DFFE Reference Number: 14/12/16/3/3/2/2385

Igolide Wind (Pty) Ltd

IGOLIDE WIND ENERGY FACILITY (UP TO 100MW), NEAR FOCHVILLE, IN THE GAUTENG PROVINCE

Draft Environmental Impact Assessment Report

OCTOBER 2023

PUBLIC

Igolide Wind (Pty) Ltd

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PROJECT NO. 41104282

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Draft Environmental Impact Assessment Report

WSP

Building 1, Maxwell Office Park
Magwa Crescent West, Waterfall City
Midrand, 1685
South Africa

Phone: +27 11 254 4800

WSP.com

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GENERAL SITE INFORMATION

Technical details of the proposed Igolide Wind Energy Facility		
Location of Site	Merafong City Local Municipality in the Gauteng Province of South Africa	
Description of all affected farm portions and 21 digit SG Codes	Farm Name	21-Digit SG Code
	Portion 14 of Farm Kraalkop 147IQ	T0IQ00000000014700014
	Portion 20 of Farm Kraalkop 147IQ	T0IQ00000000014700020
	Portion RE/22 of Farm Kraalkop 147IQ	T0IQ00000000014700022
	Portion 8 of Farm Leeuwpoort 356IQ	T0IQ00000000035600008
	Portion 57 of Farm Leeuwpoort 356IQ	T0IQ00000000035600057
	Portion 65 of Farm Leeuwpoort 356IQ	T0IQ00000000035600065
	Portion 66 of Farm Leeuwpoort 356IQ	T0IQ00000000035600066
Central coordinates of the site and activity location	26°27'2.44"S / 27°30'58.82"E	
Total Site extent	680ha	
Project Footprint (Buildable area)	64ha (including linear infrastructure, i.e., roads)	
Design Specifications		
Capacity:	Up to 100MW	
No. of turbines:	Up to 10	
Turbine hub height:	Up to 200m	
Rotor Diameter:	Up to 200m	
Tip Height :	Up to 300m	
Foundation:	Approximately 25m diameter x 3m deep. Excavation approximately 2 200m^3, in sandy soils due to access requirements and safe slope stability requirements.	
Turbine Hardstand:	Hardstand does not require concrete. Area required will be approximately 1ha per turbine.	
Tower Type	Steel or concrete towers can be utilised at the site. Alternatively, the towers can be of a hybrid nature, comprising concrete towers and top steel sections.	
On-site IPP substation and battery energy storage system (BESS):	The total footprint for the on-site substation, including the BESS, will be up to 2.5ha in extent.	

Technical details of the proposed Igolide Wind Energy Facility

	The on-site IPP portion substation will consist of a high voltage substation yard to allow for multiple 132kV feeder bays and transformers, control building, telecommunication infrastructure, and other substation components, as required. A 500m buffer around the on-site IPP substation has been assessed to ensure flexibility in routing the powerline. The BESS storage capacity will be up to 400 megawatt-hour (MWh) . It is proposed that Lithium Battery Technologies, such as Lithium Iron Phosphate, Lithium Nickel Manganese Cobalt oxides or Vanadium Redox flow technologies will be considered as the preferred battery technology; however, the specific technology will only be determined following Engineering, Procurement, and Construction ("EPC") procurement. The main components of the BESS include the batteries, power conversion system and transformer which will all be stored in various rows of containers. The BESS components will arrive on site pre-assembled.
Grid (to form part of a separate application for EA)	A single or double circuit 132kV overhead powerline and 132kV switching station (adjacent to the on-site IPP substation) to feed the electricity generated by the proposed WEF into the national grid. A corridor of up to 250m in width (125m on either side of the centre line) has been identified for the placement of the 132kV single or double circuit power line to allow flexibility in the design of the final powerline route, and for the avoidance of sensitive environmental features (where possible).
Cables:	The medium voltage collector system will comprise cables up to and including 33kV that run underground, except where a technical assessment suggests that overhead lines are required, connecting the turbines to the on-site IPP.
Operations and Maintenance (O&M) building footprint:	Operations and Maintenance ("O&M") building footprint to be located near the on-site substation. Typical areas include: ▪ Operations building of 200m^2 ▪ Workshop and stores area of ~300m^2 ▪ Refuse area for temporary waste storage and conservancy tanks to service ablution facility. The total combined area of the buildings will not exceed 5 000m^2.
Construction camps:	The construction camp will house the contractor offices, ablution facilities, mess area, etc., and will have a footprint of approximately 1ha. The construction camp will be demolished after commercial operations date and the area rehabilitated.
Temporary laydown or staging areas:	The laydown area will be used for the storage of equipment or components that will be incorporated into the facility (such as electrical cables) as well as non-facility related equipment and components such as shipping frames, concrete shuttering, etc. The laydown area will also be used for the storage (and filling of vehicles) of diesel fuel. The laydown area will have a footprint of approximately 2ha, however, this could increase to 3ha for concrete towers (should they be required). The laydown area will be demolished after commercial operations date and the area rehabilitated
Cement Batching Plant (temporary):	The cement batching plant will be used to mix and blend cement, water, sand and aggregates to form quality concrete to be used for foundations. The cement batching plant will have a footprint of approximately 1ha.
Access and Internal Roads:	Access and internal roads will be approximately 8 - 10m in width, increasing up to 20m for turning circle/bypass areas to allow for larger component transport. The access and internal roads will be placed within a corridor of up to 20m width to accommodate cable trenches, stormwater channels and turning circle/bypass areas of up to 20m.

Technical details of the proposed Igolide Wind Energy Facility	
	Existing access roads will be used to minimise impact. Where required, the width of the existing roads will be widened to ensure the passage of vehicles.
Supporting Infrastructure:	▪ Fencing; ▪ Lighting; ▪ Lightning protection; ▪ Telecommunication infrastructure; ▪ Stormwater channels; ▪ Water pipelines; ▪ Offices; ▪ Operational control centre; ▪ Operations and maintenance area / warehouse / workshop; ▪ Ablution facilities; ▪ Gatehouse; ▪ Security building; ▪ Visitor's centre; and ▪ Substation building.

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EMPR

GLOSSARY

Abbreviation	Definition
AC	Alternating current
AEL	Atmospheric Emissions License
AIS	Alien and Invasive Species
ATNS	Air Traffic and Navigation Services
BESS	Battery Energy Storage System
BMS	Battery Management System
CA	Competent authority
CAA	Civil Aviation Authority
CARA	Conservation of Agricultural Resources Act (No. 43 of 1983)
CBA	Critical Biodiversity Area
CHSSP	Community Health, Safety and Security Plan
CCIA	Climate Change Impact Assessment
CSP	Concentrated Solar Power
DALRRD	Department of Agriculture Land Reform and Rural Development
DC	Direct current
DFFE	Department of Forestry, Fisheries and Environment
DMRE	Department of Mineral Resources and Energy
DR	District roads
DSR	Draft Scoping Report
DWS	Department of Water & Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECA	Environmental Conservation Act 73 of 1989
ECO	Environmental Control Officer

Abbreviation	Definition
EHS	Environmental Health and Safety
EI&ES	Ecological Importance and Ecological Sensitivity
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EP	Equator Principles
EPFI	Equator Principles Financial Institutions
ERA	Electricity Regulation Act (No. 4 of 2006)
ESA	Ecological Support Area
FI	Financial institutions
GA	General Authorisation
GHG	Greenhouse gas
GIIP	Good international industry practice
GNR	Government Notice Regulation
GSDM	Gert Sibande District Municipality
ha	Hectares
HIA	Heritage Impact Assessment
IBA	Important Bird & Biodiversity Area
ICAO	International Civil Aviation Organisation
IEP	National Integrated Energy Plan
IFC	International Finance Corporation
IRP	Integrated Resource Plan
LLM	Lekwa Local Municipality
LUPA	Land Use Planning Act (Act 3 of 2014)
MW	Megawatt
MCLM	Merafong City Local Municipality
NDP	National Development Plan
NEMA	National Environmental Management Act (Act 107 of 1998)

Abbreviation	Definition
NEMAQA	National Environmental Management: Air Quality Act 39 of 2004
NEMBA	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
NEMPAA	National Environmental Management Protected Areas Act (No. 57 of 2003)
NHRA	National Heritage Resource Act (Act No. 25 of 1999)
NID	Notification of Intent to Develop
NPAES	National Protected Area Expansion Strategy 2010
NR	National Routes
NWA	National Water Act, 1998 (Act No. 36 of 1998)
O&M	Operational and maintenance
OHSA	Occupational Health and Safety Act (No. 85 of 1993)
PCS	Power Conditioning System
PICC	Presidential Infrastructure Coordinating Commission
PPP	Public Participation Process
PS	Performance Standards
PV	Photovoltaic
REC	Recommended ecological condition
REDZ	Renewable Energy Development Zones
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
RFI	Radio Frequency Interference
S&EIA	Scoping and EIA
SABS	South African Bureau of Standards
SACAA	South African Civil Aviation Authority
SAHRA	South African Heritage Resources Agency
SAHRA	South African Heritage Resources Agency
SALA	Subdivision of Agricultural Land Act
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency

Abbreviation	Definition
SANS	South African National Standards
SARPs	Standards and Recommended Practices
SAWS	South African Weather Service
SDF	Spatial Development Frameworks
SDG	Sustainable Development Goals
SEF	Solar Energy Facilitates
SEP	Stakeholder Engagement Plan
SER	Stakeholder Engagement Report
SG	Surveyor General
SKA	Square Kilometre Array
TOPs	Threatened or Protected Species
UNDP	United Nations' Development Programmes
WBG	World Bank Group
WSP	WSP Group Africa (Pty) Ltd
WUA	Water Use Authorisation
WUL	Water Use License

1 INTRODUCTION

WSP Group Africa (Pty) Ltd (WSP) has been appointed by Igolide Wind (Pty) Ltd (Igolide) (a private special purpose company to be incorporated), to undertake an Environmental Impact Assessment (EIA) to meet the requirements under the National Environmental Management Act (Act 107 of 1998) (NEMA), for the proposed Igolide Wind Energy Facility (WEF) and its associated infrastructure, including an on-site Independent Power Producer (IPP) substation, located northeast of Fochville in the Merafong West Local Municipality (MLM) in the Gauteng Province (**Figure 1-1**).

The proposed development is subject to a Scoping and EIA (S&EIA) Process in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA) (as amended) and Appendix 2 and 3 of the EIA Regulations, 2014 promulgated in Government Gazette 40772 and GN R326, R327, R325 and R324 on 7 April 2017. The competent authority for this S&EIA Process is the national Department of Forestry, Fisheries and Environment (DFFE).

1.1 PURPOSE OF THIS REPORT

The Scoping and EIA (S&EIA) process is an interdisciplinary procedure to ensure that environmental and social considerations are included in decisions regarding projects. Simply defined, the process aims to identify the possible environmental and social effects of a proposed activity and how those impacts can be mitigated.

This environmental impact report (EIR) aims to provide stakeholders with information on the proposed development including location, layout and technological alternatives, the scope of the environmental assessment and key impacts identified in the environmental assessment, and the consultation process undertaken through the EIA process.

1.2 BACKGROUND INFORMATION

Igolide Wind (Pty) Ltd, proposes to establish the up to 100MW Igolide Wind Energy Facility (WEF) (hereafter the ‘Project’), and associated infrastructure, including an on-site IPP substation, near Fochville in Gauteng. The proposed WEF triggers a Scoping and Environmental Impact Reporting (S&EIR) process in terms of Sections 24 and 24D of the National Environmental Management Act (NEMA) (No. 107 of 1998), as read with GNR 983, GNR 984 and GNR 985 (as amended). The extent of the Project footprint will be approximately 64 hectares (ha), including linear infrastructure, i.e., roads).

The proposed project will comprise the following key components (**Table 1-1**):

Table 1-1 - Proposed key components of the project

golide WEF	Description
Capacity:	Up to 100MW
Total Site extent	680ha
Project Footprint (Buildable area)	64ha (including linear infrastructure, i.e., roads)
No. of turbines:	10

golide WEF	Description
Turbine hub height:	Up to 200m
Rotor Diameter:	Up to 200m
Tip Height :	Up to 300m
Foundation:	Approximately 25m diameter x 3m deep. Volume to be excavated will be approximately 2 200m^3, in sandy soils due to access requirements and safe slope stability requirements.
Turbine Hardstand:	Hardstand does not require concrete. Area required will be approximately 1 ha per turbine.
Tower Type	Steel or concrete towers can be utilised at the site. Alternatively, the towers can be of a hybrid nature, comprising concrete towers and top steel sections.
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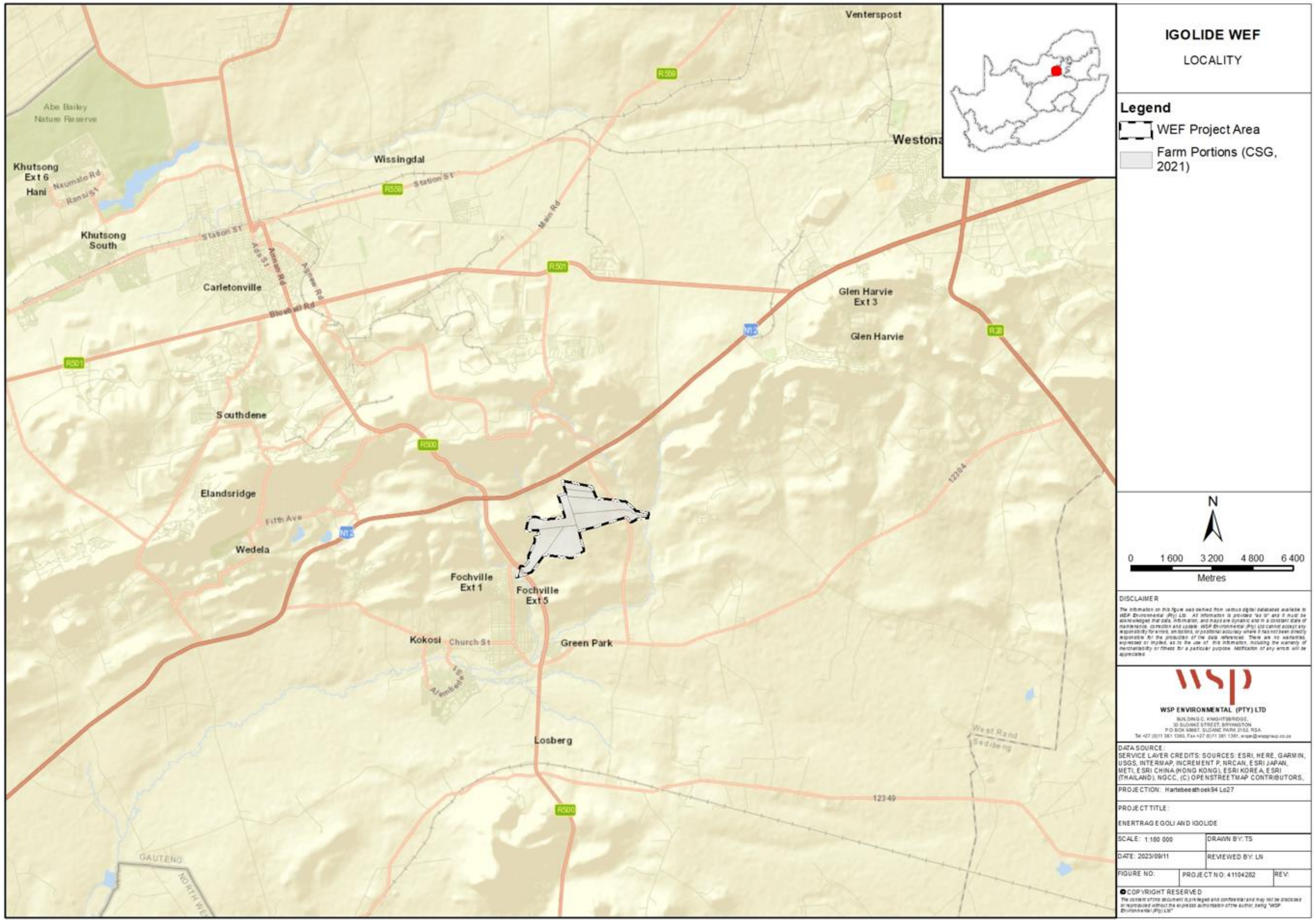


Figure 1-1 – Regional locality map of the project

1.3 DETAILS OF KEY ROLE PLAYERS

1.3.1 PROJECT PROPONENT

Igolide Wind (Pty) Ltd is the project proponent (Applicant) with regards to this application for the construction and operation of the Igolide WEF. **Table 1-2** provides the relevant details of the project proponent.

Table 1-2 – Details of Project Proponent

Proponent:	Igolide Wind (Pty) Ltd
Contact Person:	Mercia Grimbeek/Mmakoena Mmola
Postal Address	Suite 104, Albion Springs, 183 Main Road, Rondebosch, Cape Town, South Africa 7700
Telephone:	071 752 8033
Email:	Mercia.Grimbeek@enertrag.com / mmakoena.mmola@enertrag.com

1.3.2 COMPETENT AUTHORITY

Section 24C(2)(a) of NEMA stipulates that the Minister of Forestry, Fisheries and the Environment ("the Minister") must be identified as the competent authority if the activity has implications for international environmental commitments or relations. GN 779 of 01 July 2016 identifies the Minister as the CA for the consideration and processing of environmental authorisations and amendments thereto for activities related to the Integrated Resource Plan (IRP) 2010 – 2030.

As the proposed project is related to the IRP, DFFE is the CA for the proposed Project. **Table 1-3** provides the relevant details of the competent authority on the Project.

Table 1-3 – Competent Authority

Aspect	Competent Authority	Contact Details
Competent Authority: Environmental Authorisation	Department of Forestry, Fisheries, and the Environment (DFFE)	Case Officer: Lunga Dlova Integrated Environmental Authorisations Email: LDlova@dffe.gov.za Tel: 012 399 8524

1.3.3 COMMENTING AUTHORITY

The commenting authorities for the project include:

- Gauteng Department of Agriculture and Rural Development (GDARD);
- DFFE: Biodiversity and Conservation;
- DFFE: Protected Areas;
- Department of Water and Sanitation (DWS);
- Department of Mineral Resources and Energy (DMRE);
- Department of Agriculture, Land Reform and Rural Development (DALRRD);

- Department of Public Works;
- Department of Defence;
- National Department of Transport;
- South African National Roads Agency Limited (SANRAL);
- South African Heritage Resources Agency (SAHRA);
- South African Civil Aviation Authority (CAA);
- Air Traffic and Navigation Services (ATNS);
- Square Kilometre Array (SKA);
- South African Weather Service (SAWS);
- The Provincial Heritage Resources Authority: Gauteng
- Merafong City Local Municipality;
- West Rand District Municipality;
- BirdLife South Africa;
- Endangered Wildlife Trust; and
- South African National Parks.

Refer to the Stakeholder Engagement Report (SER) Report in **Appendix D** for a full list of commenting authorities.

1.3.4 ENVIRONMENTAL ASSESSMENT PRACTITIONER

WSP was appointed in the role of Independent EAP to undertake the S&EIA process for the proposed Project. The CV of the EAP is available in **Appendix A**. The EAP declaration of interest and undertaking is included in **Appendix B**. **Table 1-4** details the relevant contact details of the EAP.

Table 1-4 – Details of the EAP

EAP:	WSP Group Africa (Pty) Ltd
Contact Person:	Ashlea Strong
Physical Address:	Building C, Knightsbridge, 33 Sloane Street, Bryanston, Johannesburg
Postal Address:	P.O. Box 98867, Sloane Park 2151, Johannesburg
Telephone:	011 361 1392
Fax:	011 361 1301
Email:	Ashlea.Strong@wsp.com
EAP Qualifications:	- Masters in Environmental Management, University of the Free State - B Tech, Nature Conservation, Technikon SA - National Diploma in Nature Conservation, Technikon SA
EAPASA Registration Number:	EAPASA (2019/1005)

Statement of Independence

Neither WSP 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 business, financial, personal or other interest that could be reasonably regarded as being capable of affecting their independence. WSP has no beneficial interest in the outcome of the Assessment.

1.3.5 SPECIALISTS

Specialist input was required in support of this application for EA. The details of the specialists are provided in **Table 1-5** below. The specialist studies are attached in **Appendix H** and their declarations in **Appendix C**.

Table 1-5 – Details of Specialists

Assessment	Name of Specialist	Company	Specialist Report attached as
Terrestrial Biodiversity Compliance Statement	Dr Noel van Rooyen and Prof. Gretel van Rooyen	Ekotrust CC	**Appendix H.1**
Agricultural Compliance Statement	Johann Lanz	Independent consultant	**Appendix H.2**
Avifauna Impact Assessment	Albert Froneman and Megan Loftie-Eaton	AfriAvian Environmental (Formerly Chris van Rooyen Consulting)	**Appendix H.4**
Aquatic Biodiversity Impact Assessment	Lufuno Nemakhavhani	WSP Group Africa (Pty) Ltd	**Appendix H.3**
Geotechnical Assessment	Heather Davis	WSP Group Africa (Pty) Ltd	**Appendix H.10**
Archaeological and Cultural Heritage Impact Assessment	Dr Jayson Orton	ASHA Consulting (Pty) Ltd	**Appendix H.6**
Palaeontological Impact Assessment	Prof. Marion Bamford	ASHA Consulting (Pty) Ltd	**Appendix H.14**
Noise Assessment	M. de Jager	Enviro-Acoustic Researchcc	**Appendix H.16**
Social Impact Assessment	Tony Barbour	Tony Barbour Environmental Consulting	**Appendix H.9**
Risk Assessment	Debra Mitchell	ISHECON cc	**Appendix H.11**
Traffic Assessment	A. Johnson	JG Afrika (Pty) Ltd	**Appendix H.7**
Visual Impact Assessment (including Flicker)	Kerry Schwartz	SLR Consulting (Pty) Ltd	**Appendix H.8**
Bat Impact Assessment	Werner Marais	Animalia Consultants	**Appendix H.5**

Assessment	Name of Specialist	Company	Specialist Report attached as
Plant Species	Alpheus Moalosi	WSP Group Africa (Pty) Ltd	**Appendix H.12**
Animal Species	Alpheus Moalosi	WSP Group Africa (Pty) Ltd	**Appendix H.13**

1.4 IMPACT ASSESSMENT TERMS OF REFERENCE

The 2014 EIA Regulations (GNR 982), as amended, identifies the proposed Igolide WEF development as an activity being subject to an S&EIR process due to the applicability of the EIA Listing Notices 1, 2 and 3 (GNR 983, 984 and 985, as amended). For the project to proceed, it will require an Environmental Authorisation (EA) from the DFFE.

WSP has been appointed as the independent EAP to carry out the S&EIR process in accordance with the EIA Regulations, 2014, as amended in 2017.

The Scoping Process has been completed and involved consultation with interested and affected parties and the drafting of the Plan of Study (PoS) for EIA, which culminated in the submission of a Final Scoping Report (FSR) to the DFFE. The DFFE acceptance of the FSR and authorisation to proceed with the EIR was received on 18 September 2023 (**Appendix G**). The final EIR is due to the DFFE on 22 January 2024.

This draft EIAR will be made available for public comment from **27 October 2023** to **27 November 2023.**

As defined in Appendix 3 of GNR 982, as amended, the objective of the impact assessment process is to, through a consultative process:

- Determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;
- Describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
- Identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;
- Determine the—
  - Nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and
- Degree to which these impacts-
  - Can be reversed;
  - May cause irreplaceable loss of resources, and
  - Can be avoided, managed or mitigated;
- Identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;

- Identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;
- Identify suitable measures to avoid, manage or mitigate identified impacts; and
- Identify residual risks that need to be managed and monitored.

Public participation is a requirement of the S&EIR process; it consists of a series of inclusive and culturally appropriate interactions aimed at providing stakeholders with opportunities to express their views, so that these can be considered and incorporated into the S&EIR decision-making process. Effective public participation requires the prior disclosure of relevant and adequate project information to enable stakeholders to understand the risks, impacts, and opportunities of the proposed Project. The objectives of the public participation process can be summarised as follows:

- Identify relevant individuals, organisations and communities who may be interested in or affected by the Proposed Project;
- Clearly outline the scope of the Proposed Project, including the scale and nature of the existing and proposed activities;
- Identify viable Proposed Project alternatives that will assist the relevant authorities in making an informed decision;
- Identify shortcomings and gaps in existing information;
- Identify key concerns, raised by Stakeholders that should be addressed in the subsequent specialist studies;
- Highlight the potential for environmental impacts, whether positive or negative; and
- To inform and provide the public with information and an understanding of the Proposed Project, issues and solutions.

1.5 OBJECTIVES OF THE S&EIA PROCESS AS PER THE PROCEDURAL FRAMEWORK

The S&EIR process consists of various phases with associated timelines as defined in GNR 982. The process can generally be divided into four main phases, namely, (i) a Pre-application Phase, (ii) an Application and Scoping Phase, (iii) an Impact Assessment Phase (**current phase**) and (iv) Authorisation and Appeal Phase.

The main objectives of the phases can be described as follows:

- Pre-Application Phase (**Completed**):
  - Undertake consultation meetings with the relevant authorities to confirm the required process, the general approach to be undertaken and to agree on the public participation plan;
  - Identify stakeholders, including neighbouring landowners/residents and relevant authorities;
- Application and Scoping Phase (**Completed**):
  - Compile and submit application form to the CA and pay the relevant application fee;
  - Compile a DSR 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 draft terms of reference for the specialist studies to be undertaken in the Impact Assessment Phase; and

- Inform stakeholders of the proposed project, feasible alternatives and the S&EIR process and afford them the opportunity to register and participate in the process and identify any issues and concerns associated with the proposed project.
- Incorporate comments received from stakeholders during the DSR comment period;
- Should significant amendments be required, release the updated DSR for an additional 30-day comment period to provide stakeholders with the opportunity to review the amendments as well as provide additional input if required; and
- Submit the FSR, following the consultation period, to the relevant authorities, in this case the DFFE, for acceptance/rejection.

- Impact Assessment Phase (**Current**):

  - Continue to inform and obtain contributions from stakeholders, including relevant authorities, stakeholders, and the public and address their relevant issues and concerns;
  - Assess in detail the potential environmental and socio-economic impacts of the project as defined in the DSR;
  - Identify environmental and social mitigation measures to avoid and/or address the identified impacts;
  - Develop and/or amend environmental and social management plans based on the mitigation measures developed in the Environmental Impact Assessment Report (EIAR);
  - Submit the EIAR and the associated EMPr to the CA to undertake the decision-making process;
  - The DFEE to provide written notification of the decision to either grant or refuse EA for the proposed project; and
  - Notify all registered stakeholders of the decision and right to appeal.

- Authorisation and Appeal Phase;

  - The DFEE to provide written notification of the decision to either grant or refuse EA for the proposed project; and
  - Notify all registered stakeholders of the decision and right to appeal.

1.6 IMPACT ASSESSMENT REPORT STRUCTURE

Table 1-6 cross-references the sections where the legislated requirements as per Appendix 3 of GNR 982 of 2014 can been located within the EIR.

Table 1-6 – Legislated Report Requirements as detailed in GNR 982

Appendix 3	Legislated requirements as per the NEMA GNR 982	Relevant Report Section
(a)	Details of	
	the EAP who compiled the report; and	Section 1.3.4 **Appendix A**
	the expertise of the EAP, including a Curriculum Vitae	**Appendix A**
(b)	The location of the activity, including-	
	The 21-digit Surveyor code for each cadastral land parcel;	Section 4.1
	Where available, the physical address and farm name	Section 4.1

Appendix 3	Legislated requirements as per the NEMA GNR 982	Relevant Report Section
	Where the required information in terms of (i) and (ii) is not available, the coordinates of the boundary of the property.	N/A
(c)	A plan which locates the proposed activities applied for at an appropriate scale, or, if it is-	
	A linear activity, a description of the corridor in which the proposed activity or activities is to be undertaken; or	N/A
	On land where the property has not been defined, the coordinates within which the activity is to be undertaken.	N/A
(d)	A description of the proposed activity, including-	
	All listed and specified activities triggered and being applied for;	Section 4.3
	A description of the associated structures and infrastructure related to the development;	Section 4.3
(e)	A description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;	Section 6
(f)	A motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;	Section 4.5
(h)	A full description of the process followed to reach the proposed development footprint within the approved site, including-	
	Details of the development footprint alternatives considered;	Section 5
	Details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	Section 3.5 **Appendix D**
	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;	**Appendix D**
	The environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 7
	The impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated.	Section 9
	The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;	Section 3.4
	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;	Section 9

Appendix 3	Legislated requirements as per the NEMA GNR 982	Relevant Report Section
	The possible mitigation measures that could be applied and level of residual risk;	Section 9
	If no alternative development locations for the activity were investigated, the motivation for not considering such; and	Section 5
	A concluding statement indicating the preferred alternative development location within the approved site.	Section 5
(i)	A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred location through the life of the activity, including-	
	A description of all environmental issues and risks that were identified during the environmental impact assessment process; and;	Section 9
	An assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.	Section 9
(j)	An assessment of each identified potentially significant impact and risk, including-	
	Cumulative impacts;	Section 10
	The nature, significance and consequences of the impact and risk;	Section 8
	The extent and duration of the impact and risk;	Section 9
	The probability of the impact and risk occurring;	Section 9
	The degree to which the impact and risk can be reversed;	Section 9
	The degree to which the impact and risk may cause irreplaceable loss of resources; and	Section 9
	The degree to which the impact and risk can be mitigated.	Section 9
(k)	Where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report.	Section 11.2
(l)	An environmental impact statement which contains-	
	A summary of the key findings of the environmental impact assessment:	Section 11
	A map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and	Section 11.4
	A summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.	Section 11
(m)	Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation.	Section 11

Appendix 3	Legislated requirements as per the NEMA GNR 982	Relevant Report Section
(n)	The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment.	Section 5
(o)	Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	Section 11.3
(p)	A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed.	Section 3.6
(q)	A reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation.	Section 11.3
(r)	Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised.	N/A
(s)	An undertaking under oath or affirmation by the EAP in relation to-	
	The correctness of the information provided in the report;	**Appendix B**
	The inclusion of comments and inputs from stakeholders and I&APs;	**Appendix B**
	The inclusion of inputs and recommendations from the specialist reports where relevant; and	**Appendix B**
	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.	**Appendix B**
(t)	where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts	N/A
(u)	An indication of any deviation from the approved scoping report, including the plan of study, including-	N/A
	any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and	N/A
	a motivation for the deviation	N/A
(v)	Any specific information required by the competent authority; and	N/A
(w)	Any other matter required in terms of section 24(4)(a) and (b) of the Act	N/A

2 SCOPING PHASE SUMMARY

2.1 PROCEDURAL PROCESS

The application form was compiled and submitted to the DFFE on **23 June 2023** with the (Draft Scoping Report) DSR. The application form was acknowledged on **27 June 2023**.

The DFFE reference number allocated to this application is 14/12/16/3/3/2/2385. This reference number will appear on all official correspondence with the authorities and the public regarding the Proposed Project. A copy of the acknowledgement of receipt of the application is included in the SER (**Appendix D**).

The DSR was released for public review between **27 June 2023 to 26 July 2023**. Subsequently the scoping report was finalised and submitted to the DFFE on **07 August 2023** for their review and approval. The submission of the final scoping report was within 44 days of receipt of the application by the DFFE as required by GNR 982.

The approval of the FSR and the PoS for the EIA was received on **18 September 2023** and is included in **Appendix G.**

2.2 AUTHORITY CONSULTATION

The pre-application meeting was requested with DFFE on **2 May 2023**. The DFFE responded on **4 May 2023** and confirmed that a pre-application meeting was not needed for the project (proof of pre-app request form and email correspondence included in the SER in **Appendix D)**. In addition, WSP notified a number of commenting authorities of the Proposed Project via a notification letter, these included:

- Gauteng Department of Agriculture and Rural Development (GDARD);
- DFFE: Biodiversity and Conservation;
- DFFE: Protected Areas;
- Department of Water and Sanitation (DWS);
- Department of Mineral Resources and Energy (DMRE);
- Department of Agriculture, Land Reform and Rural Development (DALRRD);
- Department of Public Works;
- Department of Defence;
- National Department of Transport;
- South African National Roads Agency Limited (SANRAL);
- South African Heritage Resources Agency (SAHRA);
- South African Civil Aviation Authority (CAA);
- Air Traffic and Navigation Services (ATNS);
- Square Kilometre Array (SKA);
- South African Weather Service (SAWS);
- The Provincial Heritage Resources Authority: Gauteng
- Merafong City Local Municipality;
- West Rand District Municipality;
- BirdLife South Africa;
- Endangered Wildlife Trust; and
- South African National Parks.

WSP received comments on the DSR from the DFFE on **14 July 2023**, and approval on the FSR on **18 September 2023**. The comments and responses are included in Section 3 of the SER (**Appendix D**).

2.3 STAKEHOLDER CONSULTATION

Stakeholders were identified and will continue to be identified through several mechanisms. These include:

- Utilising existing databases from other projects in the area;
- Networking with local business owners, non-governmental agencies, community based organisations, and local council representatives;
- Field work in and around the project area;
- Advertising in the press;
- Placement of community notices;
- Completed comment sheets; and
- Attendance registers at meetings.

All Stakeholders identified to date have been registered on the project stakeholder database. The EAP endeavoured to ensure that individuals/organisations from referrals and networking were notified of the Proposed Project. Stakeholders were identified at the horizontal (geographical) and vertical extent (organisations level).

A list of stakeholders captured in the project database is included in Appendix A of the SER (**Appendix D**).

2.3.1 STAKEHOLDER NOTIFICATION

2.3.1.1 Direct Notification

Notification of the proposed Project was issued to potential and existing Stakeholders, via direct correspondence (i.e., site notices, emails, SMSs, etc.) on **26 June 2023**. Proof of notification is included in the SER (**Appendix D**).

2.3.1.2 Newspaper Advertisements

In accordance with the requirements of GNR 982, as amended, the proposed Project was advertised in one local newspaper. The purpose of the advertisement was to notify the public about the proposed Project and to invite them to register as stakeholders. A copy of the advertisements and proof of placement has been included in SER (**Appendix D**). The advertisement publication details are provided in **Table 2-1**.

Table 2-1 – Dates on which the adverts were published

Newspaper	Distribution Area	Language	Publication Date
Carletonville/Fochville Herald	22 June 2023	English, Afrikaans and Sesotho	Carletonville/Fochville Herald

2.3.1.3 Site Notices

The official site notices were erected as per GNR 982, as amended, on the boundary fence of the proposed site. In addition, general project notices, announcing the proposed Project and inviting stakeholders to register, were placed at various locations in and around the Project area on **26 June 2023**. Proof of placement is included in the SER (**Appendix D**).

2.3.1.4 Availability of the Draft Scoping Report

The Draft Scoping Report was made available for public review for a period of at least 30 days from **26 June 2023 to 27 July 2023** at the venues as follows:

- Fochville Public Library;
- Kokosi Public Library;
- Carletonville Public Library; and
- WSP website (https://www.wsp.com/en-ZA/services/public-documents).
- Datafree Website (https://wsp-engage.com/)

The Draft Report was also be made available to Commenting Authorities via a One Drive link. In order to ensure maximum participation of all I&APs, reports were shared on the Datafree website.

Proof of placement of the Draft Report is provided in the SER.

2.3.1.5 Availability of the Final Scoping Report

The FSR was submitted to the DFFE on 07 August 2023 for review and decision-making. Registered I&APs were notified of the submission on 08 August 2023 and the FSR was made available for their information on the WSP website (https://www.wsp.com/en-ZA/services/public-documents).

2.4 SUMMARY OF IMPACT SIGNIFICANCE SCREENING

This section provides an overview of the likely significance of various impacts during the construction phase (**Table 2-2**), operational phase (**Table 2-3**) and decommissioning phase (**Table 2-4**) as documented in the FSR, in the form of an impact screening tool which was based on two criteria, namely, probability and consequence (outlined in **Section 3.4**). This tool was used to determine whether any additional assessment may be required in the EIA phase. Impacts were refined (where applicable) and assessed during the EIA phase.

Table 2-2 – Significance of potential construction phase impacts

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
Soil, Landuse and Land Capability	Soil and land capability	Negative	4	3	High
	Soil Contamination	Negative	3	2	Medium
	Soil Compaction	Negative	3	2	Medium
	Soil Erosion	Negative	2	2	Low
Plant Species	Floral Habitat and Diversity	Negative	4	3	High
	Floral SCC	Negative	3	2	Medium
Animal Species	Faunal Habitat and Diversity	Negative	4	3	High

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
	Faunal SCC	Negative	3	3	Medium
Aquatic Biodiversity – Northern CVB Wetland	Loss of wetland habitat and ecological structure	Negative	4	4	High
	Changes to sociocultural and service provision	Negative	4	4	High
	Impacts on hydrology and sediment balance	Negative	4	4	High
	Impacts on water quality	Negative	4	4	High
Aquatic Biodiversity – Depression Wetland	Loss of wetland habitat and ecological structure	Negative	4	4	High
	Changes to sociocultural and service provision	Negative	4	4	High
	Impacts on hydrology and sediment balance	Negative	4	4	High
	Impacts on water quality	Negative	4	4	High
Aquatic Biodiversity – Eastern CVB Wetland	Loss of wetland habitat and ecological structure	Negative	2	3	Medium
	Changes to sociocultural and service provision	Negative	2	2	Low
	Impacts on hydrology and sediment balance	Negative	2	3	Medium
	Impacts on water quality	Negative	2	3	Medium
Avifauna	Displacement of priority species due to disturbance	Negative	4	2	Medium
	Displacement of priority species due to habitat transformation	Negative	4	3	High
Bats	Habitat destruction	Negative	1	3	Low
Archaeology	Impacts of the proposed development to archaeological resources (WP002 and WP003)	Negative	1	4	Medium
Palaeontology	Impact to Fossil Resources	Negative	1	3	Low

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
Transport	Temporary increase in traffic, noise and dust pollution associated with potential traffic.	Negative	2	3	Medium
Visual	Visual impact to surrounding area	Negative	4	2	Medium
Social	Creation of employment and business opportunities	Positive	2	3	Medium
	Presence of construction workers and potential impacts on family structures and social networks	Negative	2	2	Low
	Influx of job seekers	Negative	2	2	Low
	Safety risk, stock theft and damage to farm infrastructure associated with presence of construction workers	Negative	3	2	Medium
	Increased risk of grass fires	Negative	3	2	Medium
	Impact of heavy vehicles and construction activities	Negative	3	2	Medium
	Loss of farmland	Negative	3	2	Medium
Geotechnical	Soil erosion	Negative	2	2	Low
	Disturbance of fauna and flora	Negative	3	2	Medium
	Oil spillages from heavy plant	Negative	2	2	Low
	Slope stability	Negative	1	1	Very Low
	Seismic activity	Negative	1	2	Very Low
Risk	Impact on Human Health chronic exposure to toxic chemical or biological agents	Negative	3	2	Medium
	Impact on human and equipment safety - exposure to explosion over pressures	Negative	3	2	Medium

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
	human and equipment safety – exposure to fire radiation	Negative	3	2	Medium
	Impact on human and equipment safety - exposure to acute toxic chemical and biological agents for SSL BESS	Negative	3	2	Medium

Table 2-3 – Significance of potential operational phase impacts

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
Avifauna	Mortality of priority species due to collisions	Negative	3	1	Low
	Entrapment of large-bodied birds in the perimeter fence lines of WEF facilities	Negative	3	2	Medium
	Mortality of priority species due to electrocution	Negative	3	2	Medium
	Mortality of priority species due to collisions with reticulation networks	Negative	3	2	Medium
Transport	Noise and dust pollution associated potential traffic.	Negative	1	3	Low
Visual	Visual impact to surrounding area	Negative	4	2	Medium
Social	Generate renewable energy	Positive	3	4	High
	Creation of employment and business opportunities	Positive	1	4	Medium
	Benefit associated with community trust	Positive	2	3	Medium
	Benefits for landowners	Positive	1	4	Medium
	Visual impact and impact on sense of place	Negative	1	3	Low
	Impact on property values	Negative	1	3	Low

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
	Impact on tourism	Negative	1	3	Low
Risk	Impact on Human Health chronic exposure to toxic chemical or biological agents	Negative	3	2	Medium
	Impact on human and equipment safety - exposure to explosion over pressures	Negative	3	2	Medium
	human and equipment safety – exposure to fire radiation	Negative	3	2	Medium
	Impact on human and equipment safety - exposure to acute toxic chemical and biological agents for SSL BESS	Negative	3	2	Medium

Table 2-4 – Significance of potential decommissioning phase impacts

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
Agricultural Potential	Occupation of land	Negative	2	4	**Medium**
	Soil erosion and degradation	Negative	3	1	**Low**
Avifauna	Disturbance of birds & displacement effects	Negative	3	1	**Low**
Aquatic Biodiversity	Loss of aquatic habitat and biota	Negative	2	1	**Very Low**
	Aquatic ecosystem integrity	Negative	2	1	**Very Low**
Heritage	Impacts to the cultural landscape	Negative	4	1	**Medium**
Social	Impacts on regional employment and incomes associated with project activities and expenditure	Positive	4	1	**Medium**

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
	Impacts associated primarily with the influx of people	Negative	3	2	**Medium**
	Impacts on tourism	Negative	3	1	**Low**
	Impacts on surrounding landowners and communities	Negative	4	3	**Medium**

3 EIA PROCESS

3.1 DFFE WEB-BASED ENVIRONMENTAL SCREENING TOOL

DFFE has developed the National Web-based Environmental Screening Tool in order to flag areas of potential environmental sensitivity related to a site as well as a development footprint and produces the screening report required in terms of Regulation 16 (1)(v) of the EIA Regulations (2014, as amended). *The Notice of the requirement to submit a report generated by the national web-based environmental screening tool in terms of section 24(5)(h) of the NEMA, 1998 (Act No 107 of 1998) and regulation 16(1)(b)(v) of the EIA regulations, 2014, as amended (GN 960 of July 2019)* states that the submission of a report generated from the national web-based environmental screening tool, as contemplated in Regulation 16(1)(b)(v) of the EIA Regulations, 2014, published under Government Notice No. R982 in Government Gazette No. 38282 of 4 December 2014, as amended, is compulsory when submitting an application for environmental authorisation in terms of regulation 19 and regulation 21 of the EIA Regulations, 2014 (as amended) as of 04 October 2019.

The Screening Report generated by the National Web-based Environmental Screening Tool contains a summary of any development incentives, restrictions, exclusions or prohibitions that apply to the proposed development footprint as well as the most environmentally sensitive features on the footprint based on the footprint sensitivity screening results for the application classification that was selected.

A screening report for the proposed project was generated on 27 March 2023 and is attached as **Appendix F**. The Screening Report for the project identified various sensitivities for the site. The report also generated a list of specialist assessments that should form part of the S&EIA based on the development type and the environmental sensitivity of the site. Assessment Protocols in the report provide minimum information to be included in a specialist report to facilitate decision-making.

Table 3-1 below provides a summary of the sensitivities identified for the development footprint.

Table 3-1 – Sensitivities identified in the DFFE Screening Report

Theme	Very High Sensitivity	High Sensitivity	Medium Sensitivity	Low Sensitivity
Agriculture Theme		X		
Animal Species Theme			X	
Aquatic Biodiversity Theme	X			
Archaeological and Cultural Heritage Theme				X
Avian (Wind) Theme				X
Bats (Wind) Theme		X		
Civil Aviation (Wind) Theme		X		
Defence (Wind) Theme			X	
Flicker Theme	X			
Landscape (Wind) Theme	X			
Palaeontology Theme		X		
Noise Theme	X			

Theme	Very High Sensitivity	High Sensitivity	Medium Sensitivity	Low Sensitivity
Plant Species Theme			X	
RFI (Wind) Theme				X
Terrestrial Biodiversity Theme	X			

Based on the selected classification, and the environmental sensitivities of the proposed development footprint, the following list of specialist assessments have been identified for inclusion in the assessment report as determined by the screening tool.

- Agricultural Impact Assessment;
- Landscape/Visual Impact Assessment;
- Archaeological and Cultural Heritage Impact Assessment ;
- Palaeontology Impact Assessment;
- Terrestrial Biodiversity Impact Assessment;
- Aquatic Biodiversity Impact Assessment;
- Avian Impact Assessment;
- Civil Aviation Assessment;
- Defence Assessment;
- RFI Assessment;
- Noise Impact Assessment;
- Flicker Assessment;
- Traffic Impact Assessment;
- Geotechnical Assessment;
- Social Assessment;
- Plant Species Assessment; and
- Animal Species Assessment.

3.1.1 MOTIVATION FOR SPECIALIST STUDIES

The report recognises that "it is the responsibility of the EAP to confirm this list and to motivate in the assessment report, the reason for not including any of the identified specialist study including the provision of photographic evidence of the footprint situation." The specialist studies required for the proposed project, as identified by the DFFE Screening Tool are included in **Table 3-2**. The table also identifies the specialist studies commissioned and provides motivation for specialist studies not commissioned.

Table 3-2 - Specialist Studies identified by the DFFE Screening Tool

Specialist Study Identified	Specialist Study Commissioned (Yes/No)	Specialist	Motivation
Soil and Agricultural Potential Assessment	Yes	Johann Lanz Independent consultant	-

Specialist Study Identified	Specialist Study Commissioned (Yes/No)	Specialist	Motivation
Landscape/Visual Impact Assessment	Yes	Kerry Schwartz SLR Consulting (Pty) Ltd	-
Archaeological and Cultural Heritage Impact Assessment	Yes	Dr Jayson Orton ASHA Consulting (Pty) Ltd	-
Palaeontology Impact Assessment	Yes	Prof. Marion Bamford ASHA Consulting (Pty) Ltd	-
Terrestrial Biodiversity Impact Assessment	Yes	Dr Noel van Rooyen and Prof. Gretel van Rooyen Ekotrust CC	-
Aquatic Biodiversity Impact Assessment	Yes	Lufuno Nemakhavhani WSP Group Africa (Pty) Ltd	-
Avian Impact Assessment	Yes	Albert Froneman and Megan Loftie-Eaton AfriAvian Environmental (Formerly Chris van Rooyen Consulting)	-
Civil Aviation Assessment	Yes – Compliance Statement Only	WSP Group Africa (Pty) Ltd	The relevant Authorities have been included on the project stakeholder database. As of the 1st of May 2021, ATNS has been appointed as the new Obstacle application Service Provider for Wind farms and later Solar Plants. Their responsibility would pertain to the assessments, maintenance, and all other related matters in respect to Windfarms and in due time Power Plant assessments. An Application for the Approval of Obstacles has been submitted to ATNS by the Applicant. The SACAA and ATNS have been included on the project stakeholder database. They will be informed of the proposed Project, and comment will be sought.

Specialist Study Identified	Specialist Study Commissioned (Yes/No)	Specialist	Motivation
			As this theme has been identified as a high sensitivity, a compliance statement has been compiled.
Defence Assessment	Yes – Compliance Statement Only	WSP Group Africa (Pty) Ltd	The Department of Defence has been included on the project stakeholder database. They will be informed of the proposed Project, and comment will be sought. As this theme has been identified as a Medium sensitivity, a compliance statement has been compiled.
RFI Assessment	No	-	An RFI Study will not be undertaken. The SAWS and relevant telecommunications stakeholders will be engaged with as part of the Public Participation Process. As this theme has been identified as low sensitivity, a compliance statement will not be required.
Noise Impact Assessment	Yes	M. de Jager Enviro-Acoustic Researchcc	-
Flicker Assessment	Yes	Kerry Schwartz SLR Consulting (Pty) Ltd	The Flicker Assessment is being undertaken as part of the Visual Impact Assessment.
Traffic Impact Assessment	Yes	A. Johnson JG Afrika (Pty) Ltd	-
Geotechnical Assessment	Yes	Heather Davis WSP Group Africa (Pty) Ltd	A desktop study will be undertaken. A detailed Geotechnical Assessment will not be undertaken as this will be undertaken during the design phase.
Socio-Economic Assessment	Yes	Tony Barbour Tony Barbour Environmental Consulting	-
Plant Species Assessment	Yes	Alpheus Moalosi WSP Group Africa (Pty) Ltd	

Specialist Study Identified	Specialist Study Commissioned (Yes/No)	Specialist	Motivation
Animal Species Assessment	Yes	Alpheus Moalosi WSP Group Africa (Pty) Ltd	-

The following specialist study has been commissioned in addition to those above in **Table 3-2**:

- Qualitative Risk Assessment for the BESS undertaken by Debra Mitchell from ISHECON cc.

Specialist assessments were conducted in accordance with the Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes, which were promulgated in Government Notice No. 320 of 20 March 2020 and in Government Notice No. 1150 of 30 October 2020 (i.e. "the Protocols"). The assessment protocols followed as well as the site sensitivity verification undertaken by the specialists are indicated in **Section 8**.

3.2 APPLICATION FOR ENVIRONMENTAL AUTHORISATION

The application phase consisted of a pre-application consultation with DFFE and subsequently completing the appropriate application form as well as the submission and registration of the application for EA with the DFFE. The pre-application meeting was requested with DFFE on 2 May 2023. The DFFE responded on 4 May 2023 and confirmed that a pre-application meeting was not needed for the project (proof of pre-app request form and email correspondence included in the SER in **Appendix D**). The application for EA was submitted to the DFFE with the DSR on 23 June 2023. The application reference number (DFFE Reference: 14/12/16/3/3/2/2385) is included in this FSR.

3.3 BASELINE ENVIRONMENTAL ASSESSMENT

The description of the environmental attributes of the Project area was compiled through a combination of desktop reviews and site investigations. Desktop reviews made use of available information including existing reports, aerial imagery, and mapping. The specialist teams undertook site investigations, between **March** and **June 2023**, to identify sensitive features on site that informed the sensitivity mapping (see **Section 8.2**) for the proposed project.

3.4 IMPACT ASSESSMENT METHODOLOGY

3.4.1 ASSESSMENT OF IMPACTS AND MITIGATION

The assessment of impacts and mitigation evaluates the likely extent and significance of the potential impacts on identified receptors and resources against defined assessment criteria, to develop and describe measures that will be taken to avoid, minimise or compensate for any adverse environmental impacts, to enhance positive impacts, and to report the significance of residual impacts that occur following mitigation.

The key objectives of the risk assessment methodology are to identify any additional potential environmental issues and associated impacts likely to arise from the proposed project, and to propose a significance ranking. Issues / aspects will be reviewed and ranked against a series of significance criteria to identify and record interactions between activities and aspects, and resources and receptors to provide a detailed discussion of impacts. The assessment considers direct[1], indirect[2], secondary[3] as well as cumulative[4] impacts.

A standard risk assessment methodology is used for the ranking of the identified environmental impacts pre-and post-mitigation (i.e. residual impact). The significance of environmental aspects is determined and ranked by considering the criteria[5] presented in **Table 3-3.**

Table 3-3 – Impact Assessment Criterion and Scoring System

Criteria	Score 1	Score 2	Score 3	Score 4	Score 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	Very low: No impact on processes	Low: Slight impact on processes	Medium: Processes continue but in a modified way	High: Processes temporarily cease	Very High: Permanent cessation of processes
Impact Extent (E) The geographical extent of the impact on a given environmental receptor	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action
Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite

1 Impacts that arise directly from activities that form an integral part of the Project.
2 Impacts that arise indirectly from activities not explicitly forming part of the Project.
3 Secondary or induced impacts caused by a change in the Project environment.
4 Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.
5 The definitions given are for guidance only, and not all the definitions will apply to all the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.

Criteria	Score 1	Score 2	Score 3	Score 4	Score 5
Significance (S) is determined by combining the above criteria in the following formula:	$[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$				
Impact Significance Rating					
Total Score	**4 to 15**	**16 to 30**	**31 to 60**	**61 to 80**	**81 to 100**
Environmental Significance Rating (Negative (-))	**Very low**	**Low**	**Moderate**	**High**	**Very High**
Environmental Significance Rating (Positive (+))	**Very low**	**Low**	**Moderate**	**High**	**Very High**

3.4.2 IMPACT MITIGATION

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the proposed development's actual extent of impact and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures and is thus the final level of impact associated with the development. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this report.

The mitigation measures chosen are based on the mitigation sequence/hierarchy which allows for consideration of five (5) different levels, which include avoid/prevent, minimise, rehabilitate/restore, offset and no-go in that order. The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

The mitigation sequence/hierarchy is shown in **Figure 3-1** below.

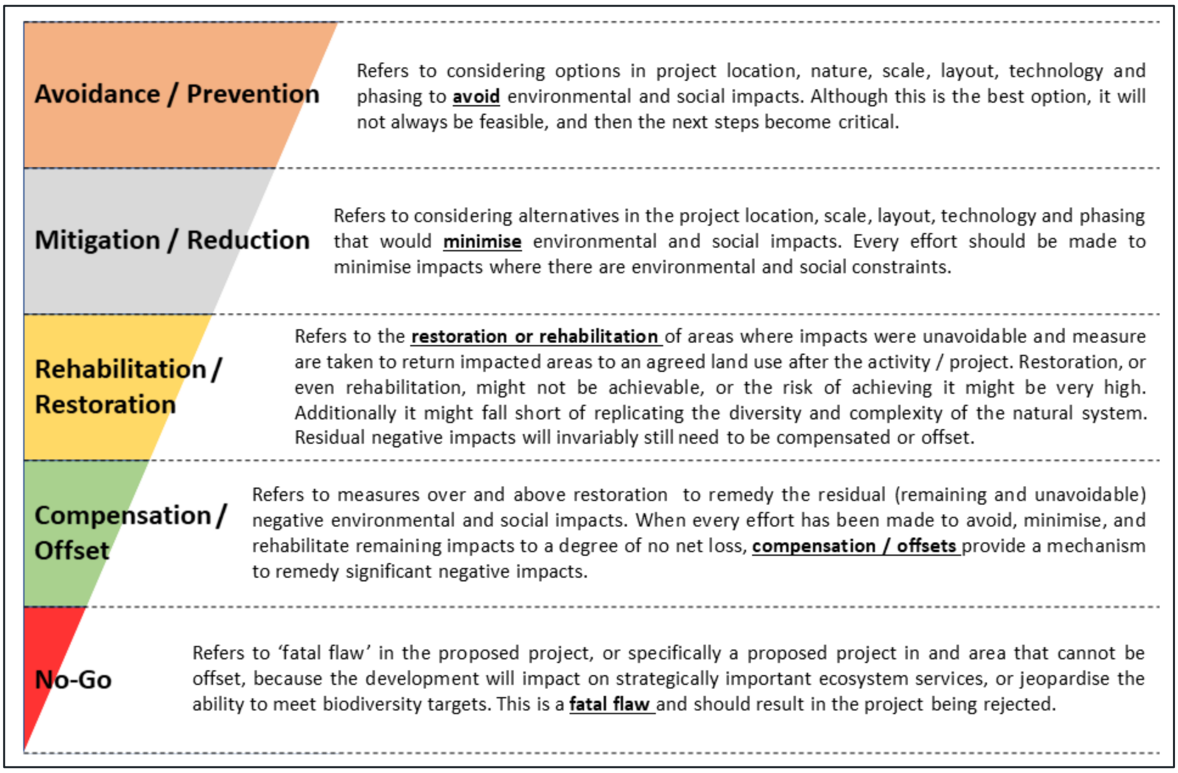


Figure 3-1 - Mitigation Sequence/Hierarchy

The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

3.5 STAKEHOLDER ENGAGEMENT PROCESS

Stakeholder engagement (public participation) is a requirement of the S&EIA process. It consists of a series of inclusive and culturally appropriate interactions aimed at providing stakeholders with opportunities to express their views, so that these can be considered and incorporated into the S&EIA decision-making process. Effective engagement requires the prior disclosure of relevant and adequate project information to enable stakeholders to understand the risks, impacts, and opportunities of the proposed project. The objectives of the stakeholder engagement process can be summarised as follows:

- Identify relevant individuals, organisations and communities who may be interested in or affected by the proposed project;
- Clearly outline the scope of the proposed project, including the scale and nature of the existing and proposed activities;
- Identify viable proposed project alternatives that will assist the relevant authorities in making an informed decision;

- Identify shortcomings and gaps in existing information;
- Identify key concerns, raised by Stakeholders that should be addressed in the specialist studies;
- Highlight the potential for environmental impacts, whether positive or negative; and
- To inform and provide the public with information and an understanding of the proposed project, issues, and solutions.

A SER has been included in **Appendix D** detailing the project's compliance with Chapter 6 of the NEMA EIA Regulations 2014, as amended.

3.5.1 STAKEHOLDER IDENTIFICATION

Stakeholders were identified and will continue to be identified through several mechanisms. These include:

- Utilising existing databases from other projects in the area;
- Advertising in the press;
- Placement of community notices; and
- Completed comment sheets.

All Stakeholders identified to date have been registered on the project stakeholder database. The EAP endeavoured to ensure that individuals/organisations from referrals and networking were notified of the proposed project. Stakeholders were identified at the horizontal (geographical) and vertical extent (organisations level).

A list of stakeholders captured in the project database is included in the SER in **Appendix D**.

3.5.1.1 Availability of the Draft Environmental Impact Assessment Report

The Draft EIR will be made available for public review for a period of at least 30 days from 27 October 2023 to 27 November 2023 , at the venues as follows:

- Fochville Public Library;
- Kokosi Public Library;
- Carletonville Public Library; and
- WSP website (https://www.wsp.com/en-ZA/services/public-documents).
- Datafree Website (https://wsp-engage.com/)

The Draft Reports will also be made available to Commenting Authorities via a One Drive link. In order to ensure maximum participation of all I&APs, reports will be shared on the Datafree website. Proof of display will be included in the Final EIA report.

3.6 ASSUMPTIONS AND LIMITATIONS

GENERAL ASSUMPTIONS AND LIMITATIONS:

- The EAP hereby confirms that they have undertaken to obtain project information from the client that is deemed to be accurate and representative of the project.
- Site visits have been undertaken to better understand the project and ensure that the information provided by the client is correct, based on site conditions observed.
- The EAP hereby confirms their independence and understands the responsibility they hold in ensuring all comments received are accurately replicated and responded to within the EIA documentation.

- The comments received in response to the public participation process, will be representative of comments from the broader community.

AGRICULTURAL POTENTIAL:

There are no specific assumptions, uncertainties or gaps in knowledge or data that affect the findings of this study.

AQUATIC BIODIVERSITY IMPACT ASSESSMENT:

In order to obtain a comprehensive understanding of the dynamics of the biota present within a watercourse (e.g., migratory pathways, seasonal prevalence, etc.), studies should include investigations conducted during different seasons, over a number of years and through extensive sampling efforts. Given the time constraints of the present study, such long-term research could not be conducted. Instead, conclusions provided within this report are based on data collected during a single low flow sampling event, a literature review, and professional experience.

The assessed Loopspruit upstream site is located within a narrow and shallow (approximately 1 m wide and deep) system dominated by reeds and the invasive (category 2 NEMBA) White Poplar trees, thus the sampling effort was hindered. Results obtained for this site should be interpreted with caution.

WETLAND AQUATIC BIODIVERSITY IMPACT ASSESSMENT:

- Some wetland vegetation that would have been used in the delineation of the wetland boundary may have been dormant due to vegetation dry back in the dry season.
- Some wetlands identified at a desktop level using the NWM5 dataset could not be confirmed on site due to access restrictions. These relates mainly to wetlands associated with the eastern extent of the Loopspruit.

NOISE IMPACT ASSESSMENT:

- Limitations - acoustical measurements and assessments:

  Ambient sound levels are the cumulative effects of innumerable sounds generated at various instances both far and near. A high measurement may not necessarily mean that the area is always noisy. Similarly, a low sound level measurement will not necessarily mean that the area is always quiet, as sound levels will vary over seasons, time of day, dependant on faunal characteristics (mating season, dawn chorus (27) early hours of the morning, temperature etc.), vegetation in the area and meteorological conditions (especially wind).

  Selecting an ideal measurement location could be difficult, with various criteria assessed to identify the viability of a certain location as a point to define ambient sound levels. When selecting a measurement location, the most important criteria would be:

  - Security of the instrument (minimise risk to the technician; prevent theft; sabotage of the equipment).
  - Safety of the equipment (ensure that it does not prevent, interfere or limit typical agricultural or household activities; ensure that the instrument are not in a location where an animal could damage the instrument); and lastly.
  - The suitability of the measurement location to define ambient sound levels (the presence of certain trees or equipment, wetland or other water resources will influence ambient sound level significantly).

As such, after ensuring that the instrument is safe and secure, there are various environmental factors that could influence ambient sound levels measured. These constraints and limitations are discussed below and could include:

- Seasonal changes in the surrounding environment can influence typical ambient sound levels, as many faunal species are more active during warmer periods than the colder periods. As an example, cicada is usually only active during warmer periods. Certain cicada species can generate noise levels up to 120 dB for mating or distress purposes, sometimes singing in synchronisation magnifying noise levels they produce from their tymbals(28).
- Defining ambient sound levels using the result of one 10-minute measurement may be very inaccurate (very low confidence level in the results) relating to the reasons mentioned above, and measurements over a longer-term period is critical.
- Some equipment that could influence measurements may be missed when deploying instruments, or, the equipment may not the audible. This could include equipment such as hidden water pumps and associated pipelines and outflows, ESKOM stepdown transformers, hidden compressors, inverters, condensers or other electrical equipment, etc. While not audible during deployment, such equipment may significantly influence ambient sound levels during quiet periods.
- Type, the number and sizes of trees in the vicinity of the instrument, as well as the distances between the microphone and these trees. Certain trees, especially fruiting trees could attract birds and other animals that will significantly impact on ambient sound levels.
- Type and number of animals in the vicinity of the microphone. Dogs, chickens, geese, etc. generate different noises randomly both night and day, and other livestock (sheep, goats, cattle, horses, etc.) kept in enclosures will also raise noise levels, especially if these animals are penned in large numbers.
- Measurements over wind speeds of 3 m/s could provide data influenced by wind-induced noises. However, when determining the ambient sound levels associated with increased wind speeds, it is desired to measure ambient sound levels at higher wind speeds.
- Ambient sound levels recorded near rivers, streams, wetlands, trees and bushy areas can be high due to faunal activity which can dominate the sound levels around the measurement point (specifically during summertime, rainfall event or during dawn chorus of bird songs). This generally is still considered naturally quiet and accepted as features of the natural environment, and in various cases sought after and pleasing. Ambient sound level data measured in such area however should not be used to develop an opinion in the potential prevailing ambient sound levels in the larger area.
- Exact location of a sound level meter in an area in relation to structures, infrastructure, vegetation, wetlands and external noise sources will influence measurements. It may determine whether you are measuring anthropogenic sounds from a receptors dwelling, or environmental ambient baseline contributors of significance (faunal, roads traffic, railway traffic movement etc.).
- As a residential area develops the presence of people will result in increased dwelling related sounds. These are generally a combination of traffic noise, voices, animals and equipment (incl. TV's and Radios). The result is that ambient sound levels will increase as an area matures.

- Calculating noise emissions – adequacy of predictive methods:

Limitations due to the calculations of the noise emissions into the environment include the following:

- Many sound propagation models do not consider sound characteristics as calculations are based on an equivalent level (with the appropriate correction implemented e.g. tone or impulse). These other characteristics include intrusive sounds or amplitude modulation.
- Most sound propagation models do not consider refraction through the various temperature layers (specifically relevant during the night-times).
- Most sound propagation models do not consider the low frequency range (third octave 16 Hz – 31.5 Hz). This would be relevant to facilities with a potentially low frequency issue.
- Many environmental models consider sound to propagate in hemi-spherical way. Certain noise sources (e.g., a speaker, exhausts, fans) emit sound power levels in a directional manner.
- The impact of atmospheric absorption is simplified, and very uniform meteorological conditions are considered. This is an over-simplification and the effect of this in terms of sound propagation modelling is difficult to quantify.
- Many environmental models are not highly suited for close proximity calculations.
- Acoustical characteristics of the ground are over-simplified, with ground conditions accepted as uniform.

- Adequacy of underlying assumptions:

  Noise experienced at a certain location is the cumulative result of innumerable sounds emitted and generated both far and close, each in a different time domain, each having a different spectral character at a different sound level. Each of these sounds is also impacted differently by surrounding vegetation, structures and meteorological conditions that result in a total cumulative noise level represented by a few numbers on a sound level meter.

  As previously mentioned, it is not the purpose of noise modelling to accurately determine a likely noise level at a certain receptor but to calculate a noise rating level that is used to identify potential issues of concern.

- Uncertainties associated with mitigation measures:

  Any noise impact can be mitigated to have a low significance; however, the cost of mitigating this impact may be prohibitive, or the measure may not be socially acceptable (such as the relocation of an NSR). These mitigation measures may be engineered, technological or due to management commitment.

  For the purpose of the determination of the significance of the noise impact mitigation measures were selected that are feasible, mainly focussing on management of noise impacts using rules, policy and require a management commitment. This, however, does not mean that noise levels cannot be reduced further, only that to reduce the noise levels further may require significant additional costs (whether engineered, technological or management).

  It was assumed the mitigation measures proposed for the construction phase, if any is included and proposed in this report, will be considered during the planning phase, implemented during the construction phase and continued during the operational phase.

- Uncertainties of information provided:

  While it is difficult to define the character of a measured noise in terms of numbers (third octave sound power levels), it is difficult to accurately model noise levels at a receptor from any operation.

The projected noise levels are the output of a numerical model with the accuracy depending on the assumptions made during the setup of the model. The assumptions include the following:

- It is technically difficult and time-consuming to improve the measurement of spectral distribution of large equipment in an industrial setting. This is due to the many correction factors that need to be considered (e.g., other noise sources active in the area, adequacy of average time setting, surrounding field non-uniformity etc.29 as per SANS 9614-3:2005).
- That octave sound power levels selected for processes and equipment accurately represent the sound character and power levels of these processes and equipment. The determination of octave sound power levels in itself is subject to errors, limitations and assumptions with any potential errors carried over to any model making use of these results.
- Sound power emission levels from processes and equipment changes depending on the load the process and equipment are subject to. While the octave sound power level is the average (equivalent) result of a number of measurements, this measurement relates to a period that the process or equipment was subject to a certain load (work required from the engine or motor to perform action). Normally these measurements are collected when the process or equipment is under high load. The result is that measurements generally represent a worst-case scenario.
- As it is unknown which processes and equipment will be operational (when and for how long), modelling considers a scenario where processes and equipment are under full load for a set time period. Modelling assumptions comply with the precautionary principle and operational time periods are frequently overestimated. The result is that projected noise levels would likely be over-estimated.
- Modelling cannot capture the potential impulsive character of a noise that can increase the potential nuisance factor, nor the potential effect of the modulation of amplitude of the noise;
- The XYZ topographical information is derived from the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Global Digital Elevation Model (DEM) data, a product of Japan's Ministry of Economy, Trade, and Industry (METI) and the National Aeronautical and Space Administration (NASA). There are known inaccuracies and artefacts in the data set, yet this is still one of the most accurate data sets to obtain 3D-topographical information.
- The impact of atmospheric absorption is simplified, and very uniform meteorological conditions are considered. This is an over-simplification and the effect of this in terms of sound propagation modelling is difficult to quantify;
- Receiver height will be assumed at a 4m height above surface level as recommended by the Institute of Acoustics (IOA, 2013) [62];
- Atmospheric conditions relating to an air temperature of 10oC and a 70% air humidity will be used to minimize the effect of air absorption (Bass et al., 1996) [6], (IOA, 2013) [62], (Kaliski and Duncan, 2008) [67]; and
- Acoustical characteristics of the ground are over-simplified with ground conditions accepted as uniform. Seventy-five percent (75%) hard ground conditions will be used for the operational modelled (using 50% soft ground for the construction phase), representing a potential worst-case scenario (Bass et al., 1996) [6], (IOA, 2013) [62], (Kaliski and Duncan, 2008) [67].
- Due to the uncertainties, modelling generally could be out with as much as +10 dBA (the potential noise level is over-modelled), although realistic values ranging from 3 dBA to less than 5 dBA are more common in practice.

TERRESTRIAL BIODIVERSITY IMPACT ASSESSMENT:

- The site visit was undertaken in January 2021 after the region had received good rains, thus the botanical assessment was conducted under favourable conditions.
- The area has been well collected in the past and the list of plant species that could potentially occur on site as obtained from the NewPosa database, is thus considered to provide a good representation of the potential flora on site. The NewPosa list was taken for an area far greater than the WEF site (grids 2627BC & 2627AD).
- Rare and threatened plant and animal species are generally uncommon and/or localised and the once-off survey may fail to locate such species.
- Rare plant species usually occur in specialised and localised habitats, thus special attention was given to these habitats. The list was supplemented by a list of SCC provided by GDARDE (2011) occurring on the farms in the immediate vicinity of the development.
- No aerial census, road census or trapping (either camera trapping or by way of Sherman traps) was conducted for fauna, since these methods generally provide an underrepresentation of the full faunal diversity within the limited timeframe available. Faunal lists were sourced from literature and the website of the Animal Demography Unit of the University of Cape Town.

AVIFAUNAL IMPACT ASSESSMENT:

This study assumed that the sources of information used in this report are reliable. In this respect, the following must be noted:

- The SABAP2 data is regarded as an adequate indicator of the avifauna which could occur at the PAOI, and it was further supplemented by data collected during the on-site surveys.
- The focus of the study was on the potential impacts of the proposed WEF on wind energy priority species.
- Priority species for wind developments were identified from the updated list of priority species for wind farms compiled for the Avian Wind Farm Sensitivity Map.
- Despite the growing body of peer reviewed literature investigating the collision risks of birds with wind turbines and overhead power lines in South Africa, relevant information for many individual species remains limited. The precautionary principle was therefore applied throughout. The World Charter for Nature, which was adopted by the UN General Assembly in 1982, was the first international endorsement of the precautionary principle. The principle was implemented in an international treaty as early as the 1987 Montreal Protocol and, among other international treaties and declarations, is reflected in the 1992 Rio Declaration on Environment and Development. Principle 15 of the 1992 Rio Declaration states that: "to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall be not used as a reason for postponing cost-effective measures to prevent environmental degradation."
- The assessment of impacts is based on the baseline environment as it currently exists at the PAOI.
- Conclusions drawn in this study are based on experience of the specialists on the species found on site and similar species in different parts of South Africa. Bird behaviour can never be entirely reduced to formulas that will be valid under all circumstances.
- The Broader Area is defined as the area encompassed by the four pentads where the project is located.
- The Project Area of Impact (PAOI) is defined as the area where the primary impacts on avifauna are expected.

- The Project Site is the where the actual development will be located, i.e., the footprint containing the wind turbines and associated infrastructure.

BATS IMPACT ASSESSMENT:

- Distribution maps of South African bat species still require further refinement, thus the bat species proposed to occur on the site (and not detected in the area yet) should be considered precautionary. If a species has a distribution marginal to the site, it was assumed to occur in the area.
- The migratory paths of bats are largely unknown, thus limiting the ability to determine if the wind farm will have a large-scale effect on migratory species. This limitation is partially overcome with the 12-months pre-construction sensitivity assessment, however some uncertainty in this regard will remain until the end of operational monitoring of at least 2 years.
- The sensitivity map is based partially on satellite imagery, and ground truthing from site visits. However, given the large extent of the site there is always the possibility that what has been mapped may differ slightly to what is on the ground.
- Species identification with the use of bat detection and echolocation is less accurate when compared to morphological identification, nevertheless it is a very certain and accurate indication of bat activity and their presence with no harmful effects on bats being surveyed.
- Automated species identification by the Kaleidoscope software may produce a small portion of incorrect identifications or unknown identifications. In the last-mentioned case, the dominant frequency of the unknown call was simply used to group the bat into a family or genus group, using dominant frequency only as the determining factor. However, the automated software is very effective at distinguishing bat calls from ultrasonic noise, therefore the number of bat passes are not significantly overestimated.
- It is not possible to determine actual individual bat numbers from acoustic bat activity data, whether gathered with transects or the passive monitoring systems. However, bat passes per night are internationally used and recognised as a comparative unit for indicating levels of bat activity in an area.
- Exact foraging distances from bat roosts or exact commuting pathways cannot be determined by the current methodology. Radio telemetry tracking of tagged bats is required to provide such information if needed.
- Periods of exceptional drought or rain during the pre-construction assessment study can influence bat numbers, causing measurements of lower or higher bat activity due to changes in typical water availability, and consequently, insect prey abundance.

HERITAGE IMPACT ASSESSMENT:

The field study was carried out at the surface only and hence any completely buried archaeological sites would not be readily located. Similarly, it is not always possible to determine the depth of archaeological material visible at the surface. Although the survey focused on the WEF layout, an attempt was made to identify all obvious heritage resources in reasonably proximity to the project layout. Not all resources identified from aerial photography were visited, with the emphasis placed on visiting areas where impacts might occur. It is assumed that the findings would be indicative of the overall pattern on the landscape. It must also be noted that is it very easy to miss graves in this grassland landscape. Although visibility was reasonable, it must always be assumed that graves could have been missed.

Cumulative impacts are difficult to assess due to the variable site conditions that would have been experienced in different areas and in different seasons. Survey quality is thus likely to be variable. As such, some assumptions need to be made in terms of what and how much heritage might be impacted by other developments in the broader area.

PALAEONTOLOGICAL IMPACT ASSESSMENT:

Based on the geology of the area and the palaeontological record as we know it, it can be assumed that the formation and layout of the dolomites, sandstones, shales and sands are typical for the country and only some contain trace fossils such as stromatolites or microbialites. The overlying soils and sands of the Quaternary period would not preserve fossils.

TRAFFIC IMPACT ASSESSMENT:

- Project information provided by the Client.
- According to the Eskom Specifications for Power Transformers (Eskom Power Series, Volume 5: Theory, Design, Maintenance and Life Management of Power Transformers), the following dimensional limitations need to be kept when transporting the transformer – total maximum height 5 000mm, total maximum width 4 300mm and total maximum length 10 500mm.
- Maximum vertical height clearances along the haulage route are 5.2m for abnormal loads.
- The imported elements will be transported from the most feasible port of entry, which is deemed to be the Richards Bay Port.
- If any elements are manufactured within South Africa, these will be transported from their respective manufacturing centres, which would be either in the greater Johannesburg, Cape Town, or Pinetown/Durban.
- All haulage trips on the external road network will occur on either surfaced national and provincial roads or existing gravel roads.
- Material for the construction of internal access roads will be sourced locally as far as possible.
- A maximum of 10 turbines is proposed for the site with a maximum hub height of 200m, and rotor diameter of 200m.
- Abnormal load components will include the generator (weight – 130tT and size), Nacelle (weight – 50t and size), Hub (weight – 60t and size), Blades (weight - 30t and length – up to 95m), Tower – 5 sections (weight per section – up to 81t, length up to 25m), and Transformer (s). (Weight – up to 240t).

VISUAL IMPACT ASSESSMENT

- This visual study has been undertaken based on the updated project description dated March 2023 as provided by the Proponent and the Environmental Assessment Practitioner.
- Given the nature of the receiving environment and the height of the proposed wind turbines, the study area or visual assessment zone is assumed to encompass an area of 10km from the proposed WEF – i.e., an area of 10km from the boundary of the WEF project area. The 10km limit on the visual assessment zone relates to the fact that visual impacts decrease exponentially over distance. Thus, although the turbines may still be visible beyond 10km, the degree of visual impact would diminish considerably. As such, the need to assess the impact on potential receptors beyond this distance would not be warranted.
- The identification of visual receptors involved a combination of desktop assessment as well as field-based observation. Initially Google Earth imagery was used to identify potential receptors within the study area. Where possible, these receptor locations were verified and assessed during

a site visit which was undertaken between the 9th and 10th of February 2022. Due to the extent of the study area however and the number of receptors that could potentially be sensitive to the proposed development, it was not possible to visit or verify every potentially sensitive visual receptor location. As such, several broad assumptions have been made in terms of the likely sensitivity of the receptors to the proposed development.

- It should be noted that not all receptor locations would necessarily perceive the proposed development in a negative way. This is usually dependent on the use of the facility, the economic dependency of the occupants on the scenic quality of views from the facility and on people's perceptions of the value of "Green Energy". Sensitive receptor locations typically include sites such as tourism facilities and scenic locations within natural settings which are likely to be adversely affected by the visual intrusion of the proposed development. Thus, the presence of a receptor in an area potentially affected by the proposed development does not necessarily mean that any visual impact will be experienced.
- The potential visual impact at each visual receptor location was assessed using a matrix developed for this purpose. The matrix is based on three main parameters relating to visual impact and, although relatively simplistic, it provides a reasonably accurate indicative assessment of the degree of visual impact likely to be experienced at each receptor location as a result of the proposed development. It is however important to note the limitations of quantitatively assessing a largely subjective or qualitative type of impact and as such the matrix should be seen merely as a representation of the likely visual impact at a receptor location.
- The exact status of all the receptors could not be verified during the field investigation and as such the receptor impact rating was largely undertaken via desktop means.
- Receptors that were assumed to be farmsteads were still regarded as being potentially sensitive to the visual impacts associated with the proposed development and were thus assessed as part of the VIA.
- Where receptors have been identified within the WEF project area, it has been assumed that the landowners or residents at these locations support the proposed WEF development and would not view the project in a negative light.
- Based on information provided by Igolide, all analysis for this VIA is based on a worst-case scenario where turbine heights are assumed to be 300 m at the blade tip, while substation, BESS facilities and office building heights are assumed to be between 10m and 22 m in height.
- Due to the varying scales and sources of information; maps may have minor inaccuracies. Terrain data for this area, derived from the National Geo-Spatial Information (NGI)'s 25m Digital Elevation Model (DEM), is fairly coarse and somewhat inconsistent and as such, localised topographic variations in the landscape may not be reflected on the DEM used to generate the viewshed(s) and visibility analysis conducted in respect of the proposed development.
- In addition, the viewshed / visibility analysis does not consider any existing vegetation cover or built infrastructure which may screen views of the proposed development. This analysis should therefore be seen as a conceptual representation or a worst-case scenario.
- No feedback regarding the visual environment has been received from the public participation process to date. Any feedback from the public during the review period of the Draft Scoping Report for the Facility will however be incorporated into further drafts of this report, if relevant.
- At the time of undertaking the visual study no information was available regarding the type and intensity of lighting that will be required for the proposed WEF and therefore the potential impact of lighting at night has not been assessed at a detailed level. General measures to mitigate the impact of additional light sources on the ambiance of the nightscape have however been provided.

- In the light of the fact that renewable energy projects are still relatively new in South Africa and as such, this report is based on assumptions as to the likely generic impacts associated with the proposed development.
- This study includes a broad assessment of the potential cumulative impacts of other renewable energy developments on the existing landscape character and on the identified sensitive receptors.
- At the time of writing this report, the proposed WEF layout was still in the preliminary design phase and as such, no visualisation modelling (photomontages) was undertaken for the proposed development. Photomontages will be provided in the EIA phase VIA report.
- The site visit was undertaken in early February 2022, during mid-summer, which is characterised by higher levels of rainfall and increased vegetation cover. In these conditions, slightly reduced levels of visual impact will be experienced from receptor locations in the surrounding area. Accordingly, Google Earth Street View has been used to provide an indication of views during the drier season when vegetation cover provides less screening.
- In clear weather conditions, wind turbines would present a greater contrast with the surrounding environment than they would on an overcast day. The field investigation was conducted during clear to partly cloudy weather conditions.

SOCIAL IMPACT ASSESSMENT:

- Technical suitability:
  - It is assumed that the development site represents a technically suitable site for the establishment of the proposed development.
- Strategic importance of the project:
  - The strategic importance of promoting renewable and other forms of energy is supported by the national and provincial energy policies.
- Fit with planning and policy requirements:
  - Legislation and policies reflect societal norms and values. The legislative and policy context therefore plays an important role in identifying and assessing the potential social impacts associated with a proposed development. In this regard, a key component of the SIA process is to assess the proposed development in terms of its fit with key planning and policy documents. As such, if the findings of the study indicate that the proposed development in its current format does not conform to the spatial principles and guidelines contained in the relevant legislation and planning documents, and there are no significant or unique opportunities created by the development, the development cannot be supported.
- Demographic data:
  - The data from the 2021 Census is not currently available. The 2011 Census and 2016 Household Community Survey has therefore been used.

RISK ASSESSMENT:

In order to highlight the maximum differences between the possible technology types, this study is based on the assumption that redox flow batteries (typically vanadium based chemistry) could be installed within a building using bulk tanks, while solid state batteries (typically lithium based chemistry) would be installed in shipping containers that have hundreds of individual batteries combined into packs. Redox flow batteries can be installed in containers where the individual quantities of electrolyte involved would be smaller, although the hazards are the same just smaller in magnitude.

PLANT SPECIES THEME IMPACT ASSESSMENT:

- Rare and threatened plant species are generally uncommon and/or localised and the once-off survey may fail to locate such species.
- Rare plant species usually occur in specialised and localised habitats, thus special attention was given to these habitats.

ANIMAL SPECIES THEME IMPACT ASSESSMENT:

- Field surveys were undertaken in January 2021 after the region had received good rains, thus the assessment was conducted during the wet season and as such was favourable for the detection of most fauna species, particularly herpetofauna and some invertebrates which are typically difficult to detect during the dry season when many species become cryptic or aestivate.
- Faunal lists were sourced from literature and the website of the Animal Demography Unit of the University of Cape Town, and the landowner was consulted regarding sightings of mammals on the property.
- The faunal survey was limited to daytime visual assessments via indirect sighting methods whilst traversing the site. Rare and threatened animal species are generally uncommon and/or localised and the once-off survey may fail to locate such species.
- No aerial census, road census or trapping surveys (either camera trapping or by way of Sherman traps) were conducted for fauna, since these methods generally provide an underrepresentation of the full faunal diversity within the limited timeframe available.

4 PROJECT DESCRIPTION

This section provides a description of the location of the project area and the site location alternatives considered for the project. The descriptions encompass the activities to be undertaken during the construction and operational phases as well as the consideration for site accessibility, water demand, supply, storage, and site waste management. This section also considers the need and desirability of the project in accordance with Appendix 1 of GNR 326.

4.1 LOCATION OF THE PROPOSED PROJECT

The proposed project will be developed within a project area of approximately 680ha). Within this project area, the extent of the Project footprint will be approximately 64 ha, including linear infrastructure, i.e., roads). The Project is located approximately 6km northeast of Fochville, within the Merafong City Local Municipality (MCLM) in the Gauteng Province.

The details of the properties associated with the proposed project, are outlined in **Table 4-1**. The coordinates of the project site are indicated in **Table 4-2** and **Figure 4-1**.

