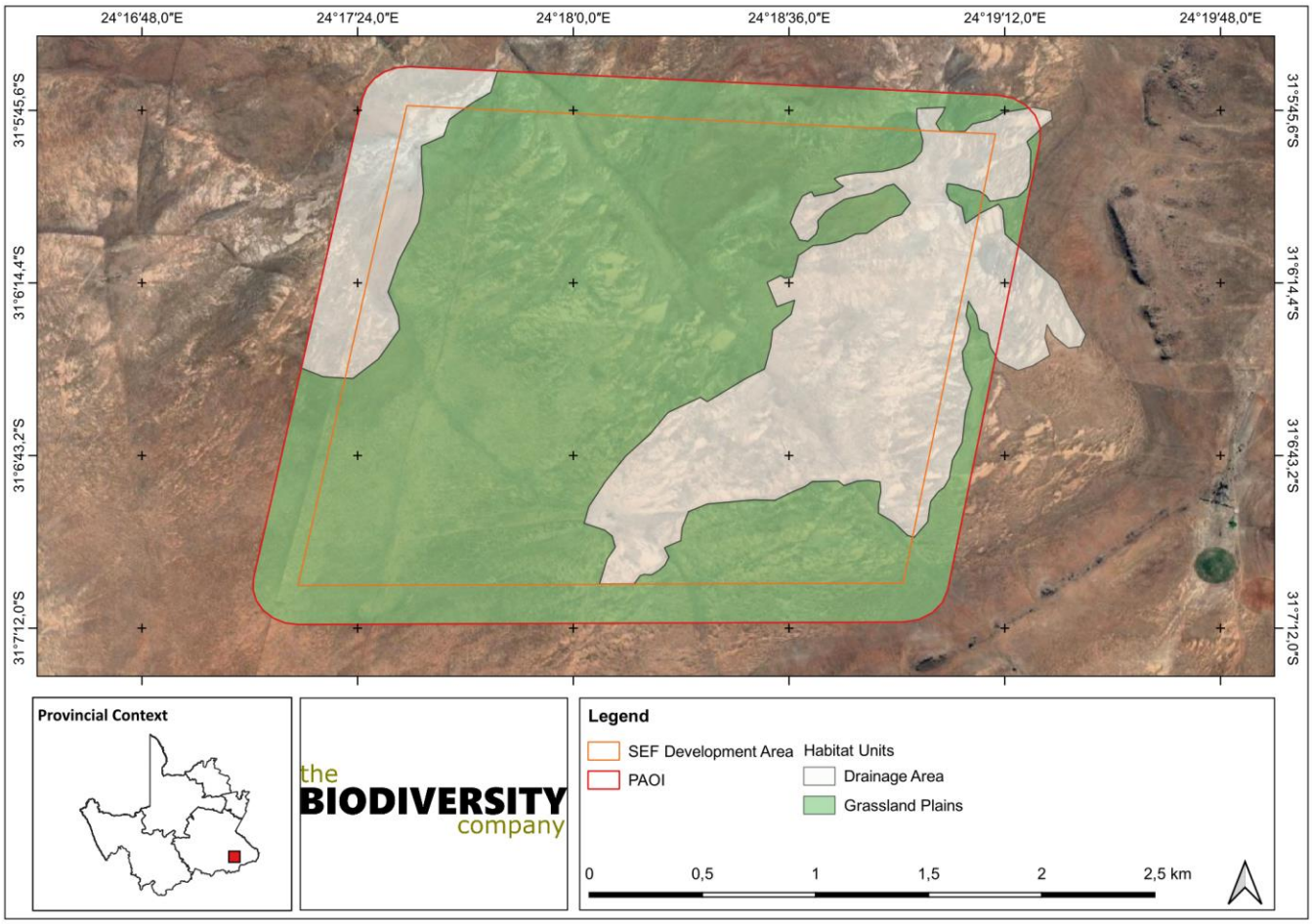


Figure 4-12: Habitat units in Orange Valley SEF development area

Table 4-6: Description of habitat units in the Orange Valley SEF development area

Habitat Type	Description	Photograph	Site Ecological Importance
Grassland Plains	Terrain consists of a low to zero slope with deep soils in comparison to the sloped habitats. The habitat unit was homogenous with regards to structure and composition with no discernible micro-habitats. This habitat unit accounts for 61% of the development area encompassing predominantly the central and southern portions of the development area.		Medium
Drainage Areas	Terrain and vegetation structure is predominantly congruent with the Grassland Plains habitat unit, albeit woody shrubs were more prevalent. Dominant species included typical karroid species such as *Chrysocomia ciliata* and *Pentzia incana* and herbs such as *Diascia longicornis* and *Arctotis arctotoides*. Nevertheless, the habitat type is considered to be more sensitive due to its role in maintenance of hydrological features within the		High

Habitat Type	Description	Photograph	Site Ecological Importance
	landscape. This habitat unit accounts for 39% of the development area, predominantly within the eastern portion, with a minor area in the north-western portion.		

Source: (The Biodiversity Company, 2023b)

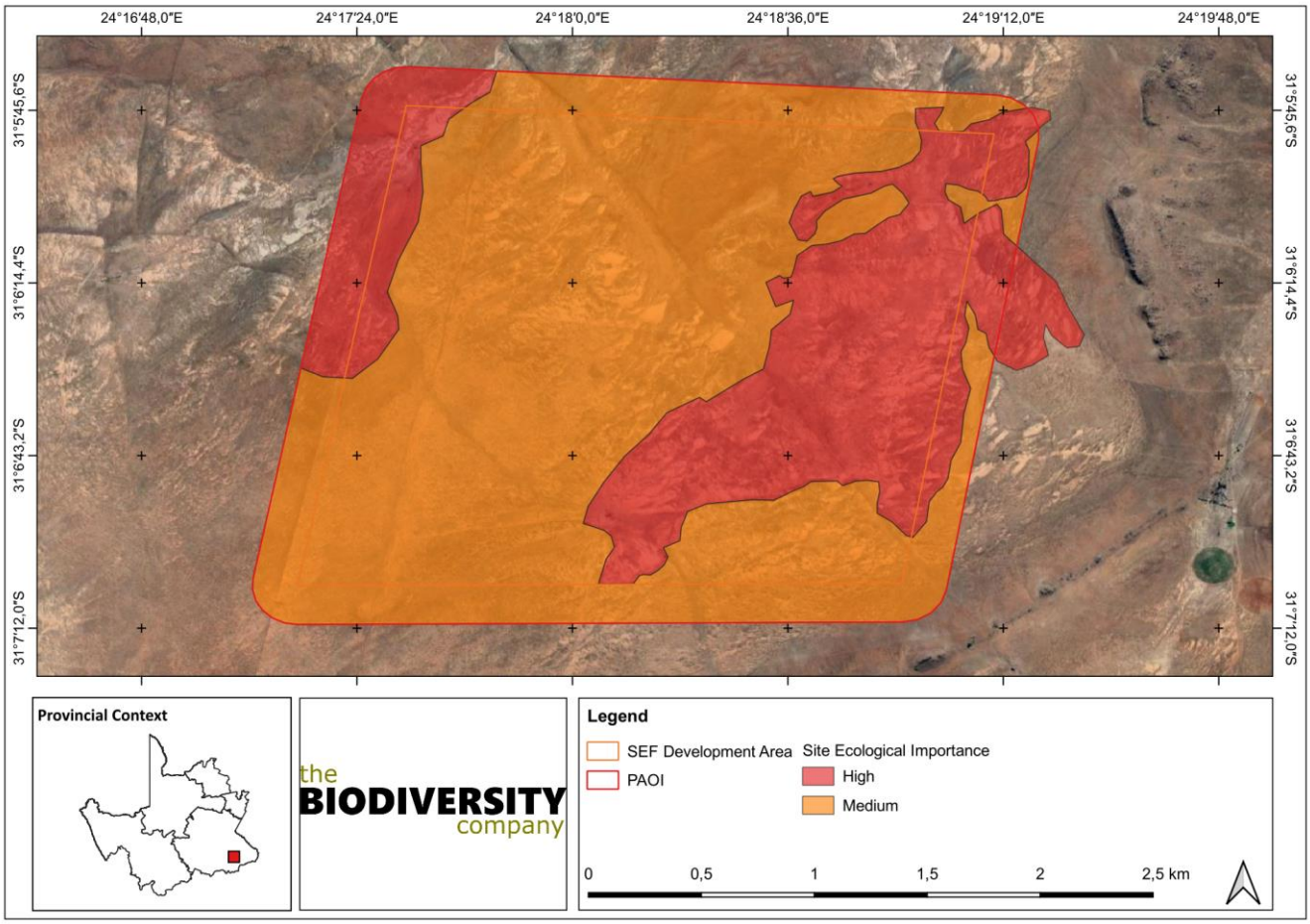


Figure 4-13: Site ecological importance of habitats in Orange Valley SEF development area

4.1.8 Terrestrial Fauna

A total of 11 amphibian species are expected to occur within the Hanover Cluster, none of which are SCC on the International Union for Conservation of Nature (IUCN) Red List Spatial Data list. Thirty four reptile species are expected to occur within the Hanover Cluster, one of which is regarded as a SCC - *Psammobates tentorius verroxii* (Verrox's Tent Tortoise) (Hofmeyer, Leuteritz, & Baard, 2018). Of the fifty seven mammal species that are expected to occur within the Hanover Cluster, seven are regarded as SCC. Table 4-7 below summarises the reptile and mammal SCC expected to occur in the Hanover Cluster (The Biodiversity Company, 2023b). Of the 57 mammal species, only 25 species of non-volant mammals and one SCC was recorded during the survey period.

Table 4-7: Mammal SCC expected to occur within the Hanover Cluster

Category	Family	Species	Common Name	Conservation Status		Likelihood of Occurrence (Hanover Cluster)
				Regional	Global	
Reptiles	Testudinidae	*Psammobates tentorius verroxii*	Verrox's Tent Tortoise	NT	NT	High
Mammals	Felidae	*Felis nigripes*	Black-footed Cat	VU	VU	Moderate
	Felidae	*Leptailurus serval*	Serval	NT	LC	Low
	Felidae	*Panthera pardus*	Leopard	VU	VU	Low
	Gliridae	*Graphiurus ocularis*	Spectacled Dormouse	NT	LC	High
	Hyaenidae	*Parahyaena brunnea*	Brown Hyaena	NT	NT	High
	Mustelidae	*Aonyx capensis*	Cape Clawless Otter	NT	NT	High
	Mustelidae	*Poecilogale albinucha*	African Striped Weasel	NT	LC	High

Source: (The Biodiversity Company, 2023b)

The Formicidae species *Messor capensis* (Cape Harvester Ant) is a major seed eater within the Karoo bioregion. The species influences soil characteristics and plant growth via its tunnelling activity. *Messor capensis* is a major dietary component of *Orycteropus afer afer* (Southern Aardvark). During foraging by *O.afer afer*, the nests are damaged and the seed stores are frequently distributed with the mound soils over a larger area. *Orycteropus afer afer* is also regarded as a keystone species within the Nama Karoo biome. The burrows they create are also utilised as shelter by an array of faunal species, which is pertinent in the climatically variable and semi-arid environment of the Orange Valley project area and surrounding landscape (Whittington-Jones, Bernard, & Parker, 2011).

4.1.8.1 Orange Valley SEF Fauna

Two species representing a single family of reptile were recorded within the Orange Valley SEF development area. Based on the habitat homogeneity within the Orange Valley SEF development area it is unlikely to support a diverse species assemblage. None of the reptile species recorded are regarded as SCC. *Stigmochelys pardalis* (Leopard Tortoise), recorded in the Orange Valley SEF development area, is regarded as a keystone species within the Nama Karoo biome. The species typically has a relatively large home range between 40 and 260 ha and is a vital seed disperser in the landscape (The Biodiversity Company, 2023b).

The 25 species of non-volant mammals identified within the broader area are likely to occupy the Orange Valley SEF development area. No fauna SCC were recorded in the Orange Valley SEF development area (The Biodiversity Company, 2023b). Due to the presence of anthropogenic activities, especially fragmentation caused by fences, a high diversity of large mammal species is not expected. Nevertheless, due to the diversity of habitats on a broad and fine scale, there is a high likelihood of occurrence of other small mammal species occurring within the Orange Valley SEF development area. Due to the diversity of habitats on a broad and fine scale, there is a high likelihood of occurrence of small mammal species within the Orange Valley SEF development area. Sherman Traps were not utilised to capture small non-volant mammals, therefore, the species richness is likely to be higher than recorded (The Biodiversity Company, 2023b).

4.1.9 Avifauna

The Hanover Cluster is located within the Platberg-Karoo Conservancy Important Bird Area (IBA), which covers the entire district of Hanover (Figure 4-14) (Marnewick, Retief, Theron, Wright, & Anderson, 2015). This IBA contributes significantly to the conservation of large terrestrial birds and raptors. 289 bird species are known to occur in the IBA (Chris van Rooyen Consulting, 2023). Threatened bird species expected to occur in the Brerroader Area (Figure 4-14) include:

- Blue Crane (Globally Vulnerable, Regionally Near Threatened);
- Blue Korhaan (Globally Near Threatened);
- Martial Eagle (Globally and Regionally Endangered);
- Black Harrier (Globally and Regionally Endangered);
- Verreaux's Eagle (Regionally Vulnerable);
- Ludwig's Bustard (Globally and Regionally Endangered); and
- Secretarybird (Globally Endangered, Regionally Vulnerable).