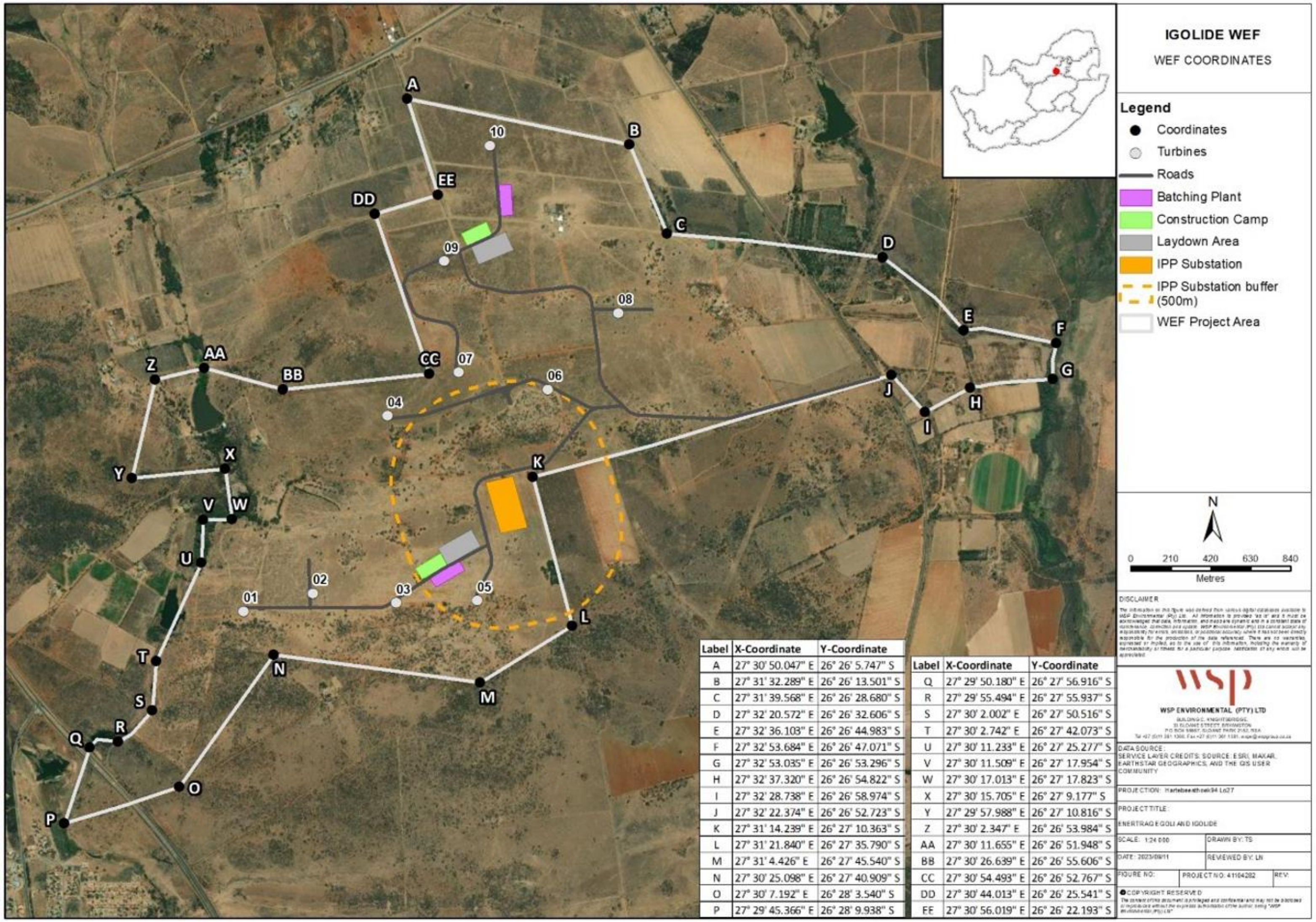
Table 4-1 – Affected Farm Portions

Farm Name	21 Digit Surveyor General Code of Each Cadastral Land Parcel
Portion 14 of Farm Kraalkop 147IQ	T0IQ00000000014700014
Portion 20 of Farm Kraalkop 147IQ	T0IQ00000000014700020
Portion RE/22 of Farm Kraalkop 147IQ	T0IQ00000000014700022
Portion 8 of Farm Leeuwpoort 356IQ	T0IQ00000000035600008
Portion 57 of Farm Leeuwpoort 356IQ	T0IQ00000000035600057
Portion 65 of Farm Leeuwpoort 356IQ	T0IQ00000000035600065
Portion 66 of Farm Leeuwpoort 356IQ	T0IQ00000000035600066

Table 4-2 – Coordinate Points of the Cadastral Land Parcel

Point	Longitude	Latitude
A	27° 30' 50.047" E	26° 26' 5.747" S
B	27° 31' 32.289" E	26° 26' 13.501" S
C	27° 31' 39.568" E	26° 26' 28.680" S
D	27° 32' 20.572" E	26° 26' 32.606" S
E	27° 32' 36.103" E	26° 26' 44.983" S
F	27° 32' 53.684" E	26° 26' 47.071" S
G	27° 32' 53.035" E	26° 26' 53.296" S
H	27° 32' 37.320" E	26° 26' 54.822" S
I	27° 32' 28.738" E	26° 26' 58.974" S
J	27° 32' 22.374" E	26° 26' 52.723" S
K	27° 31' 14.239" E	26° 27' 10.363" S
L	27° 31' 21.840" E	26° 27' 35.790" S
M	27° 31' 4.426" E	26° 27' 45.540" S
N	27° 30' 25.098" E	26° 27' 40.909" S
O	27° 30' 7.192" E	26° 28' 3.540" S
P	27° 29' 45.366" E	26° 28' 9.938" S
Q	27° 29' 50.180" E	26° 27' 56.916" S
R	27° 29' 55.494" E	26° 27' 55.937" S
S	27° 30' 2.002" E	26° 27' 50.516" S
T	27° 30' 2.742" E	26° 27' 42.073" S
U	27° 30' 11.233" E	26° 27' 25.277" S
V	27° 30' 11.509" E	26° 27' 17.954" S
W	27° 30' 17.013" E	26° 27' 17.823" S
X	27° 30' 15.705" E	26° 27' 9.177" S
Y	27° 29' 57.988" E	26° 27' 10.816" S
Z	27° 30' 2.347" E	26° 26' 53.984" S

Point	Longitude	Latitude
AA	27° 30' 11.655" E	26° 26' 51.948" S
BB	27° 30' 26.639" E	26° 26' 55.606" S
CC	27° 30' 54.493" E	26° 26' 52.767" S
DD	27° 30' 44.013" E	26° 26' 25.541" S
EE	27° 30' 56.019" E	26° 26' 22.193" S



Label	X-Coordinate	Y-Coordinate
A	27° 30' 50.047" E	26° 26' 5.747" S
B	27° 31' 32.289" E	26° 26' 13.501" S
C	27° 31' 39.568" E	26° 26' 28.680" S
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EE	27° 30' 56.019" E	26° 26' 22.193" S

Figure 4-1 - Igolide WEF Optimised Layout map (with corner coordinates)

4.2 WIND ENERGY POWER GENERATION PROCESS

Wind power is the conversion of wind energy into a useful form of energy, such as electricity, using modern and highly reliable wind turbines. Wind Power is non-dispatchable, meaning that for economic operation, all the available output must be taken when it is available.

Wind turbines, like windmills, are mounted on a tower to harness wind energy at an increased level above the ground where wind is faster and less turbulent. The kinetic energy of the wind is used to turn the blades of the turbine to generate electricity. Wind turbines can operate at varying wind speeds, with the amount of energy the wind transfers to the rotor depending on the density of the air, the rotor area and the wind speed.

The electricity generated by the wind turbines is passed through the step-up transformer and then transmitted via either underground or overhead cables to a central substation, which connects the wind energy facility to a high voltage network. Wind turbines are designed to operate automatically with minimal maintenance for approximately 20-25 years.

Figure 4-2 illustrates the following main components of a wind turbine:

- The rotor consists of three blades which are attached to a hub. The blades collect energy from the wind and converts the wind energy into rotational shaft motion/energy to turn the generator;
- The nacelle houses the equipment at the top of the tower as well as a gearbox, a generator that converts the turning motion/mechanical energy of the blades into electricity and coupling and brake;
- The tower supports the nacelle and rotor and allows the blades to be distanced safely off the ground so as to reach the stronger winds found at higher elevations;
- Turbine step-up transformer which can be indoor or outdoor, depending on the turbine model whose function is to increase the voltage capacity of the electricity generated by the turbine to a higher, grid-equivalent.
- The foundation unit ensures the stability of the turbine structure.

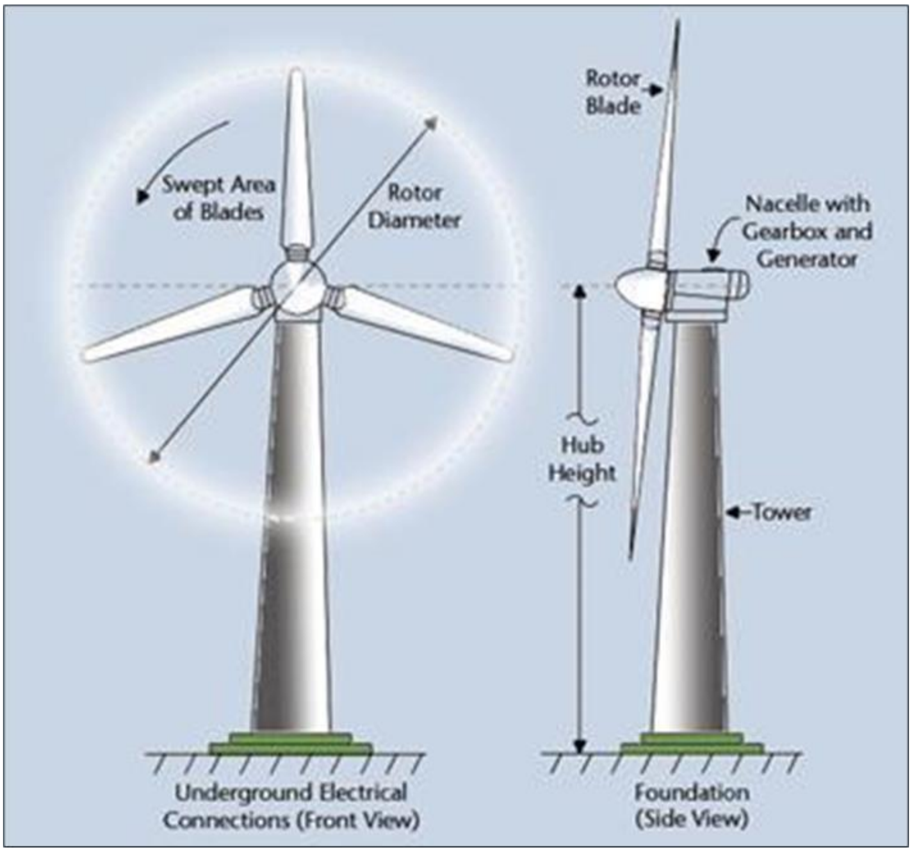


Figure 4-2 - Illustration of the main components of a wind turbine

4.3 PROJECT INFRASTRUCTURE

The proposed Igolide WEF will be developed with an installed capacity of up to 100 MW, and will comprise the following key components:

Table 4-3 - Key components for the proposed Igolide WEF

Igolide WEF	Description
Capacity:	Up to 100MW
Total Site extent	680ha
Project Footprint (Buildable area)	64ha (including linear infrastructure, i.e., roads)
No. of turbines:	10
Turbine hub height:	Up to 200m
Rotor Diameter:	Up to 200m
Tip Height :	Up to 300m
Foundation:	Approximately 25m diameter x 3m deep.

Igolide WEF	Description
	Volume to be excavated will be approximately 2 200m^3, in sandy soils due to access requirements and safe slope stability requirements.
Turbine Hardstand:	Hardstand does not require concrete. Area required will be approximately 1 ha per turbine.
Tower Type	Steel or concrete towers can be utilised at the site. Alternatively, the towers can be of a hybrid nature, comprising concrete towers and top steel sections.
On-site IPP substation and battery energy storage system (BESS):	The total footprint for the on-site substation, including the BESS, will be up to 2.5ha in extent. The on-site IPP portion substation will consist of a high voltage substation yard to allow for multiple 132kV feeder bays and transformers, control building, telecommunication infrastructure, and other substation components, as required. A 500m buffer around the on-site IPP substation has been assessed to ensure flexibility in routing the powerline. The BESS storage capacity will be up to 400 megawatt-hour (MWh) . It is proposed that Lithium Battery Technologies, such as Lithium Iron Phosphate, Lithium Nickel Manganese Cobalt oxides or Vanadium Redox flow technologies will be considered as the preferred battery technology; however, the specific technology will only be determined following Engineering, Procurement, and Construction ("EPC") procurement. The main components of the BESS include the batteries, power conversion system and transformer which will all be stored in various rows of containers. The BESS components will arrive on site pre-assembled.
Grid (to form part of a separate application for EA)	A single or double circuit 132kV overhead powerline and 132kV switching station (with a footprint of approximately 1.5ha, to be located adjacent to the on-site IPP substation) to feed the electricity generated by the proposed WEF into the national grid. A corridor of up to 250m in width (125m on either side of the centre line) has been identified for the placement of the 132kV single or double circuit power line to allow flexibility in the design of the final powerline route, and for the avoidance of sensitive environmental features (where possible).
Cables:	The medium voltage collector system will comprise cables up to and including 33kV that run underground, except where a technical assessment suggests that overhead lines are required, connecting the turbines to the on-site IPP substation.
Operations and Maintenance (O&M) building and storerooms:	The Operations and Maintenance ("O&M") building footprint will be located near the on-site substation. Typical areas include: ▪ Operations building of 200m^2 ▪ Workshop and stores area – of ~300m^2 ▪ Refuse area for temporary waste storage and conservancy tanks to service ablution facility. The total combined area of the buildings will not exceed 5 000m^2.
Construction camps:	The construction camp will house the contractor offices, ablution facilities, mess area, etc., and will have a footprint of approximately 1ha. The

Igolide WEF	Description
	construction camp will be demolished after commercial operations date and the area rehabilitated.
Temporary laydown or staging areas:	The laydown area will be used for the storage of equipment or components that will be incorporated into the facility (such as electrical cables) as well as non-facility related equipment and components such as shipping frames, concrete shuttering, etc. The laydown area will also be used for the storage (and filling of vehicles) of diesel fuel. The laydown area will have a footprint of up to 2ha, which could increase to 3ha for concrete towers, should they be required. The laydown area will be demolished after commercial operations date and the area rehabilitated.
Cement Batching Plant (temporary):	The cement batching plant will be used to mix and blend cement, water, sand and aggregates to form quality concrete to be used for foundations. The cement batching plant will have a footprint of approximately 1ha.
Access and Internal Roads:	Access and internal roads will have a width of 8 - 10m, increasing up to 20m for turning circle/bypass areas to allow for larger component transport. The access and internal roads will be placed within a corridor of up to 20m width to accommodate cable trenches, stormwater channels and turning circle/bypass areas of up to 20m. Existing access roads will be used where possible to minimise impact. Where required, the width of the existing roads will be widened to ensure the passage of vehicles.
Supporting Infrastructure:	▪ Fencing; ▪ Lighting; ▪ Lightning protection; ▪ Telecommunication infrastructure; ▪ Stormwater channels; ▪ Water pipelines; ▪ Offices; ▪ Operational and control centre; ▪ Operations and maintenance area / warehouse / workshop; ▪ Ablution facilities; ▪ Gatehouse; ▪ Security building; ▪ Visitor's centre; and ▪ Substation building.

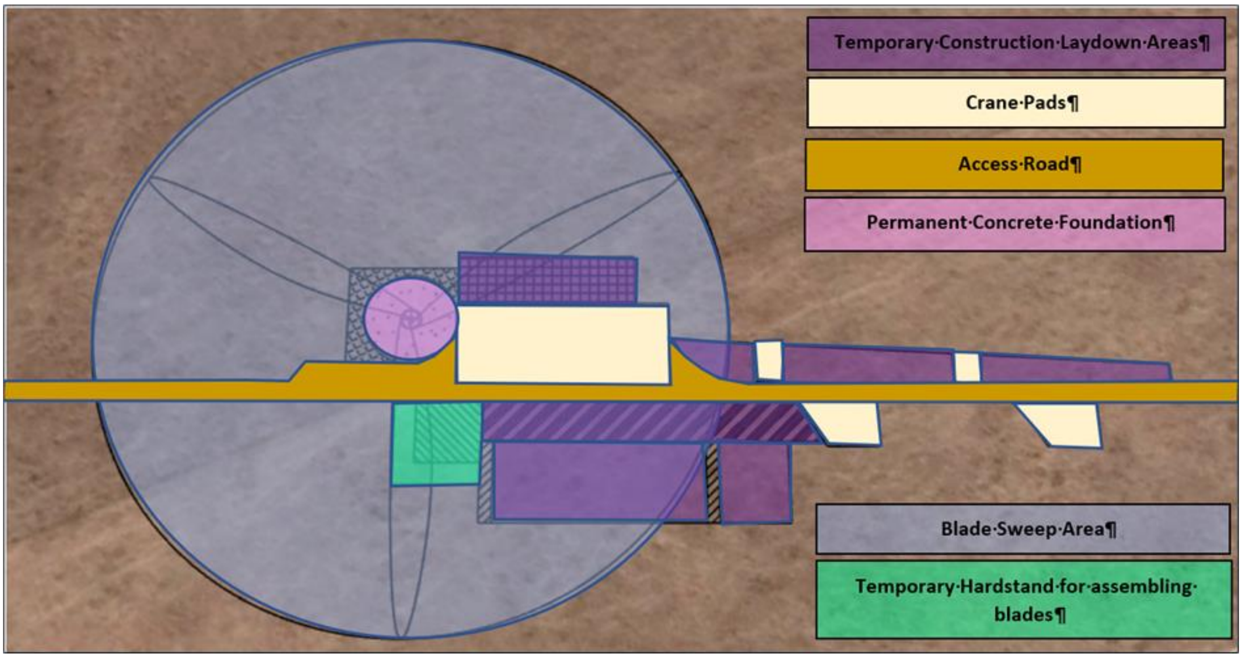


Figure 4-3 - Typical Turbine Hard Standing Requirements (illustration purposes only)

4.3.1 WIND TURBINES

- Up to 10 turbines, each with a foundation of approximately 25m in diameter and approximately 3m in depth;
- Turbine hub height of up to 200m;
- Rotor diameter of up to 200m;
- Tip height of up to 300m;
- Hard standing area: approximately 1 ha will be required per turbine; and
- Tower type: Steel or concrete towers can be utilised at the site. Alternatively, the towers can be of a hybrid nature, comprising concrete towers and top steel sections.

4.3.2 ON-SITE IPP SUBSTATION AND BATTERY ENERGY STORAGE SYSTEM (BESS)

- The total footprint for the on-site substation, including the BESS, will be up to 2.5ha in extent.
- The on-site IPP portion substation will consist of a high voltage substation yard to allow for multiple 132kV feeder bays and transformers, control building, telecommunication infrastructure, and other substation components, as required. A 500m buffer around the on-site IPP substation has been assessed to ensure flexibility in routing the powerline.
- The BESS storage capacity will be up to 400 megawatt-hour (MWh) . It is proposed that Lithium Battery Technologies, such as Lithium Iron Phosphate, Lithium Nickel Manganese Cobalt oxides or Vanadium Redox flow technologies will be considered as the preferred battery technology; however, the specific technology will only be determined following Engineering, Procurement, and Construction ("EPC") procurement. The main components of the BESS include the batteries, power conversion system and transformer which will all be stored in various rows of containers. The BESS components will arrive on site pre-assembled.

4.3.3 CABLING

The medium voltage collector system will comprise cables up to and including 33kV that run underground, except where a technical assessment suggests that overhead lines are required, connecting the turbines to the on-site IPP substation.

4.3.4 OPERATION AND MAINTENANCE BUILDING INFRASTRUCTURE

O&M building infrastructure will be required to support the functioning of the Wind Facility and for services required by operations and maintenance staff. The O&M building infrastructure will include:

- The O&M building footprint will be located near the on-site substation. Typical areas include:
- Operations building of 200m^2;
- Workshop and stores area of ~300m^2; and
- Refuse area for temporary waste storage and conservancy tanks to service the ablution facility.

The total combined area of the buildings will not exceed 5 000m^2.

4.3.5 CONSTRUCTION CAMP LAYDOWN AND BATCHING PLANT (TEMPORARY)

- The construction camp will house the contractor offices, ablution facilities, mess area, etc., and will have a footprint of approximately 1ha. The construction camp will be demolished after commercial operations date and the area rehabilitated;
- The laydown area will be used for the storage of equipment or components that will be incorporated into the facility (such as electrical cables) as well as non-facility related equipment and components such as shipping frames, concrete shuttering, etc. The laydown area will also be used for the storage (and filling of vehicles) of diesel fuel. The laydown area will have a footprint of up to 2ha, which could increase to 3ha for concrete towers, should they be required. The laydown area will be demolished after commercial operations date and the area rehabilitated; and
- The cement batching plant will be used to mix and blend cement, water, sand and aggregates to form quality concrete to be used for foundations. The cement batching plant will have a footprint of approximately 1ha.

4.3.6 ACCESS ROAD AND INTERNAL ROADS

- Access and internal roads will have a width of 8 - 10m, increasing up to 20m for turning circle/bypass areas to allow for larger component transport. The access and internal roads will be placed within a corridor of up to 20m width to accommodate cable trenches, stormwater channels and turning circle/bypass areas of up to 20m.
- Existing access roads will be used where possible to minimise impact. Where required, the width of the existing roads will be widened to ensure the passage of vehicles.

4.3.7 SUPPORTING INFRASTRUCTURE

Other Infrastructure located within the project footprint includes:

- Fencing;
- Lighting;
- Lightning protection;
- Telecommunication infrastructure;
- Stormwater channels;
- Water pipelines;
- Offices;

- Operational control centre;
- Operations and maintenance area / Warehouse / workshop;
- Ablution facilities;
- Gatehouse;
- Security building;
- Visitor's centre; and
- Substation building.

4.4 PROPOSED PROJECT DEVELOPMENT ACTIVITIES

The typical steps involved in the construction and operation of a wind energy facility is summarised below:

- Planning Phase
  - Step 1: Surveying of the development area and negotiation with affected landowners; and
  - Step 2: Final design and micro-siting of the infrastructure based on geotechnical, topographical conditions and potential environmental sensitivities.
- Construction Phase
  - Step 3: Vegetation clearing and construction of access roads/tracks (where required);
  - Step 4: Construction of turbine tower structure foundations;
  - Step 5: Assembly and erection of infrastructure on site; and
  - Step 6: Rehabilitation of disturbed areas and protection of erosion sensitive areas.
- Operation Phase
  - Step 7: Continued maintenance during operation.

4.4.1 PLANNING PHASE

Surveys will be conducted prior to construction, This will include, but will not be limited to, a geotechnical survey, site survey, and confirmation of the turbine micro-siting footprint, and survey of the on-site substation site to determine and confirm the locations of all associated infrastructure.

Site establishment will include clearing of vegetation and topsoil at the footprint of each turbine, for laydown area, batching plant and access routes. The temporary laydown area will be constructed, including establishment of the construction camp (temporary offices, storage containers, concrete batching plant etc). Site establishment will also entail the installation and/or connection of services (sanitation, electricity, etc).

4.4.2 CONSTRUCTION PHASE

The construction process will follow industry standard methods and techniques. Key activities associated with the construction phase are described in **Table 4-4**.

Table 4-4 - Construction activities

Activity	Description
Transport of components and equipment to site	Bulk materials (aggregate, steel etc.), infrastructure components (masts, blades, tower sections etc), lifting and construction equipment (excavators, trucks, compaction equipment etc.) will be sourced and transported to site via suitable National and provincial routes and designated access roads.

Activity	Description
	The infrastructure components may be defined as abnormal loads in terms of the Road Traffic Act (No. 29 of 1989) due to their large size and abnormal lengths and loads for transportation. A permit may be required for the transportation of these loads on public roads.
Excavation, earthworks and construction of foundations	Subject to the determination of founding specifications, earthworks will be required. This is likely to entail: Excavation of foundation holes to a depth of approximately 3m and pouring of concrete foundations of approximately 500 – 650m^3 from the batching plant. Concrete foundations will be constructed at each turbine location. Please note these dimensions may be larger as required by the geotechnical conditions. Levelling of the construction camp area, on-site substation area, and O&M building area, and excavation of foundations prior to construction. Excavation of trenches for the installation of underground cables.
Construction of wind turbines, site substation and BESS	A large lifting crane(s) will be required to lift the turbine sections (nacelle, blades) into place. The lifting crane/s will be brought on site and will be required to move between the turbine site. Cranes of varying sizes may be required depending on the size of the components. An on-site IPP substation will be constructed on the site. The wind turbines will be connected to the on-site IPP substation via underground or overhead (if required) up to 33kV electrical cables. The BESS will typically require the placement of multiple containers to house the BESS components.
Establishment of ancillary infrastructure	Ancillary infrastructure will include construction site office, temporary laydown area and workshop area for contractor's equipment. Establishment of the ancillary infrastructure will require the clearing of vegetation, levelling, and the excavation of foundations prior to construction.
Rehabilitation	Once all construction is completed on site and all equipment and machinery has been removed from the site, the site will be rehabilitated. On commissioning, access points to the site not required during the operation phase will be closed and prepared for rehabilitation.

4.4.3 OPERATIONAL PHASE

The proposed Igolide WEF is anticipated to have a minimum life of 20 years. The facility will operate for 24 hours, 7 days a week. While the project is self-sufficient, maintenance and monitoring activities will be required. Potable water requirements for permanent staff will be limited. During the operational phase there will be little to no Project-related movement along the servitudes as activities are limited to maintaining the servitude (including maintenance of access roads and cutting back or pruning of vegetation to ensure that vegetation does not affect the WEF), inspection of the WEF infrastructure and repairs when required. Limited impact is expected during operation since there will not be any intrusive work done outside of maintenance in the event that major damage occurs to site infrastructure. Operation of the WEF will involve the following activities, discussed below.

- Servitude and access road maintenance is aimed at eliminating hazards and facilitating continued access to the WEF. The objective is to prevent all forms of potential interruption of power supply due to overly tall vegetation/climbing plants or establishment of illegal structures within the right servitude. It is also to facilitate ease of access for maintenance activities on the WEF. During the operational phase of the project, the servitude will be maintained to ensure that the functions optimally and does not compromise the safety of persons within the vicinity of the WEF.

- Igolide WEF will develop comprehensive planned and emergency programmes through its technical operations during the operation and maintenance phase for the WEF. The maintenance activities will include:
  - Periodic physical examination of the WEF and its safety, security and integrity.
  - Defects that are identified will be reported for repair. Such defects may include defective conductors, flashed over insulators, defective dampers, vandalised components, amongst others.
  - Maintenance / repairs will then be undertaken.

4.4.4 DECOMMISSIONING PHASE

Following the initial 20-year operational period of the wind facility, the continued economic viability will be investigated. If the facility is still deemed viable, the life of the facility will be extended. The facility will only be decommissioned once it is no longer economically viable. If a decision is made to completely decommission the facility, this will be subject to a separate authorisation and impact assessment process, all the components will be disassembled, reused and recycled or disposed. The site would be returned to its current use i.e.,) mixed farming, commercial hunting, and tourism purposes. The only land use that will be directly affected might be the hunting.

4.5 NEED AND DESIRABILITY OF THE PROJECT

South Africa is faced with significant increases in electricity demand and a shortage in electricity supply. South Africa is the seventh highest coal producer in the world, with approximately 77% of the country's electricity generated from coal. This large dependence on coal and its use has also resulted in a variety of negative impacts on the environment, including the contribution to climate change. South Africa is also the highest emitter of greenhouse gases in Africa; attributed to the country's energy-intensive economy that largely relies on coal-based electricity generation.

Renewable energy development is regarded as an important contribution to meeting international and national targets of reducing reliance on fossil fuels, such as coal, which contribute towards greenhouse gas emissions and resultant climate change. The need and desirability of proposed Igolide WEF has been considered from an international, national, and regional perspective.

4.5.1 INTERNATIONAL PERSPECTIVE

The Project will greatly contribute to the countries' efforts to reduce their carbon emissions and play their role as part of the Paris Climate Accord. The Paris Agreement is a legally binding international treaty signed by 196 countries at the COP 21 in Paris, on the 12th of December 2015 to combat climate change. The goal of the Paris Accord is to limit global warming to well below 2 degrees Celsius, compared to industrial levels to avoid catastrophic natural disasters which are driven by the global temperature increase. Therefore, to achieve this long-term temperature goal, countries aim to reach global peaking of greenhouse gas emissions as soon as possible to achieve a climate-neutral world by 2050.

Failure to do so will result in catastrophic impacts on both the global and local communities, as it is predicted that as climate change increases, this would have a significant negative impact on agriculture. Studies have shown that climate change, including the drastic increases in the frequency and intensity of extremes events, have reduced food and water security, hindering efforts to meet Sustainable Development Goals.

The Kyoto Protocol, which was adopted in December 1997, is also relevant to the need of the Project. The protocol aimed to reduce the emission of gases that contribute to global warming. In force since 2005, the protocol called for reducing the emission of six greenhouse gases in 41 countries, plus the European Union, through actively cutting down on fossil fuels, or by utilising more renewable resources. The development of the Project will add capacity to the renewable energy sector of the country and strengthen the commitment and action plan to achieve the requirements, as set out in the protocol, through the generation of energy without the emission of greenhouse gases.

4.5.1 NATIONAL COMMITMENTS

The National Development Plan envisages that by 2030, South Africa would have an energy sector that produces sufficient energy to support industry at competitive prices, ensuring for poor households, while reducing carbon emissions per unit of power by about one third. The National Development Plan states the procurement of 20 000MW of renewable energy by 2030, decommissioning of 11 000MW of ageing coal-fired power stations and stepping up investments in energy-efficiency as some of the infrastructure investments that should be prioritised in the Country.

The Project is proposed in specific response to the identified energy mix of South Africa as per the requirements set out in the Integrated Resource Plan (IRP) with regards to renewable energy targets. Thermal power comprised 92.4% of the total power capacity in South Africa in 2000. With a few plants decommissioned and capacities of other technologies increasing, the share of thermal power fell during 2000 – 2019, but not my much. With international pressure to reduce emissions, the Country announced plans to increase renewable power and reduce the share of thermal power, especially coal power. These plans were elucidated in the IRP of 2016 soon after signing the Paris Agreement. Later, the intention of reduce thermal power and increase renewable power was reaffirmed in the subsequently published IRP 2018 and IRP 2019.

The need for new power generation from wind energy facilities has been identified and assessed by government at a national scale, considering the national energy requirements as well as international commitments under the Paris Agreement; therefore, the provision has been made for the inclusion of new wind power generation capacity in South Africa's energy mix. The development of the Project has the potential to contribute positive towards the identified need, while simultaneously contributing to job creation and socio-economic development, identified as a need for the Country in the NDP.

In 2011, South Africa launched a competitive procurement programme for renewable energy called the Renewable Energy Independent Power Producer Procurement Program (REIPPPP) aimed at diversifying the Country's energy mix. Under the REIPPPP, the Department of Mineral Resources and Energy (DMRE) intends to secure 14 725MW of electricity from renewable energy generation facilities utilising either onshore wind, concentrated solar thermal, solar photovoltaic, biomass, biogas, landfill gas, or hydro across a number of bidding windows, while simultaneously contributing towards socio-economic development. The REIPPPP requires renewable energy companies to create local development benefits in an effort to reduce the weight of structural and systemic issues of poverty and inequality. Therefore, in addition to electricity generation and supply, the Project will also contribute positively towards the socio-economic development of a region, over and above job creation.

The proposed Igolide WEF will also aid in overcoming the power shortages that are currently faced in the country. In 2022, South Africa witnessed its longest recorded hours of load shedding, with the power being off for 859 hours of the year as shown in **Figure 4-4**. The South African Government has taken strides to try reducing these power cuts through the implementation of bid Windows in REIPPP and lifting the independent power generation threshold to 100MW, but it is still expected that the country will undergo more load shedding.

Over the years the construction of Wind facilities has become cheaper, and less time-consuming. Thus, acting as a faster and more efficient method of meeting the ever-growing demand for electricity in the country. In addition, the Council for Scientific and Industrial Research (CSIR) reported that renewable energy assisted in relieving pressure on the constrained South African power system during load shedding in the first quarter of 2019. This indicates that renewable energy is a key factor in ensuring that the country does not face further load shedding in the future.

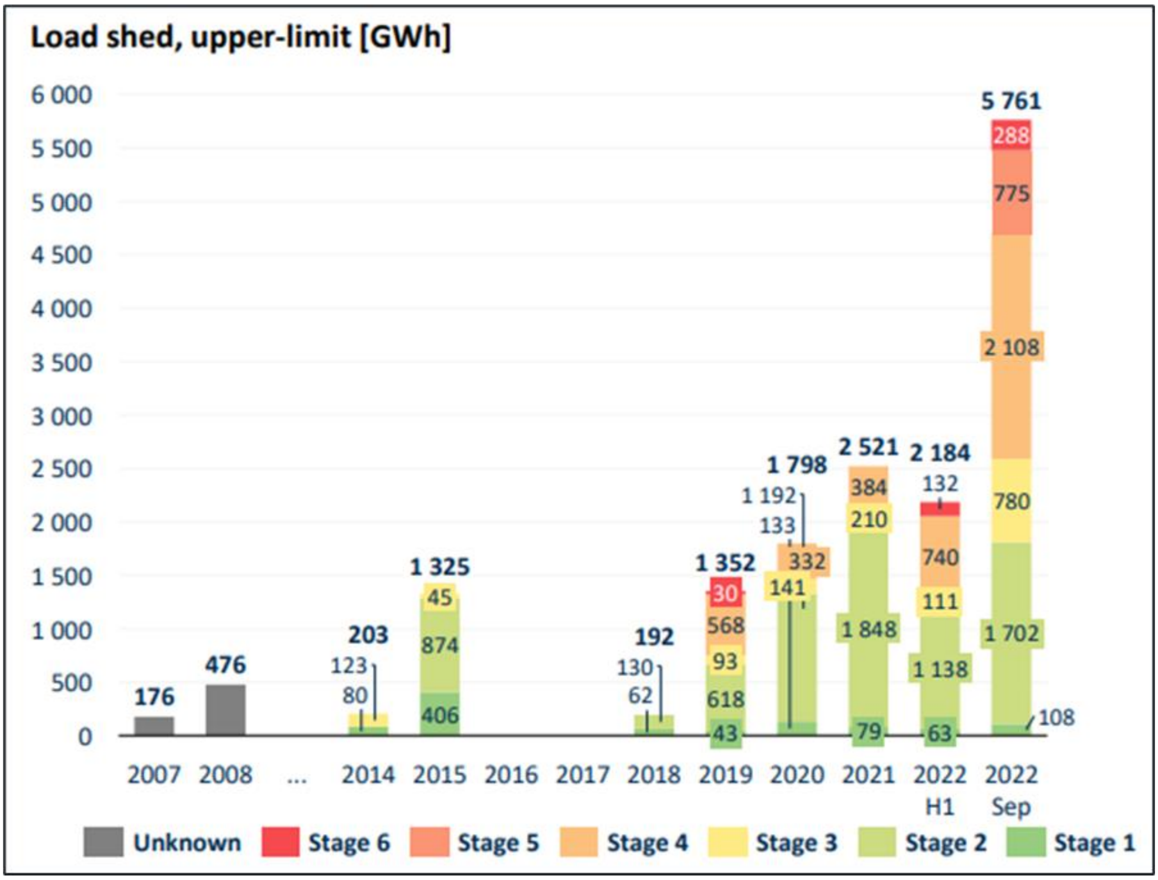


Figure 4-4 - Load shedding hours over the years in South Africa

Source: CSIR (2022)

4.5.2 NATIONAL PERSPECTIVE

4.5.2.1 National

Load shedding is the single biggest constraint on South Africa's economy. This has devasted critical economic sectors such as manufacturing, hospitality, tourism, mining and agriculture. Therefore, the Project will aid in assisting in overcoming the power shortages that are currently faced in the country. In 2022, South Africa endured 192 720 minutes of loadshedding, which is 200% more than any other year. The South African Government has taken strides to try reducing these power cuts through the implementation of bid Windows in REIPPPP and lifting the independent power generation threshold to 100 MW, but it is still expected that the country will undergo more load shedding. Over the years the construction of Wind facilities has become cheaper, and less time-consuming. Thus, acting as a faster and more efficient method of meeting the ever-growing demand for electricity in the country. Furthermore, after the COP26, South Africa signed an international partnership which will facilitate the funding of USD 8.5 billion from Germany, France, the USA, the UK and, the European Union over the next three to five years to aid in the country's transition towards a low-carbon economy. This opens an opportunity for renewable energy Independent Power Producers (IPPs) to aid in the countries quest to reduce its GHG emissions and help resolve the ongoing electricity crisis in the country.

The Council for Scientific and Industrial Research (CSIR) reported that renewable energy assisted in relieving pressure on the constrained South African power system during load shedding in the first quarter of 2019. This goes to show that renewable energy is a key factor in ensuring that the country does not face further load shedding in the future.

4.5.2.2 Provincial

To deal with the energy crisis, the Gauteng Provincial Government (GPG) hosted the Energy Expo on 16 February 2023 under the theme "Growing Gauteng Together towards a sustainable energy mix". The Expo aimed to provide a platform for showcasing solutions and technologies than can be incorporated into the GPG plans as well as to gain insights into stakeholder energy plans. The Gauteng government is committed to working with all spheres of government and stakeholders to end load shedding and ensure a stable supply of affordable power.

The provincial government's strategic intent includes the following:

- Ensuring energy security for desirable economic growth.
- Ensuring universal, affordable and modern energy to all citizens of the Gauteng City Region.
- Diversifying energy source within the province to include renewables and other forms of energy.
- Promoting energy efficiency measures across of sectors of the economy and improving provincial energy governance and administration.

Additionally, the Gauteng government has established the Energy Emergency Council to respond to the worsening electricity supply crisis.

5 PROJECT ALTERNATIVES

The EIA Regulations of 2014 (as amended) require that the S&EIA process must identify and describe alternatives to the proposed activity that were considered, or motivation for not considering alternatives. Different types or categories of alternatives could be considered including different locations, technology types, and project layouts. At the scoping level the evaluation of alternatives is provided at a high level in the absence of detailed environmental comparators for each alternative; due to the two-staged nature of the S& EIA process it is more suitable to identify and describe the potential alternatives on a high-level basis within scoping, and to perform a more detailed analysis of alternatives (with environmental comparators) in the EIA phase of the project. As such, the S&EIA will holistically assess the impacts and risks of each alternative comparatively, as suggested by Appendix 2 of the EIA Regulations of 2014 (as amended).

All alternatives outlined below are considered both feasible and reasonable. An alternatives assessment has been undertaken and included in **Section 11.3**.

5.1 TECHNOLOGY ALTERNATIVES

Based on the extensive in-house scoping study done in the province, the Igolide WEF has been selected based on several factors, namely: wind resource, grid capacity and access to the national electricity grid, topography, site access, existing competition, land availability, land use and suitability, landowner support, and environmental constraints. These factors are further explained in the subsections below:

5.1.1 WIND RESOURCE

Wind resource is the first main driver of site selection and project viability when considering the development of wind energy facilities. The project site, which is located near the town of Fochville in the Gauteng Province, has good wind resource potential. The wind resource for the development site has been monitored using on-site monitoring devices over approximately 16 months and has proven to be competitive and equal to other projects in the country. The project developer explored the wind resource around South Africa, with specific focus on the Gauteng Province, and highlighted this area as being a strong site from a resource perspective. This viable resource ensures that best value for money is gained for the economy of South Africa.

5.1.2 GRID CAPACITY AND ACCESS TO THE NATIONAL ELECTRICITY GRID

Grid capacity is one of the main constraints to the expansion of wind energy projects and renewable energy projects at large in South Africa. The failure to appoint any wind projects in Bid Window 6 was attributed to an unavailability of grid capacity in the Eastern, Northern and Western Cape provinces, where all the wind projects submitted as part of Bid Window 6 are located. Unlike the Cape Provinces of South Africa, where there is abundant wind resources but no available grid capacity, the Project site provides the opportunity to connect to the Eskom grid. For this reason, the project developer, is developing the proposed Igolide Wind Energy Facility within the Gauteng area.

A key factor in the siting of any power generation project is a viable grid connection. The anticipated grid connection (subject to a separate environmental assessment and authorisation process) is a 132kV on-site substation (comprising IPP and Eskom portions) and a 132kV single or double circuit overhead power line from the on-site substation to an existing substation. Various substations to which the Igolide WEF can connect exist in the vicinity of the project site.

5.1.3 TOPOGRAPHY, SITE ACCESS, AND COMPETITION

The project site is characterised by sloping plains and low hills. The altitude ranges from 1 500m at the lowest point in the west, up to ~1 640m at the highest point in the central part of the site. High lying areas where wind resources are at their best are favoured during the site selection process for a wind energy facility, and the project site fits this criterion.

Access to the project site is ample with the presence of existing roads mainly consisting of national and regional roads. The project site is located to the south of the N12 national road, and to the east of the R500. The secondary roads off the N12 provide direct access to the project site and either option may be utilised to access the Project site during the life of the project.

There is minimal competition in the area, with regards to renewable energy facilities, specifically wind energy facilities; thus, the Project will likely be the one of the first few wind farms in the area and will act as one of the pioneering developments and open opportunities for other wind energy developments in the area.

5.1.4 LAND AVAILABILITY

In order to develop the proposed project with a contracted capacity of up to 100MW, sufficient space is required. The preferred project site was identified within the Gauteng Province, near the Fochville area, following the confirmation of a feasible wind resource from on-site wind measurements taken over a 16-month period. The properties included in the project site are privately – owned parcels available in the area for a development of this nature through agreement with landowners and are deemed technically feasible by the project developer for such development to take place. The combination of the affected properties has an extent of ~680ha, which was considered by the project developer as sufficient for the development of the project.

5.1.5 LAND USE AND SUITABILITY

The current land use of the Project site is an important consideration in site selection to limit disruption of existing land use parcels. There is some evidence of crop production within the western section of the site. It is important to note that a wind development, dissimilar to other power generation facilities, does not result in whole-scale disturbance. For example, Gouda Wind Farm, which is located outside the town of Gouda in the Western Cape province, has shown that it is possible to construct a wind farm in an agricultural area and that crop production can continue around the wind turbines while renewable energy is generated by the turbines.

5.1.6 LANDOWNER SUPPORT

The selection of a site where the landowner is supportive of the development of renewable energy is essential for ensuring the success of the project. The owner of the properties affected by the proposed Project does not view the development as a conflict with their current or planned land use practices. The support for the development to be undertaken on the affected properties has been solidified by the provision of consent for the project to proceed on the property through the signing of a consent form.

5.1.7 ENVIRONMENTAL CONSTRAINTS

Following confirmation of the Project site as being technically feasible for the development of a wind energy facility, the project developer commenced with desktop environmental screening of the site to identify the main constraints and determine whether there were any potential fatal flaws or significant no-go areas within the site that may compromise or limit the buildable area and the potential for generating up to 100MW. This is a common approach in the development of renewable energy projects in order to inform the placement of infrastructure for further investigation in the Scoping and Environmental Impact Assessment process.

5.2 TECHNOLOGY ALTERNATIVES

5.2.1 RENEWABLE ENERGY TECHNOLOGY ALTERNATIVES

Through desktop screening, and monitoring wind resource using on-site monitoring devices over 16 months, the project developer has identified the site for the Igolide WEF as being competitive from a wind resource perspective. The project developer is therefore considering wind technology as a feasible option for implementation at the identified site based on the outcome of the onsite wind monitoring. There is a limited range of alternative technologies (turbines) available for commercial-scale wind energy facilities. Furthermore, the technology is constantly evolving. The project developer therefore confirms wind energy technology as the preferred technology alternative for the development of the project. No further renewable energy technology alternatives are considered in the S&EIA process.

5.2.2 BATTERY ENERGY STORAGE SYSTEM TECHNOLOGY ALTERNATIVES

The Proponent is considering two types of preferred battery technologies for the BESS, that is, either Solid State Lithium (SSL) or Vanadium Redox Flow (VRF) Battery Energy Storage Systems. It is important to note that the selection of specific technology will only be determined following EPC. Therefore, both technologies are currently being considered.

5.2.2.1 Lithium Solid State Batteries

Solid-State Battery consists of multiple battery cells that are assembled together to form modules. Each cell contains a positive electrode, a negative electrode and an electrolyte. The BESS will comprise multiple battery units or modules housed in shipping containers and/or an applicable housing structure which is delivered pre-assembled to the project site. Containers are usually raised slightly off the ground and layout out is rows. They can be stacked if required although this may increase the risk of events in one container spreading to another container. Supplementary infrastructure and equipment may include substations, power cables, transformers, power converters, substation buildings & offices, HV/MV switch gear, inverters and temperature control equipment that may be positioned between the battery containers. The solid-state batteries that are being considered are Lithium-ion systems.

In Lithium battery technologies, energy storage and release is provided by the movement of lithium ions from the negative electrode to the positive electrode during discharge and back when charging. Solid-State lithium (SSL) batteries have become increasing popular due to their high energy density, low self-discharge and long lifetime and cycling performances.

5.2.2.2 Vanadium redox Flow Battery

The project will employ utility scale batteries. These energy storage systems can be supplied either as containerized units or as a fixed installation within a building etc. Due to the proposed size of the facility (100MW) the Igolide WEF is currently envisioned as having units housed within a large battery building.

All electrochemical energy storage systems convert electrical energy into chemical energy when charging, and the process is reversed when discharging. With conventional batteries, the conversion and storage take place in closed cells. With redox flow batteries, however, the conversion and storage of energy are separated. Redox flow batteries differ from conventional batteries in that the energy storage material is conveyed by an energy converter. This requires the energy storage material to be in a flowable form. In redox flow batteries, charging and discharging processes can take place in the same cell. Redox flow batteries thus have the distinguishing feature that energy and power can be scaled separately. The power determines the cell size, or the number of cells and the energy is determined by the amount of the energy storage medium. In theory, there is no limit to the amount of energy that can be produced and/or stored thereby allowing for scalability of these systems. VRF battery is considered to have a large cycle life, independent power and energy ratings, relatively poor round trip, moderate cost and no self-discharge.

Figure 5-1 shows the general operating principle of redox flow batteries. The energy conversion takes place in an electrochemical cell which is divided into two half cells. The half cells are separated from each other by an ion-permeable membrane or separator, so that the liquids of the half cells mix as little as possible. The separator ensures a charge balance between positive and negative half cells, ideally without the negative and positive.

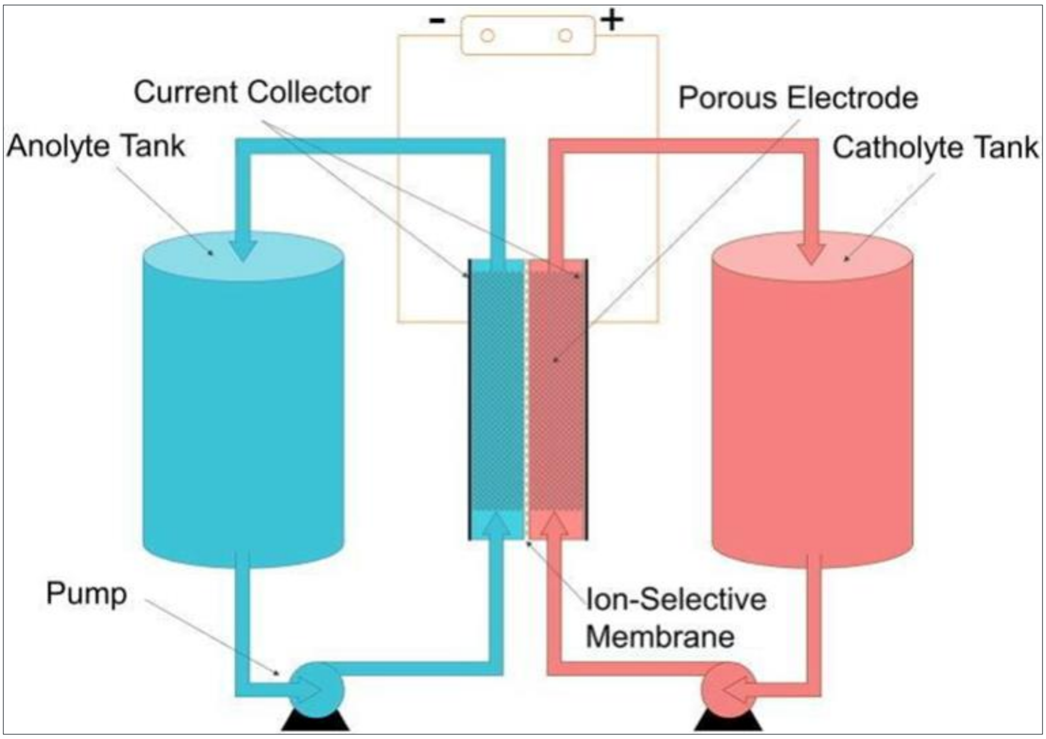


Figure 5-1 - Schematic Diagrams of Redox Flow BESS Systems (Source: Wikipedia)

The potential risks and impacts of the proposed BESS at the Igolide WEF will be assessed through a Qualitative Risk Assessment to be undertaken in the EIA phase. This study will also indicate how impacts will be minimised.

5.3 NO-GO ALTERNATIVE

In the “no project” alternative, the Igolide WEF project will not be developed. In this scenario, there could be a missed opportunity to address the need for increase in renewable energy generation in an effort to mitigate against concerns of climate change and exploitation of non-renewable resources. The no-go alternative would not assist in responding to the growing electricity demand in South Africa and would not contribute to the reliability of electricity supply at a national scale. Conversely, negative environmental impacts of the project (as outlined in Section 8) associated with the development of the proposed project would be avoided.

Specialists have considered the no-go alternative and the following has been concluded:

- Agriculture:

  The no-go alternative considers impacts that will occur to the agricultural environment in the absence of the proposed development. The development compliments agriculture by providing an additional income source, without excluding agriculture from the land, or decreasing production. Therefore, the negative agricultural impact of the no-go alternative is more significant than that of the development, and so, from an agricultural impact perspective, the proposed development is the preferred alternative. In addition, the no-go option would prevent the proposed development from contributing to the environmental, social and economic benefits associated with the development of renewable energy in South Africa.

- Heritage:

  If the project were not implemented, then the site would stay as it currently is (impact significance of neutral). Although the heritage impacts with implementation would be greater than the existing impacts, the loss of socio-economic benefits is more significant and suggests that the No-Go option is less desirable in heritage terms.

- Traffic:

  The no-go alternative implies that the proposed development of the WEF does not proceed. This would mean that there will be no negative environmental impacts and no traffic impact on the surrounding network during the construction and decommissioning phases of the proposed WEF. However, this would also mean that there would be no socio-economic benefits to the surrounding communities, and it will not assist government in meeting its' targets for renewable energy. Hence, the no-go alternative is not a preferred alternative.

- Visual:

  The 'no-go' alternative is the option of not undertaking the proposed project. Hence, if the 'no-go' option is implemented, there would be no development. The area would thus retain its visual character and sense of place and no visual impacts would be experienced by any locally occurring receptors.

- Social:

  The primary goal of the Project is to assist in providing additional capacity to Eskom to assist in addressing the current energy supply constraints. The project also aims to reduce the carbon footprint associated with energy generation. As indicated above, energy supply constraints and the associated load shedding have had a significant impact on the economic development of the South African economy. South Africa also relies on coal-powered energy to meet more than 90% of its energy needs. South Africa is therefore one of the highest per capita producers of carbon emissions in the world and Eskom, as an energy utility, has been identified as the world's second largest producer carbon emissions.

The No-Development option would represent a lost opportunity for South Africa to improve energy security and supplement is current energy needs with clean, renewable energy. Given South Africa's current energy security challenges and its position as one of the highest per capita producers of carbon emissions in the world, this would represent a significant negative social cost.

6 GOVERNANCE FRAMEWORK

6.1 NATIONAL LEGAL AND REGULATORY FRAMEWORK

The South African regulatory framework establishes well-defined requirements and standards for environmental and social management of industrial and civil infrastructure developments. Different authorities at both national and regional levels carry out environmental protection functions. The applicable legislation and policies are shown in **Table 6-1**.

Table 6-1 – Applicable National Legislation[6]

Legislation	Description of Legislation and Applicability
The Constitution of South Africa (No. 108 of 1996)	The Constitution cannot manage environmental resources as a stand-alone piece of legislation hence additional legislation has been promulgated in order to manage the various spheres of both the social and natural environment. Each promulgated Act and associated Regulations are designed to focus on various industries or components of the environment to ensure that the objectives of the Constitution are effectively implemented and upheld in an on-going basis throughout the country. In terms of Section 7, a positive obligation is placed on the State to give effect to the environmental rights.
National Environmental Management Act (No. 107 of 1998)	In terms of Section 24(2) of the NEMA, the Minister may identify activities, which may not commence without prior authorisation. The Minister thus published GNR 983 (as amended) (Listing Notice 1), GNR 984 (as amended) (Listing Notice 2) and GNR 985 (as amended) (Listing Notice 3) listing activities that may not commence prior to authorisation. The regulations outlining the procedures required for authorisation are published in the EIA Regulations of 2014 (GNR 982) (as amended). Listing Notice 1 identifies activities that require a BA process to be undertaken, in terms of the EIA Regulations, prior to commencement of that activity. Listing Notice 2 identifies activities that require an S&EIR process to be undertaken, in terms of the EIA Regulations, prior to commencement of that activity. Listing Notice 3 identifies activities within specific areas that require a BA process to be undertaken, in terms of the EIA Regulations, prior to commencement of that activity. WSP undertook a legal review of the listed activities according to the proposed project description to conclude that the activities listed in in this section are considered applicable to the development: A S&EIR process must be followed. An EA is required and has been applied for with the DFFE.

[6] It should be noted that all dimensions outlined in relation to Listing Notice 1, 2 and 3 are provisional and are subject to final design.

Legislation	Description of Legislation and Applicability
Listing Notice 1: GNR 983	**Activity 11(i)** *The development of facilities or infrastructure for the transmission and distribution of electricity—* *(i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts* *excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is —* *(a) temporarily required to allow for maintenance of existing infrastructure;* *(b) 2 kilometres or shorter in length;* *(c)within an existing transmission line servitude; and* *(d) will be removed within 18 months of the commencement of development.* **Description:** Internal distribution electrical infrastructure required to connect the facility to the grid will include a 33/132kV on-site IPP substation and 33kV cabling (buried or overhead). The Facility is located outside urban areas. Exclusions: In addition, the development of the activity does not trigger any of the exclusions as outlined below: (a) The proposed project will not be temporary to allow for maintenance. (b) The proposed infrastructure will be more than 2km in length. (c) The proposed infrastructure is not within an existing transmission line servitude. (d) The proposed infrastructure will not be removed within 18 months and is not considered temporary.
	Activity 12(ii)(a)(c) *The development of—* *(ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs—* *(a) within a watercourse; or* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.* *excluding—* *(aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;* *(bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;* **Description:** The physical footprint of internal access roads and electrical cabling required to connect the various components of the facility will exceed 100m^2 within delineated watercourses on site, or within 32m of the outer extent of the

Legislation	Description of Legislation and Applicability
	delineated watercourses on site. The footprint of the infrastructure within the watercourse and 32m of the outer extent of the delineated watercourse will be approximately 5 000 m^2 (0.5 ha). Exclusions: In addition, the development of the activity does not trigger any of the exclusions as outlined below: (aa) the development of infrastructure or structures will not occur within existing ports or harbours. Therefore, will not increase the development footprint of the port or harbour; (bb) The development activities for the proposed project are not related to the development of a port or harbour, therefore, case activity 26 in Listing Notice 2 of 2014 is not applicable.
	Activity 14 *The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 cubic metres.* **Description:** The facility will require the storage and handling of dangerous goods, including fuel, cement, and combustible and flammable liquids such as oils, lubricants and solvents, where such storage will occur inside containers with a combined capacity greater than $80m^3$ but not exceeding $500m^3$. The following estimated maximum capacities of dangerous good will be stored on site: ▪ Concrete Batching: ~145 m^3 ▪ Fuel stores (Petrol and/or Diesel): ~$250m^3$ ▪ Paint, grease, transformer oils, construction chemicals, lubricants: ~$100m^3$
	Activity 19 *The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse.* *but excluding where such infilling, depositing, dredging, excavation, removal or moving—* *(a) will occur behind a development setback;* *(b) is for maintenance purposes undertaken in accordance with a maintenance management plan [or]* *(c)falls within the ambit of activity 21 in this Notice, in which case that activity applies;* *(d)occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or* *(e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.*

Legislation	Description of Legislation and Applicability
	Description: Internal access roads and stormwater control infrastructure, as well as electrical cabling required to connect the various components of the facility will collectively require the excavation, infilling or removal of soil exceeding 10m^3 from delineated watercourses on site. The footprint of the infrastructure within the watercourse and 32m of the outer extent of the delineated watercourse will be approximately 5 000 m^2 (0.5 ha). Exclusions: In addition, the development of the activity does not trigger any of the exclusions as outlined below: (a) The project will not occur behind a development setback; (b) The project is not intended for maintenance purposes undertaken in accordance with a maintenance management plan; (c) The project does not fall within the ambit of activity 21 in this Notice and therefore, activity 19 of LN 1 applies; (d) the project does not occur within existing ports or harbours, therefore, it will not increase the development footprint of the port or harbour; or (e) The project development is not related to the development of a port or harbour, therefore, activity 26 in Listing Notice 2 of 2014 does not apply.
	Activity 24(ii) *The development of a road—* *(ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;* *but excluding a road—* *(a) which is identified and included in activity 27 in Listing Notice 2 of* *2014;* *(b) where the entire road falls within an urban area; or* *(c) which is 1 kilometre or shorter.* **Description:** Internal access roads required by the facility will be between 8m and 10m wide. Where required for turning circle/bypass areas, however, access or internal roads may be up to 20m to allow for larger component transport. The access and internal roads will be placed within a corridor of up to 20m width to accommodate cable trenches, stormwater channels and turning circle/bypass areas of up to 20m. Exclusions: In addition, the development of the activity does not trigger any of the exclusions as outlined below: (a) The proposed road infrastructure does not trigger activity 27 in Listing Notice 2 of 2014. (b) The proposed road infrastructure will fall outside an urban area.

Legislation	Description of Legislation and Applicability
	(c) The proposed road will be more than 1 kilometre in length.
	Activity 28(ii) *Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development:* *(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 ha.* *Excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.* **Description:** The facility is considered a commercial and/or industrial development and is located on several farm portions outside an urban area, used for agricultural and game farming purposes. The total area to be developed for the facility (footprint) is approximately 64ha. Exclusions: In addition, the development of the activity does not trigger any of the exclusions as the land has not been developed for residential, mixed, retail, commercial, industrial or institutional purposes.
	Activity 48(i)(a)(c) *The expansion of—* *(i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more;* *where such expansion occurs—* *(a) within a watercourse;* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.* *excluding—* *(aa) the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;* *(bb) where such expansion activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;* *(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies;* *(dd) where such expansion occurs within an urban area; or* *(ee) where such expansion occurs within existing roads, road reserves or railway line reserves.* **Description:** Transport of large infrastructure components related to the facility will require the expansion of existing access and/or internal roads, culverts or similar

Legislation	Description of Legislation and Applicability
	drainage crossing infrastructure collectively exceeding 100m^2 or more beyond existing roads or road reserves located within delineated watercourses on site, or within 32m of the outer extent of the delineated watercourses on site. The footprint of the infrastructure within the watercourse and 32m of the outer extent of the delineated watercourse will be approximately 5 000 m^2 (0.5 ha). Exclusions: In addition, the development of the activity does not trigger any of the exclusions as outlined below: (aa) The proposed infrastructure does not relate to the expansion of infrastructure or structures within existing ports or harbours and will not increase the development footprint of the port or harbour; (bb) The proposed infrastructure does not relate to the development of a port or harbour. Therefore activity 26 in Listing Notice 2 of 2014 does not apply; (cc) Activities listed in activity 14 in Listing Notice 2 of 2014 does not apply. However, both activity 12 of LN 1 and activity 14 in LN 3 are applicable as they address different aspects. Activity 12 of LN 1 addresses the footprint of the disturbance, whilst activity 14 of LN 3 addresses the geographical aspect of the proposed development and its location within a protected area. (dd) Does not occur within an urban area; (ee) does not occur within existing roads, road reserves or railway line reserves.
	Activity 56(ii) *The widening of a road by more than 6 m, or lengthening of a road by more than 1 km –* *(ii) where no reserve exists, where the existing road is wider than 8 metres.* *Excluding where widening or lengthening occur inside urban areas.* **Description:** Transport of large infrastructure components related to the facility will require the widening of existing access and/or internal roads by more than 6m and the lengthening of existing access and/or internal roads by more than 1km, where no reserve exists and where such road is wider than 8 metres. The facility is located within a rural area. Subject to detail design widening up to 20m for turning circle/bypass areas is anticipated, thereby exceeding the threshold value and triggering this activity. Exclusions: In addition, the development of the activity does not trigger any of the exclusions as the proposed road will be developed outside an urban area.
Listing Notice 2: GNR 984	**Activity 1** *The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs:*

Legislation	Description of Legislation and Applicability
	(a) within an urban area; or *(b) on existing infrastructure.* **Description:** The project comprises a Wind Energy Facility of up to 100MW. <u>Exclusions:</u> In addition, the development of the activity does not trigger any of the exclusions as the proposed facility will be developed outside an urban area and will not be on existing infrastructure.
	Activity 15 *The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for—* *(i) the undertaking of a linear activity; or* *(ii) maintenance purposes undertaken in accordance with a maintenance management plan* **Description:** The facility will require the clearance of indigenous vegetation of ~ 64ha. <u>Exclusions:</u> In addition, the development of the electrical infrastructure does not trigger any of the exclusions as the clearance of indigenous vegetation is not for a linear activity and is not for maintenance purposes.
Listing Notice 3: GNR 985	**Activity 4(c)(iv)** *The development of a road wider than 4 metres with a reserve less than 13,5 metres—* *c)Gauteng:* *ii. National Protected Area Expansion Strategy Focus Areas;* *iv. Sites identified as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans;* *vii. Sites identified as high potential agricultural land in terms of Gauteng Agricultural Potential Atlas;.* **Description:** Internal access roads required for the facility will be between 8m and 10m wide, increasing up to 20m where required for turning circle/bypass areas. The exact values will be confirmed following detailed design. The proposed roads required for the facility will be located within and may require vegetation clearance or disturbance within Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA) The site falls within an area that is classified as a Protected Agricultural Area in the Gauteng Province.

Legislation	Description of Legislation and Applicability
	The study site is part of the NPAES (NPAES 2018). Although none of the turbines are located within the NPAES, linear infrastructure such a roads and underground cables will traverse the NPAES.
	Activity 10(c)(iv): *The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80cubic metres.* *c. Gauteng:* *ii. National Protected Area Expansion Strategy Focus Areas;* *iv. Sites identified as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans;* *vii. Sites identified as high potential agricultural land in terms of Gauteng Agricultural Potential Atlas* **Description:** The facility will require the storage and handling of dangerous goods, including fuel, cement, and combustible and flammable liquids such as oils, lubricants and solvents, where such storage will occur inside containers with a combined capacity greater than 80m^3 but not exceeding 500m^3(c)(iv). The proposed roads required for the facility will be located within and may require vegetation clearance or disturbance within Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA) The site falls within an area that is classified as a Protected Agricultural Area in the Gauteng Province. The study site is part of the NPAES (NPAES 2018). Although none of the turbines are located within the NPAES, linear infrastructure such a roads and underground cables will traverse the NPAES.
	Activity 12: *The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan—* *c) Gauteng:* *ii. Within Critical Biodiversity Areas or Ecological Support Areas identified in the Gauteng Conservation Plan or bioregional plans.* **Description:** The facility will require the clearance of more than 300m2 of indigenous vegetation, which will partially include the clearance of Rand Highveld Grassland and Gauteng Shale Mountain Bushveld vegetation types, which are classified as “Vulnerable” and “Least Concern”, respectively (NEMA 2011, Skowno et al., 2019) in the Gauteng Province. The facility will require the clearance of indigenous vegetation of ~ 64ha some of which will be located within Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA).

Legislation	Description of Legislation and Applicability
	Activity 14(ii)(a)(c)(iv) *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;* *Excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.* *c) Gauteng:* *ii. National Protected Area Expansion Strategy Focus Areas* *iv. Sites identified as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans.* **Description:** The facility will require the development of internal roads and/or access roads, culverts or similar drainage crossing infrastructure around the site with a physical footprint exceeding 10m^2 within the delineated watercourses on site or within 32m of the outer extent of the delineated watercourses on site. The footprint of the infrastructure within the watercourse and 32m of the outer extent of the delineated watercourse will be approximately 5 000 m^2 (0.5 ha).In addition, the roads associated with the facility will be located within Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA) within the Gauteng Province. The study site is part of the NPAES (NPAES 2018). Although none of the turbines are located within the NPAES, linear infrastructure such a roads and underground cables will traverse the NPAES.
	Activity 18(c)(iv) *The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.* *c) Gauteng:* *ii. National Protected Area Expansion Strategy Focus Areas;* *iv. Sites identified as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans;* *vii. Sites identified as high potential agricultural land in terms of Gauteng Agricultural Potential Atlas;* **Description:** Transport of large infrastructure components related to the facility will require the widening of existing access and/or internal roads by more than 4m, and the lengthening of existing access and/or internal roads by more than 1km. The facility is located within a rural area. The facility will be located within Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA)(iv) in the Gauteng Province.

Legislation	Description of Legislation and Applicability
	The site falls within an area that is classified as a Protected Agricultural Area in the Gauteng Province. The study site is part of the NPAES (NPAES 2018). Although none of the turbines are located within the NPAES, linear infrastructure such a roads and underground cables will traverse the NPAES.
	Activity 23(ii)(a)(c)(iv) *The expansion of* *(ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more;* *Where such expansion occurs-* *(a) within a watercourse* *Excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.* *c) Gauteng:* *ii. National Protected Area Expansion Strategy Focus Areas;* *iv. Sites identified as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans;* **Description:** Transport of large infrastructure components related to the facility will require the expansion of existing access and/or internal roads, culverts or similar drainage crossing infrastructure collectively exceeding 10m^2 or more within delineated watercourses on site, or within 32m of the outer extent of the delineated watercourses on site. The exact values will be confirmed at detailed design, however, these will be within the thresholds relevant to this Listed Activity and therefore within the threshold values and triggering this activity. In addition, the development activity contemplated will be located within Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA) in the Gauteng Province. The study site is part of the NPAES (NPAES 2018). Although none of the turbines are located within the NPAES, linear infrastructure such a roads and underground cables will traverse the NPAES.
Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes (GNR 320, 20 March 2020 and GNR 1150, 30 October 2020)	The protocols provide the criteria for specialist assessment and minimum report content requirements for impacts for various environmental themes for activities requiring environmental authorisation. The protocols replace the requirements of Appendix 6 of the EIA Regulations, 2014, as amended. The assessment and reporting requirements of the protocols are associated with a level of environmental sensitivity identified by the national web based environmental screening tool (screening tool). The following environmental themes were applicable to the Igolide WEF project: ▪ Agriculture Theme ▪ Animal Species Theme ▪ Aquatic Biodiversity Theme ▪ Archaeological and Cultural Heritage Theme

Legislation	Description of Legislation and Applicability
	▪ Avian Theme ▪ Civil Aviation (Wind) Theme ▪ Defence Theme ▪ Landscape (Wind) Theme ▪ Palaeontology Theme ▪ Plant Species Theme ▪ Radio Frequency Interference (RFI) Theme ▪ Terrestrial Biodiversity Theme
Renewable Energy Development Zones and Strategic Transmission Corridors	On 16 February 2018, the DFFE gazetted the Renewable Energy Development Zones (REDZs) and Strategic Transmission Corridors and Procedures for the Assessment of Large-scale Wind and Solar Photovoltaic Energy Development Activities (GN 114) and Grid Infrastructure (GN 113). Subsequently, on 26 February 2021 a further three REDZ were gazetted (GN 142). The procedure allows for wind and solar PV activities within the eight REDZs and electricity grid development within the five power corridors to be subjected to a BA and not a full S&EIA process. In addition, the timeframes associated with the decision on the application is reduced from 107 days to 57 days. **The proposed Igolide WEF is not located within a REDZ.**
National Environmental Management: Waste Act (59 of 2008) (NEM:WA)	This Act provides for regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation. The Act also provides for the licensing and control of waste management activities through GNR. 921 (2013): List of Waste Management Activities that Have, or are Likely to Have, a Detrimental Effect on the Environment. The proposed project does not constitute a Listed Activity requiring a Waste Management Licence (WML) as defined in GNR 921. However, the contents of this report will include reasonable measures for the prevention of pollution and good international industry practice (GIIP).
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) was promulgated in June 2004 within the framework of NEMA to provide for the management and conservation of national biodiversity. The NEMBA's primary aims are for the protection of species and ecosystems that warrant national protection, the sustainable use of indigenous biological resources, the fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources. In addition, the NEMBA provides for the establishment and functions of a South African National Biodiversity Institute (SANBI). SANBI was established by the NEMBA with the primary purpose of reporting on the status of the country's biodiversity and conservation status of all listed threatened or protected species and ecosystems. The terrestrial biodiversity assessment (**Appendix H.1**) identified that the Facility will be located within Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA). The Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA) Regulations with regards to alien and invasive species have been

Legislation	Description of Legislation and Applicability
	superseded by the National Environmental Management: Biodiversity Act, 2004 (Act no. 10 of 2004) – Alien and Invasive Species (AIS) Regulations which became law on 1 October 2014. Specific management measures for the control of alien and invasive plants have been included in the Environmental Management Programme (EMPr).
National Environmental Management Protected Areas Act (No. 57 of 2003)	The purpose of the National Environmental Management Protected Areas Act (No. 57 of 2003) (NEMPAA) is to, *inter alia*, provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes. To this end, it provides for the declaration and management of various types of protected areas. Section 50(5) of NEMPAA states that "no development, construction or farming may be permitted in a nature reserve or world heritage site without the prior written approval of the management authority." According to the National Protected Area Expansion Strategy (NPAES, 2018), the study site is part of the NPAES (NPAES 2018). None of the turbines are located in the areas demarcated by the NPAES.
The National Water Act (No. 36 Of 1998)	The National Water Act, 1998 (Act No. 36 of 1998) (NWA) provides the framework to protect water resources against over exploitation and to ensure that there is water for social and economic development, human needs and to meet the needs of the aquatic environment. The Act defines water source to include watercourses, surface water, estuary or aquifer. A watercourse is defined in the Act as a river or spring, a natural channel in which water flows regularly or intermittently, a wetland, lake or dam into which or from which water flows, and any collection of water that the Minister may declare a watercourse. Section 21 of the Act outlines a number of categories that require a water user to apply for a Water Use License (WUL) and Section 22 requires water users to apply for a General Authorisation (GA) with the Department of Water and Sanitation (DWS) if they are under certain thresholds or meet certain criteria. The list of water uses applicable to the proposed Project include: a) Taking water from a water resource; c) Impeding or diverting the flow of water in a watercourse; g) Disposing of waste in a manner which may detrimentally impact on a water resource; i) Altering the bed, banks, course or characteristics of a watercourse; The DWS will make the final decision on water uses that are applicable to the project through a pre-application meeting after which a Water Use Authorisation Application (WUA) as determined by the risk assessment will be undertaken in compliance with procedural regulations published by the DWS within General Notice 267 (GN267). These regulations specify required information per water use and the reporting structure of required supporting technical information.
The National Heritage Resources Act (No. 25 Of 1999)	The National Heritage Resource Act (Act No. 25 of 1999) (NHRA) serves to protect national and provincial heritage resources across South Africa. The NHRA provides for the protection of all archaeological and palaeontological sites, the conservation and care of cemeteries and graves by the South

Legislation	Description of Legislation and Applicability
	African Heritage Resources Agency (SAHRA) and lists activities that require any person who intends to undertake to notify the responsible heritage resources agency and furnish details regarding the location, nature, and extent of the proposed development. Part 2 of the NHRA details specific activities that require a Heritage Impact Assessment (HIA) that will need to be approved by SAHRA. Parts of Section 35, 36 and 38 apply to the proposed project, principally: ▪ Section 35 (4) - No person may, without a permit issued by the responsible heritage resources authority- • destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite; • destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite. ▪ Section 38 (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as- • any development or other activity which will change the character of a site— (i) exceeding 5 000 m^2 in extent, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development. In terms of Section 38(8), approval from the heritage authority is not required if an evaluation of the impact of such development on heritage resources is required in terms of any other legislation (such as NEMA), provided that the consenting authority ensures that the evaluation of impacts fulfils the requirements of the relevant heritage resources authority in terms of Section 38(3) and any comments and recommendations of the relevant resources authority with regard to such development have been taken into account prior to the granting of the consent. However, should heritage resources of significance be affected by the proposed Igolide WEF, a permit is required to be obtained prior to disturbing or destroying such resources as per the requirements of Section 48 of the NHRA, and the SAHRA Permit Regulations (GN R668). A Heritage Report (**Appendix H-6**) has been carried out by a suitably qualified specialist, revealing: ▪ Line of planted stones within the study area, which relate to earlier farming activities in the area. The proposed project has been loaded onto the SAHRIS portal, and a case ID has been issued. This report will be uploaded on the SAHRIS portal for comment by SAHRA and HWC.
Mineral and Petroleum Resources Development Act (No. 28 of 2002)	The aim of the Mineral and Petroleum Resources Development Act (No. 28 of 2002) (MPRDA) is to make provision for equitable access to and sustainable development of the nation's mineral and petroleum resources. Section 53(1) of the MPRDA provides that any person who intends to use the surface of any land in any way that may be contrary to any object of the MPRDA, or which is likely to impede any such object, must apply to the Minister of Mineral Resources (the Minister) for approval. Section 53 of the MPRDA provides a mechanism for ensuring that, inter alia, the mining of mineral resources is not detrimentally affected through the use of the surface

Legislation	Description of Legislation and Applicability
	of land and which may, for example, result in the sterilisation of a mineral resource. A Section 53 approval will be required due to the fact that the project is located on various mining right areas. The Amendment Regulations (GNR 420 of 27 March 2020) introduced a template for section 53 applications (Form Z) and the specific information that applicants will need to provide as part of a section 53 application.
Noise Control Regulations in terms of the Environmental Conservation, 1989 (Act 73 of 1989)	In South Africa, environmental noise control has been in place for three decades, beginning in the 1980s with codes of practice issued by the South African National Standards (formerly the South African Bureau of Standards, SABS) to address noise pollution in various sectors of the country. Under the previous generation of environmental legislation, specifically the Environmental Conservation Act 73 of 1989 (ECA), provisions were made to control noise from a National level in the form of the Noise Control Regulations (GNR 154 of January 1992). In later years, the ECA was replaced by the National Environmental Management Act 107 of 1998 (NEMA) as amended. The National Environmental Management: Air Quality Act 39 of 2004 (NEMAQA) was published in line with NEMA and contains noise control provisions under Section 34: (1) The minister may prescribe essential national standards – (a) for the control of noise, either in general or by specific machinery or activities or in specified places or areas; or (b) for determining – (i) a definition of noise; and (ii) the maximum levels of noise. (2) When controlling noise, the provincial and local spheres of government are bound by any prescribed national standards. Under NEMAQA, the Noise Control Regulations were updated and are to be applied to all provinces in South Africa. The Noise Control Regulations give all the responsibilities of enforcement to the Local Provincial Authority, where location specific by-laws can be created and applied to the locations with approval of Provincial Government. Where province-specific regulations have not been promulgated, acoustic impact assessments must follow the Noise Control Regulations. Furthermore, NEMAQA prescribes that the Minister must publish maximum allowable noise levels for different districts and national noise standards. These have not yet been accomplished and as a result all monitoring and assessments are done in accordance with the South African National Standards (SANS) 10103:2008 and 10328:2008.
National Environment Management Air Quality Act (No. 39 of 2004)	The National Environment Management: Air Quality Act (No. 39 of 2004) (NEMAQA) came into effect on 11 September 2005. Persons undertaking such activities listed under GNR 893, as amended, are required to possess an Atmospheric Emissions License (AEL). The National Dust Control Regulations (GNR 827) were promulgated in terms of Section 32 of NEMAQA, which aim at prescribing general measures for the control of dust in both residential and non-residential areas.

Legislation	Description of Legislation and Applicability
	Although no AEL will be required for the construction and operation of the Igolide WEF, the dust control regulations will be applicable during construction.
Conservation of Agricultural Resources Act (No. 43 of 1983)	The Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA) provides for the implementation of control measures for soil conservation works as well as alien and invasive plant species in and outside of urban areas. In terms of the amendments to the regulations under the CARA, landowners are legally responsible for the control of alien species on their properties. Various Acts administered by the DFFE and the DWS, as well as other laws (including local by-laws), spell out the fines, terms of imprisonment and other penalties for contravening the law. Although no fines have yet been placed against landowners who do not remove invasive species, the authorities may clear their land of invasive alien plants and other alien species entirely at the landowners' cost and risk. The CARA Regulations with regards to alien and invasive species have been superseded by NEMBA Alien and Invasive Species (AIS) Regulations which became law on 1 October 2014.
Civil Aviation Act (No. 13 of 2009)	Civil aviation in South Africa is governed by the Civil Aviation Act (Act 13 of 2009). This Act provides for the establishment of a stand-alone authority mandated with controlling, promoting, regulating, supporting, developing, enforcing and continuously improving levels of safety and security throughout the civil aviation industry. This mandate is fulfilled by South African Civil Aviation Authority (SACAA) as an agency of the Department of Transport (DoT). SACAA achieves the objectives set out in the Act by complying with the Standards and Recommended Practices (SARPs) of the International Civil Aviation Organisation (ICAO), while considering the local context when issuing the South African Civil Aviation Regulations (SA CARs). As of the 1st of May 2021, Air Traffic and Navigation Services (ATNS) has been appointed as the new Obstacle application Service Provider for Windfarms and later Solar Plants. Their responsibility would pertain to the assessments, maintenance, and all other related matters in respect to Windfarms and in due time Power Plant assessments. The DFFE Screening Tool Report identified Civil Aviation as having high sensitivity for the proposed Igolide WEF, with a civil aviation aerodrome located within 8km of the site. ATNS and SACAA have been included on the project stakeholder database.
Occupational Health and Safety Act (No. 85 of 1993)	The National Occupational Health and Safety Act (No. 85 of 1993) (OHSA) and the relevant regulations under the Act are applicable to the proposed project. This includes the Construction Regulations promulgated in 2014 under Section 43 of the Act. Adherence to South Africa's OHSA and its relevant Regulations is essential.
National Energy Act (No. 34 of 2008)	The National Energy Act aims to ensure that diverse energy resources are available, in sustainable quantitates, and at affordable prices, to the South African economy in support of economic growth and poverty alleviation, taking into account environmental management requirements and interactions amongst economic sectors.

Legislation	Description of Legislation and Applicability
	The main objectives of the Act are to: ▪ Ensure uninterrupted supply of energy to the Republic; ▪ Promote diversity of supply of energy and its sources; ▪ Facilitate effective management of energy demand and its conservation; ▪ Promote energy research; ▪ Promote appropriate standards and specifications for the equipment, systems and processes used for producing, supplying and consuming energy; ▪ Ensure collection of data and information relating to energy supply, transportation and demand; ▪ Provide for optimal supply, transformation, transportation, storage and demand of energy that are planned, organised and implemented in accordance with a balanced consideration of security of supply, economics, consumer protection and a sustainable development; ▪ Provide for certain safety, health and environment matters that pertain to energy; ▪ Facilitate energy access for improvement of the quality of life of the people of Republic; ▪ Commercialise energy-related technologies; ▪ Ensure effective planning for energy supply, transportation, and consumption; and ▪ Contribute to sustainable development of South Africa's economy. In terms of the act, the Minister of Energy is mandated to develop and, on an annual basis, review and publish the Integrated Energy Plan (IEP) in the Government Gazette. The IEP analyses current energy consumption trends within different sectors of the economy (i.e. agriculture, commerce, industry, residential and transport) and uses this to project future energy requirements, based on different scenarios. The IEP and the Integrated Resource Plan are intended to be updated periodically to remain relevant. The framework is intended to create a balance between energy demand and resource availability so as to provide low-cost electricity for social and economic development, while taking into account health, safety and environmental parameters.
Electricity Regulation Act (No. 4 of 2006)	The Electricity Regulation Act (No. 4 of 2006) (ERA) aims to: ▪ Achieve the efficient, effective, sustainable and orderly development and operation of electricity supply infrastructure in South Africa; ▪ Ensure that the interests and needs of present and future electricity customers and end users are safeguarded and met, having regard to the governance, efficiency. effectiveness and long-term sustainability of the electricity supply industry within the broader context of economic energy regulation in the Republic: ▪ Facilitate investment in the electricity supply industry; ▪ Facilitate universal access to electricity; ▪ Promote the use of diverse energy sources and energy efficiency; ▪ Promote competitiveness and customer and end user choice; and ▪ Facilitate a fair balance between the interests of customers and end users, licensees, investors in the electricity supply industry and the public. The Act establishes a National Energy Regulator as the custodian and enforcer of the National Electricity Regulatory Framework. The Act also provides for licenses and registration as the manner in which generation,

Legislation	Description of Legislation and Applicability
	transmission, distribution, trading and the import and export of electricity are regulated.

6.2 POLICIES AND PLANS

Table 6-2 summarised key policies and plans as an outline of the governance framework for the project.

Table 6-2 – Applicable Regional Policies and Plans

Applicable Policy	Description of Policy
National Development Plan	The National Development Plan aims to eliminate poverty and reduce inequality by 2030. The NDP identifies a number of enabling milestones. Of relevance to the proposed development the NDP refers to the need to produce sufficient energy to support industry at competitive prices and ensure access for poor households, while reducing carbon emissions per unit of power by about one-third. In this regard the infrastructure is not just essential for faster economic growth and higher employment. It also promotes inclusive growth, providing citizens with the means to improve their own lives and boost their incomes. Infrastructure is essential to development. Chapter 3, Economy and Employment, identifies some of the structural challenges specific to South Africa, including an energy constraint that will act as a cap on growth and on options for industrialisation. The NDP notes that from an environmental perspective South Africa faces several related challenges. The reduction of greenhouse gas emissions and shift to a green low-carbon economy, is one of these challenges. In terms of implementation the NDP identifies three phases. The first two are of specific relevance to the proposed project. The first phase (2012–2017) notes that ensuring the supply of energy and water is reliable and sufficient for a growing economy. The second phase (2018–2023) involves building on the first phase to lay the foundations for more intensive improvements in productivity. The provision of affordable and reliable energy is a key requirement for this to take place. Chapter 4, Economic infrastructure, notes that economic infrastructure provides the foundation for social and economic development. In this regard South Africa must invest in a strong network of economic infrastructure designed to support the country's medium- and long-term economic and social objectives. The plan envisages that, by 2030, South Africa will have an energy sector that promotes: ▪ Economic growth and development through adequate investment in energy infrastructure. The sector should provide reliable and efficient energy service at competitive rates, while supporting economic growth through job creation. ▪ Environmental sustainability through efforts to reduce pollution and mitigate the effects of climate change. More specifically, South Africa should have adequate supply security in electricity and in liquid fuels, such that economic activity, transport, and welfare are not disrupted. The plan sets out steps that aim to ensure that, in 20 years, South Africa's energy system looks very different to the current situation. In this regard coal

Applicable Policy	Description of Policy
	will contribute proportionately less to primary-energy needs, while gas and renewable energy resources, will play a much larger role.
Integrated Resource Plan (2010 – 2030)	The IRP is an electricity capacity plan which aims to provide an indication of the country's electricity demand, how this demand will be supplied and what it will cost. On 6 May 2011, the then Department of Energy (DoE) released the Integrated Resource Plan 2010-2030 (IRP 2010) in respect of South Africa's forecast energy demand for the 20-year period from 2010 to 2030. The promulgated IRP 2010–2030 identified the preferred generation technology required to meet expected demand growth up to 2030. It incorporated government objectives such as affordable electricity, reduced greenhouse gas (GHG) emissions, reduced water consumption, diversified electricity generation sources, localisation and regional development. The IRP recognises that solar PV, wind and CSP with storage present an opportunity to diversify the electricity mix, to produce distributed generation and to provide off-grid electricity. Renewable technologies also present huge potential for the creation of new industries, job creation and localisation across the value chain.
New Growth Path	Government released the New Economic Growth Path Framework on 23 November 2010. The aim of the framework is to enhance growth, employment creation and equity. The policy's principal target is to create five million jobs over the next 10 years and reflects government's commitment to prioritising employment creation in all economic policies. The framework identifies strategies that will enable South Africa to grow in a more equitable and inclusive manner while attaining South Africa's developmental agenda. Central to the New Growth Path is a massive investment in infrastructure as a critical driver of jobs across the economy. In this regard the framework identifies investments in five key areas namely: energy, transport, communication, water, and housing.
National Infrastructure Plan	The South African Government adopted a National Infrastructure Plan (NIP) in 2012. The NIP aims to transform the South African economic landscape while simultaneously creating significant numbers of new jobs and strengthening the delivery of basic services. It outlines the challenges and enablers which needs to be addressed in the building and developing of infrastructure. The Presidential Infrastructure Coordinating Commission (PICC) was established by the Cabinet to integrate and coordinate the long-term infrastructure build. The plan also supports the integration of African economies. In terms of the plan Government will invest R827 billion over the next three years to build new and upgrade existing infrastructure. The aim of the investments is to improve access by South Africans to healthcare facilities, schools, water, sanitation, housing and electrification. The plan also notes that investment in the construction of ports, roads, railway systems, electricity plants, hospitals, schools and dams will contribute to improved economic growth.
Integrated Energy Plan	The development of a National IEP was envisaged in the White Paper on the Energy Policy of the Republic of South Africa of 1998 and, in terms of the National Energy Act, 2008 (Act No. 34 of 2008), the Minister of Energy is mandated to develop and, on an annual basis, review and publish the IEP in the Government Gazette. The purpose of the IEP is to provide a roadmap of

Applicable Policy	Description of Policy
	the future energy landscape for South Africa which guides future energy infrastructure investments and policy development. The IEP notes that South Africa needs to grow its energy supply to support economic expansion and in so doing, alleviate supply bottlenecks and supply-demand deficits. In addition, it is essential that all citizens are provided with clean and modern forms of energy at an affordable price. As part of the Integrated Energy Planning process, eight key objectives are identified, namely: ▪ Objective 1: Ensure security of supply. ▪ Objective 2: Minimise the cost of energy. ▪ Objective 3: Promote the creation of jobs and localisation. ▪ Objective 4: Minimise negative environmental impacts from the energy sector. ▪ Objective 5: Promote the conservation of water. ▪ Objective 6: Diversify supply sources and primary sources of energy. ▪ Objective 7: Promote energy efficiency in the economy. ▪ Objective 8: Increase access to modern energy. The IEP provides an assessment of current energy consumption trends within different sectors of the economy (i.e., agriculture, commerce, industry, residential and transport) and uses this information to identify future energy requirements, based on different scenarios. The scenarios are informed by different assumptions on economic development and the structure of the economy and also take into account the impact of key policies such as environmental policies, energy efficiency policies, transport policies and industrial policies, amongst others. Based on this information the IEP then determines the optimal mix of energy sources and technologies to meet those energy needs in the most cost-effective manner for each of the scenarios. The associated environmental impacts, socio-economic benefits and macroeconomic impacts are also analysed. The IEP is therefore focused on determining the long-term energy pathway for South Africa, taking into account a multitude of factors which are embedded in the eight objectives. As part of the analysis four key scenarios were developed, namely the Base Case, Environmental Awareness, Resource Constrained and Green Shoots scenarios: ▪ The Base Case Scenario assumes that existing policies are implemented and will continue to shape the energy sector landscape going forward. It assumes moderate economic growth in the medium to long term. ▪ The Environmental Awareness Scenario is characterised by more stringent emission limits and a more environmentally aware society, where a higher cost is placed on externalities caused by the supply of energy. ▪ The Resource Constrained Scenario in which global energy commodity prices (i.e. coal, crude oil and natural gas) are high due to limited supply. ▪ The Green Shoots Scenario describes an economy in which the targets for high economic growth and structural changes to the economy, as set out in the National Development Plan (NDP), are met. The IEP notes that South Africa should continue to pursue a diversified energy mix which reduces reliance on a single or a few primary energy sources. In terms of existing electricity generation capacity, the IEP indicates

Applicable Policy	Description of Policy
	that existing capacity starts to decline notably from 2025, with significant plant retirement occurring in 2031, 2041 and 2048. By 2050 only 20% of the current electricity generation capacity remains. As a result, large investments are required in the electricity sector in order to maintain an adequate supply in support of economic growth. By 2020, various import options become available, and some new coal capacity is added along with new wind, solar and gas capacity. The mix of generation capacity technologies by 2050 is considerably more diverse than the current energy mix, across all scenarios. The main differentiating factors between the scenarios are the level of demand, constraints on emission limits and the carbon dioxide externality costs. In all scenarios the energy mix for electricity generation becomes more diverse over the period to 2050, with coal reducing its share from about 85% in 2015 to 15–20% in 2050 (depending on the scenario). Solar, wind, nuclear, gas and electricity imports increase their share. The Environmental Awareness and Green Shoots scenarios take on higher levels of renewable energy. An assessment of each scenario against the eight objectives with reference to renewable energy notes while all scenarios seek to ensure that costs are minimised within the constraints and parameters of each scenario, the Base Case Scenario presents the least cost followed by the Environmental Awareness, Resource Constrained and Green Shoots scenarios respectively when total energy system costs are considered. In terms of promoting job creation and localisation potential the Base Case Scenario presents the greatest job creation potential, followed by the Resource Constrained, Environmental Awareness and Green Shoots scenarios respectively. In all scenarios, approximately 85% of total jobs are localisable. For electricity generation, most jobs result from solar technologies followed by nuclear and wind, with natural gas and coal making a smaller contribution. The Environmental Awareness Scenario, due to its stringent emission constraints, shows the lowest level of total emissions over the planning horizon. This is followed by the Green Shoots, Resource Constrained and Base Case scenarios. These trends are similar when emissions are considered cumulatively and individually by type.
National Protected Area Expansion Strategy (2018)	The National Protected Area Expansion Strategy 2018 (NPAES) areas were identified through a systematic biodiversity planning process. They present the best opportunities for meeting the ecosystem-specific protected area targets set in the NPAES and were designed with strong emphasis on climate change resilience and requirements for protecting freshwater ecosystems. These areas should not be seen as future boundaries of protected areas, as in many cases only a portion of a particular focus area would be required to meet the protected area targets set in the NPAES. They are also not a replacement for fine scale planning which may identify a range of different priority sites based on local requirements, constraints and opportunities (NPAES, 2018). According to the NPAES, the study site is part of the NPAES (NPAES 2018). None of the turbines are located in the areas demarcated by the NPAES.