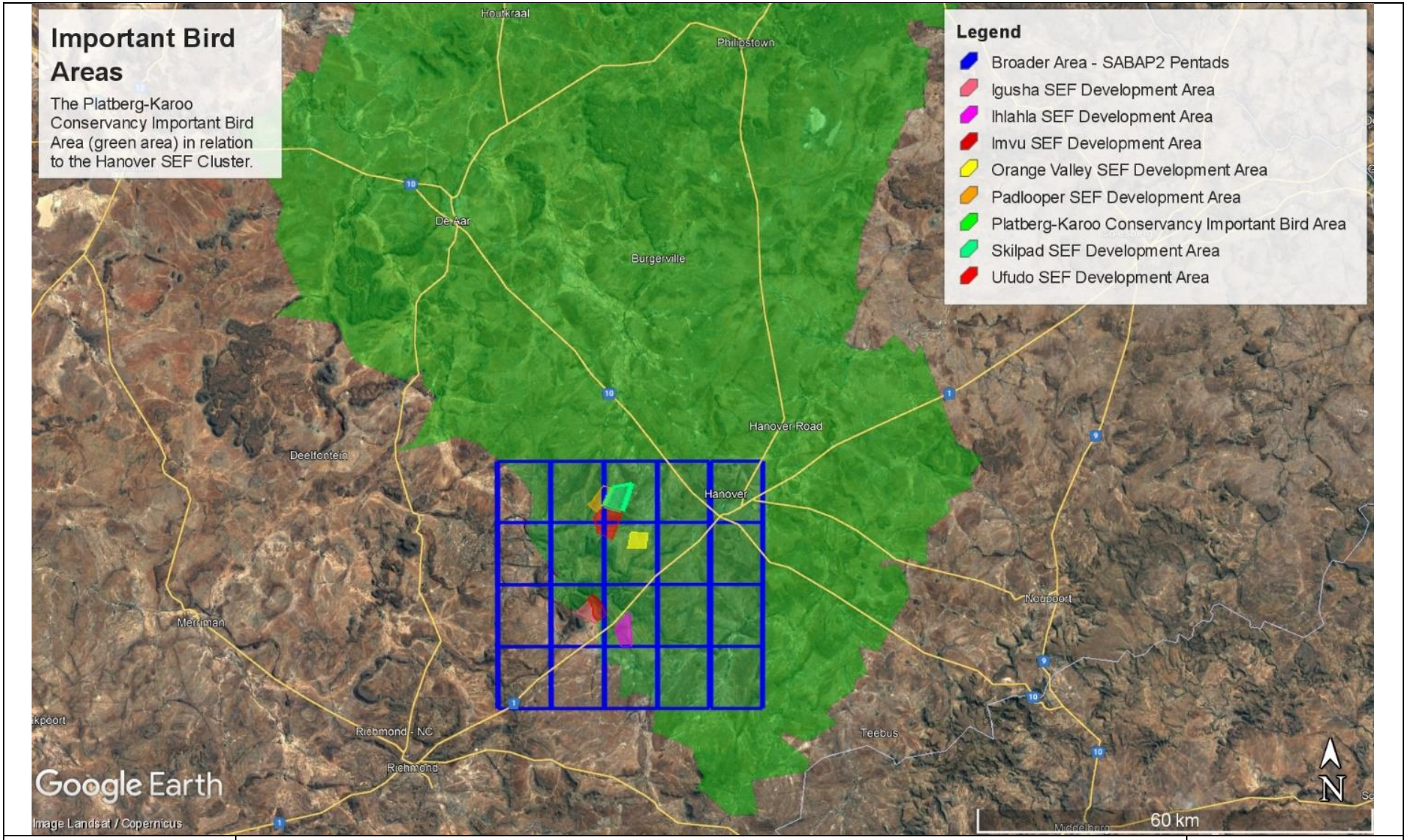
4.1.9.1 Orange Valley SEF Avifauna

The Orange Valley SEF development area comprises or is directly adjacent to the following distinct habitat features utilised by avifauna:

- Natural habitat:
    - Nama Karoo grassland and shrub;
    - Drainage woodland;
    - Drainage lines, wetlands; and
    - Mesas, ridges and koppies; and
- Anthropogenic modifications:
    - Agricultural lands;
    - Alien trees;
    - High voltage powerlines; and
    - Boreholes and dams.

According to the Southern African Bird Atlas Project 2 (SABAP2) a total of 181 bird species could potentially occur within the pentad (group of five) in which the Orange Valley SEF is located. Of these, 77 are classified as priority species for solar developments. Of the 77 solar priority species, 43 have a medium to high probability of occurring regularly in the pentad (Chris van Rooyen Consulting, 2023).

During on-site monitoring in May 2022, nine priority species and four Red Data species / SCC were recorded. The four SCC comprised: *Sagittarius serpentarius* (Secretarybird - Globally Endangered, Regionally Vulnerable), *Grus paradisea* (Blue Crane - Globally Vulnerable, Regionally Near Threatened), *Eupodotis caerulescens* (Blue Korhaan - Globally Near Threatened), and *Eupodotis vigorsii* (Karoo Korhaan - Regionally Near Threatened) (Chris van Rooyen Consulting, 2023).



srk consulting	**HANOVER RENEWABLE ENERGY CLUSTER SEF** Platberg-Karoo Conservancy Important Bird Area in relation to the Hanover Cluster	Project No. 583169

Figure 4-14: Platberg-Karoo Conservancy Important Bird Area in relation to the Hanover Cluster

4.2 Socio-economic Environment

4.2.1 Regional Socio-economic Environment

The project lies in the sparsely populated PKSDM, which comprises eight Local Municipalities (LMs). The PKSDM is situated in the south-eastern part of the Northern Cape Province and borders the Free State, Eastern Cape and Western Cape Provinces. The PKSDM is the second largest District in the Northern Cape, covering 104 095 km² (28%) of the provincial area, with a population of 195 596 in 2016, or 16% of the provincial population (Wazimap, 2022a) (PKSDM, 2022a).

The PKSDM population increased by 5% from 2011 to 2016, at a slightly higher rate than the Northern Cape Province population (4%) (Wazimap, 2022a) (PKSDM, 2022a). Approximately 25% (~45 400 people) of the District's residents live in the Emthanjeni LM (StatsSA, 2022a) in 2016, followed by Siyancuma (35 900) and Umsobomvu LMs (30 800) (StatsSA, 2022a).

South Africa's year-on-year Gross Domestic Product (GDP) growth rate has decreased over time, and this is mirrored in the Northern Cape's GDP (NCP, 2021). Annual population growth rate of 1.5% in the PKSDM exceeded the (negative) economic growth rate of -0.69% in 2019 (COGTA, 2020), exacerbating the decline in income per capita. In 2020, the COVID-19 pandemic and associated domestic lockdowns put further strain on the already contracting national economy. Economic growth remained subdued nationally in 2021 with the persistence of the COVID-19 pandemic and unrest in parts of the country in July 2021. Economic growth is likely to have rebounded in 2022.

The PKSDM has a diverse economy, with community services (29%), agriculture (16%) and transport (14%) contributing the most to the District's economy (PKSDM, 2022a). The secondary sector, which includes the manufacturing, electricity and construction sectors, contributes a further 14% to the economy, while the mining sector contributes approximately 4% to the economy of the District (PKSDM, 2022a).

The tertiary (services) sector provides 47% of jobs in PKSDM, followed by the secondary sector (33%) and the primary sector (20%) – the latter are thus more labour intensive relative to their GDPR contribution. Employment opportunities in the District are very limited. In rural areas, employment is primarily in the agricultural sector, which provides opportunities for semi-skilled and unskilled workers and does not pay high wages. Towns have a slightly more diverse employment profile. Generally, the District is characterised by high levels of poverty and low levels of education.

The unemployment rate in the PKSDM was 33.9% in 2017, up from 28.3% in 2011 (PKSDM, 2019) (Wazimap, 2022a). Some 18.3% of all unemployed people in the Northern Cape Province in 2018 resided in the PKSDM (COGTA, 2020). The number of unemployed people increased annually by 1.84% on average between 2008 and 2018, marginally lower than the 2.14% annual average increase in the Northern Cape Province (COGTA, 2020).

Poverty and inequality are entrenched throughout the province (NCP, 2021) and rising, affecting more than half of provincial residents. PKSDM poverty levels are slightly lower than the provincial average. The percentage of people living in poverty in the District increased from 52.3% to 53.4% between 2010 and 2019, whereas it increased from 52.7% to 55.4% across the Northern Cape Province (NCP, 2021) – which does not yet take the economic effects of the COVID-19 pandemic into account.

4.2.2 Local Socio-economic Environment: Emthanjeni Local Municipality

4.2.2.1 Demographics

The population of the Emthanjeni LM increased by 1.7% between 2011 and 2016 to 45 404, faster than the PKSDM population which grew by less than 1%. The population density in the Emthanjeni

LM was estimated at 3.4 people / km^2 in 2016, very low albeit significantly higher than the District average, reflecting the predominantly rural nature of the region.

Approximately 52% of the Emthanjeni LM population (or ~23 900 people) is between 18 and 64 years old (i.e. of working age), while 38% of residents (~17 50) are younger than 18 years and ~10% (~4 000) are older than 65 years (Wazimap, 2022c)..

The population in the Emthanjeni LM comprises 61% Coloureds, 32% Black Africans and 7% Whites (see Table 4-8), though the proportion of the Coloured population in Ward 6 is lower at 48% (ELM, 2021). Average household size remained relatively constant between 2011 and 2016 at ~four individuals per household (ELM, 2021) (Municipalities of South Africa, 2022).

Table 4-8: Demographics in the Emthanjeni LM, PKSDM and Province

Population Group	Emthanjeni LM		PKSDM		Northern Cape Province	
Black African	14 515	32%	58 688	30%	574 246	48%
Coloured	27 644	61%	123 916	63%	521 261	44%
Indian/ Asian	116	0.3%	734	0.4%	6 486	0.5%
White	3 129	7%	12 258	6%	91 787	8%

Source: (Wazimap, 2022c)

Note: Percentages may not add up to 100 due to rounding.

4.2.2.2 Education

The population of the Emthanjeni LM exhibits a low level of skill. Approximately 11% of the population over 20 years of age have no schooling, 7% have primary school education, 33% have a high school education, 26% have completed Grade 12, 3% have some form of tertiary education (Figure 4-15) (Wazimap, 2022c).

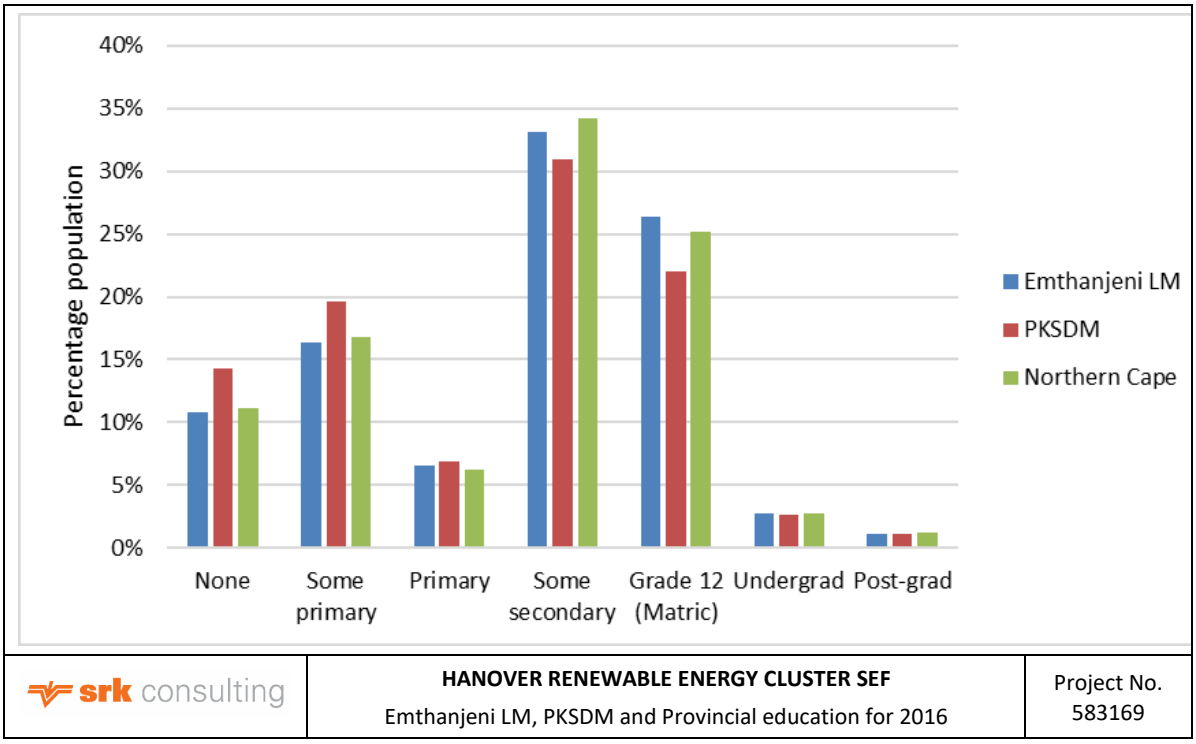


Figure 4-15: Emthanjeni LM, PKSDM and provincial education for 2016[23]

Source: (Wazimap, 2022c)

[23] Data reflects education levels of individuals 20 years and older.