6.3 PROVINCIAL AND MUNICIPAL LEGAL AND REGULATORY FRAMEWORK

Table 6-3 – Provincial and Municipal Plans

Applicable Plan	Description of Plan
The Gauteng Provincial Employment, Growth and Development Strategy (GEGDS)	The Gauteng Provincial Employment, Growth and Development Strategy (GEGDS) identifies the need for creating accessible and decent work within a growing, sustainable, and inclusive economy as a priority for the province. The GEGDS aims to address the deep structural weaknesses within the economy that has yielded persistent high unemployment and excluded marginalized populations despite the economic growth of the region. Key aims of GEGDS: ▪ Provide a framework within which relevant government departments can develop and/or refine their strategic policy interventions or drivers, while creating decent work and building a growing, inclusive economy. ▪ Identify effective interventions for provincial government to mitigate the impact of economic crises while initiating programmes that can maximise (decent) employment creation in the medium term. ▪ Address inequality through the investment in people and the progressive realisation of decent jobs. ▪ Support social cohesion through interventions that directly contribute towards employment creation and a healthy, well-nourished, and safe labour force. ▪ Highlight the need for effective monitoring, reviewing, and evaluating of the various interventions or drivers. ▪ To act as the framework that leads to the Gauteng Growth Path, which is the living or real implementation of the GEGDS. To achieve this GEGDS proposes necessary and profound structural changes to the Gauteng economy that are based on a rapid shift to an endogenous economy rooted in three key factors: ▪ Innovation. ▪ Green Growth. ▪ Inclusivity. There are three integral components that make up the strategy, namely: the seven foundational provincial priorities, the five strategic pillars, and seven cross-cutting drivers. The foundational provincial priorities of relevance include: ▪ Creating Decent Work and Building a Sustainable and Inclusive Economy. ▪ Building Cohesive and Sustainable Communities including Spatial Development. This GEGDS outlines the strategic interventions by which Gauteng will work to make this innovating, green and inclusive economy a reality. These interventions are organised into five strategic pillars. The strategic pillars of relevance include:

Applicable Plan	Description of Plan
	▪ Transforming the provincial economy through improved efficiency. ▪ Sustainable employment creation. ▪ Sustainable communities and social cohesion. Each pillar contains several government interventions, which enable them to implement this strategy. These are called drivers. Cross-cutting drivers of relevance include: ▪ Green Economy and Sustainable Energy Usage. ▪ Innovation and the Knowledge Economy. ▪ Infrastructure – Strategic, Socio-economic and Bulk. ▪ Green Jobs. ▪ Spatial Planning.
Gauteng Provincial Spatial Development Framework (2030)	The Gauteng Provincial Spatial Development Framework (GSDF) 2030 aspires to establish a compact urban form that has a balanced, polycentric spatial network, with strong and resilient nodes enabling mutually beneficial exchanges of goods and services, and movement of people as well as the protection of green spaces and sustainable energy use. To support this vision, four spatial development strategies are to be followed: ▪ Capitalising on proximity. ▪ Managing new settlement development. ▪ Building an economic network. ▪ Creating a viable and productive hinterland. The effective provision and maintenance of bulk infrastructure, including energy production, is prioritised within the capitalising on proximity strategy. Ten high-priority provincial spatial development proposals are outlined. While none focus specifically on energy production, the following are important in terms of conservation and bulk infrastructure development: ▪ Municipal urban growth management. ▪ Strengthening and enhancing agricultural production and agro-processing. ▪ Actively pursuing environmental management and eco-system protection. ▪ Boosting and optimising provincial tourism opportunities. The GSDF notes that the West Rand District Municipality (WRDM) is currently operating at near capacity in terms of energy production and the lack of stable generation capacity from current providers act as a major constraint to economic development and investor confidence. The GSDF also notes that Merafong's electricity network was not designed to supply the developments and extensions that are currently underway in the district.
Gauteng Integrated Energy Strategy (2012)	The aim of the Gauteng Integrated Energy Strategy (GIES) is to direct the energy supply and consumption of the Gauteng province over the next five to forty-five years by integrating and supporting sustainable energy and climate change initiatives,

Applicable Plan	Description of Plan
	both locally and internationally. The key goals of this strategy include: ▪ Providing the leadership and institutional framework required to drive the strategy. ▪ Implementing strong energy efficient measures. ▪ Facilitating the development and growth of renewable and alternative energy options. ▪ Supporting the move towards a low carbon economy. ▪ Prioritizing energy security and access to safe, clean, and affordable energy. ▪ Developing and growing the alternative and energy efficiency industry as a critical aspect of Gauteng's economy. The relative policy implications include: ▪ Shifting to a low carbon economy. ▪ Maximizing the use of local energy resources. ▪ Development of the renewable energy industry as an employment creation opportunity. The GIES hopes to achieve a low carbon economy, Gauteng as a hub of innovation, focused on clean energy technology, decentralised energy generation-micro generation, as well as clean and renewable energy contributing 50% of the total energy mix of the province.
Growing Gauteng Together 2030	Growing Gauteng Together 2030 (GGT2030) is a plan of action realised by the Gauteng government to drive the province towards a more sustainable and inclusive future. The plan includes seven priorities that are to be executed to achieve this vision. The relevant priorities include: ▪ The Economy, Jobs, and Infrastructure. ▪ Integrated Human Settlements and Land Release. ▪ Safety, Social Cohesion and Food Security. ▪ Sustainable Development for Future Generations. This vision will be implemented along five developmental corridors of Gauteng. The Western Development Corridor includes WRDM, and the focus is around diversifying the district economy to include tourism, agriculture, and agro-processing, and renewable energy projects.
Merafong City Local Municipality Integrated Development Plan (2020)	The vision for the Merafong City Local Municipality (MCLM) Integrated Development Plan (IDP) is "A prosperous, Sustainable and Community-oriented City". The Key Performance Areas (KPA) adopted by the municipality to realise this vision are: ▪ KPA 1: Basic Service Delivery ▪ KPA 2: To Promote Local Economic Development ▪ KPA 3: To Promote Municipal Transformation & Organisational Development ▪ KPA 4: To ensure Municipal Financial Viability & Management

Applicable Plan	Description of Plan
	▪ KPA 5: To ensure Good Governance and Public Participation ▪ KPA 6: Spatial Development Framework There are various Development Strategies of Merafong Municipality, which are informed by a Strategic Turn-Around plan developed during a strategic review session held in 2018. Of relevance to the project is the Electricity Supply Strategy (2020/2021), which identifies a variety of strategic interventions for the municipality. The Strategic Turnaround Plan is aligned to 14 regional outcomes, with Outcome 1: Provision of Basic Service Delivery as well as Outcome 8: Sustainable Environment being relevant to the project. The MCLMIDP notes that the status of the current Energy Plan needs to be re-assessed to integrate with the greater West Rand Plan.
Merafong City Local Municipality Spatial Development Framework (2019)	Merafong Spatial Development Framework (MSDF), forms part of a hierarchy of plans that consolidate into the IDP. It concentrates on the spatial aspects of development planning and identifies the opportunities and constraints associated with the district. The Merafong City's SDF proposes the following structuring tools: ▪ Improve urban efficiency and rectify Apartheid spatial disparities through realigning the urban structure of Merafong settlements into three distinct urban areas. ▪ Improve urban and rural liveability where basic needs are met, the cost of living is bearable, amenities and employment are accessible, and urban space is aesthetically pleasing and healthy. ▪ Facilitate sustainable economic growth and diversification, through identified strategic nodes, which include a bio-energy eco-industrial park. ▪ Protect natural and agricultural resources to ensure a sustainable coexistence between urban, mining, agricultural and ecological land uses. Opportunities in the MSDF of relevance to the project include a Bioenergy Agro-Industrial Park and the Merafong Solar Farm Cluster Concept. Additionally, the adaptation of unsustainable, unused, or old mines and mine dumps for reuse or rehabilitation also presents an opportunity. The mines Driefontein North and Kusasalethu/ Elandsrand were identified as particularly promising for the establishment of solar farms or other renewable energy sources.

6.4 INTERNATIONAL STANDARDS AND GUIDELINES

6.4.1 IFC PERFORMANCE STANDARDS

The International Finance Corporation (IFC) is an international financial institution that offers investment, advisory, and asset management services to encourage private sector development in developing countries. The IFC is a member of the World Bank Group (WBG) and is headquartered in

Washington, D.C., United States. It was established in 1956 as the private sector arm of the WBG to advance economic development by investing in strictly for-profit and commercial projects that purport to reduce poverty and promote development.

The IFC's stated aim is to create opportunities for people to escape poverty and achieve better living standards by mobilizing financial resources for private enterprise, promoting accessible and competitive markets, supporting businesses and other private sector entities, and creating jobs and delivering necessary services to those who are poverty-stricken or otherwise vulnerable. Since 2009, the IFC has focused on a set of development goals that its projects are expected to target. Its goals are to increase sustainable agriculture opportunities, improve health and education, increase access to financing for microfinance and business clients, advance infrastructure, help small businesses grow revenues, and invest in climate health.

The IFC is owned and governed by its member countries but has its own executive leadership and staff that conduct its normal business operations. It is a corporation whose shareholders are member governments that provide paid-in capital and which have the right to vote on its matters. Originally more financially integrated with the WBG, the IFC was established separately and eventually became authorized to operate as a financially autonomous entity and make independent investment decisions. It offers an array of debt and equity financing services and helps companies face their risk exposures, while refraining from participating in a management capacity. The corporation also offers advice to companies on making decisions, evaluating their impact on the environment and society, and being responsible. It advises governments on building infrastructure and partnerships to further support private sector development.

The IFC’s Sustainability Framework articulates the Corporation’s strategic commitment to sustainable development and is an integral part of IFC’s approach to risk management. The Sustainability Framework comprises IFC’s Policy and Performance Standards on Environmental and Social Sustainability, and IFC’s Access to Information Policy. The Policy on Environmental and Social Sustainability describes IFC’s commitments, roles, and responsibilities related to environmental and social sustainability. IFC’s Access to Information Policy reflects IFC’s commitment to transparency and good governance on its operations and outlines the Corporation’s institutional disclosure obligations regarding its investment and advisory services. The Performance Standards (PSs) are directed towards clients, providing guidance on how to identify risks and impacts, and are designed to help avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable way, including stakeholder engagement and disclosure obligations of the client in relation to project-level activities. In the case of its direct investments (including project and corporate finance provided through financial intermediaries), IFC requires its clients to apply the PSs to manage environmental and social risks and impacts so that development opportunities are enhanced. IFC uses the Sustainability Framework along with other strategies, policies, and initiatives to direct the business activities of the Corporation to achieve its overall development objectives. The PSs may also be applied by other financial institutions (FIs).

The Project is considered a **Category B project** in terms of the IFC Policy on E&S Sustainability (2012), having the potential to cause limited adverse environmental or social risks and/or impacts that are few in number, generally site specific, largely reversible, and readily addressed through mitigation measures.

The objectives and applicability of the eight PSs are outlined in **Table 6-4.**

Table 6-4 – Objectives and Applicability of the IFC Performance Standards

Reference	Requirements		Project Specific Applicability
Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts			
Overview	Performance Standard 1 underscores the importance of managing environmental and social performance throughout the life of a project. An effective Environmental and Social Management System (ESMS) is a dynamic and continuous process initiated and supported by management, and involves engagement between the client, its workers, local communities directly affected by the project (the Affected Communities) and, where appropriate, other stakeholders."		
Objectives	▪ To identify and evaluate environmental and social risks and impacts of the project. ▪ To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks and impacts to workers, Affected Communities, and the environment. ▪ To promote improved environmental and social performance of clients through the effective use of management systems. ▪ To ensure that grievances from Affected Communities and external communications from other stakeholders are responded to and managed appropriately. ▪ To promote and provide means for adequate engagement with Affected Communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.		
Aspects	1.1	Policy	The IFC Standards state under PS 1 (Guidance Note 23) that "*the breadth, depth and type of analysis included in an ESIA must be proportionate to the nature and scale of the proposed project's potential impacts as identified during the course of the assessment process*." This document is the draft deliverable from the S&EIA process (EIA Phase) undertaken for the proposed Project. The impact assessment comprehensively assesses the key environmental and social impacts and complies with the requirements of the South African EIA Regulations. In addition, an EMPr (**Appendix I**) has been compiled during for the project.
	1.2	Identification of Risks and Impacts	
	1.3	Management Programmes	
	1.4	Organisational Capacity and Competency	
	1.5	Emergency Preparedness and Response	
	1.6	Monitoring and Review	
	1.7	Stakeholder Engagement	
	1.8	External Communication and Grievance Mechanism	
	1.9	Ongoing Reporting to Affected Communities	
Performance Standard 2: Labour and Working Conditions;			
Overview	Performance Standard 2 recognises that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers.		

<table>
<tr><th>Reference</th><th colspan="2">Requirements</th><th>Project Specific Applicability</th></tr>
<tr><td>Objectives</td><td colspan="3">To promote the fair treatment, non-discrimination, and equal opportunity of workers.
To establish, maintain, and improve the worker-management relationship.
To promote compliance with national employment and labour laws.
To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client’s supply chain.
To promote safe and healthy working conditions, and the health of workers.
To avoid the use of forced labour.</td></tr>
<tr><td rowspan="5">Aspects</td><td>2.1</td><td>Working Conditions and Management of Worker Relationship
Human Resources Policy and Management
Working Conditions and terms of Engagement
Workers organisation
Non- Discrimination and Equal Opportunity
Retrenchment
Grievance Mechanism</td><td rowspan="5">Even though the nature and scale of the project is considered to be small, PS2 is considered applicable as a contractor will be appointed to undertake the required scope of work.

Whilst PS2 will be applicable to the Project, it is not intended to be addressed in detail at the EIA stage. Recommendations are provided concerning development of a detailed Human Resources (HR) and Occupational Health and Safety (OHS) system by the developer and its partners as the Project moves towards implementation. In addition, measures to address the Interim Advice for IFC Clients on Supporting Workers in the Context of COVID-19 are referenced.

The EMPr (Appendix I) incorporates the requirements for compliance with local and international Labour and Working legislation and good practice on the part of the contractors.</td></tr>
<tr><td>2.2</td><td>Protecting the Workforce
Child Labour
Forced Labour</td></tr>
<tr><td>2.3</td><td>Occupational health and Safety</td></tr>
<tr><td>2.4</td><td>Workers Engaged by Third Parties</td></tr>
<tr><td>2.5</td><td>Supply Chain</td></tr>
<tr><td colspan="4">Performance Standard 3: Resource Efficiency and Pollution Prevention</td></tr>
<tr><td>Overview</td><td colspan="3">Performance Standard 3 recognises that increased economic activity and urbanisation often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels. There is also a growing global consensus that the current and projected atmospheric concentration of greenhouse gases (GHG) threatens the public health and welfare of current and future generations. At the same time, more efficient and effective resource use and pollution prevention and GHG emission avoidance and mitigation technologies and practices have become more accessible and achievable in virtually all parts of the world.</td></tr>
<tr><td>Objectives</td><td colspan="3">To avoid or minimise adverse impacts on human health and the environment by avoiding or minimising pollution from project activities.
To promote more sustainable use of resources, including energy and water.
To reduce project related GHG emissions.</td></tr>
<tr><td>Aspects</td><td>3.1</td><td>Policy Resource Efficiency
Greenhouse Gases</td><td></td></tr>
</table>

Reference	Requirements		Project Specific Applicability
		▪ Water Consumption	PS3-related impacts, such as the management of construction waste, hazardous substances, and stormwater are assessed in **Section 9** of this report. There are no material resource efficiency issues associated with the Project. The EMPr includes general resource efficiency measures. The Igolide WEF seeks to facilitate resource efficiency and pollution prevention by contributing to the South African green economy. Dust air pollution in the construction phase has been addressed in the EMPr. The Project will not result in the release of industrial effluents. Potential pollution associated with sanitary wastewater is low and mitigation measures have been included in the EMPr. Land contamination of the site from historical land use (i.e. low intensity agricultural / grazing) is not considered to be a cause for concern. The waste generation profile of the project is not complex. Waste mitigation and management measures have been included in EMPr. Hazardous materials are not a key issue; small quantities of construction materials (oil, grease, diesel fuel etc.) are the only wastes expected to be associated with the project. The EMPr (**Appendix I**) considers anticipated hazardous materials into account and recommends relevant mitigation and management measures.
	3.2	▪ Pollution Prevention ▪ Air Emissions ▪ Stormwater ▪ Waste Management ▪ Hazardous Materials Management ▪ Pesticide use and Management	
Performance Standard 4: Community Health, Safety, and Security			
Overview	Performance Standard 4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts.		
Objectives	▪ To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances. ▪ To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities		
Aspects	4.1	▪ Community Health and Safety ▪ Infrastructure and Equipment Design and Safety ▪ Hazardous Materials Management and Safety ▪ Ecosystem Services	The requirements included in PS 4 has been addressed in the EIA process and the development of the EMPr. During the construction phase there will be an increase in vehicular traffic along public roads, largely due to the need for importation of construction material. Pedestrian and road safety risks have been qualitatively evaluated in the EIA process and the clients' standard safety and security measures, as well as potential additional measures

Reference	Requirements		Project Specific Applicability
		▪ Community Exposure to Disease ▪ Emergency Preparedness and Response	recommended by WSP, are detailed in the EMPr (**Appendix I**).
	4.2	Security Personnel	
Performance Standard 5: Land Acquisition and Involuntary Resettlement			
Overview	Performance Standard 5 recognises that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood) as a result of project-related land acquisition and/or restrictions on land use.		
Objectives	▪ To avoid, and when avoidance is not possible, minimise displacement by exploring alternative project designs. ▪ To avoid forced eviction. ▪ To anticipate and avoid, or where avoidance is not possible, minimise adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected. ▪ To improve, or restore, the livelihoods and standards of living of displaced persons. ▪ To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.		
Aspects	5.1	▪ Displacement ▪ Physical Displacement ▪ Economic Displacement ▪ Private Sector Responsibilities under Government Managed Resettlement	PS5 is not applicable to the proposed Igolide WEF as no physical or economic displacement or livelihood restoration will be required. The proposed Igolide WEF is located on privately owned land. A section of the land is utilised for agriculture by the landowners. The significance of all potential agricultural impacts is kept low by the very small proportion of the land that is impacted. An Agricultural Potential Assessment has been undertaken and is included in **Appendix H-2**.
Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources			
Overview	Performance Standard 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development.		
Objectives	▪ To protect and conserve biodiversity. ▪ To maintain the benefits from ecosystem services. ▪ To promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.		
Aspects	6.1	Protection and Conservation of Biodiversity	The Igolide WEF overlaps with a small isolated CBA (CBA2: Important) in the Eastern Corner of the footprint. A Terrestrial Biodiversity assessment as well as an Avifaunal Impact Assessment and Aquatic Biodiversity

Reference	Requirements		Project Specific Applicability
			Impact Assessment have been included in this EIA report (**Appendix H**). The methodologies for the specialist assessments include a combination of literature review, in-field surveys and sensitivity mapping. This substantively complies with the PS 6 general requirements for scoping and baseline assessment for determination of biodiversity and ecosystem services issues. The determination of habitat sensitivity was undertaken within the legal and best practice reference framework for South Africa. The prevalence of invasive alien species has been determined, and mitigation and management measures are included in the EMPr (**Appendix I**).
Performance Standard 7: Indigenous People			
Overview	Performance Standard 7 recognizes that Indigenous Peoples, as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. In many cases, their economic, social, and legal status limits their capacity to defend their rights to, and interests in, lands and natural and cultural resources, and may restrict their ability to participate in and benefit from development. Indigenous Peoples are particularly vulnerable if their lands and resources are transformed, encroached upon, or significantly degraded.		
Objectives	▪ To ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples. ▪ To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts. ▪ To promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner. ▪ To establish and maintain an ongoing relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the project's life-cycle. ▪ To ensure the Free, Prior, and Informed Consent (FPIC) of the Affected Communities of Indigenous Peoples when the circumstances described in this Performance Standard are present. ▪ To respect and preserve the culture, knowledge, and practices of Indigenous Peoples.		
Aspects	7.1	General ▪ Avoidance of Adverse Impacts ▪ Participation and Consent	As per the international instruments under the United Nations (UN) Human Rights Conventions, no indigenous peoples are present within the study area.
	7.2	Circumstances Requiring Free, Prior, and Informed Consent ▪ Impacts on Lands and Natural Resources Subject to Traditional Ownership or Under Customary Use	

Reference	Requirements		Project Specific Applicability
		- Critical Cultural Heritage - Relocation of Indigenous Peoples from Lands and Natural Resources Subject to Traditional Ownership or Under Customary Use	
	7.3	Mitigation and Development Benefits	
	7.4	Private Sector Responsibilities Where Government is Responsible for Managing Indigenous Peoples Issues	
Performance Standard 8: Cultural Heritage			
Overview	Performance Standard 8 recognizes the importance of cultural heritage for current and future generations.		
Objectives	- To protect cultural heritage from the adverse impacts of project activities and support its preservation. - To promote the equitable sharing of benefits from the use of cultural heritage.		
Aspects	8.1	Protection of Cultural Heritage in Project Design and Execution	A Heritage Assessment (**Appendix H-6**) has been carried out by a suitably qualified specialist. A Chance Find Procedure is included in the EMPr during the EIA phase of the project.

6.4.2 WORLD BANK GROUP ENVIRONMENTAL HEALTH AND SAFETY GUIDELINES

In support of the Performance Standards, the World Bank Group (WBG) has published a number of Environmental Health and Safety (EHS) Guidelines. The EHS Guidelines are technical reference documents that address IFC's expectations regarding the industrial pollution management performance of its projects. They are designed to assist managers and decision makers with relevant industry background and technical information. This information supports actions aimed at avoiding, minimising, and controlling EHS impacts during the construction, operation, and decommissioning phase of a project or facility. The EHS Guidelines serve as a technical reference source to support the implementation of the IFC Performance Standards, particularly in those aspects related to PS3: Pollution Prevention and Abatement, as well as certain aspects of occupational and community health and safety.

Where host country regulations differ from the levels and measures presented in the EHS Guidelines, projects seeking international funding may be expected to achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, a full and detailed justification for any proposed alternatives is required.

The following IFC / WBG EHS Guidelines have been generally consulted during the preparation of the EIA in order to aid the identification of EHS aspects applicable to the project:

- Electric Power Transmission and Distribution (2007) - information relevant to power transmission between a generation facility and a substation located within an electricity grid, in addition to power distribution from a substation to consumers located in residential, commercial, and industrial areas
- General EHS Guidelines – this includes a section on a range of environmental, occupational health and safety, community health and safety, and construction activities that would apply to the project. The guideline also contains recommended guidelines adopted form the World Health Organisation (WHO) for ambient air and water quality, which are referred to in the relevant impact assessment sections in the EIA report.

6.4.3 EQUATOR PRINCIPLES

The Equator Principles (EPs) is a risk management framework, adopted by financial institutions, for determining, assessing, and managing environmental and social risk in projects and is primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making.

The EPs apply globally to all industry sectors and to five financial products 1) Project Finance Advisory Services, 2) Project Finance, 3) Project-Related Corporate Loans, 4) Bridge Loans and 5) Project-Related Refinance and Project-Related Acquisition Finance. The relevant thresholds and criteria for application is described in detail in the Scope section of the EP. Currently 125 Equator Principles Financial Institutions (EPFIs) in 37 countries have officially adopted the EPs, covering the majority of international project finance debt within developed and emerging markets. EPFIs commit to implementing the EPs in their internal environmental and social policies, procedures and standards for financing projects and will not provide Project Finance or Project-Related Corporate Loans to projects where the client will not, or is unable to, comply with the EPs.

While the EPs are not intended to be applied retroactively, EPFIs apply them to the expansion or upgrade of an existing project where changes in scale or scope may create significant environmental and social risks and impacts, or significantly change the nature or degree of an existing impact. The EPs have greatly increased the attention and focus on social/community standards and responsibility, including robust standards for indigenous peoples, labour standards, and consultation with locally affected communities within the Project Finance market.

The EPs have also helped spur the development of other responsible environmental and social management practices in the financial sector and banking industry and have supported member banks in developing their own Environmental and Social Risk Management Systems.

The requirements and applicability of the EPs are outlined in **Table 6-5**.

It should be noted that Principles 8 and 10 relate to a borrower's code of conduct and are therefore not considered relevant to the S&EIA process and have not been included in this discussion.

Table 6-5 - Requirements and Applicability of the Equator Principles

Requirement		Project Specific Applicability
Principle 1: Review and Categorisation		
Overview	When a project is proposed for financing, the EPFI will, as part of its internal social and	Based upon the significance and scale of the Project's environmental and

Requirement		Project Specific Applicability
	environmental review and due diligence, categorise such project based on the magnitude of its potential impacts and risks in accordance with the environmental and social screening criteria of the IFC. Using categorisation, the EPFI's environmental and social due diligence is commensurate with the nature, scale, and stage of the Project, and with the level of environmental and social risks and impacts. The categories are: - Category A: Projects with potential significant adverse environmental and social risks and/or impacts that are diverse, irreversible or unprecedented; - Category B: Projects with potential limited adverse environmental and social risks and/or impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures; and - Category C: Projects with minimal or no adverse environmental and social risks and/or impacts.	social impacts, the proposed project is regarded as a Category B project i.e. a project with potential limited adverse environmental or social risks and/or impacts that are few in number, generally site-specific, largely reversible, and readily addressed through mitigation measures.
Principle 2: Environmental and Social Assessment		
Overview	For all Category A and Category B Projects, the EPFI will require the client to conduct an appropriate Assessment process to address, to the EPFI's satisfaction, the relevant environmental and social risks and scale of impacts of the proposed Project (which may include the illustrative list of issues found in Exhibit II). The Assessment Documentation should propose measures to minimise, mitigate, and where residual impacts remain, to compensate/offset/remedy for risks and impacts to Workers, Affected Communities, and the environment, in a manner relevant and appropriate to the nature and scale of the proposed Project. The Assessment Documentation will be an adequate, accurate and objective evaluation and presentation of the environmental and social risks and impacts, whether prepared by the client, consultants or external experts. For Category A, and as appropriate, Category B Projects, the Assessment Documentation includes an Environmental and Social Impact Assessment (ESIA). One or more specialised studies may also need to be undertaken. For other Category B and potentially C Projects, a limited or focused environmental or social	This document is the third deliverable (i.e., Draft EIA Report) from the S&EIA process undertaken for the proposed Project. The impact assessment has been undertaken, and comprehensively assesses the key environmental and social impacts and complies with the requirements of the South African EIA Regulations. In addition, an EMPr has been be compiled.

Requirement		Project Specific Applicability
	assessment may be appropriate, applying applicable risk management standards relevant to the risks or impacts identified during the categorisation process.	
Principle 3: Applicable Environmental and Social Standards		
Overview	The Assessment process should, in the first instance, address compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues. The EPFI's due diligence will include, for all Category A and Category B Projects globally, review and confirmation by the EPFI of how the Project and transaction meet each of the Principles. For Projects located in Non-Designated Countries, the Assessment process evaluates compliance with the then applicable IFC PS and WBG EHS Guidelines. For Projects located in Designated Countries, compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues.	As South Africa has been identified as a non-designated country, the reference framework for environmental and social assessment is based on the IFC PS. In addition, this S&EIA process has been undertaken in accordance with NEMA (the host country's relevant legislation).
Principle 4: Environmental and Social Management System and Equator Principles Action Plan		
Overview	For all Category A and Category B Projects, the EPFI will require the client to develop or maintain an Environmental and Social Management System (ESMS). Further, an Environmental and Social Management Plan (ESMP) will be prepared by the client to address issues raised in the assessment process and incorporate actions required to comply with the applicable standards. Where the applicable standards are not met to the EPFI's satisfaction, the client and the EPFI will agree on an Equator Principles Action Plan (EPAP). The EPAP is intended to outline gaps and commitments to meet EPFI requirements in line with the applicable standards.	A formal project specific ESMS will be compiled in the event that the project is developed in the future. Management and monitoring plans outlined in the EMPr will serve as the basis for an ESMS for the proposed Project.
Principle 5: Stakeholder Engagement		
Overview	EPFI will require the client to demonstrate effective Stakeholder Engagement as an ongoing process in a structured and culturally appropriate manner with Affected Communities Workers and, where relevant, Other Stakeholders. For Projects with potentially significant adverse impacts on Affected Communities, the client will conduct an	The S&EIA process includes an extensive stakeholder engagement process which complies with the South African EIA Regulations. The process includes consultations with local communities, nearby businesses, and a range of government sector stakeholders (state owned enterprises,

Requirement		Project Specific Applicability
	Informed Consultation and Participation process. To accomplish this, the appropriate assessment documentation, or non-technical summaries thereof, will be made available to the public by the borrower for a reasonable minimum period in the relevant local language and in a culturally appropriate manner. The borrower will take account of and document the process and results of the consultation, including any actions agreed resulting from the consultation. Disclosure of environmental or social risks and adverse impacts should occur early in the Assessment process, in any event before the Project construction commences, and on an ongoing basis.	national, provincial, and local departments). The stakeholder engagement process solicits interest from potentially interested parties through the placement of site notices and newspaper advertisements as well as written and telephonic communication. The stakeholder engagement process is detailed in **Section 2.3** and in the SER **(Appendix D)**.
Principle 6: Grievance Mechanism		
Overview	For all Category A and, as appropriate, Category B Projects, the EPFI will require the client, as part of the ESMS, to establish effective grievance mechanisms which are designed for use by Affected Communities and Workers, as appropriate, to receive and facilitate resolution of concerns and grievances about the Project's environmental and social performance. The borrower will inform the Affected Communities and Workers about the grievance mechanism in the course of the stakeholder engagement process and ensure that the mechanism addresses concerns promptly and transparently, in a culturally appropriate manner, and is readily accessible, at no cost, and without retribution to the party that originates the issue or concern.	The EMPr (**Appendix I**) includes a Grievance Mechanism Process for Public Complaints and Issues. This procedure effectively allows for external communications with members of the public to be undertaken in a transparent and structured manner.
Principle 7: Independent Review		
Overview	For all Category A and, as appropriate, Category B Projects, an Independent Environmental and Social Consultant, not directly associated with the client, will carry out an Independent Review of the Assessment Documentation including the ESMPs, the ESMS, and the Stakeholder Engagement process documentation in order to assist the EPFI's due diligence, and assess Equator Principles compliance.	This principle will only become applicable in the event that the project is developed in the future.

Requirement		Project Specific Applicability
Principle 9: Independent Monitoring and Reporting		
Overview	To assess Project compliance with the Equator Principles after Financial Close and over the life of the loan, the EPFI will require independent monitoring and reporting for all Category A, and as appropriate, Category B projects. Monitoring and reporting should be provided by an Independent Environmental and Social Consultant; alternatively, the EPFI will require that the client retain qualified and experienced external experts to verify its monitoring information, which will be shared with the EPFI in accordance with the frequency required.	This principle will only become applicable in the event that the project is developed in the future.

6.5 OTHER GUIDELINES AND BEST PRACTICE RECOMMENDATIONS

6.5.1 GENERIC EMPR RELEVANT TO AN APPLICATION FOR SUBSTATION AND OVERHEAD ELECTRICITY TRANSMISSION AND DISTRIBUTION INFRASTRUCTURE

NEMA requires that an EMPr be submitted where an EIA has been identified as the environmental instrument to be utilised as the basis for a decision on an application for environmental authorisation. The content of an EMPr must either contain the information set out in Appendix 4 of the EIA Regulations, 2014, as amended, or must be a generic EMPr relevant to an application as identified and gazetted by the Minister in a government notice. Once the Minister has identified, through a government notice, that a generic EMPr is relevant to an application for EA, that generic EMPr must be applied by all parties involved in the EA process, including, but not limited to, the applicant and the CA.

GN 435 of 22 March 2019 identified a generic EMPr relevant to applications for substations and overhead electricity transmission and distribution infrastructure which require authorisation in terms of Section 42(2) of NEMA. Applications for overhead electricity transmission and distribution infrastructure that trigger Activity 11 of Listing Notice 1 or Activity 9 of Listing Notice 2 and any other listed or specified activities must use the generic EMPr.

The objective of the generic EMPr is "*to prescribe and pre-approve generally accepted impact management outcomes and impact management actions, which can commonly and repeatedly be used for the avoidance, management and mitigation of impacts and risks associated with the development or expansion of overhead electricity transmission and distribution infrastructure. The use of a generic EMPr is intended to reduce the need to prepare and review individual EMPrs for applications of a similar nature*."

The generic EMPr for Substations has been included in the Site-Specific EMPr (**Appendix I**).

6.6 ADDITIONAL PERMITS AND AUTHORISATIONS

Table 6-6 outlines the additional permits and authorisations required for the proposed development, as well as the relevant Competent Authorities responsible.

Table 6-6 – Additional Permits and Authorisations required for the proposed development

Permits / Authorisation	Legislation	Relevant Authority	Status
Notification Of Intent To Develop (NID) Section 38 (1) and Section 38 (8)	Section 38 (1) & (8) of the NHRA	HWC and SAHRA	Submitted – Case ID: 21549
Subdivision of Agricultural Land Act (SALA) Consent / Change of Land Use (re-zoning)	Subdivision of Agricultural Land Act (Act No. 70 of 1970) / Spatial Planning and Land Use Management Act (Act No. 16 of 2013) (SPLUMA)	DALRRD	An application will be submitted following conclusion of the EIA process and receipt of an EA
Water Use Licence / General	National Water Act (Act No. 36 of 1998)	Department of Water and Sanitation	An application will be submitted following the conclusion of the EIA process
Obstacle Permit	Civil Aviation Act (Act 13 of 2009)	Air Traffic and Navigation Services / Civil Aviation Authority	An application has already been submitted to ATNS
Section 53 Approval	Minerals and Petroleum Resources Development Act (No. 28 of 2002)	Department of Mineral Resources and Energy	An application will be submitted during the EIA process
Permits for removal or destruction of Threatened or Protected Species (TOPs)	Transvaal Nature Conservation Ordinance (No. 12 of 1983)	GDARD	Permits will be obtained prior to the commencement of construction.

7 BASELINE ENVIRONMENT

The following chapter presents an overview of the biophysical and socio-economic environment in which the proposed Project is located. It is important to gain an understanding of the Project area and its surroundings, as it will provide for a better understanding of the receiving environment in which the Project is being considered.

The description of the baseline environment is essential in that it represents the conditions of the environment before the construction of the proposed Project (i.e., the current, or status quo, environment) against which environmental impacts of the proposed Project can be assessed and future changes monitored.

The area has previously been studied to some extent and is recorded in various sources. Consequently, some components of the baseline have been generated based on literature review. However, where appropriate, baseline information has been supplemented or generated by specialists appointed to undertake baseline and impact assessments for the proposed Project.

7.1 PHYSICAL ENVIRONMENT

7.1.1 CLIMATE

*The following is extracted from the Terrestrial Biodiversity Assessment compiled by Ekotrust cc and included as **Appendix H.1**.*

7.1.1.1 Regional Climate and rainfall

The site within falls a seasonal summer-rainfall, warm-temperate region, with very dry winters. The mean annual precipitation of the Rand Highveld Grassland is 654 mm (range from 570 mm in the west to 730 mm in the east) with a peak in rainfall in January. The annual precipitation coefficient of variation is 25%. Mean annual potential evaporation is 1926 mm, while the mean annual soil moisture stress is 73%. Mean annual temperature is 14.7°C and frost is frequent in winter with a mean of 32 days per annum.

The mean annual rainfall in the region ranges from 613 mm at Fochville to 652 mm at the farm Leeuwpoort (**Table 7-1**). The mean annual rainfall as measured at Carletonville is 646 mm (**Table 7-2, Figure 7-1**). The total annual rainfall at Carletonville during dry and wet years respectively may range from 421 mm to 1109 mm, indicating a high variation in the annual rainfall and therefore a rainfall scenario that is highly unpredictable. The rainy season at Carletonville is predominantly from October to April when about 92% of the annual rainfall occurs. December and January are the wettest months and the driest period is from June to August, when less than 10 mm of rain per month is recorded (**Figure 7-1**). Maximum rainfall measured over a 24-hour period at Carletonville was 159 mm, recorded in December. The highest monthly rainfall recorded was 272 mm, measured in January.

Table 7-1 - Rainfall at some weather stations in the general environs of the Igolide site

	Mean Annual Rainfall (mm)				
Month	**Fochville**	**Leeuwpoort**	**Carletonville**	**Potchefstroom**	**Elandsfontein**
Jan	110	117	119	119	107
Feb	74	87	73	83	95
Mar	83	85	77	78	85
Apr	41	43	58	61	32
May	20	23	13	15	20
June	7	7	6	7	7
July	6	8	4	4	9
Aug	6	6	8	10	8
Sep	18	18	20	20	18
Oct	55	57	66	55	52
Nov	93	97	93	85	80
Dec	98	97	109	94	105
Year	**613**	**652**	**646**	**631**	**618**

Table 7-2 - Maximum rainfall (mm) in 24 hours, highest maximum and lowest monthly minimum rainfall at Carletonville: 26° 20' S; 27° 23' E; 1500 m

	Rainfall (mm)			
Month	**Mean (month)**	**24 h max**	**Max per month**	**Min per month**
Jan	119	71	272	44
Feb	73	111	204	29
Mar	77	79	204	3
Apr	58	72	201	7
May	13	33	75	0
June	6	21	35	0
July	4	29	29	0
Aug	8	35	81	0
Sep	20	45	90	0
Oct	66	102	169	8
Nov	93	73	216	24
Dec	109	159	252	46
Year	**646**	**159**	**1109**	**421**

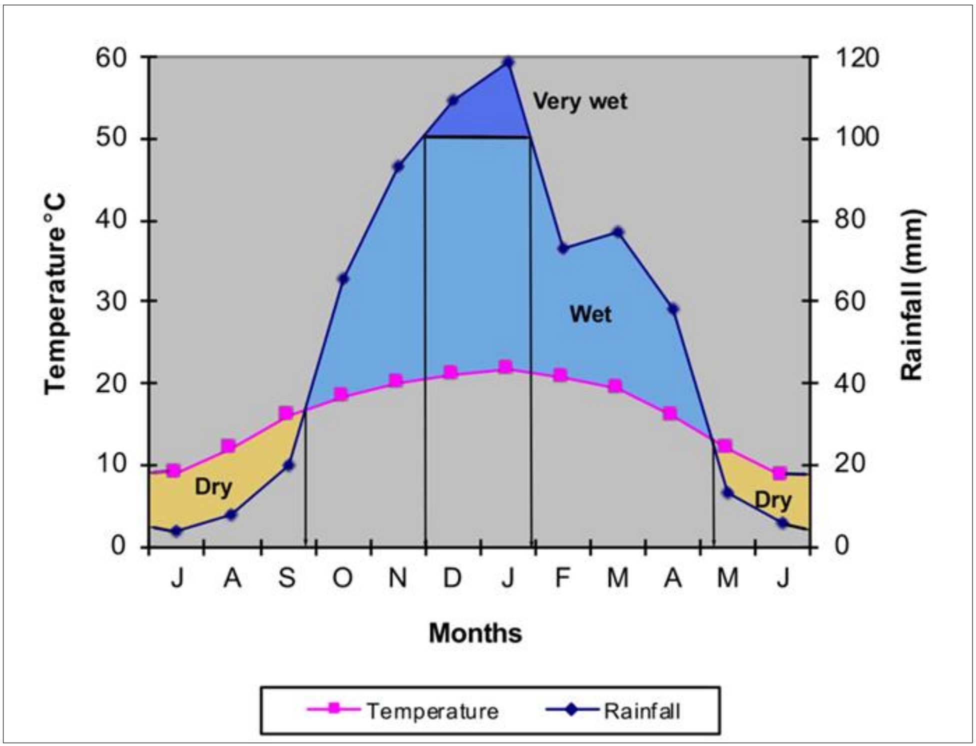


Figure 7-1 - Climate diagram for Carletonville

(Months on X-axis are from July to June. When the rainfall curve is below the temperature curve it indicates a dry period and when the monthly rainfall is higher than 100 mm it indicates a very wet period)

7.1.1.2 Temperature

The mean annual temperature for Carletonville is 16.3°C (**Table 7-3**) with the extreme maximum and minimum temperatures 37.1°C and -9.5°C respectively. The mean daily maximum for January is 27.9°C and for July it is 18.4°C, whereas the mean daily minimum for January is 16.5°C and for July it is 7.9°C. Frost may occur anytime from April to October.

Table 7-3 - Temperature data (°C) for Carletonville: 26° 20' S; 27° 23' E; 1500 m

	Temperature (°C)												
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Max	27.8	27.2	26.1	23.1	20.7	17.8	18.4	21.1	24.5	25.9	26.6	27.6	23.9
*Ext. Max	37.1	35.2	33.7	31.8	29.2	24.4	24.8	27.6	32.6	34.7	35	35.2	37.1
Min	16.5	16.9	14.5	9.8	8.8	3.5	7.9	8.7	8.4	11.5	8.8	15.1	3.5
*Ext. Min	7.5	5.5	2.0	-1.2	-5.6	-9.0	-8.8	-9.5	-3.3	-0.7	2.8	1.2	-9.5
Mean	21.6	20.9	19.5	15.9	12.1	8.7	9.0	11.9	16.1	18.4	20.0	21.1	16.3

Max = mean daily maximum temperature for the month
*Ext. Max = extreme maximum temperature recorded per month
Min = mean daily minimum temperature for the month
*Ext. Min = extreme minimum temperature recorded per month
Mean = mean monthly temperature for each month and for the year

7.1.2 AGRICULTURAL POTENTIAL

*The following is extracted from the Agricultural Compliance Statement compiled by Johann Lanz and included as **Appendix H.2.***

The important parameters that control the agricultural production potential of the site are given in **Table 7-4**. The land type soil data is given in Appendix 5 of the study. A satellite image map of the development site is given in **Figure 7-2** and photographs of site conditions are shown in **Figure 7-3** and **Figure 7-4**.

The site falls within an area that is classified as a Protected Agricultural Area. A Protected Agricultural Area is a demarcated area in which the climate, terrain, and soil are generally conducive for agricultural production and which, historically, has made important contributions to the production of the various crops that are grown across South Africa. Within Protected Agricultural Areas, the protection, particularly of arable land, is considered a priority for the protection of food security in South Africa. Obviously, all land within a Protected Agricultural Area is not necessarily of sufficient agricultural potential to be suitable for crop production, due to site-specific terrain, soil, and other constraints, and is therefore not necessarily worthy of prioritised protection as agricultural production land. The proposed wind farm site is such land that is of insufficient agricultural potential to be suitable for crop production.

Table 7-4 - Parameters that control and/or describe the agricultural production potential of the site

	Parameter	Value
Climate	Köppen-Geiger climate classification	Cwb
	Köppen-Geiger climate description	Temperate, dry winter, warm summer
	Mean Annual Rainfall (mm)	613
	Reference Crop Evaporation Annual Total (mm)	1354
	Climate capability classification (out of 9)	Between 5 and 6, but predominantly 6 (moderate to high)
Terrain	Terrain type	The site is situated on a low ridge line
	Slope gradients (%)	3
	Altitude (m)	1600
	Terrain capability classification (out of 9)	Between 4 and 7, but predominantly 6 (moderate to high)
Soil	Geology	Timeball Hill and Rooihoogte Formations [Mudrock, quartzite (ferruginous in places), wacke, chert breccia, minor diamictite, conglomerate, shale, magnetic ironstone] and Hekpoort and Boshoek Formations (Tuff, agglomerate)
	Land type	Fb15 and Ba1
	Description of land type soils	Predominantly shallow (with some deep), medium textured, soils on underlying weathered bedrock. Rock outcrops common.
	Dominant soil forms	Hutton, Mispah, Glenrosa

	Parameter	Value
	Soil capability classification (out of 9)	Between 4 and 6, but predominantly 6 (moderate to high)
Land use	Agricultural land use in the surrounding area	Grazing and rain-fed field crops
	Agricultural land use on the site	Grazing of game only
	Land Cover classification on the site	Natural grassland, fallow land
General	Long-term grazing capacity (hectares per Large Stock Unit)	6 (very high)
	Land capability classification (out of 15)	Between 4 and 10, but predominantly 8 (moderate)
	Within Protected Agricultural Area	Yes

Figure 7-2 - Satellite image map of the development
Source: Lanz, 2023

Figure 7-3 - Photograph of typical site conditions showing the rockiness of the site
Source: Lanz, 2023

Figure 7-4 - Photograph of typical site conditions showing the rockiness of the site
Source: Lanz, 2023

This assessment of the agricultural production potential of the site is based on an integration of the different parameters in **Table 7-4** above. Although cropping occurs in the area (on better soils that are off the ridge line), and occurred on the site many years ago, the cropping potential of the site is limited predominantly by shallow, rocky soils that dominate the higher lying land on the ridge line where the turbines are situated. Cropping on the site is no longer economically viable. The marginal agricultural potential of the site limits its agricultural use to grazing only. It should be noted that cropping potential changes with a changing agricultural economy over time. Poorer soils that may have been cropped with economic viability in the past, are abandoned as cropland because they become too marginal for viable crop production in a more challenging agricultural economy, with increased input costs.

7.1.3 TOPOGRAPHY

*The following is extracted from the Terrestrial Biodiversity Impact Assessment compiled by Ekotrust cc and included as **Appendix H.1**.*

The site is characterised by grassland on the sloping plains and low hills, with bushveld patches on the rocky plains and koppies (ridges). The altitude ranges from 1500 m at the lowest point in the west up to approximately 1640 m at the highest point on the hill in the central part of the site. The site is drained from north to south on the western boundary by the Kraalkopspruit and its tributaries and by a stream in the east.

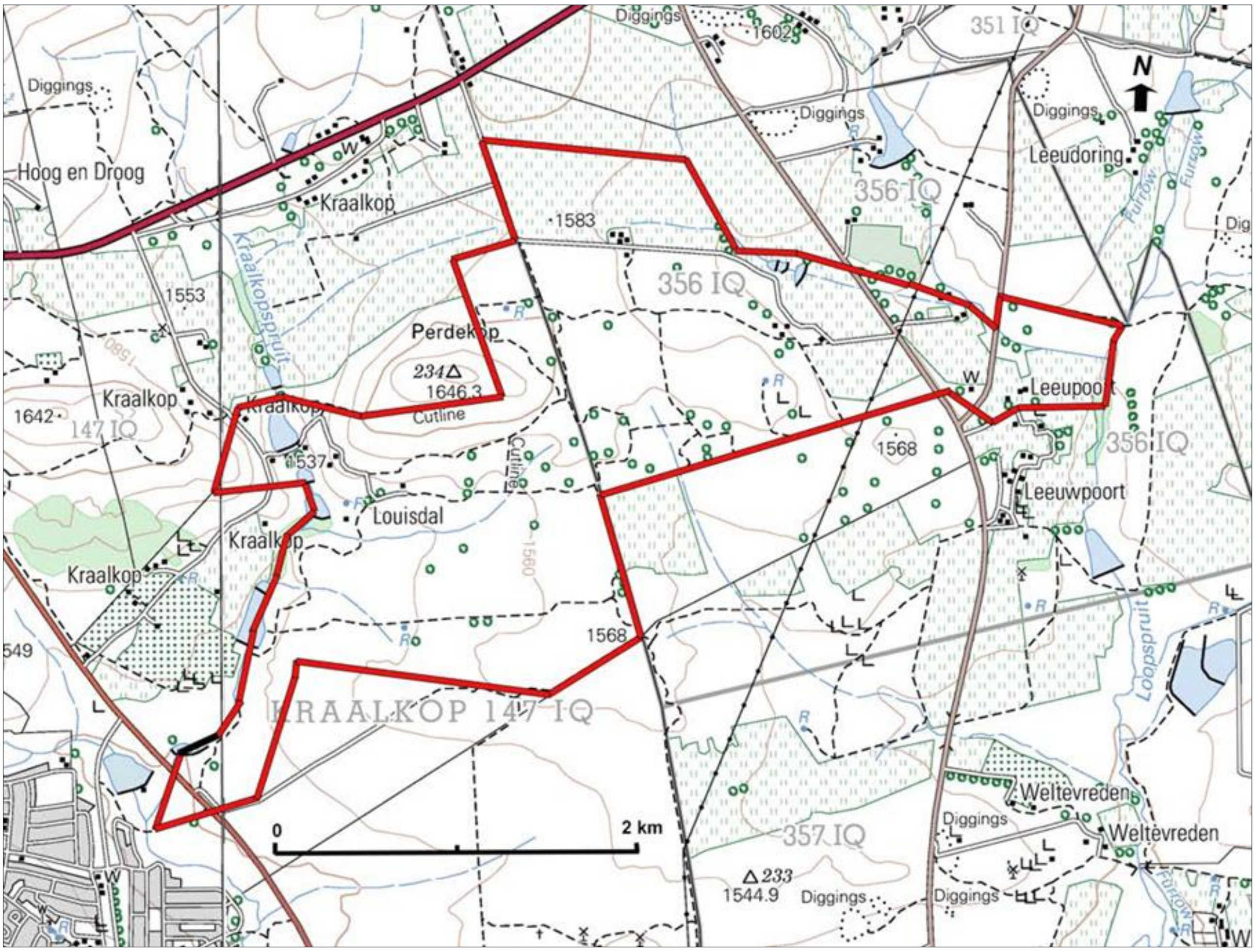


Figure 7-5 - Topocadastral map of the Igolide WEF site (2627BC Westonaria 2010, 2627AD Carltonville 2010)

Source: Ekotrust, 2023

7.1.4 GEOLOGICAL CONTEXT

*The following is extracted from the Palaeontological Study compiled by Professor Marion Bamford (Palaeobotanist) and included as **Appendix H.14**.*

The project lies in the Transvaal Basin with exposed strata of Transvaal Supergroup (**Figure 7-6**). Much of the project footprint area was ploughed and cultivated in the past as indicated by the 1968 aerial map (**Figure 7-7**).

The Late Archaean to early Proterozoic Transvaal Supergroup is preserved in three structural basins on the Kaapvaal Craton. In South Africa are the Transvaal and Griqualand West Basins, and the Kanye Basin is in southern Botswana. The Griqualand West Basin is divided into the Ghaap Plateau sub-basin and the Prieska sub-basin. Sediments in the lower parts of the basins are very similar but they differ somewhat higher up the sequences. Several tectonic events have greatly deformed the south western portion of the Griqualand West Basin between the two sub-basins.

The Transvaal Supergroup comprises one of world's earliest carbonate platform successions. In some areas there are well preserved stromatolites that are evidence of the photosynthetic activity of blue green bacteria and green algae. These microbes formed colonies in warm, shallow seas.

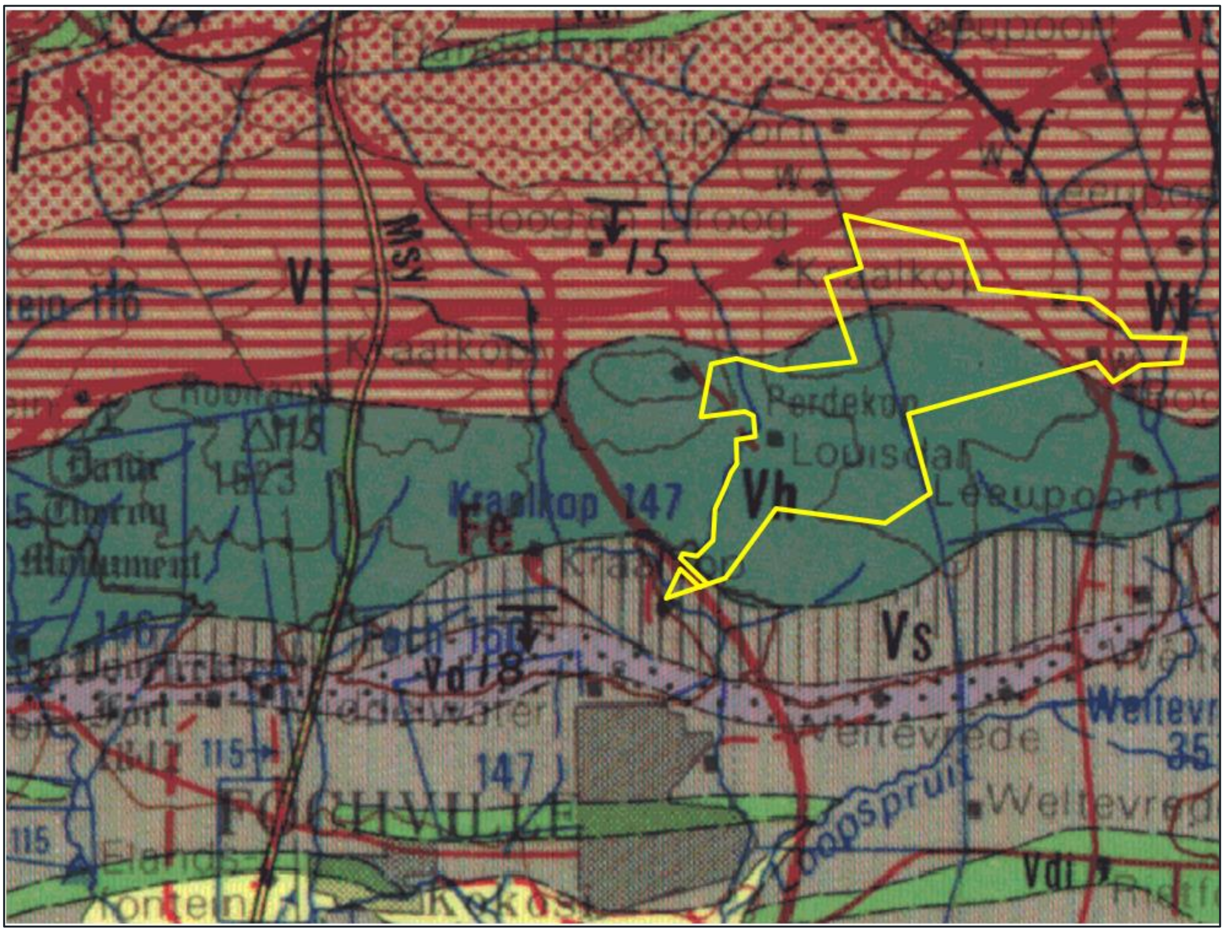


Figure 7-6 - Geological map of the area around the proposed Igolide WEF indicated within the yellow polygon

Source: Bamford, 2023

*Abbreviations of the rock types are explained in **Table 7-5**. Map enlarged from the Geological Survey 1: 250 000 map 2626 West Rand.*

Table 7-5 - Explanation of symbols for the geological map and approximate ages

Symbol	Group/Formation	Lithology	Approximate Age
Vdi	Diabase	Intrusive volcanic rocks	Post Transvaal SG
Vsi	Silverton Fm, Pretoria Group, Transvaal SG	Shale, carbonaceous in places, hornfels, chert	Ca 2202 Ma
Vd	Daspoort Fm, Pretoria Group, Transvaal SG	Sandstone, mudrock	Ca 2230 Ma
Vs	Strubenkop Fm, Pretoria Group, Transvaal SG	Shale, in places ferruginous	Ca 2242 Ma
Vdw	Dwaalheuvel Fm, Pretoria Group, Transvaal SG	Quartzite, chert, jaspilite	<2242 Ma
Vh	Hekpoort Fm, Pretoria Group, Transvaal SG	Volcanic rocks	Ca 2224 Ma
Vt	Timeball Hill Fm Pretoria Group, Transvaal SG	Shale, siltstone, conglomerate in places; dotted = Quartzite	Ca 2316 – 2266 Ma

Source: Prof Marion Bamford, 2023

(Eriksson et al., 2006; Zeh et al., 2020). SG = Supergroup; Fm = Formation; Ma = million years; grey shading = formations impacted by the project.

In the Transvaal Basin the Transvaal Supergroup is divided into two Groups, the lower Chuniespoort Group and the upper Pretoria Group (with ten formations). The Chuniespoort Group is divided into the basal Malmani Subgroup that comprises dolomites and limestones and is divided into five formations based on chert content, stromatolitic morphology, intercalated shales and erosion surfaces. The top of the Chuniespoort Group has the Penge Formation and the Duitschland Formation.

Making up the lower Pretoria Group are the Timeball Hill Formation and the Boshoek Formation. The Hekpoort, Dwaalheuwel, Strubenkop and Daspoort Formations form a sequence as the middle part of the Pretoria Group, Transvaal Supergroup, and represent rocks that are over 2060 million years old. The Hekpoort Formation is a massive lava deposit and is overlain by the Dwaalheuwel conglomerates, siltstone and sandstone (not present here). A hiatus separates the Strubenkop Formation slates and shales from the overlying quartzites of the Daspoort Formation. Upper Pretoria Group formations are the Silverton, Magaliesberg, Vermont, Lakenvalei, Nederhorst, Steenkampsberg and Houtenbek Formations.

The Transvaal sequence has been interpreted as three major cycles of basin infill and tectonic activity with the first deep basin sediments forming the Chuniespoort Group, the second cycle deposited the lower Pretoria Group, and the sediments in this area are from the interim lowstand that preceded the third cycle. These sediments were deposited in shallow lacustrine, alluvial fan and braided stream environments.

The Pretoria Group is approximately 6-7km thick and is composed mostly of mudrocks alternating with quartzitic sandstones, significant interbedded basaltic-andesitic lavas and subordinate conglomerates, diamictites and carbonate rocks. These have been subjected to low grade metamorphism. The Bushveld Complex intrusion has affected the layering of the formations.

Overlying the Rooihoogte Formation is the Timeball Hill Formation which is composed of thick shales and subordinate sandstones that were deposited in a fluvio-deltaic basin-filling sequence. A number of facies are included in this formation. At the base is black shale facies associated with subsurface lavas and pyroclastic rocks of the Bushy Bend Lava Member. Above these are rhythmically interbedded mudstones/siltstones and fine-grained sandstones that have been interpreted as turbidite deposits. These fine-grained sediments grade up into the medial Klapperkop Quartzite Member that has been interpreted as fluvio-deltaic sandstones which fed the more distal turbidites (ibid). Above this is an upper shale member and rhythmite facies. In the east of the Transvaal Basin the Upper Timeball Hill shales have undergone extensive soft-sediment deformation caused by the onset of tectonic instability that led to the eventual fan deposits of the Boshoek Formation and the flood basalts of the Hekpoort Formation (ibid).

Figure 7-7 - Aerial photograph from 1968 to show that the project footprint was ploughed and cultivated in the past (Any rocks would have been removed)

The Hekpoort Formation is composed of subaerial lavas that intruded into the Boshoek sandstones. These basaltic-andesitic lavas are thickest in the south of the Transvaal basin, thinning to the west and thinnest in the northeast.

The Dwaalheuwel Formation sandstones overlie the Hekpoort Formation volcanic deposits and form two lobes, one from the northeast and one from the northwest. These are sandy distal fan and fluvial braid-plain deposits and are absent from the south of the Transvaal Basin (ibid).

The Strubenkop Formation depositional setting has been interpreted as either a lacustrine one or a shallow marine one. This formation comprises alternating mudstones and siltstones with subordinate interbedded, immature, fine-grained sandstones and is generally upward-coarsening.

There is an unconformity between the Strubenkop shales and the overlying Daspoort Formation. In the east of the Transvaal Basin the latter is composed of mature quartz arenites and subordinate mudrocks and ironstones, but in the west of the basin it is mostly made up of immature sandstones, pebbly arenites, conglomerates and mudrocks. This formation probably represents a fluvial setting succeeded by a shallow marine setting that was the precursor to a major transgression that formed the succeeding Silverton Formation. At the top of the Daspoort Formation are localised occurrences of stromatolitic carbonates and cherts (ibid).

Within the Silverton Formation are the lower Boven Shale Member, Machadorp Volcanic Member and upper Lydenburg Shale Member. The lower shales are alumina-rich and best represented in the eastern part of the Transvaal Basin. Shallow subaqueous eruptives formed the tholiitic basalts and then the tuffaceous shales that are high in CaO-MnO-MgO formed the Lydenburg Member. The Silverton Formation has been interpreted as a high-stand facies tract that reflected the advance of an epeiric sea onto the Kaapvaal Craton from the east, so the Daspoort Formation would represent a lowstand facies tract or a transgressive systems tract (ibid).

7.1.5 GEOTECHNICAL CONTEXT

*The following is extracted from the Desktop Geotechnical Study compiled by WSP Group Africa (Pty) Ltd and included as **Appendix H.10**.*

A desktop geotechnical study was undertaken for the proposed project, and the findings are presented below.

7.1.5.1 Surface drainage

Flooding affects flat lying areas, areas confined to drained channels and flood plains. The Loopspruit river passes through the far west and far east sections of the site which can pose potential problems during wet periods especially in areas where shallow rock or clay is present. Water management is recommended on all flat areas on site to facilitate water run-off and to alleviate the possibility of standing water at the foundation positions.

7.1.5.2 Erosion

The slope on site, as well as the soil structure will influence the amount of erosion that occurs on site. The undulating gradient makes the probability of erosion likely although this is reduced by the presence of tall grass and trees (**Figure 7-8**), that cover large portions of the site. Construction might increase the likelihood of erosion due to the disturbance of natural vegetation. This should be mitigated by revegetation after construction.

Figure 7-8 - Vegetation on site
Source: WSP, 2023

7.1.5.1 SUITABILITY OF INSITU MATERIAL FOR USE IN CONSTRUCTION

Shale rock can be used during construction as backfill and in layerworks. However, some shale material breaks down on exposure to air and water and this can cause severe problems. Should the shale be indicated for use as a construction material, its durability properties would need to be assessed.

Quartzite rock is generally inert and of use as a construction material However, it is generally hard rock or harder in situ and blasting and crushing is generally required. Quartzitic sand is of use in construction but is likely be available only in very small quantities.

The soils developed on the Hekpoort Andesite Formation are unlikely to be suitable for use as a construction material due to their potential expansivity. The rock, however, is often used as general fill and in layerworks, once crushed.

7.1.5.2 EXCAVATIBITY

The excavation characteristics of the soil horizons has been evaluated according to the South African Bureau of Standards standardized excavation classification for earthworks (SABS – sa1200D). The definition of the excavation classes is indicated in **Table 7-6** and the assessment of the in-situ profile in **Table 7-7**. The ease of excavation is a critical financial factor for any development.

Table 7-6 - SABS Excavation Classes

Class of Excavation	General Definition
Soft	Excavation in material which can be efficiently removed or loaded by any of the following plant. without prior ripping: A bulldozer with a mass of at least 22 tons (which includes the mass of the ripper, if fitted) and an engine developing approximately 145kW at the flywheel. Or, A tractor-scraper unit with a mass of at least 28 tons and an engine developing approximately 245kW at the flywheel, pushed during loading by a bulldozer as specified for intermediate excavation Or, A track type front end loader with a mass of at least 22 tons and an engine developing approximately 140kW at the flywheel.
Intermediate	Excavation (excluding soft excavation) in material which can be efficiently ripped by a bulldozer with a mass of at least 35 tons when fitted with a single tine ripper and an engine developing approximately 220kW at the flywheel.
Hard	Excavation (excluding boulder excavation) in material which cannot be efficiently ripped by a bulldozer with properties equivalent to those described for intermediate excavation. This type of excavation generally includes excavation in material such as formations of unweathered rock, which can be removed only after blasting.
Boulder Class A	Excavation in material containing in excess of 40% by volume of boulders between 0.03m3 and 20m3 in size, in a matrix of softer material or smaller boulders. Excavation of fissured or fractured rock shall not be classed as boulder excavation but as hard or intermediate excavation according to the nature of the material.
Boulder Class B	Where material contains 40% or less by volume of boulders in a matrix or soft material or smaller boulders.

Table 7-7 - Excavatability on site

Material	Excavation Class
Strubenkop Shale and Timeball Hill Formations	▪ Soft excavations in residual shale, quartzite and hornfels and in very soft rock. ▪ Intermediate to hard excavation in medium hard and hard rock.
Hekpoort Andesite Formation	▪ Soft excavations in residual andesite, agglomerate and tuff, and in very soft rock. Some boulder excavation may be required. ▪ Intermediate to hard excavation in medium hard and hard rock.

7.1.5.3 SLOPE STABILITY

Development on the site is unlikely to cause any slope instability as no significant cut slopes will be developed. Where excavations are required, up to a depth of 3m, excavations should be excavated at a batter of 1:1 in soil where no water or seepage is evident and to 1:2, or flatter, where water is encountered. Rock can be excavated at a batter of 1:0.5 or vertically in the temporary case up to a depth of 3m.

7.1.5.4 SEISMIC HAZARD

The peak ground acceleration is between 0.16g and 0.20g for the site. The peak ground acceleration may be described as the maximum acceleration of the ground shaking during an earthquake, which has a 10% probability of being exceeded in a 50-year period as per **Figure 7-9**.

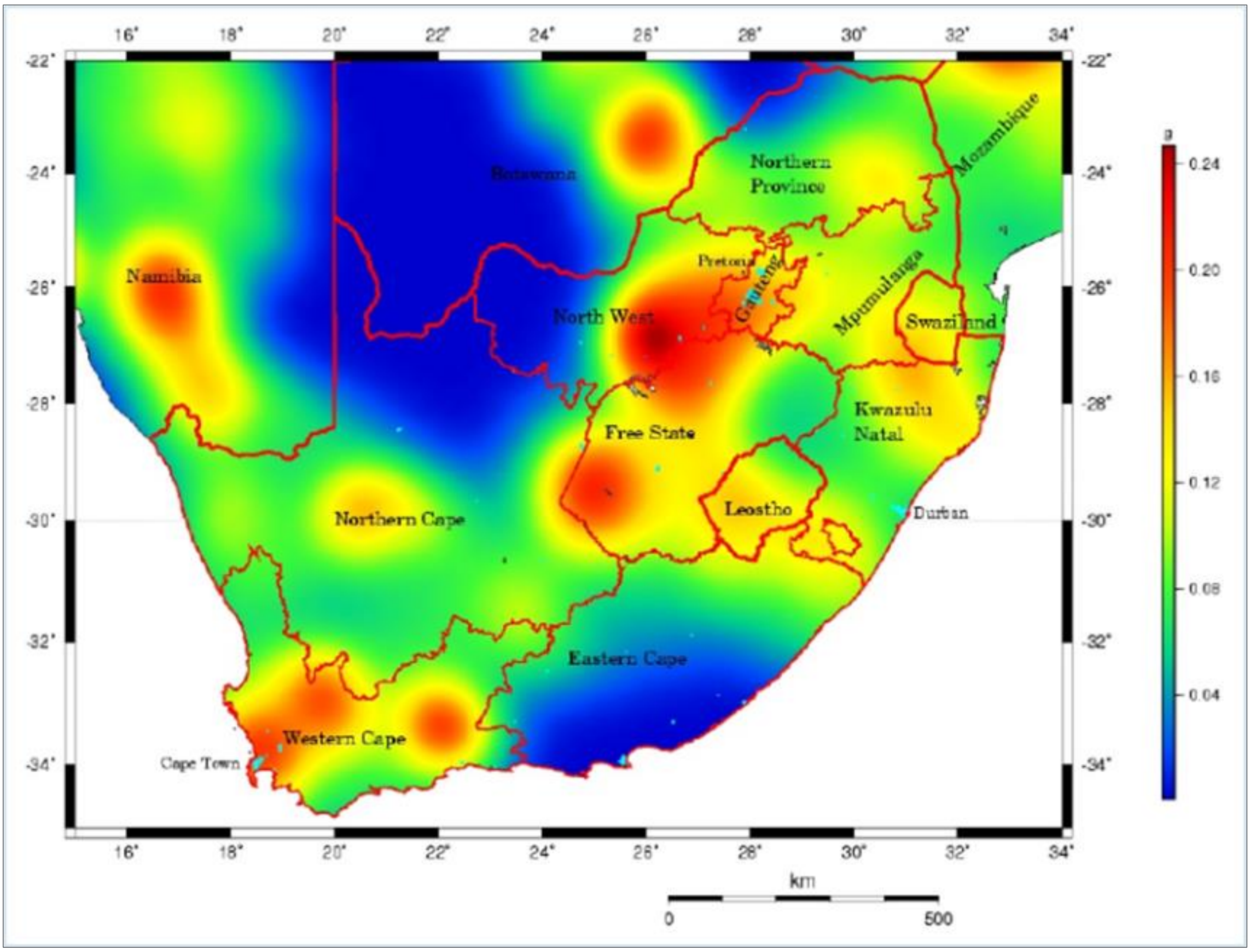


Figure 7-9 - Probabilistic seismic hazard map of South Africa

The site is situated in a zone were mining induced and natural seismic activity is possible (**Figure 7-10**). The last seismic event in the area was recoded on the 18th of January 2022 with a magnitude of 3.3.

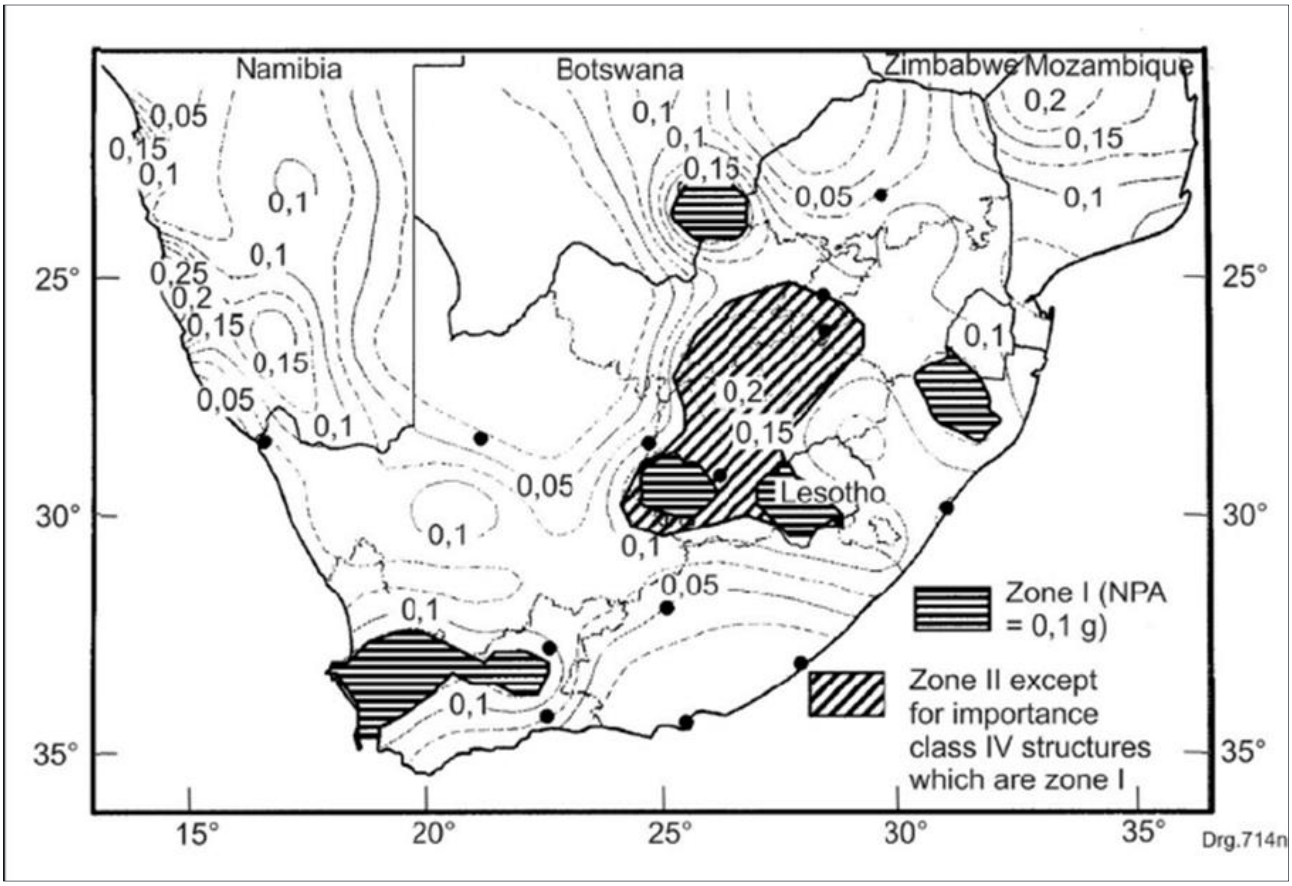


Figure 7-10 - Seismic zones of South Africa

7.1.5.5 UNDERMINING

Subsidence at surface in undermined areas is caused by the collapse and failure of the underground mining voids relatively close to the surface. The extent of mining activity in South Africa, shown in **Figure 7-11**, which depicts that the site is in an area with a significant number of gold mines.

Kloof mine is an underground gold mine located approximately 6km west of the site and could potentially pose problems for the proposed project with the possibility of a mine induced seismic event. The specialist recommended that the extent of any undermining below the site should be assessed, in detail, prior to development as the possibility of surface subsidence cannot be discounted should the site be undermined.

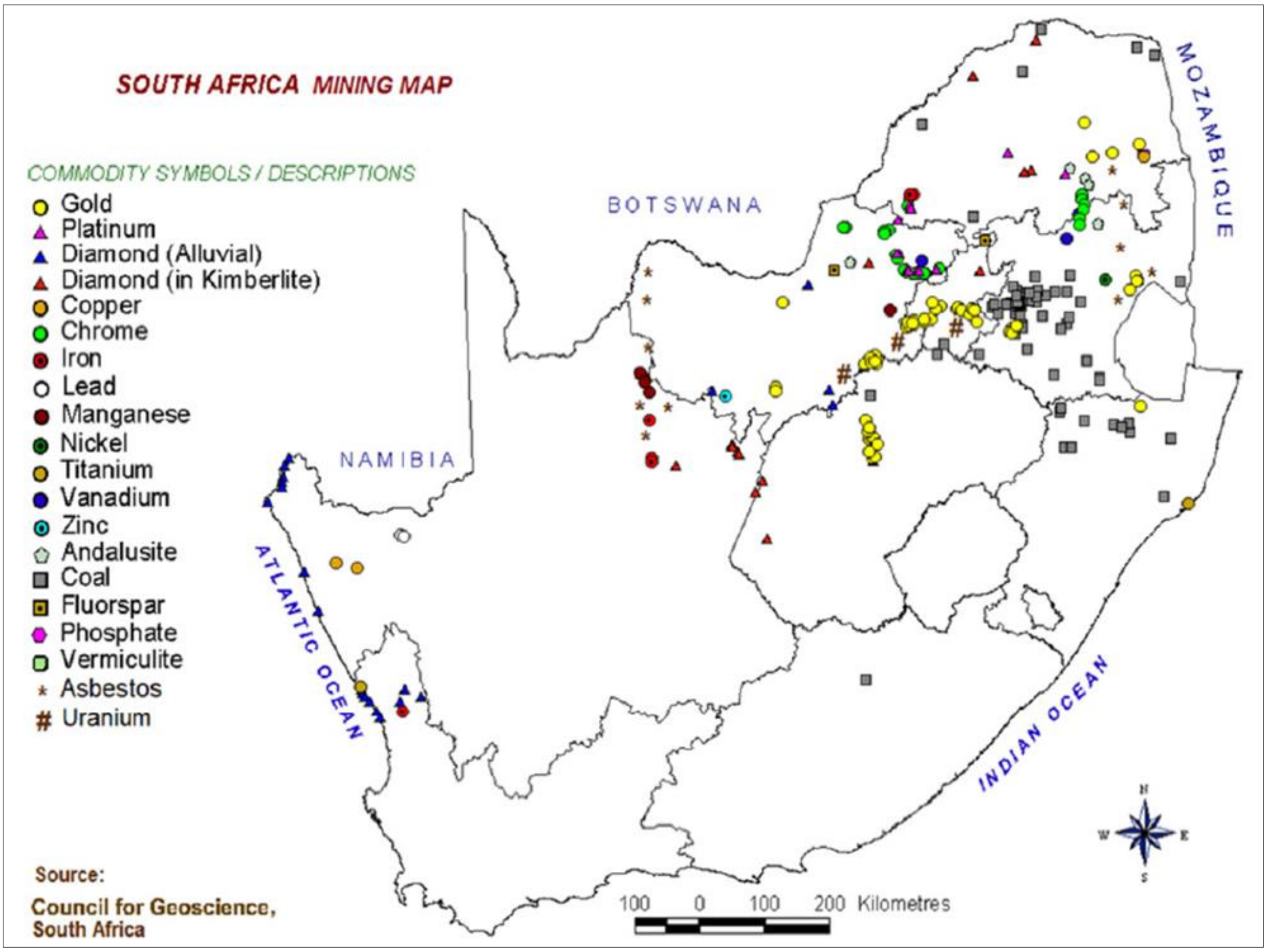


Figure 7-11 - Map indicating mining areas in South Africa

7.1.5.6 FOUNDATIONS

The turbines exert both a static load and a dynamic load on the founding material and competent material is required for founding to ensure stability and serviceability of the structures in the in the long term. Outcrops and shallow rock are expected under parts of the project site underlain by rocks of the Strubenkop Shale and Timeball Hill Formations. The depth to rock in those areas underlain by the Hekpoort Andesite Formation is expected to be highly variable over a very small distance.

7.1.6 SURFACE WATER

The following is extracted from the Aquatic Biodiversity Assessment compiled by WSP Group Africa (Pty) Ltd and included as **Appendix H.3**.

The proposed site lies within the C23J quaternary catchment of the primary drainage region C within the Vaal Water Management Area (WMA). The Kraalkopspruit Sub-Quaternary Reach (SQR) C23J-01507 drains the Project Area to the west, while the perennial Loopspruit SQR C23J-01487 drains the study area on the east (**Figure 7-12**).

The Kraalkopspruit SQR is a first order stream which flows for approximately 10 km in a southward direction before joining the Loopspruit. The Loopspruit SQR is also a first order stream which flows for approximately 17 km in the southwest direction.

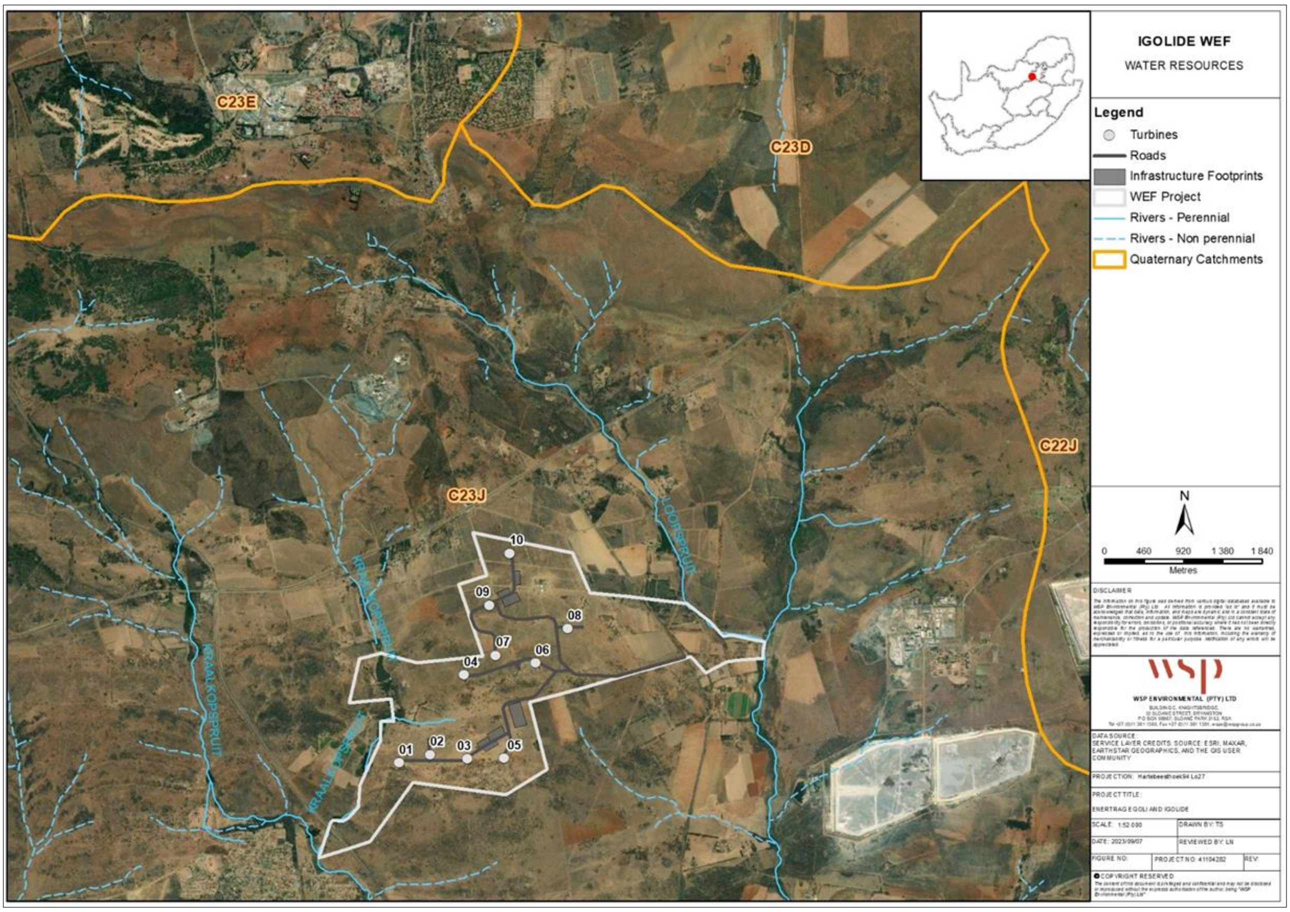


Figure 7-12 - Quaternary Catchments associated with the proposed project

7.2 BIOLOGICAL ENVIRONMENT

7.2.1 AQUATIC BIODIVERSITY

The following is extracted from the Aquatic Biodiversity Assessment and Wetland Assessment compiled by WSP Group Africa (Pty) Ltd and included as **Appendix H.3** *and* **Appendix H.15** *respectively.*

7.2.1.1 Classification of aquatic features

Freshwater Ecosystem Priority Areas (FEPA) sub-catchment

The proposed development footprint in relation to FEPA sub-catchments and mapped National Freshwater Ecosystem Priority Areas (NFEPA) wetlands is illustrated on **Figure 7-13** and **Figure 7-14**. FEPA sub-catchment areas provide strategic spatial priorities for conserving south Africa's freshwater ecosystems and supporting sustainable use of water resources. Areas mapped as FEPA sub-catchment provide guidance on which watercourses should remain in a natural or near natural condition to support water resource protection goals of the water act.