4.2.2.3 Social Characteristics and Economy

The average annual income of households in both Ward 6 and the Emthanjeni LM was R29 400 in 2011 (Wazimap, 2022d), with 37% of households earning less than R20 000 per annum (Table 4-9). A larger proportion of households in the Emthanjeni LM earns higher incomes compared to Ward 6 (Wazimap, 2022e), likely a result of fewer high-income opportunities in the rural ward. Ward 6 household income compares positively with the Northern Cape Province (Table 4-9).

Table 4-9: Annual household income distribution

Annual household income	Ward 6		Emthanjeni LM		PKSDM		Northern Cape	
	No. hh	% hh	No. hh	% hh	No. hh	% hh	No. hh	% hh
Under R20 000	628	37%	3 786	36%	20 838	42%	130 234	42%
R20 000 - R40 000	381	23%	2 392	22%	11 828	24%	66 880	21%
R40 000 - R75 000	310	18%	1 784	17%	7 672	15%	46 057	15%
R75 000 - R150 000	214	13%	1 279	12%	4 701	9%	31 908	10%
R150 000 - R300 000	104	6%	949	9%	3 159	6%	22 300	7%
R300 000 - R600 000	35	2%	371	4%	1 404	3%	11 269	4%
Over R600 000	15	1%	124	1%	555	1%	4 744	2%

Source: (Wazimap, 2022e)

Note: Percentages may not add up to 100 due to rounding.

The economy of the Emthanjeni LM is dominated by agriculture, which is also the largest contributor to employment in the region. Other important economic sectors in the Emthanjeni LM include the services sector (notably government services), manufacturing (*inter alia* stone crushing, brick manufacturing, renewable energy generation, meat processing), retail, transport and tourism. The LM has seen significant investments in renewable energy, manufacturing and warehousing in recent years (ELM, 2021).

Some 37% of the of the municipal population 15 years and older was employed in 2011, while ~14% were unemployed in 2011. Approximately 5% were discouraged work seekers and 44% were not economically active (which includes children over the age of 15 who still attend school or tertiary institutions) (Wazimap, 2022d) (see Figure 4-16). A significantly higher portion of population in the Emthanjeni LM – and particularly Ward 6 – was employed compared to the PKSDM and Northern Cape.

Figure 4-16: Employment statistics of the Emthanjeni LM (left) and Ward 6 (right) in 2011

Source: (ELM, 2021) (Wazimap, 2022d) (Wazimap, 2022e)

Of the 37% of the working-age population that were employed in the Emthanjeni LM in 2011, 67% worked in the formal sector (Wazimap, 2022d), while 32% had more precarious employment in the informal sector and private households (Figure 4-17).

In Ward 6, employment in the informal sector and private households is nearly double the proportion of Emthanjeni LM, indicating less secure and likely lower-income work opportunities in Ward 6, and likely higher dependence on the agricultural sector for employment.

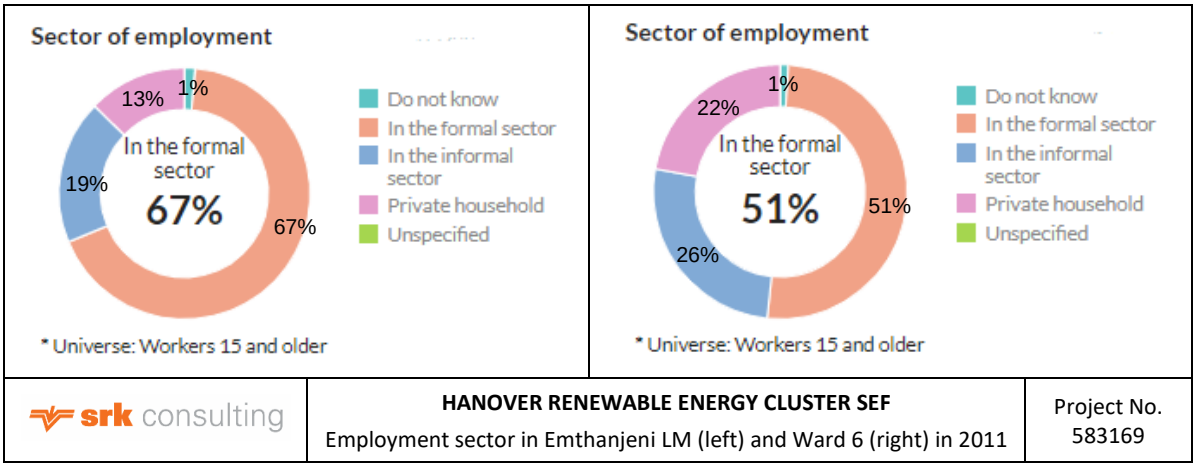


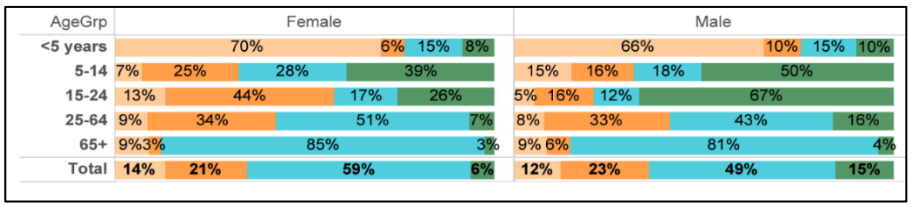
Figure 4-17: Employment sector in Emthanjeni LM (left) and Ward 6 (right) in 2011

Source: (Wazimap, 2022d) (Wazimap, 2022e)

4.2.2.4 Health

The PKSDM is serviced by nine hospitals and 32 permanent Community Health Care and Clinic facilities (PKSDM, 2022a), of which two hospitals and six clinics are located in the Emthanjeni LM. In the PKSDM, young people between 5 and 25 years succumbed primarily to injuries (notably drowning, road injuries and interpersonal violence) – particularly amongst men – and Tuberculosis (TB) and Human Immunodeficiency Virus (HIV) – particularly amongst women. For people older than 25 years, non-communicable diseases (NCD) become the most important cause of death, indicating a

potentially high incidence of poor nutrition and lifestyle, while TB and HIV remain an important factor (Figure 4-18) (PKSDM, 2014) (Health Systems Trust, 2020). HIV prevalence increased from ~ 17 000 to 24 000 between 2016 and 2019 in the Emthanjeni LM (ELM, 2022).



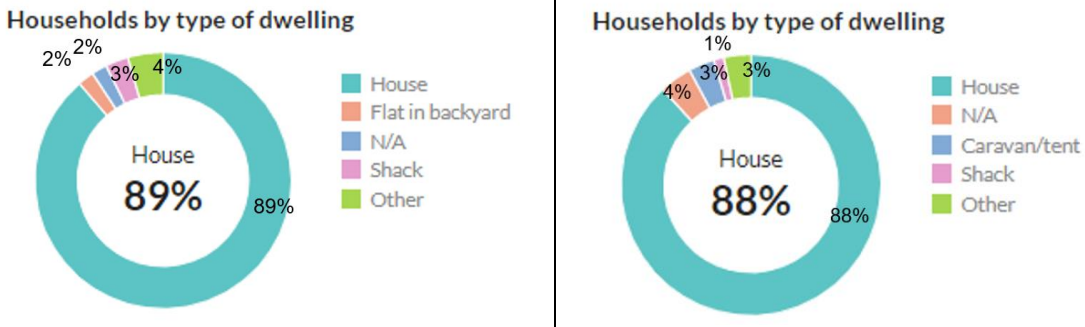
srk consulting	HANOVER RENEWABLE ENERGY CLUSTER SEF Cause of deaths in the PKSDM (2012-2017)	Project No. 583169

Figure 4-18: Cause of deaths in the PKSDM (2012-2017)

Source: (Health Systems Trust, 2020)
Note: Comm_mat_peri_nut: Communicable diseases, maternal, perinatal and nutritional conditions. NCD: Non-communicable diseases.

4.2.2.5 Service Delivery

In 2011, only 89% of households in the Emthanjeni LM resided in formal dwellings (houses and apartments), while the remainder lived in informal dwellings (shacks – 3% and backyard flats – 2%) (Wazimap, 2022c). The number of households living in formal residences decreased from 89% in 2011 to 76% in 2016 (Wazimap, 2022d). According to the 2016 Community Survey, 43% of Emthanjeni LM residents lived in RDP houses or other government-subsidised dwellings at the time. In Ward 6, 88% of households lived in a formal house or apartment in 2011, with a small portion of households (1.2%) residing in informal dwellings (see Figure 4-19) (Wazimap, 2022e).



srk consulting	HANOVER RENEWABLE ENERGY CLUSTER SEF Dwelling types in Emthanjeni LM (left) and Ward 6 (right) in 2011	Project No. 583169

Figure 4-19: Dwelling types in Emthanjeni LM (left) and Ward 6 (right) in 2011

Source: (Wazimap, 2022d) (Wazimap, 2022e)

Access to services is variable across the Emthanjeni LM, but generally poorer in the rural areas. A number of small towns within the Emthanjeni LM rely on groundwater, including De Aar, Hanover and Britstown, via borehole. Most households in Ward 6 have access to municipal water supply (78%), while access to flush toilets (74%) and refuse removal (76%) is similar, but approximately 10% lower than the LM average (Wazimap, 2022d) (Wazimap, 2022e). Due to the rural nature of Ward 6, more households have a septic tank (26% in Ward 6 compared to less than 1% in urban wards).

4.3 Cultural and Historical Environment

4.3.1 Historical Context

Hanover was established in 1854 on Petrusvallei, one of the early farms of the area. The farm was originally granted to W. L. Pretorius in November 1841 and passed through a number of hands before it was purchased in July 1854 by a six-man committee whose intention was to start a settlement and church farm (ACO Associates cc, 2023).

In early 1856, 40 plots were sold. Soon a town established at the foot of a cluster of hills near a strong natural spring called The Fountain, which still delivers over 200,000 litres of fresh water a day, supplying the leiwater system that irrigates the gardens of the town (University of the Free State Department of Architecture, 2013).

Hanover grew quickly and by the latter years of the 19th century boasted a jail, a courthouse, a post and telegraph office, a bank, several general dealers, a hotel and a school. Its list of tradesmen included a mason, a farrier and groom, painter, miller, dam builder, brick maker, scab inspector, carpenter, wagon maker, butcher, a post rider and carriers to the railway station 18 km away. The original farmstead survives and today houses a museum (University of the Free State Department of Architecture, 2013) (Kriek & Willis, n.d.).

During the South African (Anglo-Boer) War of 1899-1902, the De Aar / Hanover / Graaf Reinet area was a hive of activity. Boer forces were strong in Northern Cape, where towns were thinly garrisoned by the British, and towns as far east as Molteno were occupied by Boer commandos (Beater, 2011).

The railway links between Cape Town and the interior were crucial for the British providing the means to quickly transport soldiers, horses, ammunition and food from the harbours in Table Bay and Algoa Bay to the interior (ACO Associates cc, 2023).

The railways were an obvious target for Boer forces and between December 1900 and September 1901, 135 train wrecking incidents were recorded across South Africa, with the Boer commandos blowing up railway lines, derailing trains, and taking supplies from the trains meant for the British forces (Beater, 2011).

One of the main lines, from Algoa Bay to Kimberley via De Aar, passed through Hanover Road, approximately 10 km east of the town and was a target for Boer activities during the guerrilla warfare period from 1900. The safeguarding of the line in the De Aar, Hanover and Noupoort area was thus extremely important. A blockhouse was constructed at Noupoort and Beater (Beater, 2011) reports on five apparent redoubts overlooking the alignment of the old railway line on the farm Taaiboschfontein (Farm 41) approximately 28 km north of Hanover (ACO Associates cc, 2023).

4.3.2 Archaeological Context

A vast “litter” of stone artefacts blanket the Karoo range from heavily weathered Early (ESA) and Middle Stone Ages (MSA) lithics dating back to ~1 million years ago (Mya) to the Later Stone Age (LSA) artefacts deposited within the last 30 000 years (ACO Associates cc, 2023).

Between 1979 and 1981 more than 14 000 archaeological stone tool occurrences were recorded in the Seekoei River drainage, between the Sneeuberg in the south and Hanover in the north (Sampson, 1985). A long sequence of archaeological material in the Upper Karoo was recorded, indicating the occupation of the region by our forebears since the ESA Acheulian (after 1 Mya), through multiple MSA phases, four LSA phases to herder sites, many with low stone-walled kraals and Khoekhoe-like, thin-walled ceramics, dating to within the last 2,000 years (Sampson, 1985).

Due to the geology of the Karoo, caves and rock shelters are very rare. Most pre-colonial archaeology is found on open sites and comprises principally stone artefacts. Ostrich eggshell is sometimes

preserved, and occasionally pottery on sites that are less than 2 000 years old, but bone and other organic material is rarely preserved on Karoo sites, except in rare, stratified contexts (ACO Associates cc, 2023).

The lack of any archaeological material aside from lithics means that dating of sites and material can be difficult, but there is an important correlation between stone tool age and the patina on the hornfels, the fine-grained metamorphic rock also called lydianite and indurated shale which is the dominant Stone Age raw material used in the Karoo. Lithics patinated dark brown to yellow = ESA; red = MSA; grey to grey brown = LSA (Lockshoek); light brown/tan = LSA (Interior Wilton); and black = LSA (Smithfield). This culture-history sequence forms a basis for identifying stone tool industries and historic occupations over the entire region (Huffman, 2013).