Figure 7-13 - FEPA Sub-Catchments in relation to the Study Area

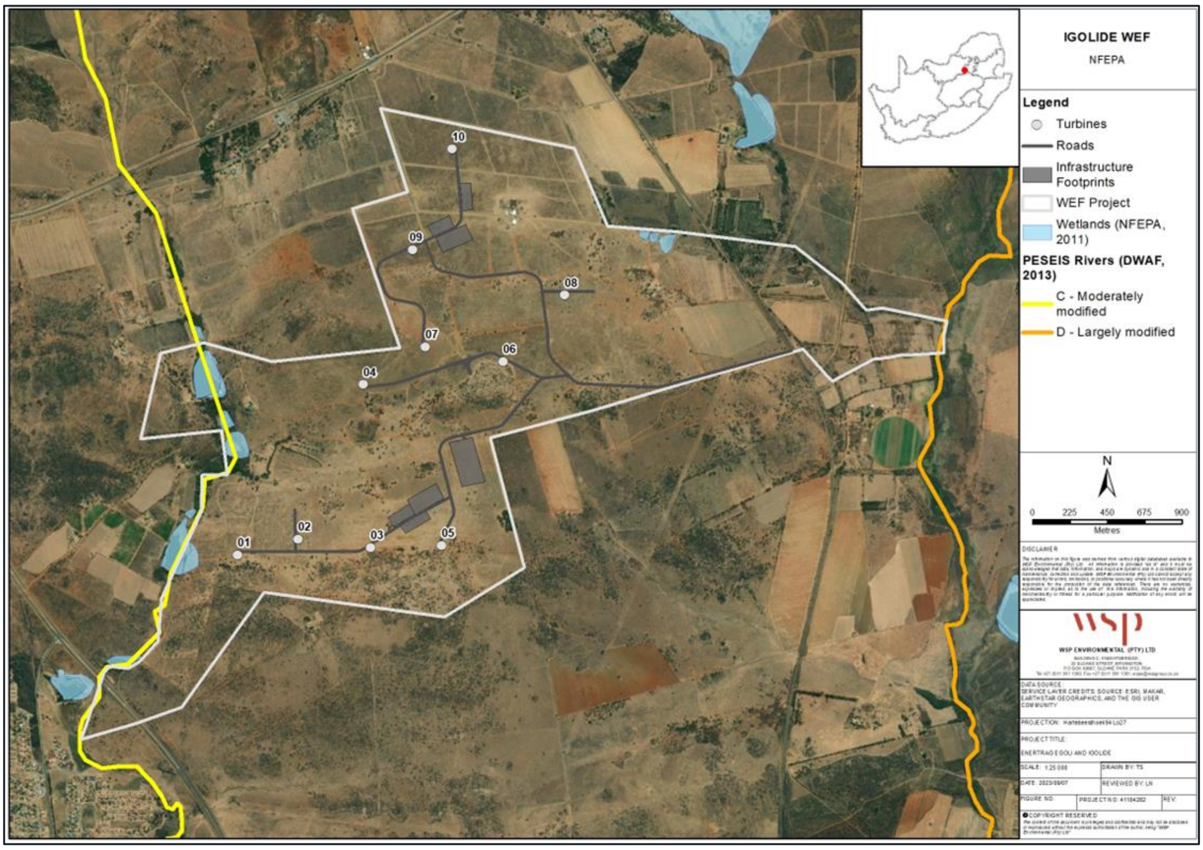


Figure 7-14 - NFEPA Wetlands and Rivers within the Study Area

7.2.1.2 National Wetland Map 5 – Wetlands

The South African National Wetland Map version 5 (NWM5) portrays the most up-to-date spatial data for the extent and types of estuarine and inland aquatic (freshwater) ecosystems of South Africa. The proposed development footprint in relation to wetlands mapped as part of the National Wetland Map 5 project is illustrated on **Figure 7-15**. Based on NWM5 the Project area intercepts a number of wetland systems including a channelled valley bottom wetland, a hillslope seep, and an unchanneled valley bottom wetland as seen in **Figure 7-15**.

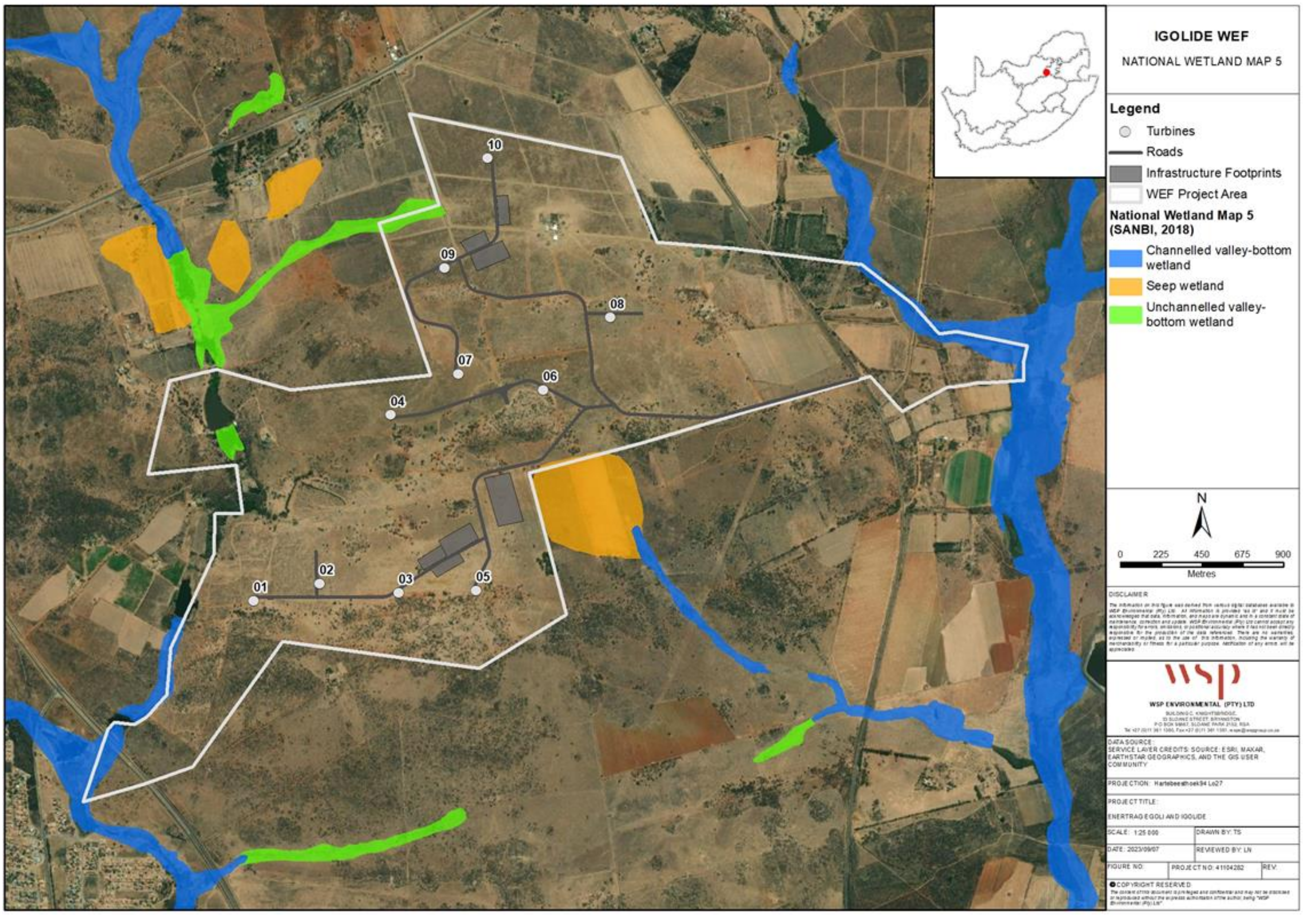


Figure 7-15 - National Wetland Map 5 Wetlands on site

Gauteng Conservation Plan (C-Plan)

The proposed project lies within isolated patches of CBA-important Areas and CBA-Ecological Support Areas (**Figure 7-16**).

CBAs are natural or near-natural terrestrial or aquatic areas required to meet targets for biodiversity pattern and/or ecological processes and ESAs are areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of protected areas or CBAs and for delivering ecosystem services.

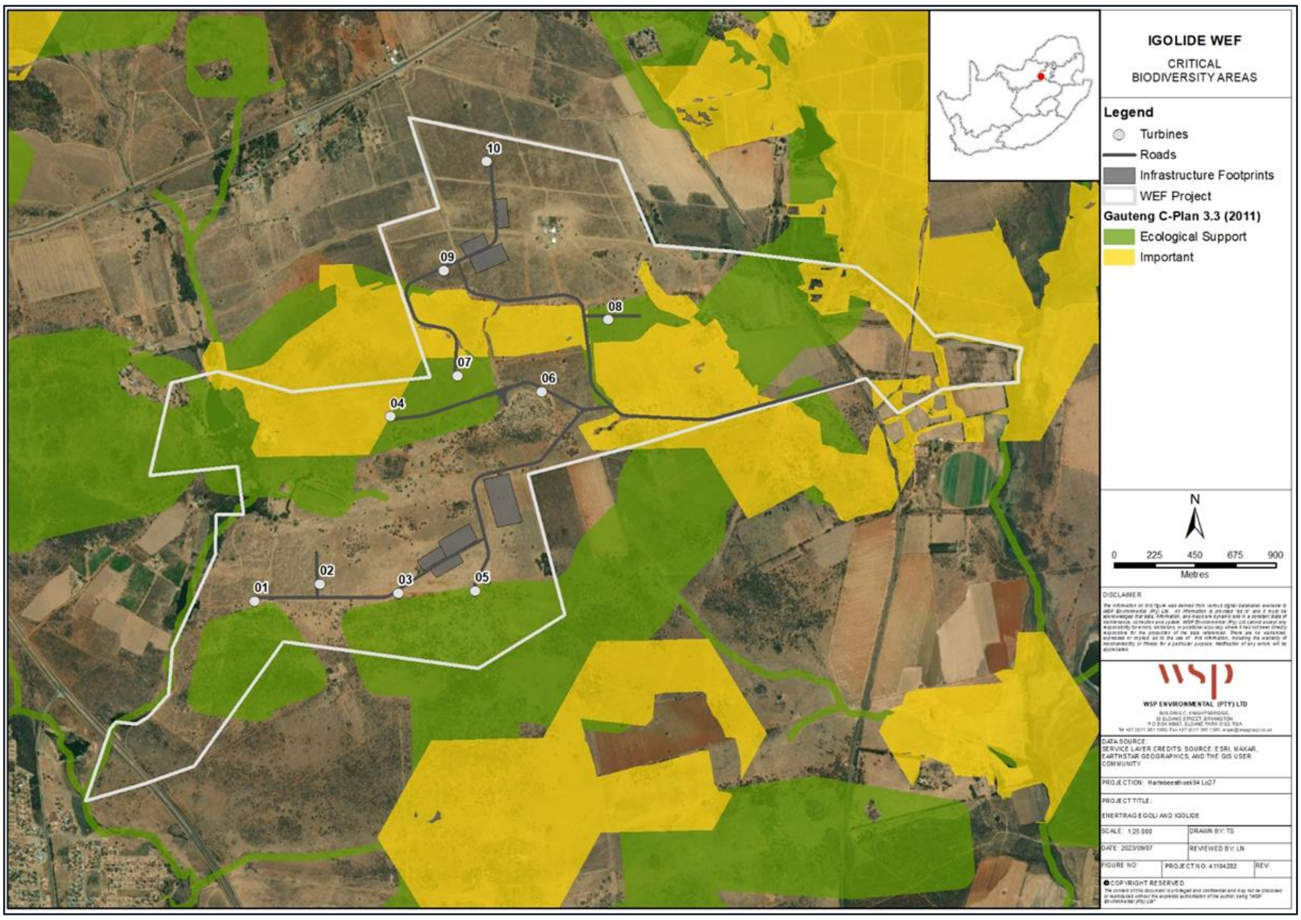


Figure 7-16 - Critical Biodiversity Areas associated with the proposed project

7.2.1.3 Present Ecological State, Importance and Sensitivity

The Present Ecological State (PES) for the associated Kraalkopspruit and Loopspruit SQRs is Moderately Modified and Largely Modified respectively. The Ecological Importance and Sensitivity (EIS) for the Kraalkopspruit SQR is moderate and high respectively, and moderate for the Loopspruit SQR. The EIS categories are based on the diversity of fish and aquatic macroinvertebrate taxa expected to occur within these systems and their sensitivities to water quality modifications (**Table 7-8** and **Table 7-9**).

Table 7-8 - Desktop Present Ecological State, Importance and Sensitivity for the focus Sub-Quaternary Reaches

River	Kraalkopspruit	Loopspruit
SQR Code	C23J-01507	C23J-01487
Ecological Category	C	D
Category Description	Moderately Modified	Largely Modified
Ecological Importance (EI)	Moderate	Moderate
Ecological Sensitivity (ES)	High	Moderate

River	Kraalkopspruit	Loopspruit
No. of fish species	5	4
No. of aquatic invert taxa	42	41

Expected Fish Species and Aquatic Macroinvertebrate Taxa

The expected fish species and aquatic macroinvertebrate taxa for the SQRs associated with the proposed project are presented in **Table 7-9** and **Table 7-10** respectively. Five fish species are expected, all of which are categorized as Least Concern (LC) according to the IUCN Red List of Threatened Species. The fish species tolerances to modified water quality and no-flow conditions vary between tolerant to moderately Intolerant. A total of 42 aquatic macroinvertebrate taxa are expected within the study area. The community assemblage is predominantly comprised of taxa with a high preference for slow flows, and with very low sensitivities toward water quality modifications. Few taxa have a high requirement for fast flowing water (i.e., Ceratopogonidae, Chironomidae, Simuliidae, Tipulidae and Ancylidae).

Table 7-9 - Expected fish species, respective tolerance/intolerance to water quality modifications and no-flow conditions and IUCN conservation status

SQR		Fish Species	Tolerance		Conservation Status
			Modified Water Quality	No-Flow	
C23J-01507	C23J-01487	*Tilapia sparrmanii*	Tolerant	Tolerant	LC
		Enteromius anoplus	Moderately tolerant	Moderately tolerant	LC
		Enteromius paludinosus	Tolerant	Moderately tolerant	LC
		Pseudocrenilabrus philander	Tolerant	Tolerant	LC
		Enteromius pallidus	Moderately Intolerant	Moderately tolerant	LC

Table 7-10 - Expected aquatic macroinvertebrates

Taxa/ Family names		
Turbellaria	*Gerridae*	*Chironomidae*
Oligochaeta	*Hydrometridae*	*Culicidae*
Hirudinea	*Naucoridae*	*Muscidae*
Potamonautidae	*Nepidae*	*Psychodidae*
Atyidae	*Notonectidae*	*Simuliidae*
Hydracarina	*Pleidae*	*Syrphidae*
Baetidae > 1 sp	*Veliidae/mesoveliidae*	*Tabanidae*
Caenidae	*Hydropsychidae 1 sp*	*Tipulidae*
Coenagrionidae	*Hydroptilidae*	*Ancylidae*
Aeshnidae	*Leptoceridae*	*Lymnaeidae*
Gomphidae	*Dytiscidae*	*Physidae*
Libellulidae	*Gyrinidae*	*Planorbinae*

Taxa/ Family names		
Belostomatidae	*Hydrophilidae*	*Corbiculidae*
Corixidae	*Ceratopogonidae*	*Sphaeriidae*

7.2.1.4 Wetland Classification and Assessment

A total of seven wetland systems were identified within a 500m buffer of the proposed project development. The infield sampling of soil and vegetation in conjunction with the recording of diagnostic topographical /terrain indicators and features, enabled the delineation of the wetlands, which included two channelled valley bottom wetlands, and five hillslope seepage wetlands. These are discussed in detail below.

Channelled valley bottom wetlands

Two Channelled Valley Bottom (CVB) wetlands, one associated with the Kraalkoopspruit (CVB 1) and one with Loopspruit (CVB 2) occurs within the study area (**Figure 7-17** and **Figure 7-18**). Channelled valley bottoms wetlands (CVB) are characterised by having a well-defined stream channel but lacking characteristic floodplain features, which was the case for the CVB wetlands on site. These systems receive water inputs from the main channel and from adjacent slopes.

The CVB wetlands were characterised by riparian vegetation along the channelised section of the wetland, species such as Populus sp. and Salix sp. (Weeping willow), were identified along the CVB wetlands. The permanent zone of the wetlands was dominated by the wetland sedges such as Juncus oxycarpus, Juncus effuses and the perennial grass Phragmites australis, while the seasonal zones were characterised by imperata cylindrica.

Figure 7-17 - A view of the CVB 1 wetland

Figure 7-18 - A view of the CVB 2 wetland

Channelled valley bottom wetlands

A total of five seasonal hillslope seepage (seep) wetlands were identified within the study area, these were connected to the CVB wetlands mentioned above (**Figure 7-19**). Hillslope seepage wetlands are created and maintained by infiltration processes that occur in the surrounding non-wetland areas within the catchment. This type of system typically contributes to flow in the watercourses, even if this contribution is only on a seasonal basis. The hillslope seepage wetlands were dominated by hygrophilous grasses, with some wetter areas characterised by wetland plant species *Schnoplectus paludicola, Centella asiatica, and Cyperus marginatus.* Majority of the seep wetlands were also dominated by alien invasive species such as *Verbena bonarensis*, *Tagetes minuta*, *Datura ferox*, which colonised areas along road crossings and dam walls.

Figure 7-19 - Wetland identified within the study area

7.2.1.5 Wetlands – Present Ecological State

Present ecological State

The wetlands on site were assessed to be in a Moderately Modified PES (**Table 7-11**). This was attributed to the current impacts identified on site such as headcut erosion within seep wetlands, impoundment of water at dams, alien invasive species colonisation at road crossings as well as alien invasive vegetation (i.e. *Eucalyptus)*, preferential flow paths along animal tracks and crop farming at wetland edges (**Figure 7-20** and **Figure 7-21**).

Based on the PES assessment scores, the hydrology and geomorphological impacts on the wetlands are the main contributing factor to their Moderately modified state. This is due to the presence of dams which interrupt the surface hydrology and impound surface flow, as well as presence of erosional features, particularly within the seep wetlands. The PES score for the wetlands in the study area are presented in **Table 7-11**.

Table 7-11 - Summary of Impact Scores and PES Class

Wetland Unit	Size (ha)	Hydrology Impact Category	Geomorphology Impact Category	Water Quality Impact Category	Vegetation Impact Category	Overall PES Category
CVB 1	42.2	D	C	B	C	C
CVB 2	47.9	D	C	B	C	C
Seep 1	8.8	C	C	A	B	C
Seep 2	7.8	C	D	A	B	C
Seep 3	3.2	C	C	A	B	C
Seep 4	1.9	C	D	A	B	C
Seep 5	15.03	C	D	A	B	C

Figure 7-20 - Major impacts identified at Channelled valley bottom wetlands

Figure 7-21 - Major impacts identified at Seep wetlands

7.2.1.6 Ecoservices

Both the CVB wetlands and the seep wetlands were grouped and assessed as one CVB and one seep wetland system, based on homogenous condition and services supplied by and/or demanded from these wetlands.

The majority of the ecosystem services were rated as very low in terms of their overall importance. Regulating and supporting services such as sediment trapping, phosphate assimilation, nitrate assimilation and toxicant assimilation were determined as moderate, particularly for the CVB wetlands which is also important in terms of streamflow regulation and flood attenuation. The wetlands also rated moderate for harvestable wood and occurrence of game for harvesting, since the study area is used mainly for game farming.

7.2.1.7 Wetlands – Ecological Importance and Sensitivity

All wetlands in the study area were assessed as being of Low /Marginal EIS, with the exception of the CVB wetlands, which were assessed as being of Moderate EIS (**Table 7-12**). The moderate EIS of the CVB wetlands was attributed to its hydrological functional importance as these wetlands perform a role in landscape connectivity at the regional level, providing regulating and supporting benefits, such as streamflow regulation and flood attenuation. Furthermore, the CVB wetlands, especially CVB 1 which is located within an active hunting range, has direct human benefits in terms of recreational benefits.

Table 7-12 - Summary of wetland EIS scores and ratings

Wetland Unit	Ecological Importance and Sensitivity Score	Hydrological Functions Score	Direct Human Benefits Score	Integrated EIS Score	Overall PES Class
CVB 1	1.0	1.7	0.7	1.7	Moderate
CVB 2	1.0	1.8	0.5	1.8	Moderate
Seep 1	0.6	0.0	0.0	0.6	Low/Marginal
Seep 2	0.8	0.9	0.0	0.6	Low/Marginal
Seep 3	0.6	0.0	0.0	0.6	Low/Marginal
Seep 4	0.8	0.0	0.0	0.6	Low/Marginal
Seep 5	0.6	0.0	0.0	0.6	Low/Marginal

7.2.1.8 Site Verification Outcome

The Environmental Screening Tool rates the aquatic biodiversity theme as 'Very High Sensitivity' due to the presence of wetland features and areas mapped as wetland CBA and FEPA sub-catchment in the study area. Based on the findings of this study, the presence of wetland features on site was confirmed, however, these wetlands were considered to be in a Moderately Modified PES (**Figure 7-**

22) with Moderate to Low/Marginal EIS function and WetEcoservices and are therefore rated to be in a ‘high Sensitivity’.

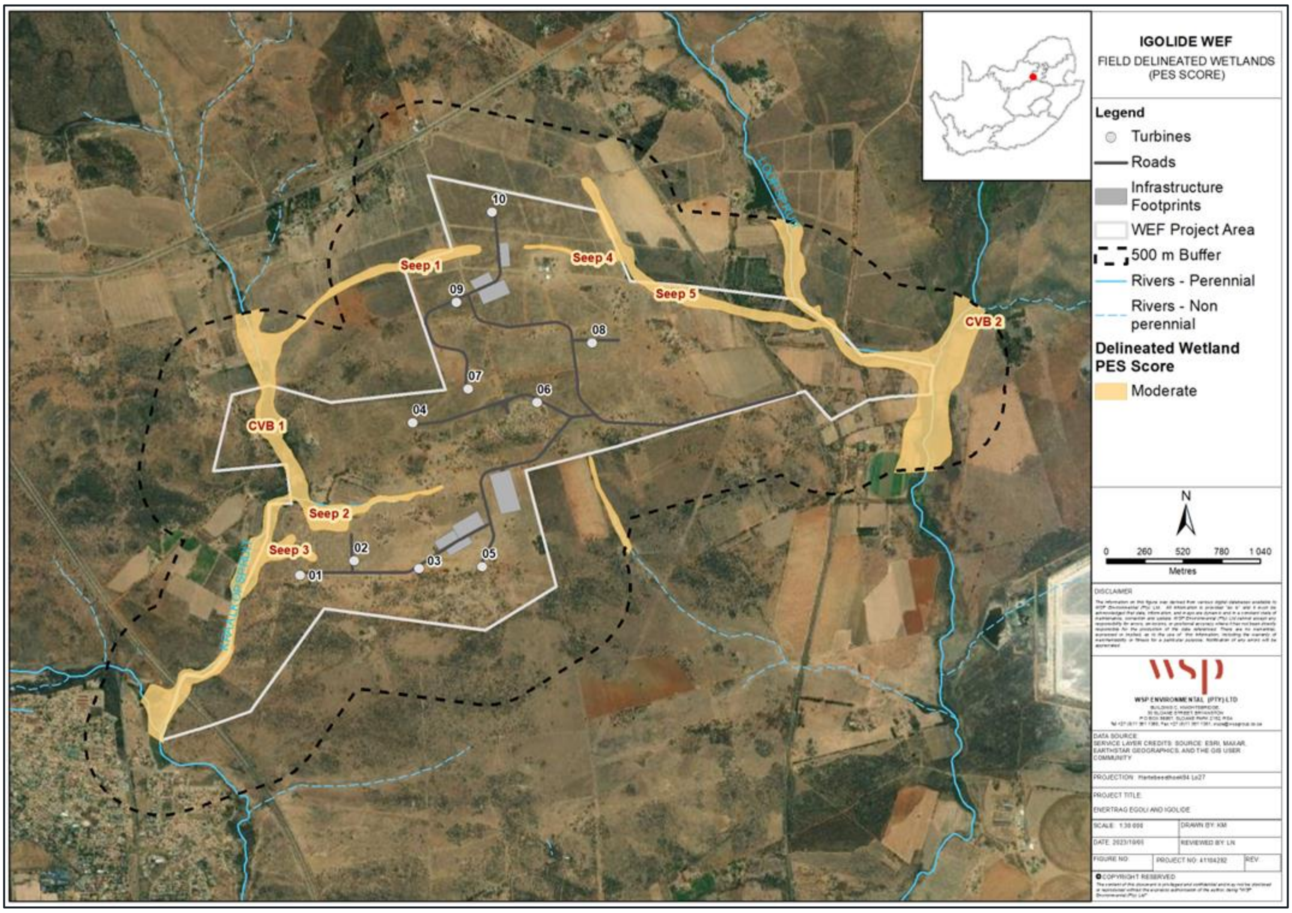


Figure 7-22 - Map showing the PES of wetlands on site

7.2.2 TERRESTRIAL BIODIVERSITY

The following is extracted from the Terrestrial Biodiversity Assessment compiled by WSP and included as **Appendix H.1***.*

The project site falls in the Grassland Biome, the northern section of the site falls in the Central Bushveld Bioregion, while the remainder of the site falls in the Mesic Highveld Grassland Bioregion. The site does not fall within any Centre of Plant Endemism.

7.2.2.1 Vegetation types

Rand Highveld Grassland

Majority of the site is covered by Rand Highveld Grassland (**Figure 7-23**), and this vegetation type is heterogeneous and geographically disjunct. It covers a highly variable landscape with sloping plains and ridges elevated over the undulating surrounding plains. The vegetation comprises a species-rich sour grassland alternating with shrubland on rocky outcrops. The rocky hills support woody species such as *Senegalia caffra, Celtis africana, Protea caffra* and *Searsia* spp. Dwarf shrubs include *Seriphium plumosum* and *Searsia magalismontana*. The grass layer is characterised by *Eragrostis chloromelas, Diheteropogon amplectens, Loudetia simplex, Setaria sphacelata, Themeda triandra,*

Trachypogon spicatus and *Tristachya rehmannii*. Common herbs include *Justicia anagalloides, Acalypha angustata, Helichrysum nudifolium, Nidorella hottentotica* and *Selago densiflora.*
Endemic taxa include Melanospermum rudolfii, Polygala spicata, Anacampseros subnuda subsp. lubersii, Frithia humilis, Crassula arborescens subsp. undulatifolia, Delosperma purpureum, Encephalartos lanatus and E. middelburgensis.

Although the conservation status of this vegetation type was listed as "Endangered" by Mucina & Rutherford (2006) it is listed as "Vulnerable" by NEMA (2011) and Skowno *et al*. (2019). Only 1.8% is statutorily conserved and almost half has been transformed mostly by cultivation, plantations and urbanisation.

Gauteng Shale Mountain Bushveld

This vegetation type covers the northern parts of the Igolide site (**Figure 7-23**). The unit is characterised by low, broken ridges varying in steepness and with a high surface rock cover. The vegetation is a short (3–6 m tall) semi-open bushveld dominated by a variety of woody species including *Senegalia caffra, Dombeya rotundifolia, Vachellia karroo, Celtis africana, Combretum molle, Englerophytum magalismontanum, Protea caffra, Searsia magalismontana, Cussonia spicata, Zanthoxylum capense, Vangueria infausta, Ziziphus mucronata, Ancylobotrys capensis, Euclea crispa, Ehretia rigida, Diospyros lycioides* and *Grewia occidentalis.* The grass layer is characterised by *Hyparrhenia dregeana, Cymbopogon caesius, Cymbopogon pospischilii* and *Eragrostis curvula*. The conspicuous forbs include *Macledium zeyheri, Helichrysum nudifolium, Helichrysum rugulosum, Hermannia lancifolia, Senecio venosus and Hilliardiella elaeagnoides*. In rocky areas the ferns *Cheilanthes hirta* and *Pellaea calomelanos* are prominent.

Although the conservation status of this vegetation type was listed as "Vulnerable" by Mucina & Rutherford (2006) it is listed as "Least Concern" by NEMA (2011) and Skowno *et al*. (2019). About 4.9% is statutorily conserved and more than 20% has been transformed mostly by cultivation, plantations, mines and quarries and urbanisation.

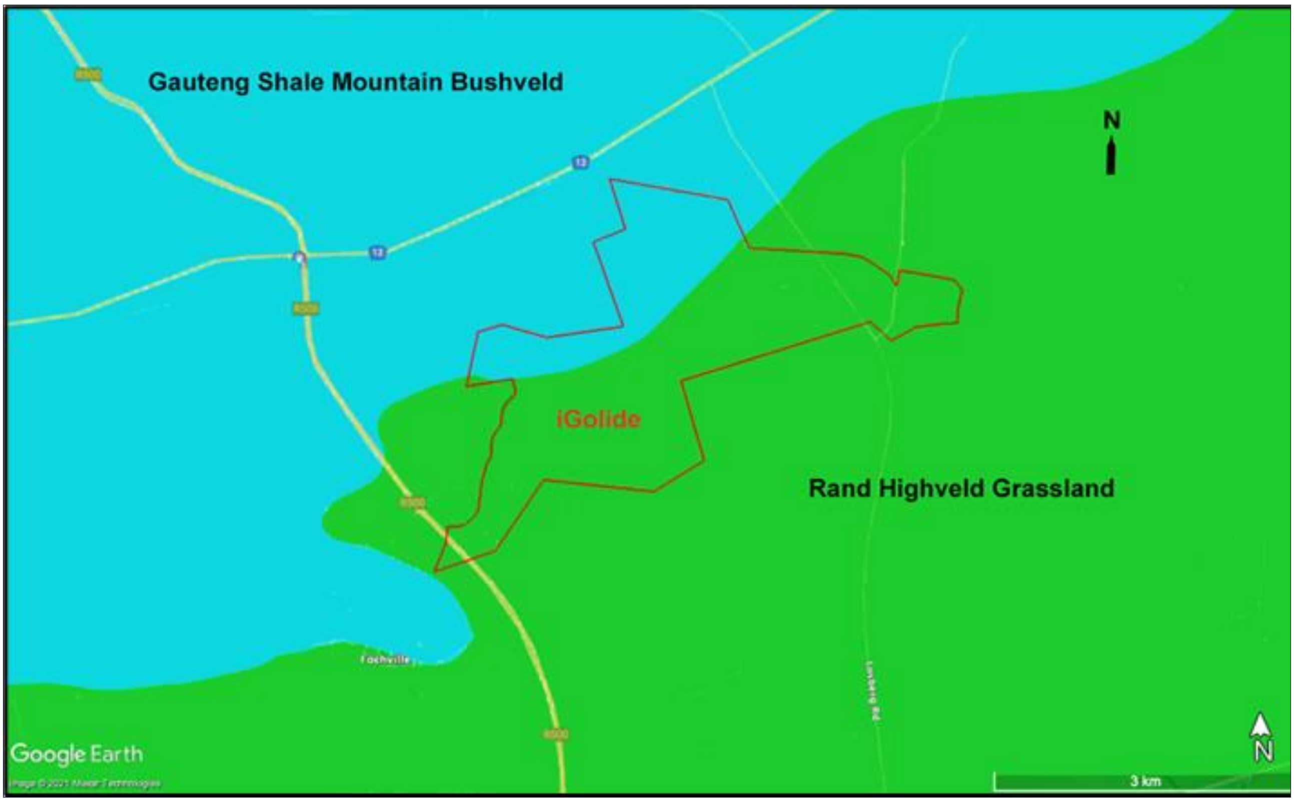


Figure 7-23 - Vegetation types in the region of the Igolide site

Plant communities

Based on species composition, nine natural habitats (plant communities) were distinguished, described and mapped on the Igolide site and a further five man-made units were also distinguished (**Figure 7-24**):

- *Trachypogon spicatus* grassland
- *Melinis repens - Selaginella dregei* rocky grassland
- *Cymbopogon caesius - Elionurus muticus* rocky grassland
- *Hyparrhenia hirta - Eragrostis chloromelas* grassland
- *Eragrostis plana - Trisetopsis imberbis* wetlands/floodplains
- *Vachellia karroo - Ehretia rigida* rocky bushveld
- *Salix babylonica - Phragmites australis* riverine vegetation
- *Hyparrhenia tamba* floodplains
- *Eragrostis tef - Tagetes minuta* abandoned cropland
- Planted pasture (*Digitaria eriantha*)
- *Eucalyptus camaldulensis* plantations (degraded)
- Hedges (*Robinia sp., Pyracantha sp., Cedrus sp., Searsia pyroides*)
- Dams
- Habitation/infrastructure

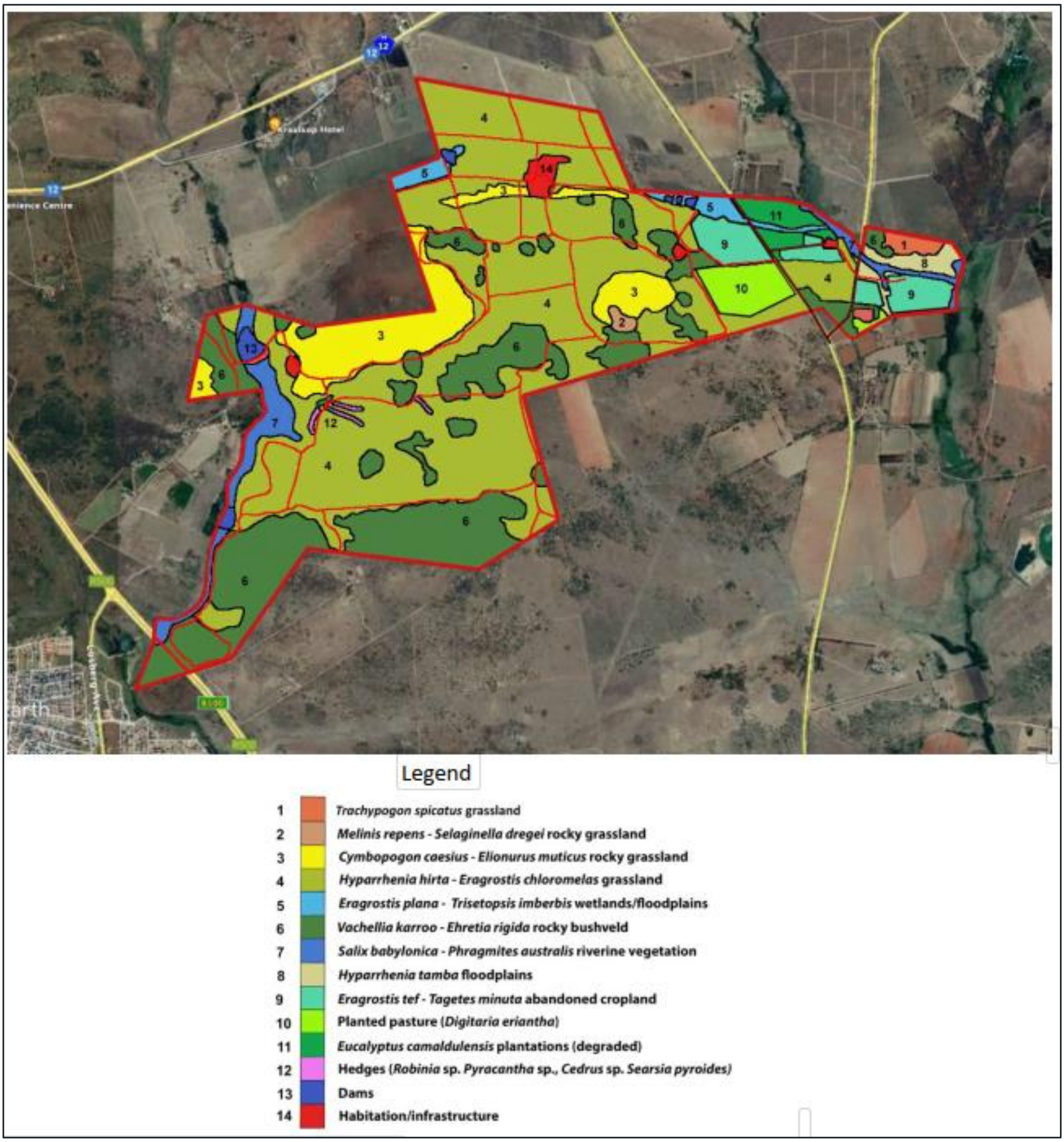


Figure 7-24 - Vegetation map of the Igolide site

7.2.2.2 Alien Invasive Plant Species

Forty-nine alien plant species were recorded on the project site of which 22 are currently declared alien invasive species and 27 naturalised alien species; and 38 alien species were listed by NewPosa for the region.

Category 1b Listed Invasive Species

The following species were recorded at the project site:

- *Campuloclinium macrocephalum*
- *Cuscuta campestris*
- *Eucalyptus camaldulensis**
- *Melia azedarach*
- *Pyracantha angustifolia*
- *Robinia pseudoacacia*
- *Solanum pseudocapsicum*
- *Verbena bonariensis*
- *Xanthium spinosum*
- *Cirsium vulgare*
- *Datura ferox*
- *Ipomoea purpurea*
- *Opuntia ficus-indica*
- *Pyracantha crenulata*
- *Solanum elaeagnifolium*
- *Solanum sisymbriifolium*
- *Verbena brasiliensis*

**Exempted for an existing plantation*

Other category 1b Alien Invasive Species

The following species were recorded at the project site:

- *Agrimonia procera*
- *Argemone ochroleuca*
- *Datura stramonium*
- *Xanthium strumarium*
- *Araujia sericifera*
- *Cestrum parqui*
- *Phytolacca octandra*

Category 2 Listed Invasive Species

The following Category 2 Listed Invasive Species were recorded on Igolide:

- *Acacia dealbata*
- *Ricinus communis*
- *Acacia mearnsii**
- *Populus canescens*

**Exempted for an existing plantation*

Category 3 Listed Invasive Species

Twenty-seven naturalised weedy alien species were recorded on the site. Another 37 naturalised weedy alien species were also listed by NewPosa for the region. One non-declared alien tree species was recorded on site - *Cedrus deodora* and one non-declared alien tree species was listed by NewPosa for the region: *Ulmus parvifolia.*

7.2.2.3 National Protected Areas Expansion Strategy (NPAES)

The study site is part of the NPAES (NPAES 2018). Only one of the turbines (Turbine 04) was located in the areas demarcated by the NPAES , it is recommended that this turbine is relocated to fall outside of the NPAES (**Figure 7-25**).

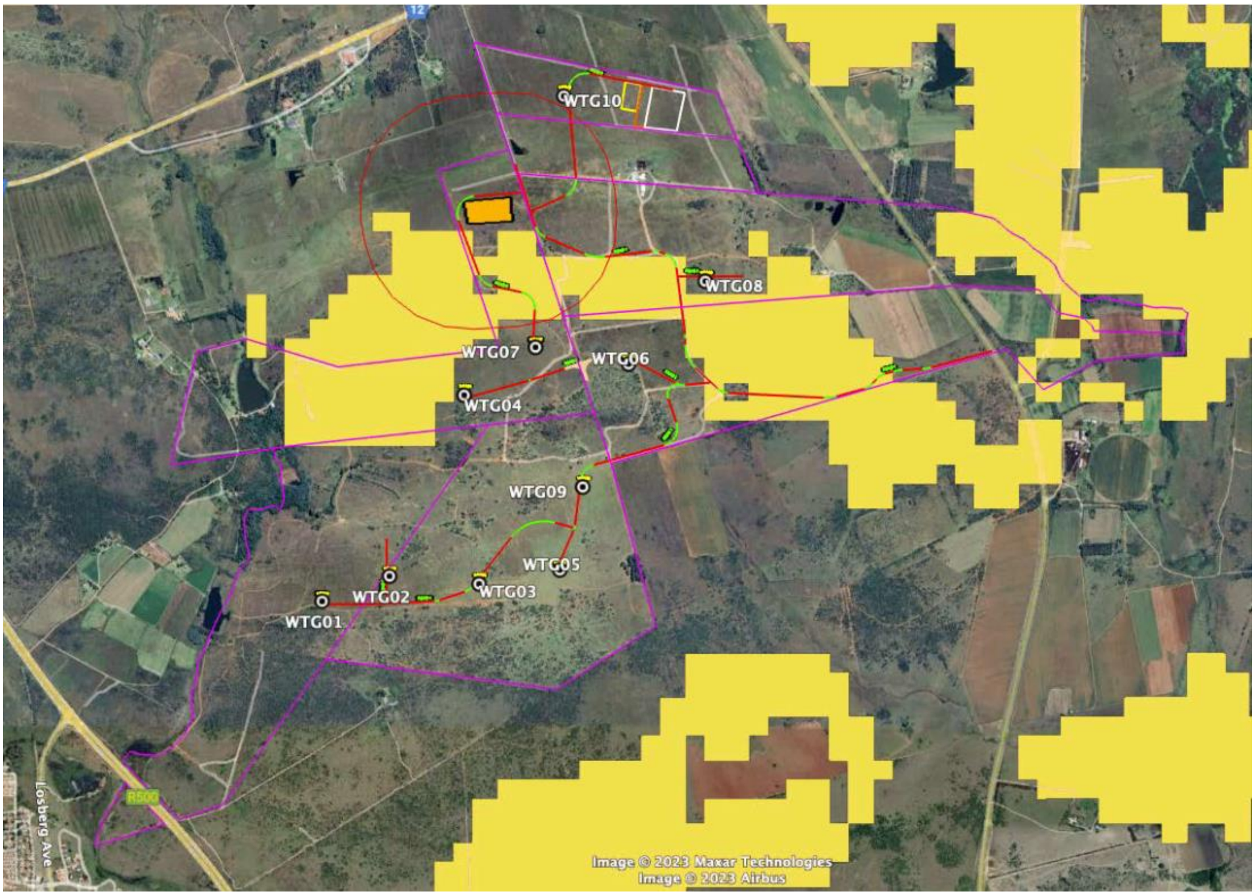


Figure 7-25 - NPAES map of the Igolide WEF site (NPAES 2018, Yellow polygons) with proposed roads and location of 10 Turbines indicated

7.2.2.4 Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs) and Other Natural Areas (ONAs)

The CBA map in **Figure 7-26** indicates the presence of a CBA2 (Important area) on the rocky grassland habitats (Habitat 2 and Habitat 3) and parts of the rocky bushveld (Habitat 6) as well as grassland on the plains (Habitat 4).

The ESAs cover parts of the rocky grassland (Habitat 3), some of the rocky bushveld (Habitat 6) and wetlands/floodplains (Habitat 5). The ESAs also cover areas of abandoned cropland (Habitat 9) and planted pasture (Habitat 10). Turbines 04, 07 and 08 lie in ESAs but outside the NPAES and their locations could be reconsidered.

An Ecological Support Area (ESA) is not essential for meeting biodiversity targets but plays an important role in supporting the ecological functioning in a CBA. ESAs need to be maintained in at least a functional and often natural state (SANBI 2021). It is important that a project should not result in impacts to threatened species or ecological processes. Infrastructure should be designed to avoid additional impacts on ecological processes.

Other Natural Areas (ONAs) have not been identified as a priority but retain most of their natural character and perform a range of biodiversity and ecological infrastructure functions. Land use guidelines for Terrestrial Other Natural Areas (ONAs) are not required to meet biodiversity targets.

ONAs represent a substantial part of the site and form a matrix within which the CBAs and ESAs occur (**Figure 7-26**). The site options for the on-site IPP substation/BESS facility and the other ancillary areas (batching plant, construction camp and laydown) fall in ONAs.

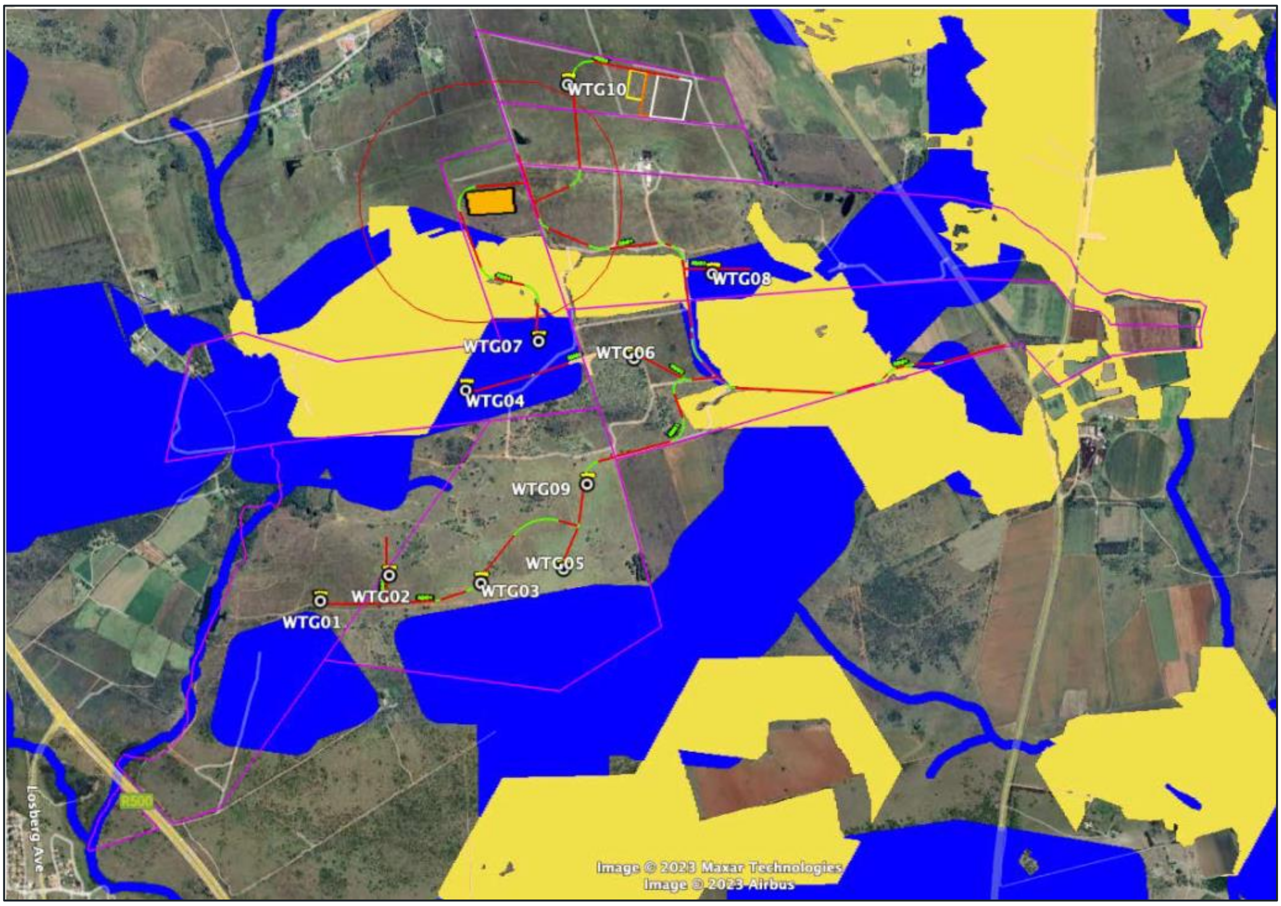


Figure 7-26 - Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs) and Other Natural Areas (ONAs) of the Igolide site and environs with proposed roads and location of 10 WTGs
Source: Ekotrust, 2023

Orange rectangle = on-site IPP substation/BESS; red/yellow/white rectangles = other ancillary areas (batching plant, construction camp and laydown); Yellow polygons = CBA2 (important area); blue polygons = ESAs; not coloured areas = ONAs.

7.2.2.5 Habitat sensitivity

Overall, the rocky outcrop (Habitat 2) and drainage lines (Habitats 5 & 7) were more sensitive than the other habitats on site. Habitats 9 – 12 are man-made habitats, e.g. cropland, planted pasture, plantations and wind breaks and all have a very low sensitivity rating. The dams are included in Habitat 7 and have been assigned a medium sensitivity in **Figure 7-27**.

The site options for the on-site IPP substation and BESS facility and the other ancillary areas (batching plant, construction camp and laydown). This site falls in an area with low habitat sensitivity. The WEF infrastructure is currently located predominantly in Habitat 4 (Grassland) and all rocky hills, rocky outcrops (sheets) and drainage lines are avoided (**Figure 7-26** and **Figure 7-27**). The ten turbines are located in a habitat with a low sensitivity rating for the vegetation (Habitat 4).

Only one species recorded on site is provincially protected (*Gladiolus permeabilis*) and no CITES listed species were encountered on site. Protected and CITES listed species were not considered as being of conservation concern because none of them qualify as SCC according to the SANBI definition. Furthermore, no ToPS listed species or species endemic to one of the national vegetation types were recorded on site.

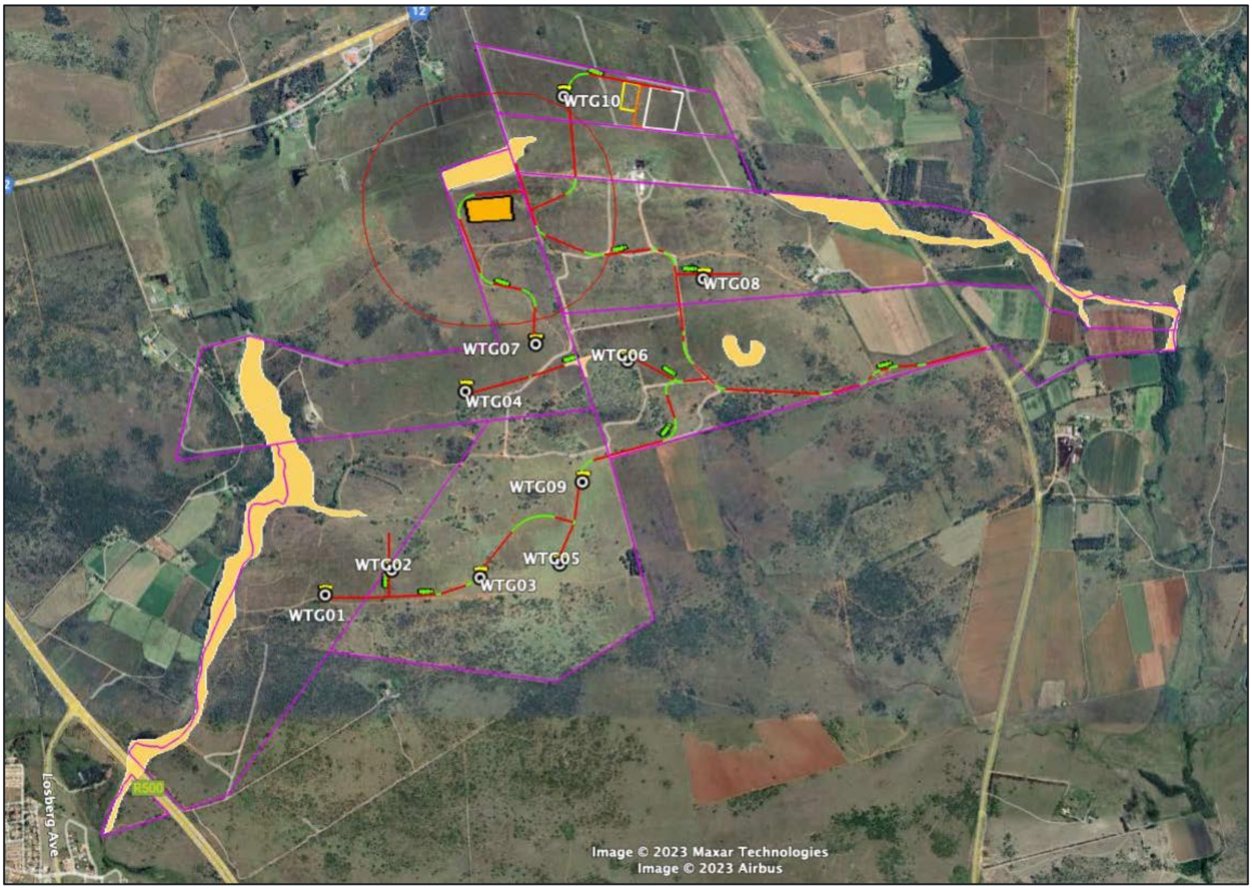


Figure 7-27 – Sensitivity map of the plant communities (habitats) of the Igolide WEF site.
Source: Ekotrust, 2023

Areas marked in yellow were classified as Medium Sensitivity in the Terrestrial Biodiversity and Species Specialist Assessment while the remainder of the habitats are indicated as low sensitivity. The proposed roads and location of 10 turbines (WTG) are indicated. Orange rectangle = on-site IPP substation/BESS; red/orange/white rectangles = other ancillary areas (batching plant, construction camp and laydown).

7.2.3 PLANT SPECIES THEME

*The following is extracted from the Plant Species Theme Assessment compiled by WSP and included as **Appendix H.12.***

7.2.3.1 Characteristics of onsite vegetation communities

Based on species composition, nine natural habitats (plant communities) were distinguished, described and mapped on the Igolide site (**Figure 7-28**). These include:

- *Trachypogon spicatus* grassland,
- *Melinis repens* - *Selaginella dregei* rocky grassland
- *Cymbopogon caesius* - *Elionurus muticus* rocky grassland
- *Hyparrhenia hirta* - *Eragrostis chloromelas* grassland
- *Eragrostis plana* - Trisetopsis imberbis wetlands/floodplains

- *Vachellia karroo* - *Ehretia rigida* rocky bushveld
- *Salix babylonica* - *Phragmites australis* riverine vegetation
- *Hyparrhenia tamba* floodplains
- *Eragrostis tef* - *Tagetes minuta* abandoned cropland

A further five man-made units were also distinguished

- Planted pasture (*Digitaria eriantha*)
- *Eucalyptus camaldulensis* plantations (degraded)
- Hedges (*Robinia sp., Pyracantha sp., Cedrus sp., Searsia pyroides*)
- Dams
- Habitation/infrastructure

Full description of the latter vegetation communities is outlined in section 5.3 Ekotrust (2023) report.

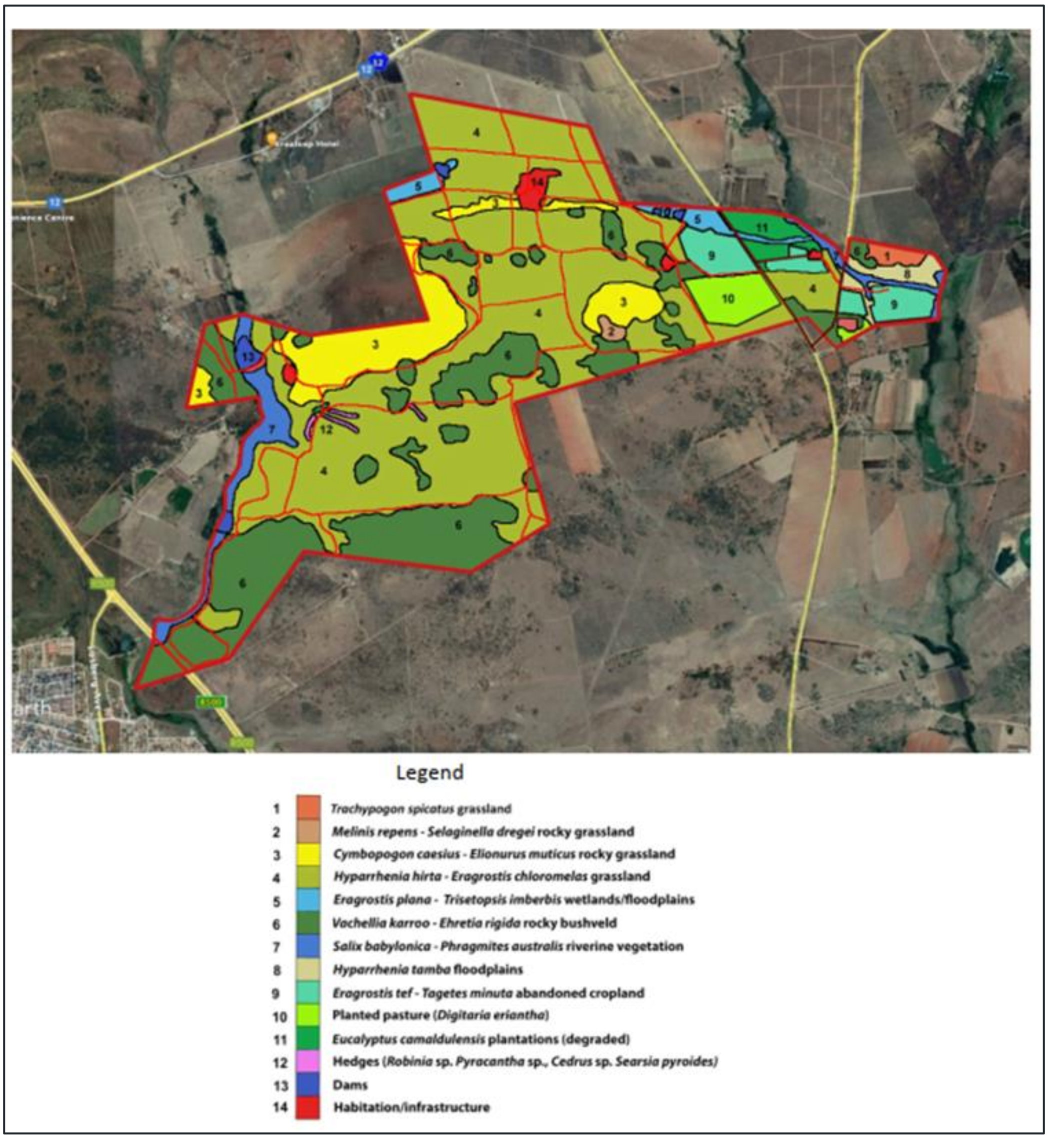


Figure 7-28 - Vegetation map of the Igolide site showing nine (9) identified natural habitats

7.2.3.2 Terrestrial Flora Baseline Characterisation

IUCN Red-listed species

For the IUCN Categories, the definitions in section 7.1 of the Ekotrust (2023) report were applied.

Khadia beswickii (VU) is the only IUCN threatened species occurring in the region according to the NewPosa list (Appendix B). Near Threatened (NT), Data Deficient (DDD) and Data Deficient (Taxononically) (DDT) species are not classified as threatened according to the IUCN classification

SANBI: Species of Conservation Concern

According to the South African National Biodiversity Institute (SANBI 2020), SCCs include all species that have been assessed according the IUCN Threatened or Red-List Criteria as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Data Deficient (DD), as well as range-restricted species which are not declining and are nationally listed as Rare or Critically Rare. The DD category is split into those that are taxonomically unresolved (DDT) and those where insufficient data (DDD) are available to make a judgement on endangered status. The Taxonomically Data Deficient (DDT) species were excluded as SCC since taxonomic problems hinder the distribution range and habitat from being well defined, so that an assessment of extinction risk is not possible.

The SCC species listed for the region (NewPosa list, SANBI) are *Khadia beswickii* (VU) and *Adromischus umbraticola subsp. umbraticola* (NT). These two species were not recorded on the Igolide site. Furthermore, two near threatened species, *Gnaphalium nelsonii* and *Cineraria austrotransvaalensis*, could potentially occur on site according to the Gauteng C-plan.

Screening Tool

The Screening Tool highlighted four plant species as being of concern. None of the SCC, including Khadia beswickii, were recorded on site and the Gauteng C-Plan did not reflect their possible occurrence on site.

Protected species (Gauteng (GDARD 1983; 2014a))

Thirteen (13) plant species are listed as protected in the region according to the GDARD (1983, 2014a). Most of these Schedule 11 species are members of the *Asphodelaceae* and *Iridaceae*. One Schedule 11 Protected Plant Species was recorded during the site survey in January 2021 (see Appendix A of the Ekotrust (2023) report):

Gladiolus permeabilis Iridaceae

Two rare plant species could potentially occur on the Igolide site according to data provided by GDARDE (2011, C-Plan). They are *Cineraria austrotransvaalensis* and *Gnaphalium nelsonii*, both with a Near Threatened status. Neither species are listed in the NewPosa species list for the region or were recorded on site during the site survey.

ToPS list (NEM:BA 2007c)

No species classified as protected within the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA 2007c) is listed for the study area and none were found at the site.

CITES appendices

Appendix II of CITES lists species that are not necessarily now threatened with extinction, but that may become so unless trade is closely controlled. Thirteen (13) Appendix II species are listed for the region including mostly Aloe species and species of the Orchidaceae. None of the CITES listed species were recorded during the site survey (see Appendix A of the Ekotrust (2023) report).

Protected Tree Species - National Forests Act (Act No. 84 of 1998)

No nationally protected tree species is listed for the site (NFA 2023) and none were recorded during the site visit.

Endemic species

Plant species endemic to the Rand Highveld Grassland Vegetation Type include the following (Mucina & Rutherford 2006):

Anacampseros subnuda subsp. lubbersii Crassula arborescens subsp. undulatifolia Delosperma purpureum Encephalartos lanatus Encephalartos middelburgensis Frithia humilis Melanospermum rudolfii Polygala spicata

None of the listed species were recorded on the Igolide site.

No endemic species are listed for the Gauteng Shale Mountain Bushveld Vegetation Type.

Conservation of Agricultural Resources Act (Act No. 43 of 1983) (CARA) and the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEM:BA 2020a & b)

A total of 49 alien species were recorded for the Igolide site (Appendix B of the Ekotrust (2023) report) of which 21 species are categorised as invasive, 27 species as naturalised alien species and one alien tree species. Alien species with an invasive categorisation will have to be controlled during the construction and operational stages of the project. Alien invasive species listed for the study area include species listed in **Figure 7-15**.

Table 7-13 - Alien invasive species listed for the study area

List of alien invasive species listed for the study area	
*Acacia dealbata**	*Opuntia ficus-indica**
Agrimonia procera	*Phytolacca octandra*
Araujia sericifera	*Populus canescens**
Argemone ochroleuca subsp. ochroleuca	*Pyracantha angustifolia**
*Campuloclinium macrocephalum**	*Pyracantha crenulata**
Cestrum parqui	*Ricinus communis**
*Cirsium vulgare**	*Robinia pseudoacacia**
Cuscuta campestris	*Solanum elaeagnifolium**
*Datura ferox**	*Solanum pseudocapsicum**
Datura stramonium	*Solanum sisymbriifolium**

List of alien invasive species listed for the study area	
*Eucalyptus camaldulensis**	*Verbena bonariensis**
*Ipomoea purpurea**	*Verbena brasiliensis**
*Melia azedarach**	*Xanthium spinosum**
*Opuntia ficus-indica**	*Xanthium strumarium*
Species recorded during the site survey are marked with an asterisk (*)	

7.2.3.3 Site Ecological Importance

Table 7-14 presents the summary matrix of the ecological importance of vegetation communities identified in the study area. For a detailed assessment of Site Ecological sensitivity analysis, see section 10 of the Ekotrust (2023) report (Appendix A). A corresponding map is presented in **Figure 7-30**.

Table 7-14 - Sensitivity of the different plant communities (habitats) identified on site

Habitat unit		Ecological importance and sensitivity
1	*Trachypogon spicatus grassland*	Low
2	*Melinis repens - Selaginella dregei rocky grassland*	Medium
3	*Cymbopogon caesius - Elionurus muticus rocky grassland*	Low
4	*Hyparrhenia hirta - Eragrostis chloromelas grassland*	Low
5	*Eragrostis plana - Trisetopsis imberbis wetlands/floodplains*	Medium
6	*Vachellia karroo - Ehretia rigida rocky bushveld*	Low
7	*Salix babylonica - Phragmites australis riverine vegetation*	Medium
8	*Hyparrhenia tamba floodplains*	Low
9	*Eragrostis tef - Tagetes minuta abandoned cropland*	Low
10	*Planted pasture (Digitaria eriantha)*	Low
11	*Eucalyptus camaldulensis plantations (degraded)*	Low
12	*Hedges (Robinia sp., Pyracantha sp., Cedrus sp., Searsia pyroides)*	Low

Overall, the rocky outcrop (Habitat 2) and drainage lines (Habitats 5 & 7) were more sensitive than the other habitats on site. Habitats 9 – 12 are man-made habitats, e.g. cropland, planted pasture, plantations and wind breaks and all have a very low sensitivity rating. The dams are included in Habitat 7 and have been assigned a medium sensitivity (**Figure 7-30**). This site falls in an area with low habitat sensitivity. The WEF infrastructure is currently located predominantly in Habitat 4 (Grassland) and all rocky hills, rocky outcrops (sheets) and drainage lines are avoided. The ten turbines are located in a vegetation community with a low sensitivity rating (Habitat 4) (**Figure 7-30**).

Buffers are applicable to the development along the watercourses. A buffer zone of 32 m is usually applied to drainage lines, although the bat and aquatic specialists may apply wider buffer zones along these habitats. It is recommended that the buffer zones specified in the aquatic report are used as guideline. Only one plant species recorded on site is provincially protected (*Gladiolus permeabilis*) and no CITES listed species were encountered on site. Protected and CITES listed species were not considered as being of conservation concern because none of them qualify as SCC according to the SANBI definition (SANBI 2020). Furthermore, no ToPS listed species, or species endemic to one of the national vegetation types, were recorded on site.

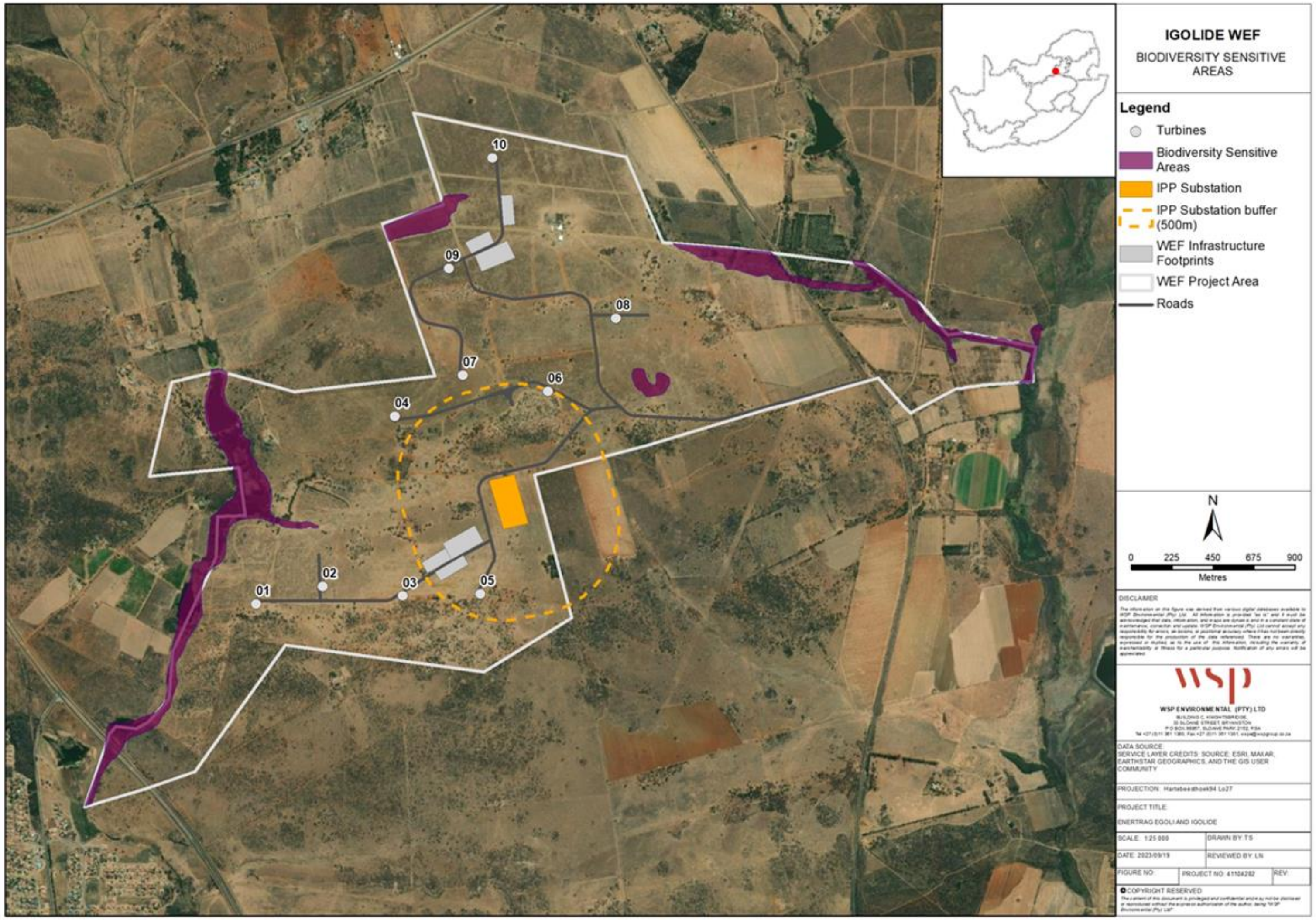


Figure 7-29 - Sensitivity map of the plant communities (habitats) of the proposed site

7.2.4 ANIMAL SPECIES THEME

*The following is extracted from the Plant Species Theme Assessment compiled by WSP and included as **Appendix H.13.***

7.2.4.1 Mammals

IUCN Threatened Mammal Species

Five IUCN threatened mammal species were listed for the environs of the Igolide site on the website of the Animal Demography Unit, University of Cape Town (**Figure 7-13**). The threatened category include species that are Critically Endangered (CR), Endangered (EN) and Vulnerable (VU).

Table 7-15 - IUCN threatened mammal species

IUCN threatened mammal species		Threatened category
Redunca fulvorufula	Mountain reedbuck*	EN
Acinonyx jubatus	Cheetah	VU
Panthera pardus	Leopard	VU
Cloeotis percivali	Percival's short-eared trident bat	EN
Mystromys albicaudatus	African white-tailed rat	VU

**species recorded on site or confirmed by landowner*

Six mammal species were listed as Near Threatened (**Table 7-16**). However, none were recorded on the site).

Table 7-16 - IUCN near threatened mammal species

IUCN near threatened mammal species		Threatened category
Atelerix frontalis	Southern African Hedgehog	NT
Leptailurus serval	Serval	NT
Aonyx capensis	African clawless otter	NT
Miniopterus schreibersii	Schreibers's long-fingered bat	NT
Pipistrellus rusticus	Rusty pipistrelle	NT
Hydrictis maculicollis	Spotted-necked otter	VU

- Southern Mountain reedbuck (*Redunca fulvorufula fulvorufula*):

  The southern mountain reedbuck is listed as **Endangered A2b** due to large population declines in all protected areas for which long-term count data are available. However, the species has been extensively reintroduced into parts of its former range. A large portion of the Igolide site is currently a game farm and the species could have been introduced.

Due to their specialised habitat requirements, the distribution of the mountain reedbuck is patchy and discontinuous and that they are found only where there is suitable habitat. They favour grass-covered ridges and hillsides in broken, rocky country or high-altitude grasslands. They are dependent on steep slopes, a well-developed grass layer and some scattered woody cover to evade predators. The mountain reedbuck favours slopes with a gradient of 20° or more. In regions where cover is locally more abundant in lower valleys than on upper slopes and ridges, it often prefers the lower slopes. They avoid the open conditions with no cover associated with the summits of mountainous areas as well as dense woody cover. They also occur in dry hilly areas (such as the Nama-Karoo), utilising steep slopes and the bases of hills for grazing. The extent of available slopes for predator evasion is regarded as an indicator of the quality of their territory.

The Screening Tool did not list the Southern mountain reedbuck for the site and it could thus have been introduced on site. Its presence on site and its status of “Endangered” should be considered when developing the Igolide site.

The Screening Tool highlighted the following two mammal species in the region, however, neither were recorded on site during the survey although they may occur in the region:

- Spotted-necked otter (*Hydrictis maculicollis*)
  Potentially suitable habitat for the Spotted-necked otter (dams, rivers, permanent water bodies) is available on site. Although widespread, it is restricted to areas of permanent fresh water offering good shoreline cover and an abundant prey base. Overall, the population may be declining as river habitat is lost to development and infestations of alien species in riparian areas, and riverside vegetation degradation from overgrazing. The main interventions revolve around riparian protection. Thus, rivers should be carefully managed to increase flow and reduce turbidity, and development on banks should be restricted. The Igolide development will avoid all rivers and wetlands
- Maquassie musk shrew (*Crocidura maquassiensis*)
  This species is classified as Vulnerable (Taylor et al. 2016). It depends on wetlands as suitable habitat in savanna and grassland. Although it has a wide inferred extent of occurrence, it appears to be patchily distributed. The main threats to shrews are the loss or degradation of moist, productive areas such as wetlands and rank grasslands within suitable habitat. *Crocidura maquassiensis* has not been reported from Gauteng or North West Province post-1999 and thus there is a low probability for it to occur on site

Provincially protected mammal species

Ten of the terrestrial mammal species listed, are Schedule 2 Protected Game in Gauteng. However, the hippopotamus was not recorded on site. The following nine species were recorded on the Igolide site:

- *Alcelaphus buselaphus caama* Red hartebeest
- *Connochaetes gnou* Black wildebeest
- *Kobus ellipsiprymnus ellipsiprymnus* Waterbuck
- *Oryx gazella* Gemsbok
- *Raphicerus campestris* Steenbok
- *Redunca fulvorufula* Mountain reedbuck
- *Taurotragus oryx* Cape eland

- *Giraffa giraffa giraffa* Giraffe
- *Lepus saxatilis* Scrub hare

Three mammal species listed in the ADU database are Schedule 4 Protected Wild Animals (not recorded on site):

- *Acinonyx jubatus* Cheetah
- *Panthera leo* Lion
- *Panthera pardus* Leopard

Three species are listed as Schedule 8 Problem Animals (all recorded on site):

- *Canis mesomelas* Black-backed jackal
- *Chlorocebus pygerythrus pygerythrus* Vervet monkey
- *Caracal caracal* Caracal

Nationally Threatened or Protected Species: ToPS

According to ToPS legislation (NEMBA 2007c), three mammal species with potential to occur in the area are listed as Vulnerable and five species are Protected (Appendix C of Ekotrust (2023) report).

Vulnerable:

- Panthera leo (Lion)
- Panthera pardus (Leopard)
- Acinonyx jubatus (Cheetah)

Protected:

- Atelerix frontalis (Southern African hedgehog)
- Aonyx capensis (African Clawless otter)
- Connochaetes gnou (Black wildebeest)
- Leptailurus serval (Serval)
- Hydrictis maculicollis (Spotted-necked otter)

7.2.4.2 Reptiles

Forty-four (44) reptile species are listed for the region (Ekotrust 2023). The list includes one IUCN threatened (Vulnerable) species, i.e. *Crocodylus niloticus*, for the region, although this species is not present on site. Provincially protected reptile species include 26 Schedule 2 Protected Game, and 17 Schedule 5 snakes. The python *Python natalensis* is the only protected reptile species according to the ToPS list (NEMBA 2007c) with potential to occur on site; however, its occurrence is considered unlikely given the cultivated nature of surrounding lands and limited prey opportunities

7.2.4.3 Frogs

Sixteen species were listed for the region and the Giant Bull Frog *Pyxicephalus adspersusis* listed as Near Threatened and is also on the ToPS list as a protected species (NEMBA 2007c). No seasonally wet pans that would constitute suitable breeding habitat for Giant Bullfrog occur in the project area. None of the sixteen species were confirmed on site during the survey (Ekotrust, 2023). However, common species such as common river frog (*Amietia delalandii)* are likely present in suitable habitat (e.g. riparian habitat, wetlands, dams).

7.2.4.4 Lepidoptera

One of the 100 species of the Lepidoptera is listed as Endangered, i.e., *Lepidochrysops praeterita* (Highveld giant cupid).

The two Lepidopteran species listed by the Screening Tool are unlikely to occur on site because their host plant was not recorded on site. *Lepidochrysops praeterita* is not ranked as sensitive although it has an IUCN status of Vulnerable. The species is not exploited, collected, traded or utilised in a targeted manner. This taxon is confined to grassy, rocky, typically south-facing slopes, where its host plant (*Ocimum obovatum*). Most localities are within an altitudinal band between 1500 m and 1750 m. *Lepidochrysops praeterita* is highly localized and appears to have a very specific habitat niche.

7.2.4.5 Odonata

Fifty-three species of Odonata were listed for the region and all have a status of Least Concern according to the IUCN classification.

7.2.4.6 Scorpions

Four scorpion species are listed for the region and two are listed as ToPS species (NEMBA 2007c). Although no scorpion species were confirmed on site during the survey, it is possible that they occur in suitable habitat (e.g. rocky grassland)

7.2.4.7 Spiders

All baboon spiders are provincially protected; one of which Harpactira hamiltoni is a ToPS protected species (NEMBA 2007c). Although none of the species were confirmed on site during the survey, undisturbed areas of Vachellia karroo - Ehretia rigida rocky bushveld mapped in the study area could constitute potentially suitable habitat. This habitat will be avoided by the turbines.

7.2.4.8 Other insects

According to the RSA Red List, *Clonia uvarovi* is rated as Vulnerable. It inhabits tall savanna woodland. The habitat on site could be described as bushveld which may be marginally suitable for the species. However, its habitat will not be affected by the turbines.

7.2.4.9 Site Ecological Importance for Animal Species

An assessment of the sensitivity of the mapped plant communities, based on ecological integrity and protected species support, is presented in Section 10 of the Ekotrust (2023) report. An assessment of site ecological importance for animal species, based on their associations with mapped habitat units in the study area, is shown on **Figure 7-24**.

Rocky grassland and bushland were assessed as medium importance due to their support of southern mountain reedbuck and potentially *Clonia uvarovi*; while wetlands, rivers and floodplain habitats are important landscape corridors for fauna movement, as well as providing habitat for southern mountain reedbuck on site, and potentially spotted-necked otter and Maquassie shrew at the regional level.

Habitats 9 – 12 are transformed habitats (cropland, planted pasture, plantations and wind breaks) and all have a very low sensitivity rating.

The WEF infrastructure is currently located predominantly in Habitat 4 (Grassland) and all rocky hills, rocky outcrops (sheets) and drainage lines are avoided. Habitat 4 (*Hyparrhenia hirta - Eragrostis chloromelas* grassland) has been assessed as having medium SEI for fauna species – primarily on the basis of the support of southern mountain reedbuck, which occurs in the study area. However, since southern mountain reedbuck was probably reintroduced to the game farm within the study area, the magnitude of the potential project impacts (habitat loss, sensory disturbance) is reduced.

Buffers are applicable to the development along the watercourses. A buffer zone of 32 m is usually applied to drainage lines; this should be cross-referenced with the bat and aquatic specialist studies, and the widest recommended buffer zone applied.

CITES listed species were not considered as being of conservation concern because none of them qualify as SCC according to the SANBI definition (SANBI 2020). No ToPS listed species or endemic species were recorded on site.

7.2.5 AVIFAUNA

The following is extracted from the Avifauna Impact Assessment compiled by AfriAvian Environmental (Pty) Ltd and included as ***Appendix H.4.***

7.2.5.1 Vegetation description

The project site is situated along an ecotone between the Savanna and Grassland Biomes but falls mainly within the Grassland Biome (**Figure 7-30**) and within the Central Bushveld Bioregion (northern half of the project site) and the Mesic Highveld Grassland Bioregion (southern half of the project site) (**Figure 7-31**). The natural vegetation at the project site consists predominantly of Gauteng Shale Mountain Bushveld and Rand Highveld Grassland.

The typical landscape associated with Rand Highveld Grassland is highly variable, containing extensive sloping plains and a series of ridges slightly elevated over undulating surrounding plains. The Gauteng Shale Mountain Bushveld is represented by woody vegetation and a grass dominated herbaceous layer.

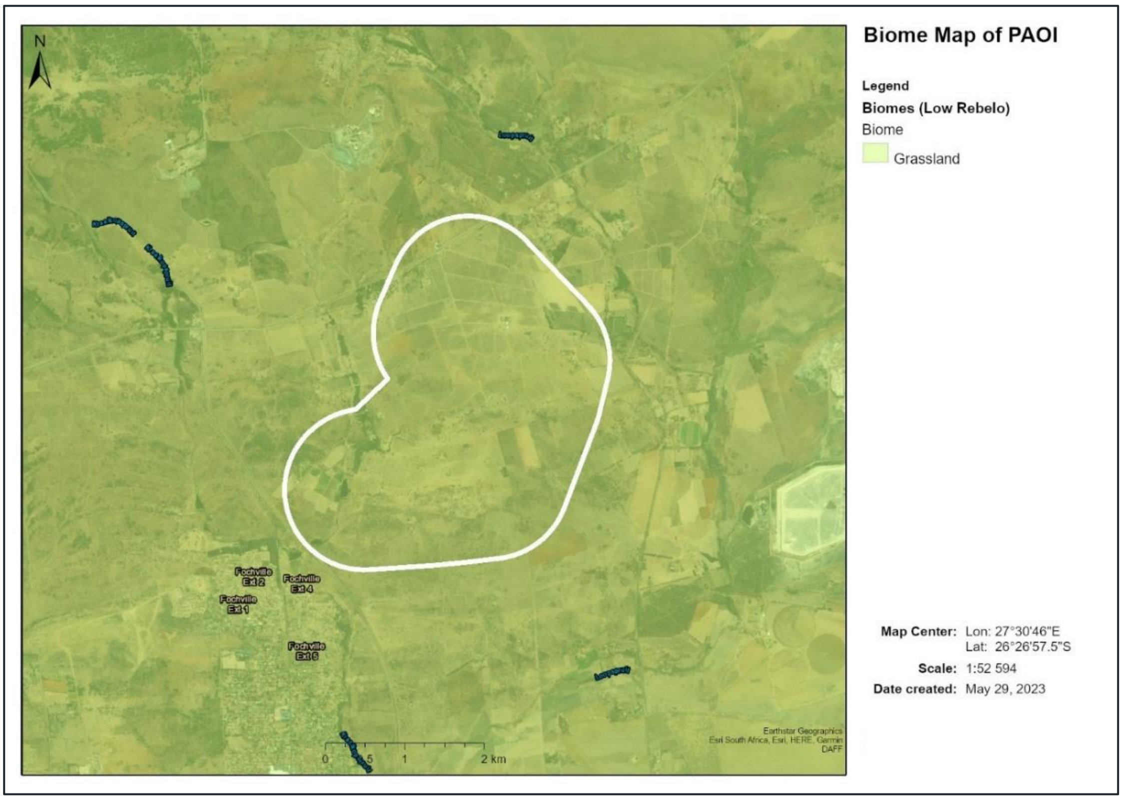


Figure 7-30 - The study area (outlined in white) falls within the Grassland Biome
Source: AfriAvian Environmental, 2023

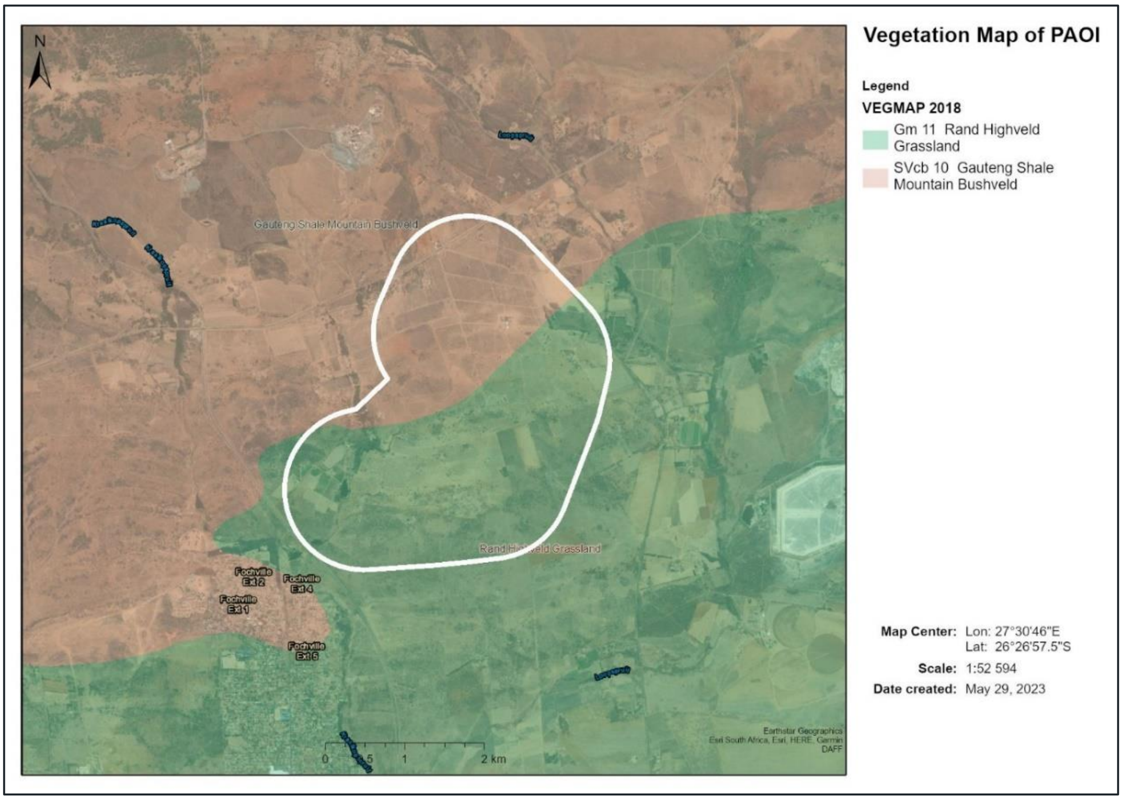


Figure 7-31 - Vegetation map of the study area (outlined in white)
Source: AfriAvian Environmental, 2023

7.2.5.2 Avifaunal community in/around the site

- Important Bird Areas (IBAs):
  The proposed project site does not fall within an Important Bird Area (IBA). The closest IBA, the Suikerbosrand Nature Reserve, lies 63km east of the project site.
- National Protected Areas and National Protected Areas Expansion Strategy (NPAES) Focus Areas:
  The proposed project does not fall within a protected area or an NPAES focus area.
- The Renewable Energy Development Zones (REDZ):
  The proposed project is not located in a REDZ.

A total of 307 species could potentially occur within the broader area of the proposed project site, and of these, 32 are classified as priority species for wind energy developments. Of the 32 priority species, 11 have a medium to very high probability of occurring regularly in the project site, and 12 were recorded during the on-site field surveys.

Ten of the priority species recorded in the broader area are also Species of Conservation Concern (SCC). Two SCC were recorded during the on-site surveys thus far, namely Secretarybird (Globally Endangered and Regionally Vulnerable) and Lanner Falcon (Regionally Vulnerable). There is also confirmed habitat for African Grass Owl (Regionally Vulnerable) within the project site.