Dolerite is the source of hornfels in the Karoo, which occurs in the contact zone between intrusive magma and shale beds. Furthermore, it also served as foci for pre-colonial campsites, and provided the palettes for the rock engravings that largely replace painted rock art in this cave- and rock shelter-poor environment (Huffman, 2013) (Palaeo Field Services, 2014).

ESA Acheulian sites tend to cluster close to sources of tool-making stone raw material and are generally found on the flats rather than on ridges and hills. These sites and artefacts are often buried under the more recent sediments and, as a result, ESA lithics and sites have seldom been reported by the various surveys undertaken in the region.

MSA artefact occurrences in the region are almost exclusively open sites, and tend to be visible as dense clusters of lithics in erosion features along stream banks, as scatters of tools on the edges of pans and at the base of small hills or koppies, or as a wide and persistent scatter or “litter” of lithics across the landscape, which are particularly visible on gravel lag surfaces where the overlying coversands have been removed by erosion (Sampson, 1985).

Thousands of LSA sites have been recorded in the region and these are attributed to the ancestors of the San peoples and, after 2 000 years ago, to Khoekhoen pastoralists (Sampson, 1985) (Webley & Orton, 2011). LSA material is also generally found in the open due to the scarcity of rock shelters and comprises large scatters of stone tools (ACO Associates cc, 2023).

The San in general were nomadic hunter-gatherers who moved between temporary campsites, re-occupying some places from time to time. As a result, LSA sites in this region, often contain more than one industry (Sampson, 1974). LSA sites are also usually located in the general vicinity of hornfels quarries, but this has not been an important determinant because of the abundance of outcrops, and the availability of earlier, particularly MSA in the landscape (ACO Associates cc, 2023).

The earliest phase of the LSA dates to around 10,000 years ago and is described by Sampson (Sampson, 1985) as the Lockshoek. The Lockshoek is one of the terminal Pleistocene / early Holocene, non-microlithic industries that belong to the Oakhurst complex and it is the oldest archaeological unit (about 12 000 to 8 000 years ago) that can be associated with the San (i.e. Bushmen). The entire Later Stone Age sequence afterwards is commonly credited to ancestral San (Deacon, 1984) (Huffman, 2013). The Lockshoek is characterised by large sidescrapers, frontal scrapers, endscrapers, thick backed adzes and a wide variety of ground stone implements and sites are overwhelmingly found near water points (Webley & Orton, 2011).

The Lockshoek is followed by the Interior Wilton which includes small convex scrapers, adzes, drills, reamers, as well as ceramics in its final phase. Unlike the Lockshoek, Interior Wilton sites are found on hills and ridges with commanding views of rivers and valleys (Webley & Orton, 2011).

The Interior Wilton is followed by the Smithfield which is characterised by abundant endscrapers made on elongated flakes, often with extensive trimming down the margins. Sampson’s Smithfield is generally associated with ceramics (Webley & Orton, 2011).

Smithfield surface sites are concentrated on low dolerite hills and ridges, but not in the mountains or out on the flats. They occur in dense clusters each composed of several sites approximately a few hundred metres apart. Most clusters are found near waterholes on adjacent hills or ridges and clusters near both water and hornfels quarries tend to contain more sites. Clusters rarely form around hornfels quarries. Sites with ceramics cluster tightly on the landscape, mainly near waterholes, and are assumed to be the residues of camps (Sampson, 1984).

Painted rock art is the exception rather than the rule in the Karoo, and in its stead there are rock engravings on the black patinated dolerite boulders characteristic of the region. These engravings were created by the San and their ancestors over the past ~10 000 years and are an enduring reminder of the creative skills of the artists and their beliefs and rituals (Parkington, Morris, & Rusch, 2008) (Deacon, 1984).

Rock engravings and paintings in the Northern Cape and Karoo vary across time in terms of technique, form and content, both between and within sites. Hairline engravings are the oldest, while the scraped and pecked techniques are at least partly coeval. Finger paintings are late, and the recent scratched engravings date from the nineteenth century and include modem inscriptions and vandalism (Morris, 1998)

4.3.3 Palaeontological Context

The Karoo is a vast palaeontological landscape underlain by multiple shale and mudstone strata which together represent ~400 million years of depositional history. These strata contain an array of fossils, ranging from fish, early vertebrates and plant remains to trace fossils and are one of the most complete fossil repositories on the planet and have been a subject of research since the early 20th century (ACO Associates cc, 2023).

The best-known depositional event of the Karoo sequence is the laying down of the Beaufort shales about 230 Mya. These shales are a rich, stratified sequence of fish, reptilian and amphibian remains that are fossilized in Permian and Triassic period swamp deposits (Truswell, 1977).

The Hanover Cluster is located in the north central part of the Karoo Basin and is underlain by significant geological units that vary in age from the Permian to the Quaternary. Extensive portions of the area are underlain by Permian aged sedimentary rocks of the Adelaide Subgroup of the Beaufort Group and by dolerite of the Karoo Supergroup. Limited areas are underlain by Quaternary aged calcrete and large parts of the region are covered in relatively thick (2 m) Quaternary colluvial sediments that cover potentially productive fossils horizons (ACO Associates cc, 2023).

4.3.4 Orange Valley SEF Cultural and Historical Environment

4.3.4.1 Archaeological Context

Surface archaeological sites or material in this area tend to cluster on rocky outcrops such as dolerite dykes and may thus be present on the dykes within the Orange Valley SEF development area. The potential for pre-colonial archaeological material within the Orange Valley SEF development envelope can be described as follows (ACO Associates cc, 2023):

- ESA lithics were recorded elsewhere in the Hanover Cluster. Such material may be present in the Orange Valley SEF development envelope but its age means that it is likely to be buried and only exposed on areas where the cover sands have been removed;
- The many MSA artefact occurrences in the region and elsewhere in the Hanover Cluster are almost exclusively open sites, and tend to be visible as dense clusters of lithics in erosion features along stream banks, as scatters of tools on the edges of pans and at the base of small hills or koppies, or as a wide and persistent scatter or “litter” of lithics across the landscape, which are

particularly visible on gravel lag surfaces where the overlying cover sands have been removed by erosion;

- LSA artefact assemblages in this area tend to be relatively small and discrete and are usually located at or near features in the landscape like rocky outcrops and springs. These sites may be found on the surface of the cover sands. Ostrich eggshell, bone and pottery is likely to be present, particularly on the more recent of the LSA sites (ACO Associates cc, 2023).

4.3.4.2 Palaeontological Context

The expansive plain comprising the development envelope is underlain for the most part by highly fractured green-grey and red coloured mudstone with thinly bedded fine- to medium-grained yellowish sandstone of the Balfour Formation. Sandstone bodies are relatively thin (1,5 m) lenticular structures with well-defined sharp basal contacts with underlying mudstone. These contact zones are important palaeo-environmental indicators and in the Orange Valley SEF development area the outcrops invariably contain significant palaeontological heritage items, including vertebrate fossil bones (ACO Associates cc, 2023). Excavations and earthworks associated with the Orange Valley SEF might, therefore, expose very highly significant fossil bearing strata from the *Daptocephalus* Assemblage Zone.

Intruding through the Adelaide Subgroup sediments in the north-eastern corner of the development envelope is a Jurassic period dolerite intrusion of the Karoo Supergroup which, being more weathering-resistant, tend to form the relief in the area. This intrusion provides the only relief on the wider Orange Valley SEF project site. The geological chart indicates three roughly parallel dolerite dykes running roughly north-west to south-east across the development area, two of which have been excluded from the development envelope. The Jurassic dolerite, being igneous in origin, is non-fossiliferous and, thus, palaeontologically not significant.

The Quaternary sands in the water courses were transported from farther north in the past when there was likely much more rainfall in the system, and more recently with flash flooding. Their composition and origin can be very mixed. They have the potential to preserve fossils, but having been washed down slopes and streams into rivers, any fossils would have been transported from their sites of origin and their context and associations with other fossil material in the assemblage will have been lost. These sediments are indicated as moderately sensitive on the SAHRIS map (ACO Associates cc, 2023).

4.3.5 Visual and Aesthetic Environment

The Hanover Cluster is characterised by a number of broad-scale landscape types illustrated in Figure 4-20.

The basis for the visual character of the Hanover Cluster is provided by the topography, vegetation and land use of the area, which is predominantly a rural environment characterised by the low grasses and shrubs, koppies and ridges with vistas of undeveloped land resulting in a stark, almost inhospitable, occasionally striking visual environment. The vast expanse of agricultural land that comprises the project site is considered a natural transition landscape (SRK Consulting, 2023).

The visual quality of the study area is defined by the vast areas of agricultural grazing land and the occasional pockets of development such as farmsteads and small towns (Figure 4-21). Steel windmills that have become iconic to the Karoo landscape are often viewed in the landscape with koppies in the middle- and background (Figure 4-23). Ephemeral rivers and riverbeds and farm dams also add to visual quality (SRK Consulting, 2023).

Visual receptors have been identified based on surrounding land uses. The visual receptors for the Hanover Cluster are briefly described below:

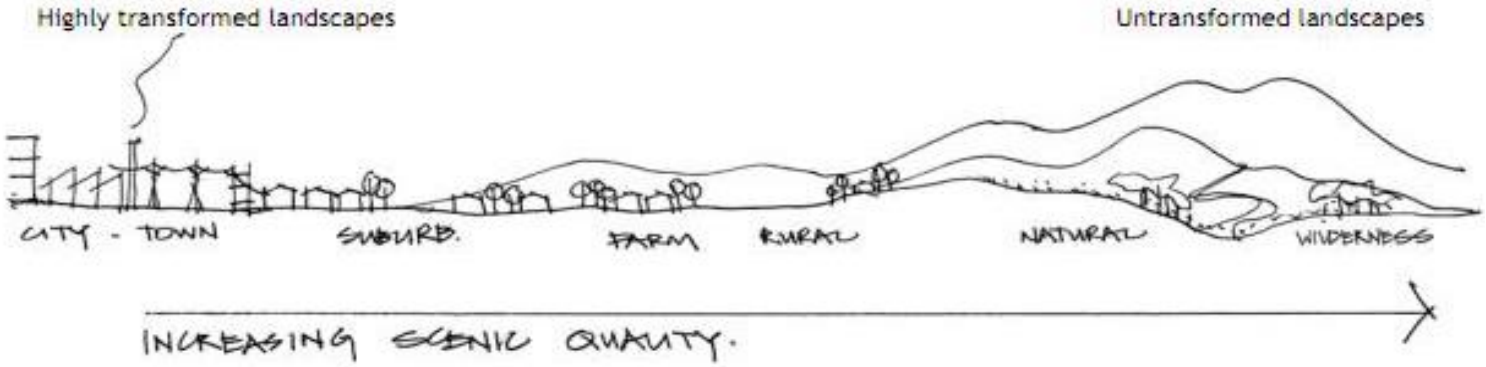
- Farmstead Residents: Isolated farmsteads are interspersed throughout the Cluster site and surrounding area. Farmstead residents are considered to be highly sensitive receptors.
- Hospitality: A number of guesthouses and lodges are located within the Cluster site and in the surrounding area, including the Klipfontein Hunting Lodge, Wortelfontein Guest Farm. Other guesthouses are located some distance from the project sites.
- Motorists: The N1 and N10 roads are located to the south and east of the Hanover Cluster respectively. There is also a network of farm roads within and surrounding the Hanover Cluster.

The five landowners and occupiers (tenants) of the 21 farms are considered receptors; however, they have reached a negotiated agreement with Mainstream and will receive financial remuneration in compensation for development on their properties. As such, they are not deemed to be sensitive receptors (SRK Consulting, 2023).

Motorists on the N1 and N10 are likely to experience partial views of the renewable energy facilities, particularly WEFs that have been developed beyond the project area. Therefore, some of the motorists may have become accustomed to views of WEFs and SEFs in the region. The relationship of receptors in the study area to place may be predominantly biographical and dependent, and spiritual (SRK Consulting, 2023).

The sense of place of the Hanover Cluster project area is strongly influenced by the surrounding landscape, which is a semi-arid undeveloped rural agricultural environment, interspersed with koppies providing interest and relief to the landscape. The project area mostly feels remote and deserted with isolated farmsteads across the project area (SRK Consulting, 2023).

Highly Transformed Landscape – Urban/Industrial	Transition Landscape	Modified Rural Landscape	Natural Transition Landscape	Untransformed Landscape – Natural
Substantially developed landscape. High levels of visual impact associated with buildings, factories, roads and other related infrastructure (e.g. powerlines).	Transitional landscape associated with the interface between, rural, agricultural area and more developed suburban or urban zones.	Typical character is rural landscape, defined by field patterns, forestry plantations and agricultural areas and associated small-scale roads and buildings.	A changing landscape character associated with the interface between natural areas and modified rural / pastoral or agricultural zones.	No / minimal impact associated with the actions of man. National parks, coastlines, pristine forest areas.



Source: (CNDV, 2006)


(Shan Ding Lu, 2009)


(Night Jar Travel South Africa, 2012)


(Boschkloof, 2012)

srk consulting

HANOVER RENEWABLE ENERGY CLUSTER SEF

Typical Visual Character Attributes

Project No. 583169

Figure 4-20: Typical visual character attributes

srk consulting	**HANOVER RENEWABLE ENERGY CLUSTER SEF** Town of Hanover	Project No. 583169

Figure 4-21: Town of Hanover

srk consulting	**HANOVER RENEWABLE ENERGY CLUSTER SEF** Steel Windmills	Project No. 583169

Figure 4-22: Steel windmills

srk consulting	**HANOVER RENEWABLE ENERGY CLUSTER SEF** Views across the project area	Project No. 583169

Figure 4-23: Views across the Hanover Cluster area

4.3.5.1 Orange Valley SEF Visual and Aesthetic Environment

The visual quality of the Orange Valley SEF development envelope is consistent with the visual quality of the region: natural, visually untransformed environment that can be experienced by receptors as barren and harsh due to the desolate nature of the landscape (Figure 4-23). The Orange Valley SEF development envelope is used for sheep grazing and is aesthetically intact (SRK Consulting, 2023).