Table 7-17 - Priority species which could occur at the project site, habitat classes within the project site, and the potential impacts of the Igolide WEF on avifauna

Species name	Scientific name	SABAP2 Reporting Rate %		Global Conservation Status	Regional Conservation Status	Recorded during monitoring	Likelihood of regular occurrence at PAOI	Primary grassland	Secondary grassland	Open woodland	Drainage lines and wetlands	Dams	Agriculture	HV lines	Collision with turbines	Displacement - habitat transformation	Displacement - disturbance (breeding)	Electrocution MV lines	Collision powerlines
		Full protocol	Ad hoc protocol																
African Fish Eagle	*Haliaeetus vocifer*	1,45	0,75	-	-		M				x	x			x			x	
African Grass Owl	*Tyto capensis*	0,00	0,75	-	VU		L	x			x				x	x	x	x	x
African Harrier-Hawk	*Polyboroides typus*	0,73	0,75	-	-		L			x		x			x	x	x	x	
African Hawk-eagle	*Aquila spilogaster*	0,36	0,00	-	-		L			x		x			x	x		x	
Amur Falcon	*Falco amurensis*	1,63	2,26	-	-	x	M	x	x				x	x	x	x		x	
Black Harrier	*Circus maurus*	0,18	0,00	EN	EN		L	x							x	x		x	
Black Kite	*Milvus migrans*	0,00	0,75	-	-		L			x		x	x		x	x	x	x	
Black Sparrowhawk	*Accipiter melanoleucus*	1,45	0,00	-	-	x	M			x					x	x	x	x	
Black-chested Snake Eagle	*Circaetus pectoralis*	0,18	0,00	-	-		L	x	x	x		x	x	x	x	x	x	x	

Species name	Scientific name	SABAP2 Reporting Rate %		Global Conservation Status	Regional Conservation Status	Recorded during monitoring	Likelihood of regular occurrence at PAOI	Primary grassland	Secondary grassland	Open woodland	Drainage lines and wetlands	Dams	Agriculture	HV lines	Collision with turbines	Displacement - habitat transformation	Displacement - disturbance (breeding)	Electrocution MV lines	Collision powerlines
		Full protocol	Ad hoc protocol																
Black-winged Kite	*Elanus caeruleus*	47,19	13,53	-	-	x	H	x	x	x			x	x	x	x	x	x	
Black-winged Pratincole	*Glareola nordmanni*	0,18	0,00	NT	NT		L	x	x		x		x		x				
Booted Eagle	*Hieraaetus pennatus*	0,36	0,75	-	-		L	x	x	x		x		x	x	x		x	
Cape Vulture	*Gyps coprotheres*	0,18	0,00	VU	EN		L	x	x	x		x		x	x	x		x	x
Common Buzzard	*Buteo buteo*	7,80	2,26	-	-	x	M	x	x	x		x	x	x	x	x		x	
Greater Flamingo	*Phoenicopterus roseus*	0,00	0,75	-	NT		L					x			x				x
Greater Kestrel	*Falco rupicoloides*	1,09	0,75	-	-		L	x	x					x	x	x	x	x	
Jackal Buzzard	*Buteo rufofuscus*	0,54	0,75	-	-		L	x	x	x		x	x	x	x	x	x	x	
Lanner Falcon	*Falco biarmicus*	0,36	0,75	-	VU	x	M	x	x	x		x	x	x	x	x	x	x	
Lesser Kestrel	*Falco naumanni*	1,27	0,00	-	-		L	x	x				x	x	x	x		x	
Long-crested Eagle	*Lophaetus occipitalis*	0,73	0,75	-	-		L	x		x		x		x	x	x	x	x	
Marsh Owl	*Asio capensis*	1,27	1,50	-	-	x	M	x			x				x	x	x	x	x

Species name	Scientific name	SABAP2 Reporting Rate %		Global Conservation Status	Regional Conservation Status	Recorded during monitoring	Likelihood of regular occurrence at PAOI	Primary grassland	Secondary grassland	Open woodland	Drainage lines and wetlands	Dams	Agriculture	HV lines	Collision with turbines	Displacement - habitat transformation	Displacement - disturbance (breeding)	Electrocution MV lines	Collision powerlines
		Full protocol	Ad hoc protocol																
Martial Eagle	*Polemaetus bellicosus*	0,00	0,75	EN	EN		L	x	x	x		x		x	x	x		x	
Melodious Lark	*Mirafra cheniana*	0,18	0,75	-	-	x	L	x	x						x	x	x		
Northern Black Korhaan	*Afrotis afraoides*	54,08	4,51	-	-	x	H	x	x						x	x	x		x
Pale Chanting Goshawk	*Melierax canorus*	3,81	0,75	-	-	x	M	x	x	x		x		x	x	x	x	x	
Secretarybird	*Sagittarius serpentarius*	0,18	0,00	EN	VU	x	L	x	x	x		x			x	x	x		x
Spotted Eagle-Owl	*Bubo africanus*	11,98	0,75	-	-	x	H	x	x	x		x	x		x	x	x	x	x
Verreaux's Eagle	*Aquila verreauxii*	3,09	2,26	-	VU		L	x	x	x		x		x	x	x		x	
Verreaux's Eagle-Owl	*Bubo lacteus*	0,00	0,75	-	-		L			x		x			x	x	x	x	
Western Osprey	*Pandion haliaetus*	0,18	0,75	-	-		L					x			x			x	
White Stork	*Ciconia ciconia*	1,63	1,50	-	-	x	M	x	x				x		x	x			x
Yellow-billed Stork	*Mycteria ibis*	0,00	0,75	-	EN		L				x	x			x				x

Global and Regional (South African) Red List status: CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least concern

7.2.5.3 Sensitivity analyses and verification

Very high sensitivity: All Infrastructure Exclusion Zone

Included are areas that have been identified as suitable habitat for African Grass Owls (Regionally Vulnerable). Key wetlands used by African Grass Owl were identified from a presence locality dataset provided by Craig Whittington-Jones and supplemented with personal records of African Grass Owl breeding sites. Roadkill and marginal/stochastic sites were disregarded for this analysis, with an emphasis being placed on records noted as confirmed or suspected breeding sites, as well as sites noted to host the species consistently, but where breeding was unconfirmed. A systematic GIS grid was then used to generate positive training data samples from these sites representing suitable breeding wetlands for African Grass Owl.

Very high sensitivity: Turbine exclusion zone

Drainage lines, wetlands, dams: A wind turbine exclusion zone (including the rotor swept area) should be implemented within a 50m buffer around drainage lines, wetlands, dams and in all African Grass Owl breeding habitat. Wetlands (including dam margins) are important breeding, roosting and foraging habitat for a variety of SCC, most notably for African Grass Owl (Regionally Vulnerable), Greater Flamingo (Regionally Near Threatened), Maccoa Duck (Globally Vulnerable, Regionally Near Threatened), and Yellow-billed Stork (Regionally Endangered). These SCC have all been recorded in the broader area through the Southern African Bird Atlas Project (SABAP2). It should also be noted that any road and/or grid line crossings across these features should be restricted to what is unavoidable.

High sensitivity: Limited infrastructure zone

Development in the remaining natural grassland in the project site must be limited as far as possible. Where possible, infrastructure must be located near margins, with shortest routes taken from the existing roads. The grassland is potential breeding, roosting and foraging habitat for a variety of SCC. These include African Grass Owl (Globally Least Concern, Regionally Vulnerable), and Secretarybird (Globally Endangered, Regionally Vulnerable). **Figure 7-32** below is a preliminary sensitivity map, indicating sensitivity areas identified for development.

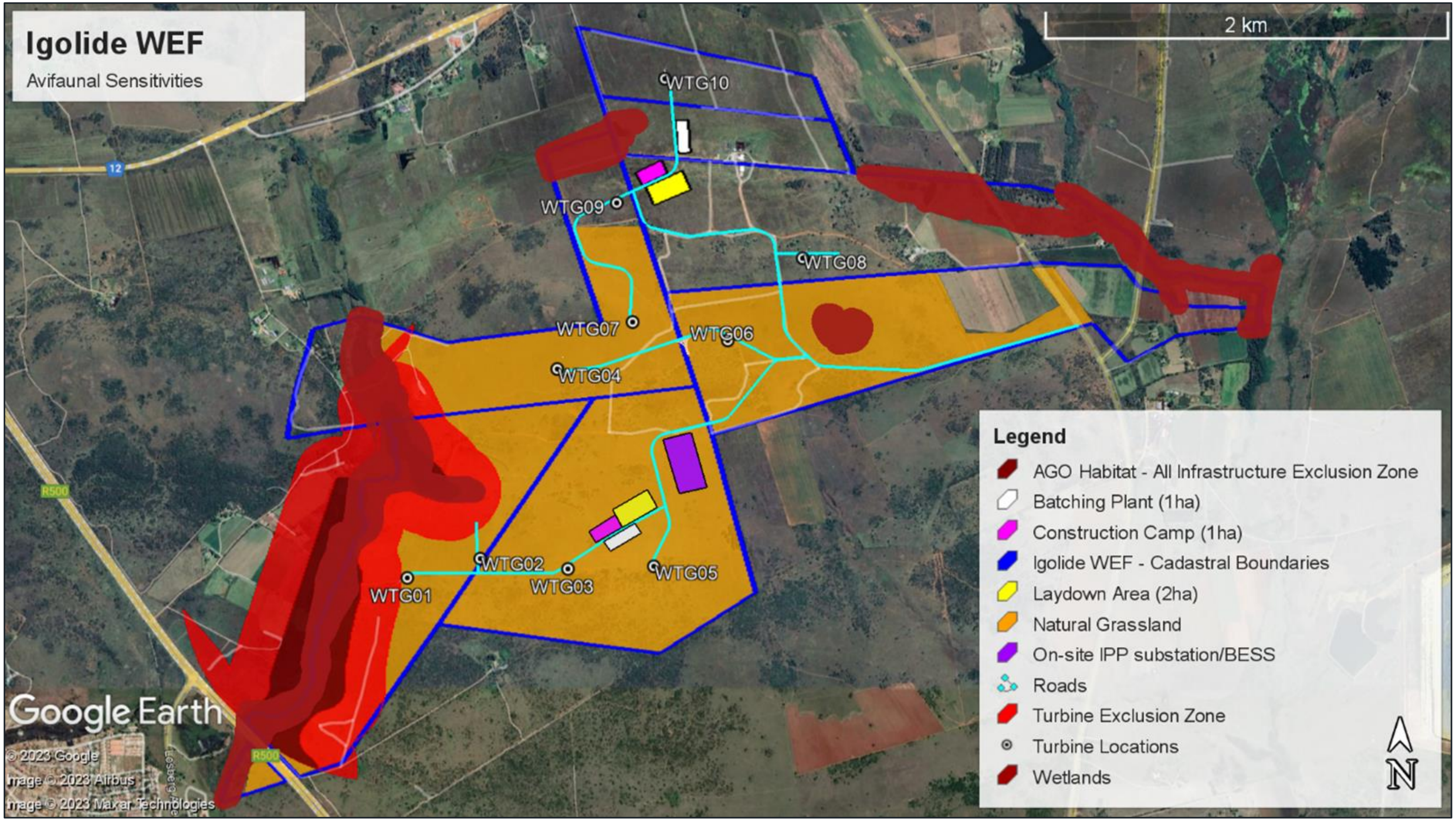


Figure 7-32 - Avifaunal Sensitivities Map for the Igolide WEF. Wind turbine exclusion zones indicated in red

Source: AfriAvian Environmental, 2023

7.2.6 BATS

The following is extracted from the Bats Assessment compiled by Animalia Consultants (Pty) Ltd and included as **Appendix H.5.**

7.2.6.1 Protected areas, known sensitivities and caves/roosts within 100km from the site

The Tweefontein Private Nature Reserve is the closest protected area to the site, approximately 17.5km to the south east (**Figure 7-33**). This nature reserve is not a well-known hotspot for bat activity or bat roosts that may influence the site, although the presence of natural vegetation may promote bat diversity and activity levels.

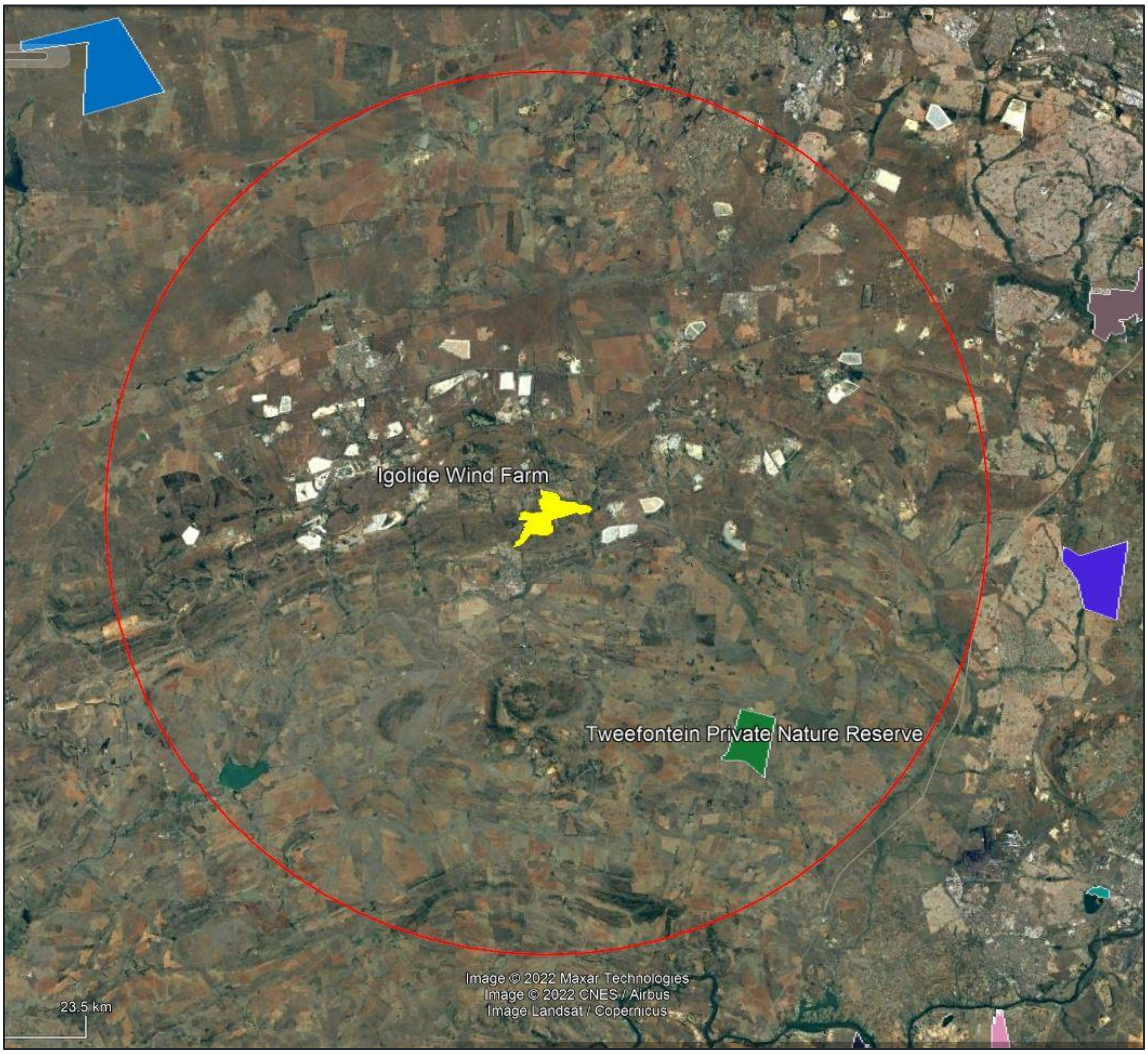


Figure 7-33 - Protected areas within a radius of 30km (red line) around the site (SAPAD, DFFE, October 2021)

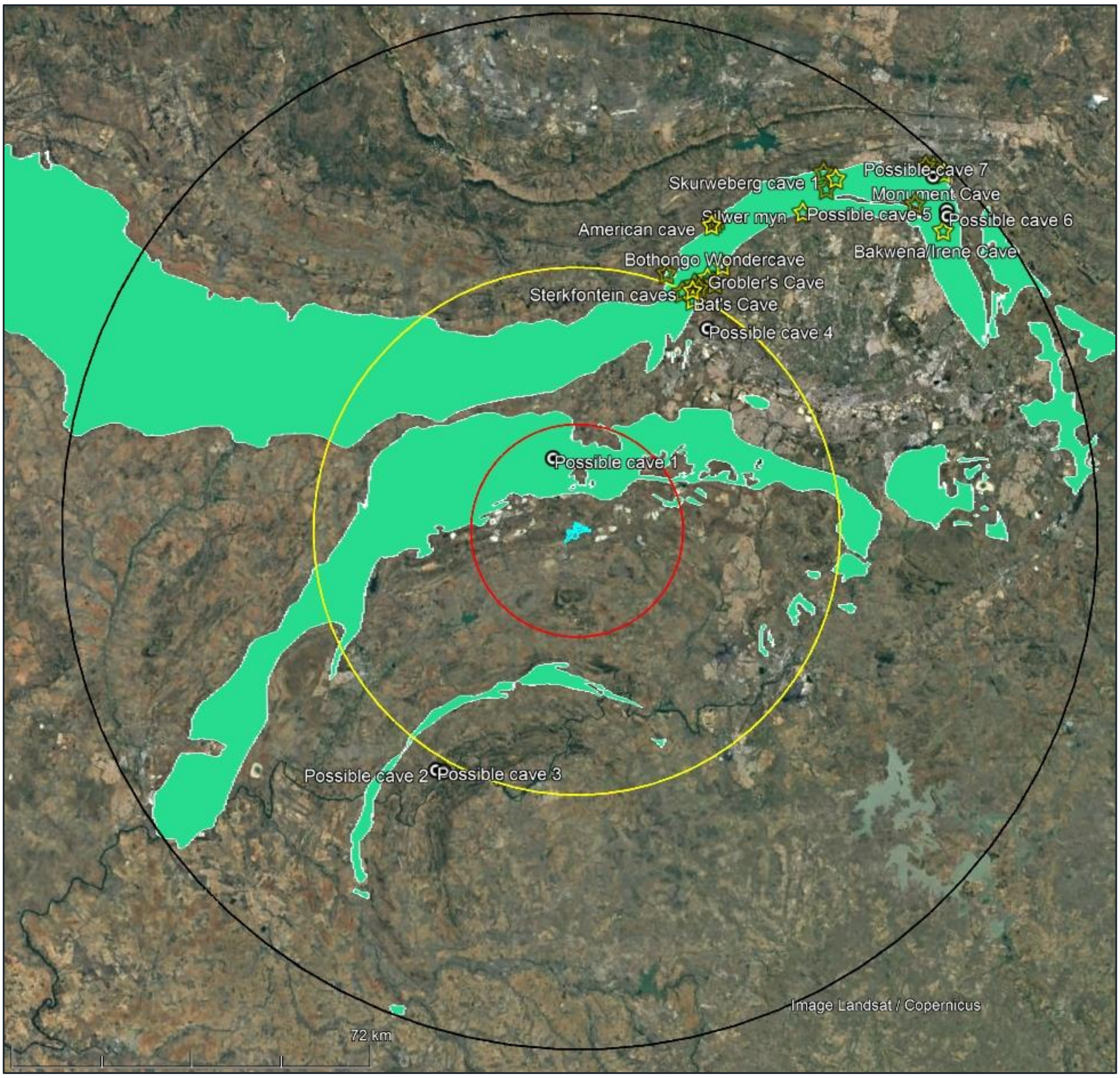


Figure 7-34 - Confirmed and possible bat roosts within 100km (black circle), 50km (yellow circle) and 20km (red circle) of the site. Dolomite geology indicated in green

The SEA assigns 20km high sensitivity and 50km medium sensitivity buffers to large bat roosts for wind energy. Based on museum records of cave bats in the area there may be a possible cave within 20km of the site (called Possible Cave 1). However the bat activity data collected over 12 months do not indicated abnormally high levels of cave bat activity that may indicate activity of this cave to be overlapping with the site.

Other caves, some with large bat roosts and most with the potential to house large roosts, within the 50km and 100km radius include: Nash's Cave, Bat's Cave, Bakwena/Irene Cave, Skurweberg Caves, Gladysvale Mine, American Cave, Monument Cave, Fountains Cave, Scramblers, Sterkfontein, Gladysvale Mine, Kromdraai Mine, Minaar's Cave, Wondercave, Silwer Myn, Grobler's Cave, Porcupine Cave, Mamelodi Cave, Groenkloof, Swartkop cave.

It must be noted that these caves are grouped to the North of the site and movement between these caves will not be affected by the WEF. Only movement between Possible Cave 1 , 2 and 3 may be affected by the WEF, although the passive data did not indicate migration movements. However, the prevalence of cave forming dolomite within 6km from the site increases the likelihood of undiscovered caves significantly, and the possibility of future bat migrations during the operational phase must be accounted for in reactive mitigation measures.

7.2.6.2 Ecology of bat species that may be impacted the most by the Wind Farm.

There are several bat species in the vicinity of the site that occur commonly in the area. Some of these species are of special importance based on their likelihood of being impacted by the proposed wind farm, due to high abundances and certain behavioural traits. They have also been dominating records of fatalities at nearby wind farms. The relevant species are discussed below.

***Tadarida* aegyptiaca**

The Egyptian Free-tailed Bat, *Tadarida aegyptiaca*, is a Least Concern species (IUCN Red List 2016) as it has a wide distribution and high abundance throughout South Africa and is part of the Free-tailed bat family (Molossidae). It occurs from the Western Cape of South Africa, north through to Namibia and southern Angola; and through Zimbabwe to central and northern Mozambique. This species is protected by national legislation in South Africa. They roost communally in small (dozens) to medium-sized (hundreds) groups in rock crevices, under exfoliating rocks, in hollow trees and behind the bark of dead trees. *Tadarida aegyptiaca* has also adapted to roosting in buildings, in particular roofs of houses. Thus, the rocky boulder crevices and man-made structures on the site would be important roosts for this species.

Tadarida aegyptiaca forages over a wide range of habitats, flying above the vegetation canopy. It appears that the vegetation has little influence on foraging behaviour as the species forages over desert, semi-arid scrub, savannah, grassland and agricultural lands. Its presence is strongly associated with permanent water bodies due to concentrated densities of insect prey.

After a gestation of four months, a single pup is born, usually in November or December, when females give birth once a year. In males, spermatogenesis occurs from February to July and mating occurs in August. Maternity colonies are apparently established by females in November.

The Egyptian Free-tailed bat is considered to have a high likelihood of risk of fatality due to wind turbines (MacEwan et al. 2020) and are displaying moderate to high numbers of mortalities at operating wind farms in South Africa. Due to the high abundance and widespread distribution of this species, high mortality rates due to wind turbines would be a cause of concern as these species have more significant ecological roles than the rarer bat species.

Laephotis capensis

Laephotis capensis (Cape serotine bat) has a conservation status of Least Concern (IUCN Red List 2016) as it is found in high numbers and is widespread over much of Sub-Saharan Africa.

High mortality rates of this species due to wind turbines would be a cause of concern as L. capensis is abundant and widespread and as such has a more significant role to play within the local ecosystem than the rarer bat species. They do not undertake migrations and thus are considered residents of the site. It roosts individually or in small groups of two to three bats in a variety of shelters, such as under the bark of trees, and inside the roofs of houses. They will use most man-made structures as day roosts which can be found on the site and surrounding areas.

Mating takes place from the end of March until the beginning of April. Spermatozoa are stored in the uterine horns of the female from April until August, when ovulation and fertilisation occurs. They give birth to twins during late October and November, but single pups, triplets and quadruplets have also been recorded.

They are tolerant of a wide range of environmental conditions as they survive and prosper within arid semi-desert areas to montane grasslands, forests, and savannas; indicating that they may occupy several habitat types across the site and are amenable towards habitat changes. They are however clutter-edge foragers, meaning they prefer to hunt on the edge of vegetation clutter mostly, but can occasionally forage in open spaces. They are thought to have a Medium-High likelihood of risk of fatality due to wind turbines and are displaying moderate to high numbers of mortalities at operating wind farms in South Africa.

Miniopterus natalensis

Miniopterus natalensis (Natal long-fingered bat), occurs widely across the country but mostly within the southern and eastern regions and is listed as Near Threatened. This bat is a cave-dependent species and identification of suitable roosting sites may be more important in determining its presence in an area than the presence of surrounding vegetation. It occurs in large numbers when roosting in caves with approximately 260 000 bats observed making seasonal use of the De Hoop Guano Cave in the Western Cape, South Africa. Culverts and mines have also been observed as roosting sites for either single bats or small colonies in South Africa. Separate roosting sites are used for winter hibernation activities and summer maternity behaviour, with the winter hibernacula generally occurring at higher altitudes in more temperate areas and the summer hibernacula occurring at lower altitudes in warmer areas of the country.

Mating and fertilisation usually occur during March and April and is followed by a period of delayed implantation until July/August. Birth of a single pup usually occurs between October and December as the females congregate at maternity roosts.

The Natal long-fingered bat undertakes short migratory journeys between hibernaculum and maternity roosts. Due to this migratory behaviour, they are considered to be at high risk of fatality from wind turbines if a wind farm is placed within a migratory path (MacEwan et al. 2020). The mass movement of bats during migratory periods could result in mass casualties if wind turbines are positioned over a mass migratory route and such turbines are not effectively mitigated. Very little is known about the migratory behaviour and paths of M. natalensis in South Africa with migration distances exceeding 150 kilometres. However, from personal observations it has been noted that they can occur individually or in small groups in rock hollows or man-made structures such as culverts.

MacEwan et al. (2020) advise that M. natalensis faces a medium to high risk of fatality due to wind turbines. This evaluation was based on broad ecological features and excluded migratory information. And are displaying low to moderate numbers of mortalities at operating wind farms in South Africa.

7.2.6.3 Passive Bat activity

Passive bat data was collected for the 12-month monitoring at the Igolide Wind Farm between the period of October 2021 to March 2023 for the Short Mast and February 2022 to March 2023 for the Met Mast. **Figure 7-35** to **Figure 7-40** graphically display the data collected, pertaining to the total bat passes recorded at the Met Mast (7m, 55m and 110m) and the Short Mast systems (7m), as well as the average hourly bat passes per system.

Bat activity was divided into categories (**Table 7-18**) according to the risk of being impacted on by wind turbines, as well as other important ecological significance (as is the case with cave bats).

Table 7-18 - The categories used for grouping and presenting bat activity in the passive bat activity graphs. "Risk" represents the likelihood of fatality to turbine collision

Graph category and abbreviation	Motivation of graph category	Species detected in graph category
High risk (H)	• Open-air foragers • High-flying in rotor swept zone	• *Tadarida aegyptiaca* • Other members of Molossidae family
Medium – High risk (MH)	• Migrant bats, can influence multiple ecologies • Cave bats, may possibly indicate presence of undiscovered bat cave roosts or migartions • Can also roost in non-cave hollows • Forages on the edges of vegetation clutter (clutter-edge foragers) • Medium height foraging, overlapping with lower rotor swept zone	• *Miniopterus natalensis* • *Miniopterus* spp. • *Myotis tricolor*
Medium risk (M)	• Forages on the edges of vegetation clutter (clutter-edge foragers) • Medium height foraging, overlapping with lower rotor swept zone	• *Laephotis capensis* • *Eptesicus hottentotus* • Other members of Vespertilionidae family
Low risk (L)	• Non-migrant cave and hollow dwelling bats, but may possibly indicate presence of caves, therefore presented in graphs • Forages in dense vegetation clutter (clutter foragers) • Low height foraging, outside rotor swept zone	• *Rhinolophus* spp.

The five bat species detected on site were: *Eptesicus hottentotus, Tadarida aegyptiaca, Myotis tricolor, Laephotis capensis,* and *Miniopterus natalensis*. Additionally, bat passes were recorded that are classified up to family level for the Vespertilionidae and Rhinolophidae. First mentioned is taxonomically a large family that includes many species that behave ecologically similarly with regards to their risk of collision with wind turbines. When the frequency of their vocalisations overlaps, these species are more difficult to distinguish from one another, and are grouped together.

It must be noted that the species *Laephotis capensis* (Cape Serotine bat) is very well-represented in the data for this site. *L. capensis* (part of Medium risk category) displayed an abnormally high peak of activity during the autumn of 2022 at 110m on the Met Mast, this is unusual since this species is not generally utilising the higher airspaces frequently. A smaller peak was observed during late winter and early spring is 2022. These activity peaks may be due to the mating season of this species being in autumn and birth of young being in late winter and spring (generally October).

However, bat activity was still overall higher on low microphones than higher microphones, as expected. Since the Medium risk category dominated at all systems and at all heights, with *L. capensis* displaying the highest activity levels at both masts. And *L. capensis,* that forages on the edge of vegetation clutter, made up the majority of the Medium risk category.

The temporal data displays the spread of bat activity over each month and may indicate abrupt peaks in activity. *Miniopterus natalensis* is a cave dwelling species within the High-Medium risk category but may also take residence in smaller numbers in culverts and other suitable man-made hollows, this species did not show any abrupt peaks of activity that may indicate that the site is on any migration route. The species was not particularly frequently recorded on the systems, although it was present in the data from each system.

Average hourly activity is useful since it considers only the nights on which the systems recorded successfully and are therefore a true indication of monthly activity levels. The seasons of autumn and spring had the highest average activity levels across all systems on site. These higher activity months are important to consider in case mitigation may be required during the operational phase.

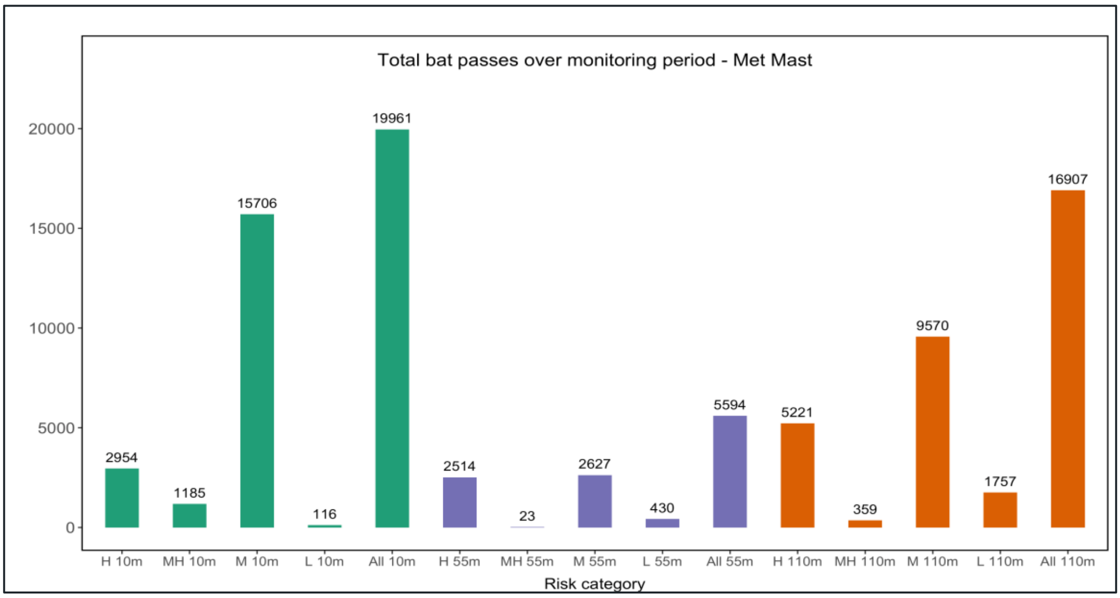


Figure 7-35 - Total number of bat passes recorded over the monitoring period by the Met Mast

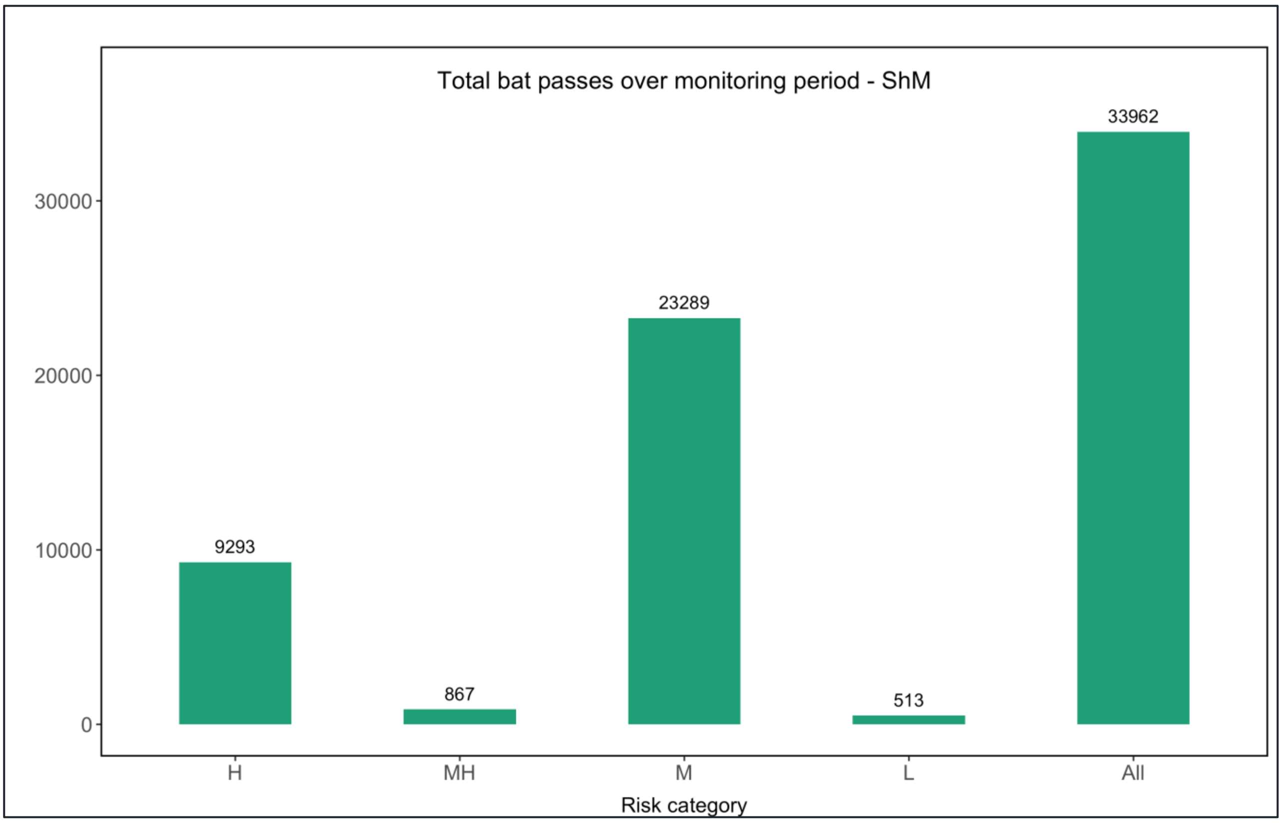


Figure 7-36 - Total number of bat passes recorded over the monitoring period by Short Mast1 (ShM1)

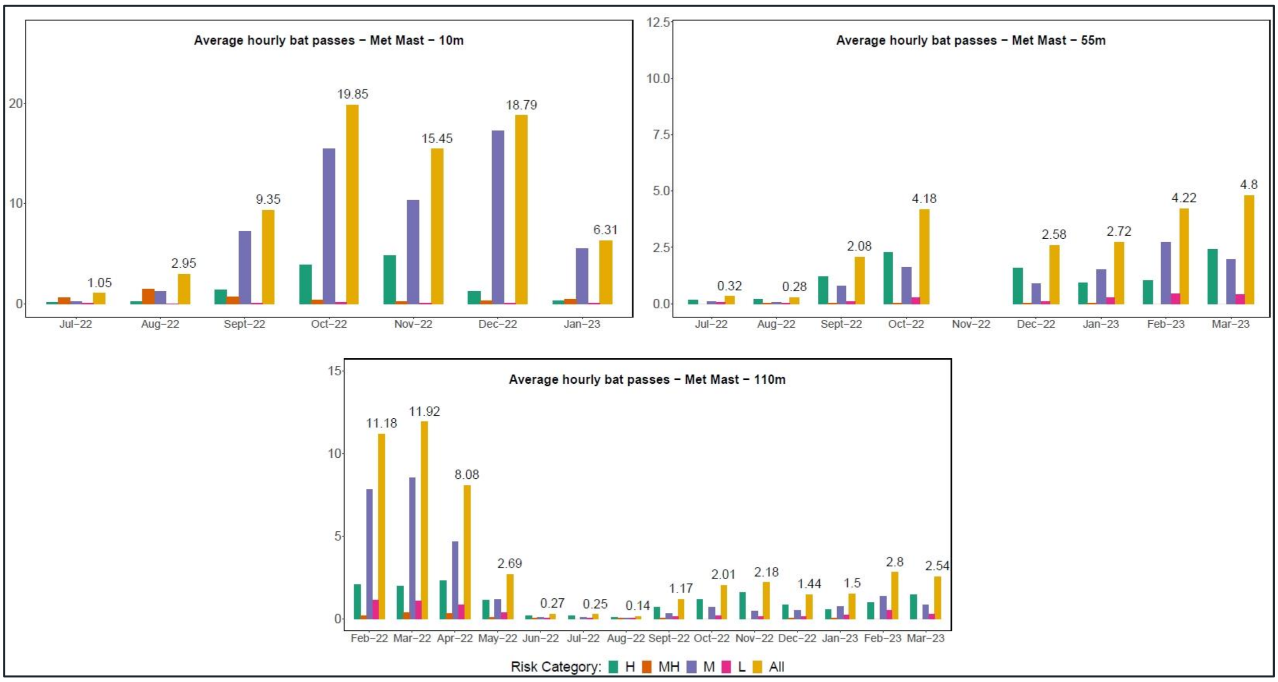


Figure 7-37 - Average hourly bat passes recorded per month by the Met Mast – 10m, 55m and 110m

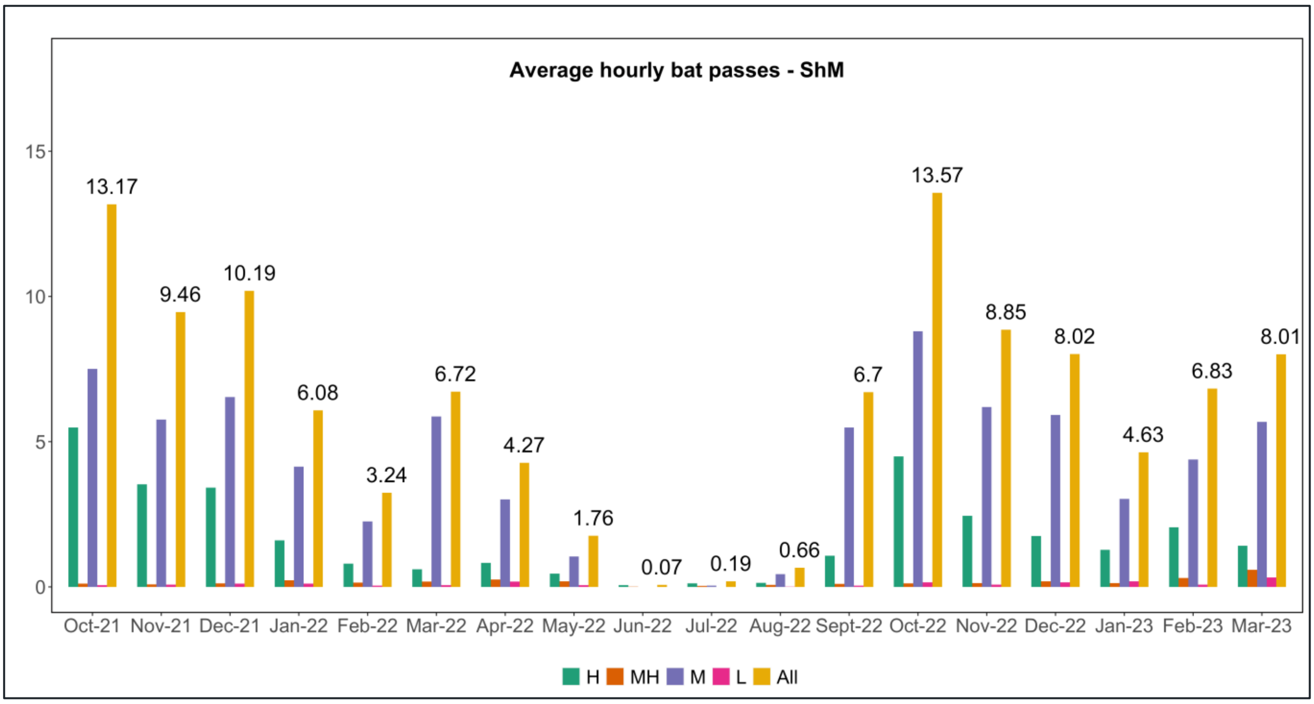


Figure 7-38 - Average hourly bat passes recorded per month by Short Mast1

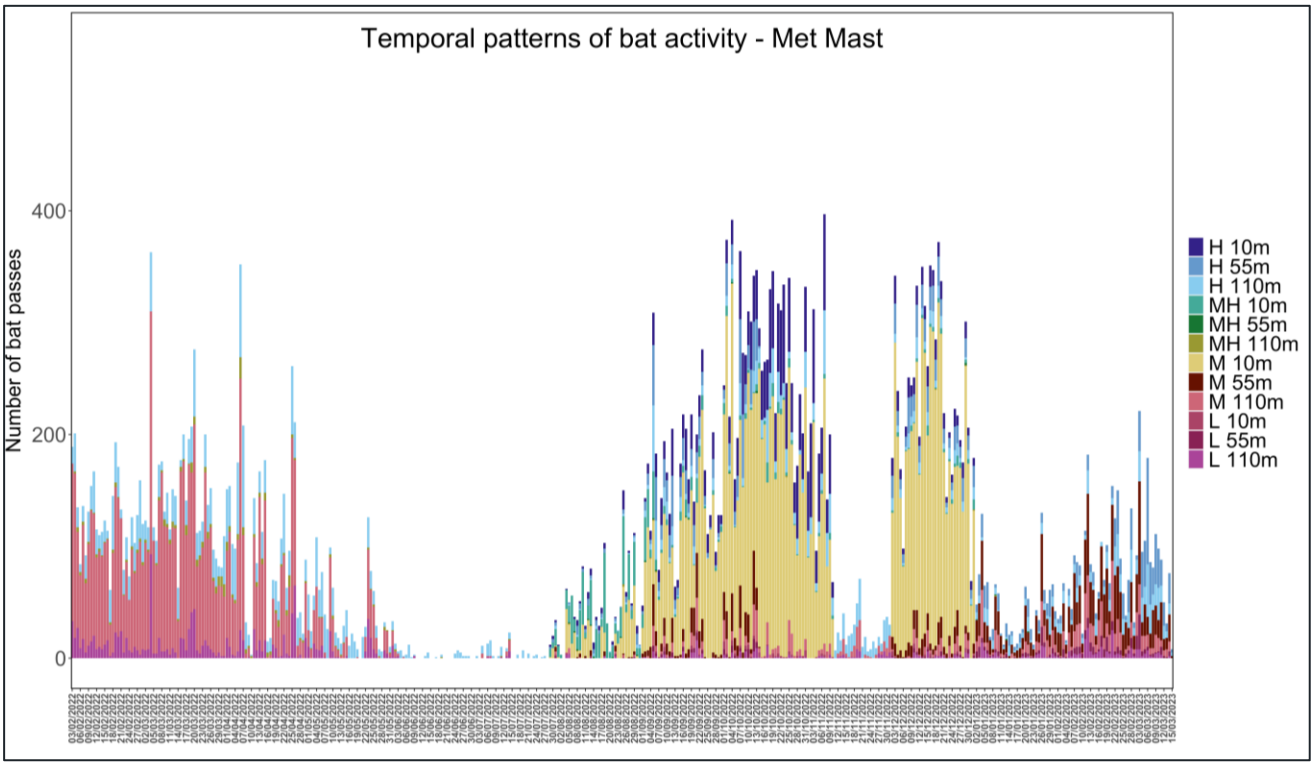


Figure 7-39 - Temporal distribution of bat passes detected over the monitoring period by the Met Mast

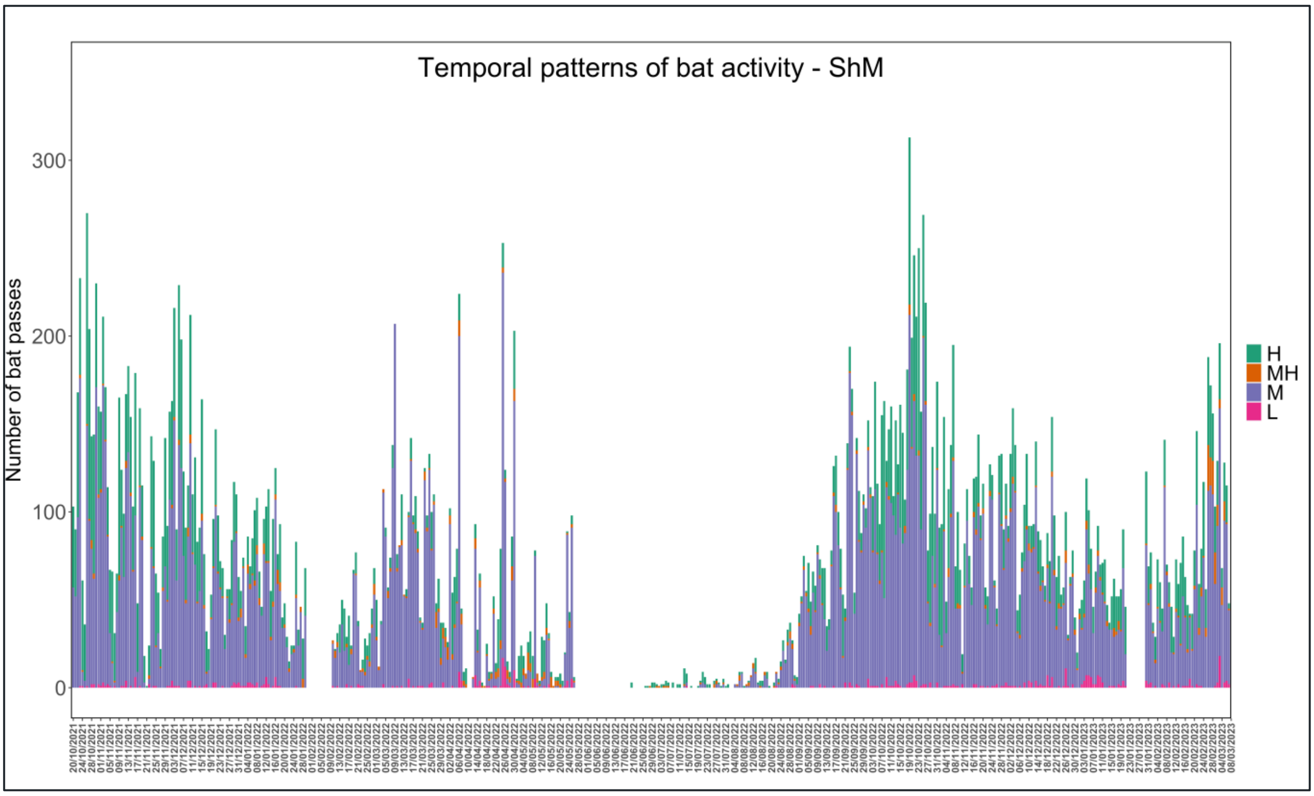


Figure 7-40 - Temporal distribution of bat passes detected over the monitoring period by Short Mast 1

7.3 SOCIAL AND ECONOMIC ENVIRONMENT

7.3.1 ARCHAEOLOGICAL AND CULTURAL HERITAGE

*The following is extracted from the Heritage Impact Assessment compiled by ASHA Consulting (Pty) Ltd and included as **Appendix H.6**.*

The study area is an undulating landscape with the lowlands largely ploughed and the hills often covered in bush and rocks. Although no field survey has yet been conducted, aerial photography revealed the presence of Late Iron Age settlements amongst the bushy areas.

Stone Age

The region surrounding the study area lacks any significant Stone Age sites and finds in the area are limited to low significance surface scatters of artefacts. These scatters represent the movement of early humans within the landscape but, due to their poor context, do not represent definitive occupation sites. A survey conducted within sections of the current project area (Huffman et al. 1994) found multiple MSA and LSA scatters on sandy terraces. The MSA tools were made from red ironstone and the LSA lithics were made from fine grained cherts and chalcedonies. As such, Stone Age scatters are likely to occur within the project area. MSA and LSA sites are likely to be dominant since ESA finds within this region are rare. An ESA scatter was, however, identified during a survey around 15km east of the project area (Schoeman et al. 2004).

Iron Age

Bantu-speaking people moved into Eastern and Southern Africa about 2000 years ago (Mitchell 2002). These people cultivated sorghum and millets, herded cattle and small stock and manufactured iron tools and copper ornaments. Because metalworking represents a new technology, archaeologists call this period the Iron Age. Characteristic ceramic styles help archaeologists to separate the sites into different groups and time periods. The Iron Age as a whole represents the spread of Bantu-speaking people and includes both the Pre-Historic and Historic periods. It can be divided into three distinct periods:

- The Early Iron Age (EIA): Most of the first millennium AD.
- The Middle Iron Age (MIA): 10th to 13th centuries AD.
- The Late Iron Age (LSA): 14th century to colonial period.

The Iron Age is characterised by the ability of people to manipulate and work Iron ore into implements that assisted them in creating a favourable environment to make a better living.

Iron Age occupation in the vicinity of the study area only started during the LIA after climatic conditions became favourable in the region for LIA settlement and agricultural activities. Iron Age communities in the region are associated with Sotho and Tswana speaking people who entered and settled in the region. LIA stone-walled complexes can be found spread across the broader landscape with associated artefacts. These LIA settlements can be widely found on flat-topped ridges and hills throughout the landscape (Dreyer 2006). The hills surrounding Fochville are well known for the Tlokwe Ruins which are scattered throughout. The region surrounding the project area is known to have been inhabited by the Bakwena baMare-a-Phogole who are known to have settled south of Fochville during the LIA (Vorster 1969). Under the leadership of their chief, Kokosi, the baMare-a-Phogole are believed to have inhabited the region until the 1820s when Mzilikazi and his Matabele raided the interior of South Africa and killed and drove out many Iron Age communities (Sadr 2020). A township just west of Fochville was named Kokosi after the LIA chief. The stone walled settlements within the larger region were later classified as belonging to the Molokwane settlement type which is prevalent across this part of Gauteng (Huffman 2007).

During the mid-17th century Europeans started to settle in modern-day Cape Town. During and after the conflict caused by the Mfecane (1820-1840), during the reign of king kaSenzangakhona Zulu, known as Shaka, Dutch-speaking farmers started to migrate to the interior regions of South Africa. This period is marked by various skirmishes and battles between the local inhabitants, Dutch settlers and the British (Giliomee & Mbenga 2007).

Large stone walled complexes can be clearly seen on Google Earth imagery within the project area (**Figure 7-41** and **Table 7-19**). No graves are currently known within the study area, but there is a possibility that graves, especially of still born babies, can be associated with the Iron Age settlements.

Table 7-19 - List of Heritage Finds

Waypoint	Location	Description
01	S26 27 40.3 E27 30 52.2	An overgrown Late Iron Age stone-walled settlement measuring about 1050 m by 540 m.
02	S26 27 47.0 E27 30 15.7	An overgrown Late Iron Age stone-walled settlement measuring about 750 m by 500 m.
03	S26 27 24.0 E27 30 39.5	An overgrown Late Iron Age stone-walled settlement measuring about 110 m by 120 m.
04	S26 27 10.5 E27 30 46.6	An overgrown Late Iron Age stone-walled settlement measuring about 110 m by 60 m.
05	S26 27 00.6 E27 30 11.1	An overgrown Late Iron Age stone-walled settlement measuring about 590 m by 260 m.
06	S26 26 55.2 E27 30 32.3	A single circular overgrown Late Iron Age stone-walled feature of about 45 m diameter. The southern edge of it has been damaged by farm road construction along the northern edge of the study area with the preserved part being outside the study area.
07	S26 26 50.8 E27 30 54.8	An overgrown Late Iron Age stone-walled settlement measuring about 230 m by 150 m.
08	S26 26 39.2 E27 30 58.8	An overgrown Late Iron Age stone-walled settlement measuring about 390 m by 120 m.
09	S26 26 52.8 E27 30 30.0	An overgrown Late Iron Age stone-walled settlement measuring about 30 m by 30 m. Not readily visible on aerial photography.
10	S26 26 56.2 E27 30 51.5	An overgrown Late Iron Age stone-walled settlement measuring about 330 m by 100 m.
11	S26 24 54.2 E27 32 53.5	An overgrown Late Iron Age stone-walled settlement measuring about 500 m by 160 m. Outside study area.
12	S26 26 43.1 E27 30 42.4	An overgrown Late Iron Age stone-walled settlement measuring about 190 m by 80 m. Outside study area.
13	S26 27 41.7 E27 31 22.7	An overgrown Late Iron Age stone-walled settlement measuring about 510 m by 360 m. Outside study area.
14	S26 27 57.9 E27 29 58.3	An overgrown stone-walled complex measuring about 120 m by 80 m that includes a large, rectangular feature and that thus might be historical. It is not visible on the 1968 or 1934 aerial photography, presumably due to long disuse and seasonal vegetation cover.

Waypoint	Location	Description
15	S26 26 15.7 E27 32 25.2	Small, likely recent graveyard located beneath an existing Eskom powerline. Outside study area.
F1	S26 26 25.8 E27 31.19.4	Modern structures.
F2	S26 26 41.2 E27 31 49.6	Modern structures.
F3	S26 26 54.4 E27 32 34.1	Structures here are older than 1938 but looks very much altered.
F4	S26 27 14.9 E27 30 24.6	Structures here are older than 1968 and probably also 1938.
F5	S27 27 09.7 E27 30 34.1	Structures here are older than 1938.
F6	S26 27 04.5 E27 30 22.3	Modern structures.
F7	S26 27 03.4 E27 30 12.9	Modern structures.
F8	S26 26 56.9 E27 30 03.6	Structures here are older than 1938.

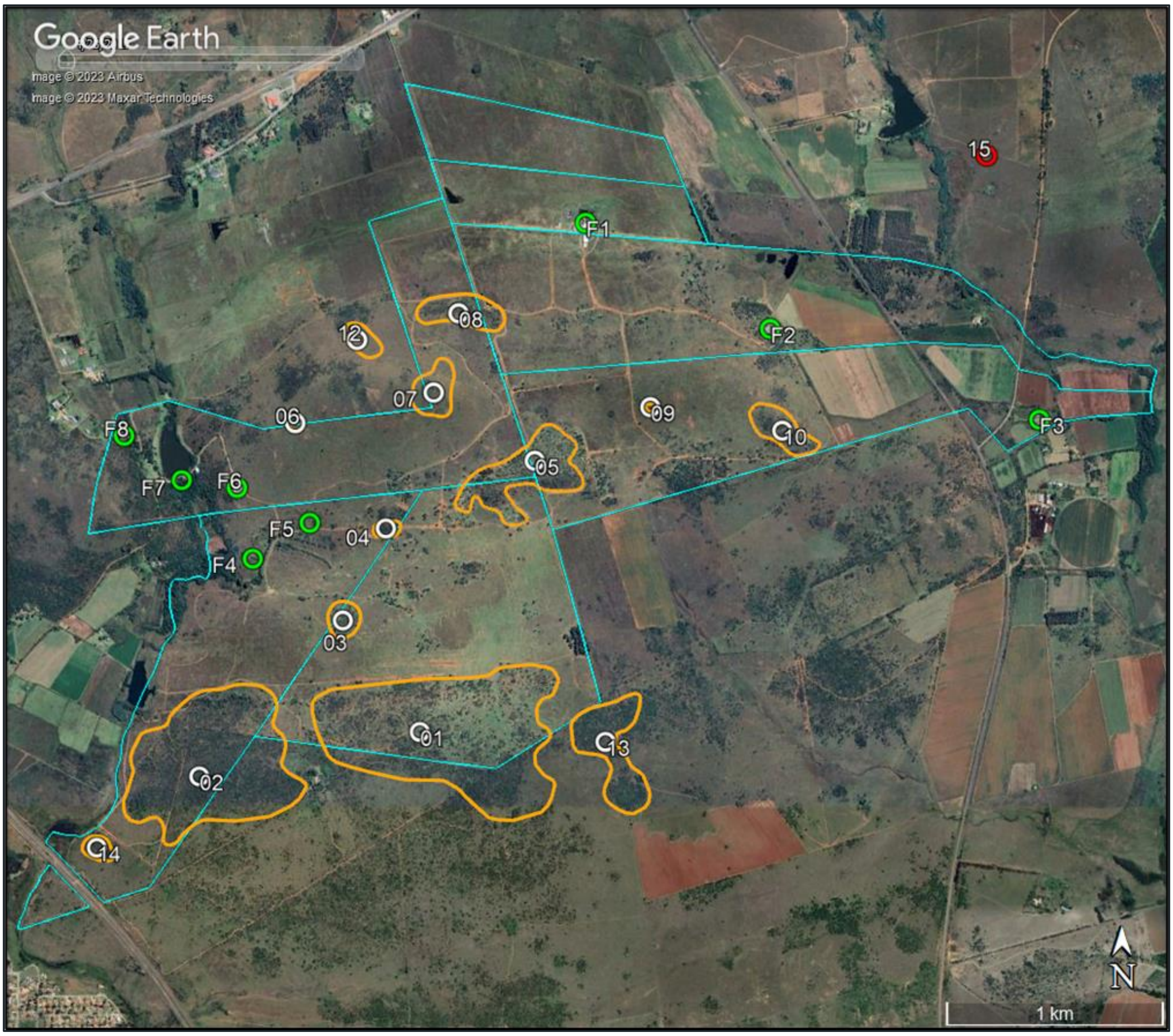


Figure 7-41 - Aerial view of the study area showing visible stone-walled archaeological sites (white symbols), farm buildings (green symbols) and a graveyard (red symbol). Stone-walled site 11 lies out of view towards the northeast and is not relevant to the WEF project

Graves

One historical cemetery (Site 23) and a burial site marked by at least two stone packed graves (Site 18) were seen within the study area. There is also a possibility that burial sites can be associated with the Iron Age settlements. A modern graveyard was noted from aerial photography just beyond the north-eastern edge of the study area (Site 15). It must be noted that graves can easily be concealed in the grass and further graves may well be present in the area.

7.3.1.1 Cultural Landscape

The cultural landscape is largely a rural landscape but with pockets of industrialisation (mines) and development (Fochville). It does still retain aesthetic value but is not an uncommon landscape type and has been compromised by industrialisation. Figure 33 shows all recorded heritage resources by grade relative to the project layout.

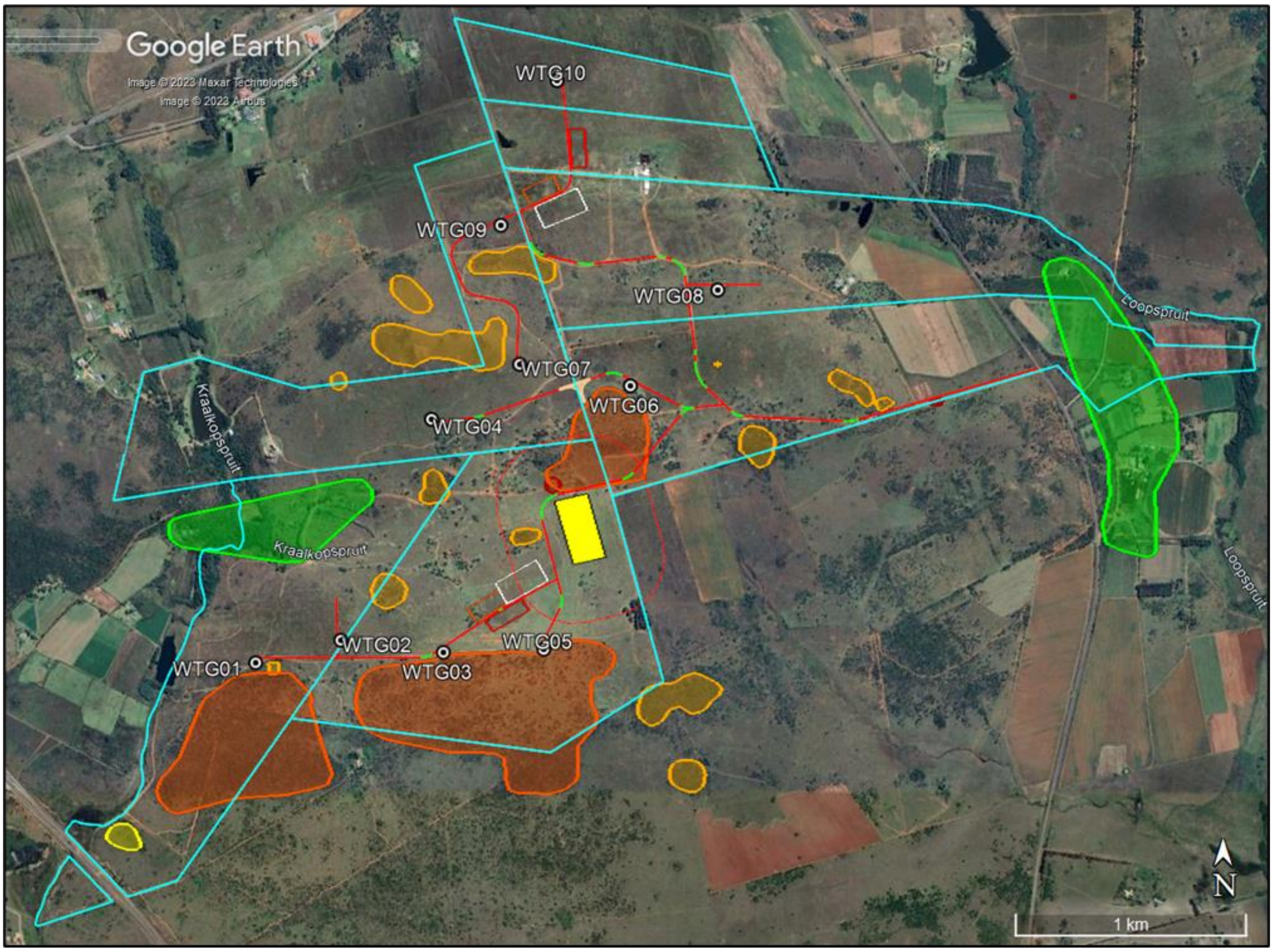


Figure 7-42 - Aerial view of the project layout relative to the archaeological sites

Source: Beyond Heritage, 2023

Dark red = IIIA, light red = IIIB, orange = GPA, yellow = GPB) and areas with buildings (yellow polygons)

7.3.2 PALAEONTOLOGY

*The following is extracted from the Palaeontological Impact Assessment by Prof Marion Bamford and included in Appendix 2 of the Heritage Impact Assessment (***Appendix H.6***).*

The palaeontological sensitivity of the WEF site under consideration is presented in Figures 5-6. The site is mostly on moderately fossiliferous Hekpoort Formation (green on SAHRIS and orange in the DFFE map) and on the highly fossiliferous Timeball Hill Formation (SAHRIS orange; DFFE dark orange). The southwestern corner is on the moderately fossiliferous Silverton Formation, most probably the basal Boven Shale Member. It has been interpreted as a high-stand facies tract that reflects the advance of an epeiric sea onto the Kaapvaal Craton from the east, and therefore the underlying Daspoort Formation would represent a low-stand facies tract or a transgressive systems tract.

There is consensus in the geological literature that the Silverton Formation environment was a high energy one with shallow to deep water shales being deposited as sub-storm wave-base pelagic deposits, within an epeiric embayment on the Kaapvaal Craton. Several sub aqueous dykes and volcanic eruptions have also been recorded (Lenhardt et al., 2020). The formation is dated between 2240 and 2080 Ma (Zeh et al., 2020) and this is too old for any body fossils so the only fossils were microscopic algae and bacteria which if preserved, are in the form of the trace fossils such as stromatolites or microbial mats. There are no records of such trace fossils in the Silverton formation although they are present in the overlying Magaliesberg Formation.

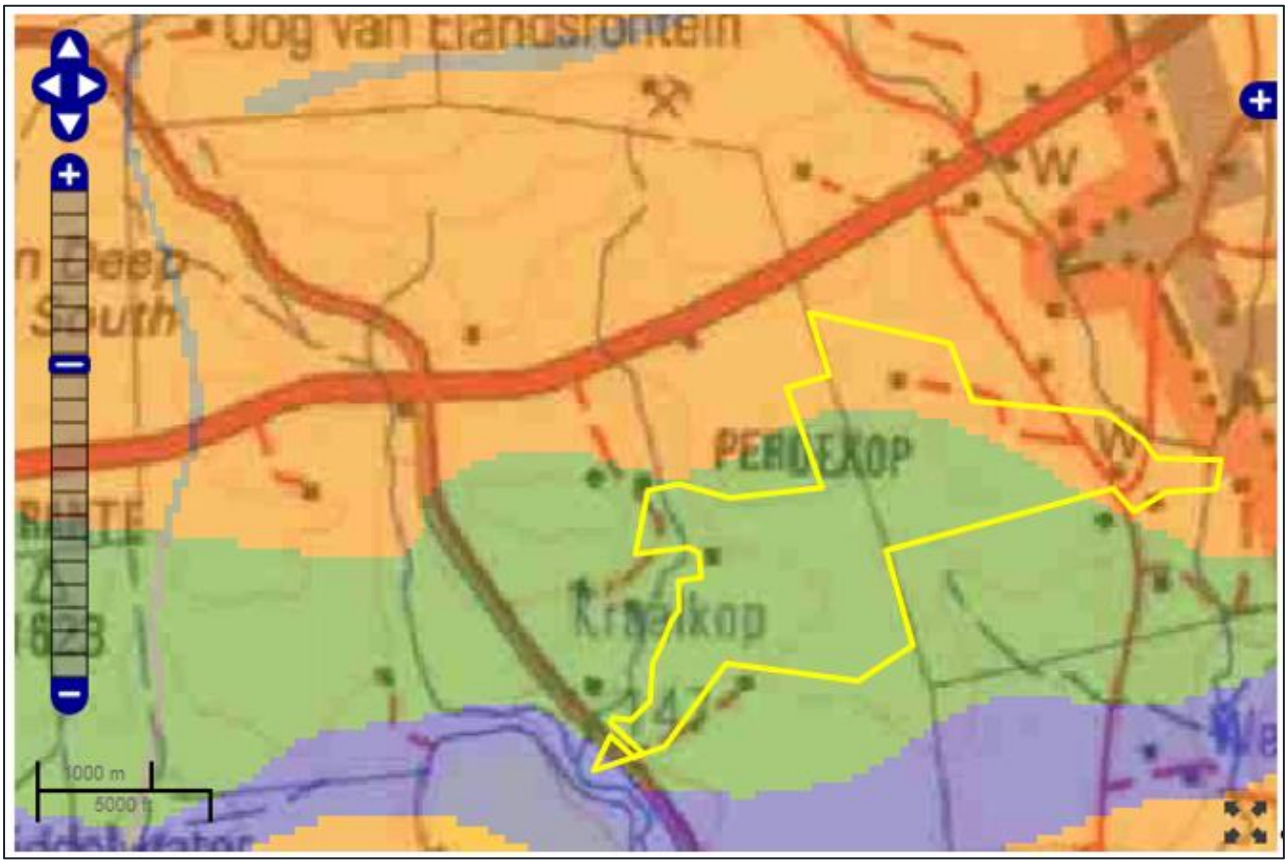


Figure 7-43 - SAHRIS palaeosensitivity map for the site for the proposed Igolide WEF with the project boundary indicated within the yellow outline

Source: Bamford, 2023

Background colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero

7.3.3 TRAFFIC

The following is extracted from the Transport Impact Assessment by iWink Consulting (Pty) Ltd and included as ***Appendix H.7****.*

7.3.3.1 Surrounding road network

The road classification mentioned has been derived from the COTO's South African Road Classification and Access Management Manual (TRH26). The surrounding road network is shown in **Figure 7-44**.

- The N12:

  The N12 is a Class R1 Rural Principal Arterial. A section of the N12 is located just north of the project site. This section of the N12 is a surfaced single carriageway which generally accommodates two lanes per direction of travel. The shoulders accommodated are gravel shoulders.

- The R500:

  Based on the TRH26 rural road classification system, the R500 can be classified as a Class R2 Rural Major Arterial. The road is located to the west of the site and is a surfaced dual carriageway. The section to the west of the site accommodates two lanes per direction and a gravel shoulder.

- Losberg Road:

  Losberg Road can be classified as a Class R3 Rural Minor Arterial. The road is a surfaced single carriageway road with one lane per direction and gravel shoulders. The road is located to the east of the site.

- Loopspruit Avenue:

  Loopspruit Avenue can be classified as a Class R3 Rural Minor Arterial. The road is a surfaced single carriageway road with one lane per direction and gravel shoulders. The road is located to the south of the site.

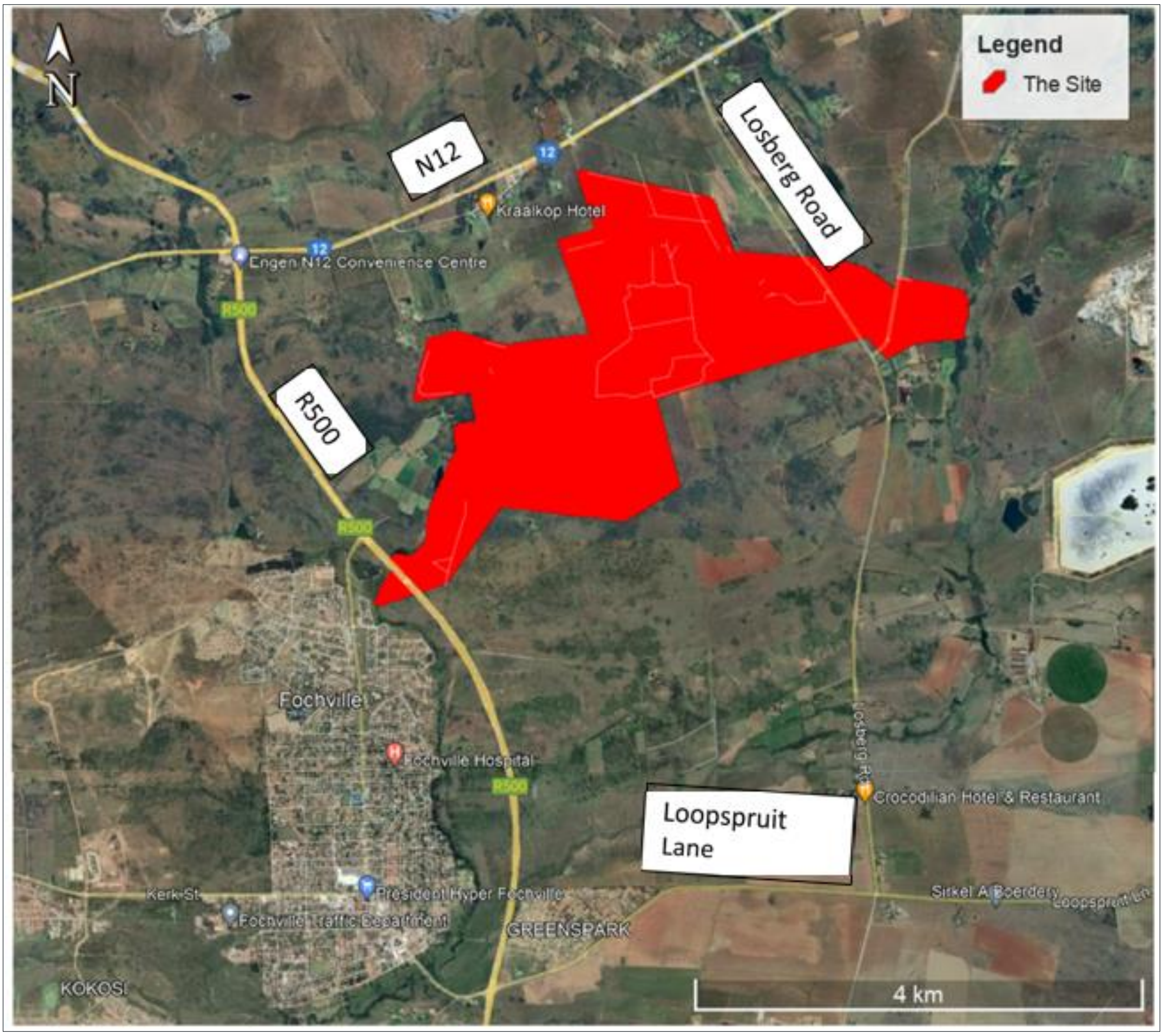


Figure 7-44 - Surrounding Road Network

7.3.3.2 Site access

Three site access point options (**Figure 7-45**) are suggested for the site. One of the access points is proposed off the R500 approximately 0.6km south of the Losberg Avenue/R500 intersection. The remaining two access point alternatives are located off Losberg Road towards the east of the site.

The access proposed off the R500 is not recommended due to access spacing restrictions along Class 2 roads. The proposed access points along Losberg Road are located off existing farm access points thus access spacing restrictions are not envisaged. It must however be noted that the potential site entrance (B) is located just north of a horizontal road curve on Losberg Road. Sight distance issues are envisaged towards the south of the access.

It is therefore recommended that the road reserve be kept clear of obstructions to improve sight lines. Additionally, potential site entrance (B) can be utilised as an alternative access instead of a main access to limit the number of vehicles using the access.

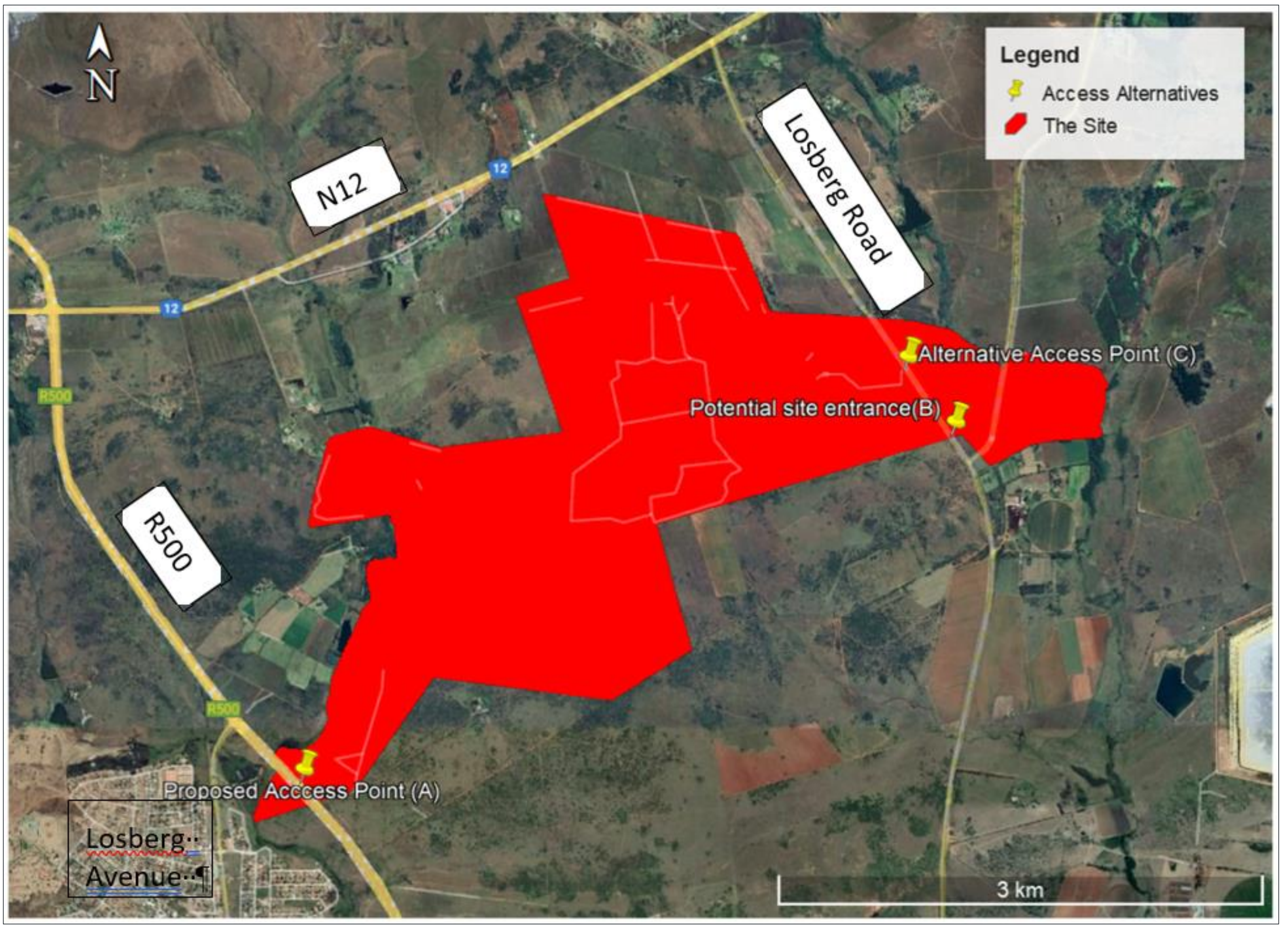


Figure 7-45 - Site Access Points

7.3.3.3 Provision for emergency vehicles

As a guide, emergency service routes are typically recommended to have a total unobstructed width of not less than 5.0 m, while property access control gates and accesses to buildings must have a total unobstructed width of not less than 4.5m. A minimum height clearance of 4.2m, is recommended if an overhead structure is planned.

7.3.3.4 Internal roads

The geometric design constraints encountered due to the terrain should be taken into consideration by the geometric designer. Preferably, the internal roads need to be designed with smooth, relatively flat gradients (recommended to be no more than 8%) to allow a larger transport load vehicle to ascend to the respective laydown areas.

7.3.3.5 Main Route for the Transportation of Materials, Plant and People to the proposed facility

It is assumed that the materials, plant, and workers will be sourced from the surrounding towns as far as possible. The closest towns to the site are Carletonville, Fochville, and Wedela.

7.3.4 VISUAL

*The following is extracted from the Visual Impact Assessment compiled by SLR Consulting (South Africa) Pty Ltd and included as **Appendix H.8.***

7.3.4.1 Visual character

The physical and land use-related characteristics of the study area as described above contribute to its overall visual character. Visual character largely depends on the level of change or transformation from a natural baseline in which there is little evidence of human transformation of the landscape. Varying degrees of human transformation of a landscape would engender differing visual characteristics to that landscape, with a highly modified urban or industrial landscape being at the opposite end of the scale to a largely natural undisturbed landscape. Visual character is also influenced by the presence of built infrastructure including buildings, roads, and other objects such as telephone or electrical infrastructure. The visual character of an area largely determines the sense of place relevant to the area. This is the unique quality or character of a place, whether natural, rural, or urban which results in a uniqueness, distinctiveness, or strong identity.

The predominant land use in the area (maize cultivation) has significantly transformed the natural landscape across much of the study area. In addition, the landscape becomes progressively more transformed towards the northern section of the study area where mining activities and high voltage power lines have resulted in a high degree of visual degradation. The more industrial character of the landscape is an important factor in this context, as the introduction of the proposed WEF would result in less visual contrast where other anthropogenic elements are already present, especially where the scale of those elements is similar to that of the proposed development.

The scenic quality of the landscape is also an important factor that contributes to the visual character or inherent sense of place. Visual appeal is often associated with unique natural features or distinct variations in form. As such, the pastoral landscape and undulating plains in parts of the study area are important features that could increase the visual appeal and visual interest in the area.

Cultural landscapes are becoming increasingly important concepts in terms of the preservation and management of rural and urban settings across the world. The concept of 'cultural landscape' is a way of looking at a place that focuses on the relationship between human activity and the biophysical environment (Breedlove, 2002). In this instance, the rural / pastoral landscape represents how the environment has shaped the predominant land use and economic activity practiced in the area, as well as the patterns of human habitation and interaction. Mining activity in the broader region has also played an important role in shaping the present-day landscape.

In light of this, it is important to assess whether the introduction of a WEF into the study area would be a degrading factor in the context of the prevailing character of the cultural landscape. Broadly speaking, visual impacts on the cultural landscape in the area around the proposed development would be reduced by the fact that the visual character in much of the area has been significantly transformed and degraded by mining and infrastructural development.

7.3.4.2 Sensitivity analyses

During the Scoping Phase of the EIA process, a site sensitivity assessment was undertaken to identify any areas of the development site which should be precluded from the development footprint. From a visual perspective, sensitive areas would be areas where the placement of wind turbines would result in the greatest probability of visual impacts on potentially sensitive visual receptors. The results of the exercise undertaken in respect of the proposed Igolide WEF are provided below and the identified areas of sensitivity in relation to the Scoping and EIA phase layouts are shown in are shown in **Figure 7-46** and **Figure 7-47**.

Using GIS-based visibility analysis, it was possible to determine that the tip of at least one turbine blade (i.e., at a maximum height of 300m) would be visible from many of the identified potentially sensitive receptor locations in the study area and as such, no areas on the site are significantly more visible than the remainder of the site. However, the visual prominence of a very tall structure such as a wind turbine would be exacerbated if located on higher ridges or relatively higher-lying plateaus on the site. From a visual perspective therefore, it would be preferred if wind turbines are not located on the areas of highest elevation within the WEF development area, although it is understood that these locations are often the most suitable in terms of wind yield. Considering the low visual sensitivity of the broader area however, the ridges are not considered to be “no go areas”, but rather should be viewed as zones where turbine placement would be least preferred.

From a visual perspective, another concern is the direct visual impact of the turbines on any farmsteads or receptors located on, or within 500m of, the project area. Accordingly, a 500m zone of potential visual sensitivity has been delineated around the existing residences on the application site and also around any receptors located within 500m of the site boundary. In addition, it is recommended that a 500m zone of potential sensitivity is applied on either side of the N12 National Route and the R500 Main Road.