The owner of Farm Vogelfontein 7/71, on which the Orange Valley SEF will be located is ostensibly considered a visual receptor; however, they have reached a negotiated agreement with Mainstream and will receive financial remuneration in compensation for development on their property. As such, they are not deemed to be sensitive receptors (SRK Consulting, 2023).

Only a few farmsteads occur within 5 km of the development envelope. The N1 is located some distance away to the south and east of the Orange Valley SEF. A line of ridges lie between the Orange Valley SEF and the N1. Therefore, the motorists on the N1 are not considered receptors to the Orange Valley SEF (SRK Consulting, 2023).

The sense of place of the project area is strongly influenced by the surrounding landscape, which is a semi-arid undeveloped rural (natural) agricultural environment, interspersed with koppies and ridgelines providing some interest and relief to the landscape which is otherwise experienced as visually unspectacular. The Orange Valley SEF project area mostly feels remote and deserted with isolated farmsteads some distance (> 1.5 km) from the development envelope (SRK Consulting, 2023).

The relationship of receptors in the study area to place may be predominantly biographical, dependent, and spiritual. The sense of place is not significantly different from other similar, vast tracts of this part of the Karoo, so not instantly memorable or differentiated (SRK Consulting, 2023).

4.4 Verified Environmental Site Sensitivity

The national web based environmental screening tool identifies a number of environmental themes. The environmental site sensitivity was verified for each of these themes and informed the baseline descriptions provided in Sections 4.1 to 4.3. The verified site sensitivity for each environmental theme for Orange Valley SEF is summarised in Table 4-10.

Table 4-10: Verified site sensitivity for environmental themes applicable to Orange Valley SEF

Environmental theme	Sensitivity				Motivation for the verified sensitivity
	Very High	High	Medium	Low	
Agriculture Theme			**X**		The site is characterised with a “L6” land capability associated with non-arable soils. The overall sensitivity of the site has been categorised as “Medium”.
Animal Species Theme				**X**	No fauna SCC were recorded on site, however four avifauna SCC were recorded: *Sagittarius serpentarius* (Secretarybird), *Grus paradisea* (Blue Crane), *Eupodotis caerulescens* (Blue Korhaan), and *Eupodotis vigorsii* (Karoo Korhaan).
Aquatic Biodiversity Theme		**X**			Ephmeral drainage areas on the site were confirmed by the specialists to be of medium ecological importance, with high habitat connectivity serving as functional ecological corridors. These areas have low resilience to disturbance.
Archaeological and Cultural Heritage Theme				**X**	The site visit suggests that relatively few archaeological sites and materials, or other cultural heritage resources are present in the Orange Valley SEF development

Environmental theme	Sensitivity				Motivation for the verified sensitivity
	Very High	High	Medium	Low	
					envelope. The development envelope appears to be of generally low heritage significance.
Avian Theme		X			The site is confirmed as highly sensitive with regards to Avifauna as SCC were recorded on site: *Sagittarius serpentarius* (Secretarybird), *Grus paradisea* (Blue Crane), *Eupodotis caerulescens* (Blue Korhaan), and *Eupodotis vigorsii* (Karoo Korhaan).
Civil Aviation (Solar PV) Theme				X	No major civil aviation aerodromes are located near the Orange Valley SEF.
Defence Theme				X	No major defence installations are known to be located near the Orange Valley SEF.
Landscape (Solar) Theme		X			The landscape around the project has a limited capability to conceal the proposed project that has a low landscape integrity and is expected to be very different to the existing landscape. With the moderate visual exposure, viewer sensitivity and low visibility distance, the project area is considered to have a high sensitivity.
Palaeontology Theme		X			The relevant geological chart and the SAHRIS palaeo-sensitivity map both indicate the presence of sediments of high palaeontological sensitivity underlying the Orange Valley SEF development envelope. This is supported by the results of the palaeontological site visit and confirms that the site has a high palaeontological sensitivity.
Plant Species Theme				X	No SCCs were recorded during the ecologist's site survey.
RFI Theme				X	No RFI-sensitive installations are located near the Orange Valley SEF
Terrestrial Biodiversity Theme		X			Of the two terrestrial habitat types identified in the site, Drainage Areas are rated as High SEI and Grassland Plains are rated as Medium SEI.

5 Stakeholder Engagement

Stakeholder engagement forms a key component of the S&EIR process and is undertaken in accordance with Chapter 6 of the EIA Regulations, 2014 and the Protection of Personal Information Act 4 of 2013 (POPIA). The objectives of stakeholder engagement are outlined in this section, followed by a summary of the approach to be followed.

As of 1 July 2021, sections of the POPIA, which aims to promote protection of personal information, came into effect. The EIA Regulations, 2014 require, *inter alia*, transparent disclosure of registered stakeholders and their comments. In terms of the EIA Regulations, 2014, stakeholders who submit comments, attend a meeting or request registration in writing are deemed registered stakeholders who must be added to the project's Registered Stakeholder Database with their contact details. Therefore, **registered stakeholders are deemed to give their consent for relevant information (including name and contact details) to be processed and disclosed, in fulfilment of the requirements of the EIA Regulations, 2014 and the National Appeal Regulations, 2014.**

5.1 Objectives and Approach to Stakeholder Engagement

The overall aim of stakeholder engagement is to ensure that all IAPs have adequate opportunity to provide input into the process and raise their comments and concerns. More specifically, the objectives of stakeholder engagement are to:

- Identify IAPs and inform them about the proposed development and S&EIR process;
- Provide stakeholders with the opportunity to participate effectively in the process and identify relevant issues and concerns; and
- Provide stakeholders with the opportunity to review documentation and assist in identifying mitigation and management options to address potential environmental issues.

As the Orange Valley SEF is one of seven SEFs proposed in the Hanover Cluster, stakeholder engagement for these seven projects will be run in parallel to provide stakeholders with an opportunity to review and comment on the Orange Valley SEF and other SEFs in the Cluster simultaneously.

5.2 Stakeholder Engagement Activities

The activities undertaken and proposed during the Pre-Application and Scoping Phases of the EIA process are outlined in Table 5-1.

Table 5-1: Activities planned during the Scoping Phase

Task	Objectives	Dates
Pre-application meeting with DFFE	To discuss the proposed approach to the S&EIR processes, specialist studies and stakeholder engagement with the Competent Authority	10 November 2022
Place site notification posters around the Hanover Cluster	To notify IAPs of the commencement of the EIA process and to provide a description of the proposed project and the affected environment, as well as a description of potential environmental issues, and the proposed approach to the Impact Assessment Phase.	8 September 2022
Advertise commencement of EIA process and release Scoping Report for public comment period		16 June 2023
Public comment period	To provide stakeholders with the opportunity to review and comment on the results of the Scoping Phase.	19 June - 18 July 2023
Compile Issues and Responses Summary and finalise Scoping Report	To record all issues and concerns raised and collate these comments in the final report which provides	July 2023

Task	Objectives	Dates
	DFFE with information to decide whether to accept the Scoping Report.	

The key activities (that will be) undertaken in the stakeholder engagement process during the Scoping Phase are described further below.

5.2.1 Identification of Key Stakeholders

Regulation 42 of the EIA Regulations, 2014, as amended, provides for the opening and maintenance of a Registered Stakeholder (IAP) Database, which must contain personal information (names and contact details). Relevant IAPs from local, provincial and national authorities, conservation bodies, Non-Governmental Organisations (NGO) groups, surrounding IPPs, local businesses and forums and surrounding landowners and occupants were therefore considered for inclusion on the Registered Stakeholder Database for the project and were notified (see Section 7.2) of the opportunity to register on the Registered Stakeholder Database and / or to provide comment on the S&EIA Reports. Relevant authorities were automatically included as registered stakeholders and contact details added to the Registered Stakeholder Database.

As specified in the EIA Regulations, 2014, registered stakeholders and their contact details have been (and will be) included on the Registered Stakeholder Database to be submitted to the competent authority. However, to comply with POPIA, the Registered Stakeholder Database is not provided in reports or attached to reports made available in the public domain. However, the Registered Stakeholder Database will need to be provided to appellant(s) if the EA is appealed, and it may also need to be provided to other consultants if, for example, if it is a requirement to notify adjacent landowners of temporary noise disturbances associated with project implementation or of the findings of an external audit report. A list of stakeholders initially notified of the process is provided in Appendix D. The Registered Stakeholder Database will be updated throughout the process.

Due to the difficulty in notifying landowners in rural areas and POPIA limitations on acquiring landowner contact information, in November 2022 SRK contacted affected landowners requesting that they encourage neighbours to register on the Registered Stakeholder Database as well as providing contact details of community groups and agricultural associations which can be notified of the S&EIR process.

5.2.2 Notification of the EIA Process and Scoping Report for Public Comment

Newspaper advertisements in English, Afrikaans and Xhosa announcing the commencement of the S&EIR process, the availability of the Scoping Report for stakeholder review and inviting IAPs to register were placed in Die Echo (local newspaper).

Several A2-sized site notification posters (in English) were placed at the Hanover Cluster project boundary. These notification posters contained brief details of the proposed project and the S&EIR process and the contact details of the EAP. In addition, due to the remote area of the project, A4-sized community posters (in English) were placed at several shops, the public library and police station in Hanover. The site notification and community posters and location of where they were erected are included in Appendix E.

An electronic version of the report can also be accessed on SRK's website **www.srk.co.za** (via the 'Knowledge Centre' and 'Public Documents' links).

Hard copies of the full report are available for viewing at the following venues:

- Hanover Public Library;
- Emthanjeni Local Municipality Hanover Office; and

- SRK's office in Rondebosch.

Stakeholders are provided with a 30-day comment period.

5.2.3 Submission of Final Scoping Report / Next Steps

Following public review of the Scoping Report, issues raised by authorities and the public will be summarised and responded to in an Issues and Responses Summary, which will be appended to the Scoping Report. The Scoping Report will be updated (if necessary) taking stakeholder input into account. The Final Scoping Report will then be submitted to DFFE. The Impact Assessment Phase will formally commence on acceptance of the Final Scoping Report by DFFE.

5.3 Stakeholder Comments

In order to comply with deadlines stipulated in the EIA Regulations, 2014 the broader public has only very recently been or upon release of the Scoping Report will be formally notified of the project. However certain potentially affected property owners were made aware of the project by the project team during site screening activities during the Pre-Application Phase and through engagement during the Socio-Economic Impact Assessment. Comments received to date (which will be incorporated into an Issues and Responses Summary along with any comments received following release of the Scoping Report for public comment) are included in Appendix F.

Aside from comments from two authorities (Emthanjeni LM and PKSDM), comments and feedback regarding the project were submitted by four affected landowners and one public stakeholder. Many of the affected landowners appear to support the project and note that it is not expected to affect the current farming activities on their properties. One of the authorities noted that most communities do not feel the benefit to the community from such projects.

6 Potential Environmental and Social Impacts

The key potential environmental issues and impacts of the project have been identified based on:

- The legal requirements (Chapter 2);
- The nature of the proposed activity (Chapter 3);
- The nature of the receiving environment (Chapter 4); and
- The professional experience of the EIA team.

6.1 Key Environmental Issues and Impacts

The EIA Regulations, 2014 (Appendix 2) prescribe the required content of a Scoping Report (see Table 1-1), including the identification of risks and impacts (potential nature, significance, consequence, extent, duration and probability) of the project, and the degree to which impacts can be reversed, may cause irreplaceable loss of resources and can be avoided, managed or mitigated (Appendix 2 (h)(v) and (vii)).

The potential impacts of the project are mostly linked to the sensitivity of the ecological environment, heritage and cultural environment, social environment, and stakeholders' perceptions. The potential impacts associated with climate change are also considered.

Based on the above considerations and the professional experience of the EAP, the following *key* environmental issues – in effect, a preliminary suite of potential negative impacts and potential benefits of the project in its proposed setting – have been identified:

- **Terrestrial and aquatic ecology** – the clearance of vegetation, accidental fires, erosion and dust pollution will result in habitat loss and fragmentation and will negatively impact on the productivity of the species and diversity of the pollinator community on the site. Due to disturbance and fragmentation, encroachment of alien and invasive plants into these areas may occur. Increased noise and reflection effects could disturb fauna. The increased activity on the site during the construction phase can also result in mortality to fauna;
- **Avifauna** – disturbance and habitat transformation will displace certain avifaunal priority species in the area. Mortality of certain avifaunal priority species can result from collisions with solar panels and overhead powerlines, entrapment in perimeter fences and electrocution on overhead powerlines;
- **Socio-economic** – investment contributing to the economy and generation of employment, income and skills and increased prosperity due to socio-economic development (SED) and/or economic development (ED) initiatives and possible part ownership are potential benefits of the project;
- **Heritage** – the clearance and levelling of the site for the installation of the PV arrays can lead to loss of, or damage to, palaeontological and archaeological resources and historical structures. As the proposed project will introduce an industrial element into a predominantly rural and natural landscape, it is expected that the cultural landscape and heritage significance will be altered;
- **Visual** – construction activities, proposed infrastructure and additional lighting on the overwhelmingly natural site will alter the sense of place and lead to visual intrusion; and
- **Traffic** – increased traffic volumes on the road network during construction and operation phases causing potential disruption to existing road users and damage to dirt roads.

Specialist studies will be commissioned during the Impact Assessment Phase to address these issues (see Section 7.3). In addition, SRK EAPs will also consider climate change impacts as well as the project resilience / vulnerability to climate change.

6.2 Less Significant Issues and Impacts

Certain (preliminary) impacts, while important, are likely to be considered less significant based on the impact rating criteria above and/or can be assessed by SRK specialists without warranting appointment of external specialists. These impacts include:

- **Air Quality** – the clearance of vegetation and construction activities on site, including the movement of plant and vehicles, as well as the vehicle traffic to and from the site along gravel farm roads is likely to result in increased dust emissions;
- **Noise** – the construction activities may result in a temporary increase in noise levels on the site. There are, however, very limited receptors in close proximity;

It is proposed that these potentially less significant impacts will be assessed by the EAP (see Section 7.7.8).

6.3 Potential Mitigation Measures

Appendix 2 of the EIA Regulations, 2014 requires that possible mitigation measures that could be applied to avoid or mitigate negative impacts and optimise positive impacts must be identified in the Scoping Report.

Most of the impacts can be readily mitigated and it is not foreseen that they are likely to pose a significant risk. Where necessary, the EMPr will identify and recommend specific mitigation measures applicable to the Orange Valley SEF project.

In terms of GN 435 of 2019, the DFFE *Generic EMPr for the construction of substations* will be applicable to the on-site substation component of the Orange Valley SEF.

Table 6-1 identifies typical / routine mitigation measures that are likely to apply to the Orange Valley SEF project and which are over and above the generic mitigation measures included in the generic EMPrs for powerlines and substations. Additional and more detailed management and mitigation will be identified during impact assessment and reported in the EIA Report and EMPr.

Table 6-1: Typical mitigation measures

Phase	Typical management / mitigation measures
Pre-construction Phase	• Ensure all relevant permits and approvals are in place; • Establish buffer / exclusion zones; • Furnish all contractors with the EMPr; • Ensure contractors have subsidiary plans in place e.g. Oil Spill Contingency Plan, Waste Management Plan etc; and • Undertake environmental awareness training.
Construction Phase	• Appoint an Environmental Control Officer (ECO) to oversee environmental management and compliance with the EMPr during construction; • Maintain hazardous materials register and store all hazardous materials according to standard operating procedures; • Limit the footprint area of the construction activity to what is absolutely essential; • Ensure that no vegetation is removed or disturbed outside the delineated construction site boundary; • Maintain diesel powered equipment in good operating condition; • Manage traffic and site access; and

Phase	Typical management / mitigation measures
	• Restore or rehabilitate any areas disturbed during construction.
Operation Phase	• Undertake scheduled inspections and maintenance on all PV infrastructure; • Furnish all service providers with the EMPr; • Ensure service providers have subsidiary plans in place; • Ensure all service providers are suitably qualified and experienced; • Maintain exclusion zone procedures; • Store all hazardous materials according to Standard Operating Procedures (SOPs); and • Submit performance reports / independent EA compliance audits to authorities.

7 Plan of Study for the EIA

The proposed Plan of Study for the Impact Assessment Phase of the EIA is presented below.

7.1 Description of the Proposed EIA Process

The Impact Assessment Phase can be divided into key steps, namely:

- Consultation with relevant authorities;
- Specialist studies;
- Compilation of an EIA Report and an EMPr;
- Stakeholder engagement; and
- Submission of the Final EIA Report and EMPr to the competent authority, in this case DFFE.

These are outlined in more detail below.

7.2 Consultation with the Relevant Authorities

Consultation will be conducted with relevant authorities to clarify their requirements for the Impact Assessment Phase of the proposed project, other permit and licence applications for the project and to ensure that comments from the key authorities can be received in time to allow for them to be addressed in the EIA. The authorities (and other organs of state) that will be consulted include:

- DFFE;
- Department of Agriculture, Land Reform and Rural Development;
- Department of Defence / South African Army;
- Department of Transport;
- Department of Science and Innovation;
- Department of Mineral Resources and Energy;
- Department of Economic Development;
- South African National Roads Agency Limited (SANRAL);
- National Energy Regulator of South Africa (NERSA);
- Department of Water and Sanitation: Northern Cape Region, Orange CMA;
- SAHRA;
- Northern Cape: Department of Agriculture, Environmental Affairs, Rural Development and Land Reform;
- Northern Cape: Department of Cooperative Governance, Human Settlement and Traditional Affairs;
- Northern Cape: Department of Economic Development and Tourism;
- Northern Cape: Department of Roads and Public Work;
- NCHRA;
- South African Civil Aviation Authority (CAA);
- Air Traffic Navigation Services;
- Eskom;

- South African Radio Astronomy Observatory;
- South African Weather Service;
- Transnet;
- PKSDM;
- Emthanjeni LM; and
- South African Local Government Association.

7.3 Specialist Studies

Specialist assessments will be undertaken as part of the Impact Assessment Phase to investigate the key potential environmental issues and impacts identified during Scoping (see Section 6).

The following **specialist studies** are proposed for the Impact Assessment Phase:

- Biodiversity (including terrestrial and aquatic ecology) Impact Assessment;
- Land Capability and Agricultural Potential Compliance Statement;
- Avifauna Impact Assessment;
- Socio-Economic Impact Assessment;
- Heritage Impact Assessment;
- Visual Impact Assessment; and
- Traffic Impact Assessment.

Draft ToR for these studies are presented in Section 7.7 below.

7.4 Compilation of the Environmental Impact Assessment Report

The compilation of the EIA Report and EMPr will include the following tasks:

- Assimilation of the specialist studies / input into the EIA Report and EMPr;
- Identification and assessment of environmental impacts based on the results of the specialist studies / input and professional judgment of the EIA team. This will entail an assessment of the duration, extent, probability and intensity of the impacts to determine their significance (see Section 7.7.1 below);
- Identification of mitigation measures and recommendations for the management of the proposed project to avoid and minimise environmental impacts and maximise benefits; and
- Collation of the above information into an EIA Report and EMPr for the design, construction and operation phases of the project.

7.4.1 Alternatives Assessed in the EIA

The identification and screening of alternatives are discussed in Section 3.6. The No-Go alternative will be assessed in the Impact Assessment Phase. The No-Go alternative entails no change to the status quo, in other words the proposed project will not proceed and no PV array, substation and powerlines will be built.

7.5 Stakeholder Engagement

The stakeholder engagement process initiated during the Scoping Phase (see Section 5.2) will continue in the Impact Assessment Phase of the EIA. The key activities planned during the Impact Assessment Phase are outlined in Table 7-1.

Table 7-1: Stakeholder engagement activities planned during the Impact Assessment Phase

Task	Objectives	Dates / Timeframe
Update stakeholder database	To register additional stakeholders identified throughout the S&EIR process	Throughout S&EIR process
Compile and release EIA Report for public comment period	To assess the impacts of the project and formulate mitigation measures and management plans.	Impact Assessment Phase
Public comment period	To provide stakeholders with the opportunity to review and comment on the results of the Impact Assessment Phase.	Impact Assessment Phase
Finalise EIA Report	To present the findings of the EIA process and incorporate stakeholder comment in the final report which provides DFFE with information for decision-making.	Impact Assessment Phase
Release Final EIA Report for public review	To provide stakeholders with the opportunity to review responses to comments changes to the EIA Report (if any).	Prior to submission of EIA Report to DFFE

7.6 Submission of the Final EIA Report and EMPr to DFFE

All comments received will be incorporated into an Issues and Responses Summary which will be appended to the Final EIA Report. The Final EIA Report (including the EMPr) will then be submitted to DFFE to inform their decision regarding environmental authorisation of the proposed development.

7.7 Specialist Study Terms of Reference

The assessment of impacts will be based on the professional judgment of the specialists, fieldwork and desktop analysis, as required. General ToR applicable to all specialists, as well as specific ToR for each specialist study, are set out below. The general ToR may not apply equally to all specialists but are included to provide a comprehensive guideline. Specialists will be instructed to disregard those elements of the general ToR that are not applicable to them.

7.7.1 General Terms of Reference

SRK expects that specialists will be aware of and utilise relevant guidelines to more precisely determine methods and approaches to specialist studies and will reference these guidelines accordingly.

Specialist studies must also comply with:

- Appendix 6 of the EIA Regulations, 2014, amended in 2017; and
- DEFF “Protocols for the assessment and minimum report content requirements of environmental impacts” for agriculture, avifauna, biodiversity, noise, defence and civil aviation studies, which came into effect on 9 May 2020 and 30 October 2020[24].

The specialist studies shall be based on the procedure outlined below.

[24] GN 320 of 2020 and GN 1150 of 2020

Approach to the Study

Provide an outline of the approach used in the study. Assumptions, limitations and sources of information must be clearly identified. The knowledge of local people should, where possible, be incorporated in the study. The description of the approach shall include a short discussion of the appropriateness of the methods used in the specialist study. The assessment of the data shall, where possible, be based on accepted scientific techniques, failing which the specialist is to make judgments based on professional expertise and experience.

Description of the Affected Environment or Baseline

A description of the affected environment must be provided, both at a site-specific level and for the wider region, the latter to provide an appropriate context and cumulative impact analysis. The focus of this description shall be relevant to the specialists' field of expertise.

It is essential that the relative uniqueness or irreplaceability of the area be understood in the context of the surrounding region at a local, regional (and, if necessary, national) scale. This will largely be based on a comparison to existing data sources, where available.

The baseline should provide an indication of the sensitivity of the affected environment. Sensitivity, in this instance, refers to the 'ability' of an affected environment to tolerate disturbance (given existing and expected cumulative impacts).

Lastly, the baseline should provide a sufficiently comprehensive description of the existing environment in the study area to ensure that a detailed assessment of the potential impacts of the proposed development can be made. The baseline should include data collected through a thorough literature review as well as field surveys (where applicable).

Impact Identification and Assessment

Clear statements identifying the potential environmental impacts of the proposed project must be presented. This includes potential impacts of the upgrade and operation of the project. The specialist shall clearly identify the suite of potential **direct, indirect and cumulative environmental impacts**[25] in his/her study. The assessment of these impacts should take into account any other existing proposals in the surrounding area.

Direct impacts require a quantitative assessment which must follow the impact assessment methodology laid out in Section 7.9. The significance of impacts must be assessed both without and with assumed effective mitigation. Indirect and cumulative impacts should be described qualitatively.

The specialist shall comparatively assess environmental impacts of the development (and each alternative if applicable), as well as the No - Go alternative, and shall indicate any fatal flaws, i.e. very significant adverse environmental impacts which cannot be mitigated and which will jeopardise the project and/or activities in a particular area. All conclusions will need to be thoroughly backed up by scientific evidence.

Mitigation Measures

Specialists must recommend practicable mitigation measures or management actions that effectively minimise or eliminate negative impacts, enhance beneficial impacts, and assist project design. If appropriate, specialists must differentiate between essential mitigation and optimisation measures (i.e.

[25] An **indirect** impact is an effect that is related to but removed from a proposed action by an intermediate step or process. **Cumulative** impacts occur when: Different impacts of one activity or impacts of different activities on the natural and social environment take place so frequently in time or so densely in space that they cannot be assimilated; or impacts of one activity combine with the impacts of the same or other activities in a synergistic manner.

implicit in the 'assuming mitigation' rating), and best practice measures (which reduce impacts, but do not affect the impact rating).

Specialists are also required to recommend appropriate monitoring and review programmes to track the efficacy of mitigation measures (if appropriate).

Specialists must indicate the environmental acceptability of the proposal (and alternatives if applicable), i.e. whether the impacts are acceptable or not. A comparison between the No-Go alternative and the proposed development alternative(s) must also be included.

7.7.2 Biodiversity Specialist Study

The proposed ToR for the Biodiversity Impact Assessment are as follows:

- Undertake a desktop assessment of available terrestrial and aquatic ecology datasets;
- Undertake a field survey for fauna (mammals, reptiles and amphibians) and flora;
- For fauna, compile expected and identified species list, identify Red Data or listed species and assess and delineate habitat and proximity to any protected or ecologically important areas;
- Determine and evaluate the status of the faunal environment in terms of ecological indicators, important biodiversity attributes (such as rare and endangered species, protected species, sensitive species and endemic species);
- Determine Red and Orange Data plant species, vegetation units and habitat types and describe protected, endemic, exotic, alien invasive and culturally significant species. Consult local authorities;
- Describe and discuss fauna in relation to floristic survey findings and consider the probability of occurrence for species not observed during field surveys, with a focus on protected and endemic species;
- Delineate wetlands, watercourses and buffers;
- Determine the Present Ecological State (PES), ecosystem services and the Ecological Importance and Sensitivity (EIS) of aquatic features;
- Identify and delineate habitats and any unique or protected habitat features and sensitive habitats such as wetlands or pans, streams, rivers and rocky outcrops;
- Compile a risk matrix as required in terms of the NWA;
- Assess the significance of biodiversity impacts for the Orange Valley SEF and cumulatively for the Hanover Cluster and any other regional projects; and
- Identify mitigation measures for the reduction of the significance of negative impacts (and enhancement of benefits) and re-rate the impact significance assuming the effective implementation of mitigation measures.

The methodology to achieve the objectives of the ToR will be determined by the specialist based on professional experience.