Limiting the development of turbines in these areas will reduce visual impacts and prevent significantly adverse impacts of shadow flicker on the local residents and on passing motorists, although the full extent of these impacts can only be determined by way of a detailed Flicker Impact Assessment. At this stage however, the visual sensitivity zones are not considered “no go” areas, but rather should be viewed as zones where development should be limited. It should be stressed that these zones apply to wind turbine development only. The visual impacts resulting from the associated on-site infrastructure are considered to have far less significance when viewed in the context of the WEF as a whole and as such the associated on-site infrastructure has been excluded from the sensitivity analysis. **It should be noted that turbines placements in the EIA Phase turbine layout are all outside the zones of potential visual sensitivity.**

wsp

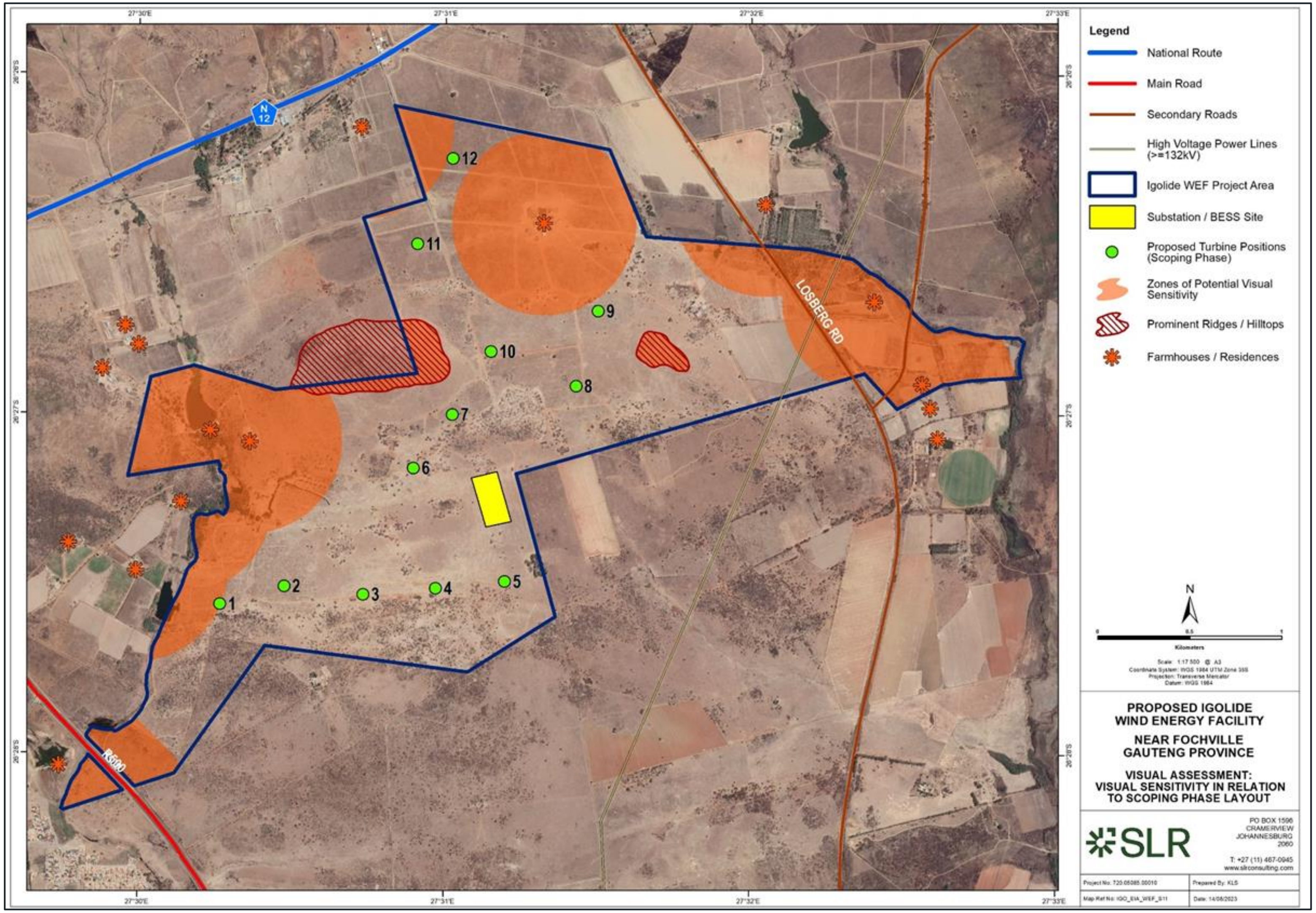


Figure 7-46 - Potential visual sensitivity in relation to the Scoping Phase WEF layout

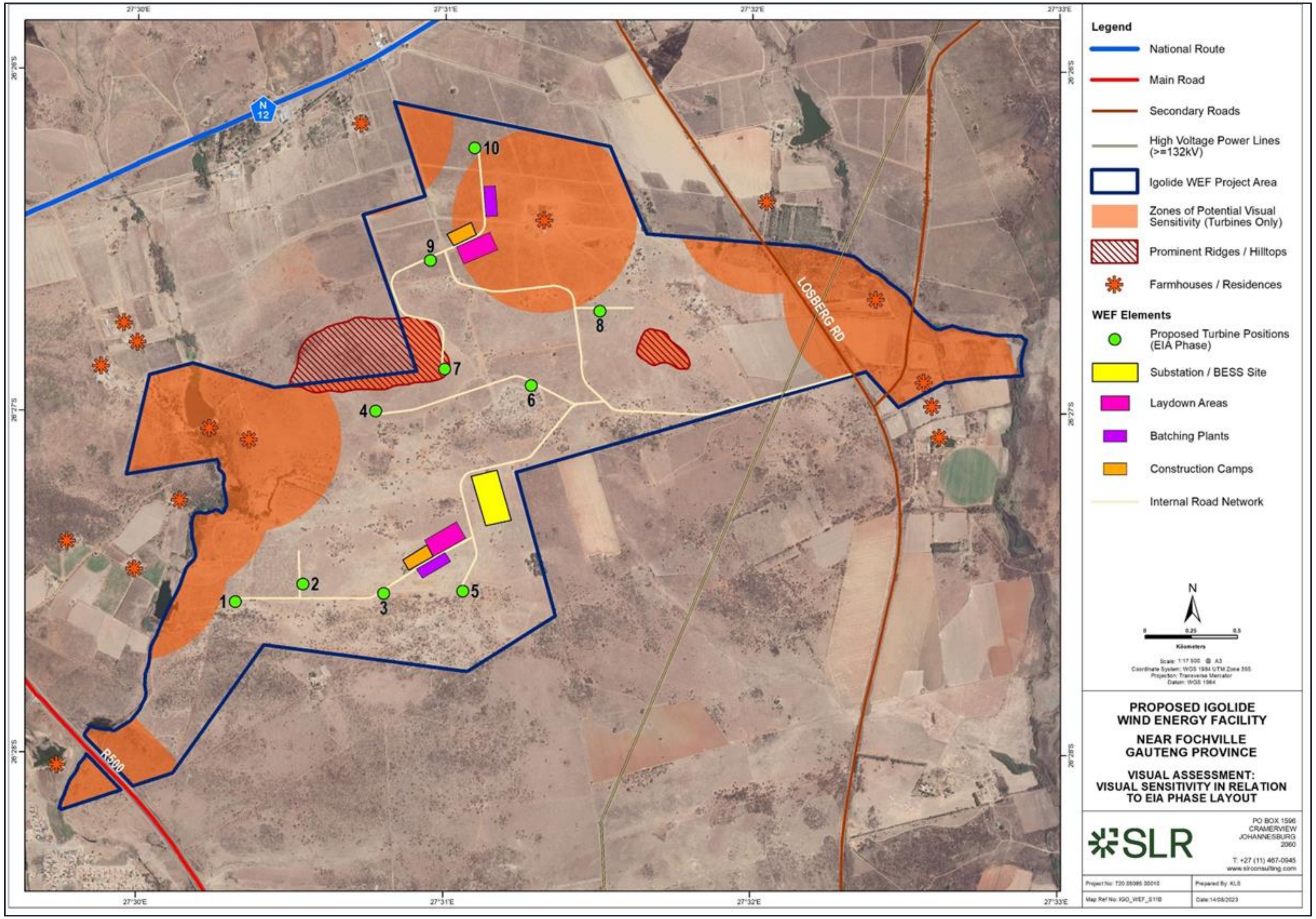


Figure 7-47 - Potential visual sensitivity in relation to the EIA Phase WEF layout

7.3.4.3 Visual receptors

The potentially sensitive visual receptor locations identified within the study area for the proposed project are indicated in **Figure 7-48.**

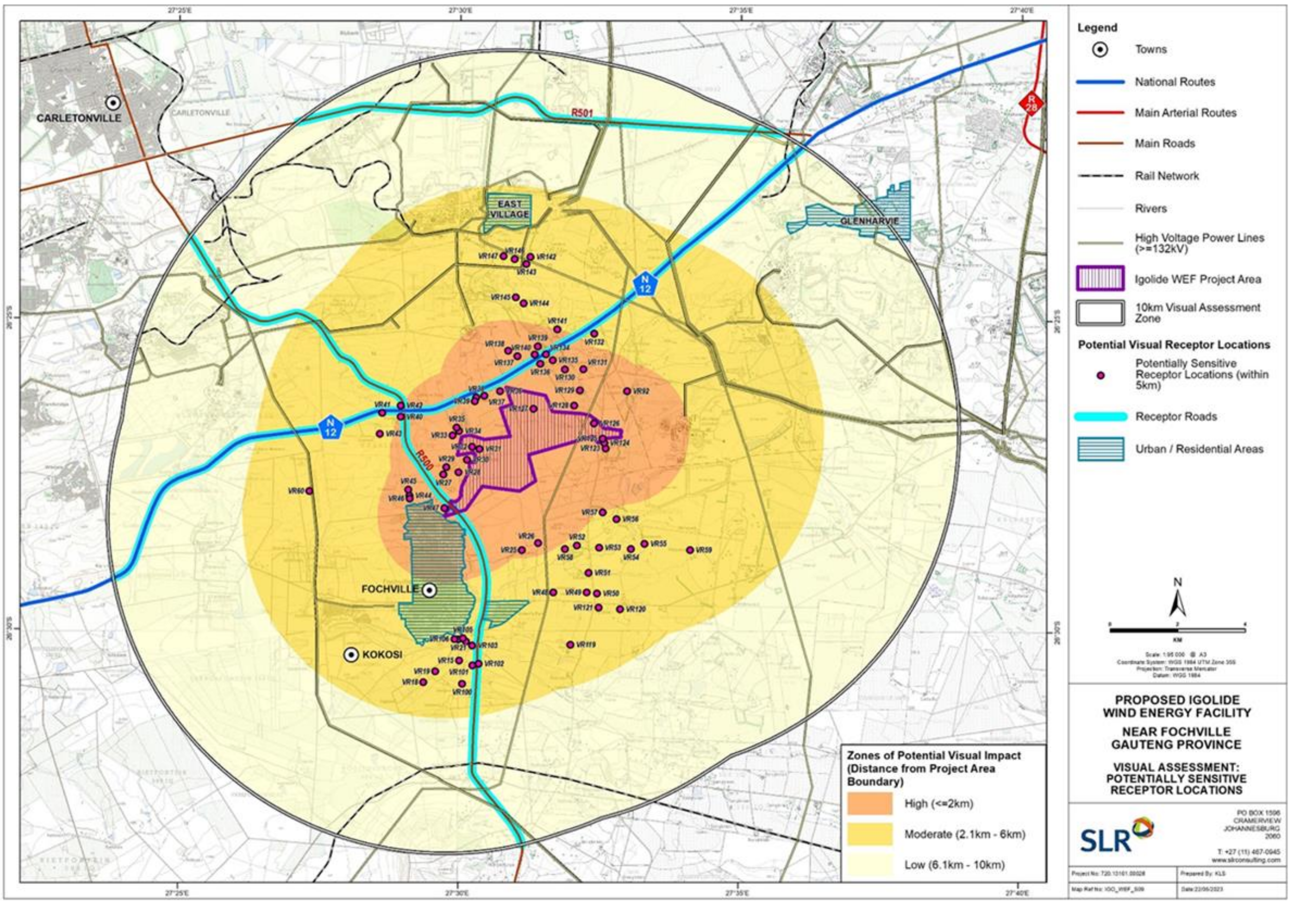


Figure 7-48 - Potential visual sensitivity in relation to the EIA Phase WEF layout

7.3.5 SOCIAL

*The following is extracted from the Socio-Economic Impact Assessment compiled by Tony Barbour Environmental Consulting and included as **Appendix H.9.***

7.3.5.1 Provincial context

The proposed site is located in the Gauteng Province, which is the smallest province in South Africa. Gauteng covers an area of 18 183 km^2, which only constitutes approximately 1.5% of South Africa total land area. The province is divided into two district municipalities and three metropolitan municipalities (MM). Gauteng's District Municipalities include Sedibeng and West Rand. The three MM include Tshwane, Johannesburg, and Ekurhuleni. The site itself is located in the WRDM.

Population

Despite having the smallest surface area, Gauteng is home to approximately a quarter of South Africa's population (Community Household Survey, 2016). The province has a population of 13 399 724 inhabitants. Of the five municipalities, Johannesburg MM has the largest population (36.9%), followed by Ekurhuleni MM (25.2%), Tshwane MM (24.4%), Sedibeng DM (7.2%), and West Rand

DM (6.3%). The majority of the population in the Gauteng Province are Black African (80.4%), followed by White (13.6), Coloured (3.3%), and Indian or Asian (2.7%).

In terms of age, 43.5% of the Gauteng population is between 15 and 39 years old, which is the highest age distribution, followed by 26.1% of those aged 40–64 years, 24.7% of those 14 and younger, while only 5.6% comprised those aged 65 years and older. Similarly, this pattern is also seen across all districts in the province. More specifically, Merafong, and the broader West Rand District, had the highest proportion of persons aged 15-64 years. Additionally, Gauteng's working age population (15-64) has declined from 72% in 2011 to 66.5% in 2016 while the proportion of persons over 65 years has doubled from 4.3% to 8.7% within the same period.

Education

Based on the information contained in the GSDF, 75.9% of persons 20 years and older had some secondary schooling in Gauteng. Persons achieving matric or higher in Gauteng made up 52.4%, which was about 20% greater than the national rate. Around 10% of those over 20 years had some higher-level schooling, with the highest proportion observed in Tshwane (13.2%) followed by Johannesburg (10.8). Approximately 7.8% of Gauteng adults have no schooling in comparison to South Africa's 18.1%. The Local Economic Development for Gauteng indicates that Sedibeng district has the lowest proportional adult education attainment levels, with 9.2% of the adult population having no form of schooling.

Gauteng also has the highest portion (14.3%) of highly skilled formal employees in South Africa. Linked to this, is Gauteng's high rate of employment (50.6%), which is 1.3 times greater than the national rate (38.9%). This reflects Gauteng's role as the economic hub of South Africa and its importance for the overall GDP of the country.

Economic development

Gauteng has a high Human Development Index figure (0.76) and follows the Western Cape (0.78) as the second highest province in South Africa. In terms of per capita income, the Gauteng Province has the highest per capita income of all nine provinces, however, income distribution is extremely skewed, with a high percentage of the population living in poverty. Gauteng's Gini coefficient is 0.62, compared to South Africa's 0.63 makes it slightly more equal than the country as a whole.

Economic sectors

Although the smallest province in South Africa, Gauteng contributes over 30% of the country's GDP, and around 10% of the total GDP of sub-Saharan Africa. The financial, real estate and business services sector is the largest contributor to the provincial GDP, contributing approximately 22.8% in 2013. This highlights the province's importance as the financial seat of South Africa. Gauteng is home to over 100 foreign and local banks' head offices, stockbrokers, and insurance giants.

The manufacturing and wholesale sectors are also key economic sectors, contributing 16.5% and 12.6% to the provinces GDP respectively. It is estimated that around 40% of South Africa's manufacturing and finance activity is done in Gauteng, as well as around 30% of the country's wholesale, retail, motor trade and accommodation.

Employment

The first quarter labour market snapshot for 2022 showed that in Gauteng employment has increased across six of the 10 sectors with key drivers including the Manufacturing, Community Services, and

Trade Sectors. Employment in the mining sector has also increased to above pre-COVID levels in this time. In contrast, employment in the Private Households as well as Construction and Transport sectors has decreased in recent years, which mirrors national trends.

7.3.5.2 Economic overview

Mining

Despite mining sector contributing only 3.3% of Gauteng's Gross Domestic Product, mining sits at the core of the WRDM and contributes over 50% of Gross Value Add. This is prevalent in Merafong City Local Municipality (MCLM), as not only does one in four people in the region rely on mining for employment, but mining sector also contributes to 29.1% GDP locally. Gold and uranium are the primary materials mined in the region.

Manufacturing

Around 40% of South Africa's manufacturing is done in Gauteng, and the manufacturing sector contributes over 16% to the overall GDP of the province. Locally, despite sectoral employment only contributing 7.2% the MCLM manufacturing sector has grown significantly since 2011 and contributed 20.8% to local GDP in 2016.

Finance, Real Estate, and Business Services

The finance and business sector are growing steadily and contributed 13.8% to MCLM GDP in 2016. This has resulted in the decline in the number of people employed in the mining sector since 2011 being offset by the growth in employment in this sector as well as the trade sector during this time.

Renewable energy

The Merafong Growth and Development Strategy offers an outline for the future development of the area, and both the Green Economy and Industrial Beneficiation have been identified as significant drivers to revitalise the economy and mining towns of West Rand. The Merafong Solar Farm Cluster Concept and Bio-energy farm proposes a Solar Farm Cluster and Bio- energy farm in Merafong City, in order to develop a renewable energy sector and reindustrialise and create opportunities in local downstream sectors like manufacturing industries and reduce electricity costs and carbon footprint in both private and public sectors.

7.3.5.3 Social environment

The social environment can therefore be described is a working agricultural / mining environment. The sensitivity of the homesteads in the area to the proposed project will be assessed during the Assessment Phase.

7.3.6 NOISE CLIMATE

The following is extracted from the Noise Impact Assessment compiled by Enviro-Acoustic Research cc and included as **Appendix H.16**.

7.3.6.1 Potential noise sources

Construction Phase

Construction equipment

It is estimated that construction will take approximately 24 – 36 months subject to the final design of the WEF, weather and ground conditions, including time for testing and commissioning. The construction process will consist of the following principal activities:

- Site survey and preparation;
- Establishment of site entrance, internal access roads, contractors' compound and passing places;
- Civil works to sections of the public roads to facilitate with turbine delivery;
- Site preparation activities will include clearance of vegetation at the footprint of each turbine as well as crane hard-standing areas. These activities will require the stripping of topsoil which will need to be stockpiled, backfilled and/or spread on site;
- Construct foundations – due to the volume of concrete that will be required, an on-site batching plant will be required to ensure a continuous concreting operation. The source of aggregate is yet to be determined but is expected to be derived from an offsite source or brought in as ready-mix. If the stones removed during the digging of foundations are suitable as an aggregate this may be used as the aggregate in the concrete mix.
- Transport of components & equipment to site – all components will be brought to site in sections by means of flatbed trucks. Additionally, components of various specialized construction and lifting equipment are required on site to erect the wind turbines and will need to be transported to site. The typical civil engineering construction equipment will need to be brought to the site for the civil works (e.g. excavators, trucks, graders, compaction equipment, cement trucks, etc.). The transportation of ready-mix concrete to site or the materials for onsite concrete batching will result in a temporary increase in heavy traffic (one turbine foundation may require up to 100 concrete trucks, and is undertaken as a continuous pour);
- Establishment of laydown & hard standing areas - laydown areas will need to be established at each turbine position for the placement of wind turbine components. Laydown and storage areas will also be required to be established for the civil engineering construction equipment which will be required on site. Hard standing areas will need to be established for operation of the cranes. Cranes of the size required to erect turbines are sensitive to differential movement during lifting operations and require a hard-standing area;
- Erect turbines - a crane will be used to lift the tower sections into place and then the nacelle will be placed onto the top of the assembled tower. The next step will be to assemble or partially assemble the rotor on the ground; it will then be lifted to the nacelle and bolted in place. A small crane will likely be needed for the assembly of the rotor while the large crane will be needed to put it in place;
- Construct substation - the underground cables carrying the generated power from the individual turbines will connect at the substation. The construction of the substation would require a site survey; site clearing and levelling (including the removal / cutting of rock outcrops) and construction of access road/s (where required); construction of a substation terrace and foundation; assembly, erection and installation of equipment (including transformers); connection of conductors to equipment; and rehabilitation of any disturbed areas and protection of erosion sensitive areas;

- Establishment of ancillary infrastructure - A workshop as well as a contractor's equipment camp may be required. The establishment of these facilities/buildings will require the clearing of vegetation and levelling of the development site and the excavation of foundations prior to construction. A laydown area for building materials and equipment associated with these buildings will also be required; and
- Site rehabilitation - once construction is completed and all construction equipment are removed; the site will be rehabilitated where practical and reasonable.

There are a number of factors that determine the audibility as well as the potential of a noise impact on receptors. Maximum noises generated can be audible over a large distance, however, these maximum noises are generally of very short duration. If maximum noise levels however exceed 65 dBA at a receptor, or if it is clearly audible with a significant number of instances where the noise level exceeds the prevailing ambient sound level with more than 15 dB, the noise can increase annoyance levels and may ultimately result in noise complaints.

Blasting

Blasting may be required as part of the civil works to clear obstacles or to prepare foundations. Should a borrow pit be used to supply rocks for construction purposes, blasting could also be expected. However, no information regarding the use, or even the feasibility of such a borrow pit is known.

However, blasting will not be considered for the following reasons:

- Blasting is highly regulated, and control of blasting to protect human health, equipment and infrastructure will ensure that any blasts will use minimum explosives and will occur in a controlled manner. With regards to blasting in borrow pits, explosives are used with a low detonation speed, reducing vibration, sound pressure levels and air blasts. The breaking of obstacles with explosives is also a specialized field, and when correct techniques are used, it causes less noise than using a rock-breaker.
- People are generally more concerned over ground vibration and air blast levels that might cause building damage than the impact of the noise from the blast.
- Blasts are an infrequent occurrence, with a loud but a relative instantaneous character. Potentially affected parties normally receive sufficient notice (siren), and the knowledge that the duration of the siren noise as well as the blast will be over relatively fast, resulting in a higher acceptance of the noise.

Traffic

A potential significant source of noise during the construction phase is additional traffic to and from the site, as well as traffic on the site. The use of a borrow pit(s), on site crushing and screening and concrete batching plants will significantly reduce heavy vehicle movement to and from the site.

Construction traffic is expected to be generated throughout the entire construction period, however, the volume and type of traffic generated will be dependent upon the construction activities being conducted, which will vary during the construction period. Noise levels due to traffic can be estimated using various different noise algorithms.

Operational Phase

The proposed development would be designed to have an operational life of up to 25 years with the possibility to further expand the lifetime of the WEF. The only development related activities on-site will be routine servicing (access roads and light traffic) and unscheduled maintenance. The noise impact from maintenance activities is insignificant, with the main noise source being the wind turbine blades and the nacelle (components inside) as highlighted in the following sections.

Noise emitted by wind turbines can be associated with two types of noise sources. These are aerodynamic sources due to the passage of air over the wind turbine blades and mechanical sources which are associated with components of the power train within the turbine, such as the gearbox and generator and control equipment for yaw, blade pitch, etc. These sources normally have different characteristics and can be considered separately. In addition, there are other noise sources of lower levels, such as the substations and traffic (maintenance).

Wind Turbine Noise: Aerodynamic sources

Aerodynamic noise is emitted by a wind turbine blade through a number of sources such as:

- Self-noise due to the interaction of the turbulent boundary layer with the blade trailing edge.
- Noise due to inflow turbulence (turbulence in the wind interacting with the blades).
- Discrete frequency noise due to trailing edge thickness.
- Discrete frequency noise due to laminar boundary layer instabilities (unstable flow close to the surface of the blade).
- Noise generated by the rotor tips.

Therefore, as the wind speed increases, noises created by the wind turbine also increase. At a low wind speed the noise created by the wind turbine is generally (relatively) low, and increases to a maximum at a certain wind speed when it either remains constant, increase very slightly or even drops.

Wind Turbine: Mechanical sources

Mechanical noise is normally perceived within the emitted noise from wind turbines as an audible tone(s) which is subjectively more intrusive than a broad band noise of the same sound pressure level. Sources for this noise are normally associated with:

- the gearbox and the tooth mesh frequencies of the step-up stages;
- generator noise caused by coil flexure of the generator windings which is associated with power regulation and control;
- generator noise caused by cooling fans; and
- control equipment noise caused by hydraulic compressors for pitch regulation and yaw control.

Tones are noises with a narrow sound frequency composition (e.g., the whine of an electrical motor). Annoying tones can be created in numerous ways: machinery with rotating parts such as motors, gearboxes, fans and pumps often create tones. An imbalance or repeated impacts may cause vibration that, when transmitted through surfaces into the air, can be heard as tones. Pulsating flows of liquids or gases can also create tones, which may be caused by combustion processes or flow restrictions. The best and most well-known example of a tonal noise is the buzz created by a flying mosquito.

Where complaints have been received due to the operation of wind farms, tonal noise from the installed wind turbines appears to have increased the annoyance perceived by the complainants and has indeed been the primary cause for complaint.

However, tones were normally associated with the older models of turbines. All turbine manufacturers have started to ensure that sufficient forethought is given to the design of quieter gearboxes and the means by which these vibration transmission paths may be broken. Through the use of careful gearbox design and/or the use of anti-vibration techniques, it is possible to minimize the transmission of vibration energy into the turbine supporting structure. The benefits of these design improvements have started to filter through into wind farm developments which are using these modified wind turbines. New generation wind turbine generators do not emit any clearly distinguishable tones.

Low Frequency Noise

Low frequency sound is the term used to describe sound energy in the region below ~200 Hz. The rumble of thunder and the throb of a diesel engine are both examples of sounds with most of their energy in this low frequency range. Infrasound is often used to describe sound energy in the region below 20 Hz.

Almost all noise in the environment has components in this region although they are of such a low level that they are not significant (wind, ocean, thunder). Sound that has most of its energy in the 'infrasound' range is only significant if it is at a very high level, far above normal environmental levels.

Because of the low rotational rates of the blades of a wind turbines, the peak acoustic energy radiated by large wind turbines is in the infrasonic range with a peak in the 8-12 Hz range. For smaller machines, this peak can extend into the low-frequency "audible" (20-20KHz) range because of higher rotational speeds and multiple blades.

It should be noted that a number of studies highlighted that these sounds are below the threshold of perception (BWEA, 2005), although this should be clarified. Most acousticians would agree that the low frequency sounds are inaudible to most people, yet, there are a number of studies that highlight that it can be more perceptible to people inside their houses as well as people that are more sensitive to low frequency sounds.

Low frequency noise is always present around us as it is produced by both man and nature. While problems have been associated with older downwind wind turbines in the 1980s, this has been considered by the wind industry and modern upwind turbines do not suffer from the same problems. Low Frequency Noise however has been very controversial in the last few years with the anti-wind fraternity claiming measurable impacts, with governments and wind-energy supporter studies indicating no link between low-frequency sound and any health impacts.

Amplitude modulation

Although considered rare, there is one other characteristic of wind turbine sound that increases the sleep disturbance potential above that of other long-term noise sources. The amplitude modulation (AM) of the sound emissions from the wind turbines creates a repetitive rise and fall in sound levels synchronized to the blade rotation speed, sometimes referred to as a “swish” or “thump”.

Pedersen (2003) highlighted a weak correlation between sound pressure level and noise annoyance caused by wind turbines. Residents complaining about wind turbines noise perceived more sound characteristics than noise levels. People were able to distinguish between background ambient sounds and the sounds the blades made. The noise produced by the blades lead to most complaints. Most of the annoyance was experienced between 16:00 and midnight. This could be an issue as noise propagation modelling would be reporting an equivalent, or “average” sound pressure level, a parameter that ignores the “character” of the sound.

That AM can be a risk and significantly increase the annoyance with WEFs cannot be disputed. It has been reported with a number of recent studies confirming this significant noise characteristic. However, even though there are thousands of wind turbine generators in the world, amplitude modulation is still one subject receiving the least complaints and due to these very few complaints, little research went into this subject. It is important to note that it is not possible to predict whether AM may occur, nor to calculate the potential related impact.

Battery Energy Storage Systems

The developer proposes to include a BESS at their WEF to store energy for use at a later time or date using electro-chemical solutions. The typical components of a BESS are:

- The battery system which could consist of:
  - Multiple cells,
  - The battery management system; and,
  - The battery thermal management system.
- Components required for the reliable operation of the overall system, including:
  - Energy management system; and,
  - System thermal management.
- Power electronics that can be grouped into the conversion unit (such as an invertor), which manage the power flow between the grid and battery, including the required control and monitoring components, voltage sensing units and thermal management of power electronic components (fans or climate control system).

There could be numerous such BESS modules running in parallel to increase the total storage capacity of the system up to the desired or needed capacity.

While certain components may generate a slight hum under load, the dominant source of noise is from the fans or climate control system used to manage heat in the system and/or to maintain the BESS within its optimal operating temperature range. These BESSs however generate low noise levels, with any potential noise impact generally limited to areas within 200m of the BESS. This is an insignificant noise level and the significance of this noise will be low.

Transformer noises (Substations)

Also known as magnetostriction , is when the sheet steel used in the core of the transformer tries to change shape when being magnetised. When the magnetism is taken away, the shape returns, only to try and deform in a different manner when the polarity is changed.

This deformation is not uniform; consequently, it varies all over a sheet. With a transformer core being composed of many sheets of steel, these deformations are taking place erratically all over each sheet, and each sheet is behaving erratically with respect to its neighbour. The resultant is the “hum” frequently associated with transformers. While this may be a soothing sound in small home appliances, various complaints are logged in areas where people stay close to these transformers. At a voltage frequency of 50 Hz, these “vibrations” take place 100 times a second, resulting in a tonal noise at 100Hz.

However, this is a relatively easy noise to mitigate with the use of acoustic shielding and/or placement of the transformer and will not be considered further in this ENIA study. Substations in addition generate low noise levels, with the hum from the transformers inaudible further than 200 m from the transformers.

Transmission Line Noise (Corona noise)

Corona noise is caused by the partial breakdown of the insulation properties of air surrounding the conducting wires. It can generate an audible and radio-frequency noise, but generally only occurs in humid conditions, as provided by fog or rain. A minimum line potential of 70kV or higher is generally required to generate corona noise depending on the electrical design. Corona noise does not occur on domestic distribution lines.

Corona noise has two major components: a low frequency tone associated with the frequency of the AC supply (100 Hz for 50 Hz source) and broadband noise. The tonal component of the noise is related to the point along the electric waveform at which the air begins to conduct. This varies with each cycle and consequently the frequency of the emitted tone is subject to great fluctuations. Corona noise can be characterised as broadband 'crackling' or 'buzzing', but fortunately it is generally only a feature that occurs during fog or rain.

It will not be further investigated, as corona discharges results in:

- Power losses,
- Audible noises,
- Electromagnetic interference,
- A purple glow,
- Ozone production; and
- Insulation damage.

As such Electrical Service Providers, such as ESKOM, go to great lengths to design power transmission equipment to minimise the formation of corona discharges. In addition, it is an infrequent occurrence with a relatively short duration compared to other operational noises.

7.3.6.2 Existing Ambient Sound Levels

Ambient sound levels were measured over a 6-night period from 3 to 9 May 2023 at four locations, resulting in more than 2,000 daytime and 1,000 night-time measurements. Each measurement was collected over a 10-minute period and included a number of sound level descriptors, including; equivalent values, minimum and maximum levels, statistical sound levels as well as spectral information. Confidence levels in the resulting data are high and it is expected that the ambient sound level data would be applicable of other locations in the area.

Bird communication noises were significant and generally dominant, with road traffic noises audible at all the measurement locations. Road traffic noises were dominant at the first measurement location (approximately 300m from the N12 road).

Considering the average fast-weighted sound level data collected in the area:

- Daytime fast-weighted sound levels ranged from 27 to more than 70 dBA, with average daytime sound levels being 48.2 dBA. This is typical of a rural to sub-urban noise district and, considering the developmental character, a rating level of 50 dBA (typical of a suburban noise district) will be assumed for the daytime period; and
- Night-time fast-weighted sound levels ranged from 31 to more than 60 dBA, with average night-time sound levels being 44.4 dBA. This is higher than the noise levels expected for a rural to suburban district (based on the developmental character). While this residual noise level is more typical of an urban noise district, this assessment will recommend a rating level of:

- 40 dBA (typical of a sub-urban noise district) at locations further than 1,000m from the N12 or R500 roads; and
- 45 dBA (typical of an urban noise district) at locations closer than 1,000m from the N12 or R500 roads.

The closest identified Noise-sensitive receptors (NSR) is shown in **Figure 7-49** and Wind category, with the potential noise-sensitive areas illustrated on **Figure 7-50**.

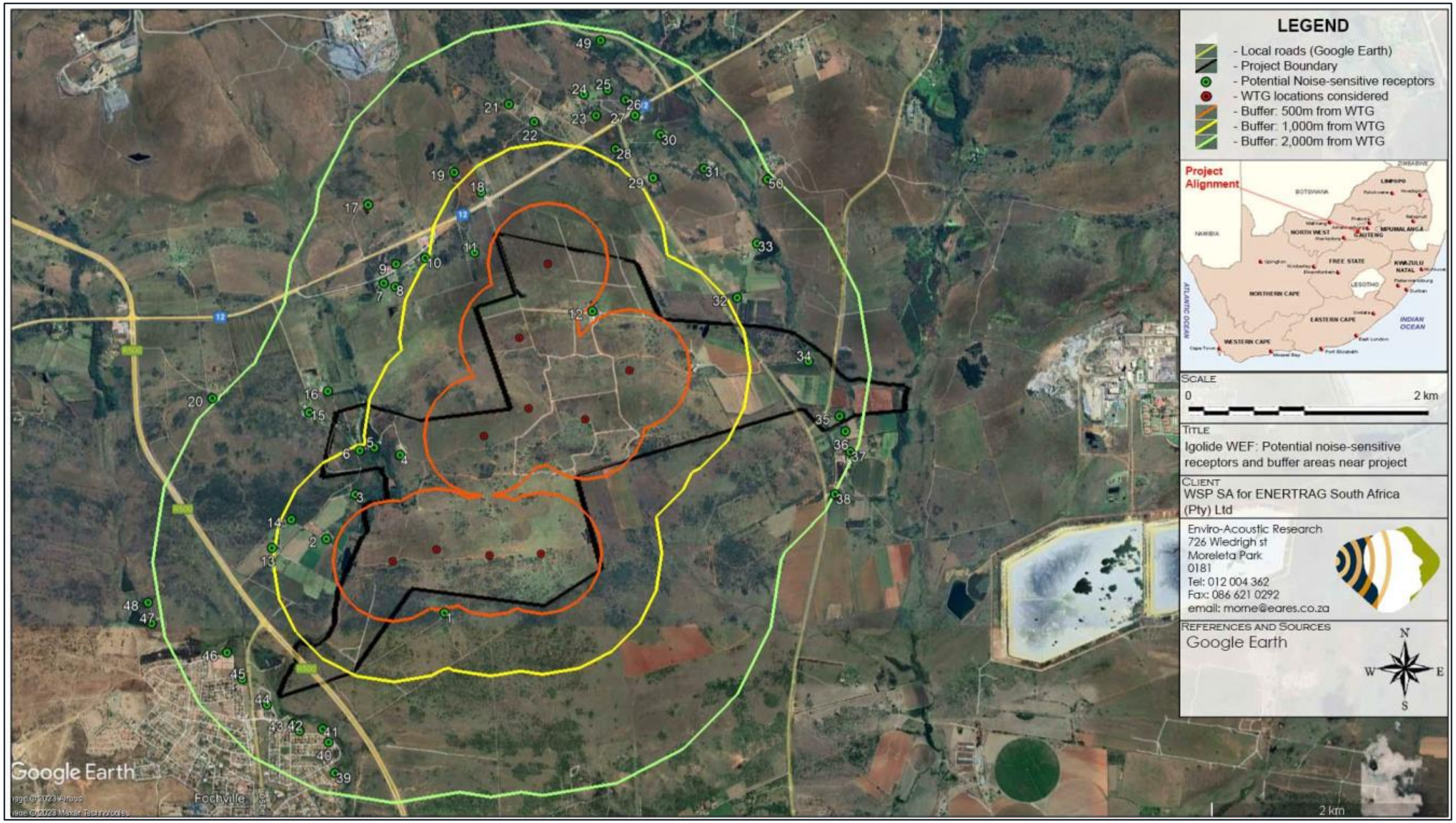


Figure 7-49 - Study area and potential noise-sensitive receptors close to the proposed project

Source: EARES, 2023

WSP

Figure 7-50 - Study area and potential noise-sensitive areas identified by the online screening tool

Source: EARES, 2023

7.4 HEALTH AND SAFETY FOR BATTERY ENERGY STORAGE SYSTEMS

*The following is extracted from the High-level Safety, Health and Environment Risk Assessment compiled by ISHECONcc and included as **Appendix H.11.***

The following issues should be considered:

- Lithium-ion BESS:
  - noxious smoke,
  - fires/explosions.
- Vanadium redox flow BESS:
  - suitable secondary spill containment for the large volume of electrolyte.
- General:
  - agricultural area.
  - small scale commercial interests, e.g., holiday resort, hotel, guest houses.
  - location of farmsteads and water resources.
  - commercial mining farther from the facility, i.e., over 5km.

Due to the possibility of noxious smoke from fires, any lithium BESS should be located over 500m from residences. The current prosed location is over 500m from any farm houses and over 2500m from the closest residential areas of Fochville. The dominant wind directions in the area are likely to be from the north. Any noxious smoke would likely blow from the proposed BESS installations towards and farming developments on the southern side which are over 100m away.

Figure 7-52 below shows the location of the various BESS installation with a 500m blue circle around the BESS. It also shows the location of near-by farmhouses / occupied facilities with a 500m red circle around each.

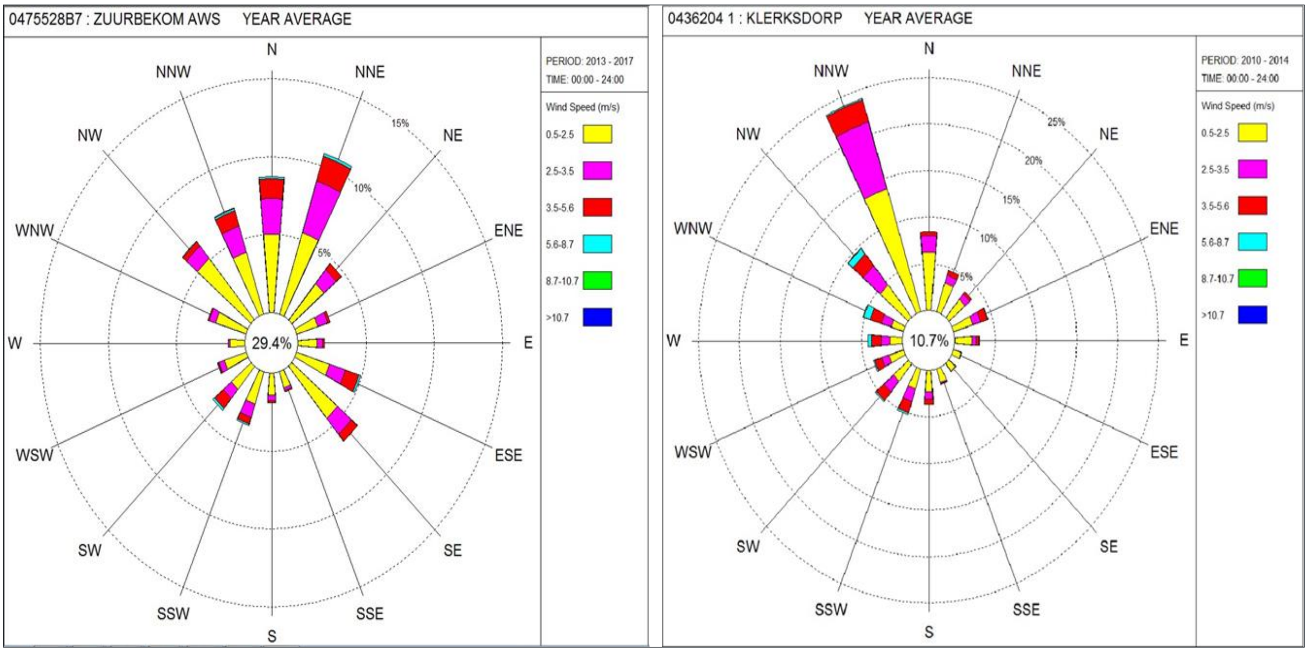


Figure 7-51 - Some Wind Rose Information for the broader area

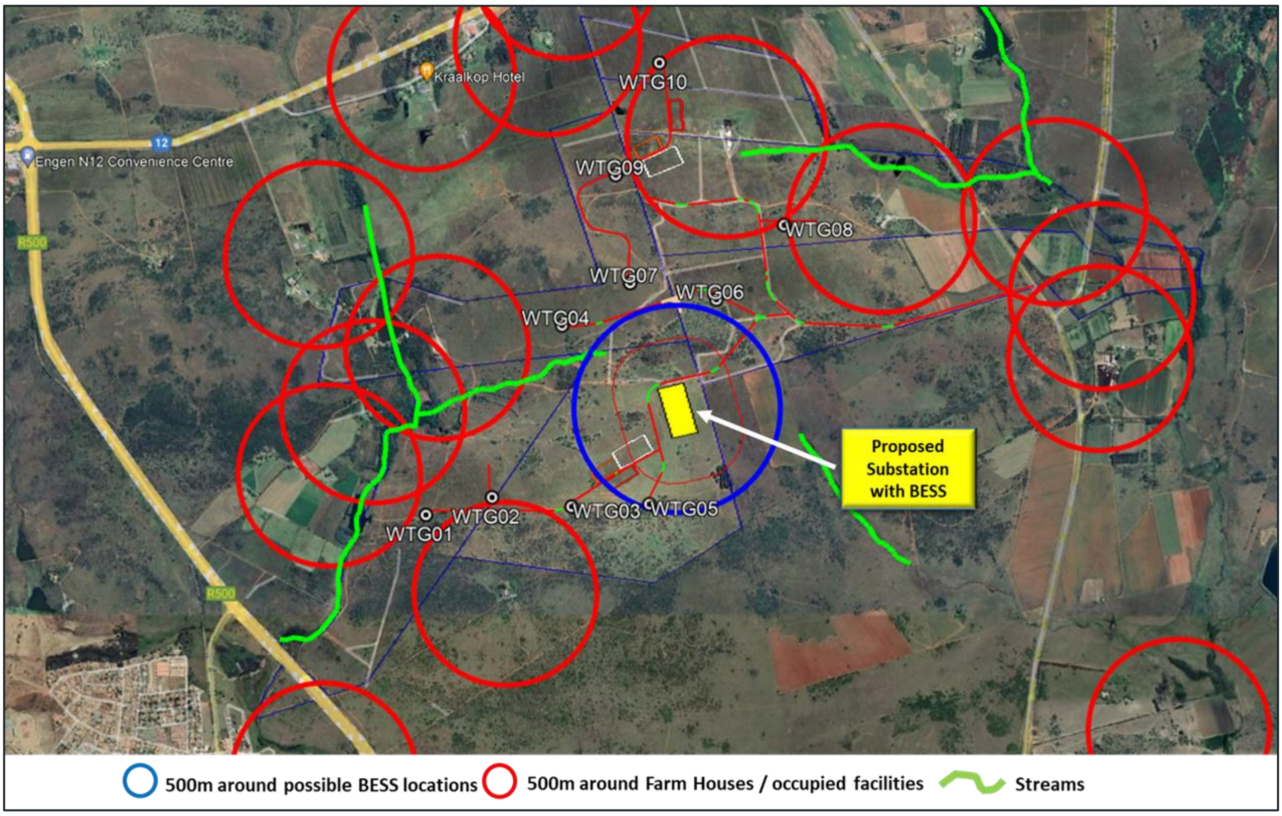


Figure 7-52 - 500m circles around the BESS Facilities (Blue) and Location of Occupied Developments / Farmhouses (Red) and Nearby Water Courses/Bodies (Green) in the immediate vicinity of the BESS

7.4.1.1 Health and Safety

As shown in **Figure 7-52**, there are numerous farmstead facilities in the general area, there are none in close proximity to the proposed BESS location. The closest farmsteads are over 1000m from the proposed BESS area.

7.4.1.2 Environment

- Supplies of water should be protected from possible chemical contamination.
- Should redox flow batteries be the chosen technology, it is suggested that the facilities be located a suitable distance away from water courses/sources.
- With lithium containers, large releases of liquids would only occur in the event of battery fire and emergency services applying fire water to a container which is unlikely in a remote location.
- It is suggested that the BESS facilities be located a suitable distance away from water courses/sources. The current proposed location does not appear to be close to any major water sources but refer to other aquatic specialist studies for specific details of separation distances.

8 SITE SENSITIVITY AND VERIFICATION

Specialist assessments were conducted in accordance with the Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes, which were promulgated in Government Notice No. 320 of 20 March 2020 and in Government Notice No. 1150 of 30 October 2020 (i.e., "the Protocols"), or Appendix 6 of the EIA Regulations, depending on which legislation apply to the assessment under consideration. A summary of the DFFE screening tool, the applicable legislation as well as the specialist sensitivity verification are detailed in **Table 8-1** below. The site verification process is discussed in **Section 8** below.

Table 8-1 - Assessment Protocols and Site Sensitivity Verifications

Specialist Assessment	Assessment Protocol	Specialist Name & Company	DFFE Screening Tool Sensitivity	Specialist Sensitivity Verification	Studies Undertaken (Yes/ No)	Appendix Reference
Agricultural Compliance Statement	*Protocol for the specialist assessment and minimum report content requirements of environmental impacts on agricultural resources by onshore wind and/or solar photovoltaic energy generation facilities where the electricity output is 20 megawatts or more*	Johann Lanz: Independent consultant	High Sensitivity	Medium Sensitivity	Yes	**Appendix H.2**
Aquatic Biodiversity Impact Assessment	*Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity*	Lufuno Nemakhavhani: WSP Group Africa (Pty) Ltd	Very High Sensitivity	Low Sensitivity	Yes	**Appendix H.3**

Specialist Assessment	Assessment Protocol	Specialist Name & Company	DFFE Screening Tool Sensitivity	Specialist Sensitivity Verification	Studies Undertaken (Yes/ No)	Appendix Reference
Terrestrial Biodiversity Impact Assessment	*Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity*	Dr Noel van Rooyen and Prof. Gretel van Rooyen: Ekotrust CC	Very High Sensitivity	The current site clearly includes areas of very high sensitivity (CBA, ESAs and NPAES), but it also includes a large portion that has not been demarcated as very high sensitivity, thus ONA.	Yes	**Appendix H.1**
Plant Species	*Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Plant Species*	Alpheus Moalosi: WSP Group Africa (Pty) Ltd	Medium Sensitivity	Low Sensitivity	Yes	Appendix H.12
Animal Species	*Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on*	Alpheus Moalosi: WSP Group Africa (Pty) Ltd	Medium Sensitivity	Low - Medium Sensitivity	Yes	**Appendix H.13**

Specialist Assessment	Assessment Protocol	Specialist Name & Company	DFFE Screening Tool Sensitivity	Specialist Sensitivity Verification	Studies Undertaken (Yes/ No)	Appendix Reference
	Terrestrial Animal Species					
Avifauna Impact Assessment	*Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species*	Albert Froneman and Megan Loftie-Eaton: AfriAvian Environmental (Formerly Chris van Rooyen Consulting)	Low Sensitivity	Low Sensitivity	Yes	**Appendix H.4**
Archaeological and Cultural Heritage Impact Assessment	*Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed*	Dr Jayson Orton: ASHA Consulting (Pty) Ltd	Low Sensitivity	Medium Sensitivity	Yes	**Appendix H.6**
Palaeontology Impact Assessment	*Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific*	Prof. Marion Bamford: ASHA Consulting (Pty) Ltd	Very High Sensitivity	Low Sensitivity	Yes	**Appendix H.14**

Specialist Assessment	Assessment Protocol	Specialist Name & Company	DFFE Screening Tool Sensitivity	Specialist Sensitivity Verification	Studies Undertaken (Yes/ No)	Appendix Reference
	Assessment Protocol has been prescribed					
Visual (Landscape) Impact Assessment	*Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed*	Kerry Schwartz: SLR Consulting (Pty) Ltd	Very High Sensitivity	Medium Sensitivity	Yes	**Appendix H.8**
Civil Aviation Assessment	*Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed*	Not Applicable	High Sensitivity	Low Sensitivity	Compliance Statement	**Section 8.1.13**
Defence Assessment	*Site Sensitivity Verification Requirements where a specialist Assessment is required but no*	Not Applicable	Medium Sensitivity	Low Sensitivity	Compliance Statement	**Section 8.1.15.**

Specialist Assessment	Assessment Protocol	Specialist Name & Company	DFFE Screening Tool Sensitivity	Specialist Sensitivity Verification	Studies Undertaken (Yes/ No)	Appendix Reference
	Specific Assessment Protocol has been prescribed					
RFI Assessment	*Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed*	Not Applicable	Low Sensitivity	Low Sensitivity	No	**Section 8.1.14**

8.1 ENVIRONMENTAL SENSITIVITIES

8.1.1 AGRICULTURAL SENSITIVITY

Agricultural sensitivity is a direct function of the capability of the land for agricultural production. The agricultural sensitivity of the site, as given by the web-based environmental screening tool, is shown in **Figure 8-1**. The screening tool classifies agricultural sensitivity according to only two independent criteria, both of which are indicators of the land's agricultural production potential:

- Whether the land is cropland or not, and
- What its land capability rating is

Land capability is defined as the combination of soil, climate and terrain suitability factors for supporting rain-fed agricultural production. It is rated by the Department of Agriculture's updated and refined, country-wide land capability mapping, released in 2016. The higher land capability values (≥8 to 15) are likely to be suitable as arable land for crop production, while lower values (<8) are only likely to be suitable as non-arable grazing land. The direct relationship between land capability rating and agricultural sensitivity is shown in **Table 8-2**.

Table 8-2 - Type Caption Here

Land capability value	Agricultural sensitivity
1 - 5	Low
6 - 8	Medium
9 - 10	High
11 - 15	Very High

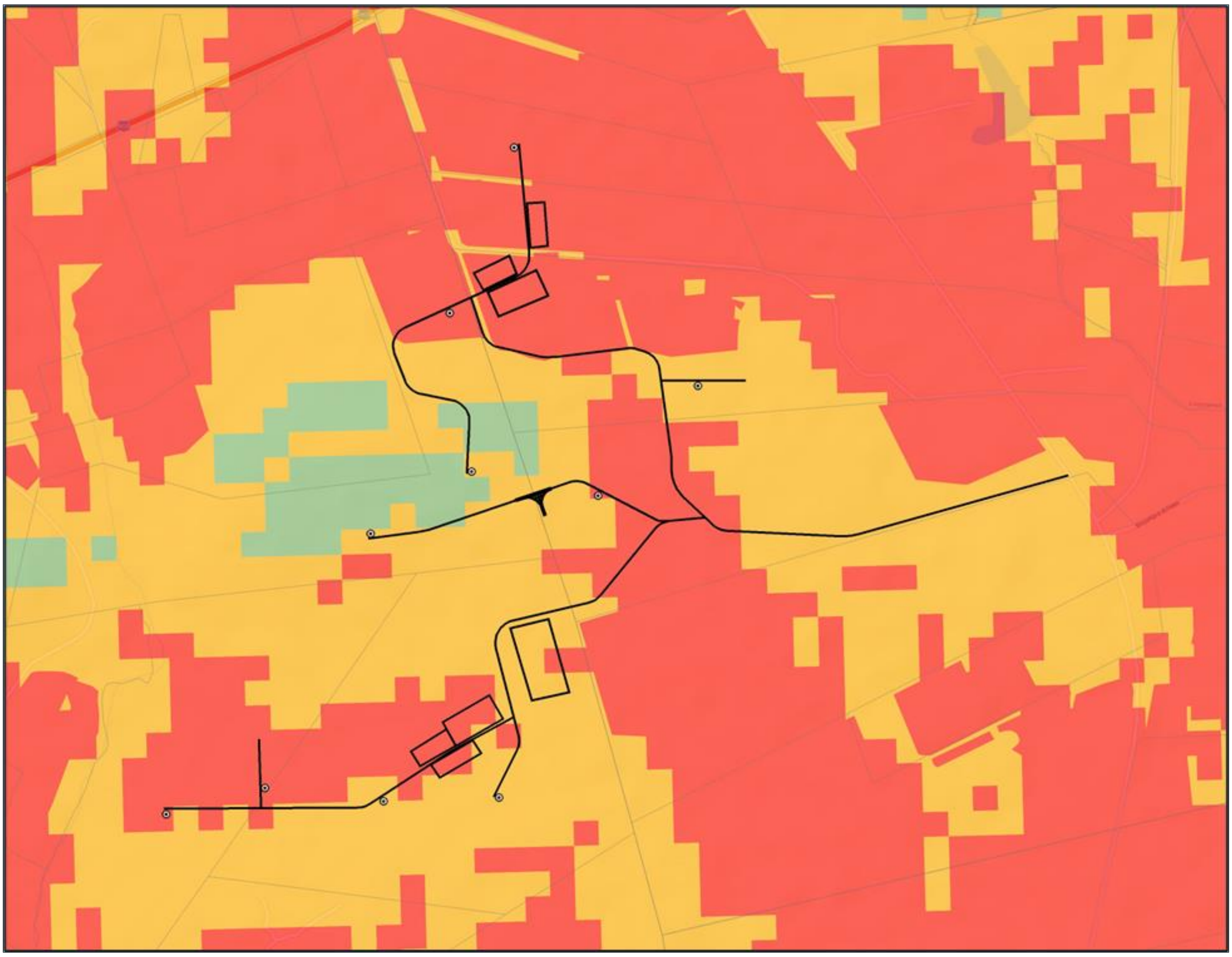


Figure 8-1 - The proposed facility footprint overlaid on agricultural sensitivity, as given by the screening tool

Source: JohannLanz, 2023

(green = low; yellow = medium; red = high; dark red = very high). The screening tool's high sensitivity is disputed by this assessment, which rates the entire footprint as being of medium agricultural sensitivity.

Because the land capability data is generated by GIS modelling and because it is applicable at a fairly small scale (1:50 000 to 1:100 000) it is not necessarily accurate for a specific site and therefore needs verification. Since crop boundaries change over time, they also need verification.

The screening tool rating of the agricultural sensitivity of the assessment area is a minimum of low, an average of medium in the areas occupied by the turbines, and a maximum of high. The screening tool rating is because part of the assessment area is classified as cropland in the data set used by the screening tool. However, that data set is outdated. The only croplands occur in the vicinity of the tar road in the eastern part of the farm, which is not where the wind farm is proposed.

All land across the wind farm site is no longer used as cropland and has not been cropped in at least the last twenty years according to the historical imagery available on Google Earth. This land should not, therefore, still be classified as cropland and allocated high sensitivity because of it. This assessment therefore disputes that any of the wind farm site is within crop boundaries. The assessment area has a classified land capability of minimum 4, average 8, and maximum 10. This assessment disputes the classified land capability, based on the assessment of the cropping potential of the site in the Agricultural Compliance Statement. The assessment therefore disputes the high rating of the sensitivity by the screening tool and verifies the assessment area as being of medium agricultural sensitivity.

8.1.2 AQUATIC BIODIVERSITY

The Project Area was assessed at desktop level using the National Web-based Environmental Screening Tool. According to the Tool, the Aquatic Biodiversity Theme for the Project Area is rated 'Very High Sensitivity' due to the presence of wetland features and areas mapped as Aquatic Critical Biodiversity Areas (CBAs), in and around the Project Area (**Figure 8-2**).

MAP OF RELATIVE AQUATIC BIODIVERSITY THEME SENSITIVITY

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low sensitivity
Very High	Aquatic CBAs
Very High	Wetlands and Estuaries

Figure 8-2 - Map of Aquatic Biodiversity Sensitivity

Source: WSP, 2023

8.1.3 TERRESTRIAL BIODIVERSITY

- The Screening Tool rated the sensitivity of the Relative Terrestrial Biodiversity Theme as very high based on the presence of CBAs, ESAs, NPAES and a vulnerable ecosystem.
- The study area is not located in a nationally protected area.
- The study site is part of the NPAES (NPAES 2018) and all turbines are located outside the NPAES.
- CBAs and ESAs are present on the site (CPlanV33_1110_ge 2017) and development within the CBAs should best be avoided. Turbine 4 lies in an ESA but on the boundary with a CBA and could be microsited eastwards to avoid the CBA. Turbines 05, 07 and 08 lie in ESAs but outside the NPAES and their locations could be reconsidered.
- The background study confirmed that the Rand Highveld Grassland vegetation type on site is listed as Vulnerable whereas the Gauteng Shale Mountain Bushveld is Least Concern. The turbines are currently located in both the Rand Highveld Grassland (7 turbines) and the Gauteng Shale Mountain Bushveld (3 turbines).
- The Freshwater Ecosystem Priority Areas (FEPAs) were not flagged by the Screening Tool.
- The current site clearly includes areas of very high sensitivity (CBA, ESAs and NPAES), but it also includes a large portion that has not been demarcated as very high sensitivity, thus ONA. According to the land use guidelines supplied by SANBI (2021), split zoning should be used, where feasible, to demarcate sensitive areas, where CBAs occur across part of a property. The development has been largely contained within areas that do not qualify as very high sensitivity, although three turbines are located in ESAs.

Figure 8-3 - Map of Terrestrial Biodiversity Sensitivity

Source: Ekotrust, 2023

8.1.4 PLANT SPECIES

The Screening Tool rated the sensitivity of the Plant Species Theme as medium. None of the SCC highlighted by the Screening Tool were recorded on site and the Gauteng C-Plan did not reflect their possible occurrence on site.

- *Khadia beswickii* (VU) occurs in rocky habitats on shallow soil (sheetrock) but was not recorded on site.
- Species 691 occurs in damp depressions in shallow soil over rock sheets. This type of habitat occurs in a small area on site but the species was not encountered during the vegetation survey.
- The wooded habitats on site may present suitable habitat for sensitive plant species 1248 and 1252 on the Screening Tool list, but they were not encountered during the site survey. Furthermore, the rocky habitats (sheets) and wooded habitats were avoided in the layout of the infrastructure on the Igolide site, thus these species should not be affected by the proposed development.
- Two near threatened species, *Gnaphalium nelsonii* and *Cineraria austrotransvaalensis*, could potentially occur on site according to the Gauteng C-plan, but these species were not mentioned by the screening tool.
- Considering the vegetation as a whole, our site surveys and sensitivity model applied to the vegetation data indicated that the vegetation across most of the site had a low sensitivity.
- Because none of the SCC highlighted by the Screening Tool were found on site, we suggest that the Plant Species Theme's site sensitivity is rated as Low.

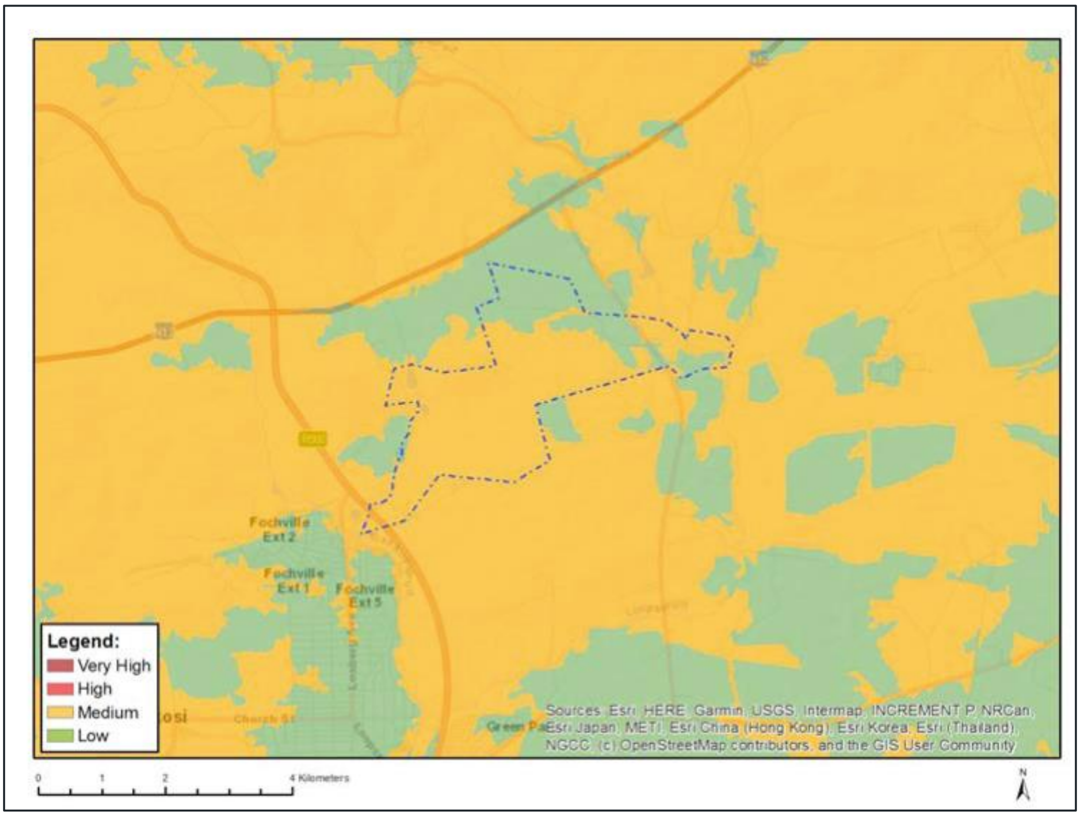


Figure 8-4 - Map of Plant Species Sensitivity

Source: Ekotrust, 2023

8.1.5 ANIMAL SPECIES

- The Screening Tool rated the sensitivity of the Animal Species Theme as medium.
- The two Lepidopteran species in the region (*Lepidochrysops praeterita* and *L. procera*) were not recorded and their host plant (*Ocimum obovatum*) was not encountered during the site survey. None of the Lepidopteran species highlighted by the Screening Tool are listed on the ADU database for the site. According to the RSA Red List, *Clonia uvarovi* (Orthoptera) is rated as Vulnerable. It inhabits tall woodland savanna (http://speciesstatus.sanbi.org/assessment/last-assessment/4333/), and no tall woodland savanna is present on site. The habitat on site could be decribed as bushveld which may be marginally suitable for the species.
- The Maquassie Musk Shrew *Crocidura maquassiensis* (VU) depends on wetlands as suitable habitat in savanna and grassland. Although it has a wide inferred extent of occurrence, it appears to be patchily distributed. It has not been reported from Gauteng or North West Province post-1999 and thus there is a low probability for it to occur on site.
- Suitable habitat for the spotted-necked otter *Hydrictis maculicollis* is available on site. It occurs widespread, but it is restricted to areas of permanent fresh water offering good shoreline cover and an abundant prey base. The watercourses were avoided by the proposed development and buffer zones are applicable.
- The avifaunal component will be addressed by the avifaunal specialist.
- Excluding the bird and bat components, we would thus rate the sensitivity of the Animal Theme as Low - Medium based on the information provided above.

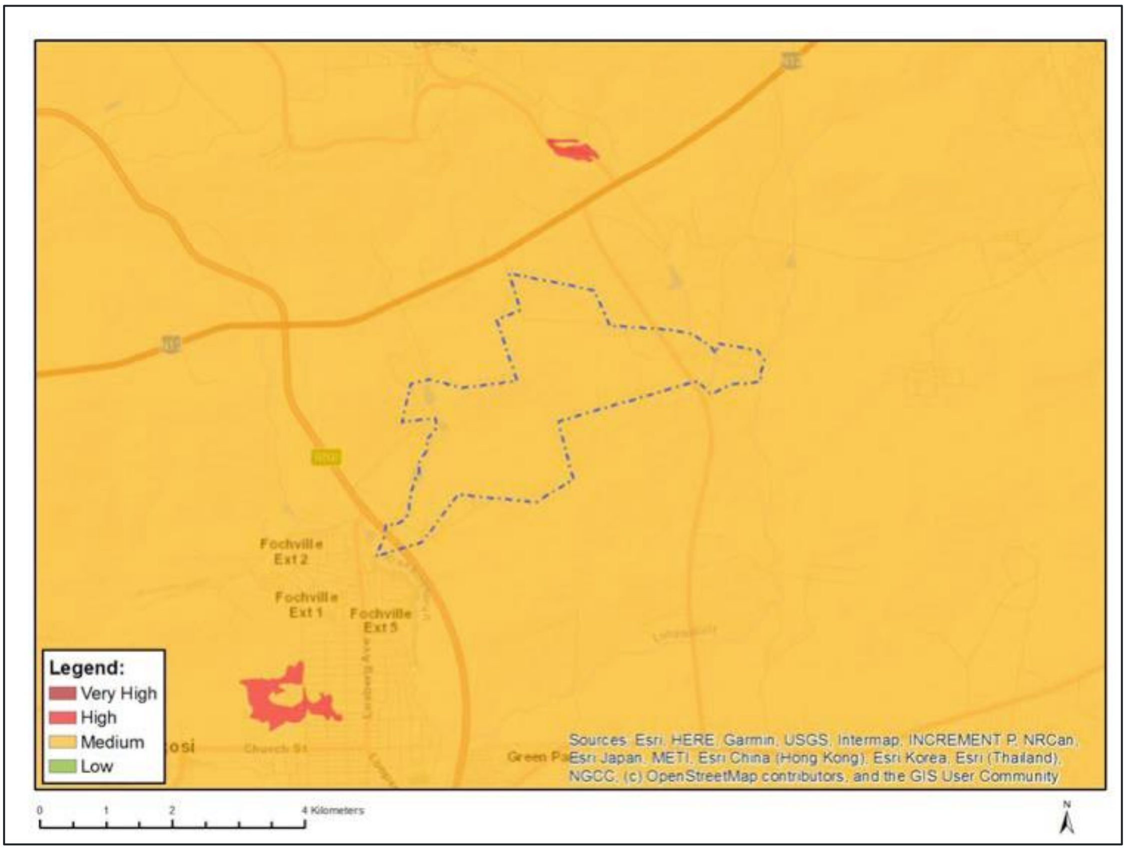


Figure 8-5 - Map of Animal Species Sensitivity

Source: Ekotrust, 2023

8.1.6 AVIFAUNA

The PAOI and immediate environment is classified as Medium Sensitivity for bird species according to the Terrestrial Animal Species Theme (**Figure 8-6**). The Medium sensitivity classification is linked to the potential occurrence of African Grass Owl Tyto capensis (Regionally Vulnerable), White-bellied Bustard Eupodotis senegalensis (Regionally Vulnerable), and Caspian Tern Hydroprogne caspia (Regionally Vulnerable). The PAOI contains confirmed habitat for Species of Conservation Concern (SCC), primarily for African Grass Owl and Secretarybird (Globally Endangered and Regionally Vulnerable), as defined in the Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020). During the on-site surveys, two SCC were recorded. These SCC were: Lanner Falcon (Regionally Vulnerable), and Secretarybird (Globally Endangered and Regionally Vulnerable).

Based on the Site Sensitivity Verification survey and the integrated pre-construction monitoring conducted at the PAOI, the classification of High Sensitivity for avifauna is advocated for the Igolide WEF.

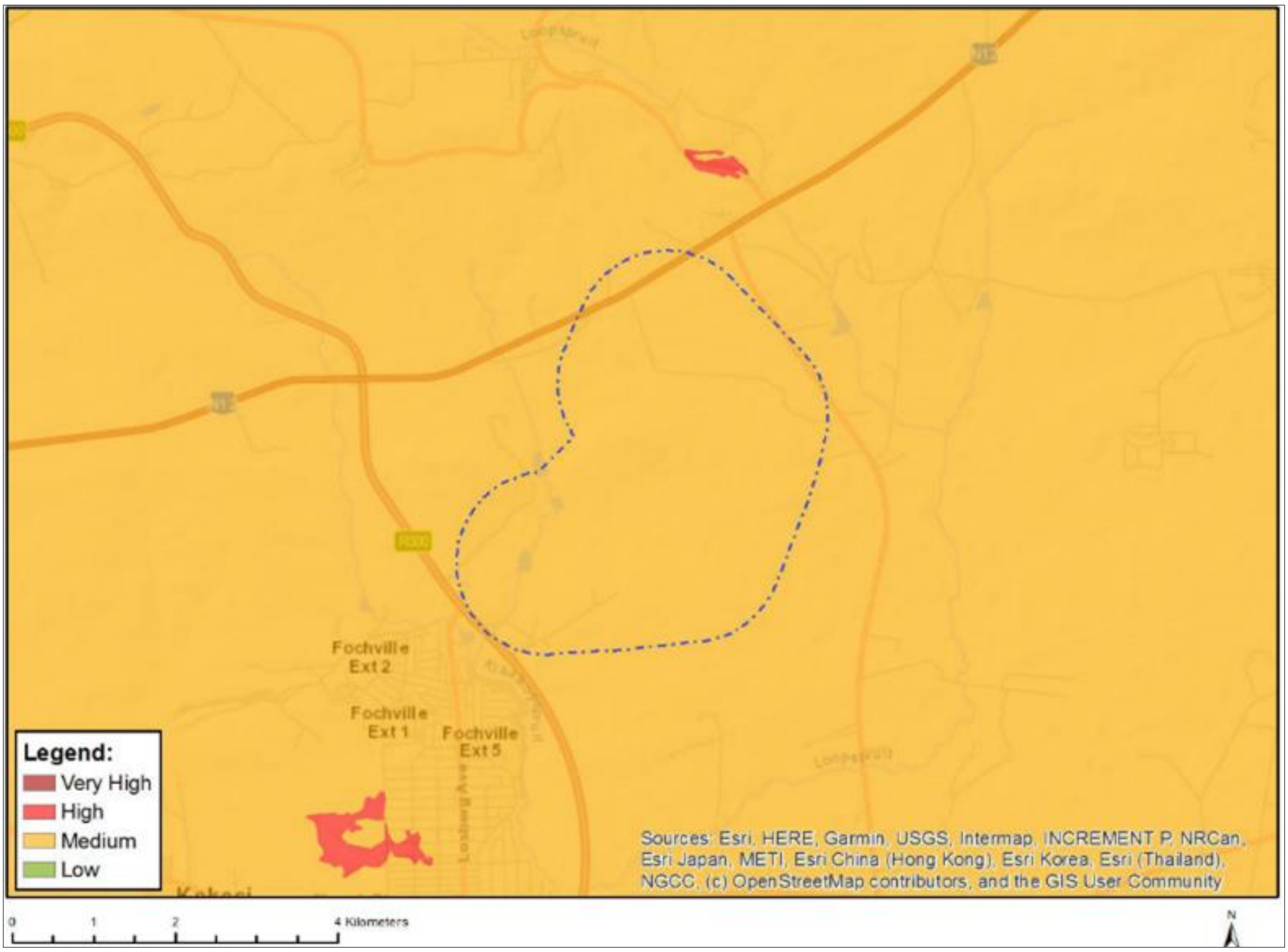


Figure 8-6 - Map of Avian Sensitivity (indicating sensitivities for the Terrestrial Animal Species theme. The Medium sensitivity classification is linked to African Grass Owl *Tyto capensis*, White-bellied Bustard *Eupodotis senegalensis*, and Caspian Tern *Hydroprogne caspia*)

Source: AfriAvian Environmental, 2023

8.1.7 BATS

We have consulted the online National Screening Tool (hereafter "Screening Tool") for the Bat Theme (Wind) and **Figure 8-7** displays the output for this investigation. In **Figure 8-7**, the red areas indicate high bat sensitivity hydrology features which are wetlands or a 500m buffer around these wetlands and/or rivers. Orange areas are designated medium sensitivity due to the presence of croplands. The remaining areas are not assigned any sensitivity by the Screening Tool. The sensitivities of the Screening Tool have been considered by the specialist, however the sensitivity map produced with this study deviates somewhat from the Screening Tool which is considered a courser output. The deviations are based on detailed site visits and rigorous assessment of satellite features on a finer resolution.

The methodology of the Site Sensitivity Verification process involved for the site to be evaluated by comparing the amount of surface rock (possible roosting space), topography (influencing surface rock in most cases), vegetation (possible roosting spaces and foraging sites), climate (can influence insect numbers and availability of fruit), and presence of surface water (influences insects and acts as a source of drinking water) to identify bat species that may be impacted by wind turbines. These comparisons were done by briefly studying the geographic literature of each site, available satellite imagery and by ground truthing with site visits. Species probability of occurrence based on the above-mentioned factors were estimated for the site and the surrounding larger area, but also considers species historically confirmed on site as well as surrounding areas.

The bat sensitivity map produced by the specialist (**Figure 8-8**), based on the methodology described above, is relatively similar to the Screening Tool sensitives with regards to the identification of several water courses and open water sources as high sensitivity areas. The extent of the buffered sensitivities identified by our fieldwork and inspection of satellite imagery is greater than that of the Screening Tool demarcation of sensitivities.

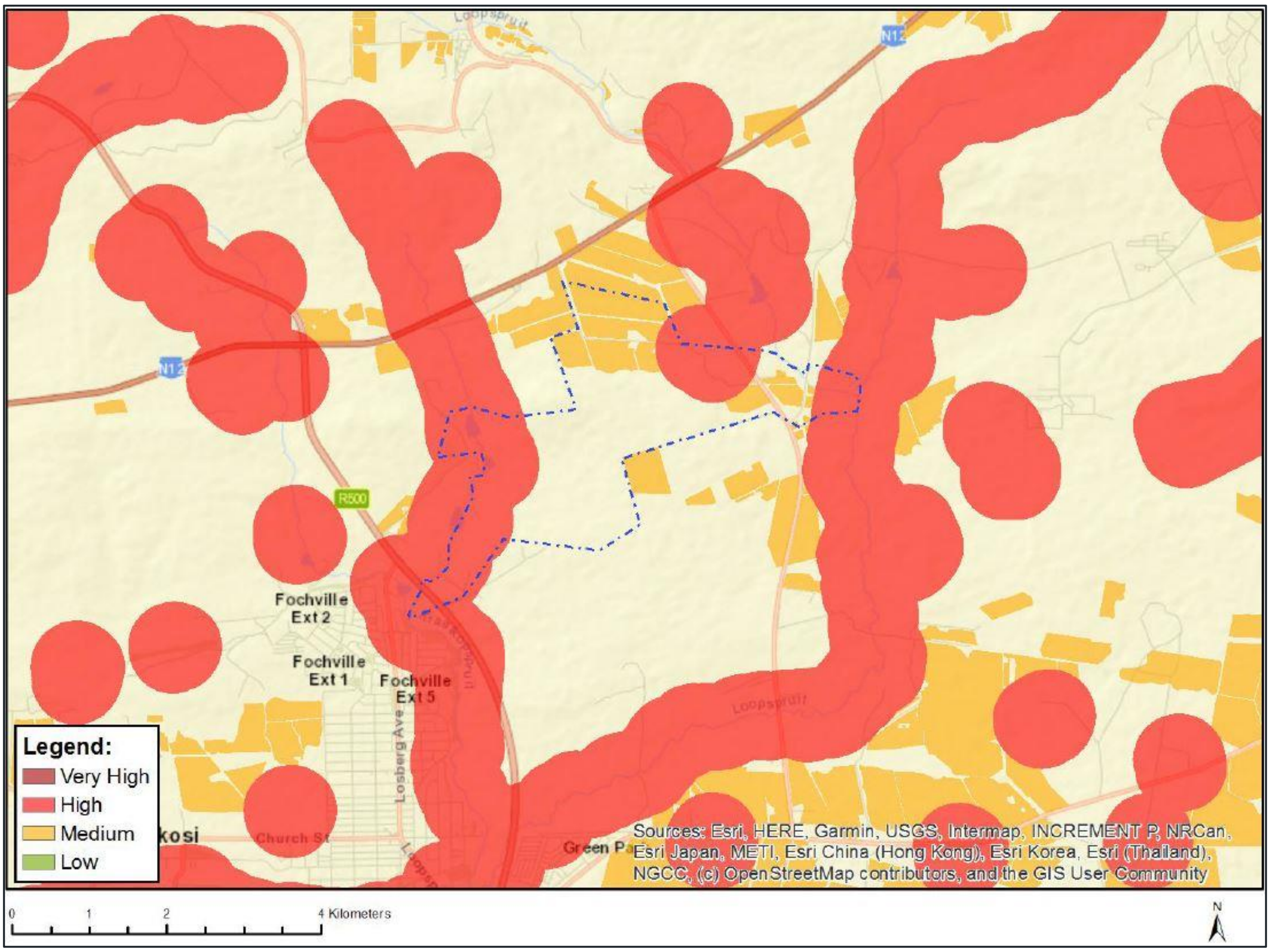


Figure 8-7 - Possible bat sensitivity features and areas wind energy for Igolide Wind Farm according to the National Environmental Screening Tool, as downloaded from https://screening.environment.gov.za/screeningtool/index.html#/app/screen_tool/Wind

Figure 8-8 depicts the sensitive areas of the site, based on features identified to be important for foraging and roosting of the species that most commonly occur on site. Thus, the sensitivity map is based on species ecology and habitat preferences.

Considering the current layout (Enertrag 31072023), and a blade length of 100m, no turbines are situated within any High Sensitivity areas (No-go) or their buffers.

Table 8-3 - Description of parameters used in the construction of the sensitivity map

Last revision	June 2023
High sensitivities and 200m buffers	Valley bottom wetlands.
	Pans and depressions.
	Dams.

Last revision	June 2023
	Clumps of larger trees especially when close to farm buildings and water sources
	Farm building and structures especially when close to irrigated land, water sources and clumps of trees.
	Drainage lines capable of supporting riparian vegetation.
	Other water bodies and other sensitivities such as manmade structures, buildings, houses, barns and sheds.
Moderate sensitivities and 150m buffers	Looser smaller groups of trees
	Seasonal drainage lines.

Table 8-4 - Igolide Wind Farm turbines located within bat sensitive areas and buffers

Bat sensitive area	**Turbines within sensitivity feature (based on a 100m blade length)**
High bat sensitivity area (no-go areas)	None
High bat sensitivity buffer (no-go areas)	None
Moderate bat sensitivity area	WTG 01, 03, 04, 05, 06 (partial blade overhang)
Moderate bat sensitivity buffer	WTG 01, 02, 03, 04, 05, 06

Table 8-5. The significance of sensitivity map categories for each infrastructure component

Sensitivity	**Turbines**	**Roads and cables**	**Internal overhead transmission lines**	**Buildings (including substation, battery storage facility and construction camp/yards)**
High Sensitivity	These areas are ‘No-go’ zones and turbines may not be placed in these areas. Turbine blades (blade overhang) may not	Preferably keep to a minimum within these areas where practically feasible.	Allowed inside these areas.	Avoid these areas (No-go areas).

Sensitivity	Turbines	Roads and cables	Internal overhead transmission lines	Buildings (including substation, battery storage facility and construction camp/yards)
	intrude into these areas.			
High Sensitivity buffer	These areas are 'No-go' zones and turbines may not be placed in these areas. Turbine blades (blade overhang) may not intrude into these areas.	Allowed inside these areas.	Allowed inside these areas.	Preferably keep to a minimum within these areas where practically feasible.
Moderate Sensitivity	Turbines within these areas may require priority (not excluding all other turbines) during post-construction studies, and in some instances, there is a higher likelihood that mitigation measures may need to be applied to them.	Allowed inside these areas.	Allowed inside these areas.	Allowed inside these areas.
Moderate Sensitivity buffer	Turbines within these areas may require priority (not excluding all other turbines) during post-construction studies, and in some instances, there is a higher likelihood that mitigation measures may need to be applied to them.	Allowed inside these areas.	Allowed inside these areas.	Allowed inside these areas.

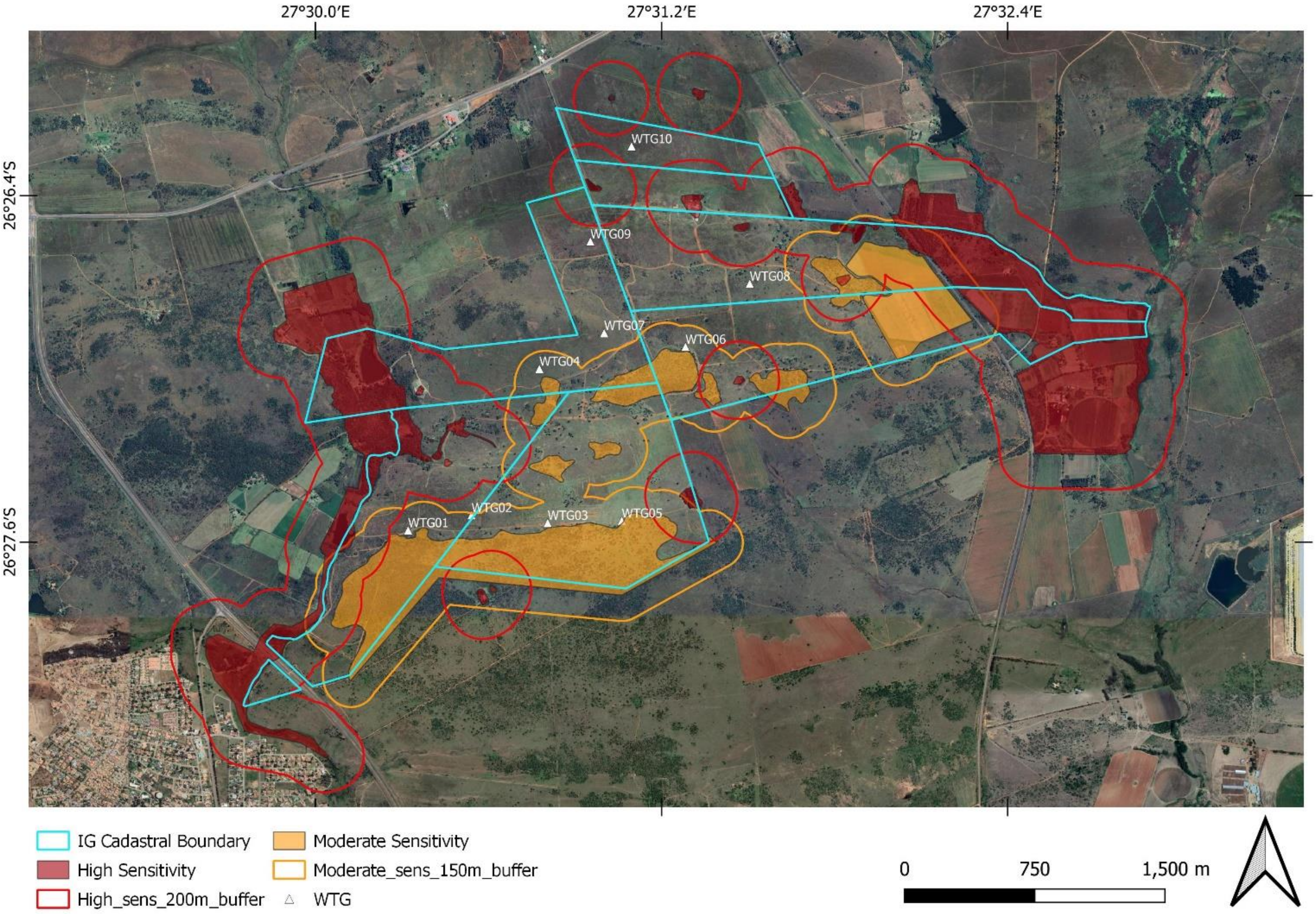


Figure 8-8 - Bat sensitivity map of the proposed Igolide Wind Farm site, showing moderate and high sensitivity zones and their buffers

8.1.8 ARCHAEOLOGICAL AND CULTURAL HERITAGE

Initial work was carried out using satellite aerial photography in combination with the authors' accumulated knowledge of the local landscape and some desktop research. This was used to provide sensitivity data which informed the scoping report and initial layout. Subsequent fieldwork confirmed the findings as well as locating further sites and graves. This information is presented in the report.

The map below is extracted from the screening tool report and shows the archaeological and heritage sensitivity to be low throughout the study area. The aerial photography and ground survey showed very clearly that there are many archaeologically sensitive areas scattered across the study area. A number of farm buildings were also shown to pre-date 1938 but these are all located away from the proposed layout. The second map below shows the areas considered to be sensitive from a heritage point of view. All are assigned medium or high sensitivity with one exception (which was not visited) that may not be old enough to be a heritage resource and was considered to be of low sensitivity.

Sites of Grade IIIA (high cultural significance), IIIB (high cultural significance) and GPA (medium cultural significance) should be regarded as of high sensitivity. GPB sites (low cultural significance) can be seen as medium. There are no sites graded GPC in the study area. The heritage specialist thus disputes the Screening Tool report.

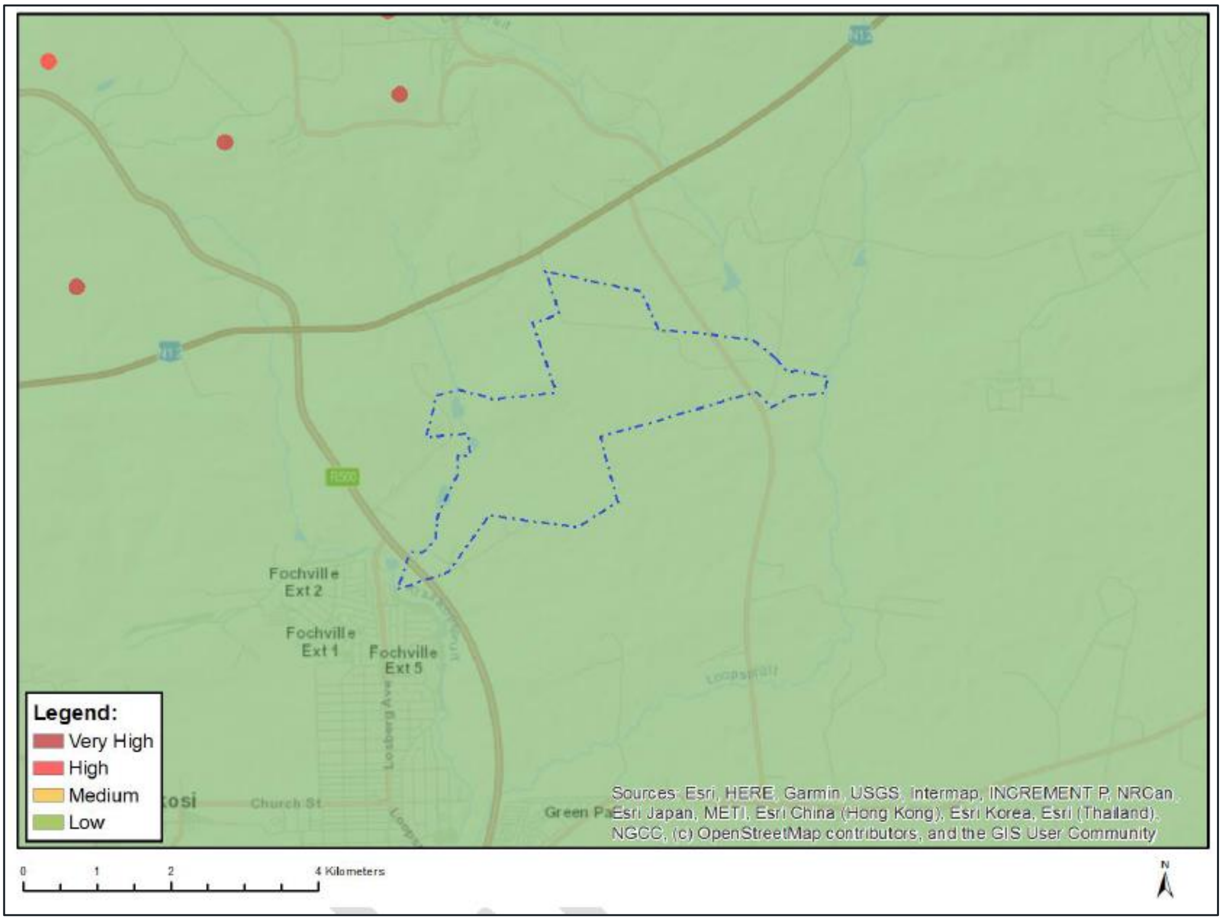


Figure 8-9 - Map of Archaeological and Heritage Sensitivity

Source: DFFE Screening Report

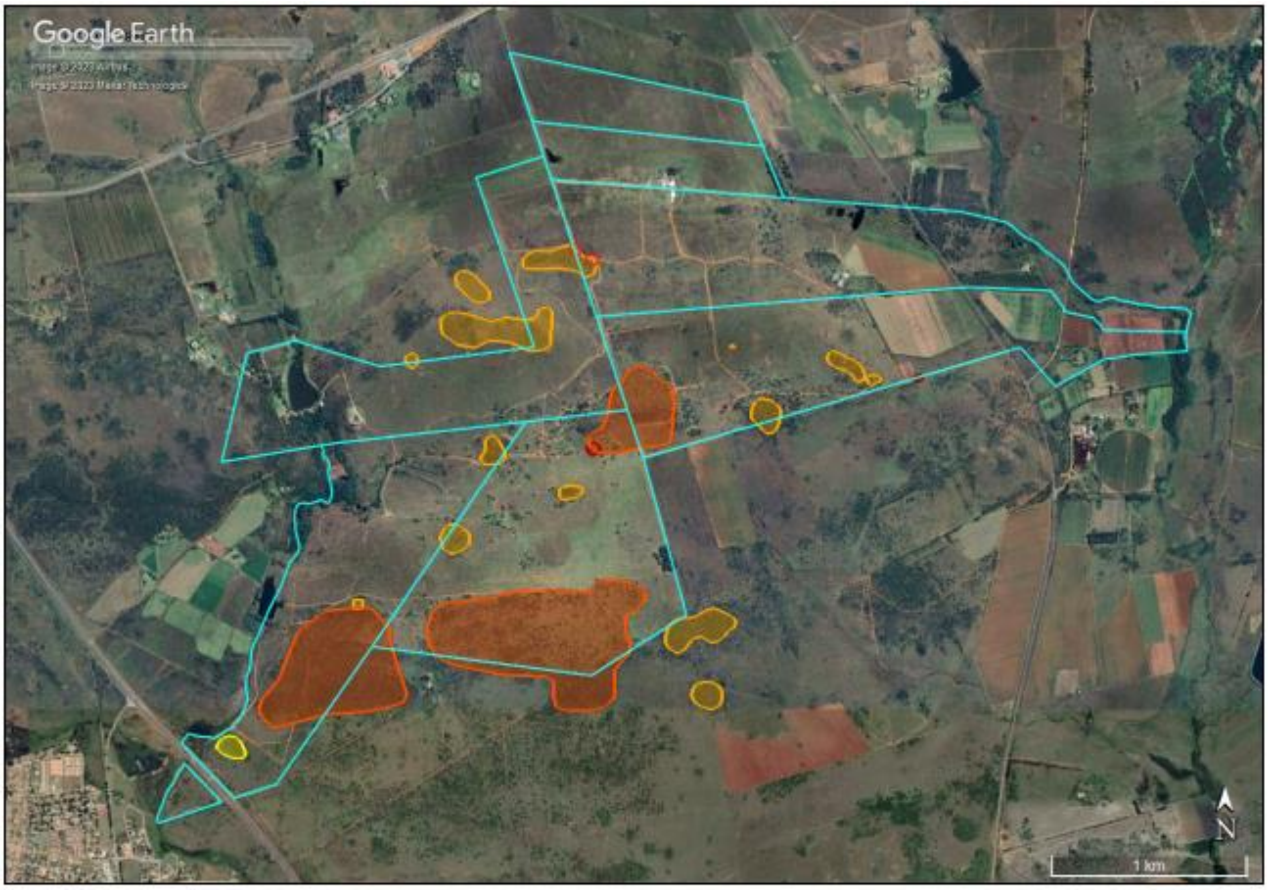


Figure 8-10 - Sensitivities from a heritage perspective

Source: DFFE Screening Report

8.1.9 PALAEONTOLOGY

The site is mostly on moderately fossiliferous Hekpoort Formation, and on the highly fossiliferous Timeball Hill Formation. The southwestern corner is on the moderately fossiliferous Silverton Formation, most probably the basal Boven Shale Member. It has been interpreted as a high-stand facies tract that reflects the advance of an epeiric sea onto the Kaapvaal Craton from the east, and therefore the underlying Daspoort Formation would represent a low-stand facies tract or a transgressive systems tract (Eriksson et al., 2006).

The North West Province Palaeotechnical Report indicates that the Silverton Formation is highly sensitive as there are stromatolites (Groenewald et al., 2014), but no evidence has been supplied and the geological records do not support this conclusion. Stromatolites and microbial mats are usually formed in shallow, low energy environments.

The Hekpoort Formation is predominantly composed of basaltic andesite and pyroclastic rocks (Eriksson et al., 2006) and this type of rock does not preserve fossils. This is noted in the Palaeotechnical Report (Groenewald et al., 2014) but they advise that caves or solution cavities could occur and these might have fossils. No fossiliferous caves are known from this area and for geological and engineering reasons, it is unlikely that turbines would placed be over cave sites.

Although the Hekpoort Formation is indicated as moderately sensitive in the Gauteng Palaeotechnical Report (Groenewald et al., 2014) this is based on “no fossils recorded”. According to Retallack et al.

(2013), the palaeosol in a road cutting near Waterval Onder contains urn-shaped microfossils measuring 1 x 0.2mm. He named the putative fossils Diskagma buttoni. Lenhardt et al. (2020) are very sceptical about the “fossils” and the reconstruction of the fossils from the thin-sections are extremely fanciful (own opinion; see Appendix A).

The Timeball Hill Formation is composed of black shales and subordinate sandstones that are interpreted cycles of fluvio-deltaic deposits, turbidites and even diamictites from glacial outwash in the northern part (Eriksson et al., 2006). Groenewald et al. (2014) suggest that there are stromatolites in this formation but none have been recorded. Stromatolites and microbial features occur in the overlying formations of the Pretoria Group.

Stromatolites are the trace fossils that were formed by colonies of green algae and blue-green algae (Cyanobacteria) that grew in warm, shallow marine settings. These algae were responsible for releasing oxygen via the photosynthetic process where atmospheric carbon dioxide and water, using energy from the sun, are converted into carbon chains and compounds that are the building blocks of all living organisms. The released carbon dioxide initially was taken up by the abundant reducing minerals to form oxides, e.g. iron oxide. Eventually free oxygen was released into the atmosphere and some was converted into ozone by the bombardment of cosmic rays. The ozone is critical for the filtering out of harmful ultraviolet rays.

Stromatolites are the layers upon layers of inorganic materials that were deposited during photosynthesis, namely calcium carbonate, magnesium carbonate, calcium sulphate and magnesium sulphate. These layers can be in the form of flat layers, domes or columns depending on the environment where they grew (Beukes, 1987). Some environments did not form stromatolites, just layers of limestone that later was converted to dolomite. The algae that formed the stromatolites are very rarely preserved, and they are microscopic so they can only be seen from thin sections studies under a petrographic microscope.

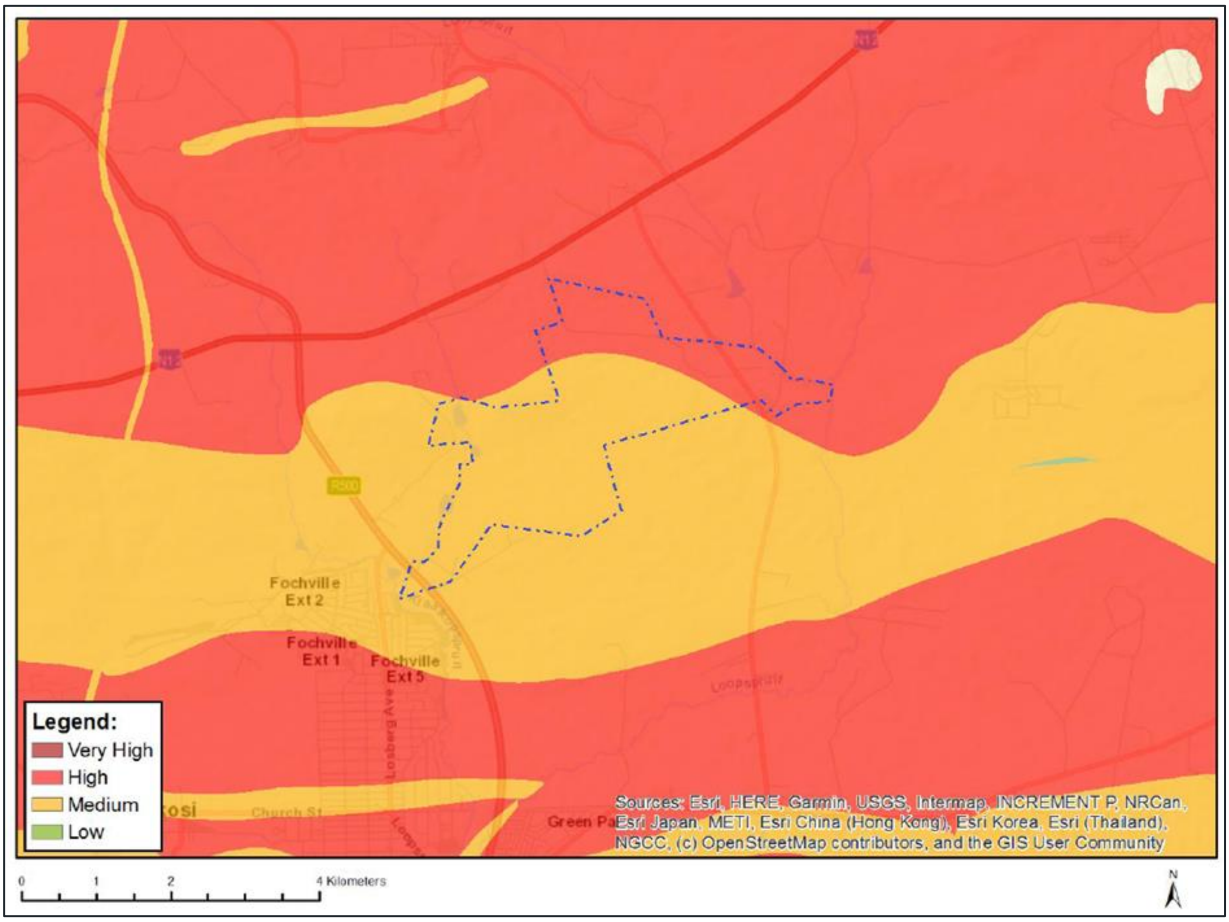


Figure 8-11 - Map of Palaeontology Sensitivity

Source: Bamford, 2023

Colours as indicated. Note that highly sensitive = dark orange in DFFE and light orange in SAHRIS, and moderately sensitive = yellow in DFFE and green in SAHRIS maps.

8.1.10 LANDSCAPE (VISUAL)

Although the Screening Tool identifies significant areas of very high landscape and flicker sensitivity, the site sensitivity verification exercise conducted in respect of this VIA (Appendix B) found little evidence to support this sensitivity rating. Desktop terrain analysis, confirmed by the field investigation, did not indicate the presence of mountain tops or high ridges within the project area and although there are some distinct hills with steep slopes, these are fairly isolated and the average slopes across the remainder of the project area are relatively flat.

The sensitivity rating for the project area is also influenced by its proximity to the town of Fochville. Considering the level of landscape transformation and degradation associated the town and its surrounds however, there is little evidence of very high levels of landscape sensitivity within a 2 km radius of the town.

The presence of receptors, either within the Igolide WEF project area, or within 500m of the project area boundary, was confirmed by the site sensitivity verification exercise. However, an assessment of receptor locations using Google Earth showed that there were no receptors present at some of the locations identified by the Screening Tool. The remaining (confirmed) receptors were factored into the sensitivity analysis, together with a 500m buffer which is considered sufficient to reduce any adverse effects of shadow flicker. The identified areas of potential visual sensitivity have been excluded from the EIA phase turbine layout for the Igolide WEF.

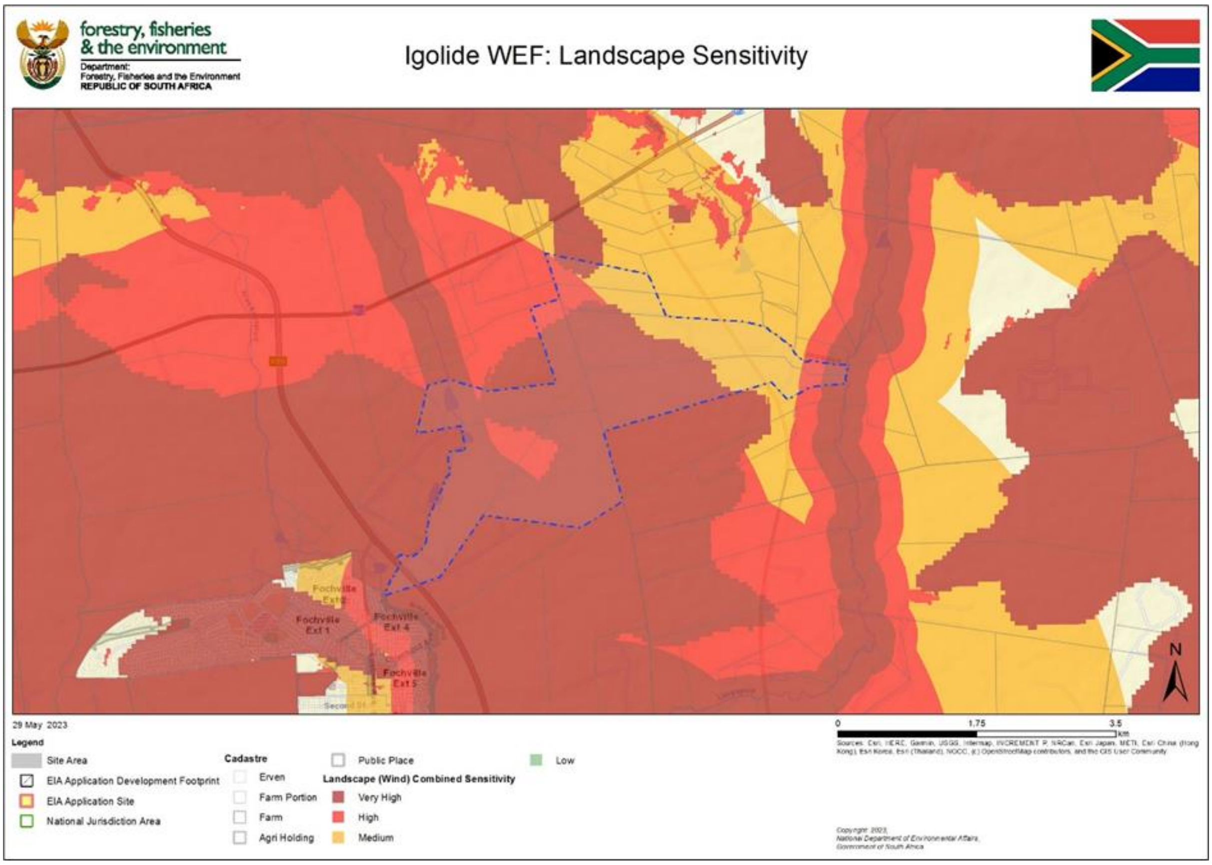


Figure 8-12 - Map of Landscape Sensitivity

Source: SLR, 2023

8.1.11 SOCIAL

No preliminary socio-economic sensitivities or sensitivity rating was identified or provided based on the DFFE Screening Tool (i.e., a preliminary sensitivity rating was not provided that could then be confirmed or altered based on further assessment).

It was determined by the specialist that the site would have a low to medium sensitivity rating based on the following:

- The planning documents relevant to the site do not identify significant or inherent constraints to appropriate development. Considered as a whole, the planning documents reviewed recognise the importance of integrated and diversified economic development that makes optimal use of the area's comparative advantages and creates economic opportunities. The concept of a renewable energy project is therefore broadly supported provided environmental impacts and impacts on other land uses and potentials are acceptable.
- Tourism facilities and attractions in the areas are very limited and sparsely distributed reducing tourism sensitivities. However, it should be recognised that the area is relatively isolated with wilderness quality and limited signs of civilisation which contributes to its tourism potential. It has

a remote sense of place which makes it more sensitive to potential impacts on tourism and also on surrounding landowners and communities.

- Given its remote and relatively isolated location, the site would be relatively sensitive to the influx of people, including job seekers, that may be associated with the project. The influx of large numbers of people are not thought likely and these risks should be manageable and are common to most larger projects.
- The area is sensitive, in a positive sense, to increased economic opportunities as they are much needed as reflected in low employment and income levels. Projects that can provide such opportunities are therefore to be encouraged where possible.

8.1.12 NOISE

The online screening tool identified a number of areas that may have a "very high" sensitivity to noise (**Figure 8-13**); and the desktop assessment identified a number of potentially noise-sensitive receptors within the areas identified to have a "very high" sensitivity to noise by the online screening tool. A Noise Specialist Assessment is being submitted because there are a number of potential noise-sensitive receptors living within 2 000 m from the proposed Project.

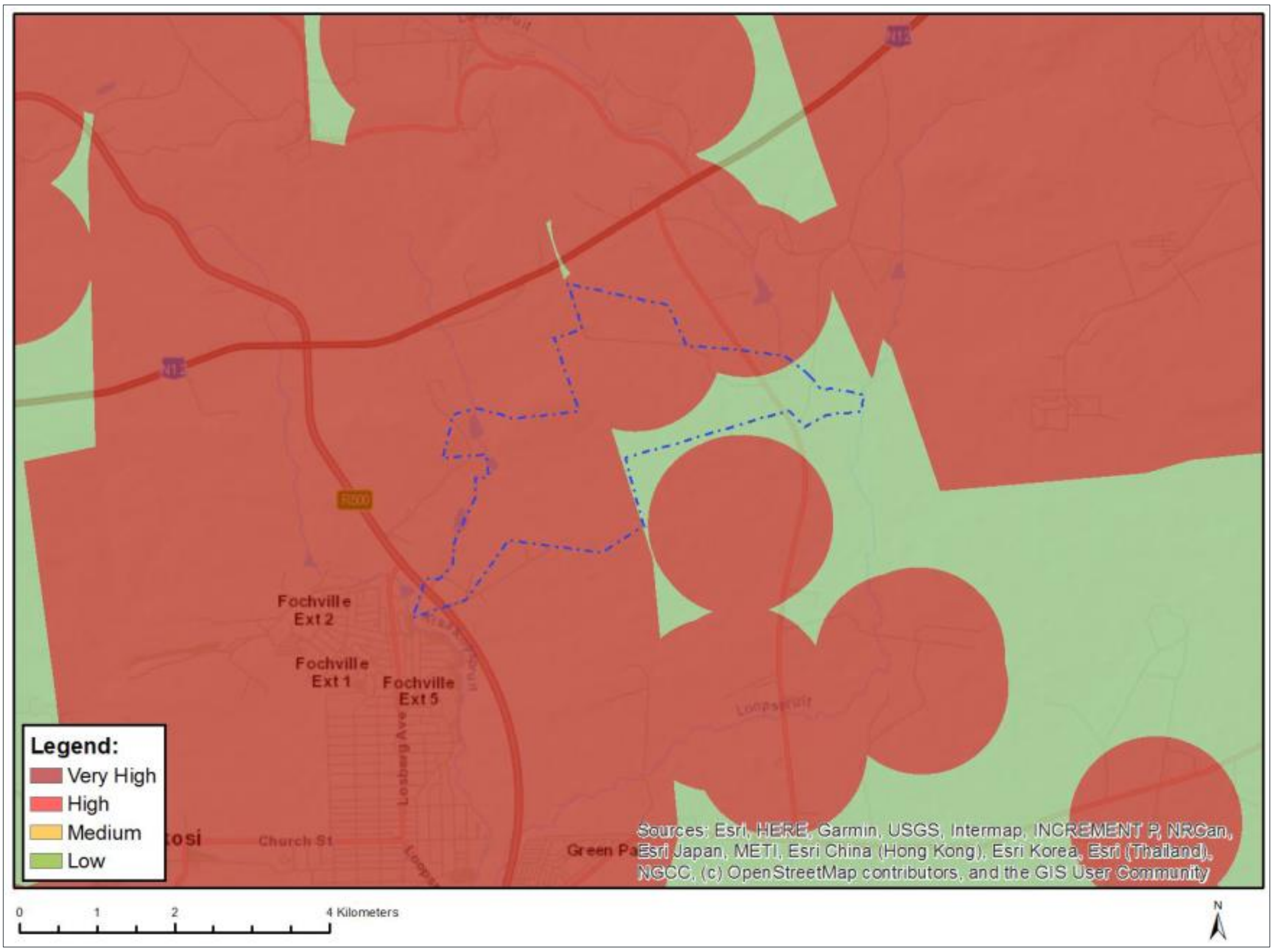
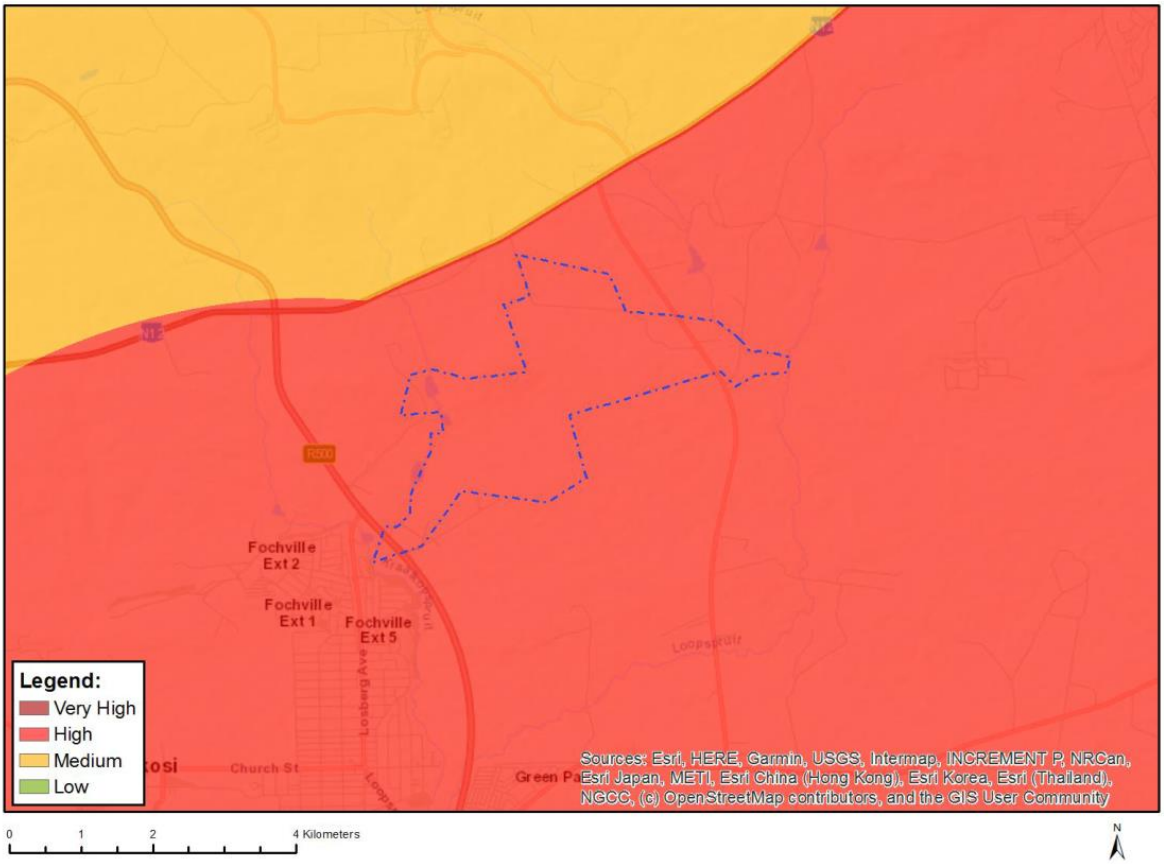


Figure 8-13 - Map of noise sensitivity
Source: EARES, 2023

8.1.13 CIVIL AVIATION

Figure 8-14 illustrates the civil aviation theme sensitivity from the screening report generated on 27 March 2023.

MAP OF RELATIVE CIVIL AVIATION (WIND) THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Within 8 km of other civil aviation aerodrome
High	Dangerous and restricted airspace as demarcated
Medium	Between 8 and 15 km of other civil aviation aerodrome

Figure 8-14 -DFFE Civil Aviation Theme

According to the DFFE Screening Tool Report, civil aviation is regarded as having high sensitivity. due to the possible location of an aerodrome within 8 km of civil aviation aerodromes.

A google earth search shows that there are no active aerodromes within 8km of the site (**Figure 8-15**). The closest active aerodrome is the Carletonville Aerodrome which is 17km northwest of the proposed Igolide WEF. The high sensitivity identified in the DFFE Screening tool is therefore disputed and regarded as Low Sensitivity.

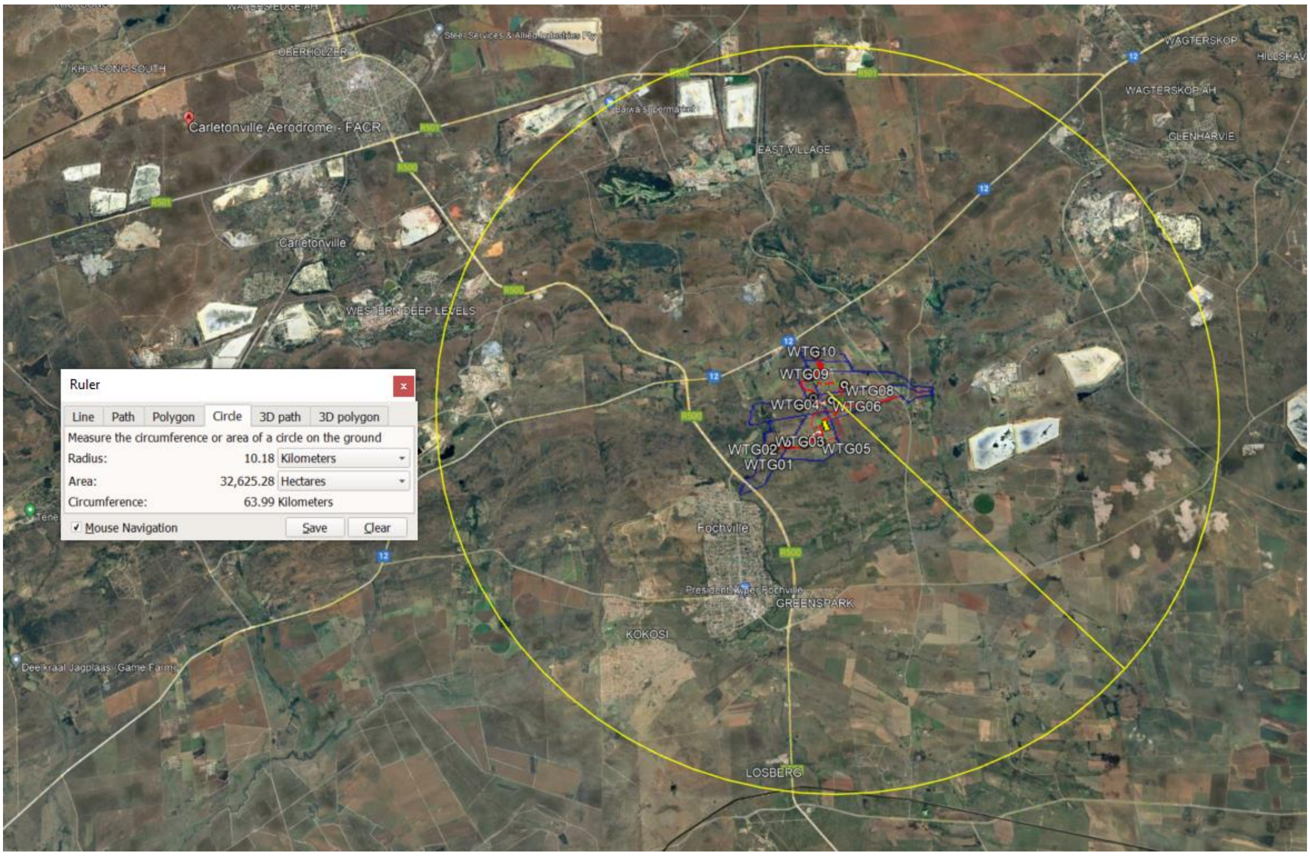


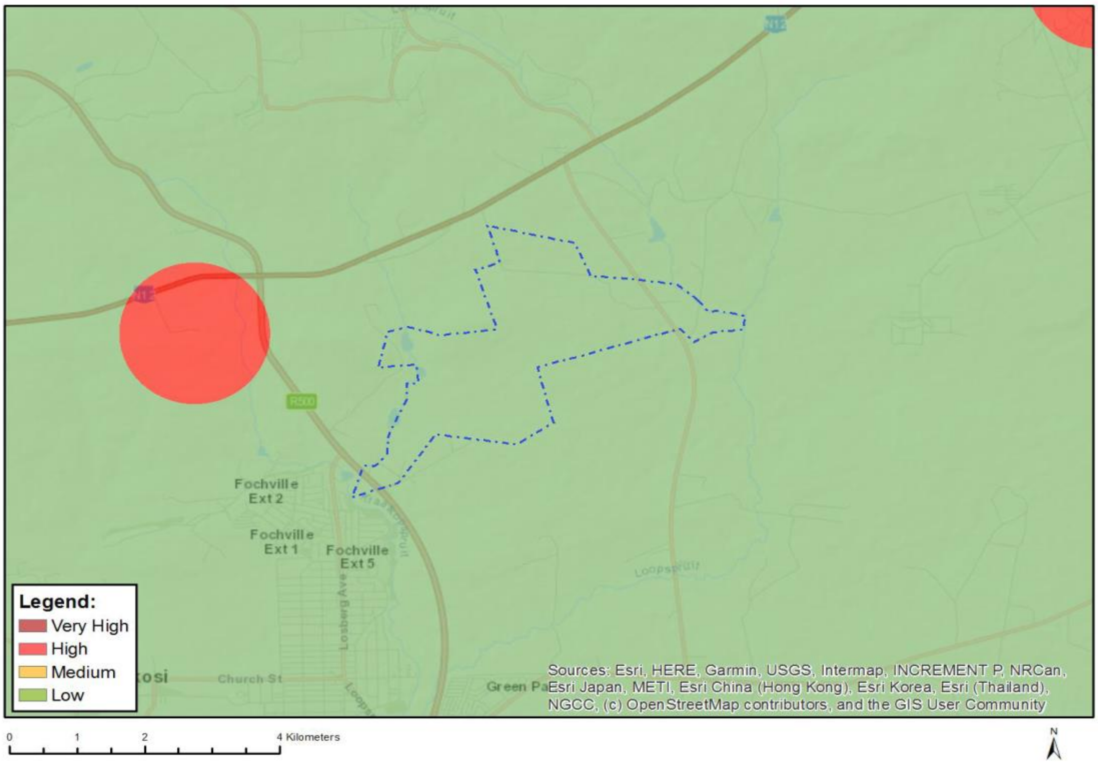
Figure 8-15 - Aerodromes located near the Proposed Igolide WEF

As of the 1st of May 2021, ATNS has been appointed as the new Obstacle application Service Provider for Wind farms and later Solar Plants. Their responsibility would pertain to the assessments, maintenance, and all other related matters in respect to Windfarms and in due time Power Plant assessments. The ATNS and SACAA have been included on the project stakeholder database. They have been informed of the proposed Project, and comment is being sought. Furthermore, an application for the Approval of Obstacles has been submitted to ATNS by the applicant.

8.1.14 RFI

Figure 8-16 illustrates the RFI theme sensitivity from the screening report generated on 27 March 2023.

MAP OF RELATIVE RFI (WIND) THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
			X

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low sensitivity for telecommunications;None;More than 60 km from a Weather Radar installation

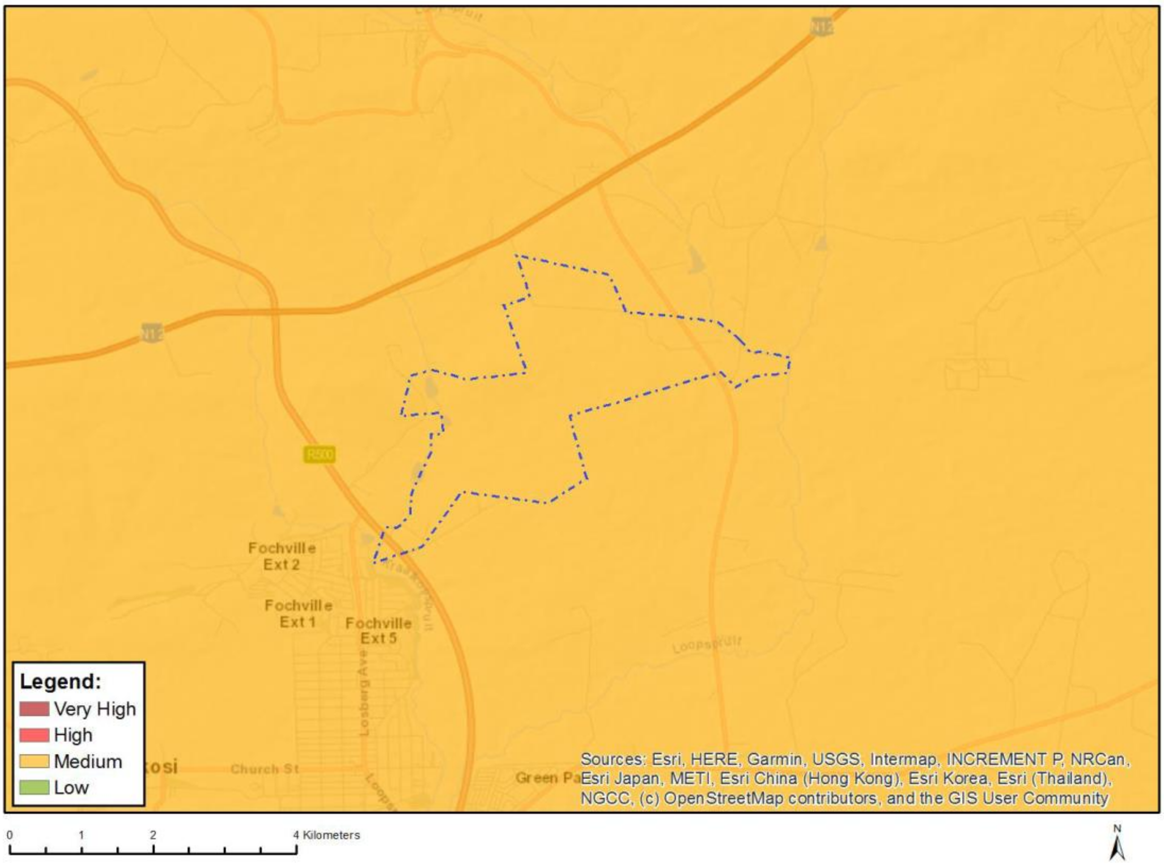
Figure 8-16 - DFFE RFI Theme

The RFI theme is considered low sensitivity and therefore a compliance statement is not required. However the relevant stakeholders have been included on the project stakeholder database i.e. SARAO, SKA and SAWS. No high sensitivity issues have been raised by the stakeholders to date.

8.1.15 DEFENCE

Figure 8-17 illustrates the Defence theme sensitivity from the screening report generated on 27 March 2023.

MAP OF RELATIVE DEFENCE (WIND) THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Medium	Defence Site

Figure 8-17 - DFFE Defence Theme

The Department of Defence has been included on the project stakeholder database. No comment has been received from the Department of Defence in this regard and the medium sensitivity is disputed and considered to be Low. This compliance statement was undertaken, the results of which dispute those of the screening tool.

8.2 SENSITIVITY MAPPING AND DEVELOPMENT ENVELOPE

A consolidated environmental sensitivity map has been compiled based on the sensitivities and buffers outlined in the following specialist studies:

- Aquatic Biodiversity;

- Terrestrial Biodiversity;
- Heritage;
- Avifauna;
- Bats; and
- Visual.

The location of the project infrastructure (i.e., layout) was determined based on initial environmental and technical screening which considered the infrastructure locations feasible from a constructability perspective. This included several key aspects, including environmental constraints and opportunities, distance to grid connection, topography, and site accessibility.

The conceptual layout (12 turbines) was assessed by the various Specialists during the Scoping Phase. **Figure 8-18** shows the environmental sensitivity features overlain with the conceptual layout.

Based on sensitivities identified by specialists during the Scoping Phase, the project layout was optimised for the EIA phase. The conceptual layout was optimised based on the following:

- The optimised layout reduced the number of turbines from 12 to 10. Figure 8-19 shows the environmental sensitivity features overlain with the optimised layout.
- The infrastructure was repositioned based on the following specialist constraints:
  - Bats – to ensure that blades do not infringe into the no-go areas;
  - Noise - to ensure there are no turbines within 500m from NSRs;
  - heritage - to ensure that the turbines and roads avoid heritage features; and
  - terrestrial - to move turbines away from CBAs.
- Repositioning of the IPP substation (500m buffer) to ensure the infrastructure to the north-west portion of the site as seen in the final layout (**Figure 11-1**).

Table 8-5 - Mapping criteria utilised by the specialists for the assessment

No-Go	Areas or features that are considered of such sensitivity or importance that any adverse effects upon them may be regarded as a fatal flaw.
High	Areas or features that are considered to have high sensitivity. Development in these areas must be limited and must remain within any acceptable limits of change as determined by the specialist. Development should also comply with any other restrictions or mitigation measures identified by the specialist.
Medium	Medium sensitivity areas are considered to be developable; however, the nature of the effects should remain within any acceptable limits of change as determined by the specialist. Development should also comply with any other restrictions or mitigation measures identified by the specialist.
Low	Low sensitivity areas that are considered to be developable however specialists may still wish to define acceptable limits of change should they deem this necessary.

NO-GO AREAS

Legislated “no go” areas or setbacks are areas or features that are considered of such significance that impacting them may be regarded as fatal flaw or strongly influence the project impact significance profile. Therefore, areas or features that are considered to have a high sensitivity or where project infrastructure would be highly constrained and should be avoided as far as possible are referred to as “no-go” areas. Infrastructure located in these areas are likely to drive up impact significance ratings and mitigations. The assumption is that the overhead lines could span these areas, but the towers/pylons should adhere to the buffer distances as indicated as far as possible where areas are too large to span (buffers) then these tower positions must be evaluated on a case by case basis prior to construction.

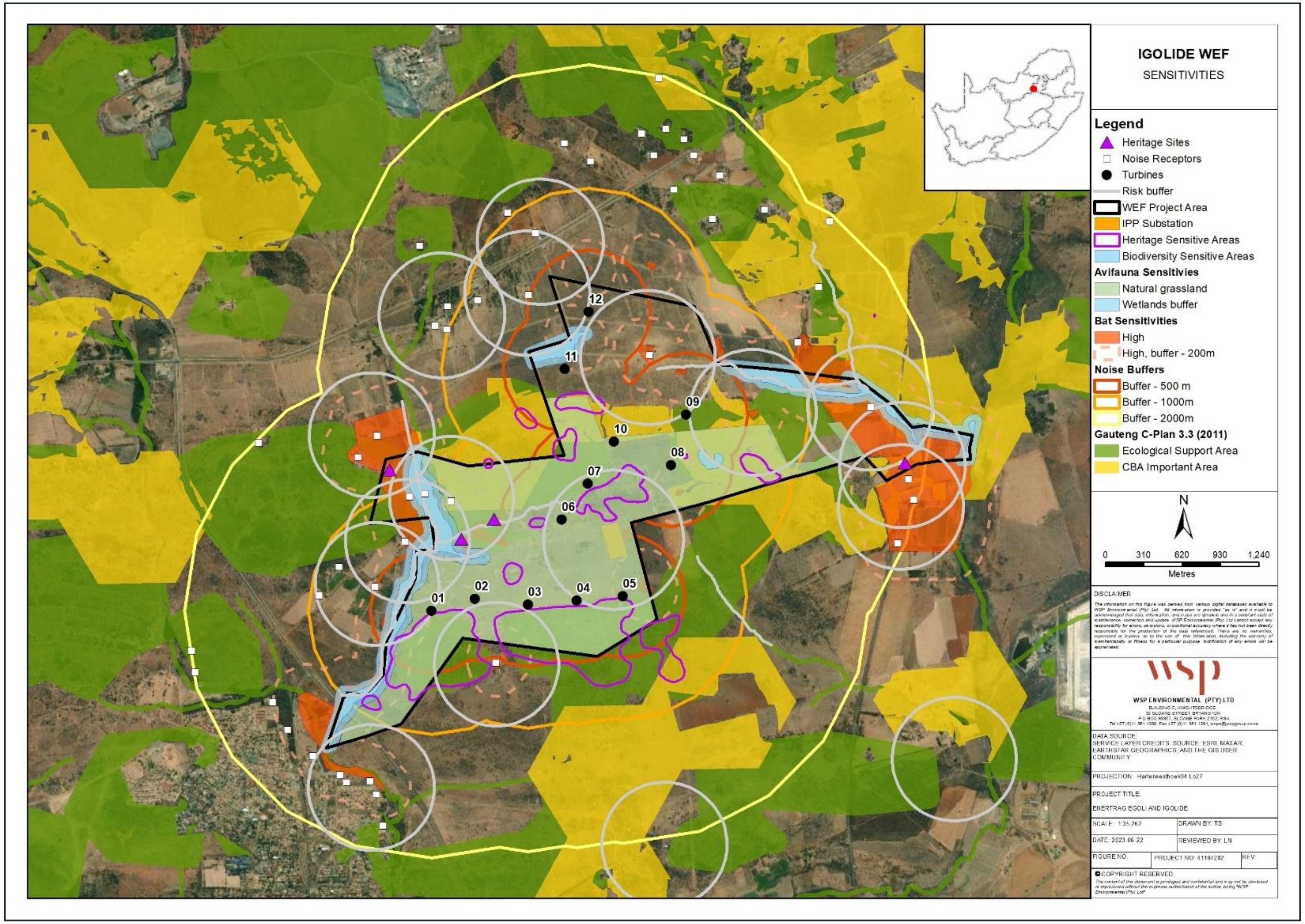


Figure 8-18 – Conceptual Layout Sensitivity Map for the proposed project (Assessed in the Scoping Phase)

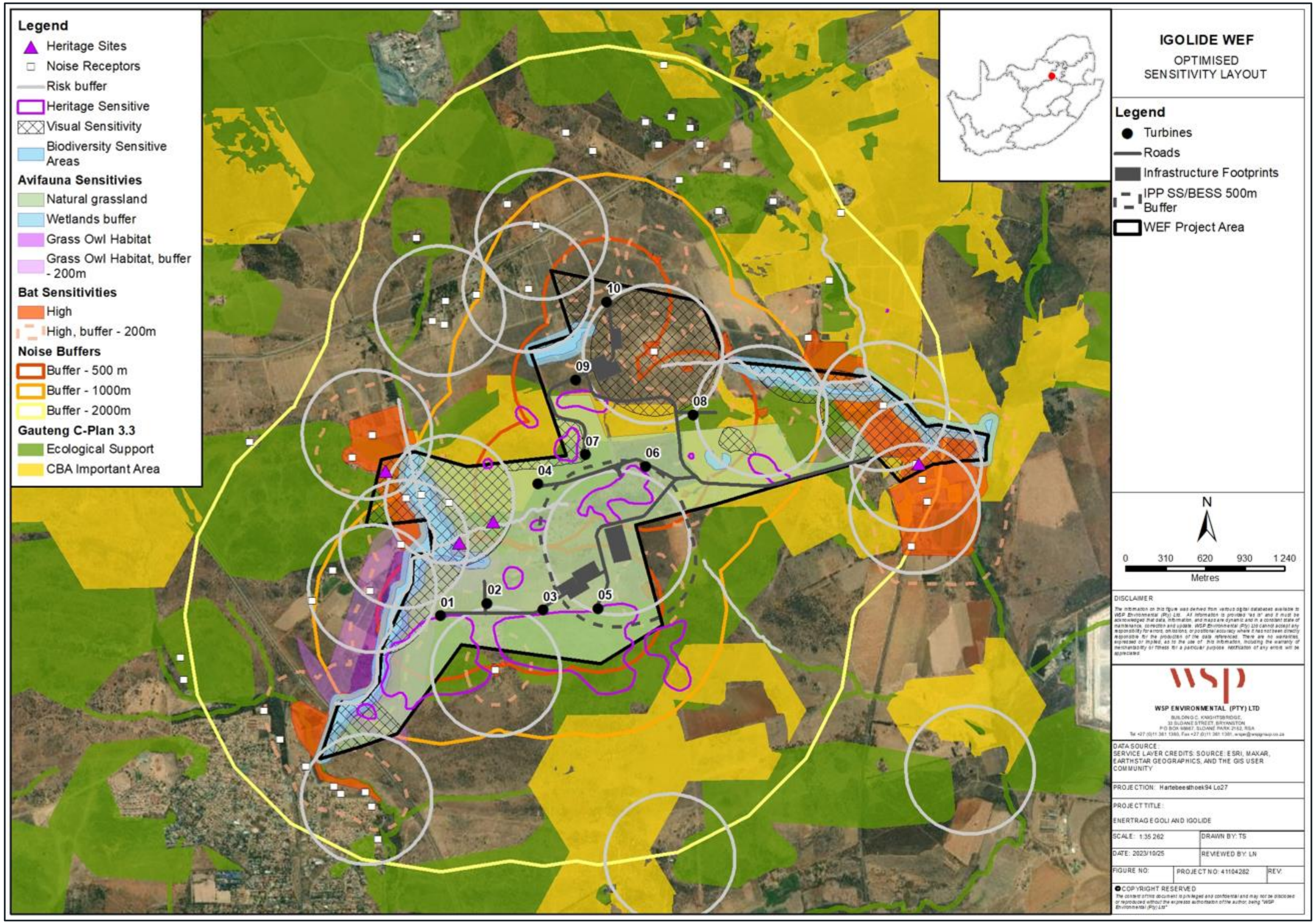


Figure 8-19 – Optimised Layout Sensitivity Map for the proposed project (Assessed in the EIA Phase)

9 ENVIRONMENTAL IMPACT ASSESSMENT

This Chapter identifies the perceived environmental and social effects associated with the proposed Project. The assessment methodology is outlined in **Section 3.4**. The issues identified stem from those aspects presented in **Section 7** of this document as well as the Project description provided in **Section 4**.

Furthermore, a decommissioning assessment will be considered as part of the decommissioning process that will be subject to a separate authorisation and impact assessment process. Any decommissioning impacts will be assessed at this stage. The impact assessment in this section encompasses the geographical, physical, biological, social, economic, heritage and cultural aspects in accordance with Appendix 1 of GNR 326.

9.1 AGRICULTURAL COMPLIANCE STATEMENT

The most significant agricultural impact possible, ignoring the duration component, is therefore a loss of a large area of high yielding cropland and the least significant impact is a loss of a small area of low carrying capacity grazing land.

In the case of wind farms, the first factor, amount of land loss, is so small that the total extent of the loss of future agricultural production potential is insignificantly small, regardless of how much production potential the land has. This is because the required spacing between turbines means that the amount of land actually excluded from agricultural use is extremely small in relation to the surface area over which a wind farm is distributed. Wind farm infrastructure (including all associated infrastructure and roads) typically occupies less than 2% of the surface area, according to the typical surface area requirements of wind farms in South Africa (DEA, 2015). Most wind energy facilities, for which I have recently done assessments, occupy less than 1% of the surface area. All agricultural activities are able to continue unaffectedly on all parts of the farmland other than turbine hardstands, roads, and the substation hub which includes battery energy storage system, buildings, etc. The actual loss of production potential is therefore insignificant.

Furthermore, the production potential of the land on site is limited to only being suitable as grazing land. The loss of a very small, widely distributed area of grazing land, of which there is no particular scarcity in the country, represents negligible loss of agricultural production potential in terms of national food security and for the affected farm. Due to the limited loss of agricultural production potential, the agricultural impact of the development is assessed here as being of low significance.

9.2 AQUATIC BIODIVERSITY IMPACT ASSESSMENT

9.2.1 CONSTRUCTION PHASE

Erosion and runoff into the associated aquatic ecosystems can result in increased sedimentation and degradation of habitat. This can directly alter aquatic habitats after deposition, which in turn will negatively impact biotic community structures by displacing biota that favour the affected habitat. Suspended solids can also directly impact aquatic biota through the accumulation of silt on respiratory organs (i.e., gills) and by decreasing visibility (i.e., increasing turbidity), which will affect feeding habits of specific taxa. Erosion and runoff from cleared land can also alter water quality by increasing turbidity, as aforementioned, and by increasing the number of contaminants entering the watercourses. This is expected to alter the physio-chemistry of water and deter water quality sensitive biota.

Vegetation clearing near watercourses can result in the introduction of alien invasive species (both fauna and flora) which often negatively impact indigenous species. This can lead to the loss of invertebrates such as dragonflies, which in turn, has the potential to alter biological community structure. Most alien invasive trees are taller and characterised by a greater root depth and are responsible for the increased uptake of water thereby decreasing both surface water runoff and groundwater recharge. This can significantly affect hydrological conditions and river flows.

Impact assessment ratings for activities associated with the construction phase the Project are presented in **Table 9-1** to **Table 9-7**. The proposed placement of infrastructure (WTG's and the substation) is located within the centre of the Project boundary, with the closest WTG (WTG09) to the Loopspruit being over 2 km away. With the presence of barriers such as the Losberg Road and cultivated lands in between the Loopspruit and the infrastructure, it is unlikely that the Loopspruit will be impacted, thus this river was not considered for the impact assessment. The closest WTGs to the Kraalkopspruit are approximately 250 m (WTG01) and 500 m (WTG02) away.

Potential impacts upon the Kraalkopspruit were determined to range between very low and low pre-mitigation and very low post-mitigation. Activities associated with the construction of the turbine hardstands for WTG01 and WTG02, and access roads are likely to impact the Kraalkopspruit, especially due to their proximity to a dirt road leading to a farm dam. Potential impacts include water quality modifications and an increase in sediment load within the Kraalkopspruit. These impacts are, however, expected to be significantly reduced by avoiding construction in the rainy season, and effective implementation of the other recommended sediment and pollutant control mitigation measures.

- **River water quality modifications**

Table 9-1 – Impact on River water quality modifications during the construction phase

Potential Impact: River water quality modifications	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	2	2	1	2	2	**14**	**Very Low**	(-)
With Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)
Mitigation and Management Measures	▪ Limit vegetation removal to the infrastructure footprint area only. Where removed or damaged,vegetation areas (riparian or aquatic related) should be revegetated as soon as possible; ▪ Bare land surfaces downstream of construction activities must be vegetated to limit erosion from the expected increase in surface runoff from infrastructure; ▪ Environmentally friendly barrier systems, such as silt nets or, in severe cases, use trenches downstream from construction sites to limit erosion and possibly trap contaminated runoff from construction;							

	▪ Storm water must be diverted from the construction site and managed in such a manner to disperse runoff and prevent the concentration of storm water flow; ▪ Water used at construction sites should be utilised in such a manner that it is kept on site and not allowed to run freely into nearby watercourses; ▪ Construction chemicals, such as cement and hydrocarbons should be used in an environmentally safe manner with correct storage as per each chemical's specific storage descriptions; ▪ All vehicles must be frequently inspected for leaks; ▪ No material may be dumped or stockpiled within any rivers or drainage lines in the vicinity of the proposed Project, and must be removed immediately without destroying habitat; ▪ All waste must be removed and transported to appropriate waste facilities; and ▪ High rainfall periods (usually November to March) should be avoided during the construction phase to possibly avoid increased surface runoff in attempt to limit erosion and the entering of external material (i.e. contaminants and/or dissolved solids) into associated aquatic systems.

- **Increased sediment load and loss of habitat**

Table 9-2 – Impact on Increased sediment load and loss of habitat during the construction phase

Potential Impact: Increased sediment load and loss of habitat	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	1	2	2	**14**	**Very Low**	(-)
With Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)
Mitigation and Management Measures	▪ Limit vegetation removal to the infrastructure footprint area only. Where removed or damaged, ▪ vegetation areas (riparian or aquatic related) should be revegetated as soon as possible; ▪ Bare land surfaces downstream of construction activities must be vegetated to limit erosion from the expected increase in surface runoff from infrastructure; ▪ Environmentally friendly barrier systems, such as silt nets or, in severe cases, use trenches downstream from construction sites to limit erosion and possibly trap contaminated runoff from construction; ▪ Storm water must be diverted from the construction site and managed in such a manner to disperse runoff and prevent the concentration of storm water flow;							

Potential Impact: Increased sediment load and loss of habitat	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
	▪ Water used at construction sites should be utilised in such a manner that it is kept on site and not allowed to run freely into nearby watercourses; ▪ Construction chemicals, such as cement and hydrocarbons should be used in an environmentally safe manner with correct storage as per each chemical's specific storage descriptions; ▪ All vehicles must be frequently inspected for leaks; ▪ No material may be dumped or stockpiled within any rivers or drainage lines in the vicinity of the proposed Project, and must be removed immediately without destroying habitat; ▪ All waste must be removed and transported to appropriate waste facilities; and ▪ High rainfall periods (usually November to March) should be avoided during the construction phase to possibly avoid increased surface runoff in attempt to limit erosion and the entering of external material (i.e. contaminants and/or dissolved solids) into associated aquatic systems.							

- **Increased river flows altering the natural flow regime**

Table 9-3 – Impact on Increased river flows altering the natural flow regime during the construction phase

Potential Impact: Increased river flows altering the natural flow regime	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	2	2	2	**18**	**Low**	(-)
With Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)
Mitigation and Management Measures	▪ Limit vegetation removal to the infrastructure footprint area only. Where removed or damaged, ▪ vegetation areas (riparian or aquatic related) should be revegetated as soon as possible; ▪ Bare land surfaces downstream of construction activities must be vegetated to limit erosion from the expected increase in surface runoff from infrastructure; ▪ Environmentally friendly barrier systems, such as silt nets or, in severe cases, use trenches downstream from construction sites to limit erosion and possibly trap contaminated runoff from construction;							

Potential Impact: Increased river flows altering the natural flow regime	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
	▪ Storm water must be diverted from the construction site and managed in such a manner to disperse runoff and prevent the concentration of storm water flow; ▪ Water used at construction sites should be utilised in such a manner that it is kept on site and not allowed to run freely into nearby watercourses; ▪ Construction chemicals, such as cement and hydrocarbons should be used in an environmentally safe manner with correct storage as per each chemical's specific storage descriptions; ▪ All vehicles must be frequently inspected for leaks; ▪ No material may be dumped or stockpiled within any rivers or drainage lines in the vicinity of the proposed Project, and must be removed immediately without destroying habitat; ▪ All waste must be removed and transported to appropriate waste facilities; and ▪ High rainfall periods (usually November to March) should be avoided during the construction phase to possibly avoid increased surface runoff in attempt to limit erosion and the entering of external material (i.e. contaminants and/or dissolved solids) into associated aquatic systems.							

- **Loss of indigenous species and reduced availability of water**

Table 9-4 – Impact on Increased river flows altering the natural flow regime during the construction phase

Potential Impact: Increased river flows altering the natural flow regime	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	2	2	2	18	Low	(-)
With Mitigation	1	1	3	4	1	9	Very Low	(-)
Mitigation and Management Measures	▪ Limit vegetation removal to the infrastructure footprint area only. Where removed or damaged, ▪ vegetation areas (riparian or aquatic related) should be revegetated as soon as possible; ▪ Bare land surfaces downstream of construction activities must be vegetated to limit erosion from the expected increase in surface runoff from infrastructure;							

Potential Impact: Increased river flows altering the natural flow regime	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
	▪ Environmentally friendly barrier systems, such as silt nets or, in severe cases, use trenches downstream from construction sites to limit erosion and possibly trap contaminated runoff from construction; ▪ Storm water must be diverted from the construction site and managed in such a manner to disperse runoff and prevent the concentration of storm water flow; ▪ Water used at construction sites should be utilised in such a manner that it is kept on site and not allowed to run freely into nearby watercourses; ▪ Construction chemicals, such as cement and hydrocarbons should be used in an environmentally safe manner with correct storage as per each chemical's specific storage descriptions; ▪ All vehicles must be frequently inspected for leaks; ▪ No material may be dumped or stockpiled within any rivers or drainage lines in the vicinity of the proposed Project, and must be removed immediately without destroying habitat; ▪ All waste must be removed and transported to appropriate waste facilities; and ▪ High rainfall periods (usually November to March) should be avoided during the construction phase to possibly avoid increased surface runoff in attempt to limit erosion and the entering of external material (i.e. contaminants and/or dissolved solids) into associated aquatic systems.						

9.2.2 OPERATIONAL PHASE

Bare lands and paved surfaces such as access roads have the potential to increase flow rates, sediment input, erosion, and contaminants in the associated watercourses if allowed to flow freely from the Project area. These influences will directly impact on water quality and aquatic habitat which in turn will negatively affect the aquatic biota.

Increased anthropogenic activities near watercourses increase the risk of introducing alien invasive species. Introduced fish species threaten local fish populations, through habitat destruction and predation for example. The continued spread of alien trees invading riparian zones will decrease river flows through uptake of water, thereby altering the hydrological regime of the watercourses.

- **Increased sediment load and loss of habitat**

Table 9-5 – Impact on Increased sediment load and loss of habitat during the construction phase

Potential Impact: Increased sediment load and loss of habitat	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	4	2	24	Very Low	(-)
With Mitigation	1	1	1	4	1	7	Very Low	(-)
Mitigation and Management Measures	▪ Runoff from the Project area should not be allowed to flow into the nearby watercourses, unless authorised by the DWS (or the competent authority); ▪ Bare surfaces downstream from the developments, where silt traps are not an option, should be well vegetated in order to attempt to limit erosion and runoff that might be carrying contaminants; ▪ Careful monitoring of the areas where dust suppression is proposed should be undertaken regularly; and ▪ Biannual aquatic biomonitoring assessments of the associated water courses should be conducted by an aquatic specialist to determine impacts, whereafter new mitigation actions should be implemented as per the specialist's recommendations.							

- **Increased river flows altering the natural flow regime**

Table 9-6 – Impact on Increased river flows altering the natural flow regime during the construction phase

Potential Impact: Increased river flows altering the natural flow regime	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	2	2	20	Very Low	(-)
With Mitigation	1	1	1	2	1	5	Very Low	(-)
Mitigation and Management Measures	▪ Runoff from the Project area should not be allowed to flow into the nearby watercourses, unless authorised by the DWS (or the competent authority); ▪ Bare surfaces downstream from the developments, where silt traps are not an option, should be well vegetated in order to attempt to limit erosion and runoff that might be carrying contaminants; ▪ Careful monitoring of the areas where dust suppression is proposed should be undertaken regularly; and							

Potential Impact: Increased river flows altering the natural flow regime	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
	▪ Biannual aquatic biomonitoring assessments of the associated water courses should be conducted by an aquatic specialist to determine impacts, whereafter new mitigation actions should be implemented as per the specialist's recommendations.							

- **Loss of indigenous species and reduced availability of water**

Table 9-7 – Impact on Loss of indigenous species and reduced availability of water during the construction phase

Potential Impact: Loss of indigenous species and reduced availability of water	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	1	3	4	2	**18**	**Low**	(-)
With Mitigation	1	1	3	4	1	**9**	**Very Low**	(-)
Mitigation and Management Measures	▪ Runoff from the Project area should not be allowed to flow into the nearby watercourses, unless authorised by the DWS (or the competent authority); ▪ Bare surfaces downstream from the developments, where silt traps are not an option, should be well vegetated in order to attempt to limit erosion and runoff that might be carrying contaminants; ▪ Careful monitoring of the areas where dust suppression is proposed should be undertaken regularly; and ▪ Biannual aquatic biomonitoring assessments of the associated water courses should be conducted by an aquatic specialist to determine impacts, whereafter new mitigation actions should be implemented as per the specialist's recommendations.							

9.3 WETLAND AQUATIC BIODIVERSITY IMPACT ASSESSMENT

9.3.1 CONSTRUCTION PHASE

- **Loss of Wetland Habitat:**
  Site establishment and construction of the proposed project infrastructure, such as access roads, wind turbine foundations and temporary laydown infrastructure could lead to the permanent loss of wetland habitat within the Project footprint. Based on the current proposed layout of the wind turbines location, none of them are located within the wetland footprint, however, some are located

within a close proximity of the seep wetlands, particularly wind turbine 1 which is located approximately 124.43 m from Seep 03. As a result, the close proximity of the turbines to wetland habitat and the disturbances expected during the construction phase, the impact is expected to have a moderate impact magnitude during construction. The impact is expected to have a medium impact duration (ceasing with construction), with a local impact extent prior to mitigation, resulting in a Moderate impact significance. With the implementation of mitigation measures such as limiting disturbance to the project footprint and keeping out of wetland habitat as far as possible (100 m buffer), the impact magnitude can be reduced to low, the extent to site only and the impact can be recoverable with rehabilitation, while the impact duration is that of a short-term duration. Post mitigation this impact can be reduced to Low impact significance.

Table 9-8 – Impact on loss of wetland habitat during the construction phase

Potential Impact: loss of wetland habitat	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	3	2	5	3	4	**52**	**Moderate**	(-)
With Mitigation	2	1	3	2	3	**24**	**Low**	(-)
Mitigation and Management Measures	▪ Areas of undisturbed, natural grassland and wetland habitat should be avoided. Areas of direct loss that cannot be avoided must be addressed via additional conservation actions/offsets as required. ▪ A loss/disturbance buffer zone of at least 100 m should be maintained between the maximum extent of construction works and the outer boundary of wetlands and riparian zones. ▪ To prevent loss of natural habitat in wetlands beyond the direct disturbance footprint, prior to any vegetation clearing, the development footprints should be clearly marked out with flagging tape/posts in the field. Vegetation clearing should be restricted to the proposed project footprints only, with no clearing permitted outside of these areas. ▪ The extent of disturbance should be limited by restricting all construction activities to the servitude as far as practically possible. ▪ Locate all laydown areas and temporary construction infrastructure at least 100 m from the edge of delineated wetlands. ▪ Wetland/river crossings should be constructed utilizing designs that ensure that hydrological integrity of the affected wetlands is preserved, and natural flow regimes are maintained (i.e., no impoundment upstream of crossings, or flow concentration downstream of crossings. ▪ Ideally construction activities should take place in winter (during the dry season). Where summer construction is unavoidable, temporary diversions of the streams and stormwater management interventions might be required.							

	- Install erosion prevention measures as part of the stormwater management plan, prior to the onset of construction activities. Measures should include energy dissipating measures such as sandbags, Ecology, or low berms on approach and departure slopes to crossings to prevent flow concentration. Sediment barriers such as silt fences or the placement of hay bales around the lower edge of bare soil areas, and active re-vegetation of disturbed areas as soon as possible.

- **Changes in wetland health/functioning:**

  Bulk earthworks involved with site development in the immediate catchment of wetlands can cause indirect impacts on wetland habitat through compaction/removal of recharge or interflow soils, as well as increased sediment deposition to downslope wetland ecosystems as a result of stormwater runoff. If not carefully managed, this impact can result in a medium impact magnitude, having a local impact scale and lasting for the duration of the construction phase, resulting in a Moderate impact significance prior to mitigation.

  With the implementation of recommended mitigation measures to address reduced wetland functioning, such as diffuse distribution of clean stormwater runoff around the WEF foundations and road crossing to affected downslope wetland systems, the impact significance can be reduced to a Low impact significance.

Table 9-9 – Impact on wetland health/functioning during the construction phase

Potential Impact: wetland health/functioning	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	3	4	44	Moderate	(-)
With Mitigation	2	1	3	2	3	24	Low	(-)
Mitigation and Management Measures	- Areas of undisturbed, natural grassland and wetland habitat should be avoided. Areas of direct loss that cannot be avoided must be addressed via additional conservation actions/offsets as required. - A loss/disturbance buffer zone of at least 100 m should be maintained between the maximum extent of construction works and the outer boundary of wetlands and riparian zones. - To prevent loss of natural habitat in wetlands beyond the direct disturbance footprint, prior to any vegetation clearing, the development footprints should be clearly marked out with flagging tape/posts in the field. Vegetation clearing should be restricted to the proposed project footprints only, with no clearing permitted outside of these areas.							

Potential Impact: wetland health/functioning	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
	▪ The extent of disturbance should be limited by restricting all construction activities to the servitude as far as practically possible. ▪ Locate all laydown areas and temporary construction infrastructure at least 100 m from the edge of delineated wetlands. ▪ Wetland/river crossings should be constructed utilizing designs that ensure that hydrological integrity of the affected wetlands is preserved, and natural flow regimes are maintained (i.e., no impoundment upstream of crossings, or flow concentration downstream of crossings. ▪ Ideally construction activities should take place in winter (during the dry season). Where summer construction is unavoidable, temporary diversions of the streams and stormwater management interventions might be required. ▪ Install erosion prevention measures as part of the stormwater management plan, prior to the onset of construction activities. Measures should include energy dissipating measures such as sandbags, Ecology, or low berms on approach and departure slopes to crossings to prevent flow concentration. Sediment barriers such as silt fences or the placement of hay bales around the lower edge of bare soil areas, and active re-vegetation of disturbed areas as soon as possible.						

- **Contamination of watercourses:**
  Stripping of topsoil and civil works activities, resulting in a decrease in water quality due to erosion, sedimentation and the alteration in the distribution and quantity of surface water runoff, will have a medium impact magnitude with a regional extent impact and a medium-term impact duration. The impact significance prior to mitigation is Moderate, with the implementation of recommended mitigation measures, this impact can be reduced to a Very Low impact significance.

Table 9-10 – Impact on Contamination of watercourses during the construction phase

Potential Impact: Contamination of watercourses	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	3	3	4	**48**	**Moderate**	(-)
With Mitigation	2	1	1	1	3	**15**	**Very Low**	(-)

Potential Impact: Contamination of watercourses	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
Mitigation and Management Measures	▪ Areas of undisturbed, natural grassland and wetland habitat should be avoided. Areas of direct loss that cannot be avoided must be addressed via additional conservation actions/offsets as required. ▪ A loss/disturbance buffer zone of at least 100 m should be maintained between the maximum extent of construction works and the outer boundary of wetlands and riparian zones. ▪ To prevent loss of natural habitat in wetlands beyond the direct disturbance footprint, prior to any vegetation clearing, the development footprints should be clearly marked out with flagging tape/posts in the field. Vegetation clearing should be restricted to the proposed project footprints only, with no clearing permitted outside of these areas. ▪ The extent of disturbance should be limited by restricting all construction activities to the servitude as far as practically possible. ▪ Locate all laydown areas and temporary construction infrastructure at least 100 m from the edge of delineated wetlands. ▪ Wetland/river crossings should be constructed utilizing designs that ensure that hydrological integrity of the affected wetlands is preserved, and natural flow regimes are maintained (i.e., no impoundment upstream of crossings, or flow concentration downstream of crossings. ▪ Ideally construction activities should take place in winter (during the dry season). Where summer construction is unavoidable, temporary diversions of the streams and stormwater management interventions might be required. ▪ Install erosion prevention measures as part of the stormwater management plan, prior to the onset of construction activities. Measures should include energy dissipating measures such as sandbags, Ecology, or low berms on approach and departure slopes to crossings to prevent flow concentration. Sediment barriers such as silt fences or the placement of hay bales around the lower edge of bare soil areas, and active re-vegetation of disturbed areas as soon as possible.							

- **Soil Erosion:**
  The removal of wetland vegetation for the construction of the proposed development could result in an increase of bare soil/surfaces in the study area, particularly in proximity to the seep wetlands, which will lead to increased velocities of runoff, and ultimately resulting in soil erosion. The impact on soil erosion is considered to have a medium magnitude, with local impact extent and a long-term impact duration, resulting in a Moderate impact significance pre mitigation. With mitigation,

such as limiting vegetation removal to the project footprint and revegetating exposed soils immediately post construction, the impact can be reduced to a Low impact significance.

Table 9-11 – Impact on wetland soil erosion during the construction phase

Potential Impact: wetland soil erosion	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	5	4	4	52	Moderate	(-)
With Mitigation	2	1	3	2	3	24	Low	(-)
Mitigation and Management Measures	▪ Areas of undisturbed, natural grassland and wetland habitat should be avoided. Areas of direct loss that cannot be avoided must be addressed via additional conservation actions/offsets as required. ▪ A loss/disturbance buffer zone of at least 100 m should be maintained between the maximum extent of construction works and the outer boundary of wetlands and riparian zones. ▪ To prevent loss of natural habitat in wetlands beyond the direct disturbance footprint, prior to any vegetation clearing, the development footprints should be clearly marked out with flagging tape/posts in the field. Vegetation clearing should be restricted to the proposed project footprints only, with no clearing permitted outside of these areas. ▪ The extent of disturbance should be limited by restricting all construction activities to the servitude as far as practically possible. ▪ Locate all laydown areas and temporary construction infrastructure at least 100 m from the edge of delineated wetlands. ▪ Wetland/river crossings should be constructed utilizing designs that ensure that hydrological integrity of the affected wetlands is preserved, and natural flow regimes are maintained (i.e., no impoundment upstream of crossings, or flow concentration downstream of crossings. ▪ Ideally construction activities should take place in winter (during the dry season). Where summer construction is unavoidable, temporary diversions of the streams and stormwater management interventions might be required. ▪ Install erosion prevention measures as part of the stormwater management plan, prior to the onset of construction activities. Measures should include energy dissipating measures such as sandbags, Ecology, or low berms on approach and departure slopes to crossings to prevent flow concentration. Sediment barriers such as silt fences or the placement of hay bales around the lower								

Potential Impact: wetland soil erosion	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
	edge of bare soil areas, and active re-vegetation of disturbed areas as soon as possible.							

- **Establishment and spread of alien invasive species:**

  Disturbances caused by vegetation clearing and earth works during construction will exacerbate the establishment and spread of alien invasive vegetation in the area. Alien plant infestations can spread exponentially, suppressing, or replacing indigenous vegetation. This may result in a breakdown of ecosystem functioning and a loss of wetland biodiversity. Consequently, this impact is considered to have a medium impact severity, with a local impact extent and a long-term impact duration, resulting in a Moderate impact significance prior to mitigation. With the development of an auditable AIS Management Plan for the project, and the strict implementation of the recommended active control and monitoring measures throughout the construction phase, the impact significance can be reduced to Very Low.

Table 9-12 – Impact on spread of alien invasive species during the construction phase

Potential Impact: Establishment and spread of alien invasive species	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	4	4	**48**	**Moderate**	(-)
With Mitigation	2	1	1	2	2	**12**	**Very Low**	(-)
Mitigation and Management Measures	▪ An alien and invasive species management plan should be developed for the Project, which includes details of strategies and procedures that must be implemented on site to control the spread of alien and invasive species. A combined approach using both chemical and mechanical control methods, with periodic follow-up treatments informed by regular monitoring, is recommended.							

9.3.2 OPERATIONAL PHASE

- **Spread of alien invasive species:**

  The potential establishment of alien invasive species in, and immediately adjacent to wetlands in the vicinity of the proposed development footprint will continue to be an impact of concern during the operational phase. Without mitigation, the impact significance is considered Moderate impact.

With the development of an auditable AIS Management Plan for the project, and the strict implementation of the recommended active control and monitoring measures throughout the operational phase, the impact significance can be reduced to a Very Low impact.

Table 9-13 – Impact on spread of alien invasive species during the operational phase

Potential Impact: Operation and Maintenance	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	4	4	48	Moderate	(-)
With Mitigation	2	1	1	1	2	10	Very Low	(-)
Mitigation and Management Measures	▪ An alien and invasive species management plan should be developed for the Project, which includes details of strategies and procedures that must be implemented on site to control the spread of alien and invasive species. A combined approach using both chemical and mechanical control methods, with periodic follow-up treatments informed by regular monitoring, is recommended.							

- **Soil Erosion:**
  The increased presence of hardened surfaces in the study area can exacerbate soil erosion, through increased and concentrated surface run off. This impact is assessed as having a medium impact magnitude, with a long-term impact duration and a high probability of occurrence. Without mitigation this impact will have a Moderate impact significance on wetland soils and with mitigation it can be reduced to a Low impact significance.

Table 9-14 – Impact on soil erosion during the operational phase

Potential Impact: Soil erosion	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	3	4	5	55	Moderate	(-)
With Mitigation	2	1	3	1	3	21	Low	(-)
Mitigation and Management Measures	▪ Areas of undisturbed, natural grassland and wetland habitat should be avoided. Areas of direct loss that cannot be avoided must be addressed via additional conservation actions/offsets as required. ▪ A loss/disturbance buffer zone of at least 100 m should be maintained between the maximum extent of construction							

Potential Impact: Soil erosion		Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
	works and the outer boundary of wetlands and riparian zones. ▪ To prevent loss of natural habitat in wetlands beyond the direct disturbance footprint, prior to any vegetation clearing, the development footprints should be clearly marked out with flagging tape/posts in the field. Vegetation clearing should be restricted to the proposed project footprints only, with no clearing permitted outside of these areas. ▪ The extent of disturbance should be limited by restricting all construction activities to the servitude as far as practically possible. ▪ Locate all laydown areas and temporary construction infrastructure at least 100 m from the edge of delineated wetlands. ▪ Wetland/river crossings should be constructed utilizing designs that ensure that hydrological integrity of the affected wetlands is preserved, and natural flow regimes are maintained (i.e., no impoundment upstream of crossings, or flow concentration downstream of crossings. ▪ Ideally construction activities should take place in winter (during the dry season). Where summer construction is unavoidable, temporary diversions of the streams and stormwater management interventions might be required. ▪ Install erosion prevention measures as part of the stormwater management plan, prior to the onset of construction activities. Measures should include energy dissipating measures such as sandbags, Ecology, or low berms on approach and departure slopes to crossings to prevent flow concentration. Sediment barriers such as silt fences or the placement of hay bales around the lower edge of bare soil areas, and active re-vegetation of disturbed areas as soon as possible.							

9.3.3 DECOMMISSIONING PHASE

- **Spread of alien invasive species:**

Table 9-15 – Impact on spread of alien invasive species during the decommissioning phase

Potential Impact: spread of alien invasive species	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	4	4	48	Moderate	(-)
With Mitigation	2	1	1	2	2	12	Very Low	(-)
Mitigation and Management Measures	▪ An alien and invasive species management plan should be developed for the Project, which includes details of strategies and procedures that must be implemented on site to control the spread of alien and invasive species. A combined approach using both chemical and mechanical control methods, with periodic follow-up treatments informed by regular monitoring, is recommended.							

9.4 TERRESTRIAL BIODIVERSITY ASSESSMENT

9.4.1 CONSTRUCTION PHASE

- **Loss of vegetation/habitat**

Natural vegetation will be cleared for new access roads, upgrading of existing tracks, laydown and construction sites, compound areas, substation, turbines and crane pads. The removal of indigenous vegetation may cause a loss of individuals of threatened, protected and/or endemic species and will also be accompanied by a loss of faunal habitat. However, no threatened or endemic species were found on site and only one provincially protected species with a Least.

Concern status was recorded. None of the SCC listed by the Screening Tool, were recorded on site. Vegetation loss is generally also associated with increased water run-off and erosion.

Since the turbine footprint is relatively small and spread across the site, the loss of prime habitat within the Gauteng Shale Mountain Bushveld and the Rand Highveld Grassland vegetation types will be small. However, it is suggested that existing tracks should be followed wherever possible. Service roads generally have a larger impact on vegetation clearance than the turbines, however since the roads will have a gravel surface animal movement should still be possible. Beyond the permanent infrastructure footprint, environmental functions and processes should however, not be altered. The ancillary areas are located in the Gauteng Shale Mountain Bushveld which is classified as Least Concern.

Table 9-16 – Impact on Loss of vegetation/habitat during the construction phase

Potential Impact: loss of vegetation/ habitat	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	3	4	4	44	Moderate	(-)
With Mitigation	2	1	3	4	3	30	Low	(-)
Mitigation and Management Measures	■ A walkthrough would be needed prior to construction to inform permit applications for protected plant species. ■ Where possible, ESAs that are located in the Vulnerable Rand Highveld Grassland should be avoided. ■ Construction crew, in particular the drivers, should undergo environmental training (induction) to increase their awareness of environmental concerns. This includes awareness as to remaining within demarcated construction areas, no littering, handling of pollution and chemical spills, avoiding fire hazards and minimising wildlife interactions. ■ Ensure that all temporary use areas e.g., laydown areas and construction camp, are located in areas of low sensitivity. ■ Footprints of the turbines, crane pads, roads, construction and substation locations should be clearly demarcated. Vegetation clearance should be confined to the footprint of the development and unnecessary clearance should be avoided. ■ The watercourses, rocky outcrops and rocky sheets should be avoided. ■ All vehicles are to remain on demarcated roads and no driving through the veld should be allowed. ■ No collection of 'fuelwood' should be allowed on site. ■ The ECO is to provide supervision on vegetation clearing activities and other activities which may cause damage to the environment, especially when construction commences and most vegetation clearing is taking place. ■ River/stream crossings should be placed in areas without extensive wetlands and preferably in areas where the risk of disruption and erosion is low. River/stream crossings should be specifically designed not to impede or disrupt the direction and flow of the water. Specific guidelines of the aquatic specialist should be followed. ■ No plants may be translocated or otherwise uprooted or disturbed without express permission from the ECO. ■ Permits are required for the destruction or removal of provincially specially protected or protected species.								

- **The potential loss of threatened, SCC, protected & endemic plant species**

The clearance of the vegetation for new access roads, upgrading of existing tracks, construction site, substation, turbines and crane pads may cause a loss of individuals of threatened, protected or endemic plant species. The site visit did however, not reveal the presence of any species with an IUCN threatened status or SCC mentioned by the Screening Tool. Only one provincially protected plant species was present on site, i.e. *Gladiolus permeabilis*. As the protected plant species at the site is not threatened, the loss of a small number of individuals (if any should mitigation be applied) is not likely to threaten the local or regional population of this species. The loss of some individuals of protected species is unlikely to alter the patterns or processes of the natural system, in the sense that environmental functions and processes will temporarily or permanently cease. *Gladiolus permeabilis* is found in Habitats 2 & 3 which were avoided by the development. Nevertheless, permits need to be obtained for the destruction or removal of provincially specially protected or protected species.

Table 9-17 – Impact on potential loss of threatened SCC, protected & endemic plant species during the construction phase

Potential Impact: potential loss of threatened SCC, protected & endemic plant species	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	4	4	2	**24**	**Low**	(-)
With Mitigation	2	1	4	4	1	**11**	**Very Low**	(-)
Mitigation and Management Measures	▪ A walkthrough would be needed prior to construction to inform permit applications for protected plant species. ▪ Placement of infrastructure should be done in such a way as to minimise the impact on SCC or protected species. ▪ Construction crew, in particular the drivers, should undergo environmental training (induction) to make them aware of the importance of SCC and protected species. ▪ Permits are required for removal of protected species prior to construction, should avoidance not be possible.							

- **Loss of faunal habitat**

The Screening Report refers to the Maquassie musk shrew *Crocidura maquassiensis* and the spotted-necked otter *Hydrictus maculicollis* as species of concern. *Crocidura maquassiensis* depends on wetlands as suitable habitat, whereas *Hydrictus maculicollis* is restricted to areas of permanent fresh water, offering good shoreline cover and an abundant prey base. *Crocidura maquassiensis* has not been reported from Gauteng or North West Province post-1999 and thus there is a very low probability for it to occur on site. Marginally suitable habitat for the spotted-necked otter is available on site. However, even if the species did occur on site it is unlikely that they would be affected by the development since their habitats will be avoided by the development. The two Lepidopteran species are unlikely to occur on site because their host plant was not recorded on site. The insect *Clonia uvarovi* inhabits tall woodland savanna, while the habitat on site could be described as bushveld. The bushveld may be marginally suitable for the species. Furthermore, the turbines are not located in any bushveld habitats.

Table 9-18 – Impact on Loss of faunal habitat during the construction phase

Potential Impact: loss of faunal habitat	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	3	4	4	44	Moderate	(-)
With Mitigation	2	1	3	4	3	30	Low	(-)
Mitigation and Management Measures	▪ Vegetation clearance should be confined to the smallest possible footprint of the development and unnecessary clearance should be avoided. ▪ Construction crew, in particular the drivers, should undergo environmental training (induction) to increase their awareness of environmental concerns. ▪ A speed limit (of e.g., 40 km/h or appropriate limit) should be set on all roads and strictly adhered to. ▪ Development should avoid drainage lines and rocky outcrops. The outcrops may be favoured habitat for reptiles and other species since they offer protection from predators. ▪ Proper waste management procedures should be in place to avoid waste lying around and to remove all waste material from the sites. ▪ Observe buffer zones along drainage lines.							

- **Direct faunal mortalities due to construction and increased traffic:**

Faunal mortalities may be caused by construction at the footprint of the infrastructure, construction vehicles or other operational activities and by electrical fences, should they be erected around the construction site and substation. In particular slow-moving species such as tortoises, might be prone to these mortalities. When animals ingest waste material or become ensnared in wires, fatalities might occur.

Larger more mobile fauna such as antelope and larger predators will most likely move away from areas of high activity during the construction phase. Smaller and less-mobile animals are not as capable of moving away and may seek shelter down burrows and other shelter sites. None of the SCC listed in the Screening Tool were encountered on site and generally the protected species listed for the region occur at a low density and thus it is unlikely that they would be directly encountered by people at the Igolide WEF.

Table 9-19 – Impact on Direct faunal mortalities due to construction and increased traffic during the construction phase

Potential Impact: Direct faunal mortalities due to construction and increased traffic	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	1	4	2	3	**27**	**Low**	(-)
With Mitigation	1	1	4	2	2	**16**	**Low**	(-)
Mitigation and Management Measures	▪ Construction crew, in particular the drivers, should undergo environmental training to increase their awareness of environmental concerns in order to reduce the number of road kills. The crew should also be made aware of not harming or collecting species such as snakes, tortoises and owls which are often persecuted. ▪ Proper waste management procedures should be in place to avoid litter, food or other foreign material from lying around and all waste material should be removed from the site. ▪ Speed limits (e.g. 40 km/h or appropriate limit) should be set on all roads on site. ▪ Personnel should not be allowed to roam into the veld. ▪ Ensure that cabling and electrical infrastructure at the site are buried sufficiently deeply to avoid being excavated by fauna and that where such infrastructure emerges above-ground that it is sufficiently protected from gnawing animals. ▪ Any dangerous fauna (e.g., snakes, scorpions) that are encountered during construction should not be handled or molested by construction staff and the ECO or other suitably qualified persons should be contacted to remove the animals to safety. ▪ Holes and trenches should not be left open for extended periods of time and should only be dug when needed for immediate construction. Trenches that may stand open for some days, should have an escape ramp to allow any fauna that fall in to escape. ▪ Should electrical fences be erected it must be done according to the norms and standards of the Nature ▪ Conservation Authorities in Gauteng. ▪ Access to the site should be strictly regulated to reduce the opportunities for poaching.								

- **Increased dust deposition:**

Increased dust deposition may harm physiological processes of plants and a reduction in the photosynthetic capacity of the plants may occur. The dust layer on the vegetation may also discourage herbivores from grazing or browsing. The increased dust levels will be temporary.

Table 9-20 – Impact on Increased dust deposition during the construction phase

Potential Impact: Increased dust deposition	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	1	1	2	3	18	Low	(-)
With Mitigation	2	1	1	2	2	11	Very Low	(-)
Mitigation and Management Measures	▪ Excessive dust must be reduced by spraying water onto the soil.							

- **Increased human activity, noise and light levels**

Construction activities will increase human presence, noise and light levels at the site. These activities may affect animal behaviour. Increased noise and light levels associated with the construction phase are temporary.

Table 9-21 – Impact on increased human activity, noise and light levels during the construction phase

Potential Impact: Increased human activity, noise and light levels	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	1	2	3	21	Low	(-)
With Mitigation	2	2	1	2	2	12	Very Low	(-)
Mitigation and Management Measures	▪ The SANS standards should be adhered to in terms of noise levels. ▪ No major construction should be done at night. ▪ If there is any part of the site that needs to be lit at night for security reasons, then appropriate lighting should be installed to minimise negative effects on nocturnal animals. Motion-detecting lights should also be considered.							

- **Impacts of roads:**

Roads are referred to under several impacts, but a summary is provided in this section. Even in natural regions roads are intrusive and destructive and cause a disturbance. Their construction destroys the vegetation, leads to compaction of the soil and loss of habitat for small animals. Roads can create barriers for small animals, cutting off dispersal routes and fragmenting habitats. Animals crossing or moving along roads can also become easy targets for predators. Compacted roads also impact on the movement of subterranean and burrowing animals. Dust kicked up by vehicles coat the roadside plants making them less attractive to animals. Poorly planned roads often result in water erosion problems and busy roads affect the movement of especially shy animals. Some destruction of the vegetation adjacent to the footprint will also inevitably occur when preparing the sites. Unnecessary clearing of vegetation beyond the footprint of the development can, however, largely be avoided.

Table 9-22 – Impacts of roads during the construction phase

Potential Impact: Impacts of roads	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	1	3	4	4	**48**	**Moderate**	(-)
With Mitigation	2	1	3	4	3	**30**	**Low**	(-)
Mitigation and Management Measures	▪ Wherever possible, existing roads/tracks should be used. ▪ The construction of a road should be done in the most environmentally sensitive manner possible. ▪ A suitably qualified person should plan, design and supervise the proper construction of roads to minimize the impact on the environment. ▪ Roads should be provided with run-off structures to reduce the risk of erosion. ▪ Proper road maintenance procedures should be in place. ▪ A long-term commitment to the maintenance of the road should be accepted. Roads can easily become ruts and erosion gullies if not properly planned and maintained. ▪ Driving in wet clayey soils after rain also result in deep tracks that damage the road surface and lead to other users bypassing such areas, thereby forming new tracks alongside the original ones. ▪ River/stream crossings should not be placed in areas with extensive wetlands and preferably in areas where the risk of disruption and erosion is low. All river/stream crossings should be inspected by the aquatic specialist during final design of the layout to ensure that optimal and acceptable locations have been chosen for river crossings. ▪ River/stream crossings should be specifically designed not to impede or disrupt the direction and flow of the water. Specific guidelines of the aquatic specialist should be followed. ▪ Roads should not have steep curbs. ▪ Implement a monitoring program for the early detection of alien invasive plant species. ▪ A control program should be employed to combat declared alien invasive plant species in the most environmentally friendly manner that does not result in undesirable secondary impacts.								

	▪ Herbicides for the control of alien species should be applied according to the relevant instructions and by appropriately trained personnel. ▪ No alien species should be used in rehabilitation or landscaping. ▪ Use only plants and seed collected on-site for revegetation. ▪ Cleared areas may need to be fenced-off during rehabilitation to exclude livestock and wildlife. ▪ Material brought onto site e.g., building sand should be regularly checked for the germination of alien species.

- **Establishment of alien vegetation:**

As a result of the clearance of indigenous vegetation and resulting degradation, alien species might invade the area. At present the level of alien infestation on site was rated as moderate to high. Twenty-one declared invasive species were noted on site and increased vehicle traffic may further facilitate the introduction of seeds of alien species. Infestation by invasive alien species may cause changes to the structure and functioning of the ecosystem which often exacerbate the further loss of indigenous vegetation. Bare areas that are not actively rehabilitated and areas receiving runoff are particularly vulnerable to alien infestation.

Table 9-23 – Impacts of Establishment of alien vegetation during the construction phase

Potential Impact: Establishment of alien vegetation	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	3	2	3	4	3	**36**	**Moderate**	(-)
With Mitigation	2	1	3	3	2	**18**	**Low**	(-)
Mitigation and Management Measures	▪ Implement a monitoring program for the early detection of alien invasive plant species. ▪ A control program should be employed to combat declared alien invasive plant species in the most environmentally friendly manner that does not result in undesirable secondary impacts. ▪ Herbicides for the control of alien species should be applied according to the relevant instructions and by appropriately trained personnel. ▪ No alien species should be used in rehabilitation or landscaping. ▪ Use only plants and seed collected on-site for revegetation. ▪ Cleared areas may need to be fenced-off during rehabilitation to exclude livestock and wildlife. ▪ Material brought onto site e.g., building sand should be regularly checked for the germination of alien species.							

- **Increased water run-off and erosion:**

Increased erosion (water and wind) and water run-off will be caused by the clearing of the indigenous vegetation and compaction of soil. The roads traversing hill slopes will be the main source of erosion if not properly constructed and provided with water run-off structures. In addition, the hardened surfaces created by the roads, crane pads and other infrastructure elements will increase runoff, which will pose an erosion risk in the areas receiving the water, even if these areas have not been disturbed. Increased run-off and erosion could affect hydrological processes in the area and change water and silt discharge into the streams.

The site lies within the summer rainfall region and can experience intense thundershowers, which will increase the potential for erosion. On slopes, active rehabilitation and mitigation measures to prevent erosion will be required.