7.7.3 Land Capability and Agricultural Potential Compliance Statement

The proposed ToR for the land capability and Agricultural Potential Compliance Statement are as follows:

- Review aerial imagery and conduct a field visit to determine land capability and agricultural potential based on soil, terrain and climate features;

- Classify land capability and land use potential in line with established categories;
- Selectively ground-truth desktop findings; and
- Determine the significance of project impacts on soil and land capability for the Orange Valley SEF and cumulatively for the Hanover Cluster and any other regional projects.

The methodology to achieve the objectives of the ToR will be determined by the specialist based on professional experience.

7.7.4 Avifauna Specialist Study

The proposed ToR for the Avifauna Impact Assessment are as follows:

- Conduct site verification visit(s);
- Prepare pre-application avifaunal monitoring plan;
- Implement the site specific pre-application avifaunal monitoring plan (four seasons);
- Consult and discuss applicable (sectoral) guidelines and policy documents;
- Identify and assess each potential impact of the project and the alternatives (if any are presented to the specialist), including impacts associated with the construction, operation and decommissioning phases, followed by a narrative description of each impact and a presentation of the assessment impact, using SRK's prescribed impact rating methodology;
- Indicate the acceptability of the project and/or alternatives;
- Identify and describe potential cumulative impacts of the proposed project in relation to proposed and existing activities impacting on the same resource;
- Recommend mitigation measures to avoid and/or minimise impacts and/or optimise benefits associated with the proposed project; and
- Recommend and draft a monitoring campaign, if applicable.

The methodology to achieve the objectives of the ToR will be determined by the specialist based on professional experience.

7.7.5 Socio-economic Specialist Study

The proposed ToR for the Socio-economic Impact Assessment are as follows:

- Review literature, internet resources, previous studies and information provided by stakeholders relating to the socio-economic environment of the study area;
- Interview local authorities and representative groups to determine stakeholder views and concerns regarding the project;
- Analyse the information and describe the socio-economic conditions and characteristics of the study area as well as the local (municipal) and, where relevant, regional (district municipal) context;
- Identify the potential socio-economic impacts and benefits of the proposed project based on the baseline data, project description, review of other studies for similar projects and professional experience;
- Assess the significance of the socio-economic impacts for the Orange Valley SEF and cumulatively for the Hanover Cluster and any other regional projects; and
- Identify mitigation measures for the reduction of the significance of negative impacts (and

enhancement of benefits) and re-rate the impact significance assuming the effective implementation of mitigation measures.

The methodology to achieve the objectives of the ToR will be determined by the specialist based on professional experience but will be informed by gathering primary (from telephonic interviews and email correspondence) and secondary data (from existing sources, such as Census data) and analysing the data to ascertain the socio-economic conditions and characteristics of the study area.

7.7.6 Heritage Specialist Study

The study will incorporate heritage, archaeology and paleontology aspects. The proposed ToR for the Heritage Impact Assessment are as follows:

- Undertake a desktop screening study to gather data and verify potential heritage sensitivities identified in the Screening Tool;
- Undertake a desktop archaeological baseline assessment;
- Undertake field work to locate, map and record archaeological sites or material and other heritage resources and identify areas in the landscape of heritage significance and sensitivity;
- Undertake a palaeontological field assessment and map and record finds to inform a Palaeontological Impact Assessment (PIA);
- Undertake a cultural landscape impact assessment;
- Compile a single integrated Heritage Impact Assessment (HIA), incorporating the results of the archaeological, palaeontological, heritage and cultural landscape assessments, to describe the:
    - Known and potential heritage resources in the study area and the region;
    - Identify potential heritage impacts for the Orange Valley SEF and cumulatively for the Hanover Cluster and any other regional projects;
    - Rate heritage impact significance and recommend mitigation measures where required; and
- Submit required documentation to and liaise with SAHRA and the Northern Cape Heritage authority as commenting authorities.

The methodology to achieve the objectives of the ToR will be determined by the specialist based on professional experience, but will be informed by the review of archaeological, palaeontological and heritage literature and information sources, including the publications generated by the Zeekoei Valley Archaeological Project, whose study area partially overlaps with the Hanover Cluster.

7.7.7 Visual Specialist Study

The proposed ToR for the Visual Impact Assessment are as follows:

- Review existing data, including data on topography, vegetation cover, and land-use, and other background information, and collect additional data where required;
- Conduct a site visit to determine key viewpoints / corridors and groundtruth existing visual character and quality;
- Describe the visual characteristics of the study area, including view catchment area, view corridors, viewpoints, viewsheds and receptors;
- Delineate the viewshed of the proposed project;
- Undertake glint and glare modelling for SPVs and flicker modelling for WEFs where required due

to proximity to potential receptors;

- Identify and assess potential visual impacts (including impacts associated with the construction, operation, decommissioning and post-closure phases of the project) for the Orange Valley SEF;
- Identify and describe potential cumulative visual impacts resulting from the Hanover Cluster and any other proposed and existing developments in the surrounding area; and
- Recommend mitigation measures to minimise impacts and/or optimise benefits associated with project.

The methodology to achieve the objectives of the ToR will be determined by the specialist based on professional experience.

7.7.8 Traffic Specialist Study

The proposed ToR for the Traffic Assessment are as follows:

- Baseline Study:
    - Obtain and review relevant background information for the study area;
    - Obtain any relevant mapping information;
    - Visit the site and identify the existing physical and operational characteristics of the roadways adjacent to the site, including the different alternative access routes;
    - Evaluate road geometry, shoulder sight distances, posted speeds and surfacing;
    - Quantitatively evaluate the existing pavement conditions;
    - Evaluate the operation of the existing road elements in terms of standard measures, such as volume / capacity ration, delay per vehicle and level-of-service;
    - Identify any current and future risks in the transportation network;
    - Evaluate the preliminary haul route;
    - Compile a baseline report; and
- Impact Assessment:
    - Identify and evaluate the construction access;
    - Evaluate abnormal load haul routes and pavement conditions of the surrounding road network;
    - Obtain necessary road network information for the peak periods;
    - Evaluate the operation of the existing road elements in terms of standard measures, such as, volume / capacity ratio, delay per vehicle and level-of-service;
    - Estimate the daily and peak hour traffic that would be generated by the development;
    - Assign the estimated site-generated traffic to the study roadways using the estimated trip distribution patterns within the site vicinity;
    - Evaluate the road network in the site vicinity in terms of the expected traffic impact;
    - Assess the cumulative traffic impact of known developments in the area;
    - Recommend mitigation measures;
    - Compile a TIA report.

The methodology to achieve the objectives of the ToR will be determined by the specialist based on

professional experience.

7.7.9 Climate Change Study

The proposed ToR for the Climate Change Assessment are as follows:

- Determine the GHG inventory of the project for project construction and operational phases with respect to direct and indirect emissions;
- Climate change impact assessment:
  - Determine a climate change baseline for the project;
  - Determine the impact of the project's GHG emissions on climate change; and
  - Identify and assess climate change impacts, including cumulative impacts of the project;
- Climate change vulnerability of the project:
  - Determine the potential impact of climate change on the project in terms of available climate data;
  - Determine the potential climate change impacts for the region in terms of project risks, the social context, project value chain and broader environmental risks; and
- Identify potential mitigation / adaptation measures.

7.8 Other Impacts

Less significant impacts (and risks) (see Section 6.2) include the following:

- Reduction in air quality due to dust emissions during the construction phase; and
- Nuisance resulting from increased noise levels during the construction phase.

These will be assessed by the EAP with input of qualified SRK specialists, where required. The evaluation of risk will draw almost entirely on other risk assessments previously undertaken for the region.

7.9 Impact Rating Methodology

The assessment of impacts will be based on specialists' expertise, SRK's professional judgement, field observations and desk-top analysis.

The **significance** of an impact is defined as a combination of the **consequence** of the impact occurring, including possible irreversibility of impacts and/or loss of irreplaceable resources, and the **probability** that the impact will occur.

The criteria used to determine impact consequence are presented in Table 7-2 below.

Table 7-2: Criteria used to determine the consequence of the impact

Rating	Definition of Rating	Score
A. *Extent* *– the area over which the impact will be experienced*		
Local	Confined to project or adjacent areas	1
Regional	Affecting the region (e.g. District Municipality or Province)	2
(Inter) national	Affecting areas beyond the Province	3
B. ***Intensity***– *the magnitude of the impact in relation to the sensitivity of the receiving environment, taking into account the degree to which the impact may cause irreplaceable loss of resources*		
Low	Site-specific and wider natural and/or social functions and processes are negligibly altered	1

Medium	Site-specific and wider natural and/or social functions and processes continue albeit in a modified way	2
High	Site-specific and wider natural and/or social functions or processes are severely altered and/or irreplaceable resources[26] are lost	3
C. ***Duration***– *the timeframe over which the impact will be reversed*		
Short-term	Up to 2 years	1
Medium-term	2 to 15 years	2
Long-term	More than 15 years or irreversible	3

The combined score of these three criteria corresponds to a **Consequence Rating**, as follows:

Table 7-3: Method used to determine the consequence score

***Combined Score* (A+B+C)**	3 – 4	5	6	7	8 – 9
Consequence Rating	Very low	Low	Medium	High	Very high

Once the consequence is derived, the probability of the impact occurring is considered, using the probability classifications presented in Table 7-4 below.

Table 7-4: Probability classification

Probability– *the likelihood of the impact occurring*	
Improbable	< 40% chance of occurring
Possible	40% - 70% chance of occurring
Probable	> 70% - 90% chance of occurring
Definite	> 90% chance of occurring

The overall **significance** of impacts is determined by considering consequence and probability using the rating system prescribed in Table 7-5 below.

Table 7-5: Impact significance ratings

		Probability			
		Improbable	Possible	Probable	Definite
Consequence	Very Low	**INSIGNIFICANT**	**INSIGNIFICANT**	**VERY LOW**	**VERY LOW**
	Low	**VERY LOW**	**VERY LOW**	**LOW**	**LOW**
	Medium	**LOW**	**LOW**	**MEDIUM**	**MEDIUM**
	High	**MEDIUM**	**MEDIUM**	**HIGH**	**HIGH**
	Very High	**HIGH**	**HIGH**	**VERY HIGH**	**VERY HIGH**

Finally the impacts are also considered in terms of their status (positive or negative impact) and the confidence in the ascribed impact significance rating. The prescribed system for considering impacts status and confidence (in assessment) is laid out in Table 7-6 below.

[26] Defined as important cultural or biological resource which occur nowhere else, and for which there are no substitutes.

Table 7-6: Impact status and confidence classification

Status of impact	
Indication whether the impact is adverse (negative) or beneficial (positive).	+ ve (positive – a 'benefit')
	– ve (negative – a 'cost')
Confidence of assessment	
The degree of confidence in predictions based on available information, SRK's judgment and/or specialist knowledge.	Low
	Medium
	High

The impact significance rating should be considered by authorities in their decision-making process based on the implications of ratings ascribed below:

- **Insignificant:** the potential impact is negligible and will not have an influence on the decision regarding the proposed activity.
- **Very Low:** the potential impact is very small and should not have any meaningful influence on the decision regarding the proposed activity.
- **Low:** the potential impact may not have any meaningful influence on the decision regarding the proposed activity.
- **Medium:** the potential impact should influence the decision regarding the proposed activity.
- **High:** the potential impact will affect the decision regarding the proposed activity.
- **Very High:** The proposed activity should only be approved under special circumstances.

Practicable mitigation and optimisation measures are recommended and impacts are rated in the prescribed way both without and with the assumed effective implementation of mitigation and optimisation measures. Mitigation and optimisation measures are either:

- **Essential**: measures that must be implemented and are non-negotiable; and
- **Best Practice:** recommended to comply with best practice, with adoption dependent on the proponent's risk profile and commitment to adhere to best practice, and which must be shown to have been considered and sound reasons provided by the proponent if not implemented.

7.10 Approach to Assessment of Cumulative Impacts

7.10.1 Introduction

Anthropogenic activities can result in numerous and complex effects on the natural and social environment. While many of these are direct and immediate, the environmental effects of individual activities (or projects) can combine (additive impact) and interact (synergistic impact) with other activities in time and space to cause incremental or aggregate effects. Effects from disparate activities may accumulate or interact to cause **additional** effects that may not be apparent when assessing the individual activities in isolation (Canadian Environmental Protection Agency, 2007). Cumulative effects can also be defined as the total impact that a series of developments, either present, past or future, will have on the environment within a specific region over a particular period of time (DEAT IEM Guideline 7, Cumulative effects assessment, 2004). The International Finance Corporation (IFC, 1998) states that environmental assessment should include consideration of *"… cumulative impacts of existing projects, the proposed project and anticipated future projects".*

The IFC's Good Practice Handbook for *Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets,* published in 2012, provides further guidance for

comprehensive stand-alone Cumulative Impact Assessment (CIA) (IFC, 2012). It places further emphasis on biodiversity and socio-economic conditions and introduces the concept of Valued Environmental and Social Components (VECs).

The IFC recommends that cumulative assessment should (a) "*be* ***commensurate with the incremental*** *contribution, source, extent, and severity of the cumulative impacts anticipated*," and (b) "*determine if the project is incrementally responsible for adversely affecting an ecosystem component or specific characteristic beyond an acceptable predetermined* ***threshold*** *(carrying capacity) …"*

For the purposes of this report, cumulative impacts are defined as 'direct and indirect impacts that act together with existing or future potential impacts of other activities or proposed activities in the area/region that affect the same resources and/or receptors'.

To define the level of cumulative impact, it is critical to look beyond the geographical boundaries and environmental impacts of a single development/project and consider the area of influence of the specific project as well as other developments currently in or proposed in the area and their understood impacts and area of influence. It may be that impacts generated by a single development are not considered to be significant, but when considered as part of a cumulative impact assessment, these require mitigation.

Key considerations for the assessment of cumulative impacts as part of the environmental impact assessment are:

- The cumulative impact assessment will need to give consideration to developments that may have contributed to cumulative effects in the past, may be contributing or are anticipated to contribute in the foreseeable future. This needs to be relevant to the timeframe within which impacts are to be experienced as a result of the project itself (i.e. all phases for which the project specific impact assessment is being undertaken). Given that the baseline environment will already be impacted on by the historical and current contributors to the cumulative impact, it is only necessary when undertaking the cumulative impact assessment to place an emphasis on an identified future cumulative baseline environment;
- Cumulative impacts may not be applicable to all aspects, as project related impacts may be confined to the project area and not subject to or contributing to impacts in the broader area of influence as a whole. For example, if the project area is confined to a water catchment which is not anticipated to be impacted on by other developments (past, present or foreseeable future) then a cumulative impact assessment need not be considered for this environmental aspect;
- A cumulative impact assessment will consider a specific area of influence which will be determined by the impact itself and the baseline environment in which it is proposed; e.g. where one or more projects affect the same ecosystem, the whole area in which the ecosystem is found may be considered the area of influence for the cumulative assessment. This will vary across project aspects and therefore a single area of influence for the cumulative impact assessment cannot be set; and
- The cumulative impact assessment can only be undertaken where information is readily available and as such will only be an initial assessment of the likely cumulative impact in terms of knowledge available at the time of the assessment. It is critical to understand the information sources and limitations that exist.

For the most part, cumulative effects or aspects thereof are too uncertain to be quantifiable, due mainly to a lack of data availability and accuracy. This is particularly true of cumulative effects arising from potential or future projects, the design or details of which may not be finalised or available and the direct and indirect impacts of which have not yet been assessed.

7.10.2 Scope of the Cumulative Assessment

For cumulative effects analysis to be a useful tool to decision makers and stakeholders, it must be limited to effects that can be meaningfully evaluated, rather than expanded to the point where the resource or receptors are no longer significantly affected or the effects are no longer of interest to stakeholders. To this end, four important aspects require consideration prior to the evaluation of cumulative effects:

- The determination of an appropriate area of influence, i.e. spatial and, to a lesser extent, temporal boundaries for evaluation of cumulative effects of the project;
- Identification of VECs;
- External natural and social stressors; and
- The evaluation of relevant projects for consideration in the cumulative effects analysis.

Each of the four aspects listed above is discussed below.

7.10.3 Area of Influence

The IFC (2012) defines the area of influence (AoI) to encompass "*cumulative impacts that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned, or reasonably defined developments at the time the risks and impact identification process is conducted.*" Consequently, the spatial and temporal boundaries for analysis of cumulative effects are dependent on a number of factors, including:

- The size and nature of the project and its potential effects;
- The size, nature and location of past and (known) future projects and activities in the area, and the significance of their adverse or beneficial environmental effects;
- Relevant ecological boundaries, including landform, vegetation, land use, habitat, soil and surface materials and climate;
- Relevant aquatic boundaries, including catchments, sub-catchments and hydrogeological discontinuities;
- The aspect of the environment impacted by the cumulative effect (boundaries selected for cumulative environmental effects on, for example, air quality might be different from those relevant to the effects on a particular species of plant or animal); and
- The period of occurrence of effects (temporal boundaries may extend beyond the timing of construction and operations) (Canadian Environmental Protection Agency, 2007).

The AoI does not include potential impacts that would occur without the project or independently of the project.

- Areas potentially impacted by the project and project facilities which are directly owned, operated, or managed by the proponent (or contractors);
- Areas potentially impacted by unplanned but predictable developments caused by the project that may occur later or at a different location
- Affected communities whose livelihoods are affected by indirect project impacts on biodiversity or ecosystems;
- Areas potentially impacted by cumulative impacts from additional planned development or other sources of similar impacts in the geographical area, any existing project or condition, and other project-related developments that can realistically be foreseen; and

- Areas and communities potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location.

The AoI has been taken as the area within 30 km radius of the project, covering ~2 830 km^2, which is sufficiently large to capture cumulative impacts on ecosystems and sufficiently small to experience cumulative impacts.

7.10.4 Identification of VECs

VECs are environmental and social attributes that are considered to be important in assessing risks; they may be: physical features, habitats, wildlife populations (e.g. biodiversity), ecosystem services, natural processes (e.g. water and nutrient cycles, microclimate), social conditions (e.g. health, economics) or cultural aspects (e.g. traditional spiritual ceremonies).

While VECs may be directly or indirectly affected by a specific development, they often are also affected by the cumulative effects of several developments. VECs are the ultimate recipient of impacts because they tend to be at the ends of ecological pathways.

VECs for this project were selected based on an understanding of the project activities, the vulnerability/sensitivity of the receiving environment; and the potential interactions between project activities and the biophysical, i.e. soil resources, freshwater and terrestrial ecology, fauna, and socioeconomic environment, i.e. social receptors (communities).

7.10.5 External Natural and Social Stressors

Natural and social stressors can also contribute to cumulative impacts. The major stressors in the area of influence are briefly discussed below.

- Veld fires, grazing and cultivation, affecting the function and composition of habitats and faunal communities;
- Droughts;
- Powerlines and other infrastructure, posing a potential risk to avifauna; and
- Existing SEFs and WEFs in De Aar and Noupoort.

7.10.6 Past, Existing and Planned Activities that may affect VECs

In addition to the project, other past, present and future activities might have caused or may cause impacts and may interact with impacts caused by the project under review.

- **Cumulative impacts of past and existing activities**: It is reasonably straightforward to identify significant past and present projects and activities that may interact with the project to produce cumulative impacts. These are taken into account in the descriptions of the biophysical and socio-economic baseline (see respective sections in Section 4).
- **Potential cumulative impacts of planned and foreseen activities:** Relevant future projects that will be included in the assessment are defined as those that are ‘reasonably foreseeable’, i.e. those that have a high probability of implementation in the foreseeable future; speculation is not sufficient reason for inclusion. Such projects may include those for which authorisations have already been granted, that are currently subject to environmental assessment processes or that have been identified in planning documents.

Projects that fall in the above categories and that may result in cumulative impacts with the proposed development and therefore have been considered in the cumulative impact analysis are listed below:

- **Past and existing projects / activities:**

Despite the project not being located in a REDZ, De Aar and Noupoort have attracted numerous renewable energy projects and have becoming nodes for renewable energy development.

- **Future projects / activities:**
    - *Future SEFs and WEFs:* Only one SEF within a 30 km radius of the project area received EAs in the past (see Section 3.2). Within ~100 km radius of the Hanover Cluster there are a total of 65 approved EAs for WEFs and / or SEFs.

7.10.7 Cumulative Impacts Analysis

The IFC (2012) defines CIA as a process of (a) analysing the potential impacts and risks of proposed developments in the context of the potential effects of other human activities and natural environmental and social external drivers on the chosen VECs over time, and (b) proposing tangible measures to avoid, reduce, or mitigate such cumulative impacts and risk to the extent possible. The key task is to ascertain how the potential impacts of a proposed development might combine, cumulatively, with the potential impacts of the other human activities and other natural stressors such as droughts or extreme climatic events.

For the most part, cumulative impacts or aspects are too uncertain to be quantifiable, mainly due to lack of (accurate) data. This is particularly true of cumulative impacts arising from potential or future projects.

8 Conclusions and Recommendations

8.1 Conclusions

In order to apply for EA for the Orange Valley SEF and associated infrastructure, an S&EIR process is being undertaken in terms of the EIA Regulations, 2014, promulgated in terms of NEMA. The Scoping Study is the first phase of this process. The objectives of the Scoping Study are to:

- Identify stakeholders and inform them of the proposed activity and the S&EIR process;
- Provide stakeholders with the opportunity to participate effectively in the process and identify any issues and concerns associated with the proposed activity;
- Identify areas of likely impact and environmental issues that will require further investigation during the Impact Assessment Phase; and
- Develop ToR for specialist studies to be undertaken.

The conclusions of the Scoping Study are as follows:

Mainstream intends to develop the 150 MW Orange Valley SEF and associated infrastructure to generate ~322 GWh of electricity per annum near Hanover, Northern Cape Province. This project will reduce the carbon intensity of South Africa's energy production. The location of the larger Hanover Cluster and proposed Orange Valley SEF is considered suitable for the development of a PV array and evacuation to the grid due to the high GHI, sufficiently large sites, suitable topography, landowner support for the project, site access and grid access.

The Orange Valley SEF will comprise the 150 MW PV array, 33 kV powerline(s) installed underground and / or overhead between the PV array and 33/132 kV on-site substation, BESS, in addition to other internal ancillary infrastructure and structures.

The proposed Orange Valley SEF is located on a vacant portion of Farm Vogelfontein 7/71 that is currently used as grazing for sheep, goats and cattle. The development envelope comprises homogenous habitats including grassland plains and drainage areas. The site is relatively flat, conducive to the development of SEF. The Brak River is directly to the north of the development area.

Various alternatives were considered during the early planning stages of the project and have been screened out and therefore will not be assessed in the EIA phase of the project.

The following key environmental issues associated with the project have been identified through the Scoping process:

- **Terrestrial and aquatic ecology** – habitat loss, disturbance and fragmentation will negatively impact on the productivity of species and species diversity;
- **Avifauna** – disturbance and habitat transformation will lead to the displacement and potentially mortality of avifauna;
- **Socio-economic** – benefits of investment in the economy and employment, income and skills;
- **Heritage and palaeontology** – loss or, or damage to, palaeontological and archaeological resources and historical structures and altered cultural landscape;
- **Visual aspects** – deterioration of sense of place and visual intrusion resulting from construction activities, proposed infrastructure and additional lighting; and
- **Traffic** – increased traffic volumes on the local road network causing potential disruption to existing road users and damage to dirt roads.

8.2 Recommendations

Based on the findings of the Scoping Study, the following specialist studies are proposed for the Impact Assessment Phase:

- Biodiversity (including terrestrial and aquatic ecology) Impact Assessment;
- Land Capability and Agricultural Potential Compliance Statement;
- Avifauna Impact Assessment;
- Socio-Economic Impact Assessment;
- Heritage Impact Assessment;
- Traffic Impact Assessment; and
- Visual Impact Assessment.

Climate change impact and resilience will also be assessed, as well as air quality and noise impacts.

8.3 Way Forward

This Scoping Report is not a final report and may be amended based on comments received from stakeholders. SRK invites stakeholders to review the report and to participate in the public consultation process. An Executive Summary of this report has been distributed to registered stakeholders and is available from SRK on request (details below).

An electronic version of the report can also be accessed on SRK's website **www.srk.co.za** (via the 'Knowledge Centre' and 'Public Documents' links).

Hard copies of the Scoping Report are available for viewing at the following venues:

- Hanover Public Library;
- Emthanjeni Local Municipality Hanover Office; and
- SRK's office in Rondebosch.

Upon request, hard copies of the Scoping Report and digital copies on USB flash drive can be posted to stakeholders at a cost.

Stakeholders can register[27] by:

- Submitting their name, contact details (specifying the preferred method of notification, e.g. e-mail), and an indication of any direct personal business, financial or other interest which they have in the application to the SRK contact below; **or**
- Filling in their details in online for by clicking on the link in the box below.

Stakeholders are invited to submit comments on the Scoping Report.

[27] By registering as a stakeholder, you consent to SRK processing and, if necessary, disclosing your personal information which SRK undertakes to do in accordance with our Protection of Personal Information Policy.

SUBMIT WRITTEN COMMENTS
AND/OR REGISTER ON THE PROJECT DATABASE
https://tinyurl.com/Hanover-SEF

Alternatively send written comments to:
Kelly Armstrong at SRK Consulting
Email: ctpp@srk.co.za

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Rondebosch, 7701, South Africa

Issues and concerns identified in the Scoping Phase will assist in focussing the EIA and will be used to refine the ToR for specialist investigations during the Impact Assessment Phase of the EIA process. Stakeholders are therefore urged to submit written comment. Once stakeholders have commented on the information presented in the Scoping Report, it will be finalised and submitted to DFFE. The public is therefore urged to submit comment. If you require assistance in compiling and submitting comments, please contact us and we will ensure that you receive appropriate support.

Comments must be submitted by **18 July 2023** to be incorporated into the Final Scoping Report.

Once stakeholders have commented on the information presented in the Scoping Report, the Final Scoping Report will be prepared and released for a second public comment period before being submitted to DFFE for approval. Stakeholders will be informed when the Final Scoping Report is submitted to the DFFE, and the Final Scoping Report, including the Issues and Response Summary will be uploaded onto SRK's website. Once a decision is taken by authorities, this decision will be communicated to registered IAPs.

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Partner

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional environmental practices.

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Appendices

Appendix A:
Curriculum Vitae of the EAPs and Signed Declarations

Appendix B:
Site Sensitivity Verification Report

Appendix C:
Coordinates of Orange Valley SEF Development Envelope

Appendix D:
Initial Stakeholder Database

Appendix E:
Site Notification and Community Posters

Appendix F:
Written Comments from Stakeholders

Note that these documents contain personal information and has such have only been included in the copy of the Scoping Report released to DFFE.

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