Table 9-24 – Impacts of Increased water run-off and erosion during the construction phase

Potential Impact: Increased water run-off and erosion	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	4	4	3	42	Moderate	(-)
With Mitigation	3	2	3	4	2	24	Low	(-)
Mitigation and Management Measures	■ Clearing of vegetation, compaction and levelling should be restricted to the footprint of the proposed development. ■ All roads should have water diversion structures with energy dissipation features to slow and disperse the water into the receiving area. ■ A rehabilitation and revegetation plan should be developed as part of the EMP. ■ Regular monitoring of the site during construction for erosion problems. ■ Silt traps should be used where there is a danger of topsoil eroding and entering streams and other sensitive areas. ■ If applicable, topsoil should be removed and stockpiled, then reapplied as soon as possible in order to facilitate regeneration of the natural vegetation on cleared areas. ■ Where applicable, construct stabilisation structures on slopes to prevent erosion. ■ Reduce activity on site after large rainfall events when the soils are wet. No driving off hardened roads until soils have dried out and the risk of bogging down has decreased. ■ A suitably qualified person should plan, design and supervise the proper construction of roads to minimise the impact on the environment.								

- **Changes in animal behaviour:**

The increased human presence and/or construction operations will increase noise levels as well as light levels at night. The increased human presence, elevated noise and light levels, loss of animal habitat and compaction of soils may alter the behavioural patterns of some animals. Some of these changes may favour certain species and negatively affect others and consequently change the composition of the animal communities. Species with small territories will be negatively affected as well as species that live in the soil.

Research elsewhere showed that the response of animals to wind energy facilities was highly species-specific and could range from avoidance to a positive reaction. The response was apparently also depended on the level of predation, with no impact noted where predation pressure was low. Wind farms affect large terrestrial mammals mainly through an increase in human activity within the wind farm area. During the construction phase, the mobile large-mammal carnivores and ungulates may temporarily avoid the site, but when construction ceases and human presence decreases, these animals generally acclimate to the wind energy infrastructure. The impact on burrowing fauna may be higher, since these animals are usually sensitive to soil tremors and disturbances, and consequently they will likely move away from construction areas. It is anticipated that the impact of the Igolide site on the fauna would mostly be temporary, i.e., during the construction phase.

Table 9-25 – Impacts of changes in animal behaviour during the construction phase

Potential Impact: Changes in animal behaviour	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	1	3	3	**24**	**Low**	(-)
With Mitigation	2	1	1	2	2	**12**	**Very Low**	(-)
Mitigation and Management Measures	- Construction crew should undergo environmental training, by way of an induction course, to increase their awareness of environmental concerns. - Development should avoid rocky outcrops and wetlands. - Soil compaction should be kept to a minimum by restricting driving to designated roads. - If there is any part of the site that needs to be lit at night for security reasons, then appropriate lighting should be installed to minimise negative effects on nocturnal animals. Motion-detecting lights should also be considered. - The mitigation measures as indicated by the noise specialist must be adhered to.							

9.4.2 OPERATIONAL PHASE

- **Direct faunal mortalities:**

Faunal mortalities may be caused by maintenance vehicles or other maintenance activities, electric fences and ingestion of waste material. In particular slow-moving species such as tortoises, might be prone to road mortalities. Fatalities might also arise when animals become ensnared in wires or in electric fences. Bird collisions with the wind turbine blades will be addressed by the avifaunal and bat specialists.

Although activity at the site is likely to be relatively low during operation, some impact on fauna may still occur as a result of personnel present on site as well as the operation of maintenance vehicles. Direct interactions between the turbines and terrestrial fauna (excluding avifauna and bats) are likely to be low. Major risk factors during operation are likely to be from vehicle collisions with fauna.

Table 9-26 – Impact on Direct faunal mortalities during the operational phase

Potential Impact: Direct faunal mortalities	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	1	4	4	3	36	Moderate	(-)
With Mitigation	2	1	4	4	2	22	Low	(-)
Mitigation and Management Measures	▪ Maintenance crew should undergo environmental training, by way of an induction course, to increase their awareness of environmental concerns. ▪ Access to the site should be strictly controlled. ▪ All excess wires, cables and waste material should be removed from the site. ▪ All vehicles at the site should adhere to a low speed limit (of e.g. 40 km/h (or whatever is appropriate) and slow-moving fauna such as tortoises on roads should be moved off the road. ▪ Electrical fences should be erected according to the norms and standards of the Nature Conservation Authorities in Gauteng.							

- **Increased light and noise levels and changes in animal behaviour:**

The loss of vegetation cover, compacting of soils, increased noise levels and the increased human presence will alter animal behavioural patterns by making certain areas unavailable and making roads difficult to traverse, Some animal species will be more affected than others. These species might undergo a reduction in their population size.

According to Todd & Skowno (2014), small mammals, reptiles and amphibians are not likely to move away from the turbines on account of the noise as these animals do not rely on sound to forage and rely largely on plant cover and other avoidance measures to avoid predators. Although frogs communicate with their calls, the pitch of the noise generated by the turbines is not likely to be similar to that of the frogs and a significant impact is unlikely. Fauna which rely heavily on hearing for foraging or predator avoidance are potentially worst affected by the noise. This would include species that rely extensively on hearing for prey detection or predator avoidance. However, it is difficult to predict the impact on these species without entering into a high degree of speculation as there has been little research on this topic and hence there is no baseline in terms of known impacts due to turbine noise on fauna, especially within the South African context. However, noise due to turbines at the site will be variable and related to wind direction and operating conditions among other factors. As most fauna are adaptable with regards to noise, it is likely that any affected fauna would adapt to the local conditions and it is not likely that there would be any ecosystem-level or trophic impacts due to turbine noise. According to Todd & Skowno (2014) the possibility that predators such as jackal and caracal would prey more heavily on livestock or wildlife as a result of turbine noise, is not a likely scenario.

Table 9-27 – Impact on Increased light and noise levels and changes in animal behaviour during the operational phase

Potential Impact: Increased light and noise levels and changes in animal behaviour	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	3	4	3	33	Moderate	(-)
With Mitigation	2	1	1	4	2	16	Low	(-)
Mitigation and Management Measures	▪ The mitigation measures as indicated by the noise specialist must be adhered to. ▪ Maintenance crew should undergo environmental training, by way of an induction course, to increase their awareness of environmental concerns. ▪ Soil compaction should be kept to a minimum by restricting driving to designated roads. ▪ If there is any part of the site that needs to be lit at night for security reasons, then appropriate lighting should be installed to minimise negative effects on nocturnal animals. Motion-detecting lights should also be considered.							

- **Establishment of alien vegetation:**

As a result of the loss of indigenous vegetation and resulting degradation, primarily during the construction phase, alien species might invade the area. Alien invasive species are generally more common in road reserves than the adjacent undisturbed farmland. The invasion by alien species will continue unless controlled. Increased vehicle traffic may further facilitate the introduction of seeds of alien species. If not controlled, infestation by invasive alien species may eventually cause changes to the structure and functioning of the ecosystem which often exacerbate the further loss of indigenous vegetation.

Table 9-28 – Impact on Establishment of alien vegetation during the operational phase

Potential Impact: Establishment of alien vegetation	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	4	3	36	Moderate	(-)
With Mitigation	2	1	3	3	2	18	Low	(-)
Mitigation and Management Measures	▪ Implement a monitoring program for the early detection of alien invasive plant species and a control program to combat declared alien invasive plant species should be employed. ▪ No alien species should be used for landscaping, rehabilitation or any other purpose. ▪ Clearing of alien species should be done on a regular basis.							

- **Increased water run-off and erosion:**

Disturbance created during construction will take several years to fully stabilise and the increase in compacted areas as a result of roads, turbines and crane pads may increase runoff which will pose an erosion risk. Particular areas of concern would be roads traversing slopes as well as any infrastructure on slopes with erodible soils. Consequently, erosion risk during operation is likely to be centred on areas disturbed during construction and on areas receiving runoff from roads and similar hardened surfaces. Increased run-off and erosion could affect hydrological processes in the area and may change water discharge into the streams and increase silt load.

Table 9-29 – Impact on Increased water run-off and erosion during the operational phase

Potential Impact: Increased water run-off and erosion	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	4	3	36	Moderate	(-)
With Mitigation	3	2	3	4	2	24	Low	(-)
Mitigation and Management Measures	▪ Proper road maintenance procedures should be in place. ▪ Regular monitoring of the site during operation for erosion problems. ▪ Should new sections of the road be needed, a suitably qualified person should plan, design and supervise the proper construction of roads. ▪ Reduced activity at the site after large rainfall events when the soils are wet.							

9.4.3 DECOMMISSIONING PHASE

- **Faunal mortalities:**

Faunal mortalities may be caused by vehicles or other decommissioning activities and waste. In particular slow-moving species such as tortoises, might be prone to road mortalities. When animals ingest waste material or become ensnared in its fatalities might also occur.

Table 9-30 – Impact on faunal mortalities during the decommissioning phase

Potential Impact: faunal mortalities	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	1	4	1	3	24	Low	(-)
With Mitigation	1	1	4	1	2	12	Very low	(-)
Mitigation and Management Measures	- Decommissioning crew should undergo environmental training to increase their awareness of environmental concerns. - Speed limits (of e.g., 40 km/h) should be adhered to. - Proper waste management procedures should be in place and no material should be left on site in order to prevent instances of ensnarement or ingestion of foreign material. Electrical fences should be erected according to the norms and standards of the Nature Conservation Authorities in Gauteng.							

- **Increased dust deposition:**

Increased dust deposition may harm physiological processes of plants and a reduction in the photosynthetic capacity of the plants may occur. The dust layer on the vegetation may also discourage herbivores from grazing or browsing the dust covered vegetation. The increased dust levels will be temporary.

Table 9-31 – Impact on Increased dust deposition during the decommissioning phase

Potential Impact: Increased dust deposition	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	1	1	2	3	18	Low	(-)
With Mitigation	1	1	1	2	2	9	Very low	(-)

Mitigation and Management Measures	▪ Excessive dust must be reduced by spraying water onto the soil.

- **Establishment of alien vegetation:**

As a result of the decommissioning activities, areas will be disturbed and alien species might invade. Increased vehicle traffic may facilitate the introduction of seeds of alien species.

Table 9-32 – Impact on Establishment of alien vegetation during the decommissioning phase

Potential Impact: Establishment of alien vegetation	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	4	3	**36**	**Moderate**	(-)
With Mitigation	2	1	1	3	2	**14**	**Very low**	(-)
▪ Mitigation and Management Measures	▪ Implement a monitoring program (e.g., at three-month intervals) for at least three years after decommissioning to document alien infestation across the site. ▪ A control program to combat declared alien invasive plant species should be employed. ▪ Areas where turbines, crane pads or other infrastructure are removed, must be revegetated with indigenous plant species. ▪ No alien species should be used for rehabilitation/revegetation or any other purpose.							

- **Increased water run-off and erosion:**

Some of the existing roads might have to be upgraded and increased erosion and water run-off will thus be caused by the clearing of the indigenous vegetation and soil disturbance. Decommissioning would involve the removal of the infrastructure of the facility and the rehabilitation of the roads and other hard infrastructure of the facility. If the rehabilitation is not successful, this would leave the site vulnerable to erosion. Without management, increased run-off and erosion could affect hydrological processes in the area and may change water discharge into the streams and increase silt load.

Table 9-33 – Impact on Increased water run-off and erosion during the decommissioning phase

Potential Impact: Increased water run-off and erosion	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	4	3	**36**	**Moderate**	(-)

	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
With Mitigation	3	2	3	4	2	24	Low	(-)
▪ Mitigation and Management Measures	▪ No new roads should be built. ▪ Proper road maintenance procedures should be in place during the decommissioning phase. ▪ Removal of all infrastructure components from the site. ▪ Rehabilitation of all cleared and disturbed areas with local species. Implement a monitoring programme (e.g., at six-month intervals) for at least three years after decommissioning to document vegetation recovery on site. ▪ Off-site disposal of all facility components such as cabling and turbine parts.							

9.5 PLANT SPECIES ASSESSMENT

9.5.1 CONSTRUCTION PHASE

Table 9-34 - Impact on Loss of vegetation/ habitat during the construction phase

Potential Impact: Loss of vegetation/ habitat	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	3	4	4	44	Moderate	(-)
With Mitigation	2	1	3	4	3	30	Low	(-)
▪ Mitigation and Management Measures	▪ Avoidance: Areas of undisturbed natural habitat should be avoided as far as practically possible: A walkthrough would be needed prior to construction to ensure that sensitive species and/or habitats are avoided and to inform permitting. Should the results of the walkthrough indicate that sensitive species and/or habitats are not fully avoided, further micrositing of the infrastructure should be undertaken through an amendment process post-authorisation. Where possible, ESAs that are located in the Vulnerable Rand Highveld Grasslan should be avoided. Construction crew, in particular the drivers, should undergo environmental training (induction) to increase their awareness of environmental concerns. This includes awareness as to remaining within demarcated construction areas, no littering, handling of pollution and chemical spills, avoiding fire hazards and minimising wildlife interactions.							

	Ensure that all temporary use areas e.g., laydown areas and construction camp, are located in areas of low sensitivity. ▪ Permits must be obtained for the destruction or removal of provincially specially protected or protected species.

Table 9-35 - Impact on Loss of threatened, SCC, protected & endemic plant species during the construction phase

Potential Impact: Loss of threatened, SCC, protected & endemic plant species	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	4	4	2	24	Low	(-)
With Mitigation	2	1	4	4	1	11	Low	(-)
▪ Mitigation and Management Measures	▪ Minimisation: ▪ Footprints of the turbines, crane pads, roads, construction and substation locations should be clearly demarcated. ▪ Vegetation clearance should be confined to the footprint of the development and unnecessary clearance should be avoided. ▪ All vehicles are to remain on demarcated roads and no driving through the veld should be allowed. ▪ No collection of 'fuelwood' should be allowed on site.							

Table 9-36 - Impact on Increased dust deposits during the construction phase

Potential Impact: Increased dust deposits	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	1	1	2	3	18	Low	(-)
With Mitigation	2	1	1	2	2	12	Very Low	(-)
▪ Mitigation and Management Measures	▪ Excessive dust must be reduced by spraying water onto the soil. Material brought onto site e.g., building sand should be regularly checked for the germination of alien species.							

Table 9-37 - Impact on Establishment of alien vegetation during the construction phase

Potential Impact: Establishment of alien vegetation	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	4	3	36	Moderate	(-)
With Mitigation	2	1	3	3	2	18	Low	(-)
▪ Mitigation and Management Measures	▪ Minimisation and Avoidance: • Implement a monitoring program for the early detection of alien invasive plant species. • A control program should be employed to combat declared alien invasive plant species in the most environmentally friendly manner that does not result in undesirable secondary impacts. • Herbicides for the control of alien species should be applied according to the relevant instructions and by appropriately trained personnel. • Material brought onto site e.g., building sand should be regularly checked for the germination of alien species. ▪ Rehabilitation: • No alien species should be used in rehabilitation or landscaping. • Use only plants and seed collected on-site for revegetation. • Cleared areas may need to be fenced-off during rehabilitation to exclude livestock and wildlife.							

Table 9-38 - Impact on Increased water run-off and erosion during the construction phase

Potential Impact: Increased water run-off and erosion	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	4	4	3	42	Low	(-)
With Mitigation	3	2	3	4	2	24	Very Low	(-)
▪ Mitigation and Management Measures	▪ Avoidance and Minimisation: • Clearing of vegetation, compaction and levelling should be restricted to the footprint of the proposed development. • All roads should have water diversion structures with energy dissipation features to slow and disperse the water into the receiving area.							

	• Regular monitoring of the site during construction must be undertaken to identify and address erosion problems. • Silt traps should be used where there is a danger of topsoil eroding and entering streams and other sensitive areas. • Where applicable, construct stabilisation structures must be installed on slopes to prevent erosion. • Reduce activity on site after large rainfall events when the soils are wet. No driving off hardened roads until soils have dried out and the risk of bogging down has decreased. • A suitably qualified person should plan, design and supervise the proper construction of roads to minimise the impact on the environment.

9.5.1 OPERATIONAL PHASE

Table 9-39 - Impact on Establishment of alien vegetation during the operational phase

Potential Impact: Establishment of alien vegetation	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	4	3	36	Moderate	(-)
With Mitigation	2	1	3	3	2	18	Low	(-)
▪ Mitigation and Management Measures	▪ Avoidance and Minimisation: ▪ Minimisation: ▪ Footprints of the turbines, crane pads, roads, construction and substation locations should be clearly demarcated. ▪ Vegetation clearance should be confined to the footprint of the development and unnecessary clearance should be avoided. ▪ All vehicles are to remain on demarcated roads and no driving through the veld should be allowed. • No collection of 'fuelwood' should be allowed on site.							

Table 9-40 - Impact on Increased water run-off and erosion during the operational phase

Potential Impact: Increased water run-off and erosion	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	4	3	36	Moderate	(-)

With Mitigation	3	2	3	4	2	**24**	**Low**	(-)

▪ Mitigation and Management Measures	▪ Minimisation and Avoidance: • Implement a monitoring program for the early detection of alien invasive plant species. • A control program should be employed to combat declared alien invasive plant species in the most environmentally friendly manner that does not result in undesirable secondary impacts. • Herbicides for the control of alien species should be applied according to the relevant instructions and by appropriately trained personnel. • Material brought onto site e.g., building sand should be regularly checked for the germination of alien species. ▪ Rehabilitation: • No alien species should be used in rehabilitation or landscaping. • Use only plants and seed collected on-site for revegetation. • Cleared areas may need to be fenced-off during rehabilitation to exclude livestock and wildlife.

9.5.1 DECOMMISSIONING PHASE

Table 9-41 - Impact on Increased dust deposits during the decommissioning phase

Potential Impact: Increased dust deposits	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	1	1	2	3	**18**	**Low**	(-)
With Mitigation	1	1	1	2	2	**10**	**Very Low**	(-)
▪ Mitigation and Management Measures	▪ Excessive dust must be reduced by spraying water onto the soil. Material brought onto site e.g., building sand should be regularly checked for the germination of alien species.							

Table 9-42 - Impact on Establishment of alien vegetation during the decommissioning phase

Potential Impact: Establishment of alien vegetation	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	4	3	36	Moderate	(-)
With Mitigation	2	1	1	3	2	14	Very Low	(-)
▪ Mitigation and Management Measures	▪ Avoidance and Minimisation: • Clearing of vegetation, compaction and levelling should be restricted to the footprint of the proposed development. • All roads should have water diversion structures with energy dissipation features to slow and disperse the water into the receiving area. • Regular monitoring of the site during construction must be undertaken to identify and address erosion problems. • Silt traps should be used where there is a danger of topsoil eroding and entering streams and other sensitive areas. • Where applicable, construct stabilisation structures must be installed on slopes to prevent erosion. • Reduce activity on site after large rainfall events when the soils are wet. No driving off hardened roads until soils have dried out and the risk of bogging down has decreased. • A suitably qualified person should plan, design and supervise the proper construction of roads to minimise the impact on the environment.							

Table 9-43 - Impact on Increased water run-off and erosion during the decommissioning phase

Potential Impact: Increased water run-off and erosion	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	4	3	36	Moderate	(-)
With Mitigation	3	2	3	4	2	24	Low	(-)
▪ Mitigation and Management Measures	▪ Avoidance and Minimisation:							

	• Clearing of vegetation, compaction and levelling should be restricted to the footprint of the proposed development. • All roads should have water diversion structures with energy dissipation features to slow and disperse the water into the receiving area. • Regular monitoring of the site during construction must be undertaken to identify and address erosion problems. • Silt traps should be used where there is a danger of topsoil eroding and entering streams and other sensitive areas. • Where applicable, construct stabilisation structures must be installed on slopes to prevent erosion. • Reduce activity on site after large rainfall events when the soils are wet. No driving off hardened roads until soils have dried out and the risk of bogging down has decreased. • A suitably qualified person should plan, design and supervise the proper construction of roads to minimise the impact on the environment.

9.6 ANIMAL SPECIES ASSESSMENT

9.6.1 PRE - CONSTRUCTION PHASE

Table 9-44 - Impact on Loss of faunal habitat during the construction phase

Potential Impact: Loss of faunal habitat	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	3	4	4	44	Moderate	(-)
With Mitigation	2	1	3	4	3	30	Low	(-)
▪ Mitigation and Management Measures	▪ Avoidance: Areas of undisturbed natural habitat should be avoided as far as practically possible: A walkthrough would be needed prior to construction to ensure that sensitive species and/or habitats are avoided and to inform permitting. Should the results of the walkthrough indicate that sensitive species and/or habitats are not fully avoided, further micrositing of the infrastructure should be undertaken through an amendment process post-authorisation. Construction crew, in particular the drivers, should undergo environmental training (induction) to increase							

	their awareness of environmental concerns. This includes awareness as to remaining within demarcated construction areas, no littering, handling of pollution and chemical spills, avoiding fire hazards and minimising wildlife interactions. Ensure that all temporary use areas e.g. laydown areas and construction camp, are located in areas of low sensitivity. Permits should be obtained for the destruction or removal of provincially specially protected or protected species.

9.6.2 CONSTRUCTION PHASE

Table 9-45 - Impact on Loss of faunal habitat during the construction phase

Potential Impact: Loss of faunal habitat	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	3	4	4	44	Moderate	(-)
With Mitigation	2	1	3	4	3	30	Low	(-)
▪ Mitigation and Management Measures	▪ Minimisation: Footprints of the turbines, crane pads, roads, construction and substation locations should be clearly demarcated. Vegetation clearance should be confined to the footprint of the development and unnecessary clearance should be avoided; and All vehicles are to remain on demarcated roads and no driving through the veld should be allowed.							

Table 9-46 - Impact on Direct faunal mortalities due to construction and increased traffic during the construction phase

Potential Impact: Direct faunal mortalities due to construction and increased traffic	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	1	4	2	3	27	Low	(-)
With Mitigation	1	1	4	2	2	16	Low	(-)
▪ Mitigation and Management Measures	▪ Minimisation and avoidance: • Speed limits (e.g. 40 km/h or appropriate limit) should be set on all roads on site.							

	- Holes and trenches should not be left open for extended periods of time and should only be dug when needed for immediate construction. Trenches that may stand open for some days, should have an escape ramp to allow any fauna that fall in to escape. - Should electrical fences be erected it must be done according to the norms and standards of the Nature Conservation Authorities in Gauteng. - Access to the site should be strictly regulated to reduce the opportunities for collusions. - Footprints of the turbines, crane pads, roads, construction and substation locations should be clearly demarcated. - Vegetation clearance should be confined to the footprint of the development and unnecessary clearance should be avoided; and - All vehicles are to remain on demarcated roads and no driving through the veld should be allowed.

Table 9-47 - Impact on Increased dust deposition during the construction phase

Potential Impact: Increased dust deposition	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	2	1	1	2	3	**18**	**Low**	(-)
With Mitigation	2	1	1	2	2	**12**	**Very Low**	(-)
▪ Mitigation and Management Measures	▪ Minimisation and avoidance: Excessive dust must be reduced by spraying water onto the soil. Footprints of the turbines, crane pads, roads, construction and substation locations should be clearly demarcated.							

Table 9-48 - Impact on Increased human activity, noise and light levels during the construction phase

Potential Impact: Increased human activity, noise and light levels.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	1	2	3	21	Low	(-)
With Mitigation	2	1	1	2	2	12	Very Low	(-)
▪ Mitigation and Management Measures	▪ Minimisation and avoidance: • The SANS standards should be adhered to in terms of noise levels. • No major construction should be done at night. • If there is any part of the site that needs to be lit at night for security reasons, then appropriate lighting should be installed to minimise negative effects on nocturnal animals.							

Table 9-49 - Impact on Impacts of roads during the construction phase

Potential Impact: Impacts of roads	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	1	3	4	4	48	Moderate	(-)
With Mitigation	2	1	3	4	3	30	Low	(-)
▪ Mitigation and Management Measures	▪ Minimisation and avoidance: • Wherever possible, existing roads/tracks should be used. • Roads should not have steep curbs. • Avoid driving in wet clay soils after rain also as it may result in deep tracks that damage the road surface and lead to other users bypassing such areas, thereby forming new tracks alongside the original ones.							

Table 9-50 - Impact on Changes in animal behaviour during the construction phase

Potential Impact: Changes in animal behaviour	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	3	4	3	33	Moderate	(-)
With Mitigation	2	1	1	4	2	16	Low	(-)
▪ Mitigation and Management Measures	▪ Minimisation and avoidance: • Development should avoid rocky outcrops and wetlands. • If there is any part of the site that needs to be lit at night for security reasons, then appropriate lighting should be installed to minimise negative effects on nocturnal animals. • Soil compaction should be kept to a minimum by restricting driving to designated roads. • The mitigation measures as indicated by the noise specialist must be adhered to.							

9.6.3 OPERATIONAL PHASE

Table 9-51 - Impact on Direct faunal mortalities during the operational phase

Potential Impact: Direct faunal mortalities	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	4	3	36	Moderate	(-)
With Mitigation	2	1	4	4	2	22	Low	(-)
▪ Mitigation and Management Measures	▪ Avoidance and Minimisation: • Access to the site should be strictly controlled. • Maintenance crew should undergo environmental training, by way of an induction course, to increase their awareness of environmental concerns. • All vehicles at the site should adhere to a low speed limit (of e.g. 40 km/h (or whatever is appropriate) and slow-moving fauna on roads should be moved off the road.							

Table 9-52 - Impact on Increased light and noise levels and changes in animal behaviour during the operational phase

Potential Impact: Increased light and noise levels and changes in animal behaviour	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	3	4	3	33	Moderate	(-)
With Mitigation	2	1	1	4	2	16	Low	(-)
▪ Mitigation and Management Measures	▪ Avoidance and Minimisation: • Minimisation and avoidance: • The SANS standards should be adhered to in terms of noise levels. • No major construction should be done at night. • If there is any part of the site that needs to be lit at night for security reasons, then appropriate lighting should be installed to minimise negative effects on nocturnal animals. • Development should avoid rocky outcrops and wetlands. • If there is any part of the site that needs to be lit at night for security reasons, then appropriate lighting should be installed to minimise negative effects on nocturnal animals. • Soil compaction should be kept to a minimum by restricting driving to designated roads. • The mitigation measures as indicated by the noise specialist must be adhered to.							

9.6.4 DECOMMISSIONING PHASE

Table 9-53 - Impact on Faunal mortalities during the decommissioning phase

Potential Impact: Faunal mortalities	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	1	4	2	3	24	Low	(-)
With Mitigation	1	1	1	2	2	10	Very Low	(-)
▪ Mitigation and Management Measures	▪ Access to the site should be strictly controlled. ▪ Maintenance crew should undergo environmental training, by way of an induction course, to increase their awareness of environmental concerns. ▪ All vehicles at the site should adhere to a low speed limit (of e.g. 40 km/h (or whatever is appropriate) and slow-moving fauna on roads should be moved off the road.							

	▪ Proper waste management procedures should be in place and no material should be left on site in order to prevent instances of ensnarement or ingestion of foreign material.

Table 9-54 - Impact on Increased dust deposition during the decommissioning phase

Potential Impact: Increased dust deposition	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	1	4	1	3	**24**	**Low**	(-)
With Mitigation	1	1	1	2	2	**10**	**Very Low**	(-)
▪ Mitigation and Management Measures	▪ Excessive dust must be reduced by spraying water onto the soil. Material brought onto site e.g., building sand should be regularly checked for the germination of alien species.							

9.7 AVIFAUNA IMPACT ASSESSMENT

9.7.1 CONSTRUCTION PHASE

Impacts to avifauna during the construction phase includes the following:

- Total or partial displacement due to noise disturbance and habitat transformation associated with the construction of the wind turbines and associated infrastructure.

Table 9-55 – Impact of displacement of priority species during the construction phase

Potential Impact: Displacement of priority species Noise pollution and environmental disruption from construction activity	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	1	3	2	5	**50**	**Moderate**	(-)
With Mitigation	4	1	3	2	3	**30**	**Low**	(-)
Mitigation and Management Measures	▪ No turbines should be constructed in the turbine exclusion buffer zones as indicated in the sensitivity map. ▪ Restrict construction to the immediate infrastructural footprint. Access to remaining areas should be strictly controlled to minimise disturbance of priority species. This recommendation especially applies within the very high and high sensitivity areas depicted in the sensitivity map. ▪ Minimise removal of natural vegetation and rehabilitate natural vegetation post-construction where possible.							

	■ Prioritise upgrading existing roads (where the requisite roads authority permission has been issued) over constructing new roads. ■ Apply noise and dust control measures according to best practice in the industry. ■ Strictly implement the recommendations of ecological and botanical specialists to reduce the level of habitat loss.

9.7.2 OPERATIONAL PHASE

Impacts to Avifauna during the operational phase includes:

- Total or partial displacement due to habitat transformation associated with the presence of the wind turbines and associated infrastructure.
- Collisions with the wind turbines.
- Electrocutions at the on-site substation and on the overhead sections of the internal 33kV network.
- Collisions with overhead sections of the internal 33kV network.

Table 9-56 – Impact of Displacement of priority species from breeding/feeding/roosting areas during the operational phase

Potential Impact: Displacement of priority species from breeding/feeding/roosting areas Habitat transformation resulting from the wind turbines and associated infrastructure	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	1	4	4	**40**	**Moderate**	(-)
With Mitigation	3	2	1	4	3	**30**	**Low**	(-)
Mitigation and Management Measures	■ No turbines should be constructed in the turbine exclusion buffer zones as indicated in the sensitivity map. ■ Restrict construction to the immediate infrastructural footprint where possible. Access to remaining areas should be strictly controlled to minimise disturbance of priority species. This recommendation especially applies within the very high and high sensitivity areas depicted in the sensitivity map. ■ Once operational, vehicle and pedestrian access to the site should be controlled and restricted to the facility footprint as much as possible to prevent unnecessary destruction of vegetation. ■ Formal live-bird monitoring should commence following initial turbine operation, as per the Best Practice Guidelines, to determine the extent to which priority species displacement has occurred. Operational monitoring should be undertaken for the first two (preferably three) years of operation, and then repeated every five years thereafter for the operational lifetime of the facility.								

Table 9-57 – Impact Bird mortality and injury resulting from collisions with the wind turbines during the operational phase

Potential Impact: Bird mortality and injury resulting from collisions with the wind turbines Population reduction of priority species	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	5	1	4	4	52	Moderate	(-)
With Mitigation	3	2	1	4	3	30	Low	(-)
Mitigation and Management Measures	▪ No turbines should be constructed in the turbine exclusion buffer zones as indicated in the sensitivity map. ▪ Restrict construction to the immediate infrastructural footprint where possible. Access to remaining areas should be strictly controlled to minimise disturbance of priority species. This recommendation especially applies within the very high and high sensitivity areas depicted in the sensitivity map. ▪ Once operational, vehicle and pedestrian access to the site should be controlled and restricted to the facility footprint as much as possible to prevent unnecessary destruction of vegetation. ▪ Formal live-bird monitoring should commence following initial turbine operation, as per the Best Practice Guidelines, to determine the extent to which priority species displacement has occurred. Operational monitoring should be undertaken for the first two (preferably three) years of operation, and then repeated every five years thereafter for the operational lifetime of the facility.								

Table 9-58 – Impact of the Electrocution of priority species on the on-site sub-stations and internal 33kV network. during the operational phase

Potential Impact: Electrocution of priority species on the on-site sub-stations and internal 33kV network. Population reduction of priority species	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	5	1	4	4	52	Moderate	(-)
With Mitigation	3	2	1	4	3	30	Low	(-)
Mitigation and Management Measures	▪ Use underground cabling as much as is practically possible. ▪ Where the use of overhead lines is unavoidable, raptor-friendly pole design should be used, with appropriate mitigation measures for complicated pole structures (e.g., insulation of live components to prevent electrocutions on								

	terminal structures and pole transformer), as recommended by the Avifaunal Specialist. ▪ Apply insulation reactively in the substation if significant electrocutions of SCC are recorded.

Table 9-59 – Impact of the Collisions of priority species with the internal 33kV network during the operational phase

Potential Impact: Collisions of priority species with the internal 33kV network Population reduction of priority species	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	5	1	4	4	**52**	**Moderate**	(-)
With Mitigation	3	2	1	4	3	**30**	**Low**	(-)
Mitigation and Management Measures	▪ Use underground cabling as much as is practically possible. ▪ All above-ground internal medium voltage lines must be marked with Eskom approved Bird Flight Diverters according to the applicable Eskom standard.							

9.7.3 DECOMMISSIONING PHASE

Impacts to Avifauna during the decommissioning phase includes:

- Total or displacement due to disturbance associated with the decommissioning of the wind turbines and associated infrastructure.

Table 9-60 – Impact of the Noise pollution and environmental disruption during the decommissioning phase during the decommissioning phase

Potential Impact: Noise pollution and environmental disruption during the decommissioning phase Total/partial displacement of priority species from breeding/feeding/roosting areas	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	1	3	2	5	**50**	**Moderate**	(-)
With Mitigation	3	2	1	4	3	**30**	**Low**	(-)
Mitigation and Management Measures	▪ Restrict dismantling to the immediate infrastructural footprint where possible. Access to remaining areas should be strictly controlled to minimise disturbance of priority species. This recommendation especially applies within the very high and high sensitivity areas depicted in the sensitivity map. ▪ Apply noise and dust control measures according to best practice in the industry							

	▪ Prioritise the use of existing access roads during the decommissioning phase and avoid construction of new roads where feasible. ▪ The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the activity footprint is concerned.

9.8 ARCHAEOLOGICAL AND CULTURAL HERITAGE IMPACT ASSESSMENT

9.8.1 CONSTRUCTION PHASE

- **Impacts to archaeological resources:**

Direct impacts to archaeological resources would occur during the construction phase when equipment is brought onto site and grubbing and excavation begin. The layout shows no turbines within known archaeological sites but some are very close which means that once the full width of the hardstands is cleared some impacts are likely. Furthermore, a project road passes through an archaeological site. The potential significance calculates to moderate negative before mitigation (**Table 9-61**).

There are no fatal flaws in terms of construction phase impacts to archaeology.

Table 9-61 – Impact to archaeological resources during the construction phase

Potential Impact: Archaeological resources Damage to or destruction of sites	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	5	5	4	60	Moderate	(-)
With Mitigation	1	1	5	5	1	12	Very low	(-)
Mitigation and Management Measures	▪ Implement a 30 m buffer between the archaeological sites and the proposed infrastructure (it is recognised that a 30 m buffer may be impossible to the south of Site 05 due to the farm boundary but the buffer in this area should be as large as is technically feasible); and ▪ Report any chance finds made during development.							

Table 9-62 – Impact to graves during the construction phase

Potential Impact: Graves Damage to or destruction of graves	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	2	5	5	5	**51**	**Moderate**	(-)
With Mitigation	5	1	5	5	1	**16**	**low**	(-)
Mitigation and Management Measures	▪ Implementing a minimum 30 m no-go buffer around the graveyard at Site 23 and fencing the portion of the graveyard falling within the project site with a farm-style fence with pedestrian gate.							

Table 9-63 – Impact to Cultural landscape during the construction phase

Potential Impact: Cultural landscape Visual intrusion into the cultural landscape	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	3	1	2	5	**40**	**Moderate**	(-)
With Mitigation	1	3	1	2	5	**35**	**Moderate**	(-)
Mitigation and Management Measures	▪ Ensuring that all areas not required during operation are rehabilitated; and ▪ Keeping the construction phase as short as possible.							

9.8.2 OPERATIONAL PHASE

- **Impacts to the cultural landscape:**

Direct impacts to the cultural landscape would occur during the operation phase through the presence of the facility in the landscape, as well as from the red aircraft navigation lights that would be lit at night. The impacts might be moderate negative before mitigation (**Table 9-64**). Mitigation would entail:

- Ensuring that all maintenance activities remain in designated and approved areas;
- Paint buildings in earthy colours where feasible to reduce contrast and
- Making use of an early-warning system to switch the red lights on only when required.

The latter measure is less significant in the context of a landscape in which large industrial facilities (mines) occur and which are generally lit at night resulting in an already visually polluted night sky.

Although the calculated rating drops slightly, the post-mitigation significance remains moderate negative. This rating is again possibly higher than it should be.

There are no fatal flaws in terms of operation phase impacts to the cultural landscape.

Table 9-64 – Impact to Cultural landscape during the construction phase

Potential Impact: Cultural landscape Visual intrusion into the cultural landscape	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	3	1	4	5	**50**	**Moderate**	(-)
With Mitigation	1	3	1	4	5	**45**	**Moderate**	(-)
Mitigation and Management Measures	▪ Ensuring that all maintenance activities remain in designated and approved areas; ▪ Paint buildings in earthy colours where feasible to reduce contrast and ▪ Making use of an early-warning system to switch the red lights on only when required.							

9.8.3 DECOMMISSIONING PHASE

The decommissioning impacts are expected to be the same as the construction phase, therefore the same mitigation measures should be implemented.

Table 9-65 – Impact to Cultural landscape during the construction phase

Potential Impact: Cultural landscape Visual intrusion into the cultural landscape	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	3	1	2	5	**40**	**Moderate**	(-)
With Mitigation	1	3	1	2	5	**35**	**Moderate**	(-)
Mitigation and Management Measures	▪ Rehabilitation of all areas not required for post-decommissioning use and must be undertaken according to a rehabilitation plan; and ▪ The decommissioning phase should be kept as short as possible.							

9.9 PALAEONTOLOGY IMPACT ASSESSMENT

9.9.1 CONSTRUCTION PHASE

Table 9-66 – Impact on palaeontological resources during the construction phase

Potential Impact: **Loss of palaeontological resources**	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	1	3	5	2	**22**	**Low**	(-)
With Mitigation	1	1	3	5	1	**10**	**Very low**	(-)
Mitigation and Management Measures	▪ The impact on the palaeontological heritage can be reduced greatly by a palaeontologist conducting an inspection of any deep excavations (>4m) within potentially sensitive parts of the site if potential fossils have been seen by the ECO. The palaeontologist can then assess whether any scientifically important fossils would need to be removed, with the relevant SAHRA permit in place. ▪ The Chance Find Protocol has been added to Section 9,14.1 of the EMPr.							

9.10 TRAFFIC ASSESSMENT

The potential impact on the surrounding environment is expected to be generated by the development traffic, of which traffic congestion and associated noise, dust, and exhaust pollution form part. It must be noted that the significance of the impact is expected to be higher during the construction and decommissioning phases because these phases generate the highest development traffic.

9.10.1 CONSTRUCTION PHASE

The construction phase will generate traffic including transportation of people, construction materials, water, and equipment (abnormal trucks transporting the transformers). The exact number of trips generated will be determined at a later stage. The impact of the temporary increase in traffic, noise and dust pollution associated with potential traffic is indicated in **Table 9-67**.

Table 9-67 – Impact of increased development trips during the construction phase

Potential Impact: Increase in Development Trips Increase in development trips for the duration of the construction phase; associated noise and dust pollution.	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character

Without Mitigation	3	4	1	2	4	**40**	**Moderate**	(-)
With Mitigation	2	4	1	2	3	**27**	**Low**	(-)
Mitigation and Management Measures	▪ Stagger components delivery to site. ▪ Reduce the construction period where possible. ▪ Stagger the construction phase. ▪ Use of mobile batch plants and quarries in close proximity to the site to decrease the impact on the surrounding road network. ▪ Staff and general trips should occur outside of peak traffic periods as much as possible. ▪ Maintenance of haulage routes. ▪ Design and maintenance of internal roads. Possibly provide two access points to the site to split construction vehicle trips and reduce the risk of congestion.							

9.10.2 OPERATIONAL PHASE

The impact of noise and dust pollution associated with potential traffic is indicated on **Table 9-68**.

Table 9-68 – Impact of noise and dust pollution associated with potential traffic during the operational phase

Potential Impact: Noise and dust pollution Slight increase in trips due to transport of permanent staff to site, irregular maintenance and bi-annual transport of water for cleaning of panels	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	2	2	1	4	2	**18**	**Low**	(-)
With Mitigation	2	2	1	4	1	**9**	**Very Low**	(-)
Mitigation and Management Measures	▪ Source on-site water if possible. ▪ Utilise cleaning systems for the panels needing less vehicle trips. ▪ Schedule trips for the provision of water for the cleaning of panels outside peak traffic times as much as possible.							

9.10.3 DECOMMISSIONING PHASE

This phase will have similar impacts and generated trips as the Construction Phase. The impact of the temporary increase in traffic, noise and dust pollution associated with potential traffic is indicated in **Table 9-69**.

Table 9-69 – Impact of increased development trips during the decommissioning phase

Potential Impact: Increase in Development Trips Increase in development trips for the duration of the construction phase; associated noise and dust pollution.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	4	1	2	4	**40**	**Moderate**	(-)
With Mitigation	2	4	1	2	3	**27**	**Low**	(-)
Mitigation and Management Measures	▪ Stagger components delivery to site. ▪ Reduce the decommissioning period where possible. ▪ Stagger the decommissioning phase. ▪ Use of mobile batch plants and quarries in close proximity to the site to decrease the impact on the surrounding road network. ▪ Staff and general trips should occur outside of peak traffic periods as much as possible. ▪ Maintenance of haulage routes. ▪ Design and maintenance of internal roads. Possibly provide two access points to the site to split construction vehicle trips and reduce the risk of congestion.							

9.11 VISUAL IMPACT ASSESSMENT

9.11.1 CONSTRUCTION PHASE

- Large construction vehicles, equipment and construction material stockpiles will alter the natural character of the study area and expose visual receptors to impacts associated with construction.
- Construction activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings.
- Temporary stockpiling of soil during construction may alter the flat landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact.
- Dust emissions and dust plumes from increased traffic on the gravel roads serving the construction site may evoke negative sentiments from surrounding viewers.
- Surface disturbance during construction would expose bare soil resulting in visual scarring of the landscape and increasing the level of visual contrast with the surrounding environment.
- Potential visual pollution resulting from littering on the construction site.

Table 9-70 – Visual Impacts during the construction phase

Potential Impact: Visual Impacts	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	4	3	**40**	**Moderate**	(-)

With Mitigation	2	2	3	2	2	**18**	**Low**	(-)
Mitigation and Management Measures	■ Carefully plan to minimise the construction period and avoid construction delays. ■ Where possible, restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting. ■ Inform receptors within 1km of the WEF development area of the construction programme and schedules. ■ Maintain a neat construction site by removing rubble, litter and waste materials regularly. ■ Minimise vegetation clearing and rehabilitate cleared areas as soon as possible. ■ Position storage / stockpile areas in unobtrusive positions in the landscape, where possible. ■ Make use of existing gravel access roads where possible. ■ Limit the number of vehicles and trucks travelling to and from the construction site, where possible. ■ Ensure that dust suppression techniques are implemented: • on all access roads; • in all areas where vegetation clearing has taken place; • on all soil stockpiles.							

9.11.2 OPERATIONAL PHASE

- The development may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings.
- The proposed WEF and associated infrastructure will alter the visual character of the surrounding area and expose potentially sensitive visual receptor locations to visual impacts.
- Shadow flicker may impact nearby receptors.
- Dust emissions and dust plumes from maintenance vehicles accessing the site via gravel roads may evoke negative sentiments from surrounding viewers.
- The nighttime visual environment will be altered as a result of operational and security lighting at the proposed WEF.

Table 9-71 – Visual Impacts during the during operational phase

Potential Impact: Visual Impacts	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	3	4	4	**52**	**Moderate**	(-)
With Mitigation	3	3	3	4	4	**52**	**Moderate**	(-)
Mitigation and Management Measures	■ Turbine colours should adhere to CAA requirements. Logos on the turbines should be kept to a minimum and							

	turbine towers should be painted in neutral colours such as white or grey. ▪ Inoperative turbines should be repaired promptly, as they are considered more visually appealing when the blades are rotating (or at work) (Vissering, 2011). ▪ If turbines need to be replaced for any reason, they should be replaced with turbines of similar height and scale to lessen the visual impact. ▪ As far as possible, limit the number of maintenance vehicles which are allowed to access the site. ▪ Ensure that dust suppression techniques are implemented on all gravel access roads. ▪ As far as possible, limit the amount of security and operational lighting present on site (whilst adhering to relevant safety standards). ▪ Light fittings for security at night should reflect the light toward the ground and prevent light spill. ▪ Lighting fixtures should make use of minimum lumen or wattage whilst adhering to relevant safety standards. ▪ Mounting heights of lighting fixtures should be limited, or alternatively foot-light or bollard level lights should be used. ▪ If possible, make use of motion detectors on security lighting. ▪ Where possible, the operation and maintenance buildings should be consolidated to reduce visual clutter. ▪ Non-reflective surfaces should be used where possible.

9.11.3 DECOMISSIONING PHASE

- Vehicles and equipment required for decommissioning will alter the natural character of the study area and expose visual receptors to visual impacts.
- Decommissioning activities may be perceived as an unwelcome visual intrusion.
- Dust emissions and dust plumes from increased traffic on the gravel roads serving the decommissioning site may evoke negative sentiments from surrounding viewers.
- Surface disturbance during construction would expose bare soil resulting in visual scarring of the landscape and increasing the level of visual contrast with the surrounding environment.
- Temporary stockpiling of soil during decommissioning may alter the flat landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact.
- Decommissioned infrastructure left on the site may be visually intrusive.

Table 9-72 - Visual Impacts during decommissioning phase

Potential Impact: Visual Impacts	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	4	3	40	Moderate	(-)
With Mitigation	2	2	3	2	2	18	Low	(-)

Mitigation and Management Measures	▪ All infrastructure that is not required for post-decommissioning use should be removed. ▪ Carefully plan to minimize the decommissioning period and avoid delays. ▪ Maintain a neat decommissioning site by removing rubble and waste materials regularly. ▪ Position storage / stockpile areas in unobtrusive positions in the landscape, where possible. ▪ Ensure that dust suppression procedures are maintained on all gravel access roads throughout the decommissioning phase. ▪ All cleared areas should be rehabilitated as soon as possible.

9.12 SOCIAL IMPACT ASSESSMENT

9.12.1 CONSTRUCTION PHASE

Creation of local employment, training, and business opportunities

The construction phase will extend over a period of approximately 18 months and create in the region of 60 employment opportunities. A percentage of the employment opportunities will benefit members from the local communities in the area, specifically Fochville and Charltonville. These opportunities will include opportunities for low, semi and highly workers. Most of the employment opportunities will accrue to Historically Disadvantaged (HD) members of the community.

The total wage bill will be in the region of R 12 million (2023 Rand values). A percentage of the wage bill will be spent in the local economy which will also create opportunities for local businesses in the local towns in the area. The capital expenditure associated with the construction phase will be approximately R 1 billion (2023 Rand value). Due to the presence of the mining sector, there are likely to qualified companies in Fochville and Charltonville that can provide the required services and products. The local service sector will also benefit from the construction phase. The potential opportunities would be linked to accommodation, catering, cleaning, transport, and security, etc. associated with the construction workers on the site.

The potential benefits for local communities are confirmed by the findings of the Overview of the IPPPP undertaken by the Department of Energy, National Treasury and DBSA (December 2021). The study found that to date, a total of 63 291 job years have been created for South African citizens, of which 48 110 job years were in construction and 15 182 in operations. By the end of December 2021, 85 projects had successfully completed construction and moved into operation. These projects created 44 172 job years of employment, compared to the anticipated 30 488. This was 45% more than planned.

In terms of benefits for local communities, significantly more people from local communities were employed during construction than was initially planned. For active projects, the expectation for local community participation was 13 284 job years. To date 25 272 job years have been realised (i.e. 90% more than initially planned), with 23 projects still in, or entering, construction. The number of black SA citizens employed during construction also exceeded the planned numbers by 74%.

The impact assessment of employment and business creation opportunities during the construction phase is indicated in **Table 9-73**.

Table 9-73 – Impact assessment of employment and business creation opportunities during the construction phase during the construction phase

<table>
<tr><th>Potential Impact: Creation of employment and business opportunities</th><th>Magnitude</th><th>Extent</th><th>Reversibility</th><th>Duration</th><th>Probability</th><th colspan="2">Significance</th><th>Character</th></tr>
<tr><td>Without Mitigation</td><td>3</td><td>2</td><td>N/A</td><td>2</td><td>3</td><td>21</td><td>Low</td><td>(+)</td></tr>
<tr><td>With Mitigation</td><td>3</td><td>3</td><td>N/A</td><td>2</td><td>4</td><td>32</td><td>Moderate</td><td>(+)</td></tr>
<tr><td>Enhancement</td><td colspan="8">Employment:
▪ Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase.
▪ Where reasonable and practical, the proponent should appoint local contractors and implement a ‘locals first’ policy, especially for semi and low-skilled job categories. However, due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area.
▪ Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria.
▪ Before the construction phase commences the proponent should meet with representatives from the LM to establish the existence of a skills database for the area. If such as database exists, it should be made available to the contractors appointed for the construction phase.
▪ The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase of the project.
▪ Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase.
▪ The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.
Business:
▪ The proponent should liaise with the LM with regards the establishment of a database of local companies, specifically BBBEE companies, which qualify as potential service providers (e.g., construction companies, catering companies, waste collection companies, security</td></tr>
</table>

	companies etc.) prior to the commencement of the tender process for construction service providers. These companies should be notified of the tender process and invited to bid for project-related work. *Note that while preference to local employees and companies is recommended, it is recognised that a competitive tender process may not guarantee the employment of local labour for the construction phase.*

Impact of construction workers on local communities

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

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

The objective will be to source as many of the low and semi-skilled workers locally. These workers will be from the local community and form part of the local family and social networks. This will reduce the risk and mitigate the potential impacts on the local community. The potential impact on the local community is therefore likely to be negligible.

While the risks associated with construction workers at a community level will be low, at an individual and family level they may be significant, especially in the case of contracting a sexually transmitted disease or an unplanned pregnancy. However, given the nature of construction projects, it is not possible to totally avoid these potential impacts at an individual or family level.

The assessment of impact of the presence of construction workers in the area on local communities is indicated in **Table 9-74**.

Table 9-74 – Assessment of impact of the presence of construction workers in the area on local communities during the construction phase

Potential Impact: Presence of construction workers in the area on local communities	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	3	2	3	27	Moderate	(-)
With Mitigation	2	1	3	2	3	24	Low	(-)

Mitigation and Management Measures	▪ Preparation and implementation of a SEP prior to and during the construction phase. ▪ Preparation and implementation of a Community Health, Safety and Security Plan (CHSSP) prior to and during the construction phase. ▪ The SEP and CHSSP should include a Grievance Mechanism that enables stakeholders to report resolve incidents. ▪ Where possible, the proponent should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically for semi and low-skilled job categories. ▪ The proponent should consider the option of establishing a Monitoring Committee (MC) for the construction phase that representatives from local landowners, farming associations, and the local municipality. This MC should be established prior to commencement of the construction phase and form part of the SEP. ▪ The proponent and contractor should develop a Code of Conduct (CoC) for construction workers. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be subject to appropriate disciplinary action and/or dismissed. All dismissals must comply with the South African labour legislation. The CoC should be signed by the proponent and the contractors before the contractors move onto site. The CoC should form part of the CHSSP. ▪ The proponent and the contractor should implement an HIV/AIDS, COVID-19 and Tuberculosis (TB) awareness programme for all construction workers at the outset of the construction phase. The programmes should form part of the CHSSP. ▪ The contractor should provide transport for workers to and from the site on a daily basis. This will enable the contactor to effectively manage and monitor the movement of construction workers on and off the site. ▪ The contractor must ensure that all construction workers from outside the area are transported back to their place of residence within 2 days for their contract coming to an end. ▪ No construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.

Influx of job seekers

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

- Impacts on existing social networks and community structures.

- Competition for housing, specifically low-cost housing.
- Competition for scarce jobs.
- Increase in incidences of crime.

These issues are similar to the concerns associated with the presence of construction workers and are discussed in Section 4.4.2. Given the location and relatively small size of the project the potential for large scale economically motivated in-migration and subsequent labour stranding is likely to be negligible. The assessment of impact of job seekers on local communities is indicated in **Table 9-75**.

Table 9-75 – Impact assessment of impact of job seekers on local communities during the construction phase

Potential Impact: Influx of job seekers impacts on family structures, social networks and community services associated with the influx of job seekers	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	3	2	3	**27**	**Low**	(-)
With Mitigation	2	1	3	2	3	**24**	**Low**	(-)
Mitigation and Management Measures	▪ Preparation and implementation of a SEP prior to and during the construction phase. ▪ Preparation and implementation of CHSSP prior to and during the construction phase. ▪ The proponent, in consultation with the LM, should investigate the option of establishing a MC to monitor and identify potential problems that may arise due to the influx of job seekers to the area. The MC should also include the other proponents of solar energy projects in the area. ▪ The proponent should implement a "locals first" policy, specifically with regard to unskilled and low skilled opportunities. ▪ The proponent should implement a policy that no employment will be available at the gate.							

Risk to safety, livestock, and farm infrastructure

The presence on and movement of construction workers on and off the site poses a potential safety threat to local famers and farm workers in the vicinity of the site. In addition, farm infrastructure, such as fences and gates, may be damaged and stock losses may also result from gates being left open and/or fences being damaged, or stock theft linked either directly or indirectly to the presence of construction workers on the site. The potential risks (safety, livestock, and farm infrastructure) can be effectively mitigated by careful planning and managing the movement of construction workers and construction related activities during the construction phase.

Minimising the potential impact of construction activities on the game farming and hunting activities was also raised as a key issue. ~ 60-70% of income generated by the IMetjan's operations is linked to hunting activities between May and August (4 months).

The Metjan directors indicated that they cannot afford to shut down the hunting operation during construction. The owners indicated that it would not be possible to isolate game in camps during construction. Hunting during the construction phase would also pose a potential safety risk to construction workers.

The potential risks (safety, livestock, and farm infrastructure) can be effectively mitigated by careful planning and managing the movement of construction on and off the site workers during the construction phase. As indicated below, the impact on hunting operations can also be mitigated. The most effective option would be close the hunting operations for a season to allow for the construction of the WEF and associated infrastructure and compensate the owners for loss of hunting related revenue. This would address the impact on owners and address safety risks to workers. The developers have indicated that impact on hunting operations has been addressed in the lease agreement.

The assessment of risk to safety, livestock, and damage to farm infrastructure is indicated in **Table 9-76**.

Table 9-76 – Impact assessment of risk to safety, livestock, and damage to farm infrastructure during the construction phase

Potential Impact: Risk to safety, livestock, and damage to farm infrastructure	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	3	2	3	2	3	**30**	**Moderate**	(-)
With Mitigation	2	1	3	2	3	**24**	**Low**	(-)
Mitigation and Management Measures	▪ The developer should compensate the directly affected landowners for impact during the construction phase. ▪ Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase. ▪ Preparation and implementation of a Community Health, Safety and Security Plan (CHSSP) prior to and during the construction phase. ▪ The proponent should enter into an agreement with the directly affected farmers whereby damages to farm property etc. during the construction phase will be compensated for. The agreement should be signed before the construction phase commences. ▪ All farm gates must be closed after passing through. ▪ Contractors appointed by the proponent should provide daily transport for low and semi-skilled workers to and from the site. ▪ The proponent should establish a MC and CoC for workers (see above). ▪ The proponent should hold contractors liable for compensating farmers and communities in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be							

	contained in the Code of Conduct to be signed between the proponent, the contractors, and neighbouring landowners. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities (see below). ▪ The proponent should implement a Grievance Mechanism that provides local farmers with an effective and efficient mechanism to address issues related to report issues related to damage to farm infrastructure, stock theft and poaching etc. ▪ The Environmental Management Plan (EMP) must outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested. ▪ Contractors appointed by the proponent must ensure that all workers are informed at the outset of the construction phase of the conditions contained in the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms. ▪ Contractors appointed by the proponent must ensure that construction workers who are found guilty of stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the CoC. All dismissals must be in accordance with South African labour legislation. ▪ It is recommended that no construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.

Increased risk of grass fires

The presence of construction workers and construction-related activities on the site poses an increased risk of grass fires that could, in turn pose, a threat to livestock, crops, wildlife and farm infrastructure. The risk of grass fires was raised as a key concern. The potential risk of grass fires will be higher during the dry, windy winter months from May to October. The impacts will be largely local and can be effectively mitigated.

The assessment of impact of increased risk of grass fires is indicated in **Table 9-77**.

Table 9-77 – Impact assessment of impact of increased risk of grass fires during the construction phase

Potential Impact: Increased risk of grass fires	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	2	3	30	Moderate	(-)
With Mitigation	2	1	3	2	2	12	Very Low	(-)
Mitigation and Management Measures	▪ Preparation and implementation of a SEP prior to and during the construction phase.							

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

Nuisance impacts associated with construction related activities

Construction related activities, including the movement of heavy construction vehicles of and on the site, has the potential to create dust, noise and safety impacts and damage to local roads. The impacts are likely to be largely local and can be effectively mitigated.

The assessment of the impacts associated with construction related activities is indicated in **Table 9-78**.

Table 9-78 – Impact assessment of the impacts associated with construction related activities during the construction phase

Potential Impact: Construction related activities	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	3	2	3	2	3	**30**	**Moderate**	(-)
With Mitigation	2	1	3	2	2	**16**	**Low**	(-)

Mitigation and Management Measures	▪ Preparation and implementation of a SEP prior to and during the construction phase. ▪ Preparation and implementation of a CHSSP prior to and during the construction phase. ▪ Timing of construction activities should be planned to avoid / minimise impact on key farming activities, including planting and harvesting operations. ▪ The proponent should establish a MC to monitor the construction phase and the implementation of the recommended mitigation measures. The MC should be established before the construction phase commences, and should include key stakeholders, including representatives from local farmers and the contractor(s). The MC should also address issues associated with damage to roads and other construction related impacts. ▪ Ongoing communication with landowners and road users during construction period. This should be outlined in the SEP. ▪ The proponent should implement a Grievance Mechanism that provides local farmers and other road users with an effective and efficient mechanism to address issues related to construction related impacts, including damage to local gravel farm roads. ▪ Implementation of a road maintenance programme throughout the construction phase to ensure that the affected roads maintained in a good condition and repaired once the construction phase is completed. ▪ Repair of all affected road portions at the end of construction period where required. ▪ Dust suppression measures must be implemented on un-surfaced roads, such as wetting on a regular basis and ensuring that vehicles used to transport building materials are fitted with tarpaulins or covers. ▪ All vehicles must be roadworthy, and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits.

Impacts associated with loss of farmland

The activities associated with the construction phase and establishment of the proposed project and associated infrastructure will result in the disturbance and loss of land available for grazing and game farming. The impact on farmland associated with the construction phase can be mitigated by minimising the footprint of the construction related activities and ensuring that disturbed areas are fully rehabilitated on completion of the construction phase. In addition, lease agreement addresses the potential impact on farming operations, including hunting.

In terms of construction related impacts the Metjan directors indicated that the location of both proposed construction terrain clusters (Alternative 1 and 2) was not acceptable. Alternative 1 is located 160 m to the west of the main stores complex and kraal on Leeuwpoort 356/8 and 356/66. The Metjan directors indicated that the location of Alternative 1 would impact on current farming and hunting activities. In addition, from a security perspective Alternative 1 is located too close to stores and kraal and the presence to construction workers would pose a risk to these operations. Alternative 2 is in a key hunting area and would impact on hunting activities (May to August). The owners also indicated that the site too isolated and central (internal) from a security point of view. The owners identified alternative areas and have discussed these with the developers.

The assessment of impact on farmland due to construction related activities is indicated in **Table 9-79**.

Table 9-79 – Impact assessment of impact on farmland due to construction related activities during the construction phase

Potential Impact: Loss of farmland	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	2	4	**40**	**Moderate**	(-)
With Mitigation	2	1	3	2	3	**24**	**Low**	(-)
Mitigation and Management Measures	▪ Eskom should assess if replacement land is available in the area that can be leased to the current lessees. ▪ The recommendations of the agricultural / soil assessment should be implemented. ▪ The footprint associated with the construction related activities (access roads, construction platforms, workshop etc.) should be minimised. ▪ An Environmental Onsite Compliance Officer (ESCO) and Environmental Control Officer (ECO) should be appointed to monitor the establishment phase of the construction phase. ▪ All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase. ▪ The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. The specifications for the rehabilitation programme should be drawn up by the Environmental Consultants appointed to manage the EIA. ▪ The implementation of the Rehabilitation Programme should be monitored by the ECO.								

9.12.2 OPERATIONAL PHASE

Improve energy security and develop the renewable energy sector

The The primary goal of the proposed project is to improve energy security in South Africa by generating additional energy. The proposed development also reduces the carbon footprint associated with energy generation. The project should therefore be viewed within the context of the South Africa's current reliance on coal powered energy to meet the majority of its energy needs, and secondly, within the context of the success of the REIPPPP.

Improved energy security

South Africa's energy crisis, which started in 2007 and is ongoing, has resulted in widespread rolling blackouts (referred to as load shedding) due to supply shortfalls. The load shedding has had a significant impact on all sectors of the economy and on investor confidence. The mining and manufacturing sector have been severely impacted and will continue to be impacted until such time as there is a reliable supply to energy. The Minister of Mineral Resources and Energy, Gwede Mantashe, indicated in February 2023 that the cost of load shedding was estimated at R1 billion a day [7]. The South African Reserve Bank indicated in February 2023 that stage 3 and stage 6 loadshedding cost the South African economy between R204 million and R899 million a day.[8]

A survey of 3 984 small business owners in 2019 found that 44% said that they had been severely affected by load shedding with 85% stating that it had reduced their revenue, with 40% of small businesses losing 20% or more or revenue during due to load shedding period[9].

Benefits associated with REIPPPP

Through the competitive bidding process, the IPPPP has effectively leveraged rapid, global technology developments and price trends, buying clean energy at lower and lower rates with every bid cycle, resulting in SA getting the benefit of renewable energy at some of the lowest tariffs in the world. The price for wind power has dropped by 50% to R0.94/kWh, while solar PV has dropped with 75% to R1.14/kWh between BW1 and BW4.

Prices contracted under the REIPPPP for all technologies are well below the published REFIT prices. The REIPPPP has effectively translated policy and planning into delivery of clean energy at very competitive prices. As such it is contributing to the national aspirations of secure, affordable energy, lower carbon intensity and a transformed 'green' economy.

The impact of approving improve energy security and support renewable sector is indicated in **Table 9-80**.

Table 9-80 – Impact of approving improve energy security and support renewable sector during the operational phase

Potential Impact: Improving energy security and support renewable sector	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	4	N/A	4	4	48	Moderate	(+)

[7] https://www.citizen.co.za/news/load-shedding-cost-economy-billion/
[8] https://businesstech.co.za/news/energy/662515/stage-6-load-shedding-costs-south-africa-r900-million-a-day-sarb/
[9] "How does load shedding affect small business in SA?". The Yoco Small Business Pulse (3: Q1 2019):

With Mitigation	4	4	N/A	4	5	**60**	**High**	(+)
Enhancement	▪ Maximise the number of employment opportunities for local community members. ▪ Implement training and skills development programs for members from the local community. ▪ Maximise opportunities for local content and procurement.							

Creation of employment opportunities

The proposed development will create approximately 30 full time employment opportunities during the operational phase. Based on similar projects the annual operating budget will be in the region of R 25 million (2023 Rand values), including wages.

The impact assessment of employment and business creation opportunities is indicated in **Table 9-81**.

Table 9-81 – Impact assessment of employment and business creation opportunities during the operational phase

Potential Impact: Creation of employment opportunities	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	1	N/A	4	2	**14**	**Very Low**	(+)
With Mitigation	3	2	N/A	4	4	**36**	**Moderate**	(+)
Enhancement	**Employment:** ▪ Where reasonable and practical, the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. ▪ Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria. ▪ Before the operational phase commences the proponent should meet with representatives from the local municipality to establish the existence of a skills database for the area. ▪ The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the operational phase of the project. ▪ Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the operational phase.							

	- The recruitment selection process should seek to promote gender equality and the employment of women wherever possible. **Business:** - The proponent should liaise with the LM with regards the establishment of a database of local companies, specifically BBBEE companies, which qualify as potential service providers. *Note that while preference to local employees and companies is recommended, it is recognised that a competitive tender process may not guarantee the employment of local labour for the construction phase.*

Generate income for affected landowners

The proponent will enter into rental agreements with the affected landowners for the use of the land for the establishment of the proposed projects. In terms of the rental agreement the affected landowners will be paid an annual amount dependent upon the number of wind turbines located on the property. The additional income will reduce the risk to his livelihoods posed by droughts and fluctuating market prices for livestock, crops, and farming inputs, such as fuel, feed etc. Given the risks posed by climate change the additional income represents a significant benefit for the affected landowner.

The assessment of benefits associated with socio-economic development contributions is indicated in **Table 9-82**.

Table 9-82 – Impact assessment of benefits associated with associated with income generated for the affected farmer(s) during the operational phase

Potential Impact: income generated for the affected farmer(s)	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	1	N/A	4	3	21	Low	(+)
With Mitigation	3	2	N/A	4	5	45	Moderate	(+)
Enhancement	- Implement agreements with affected landowners. - The loss of high-quality agricultural land should be avoided and or minimised. The recommendations of the agricultural / soil assessment should be implemented.							

Benefits associated with the socio-economic development contributions

The REIPPPP has been designed not only to procure energy but has also been structured to contribute to the broader national development objectives of job creation, social upliftment and broadening of economic ownership. Socio-economic development (SED) contributions are an important focus of the REIPPPP and are aimed at ensuring that local communities benefit directly from the investments attracted into the area. These contributions are linked to Community Trusts and accrue over the project operation life and, in so doing, create an opportunity to generate a steady revenue stream over an extended period. This revenue can be used to fund development initiatives in the area and support the local community. The long-term duration of the revenue stream also allows local municipalities and communities to undertake long term planning for the area. The revenue from the proposed WEF can be used to support a number of social and economic initiatives in the area, including:

- Creation of jobs.
- Education.
- Support for and provision of basic services.
- School feeding schemes.
- Training and skills development.
- Support for SMME's.

The minimum compliance threshold for SED contributions is 1% of the revenue with 1.5% the targeted level over the 20-25 year project operational life. For the current portfolio of projects, the average commitment level is 2%, which is 101% higher than the minimum threshold level. To date (across BW1-4) a total contribution of R22.8 billion has been committed to SED initiatives. Assuming an even, annual revenue spread, the average contribution per year would be R1.1 billion. Of the total commitment, R18.5 billion is specifically allocated for local communities where the IPPs operate. With every new IPP on the grid, revenues and the respective SED contributions will increase.

As a percentage of revenue, SED obligations become effective only when operations commence, and revenue is generated. Of the 91 IPPs that have reached financial close (BW1–BW4), 85 are operational. The SED contributions associated with these 85 projects has amounted to R 1.8 billion to date.

In terms of ED and SED spend, education, social welfare, and health care initiatives have a SED focus. SED spend on education has been almost double the expenditure on enterprise development. In this regard IPPs have supported 1 388 education institutions with a total of R437 million in contributions, from 2015 to the end of June 2021. A total of 1 276 bursaries, amounting to R210.8 million, have been awarded by 67 IPPs from 2015 until the end of June 2021. The largest portion of the bursaries were awarded to African and Coloured students (97.4%), with women and girls receiving 56.3% of total bursaries. The Northern Cape province benefitted most from the bursaries awarded, with 57.2%, followed by the Eastern Cape (20.2%) and Western Cape (14.1%). Enterprise development and social welfare are the focus areas that have received the second highest share of the contributions to date.

The Green Jobs study (2011) found that the case for renewable energy is enhanced by the positive effect on rural or regional development. Renewable energy facilities located in rural areas create an opportunity to benefit the local and regional economy through the creation of jobs and tax revenues.

The establishment of SED opportunities do therefore create significant benefits for local rural communities. However, SED investments can also be mismanaged. This is an issue that will need to be addressed when identifying and setting up SED projects.

The visual impact and impact on sense of place is indicated in **Table 9-83**.

Table 9-83 – Assessment of benefits associated with socio-economic development contributions during the operational phase

Potential Impact: Visual impact and impact on sense of place	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	N/A	4	4	36	Moderate	(-)
With Mitigation	4	3	N/A	4	5	55	Moderate	(-)
Mitigation and Management Measures	▪ The proponents should liaise with the MCLM to identify projects that can be supported by SED contributions. ▪ Clear criteria for identifying and funding community projects and initiatives in the area should be identified. The criteria should be aimed at maximising the benefits for the community as a whole and not individuals within the community. ▪ Strict financial management controls, including annual audits, should be instituted to manage the SED contributions.							

Visual impact and impact on sense of place

The proposed development has the potential to impact on the area's existing rural sense of place. Based on the findings of the Visual Impact Assessment (VIA)(SLR, 2023), the significance of the visual impact on sense of place was rated as Moderate Negative. The VIA notes that the N12 National Route and the R500 and R501 main roads could be considered as potentially sensitive receptor roads. However, the visual impacts of the proposed development on motorists would be reduced by the level of transformation and landscape degradation, especially to the north of the WEF project area. The VIA also notes that the proposed WEF comprises only ten wind turbines and it is anticipated that this factor would further reduce the visual impacts experienced by the identified receptors.

In terms of nighttime impacts linked to the civil aviation lights, the findings of the VIA indicate that the overall visual character of the night environment within the study area is considered to be moderately 'polluted' and will therefore not be regarded as pristine. While the operational and security lighting required for the proposed WEF project is likely to intrude on the nightscape and create some glare, the impact of the additional lighting is expected to be reduced by the presence of a significant amount of light already present within the surrounding area at night. However, farmsteads located in areas characterised by lower levels of disturbance / transformation would be moderately sensitive to the impact of additional lighting. In conclusion the VIA states that potential visual impacts associated with the proposed Igolide WEF are negative and of Moderate Significance. Given the absence of sensitive receptors and the significant level of human transformation and landscape degradation in areas near the proposed Igolide WEF, the project is deemed acceptable from a visual perspective and the EA should be granted. The VIA also indicates that the impacts associated with the construction, operation and decommissioning phases can be mitigated to acceptable levels provided the recommended mitigation measures are implemented.

The owners of the affected property indicated that the turbine locations were acceptable. Impact on sense of place was not raised as concern.

Table 9-84 – Visual impact and impact on sense of place during the operational phase

Potential Impact: Visual impact and impact on sense of place	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	N/A	4	4	**36**	**Moderate**	(-)
With Mitigation	3	2	N/A	4	4	**36**	**Moderate**	(-)
Mitigation and Management Measures	▪ The recommendations contained in the VIA should be implemented.							

Potential impact on property values

The potential visual impacts associated with the proposed WEF have the potential to impact on property values. Based on the results of a literature review undertaken for other REFs the potential impact on property values in rural areas is likely to be limited. A study undertaken in Australia in 2016 (Urbis Pty Ltd) found that:

- Appropriately located wind farms within rural areas, removed from higher density residential areas, are unlikely to have a measurable negative impact on surrounding land values.
- There is limited available sales data to make a conclusive finding relating to value impacts on residential or lifestyle properties located close to wind farm turbines, noting that wind farms in NSW have been constructed in predominantly rural areas.

In terms of farming activities, the owners of the property indicated that the location of the substation and BESS was not unacceptable. This is linked to impact on hunting activities and security. The substation/BESS site is located 140 m north-east of construction terrain Alternative 2. A 400 kV Eskom line is located 1.1. km to the east. The immediate context is of undisturbed veld. The concerns raised regarding the construction terrain Alternative 2 also apply the substation and BESS. The owners indicated that a site that is located on the periphery of the property would prefer a more peripheral location. The owners have proposed an alternative location on the northernmost site property, Leeuwpoort 356/65. This has been discussed with the developers.

Turbine locations are deemed unproblematic by the owners. The footprints are deemed sufficiently small not to affect game movements, and hunting exclusions (limiting shooting in certain directions) are deemed manageable.

The assessment of potential impact on property values and operations is indicated in **Table 9-85**.

Table 9-85 – Impact assessment of potential impact on property values and operations during the operational phase

Potential Impact: Impact on property values	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	N/A	4	2	16	Low	(-)
With Mitigation	2	1	N/A	4	2	14	Very Low	(-)
Mitigation and Management Measures	▪ The recommendations contained in the VIA should be implemented							

Potential impact on tourism

The potential visual impacts associated with the proposed WEF have the potential to impact on tourism facilities and tourism in the area. Based on the findings of the literature review there is limited evidence to suggest that the proposed WEF would impact on the tourism in the area at both a local and regional level.

The impact on tourism in the region is indicated in **Table 9-86**.

Table 9-86 – Impact on tourism during the operational phase

Potential Impact: Tourism	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	2	N/A	4	2	14	Very Low	(-)
With Mitigation	1	2	N/A	4	2	14	Very Low	(-)
Mitigation and Management Measures	▪ The recommendations contained in the VIA should be implemented							

9.12.3 DECOMMISSIONING PHASE

Social impacts associated with retrenchment including loss of jobs, and source of income. Decommissioning will also create temporary employment opportunities, which would represent a positive temporary impact.

The assessment of social impacts associated with decommissioning is indicated in **Table 9-87**.

Table 9-87 – Social impacts associated with decommissioning during the decommissioning phase

Potential Impact: Social impacts associated with decommissioning	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	N/A	2	3	18	Low	(-)
With Mitigation	1	2	N/A	2	3	15	Moderate	(-)
Mitigation and Management Measures	▪ The proponent should ensure that retrenchment packages are provided for all staff retrenched when the plant is decommissioned. ▪ All structures and infrastructure associated with the proposed facility should be dismantled and transported off-site on decommissioning. ▪ Revenue generated from the sale of scrap metal during decommissioning should be allocated to funding closure and rehabilitation of disturbed areas.							

9.13 GEOTECHNICAL ASSESSMENT

9.13.1 CONSTRUCTION PHASE

The construction phase could include the following impacts: Increased stormwater velocity, increase in soil and wind erosion due to clearing of vegetation, Creation of drainage paths along access tracks, and Sedimentation of non-perennial features and excessive dust.

Table 9-88 –Construction Impacts on Soil erosion

Potential Impact: Soil erosion: • Increased stormwater velocity. • Increase in soil and wind erosion due to clearing of vegetation. • Creation of drainage paths along access tracks. • Sedimentation of non-perennial features and excessive dust.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	3	3	4	48	Moderate	(-)
With Mitigation	2	1	1	2	2	12	Very low	(-)
Mitigation and Management Measures	▪ Rehabilitation of affected areas (such as revegetation). ▪ Construction of temporary berms and drainage channels to divert surface water. ▪ Minimize earthworks and fills. ▪ Use existing road network and access tracks.							

	- Correct engineering design and construction of gravel roads and water crossings. - Ensure adequate control stormwater flow.

Table 9-89 –Construction Impacts from oil spillages

Potential Impact: Contamination of ground and surface water resources from heavy plant leading to quality deterioration of the water resources.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	3	3	4	48	Moderate	(-)
With Mitigation	2	1	1	2	2	12	Very low	(-)
Mitigation and Management Measures	- Vehicle and construction machinery repairs to be undertaken in designated areas with proper soil protection. - Frequent checks and conditional monitoring.							

Table 9-90 –Construction Impacts from disturbance of fauna and flora

Potential Impact: The displacement of natural earth material and overlying vegetation leading to erosion.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	3	3	3	30	Low	(-)
With Mitigation	2	1	1	2	2	12	Very low	(-)
Mitigation and Management Measures	- Limit and control excavations where possible							

Table 9-91 –Construction Impacts on Slope stability

Potential Impact: Slope instability around structures.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	3	3	2	18	Low	(-)
With Mitigation	1	1	3	2	2	14	Very low	(-)
Mitigation and Management Measures	- Avoid steep slope areas.							

	▪ Design cut slopes according to detailed geotechnical analysis.

Table 9-92 –Construction Impacts on Seismic activity

Potential Impact: Damage of proposed development.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	3	3	2	3	36	Moderate	(-)
With Mitigation	2	2	3	3	3	30	Low	(-)
Mitigation and Management Measures	▪ Design all infrastructure according to SANS 10160-4 to ensure the proposed development meets the minimum requirements for infrastructure in a seismic zone.							

9.13.2 OPERATIONAL PHASE

Table 9-93 –Operational Impacts on Soil Erosion

Potential Impact: • Increase in soil and wind erosion due to clearance of structures. • Displacement of soil and damage to vegetation by vehicles	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	1	3	2	2	16	Low	(-)
With Mitigation	1	1	1	1	1	4	Very low	(-)
Mitigation and Management Measures	▪ Use existing road network and access tracks. ▪ Use of temporary berms and drainage channels to divert surface water. ▪ Minimize earthworks and demolish footprints. ▪ Rehabilitation of affected areas (such as revegetation). ▪ Reinstate channelized drainage features. ▪ Strip, stockpile and re-spread topsoil.							

Table 9-94 –Operational Impacts from Oil Spillages

Potential Impact: Potential oil spillages from service vehicles and heavy plant.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	5	5	3	45	Moderate	(-)

With Mitigation	1	1	1	1	1	4	Very low	(-)
Mitigation and Management Measures	▪ Vehicle repairs to be undertaken in designated areas.							

Table 9-95 - Operational Impacts from Seismic Activity

Potential Impact: **Damage of proposed development.**	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	3	3	2	3	36	Moderate	(-)
With Mitigation	2	2	3	3	3	30	Low	(-)
Mitigation and Management Measures								

9.13.3 DECOMMISSIONING PHASE

Table 9-96 - Decommissioning Impacts from Soil Erosion

Potential Impact: Soil erosion: **• Increase in soil and wind erosion due to clearance of structures.** **• Displacement of soil and damage to vegetation by vehicles.**	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	3	3	4	48	Moderate	(-)
With Mitigation	2	1	1	2	2	12	Very low	(-)
Mitigation and Management Measures	▪ Where possible, use existing road network and access tracks. ▪ Use temporary berms and drainage channels to divert surface water. ▪ Minimize earthworks and demolish footprints. ▪ Rehabilitate affected areas (such as revegetation). ▪ Reinstate channelized drainage features. ▪ Strip, stockpile and re-spread topsoil.							

Table 9-97 - Decommissioning Impacts from Oil spillages

Potential Impact: • Potential oil spillages due to clearance of structures	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	3	3	4	48	Moderate	(-)

With Mitigation	2	1	3	1	2	**14**	**Very low**	(-)
Mitigation and Management Measures	▪ Vehicle and construction machinery repairs to be undertaken in designated areas with proper soil protection. ▪ Frequent checks of vehicles and construction machinery for oil leaks.							

Table 9-98 - Decommissioning Impacts from disturbance to fauna and flora

Potential Impact: The displacement of natural earth material and overlying vegetation leading to erosion	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	3	1	3	3	3	**30**	**Low**	(-)
With Mitigation	2	1	1	2	2	**12**	**Very low**	(-)
Mitigation and Management Measures	▪ Limit and control excavations where possible							

Table 9-99 - Decommissioning Impacts from Slope instability

Potential Impact: Slope instability around structures.	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	3	1	3	3	2	**18**	**Low**	(-)
With Mitigation	1	1	3	2	2	**14**	**Very low**	(-)
Mitigation and Management Measures	▪ Avoid steep slope areas. ▪ Design cut slopes according to detailed geotechnical analysis.							

9.14 HIGH LEVEL SAFETY, HEALTH AND ENVIRONMENTAL RISK ASSESSMENT

An analysis was undertaken for the BESS to identify the failure events, their causes, consequences, as well as the preventative and mitigation measures in place on the proposed installation for all three phases of a typical project.

A summary of the impacts for the construction, operation and decommissioning phases is indicated in **Solid state** lithium-ion battery energy storage systems

Table 9-100. The full impact assessment is included in **Appendix H.11**.

9.14.1 SOLID STATE LITHIUM-ION BATTERY ENERGY STORAGE SYSTEMS

Table 9-100 – Summary of High-Level Safety, Health and Environmental Risk Impacts for Solid State Lithium-Ion BESS

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
High Level Safety, Health and Environmental Risk Assessment	Human Health - chronic exposure to toxic chemical or biological agents	C	(-)	Moderate	Low
	Human Health - exposure to noise	C	(-)	Moderate	Low
	Human Health - exposure to temperature extremes and/or humidity	C	(-)	Low	Very Low
	Human Health - exposure to psychological stress	C	(-)	Low	Low
	Human Health - exposure to ergonomic stress	C	(-)	Low	Low
	Human and Equipment Safety - exposure to fire radiation	C	(-)	Moderate	Low
	Human Health - chronic exposure to toxic chemical or biological agents	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to explosion over pressures	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to violent release of kinetic or potential energy	C	(-)	High	Low
	Human and Equipment Safety - exposure to electromagnetic waves	C	(-)	Moderate	Low
	Environment - emissions to air	C	(-)	Low	Very Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Environment - emissions to water	C	(-)	Low	Low
	Environment - emissions to earth	C	(-)	Low	Low
	Environment - waste of resources e.g., water, power etc	C	(-)	Low	Very Low
	Public - Aesthetics	C	(-)	Low	Low
	Investors - Financial	C	(-)	Moderate	Low
	Employees and investors - Security	C	(-)	Moderate	Low
	Emergencies	C	(-)	Moderate	Low
	Investors - Legal	C	(-)	Moderate	Low
	Human Health - chronic exposure to toxic chemical or biological agents	O	(-)	Moderate	Low
	Human Health - chronic exposure to toxic chemical or biological agents	O	(-)	Moderate	Low
	Human Health - exposure to noise	O	(-)	Moderate	Low
	Human Health - exposure to temperature extremes and/or humidity	O	(-)	Low	Very Low
	Human Health - exposure to psychological stress	O	(-)	Low	Very Low
	Human Health - exposure to ergonomic stress	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to fire radiation	O	(-)	High	Low
	Human and Equipment Safety - exposure to fire radiation	O	(-)	High	Low
	Human and Equipment Safety - exposure to explosion over pressures	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents	O	(-)	Low	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents	O	(-)	Moderate	Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Human and Equipment Safety - exposure to violent release of kinetic or potential energy	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to electromagnetic waves	O	(-)	Moderate	Low
	Environment - emissions to air	O	(-)	Low	Very Low
	Environment - emissions to water	O	(-)	Low	Low
	Environment - emissions to earth	O	(-)	Low	Very Low
	Environment - waste of resources e.g., water, power etc	O	(-)	Low	Very Low
	Public - Aesthetics	O	(-)	Low	Low
	Investors - Financial	O	(-)	Moderate	Low
	Employees and investors - Security	O	(-)	Moderate	Low
	Employees and investors - Security	O	(-)	Moderate	Low
	Emergencies	O	(-)	Moderate	Low
	Investors - Legal	O	(-)	Moderate	Low
	Human Health - chronic exposure to toxic chemical or biological agents	D	(-)	N/A	N/A
	Human Health - exposure to noise	D	(-)	N/A	N/A
	Human Health - exposure to temperature extremes and/or humidity	D	(-)	N/A	N/A
	Human Health - exposure to psychological stress	D	(-)	N/A	N/A
	Human Health - exposure to ergonomic stress	D	(-)	N/A	N/A
	Human and Equipment Safety - exposure to fire radiation	D	(-)	N/A	N/A
	Human and Equipment Safety - exposure to explosion over pressures	D	(-)	N/A	N/A
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents	D	(-)	N/A	N/A

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Human and Equipment Safety - exposure to violent release of kinetic or potential energy	D	(-)	N/A	N/A
	Human and Equipment Safety - exposure to electromagnetic waves	D	(-)	N/A	N/A
	Environment - emissions to air	D	(-)	N/A	N/A
	Environment - emissions to water	D	(-)	N/A	N/A
	Environment - emissions to earth	D	(-)	Moderate	Low
	Environment - waste of resources e.g., water, power etc	D	(-)	N/A	N/A
	Public - Aesthetics	D	(-)	N/A	N/A
	Investors - Financial	D	(-)	N/A	N/A
	Employees and investors - Security	D	(-)	N/A	N/A
	Emergencies	D	(-)	N/A	N/A
	Investors - Legal	D	(-)	Moderate	Low

9.14.2 VANADIUM REDOX FLOW BATTERY ENERGY STORAGE SYSTEMS

Table 9-101 – Summary of High-Level Safety, Health and Environmental Risk Impacts for the Vanadium Redox Flow BESS

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
High Level Safety, Health and Environmental Risk Assessment	Human Health - chronic exposure to toxic chemical or biological agents	C	(-)	Moderate	Low
	Human Health - exposure to noise	C	(-)	Moderate	Low
	Human Health - exposure to temperature extremes and/or humidity	C	(-)	Low	Very Low
	Human Health - exposure to psychological stress	C	(-)	Low	Low
	Human Health - exposure to ergonomic stress	C	(-)	Low	Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Human and Equipment Safety - exposure to fire radiation	C	(-)	Moderate	Low
	Human Health - chronic exposure to toxic chemical or biological agents	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to explosion over pressures	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to violent release of kinetic or potential energy	C	(-)	High	Low
	Human and Equipment Safety - exposure to electromagnetic waves	C	(-)	Moderate	Low
	Environment - emissions to air	C	(-)	Low	Very Low
	Environment - emissions to water	C	(-)	Low	Low
	Environment - emissions to earth	C	(-)	Low	Low
	Environment - waste of resources e.g., water, power etc	C	(-)	Low	Very Low
	Public - Aesthetics	C	(-)	Low	Low
	Investors - Financial	C	(-)	Moderate	Low
	Employees and investors - Security	C	(-)	Moderate	Low
	Emergencies	C	(-)	Moderate	Low
	Investors - Legal	C	(-)	Moderate	Low
	Human Health - chronic exposure to toxic chemical or biological agents	O	(-)	Moderate	Low
	Human Health - chronic exposure to toxic chemical or biological agents	O	(-)	Moderate	Low
	Human Health - exposure to noise	O	(-)	Moderate	Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Human Health - exposure to temperature extremes and/or humidity	O	(-)	Low	Very Low
	Human Health - exposure to psychological stress	O	(-)	Low	Very Low
	Human Health - exposure to ergonomic stress	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to fire radiation	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to fire radiation	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to explosion over pressures	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents	O	(-)	Low	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to violent release of kinetic or potential energy	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to electromagnetic waves	O	(-)	Moderate	Low
	Environment - emissions to air	O	(-)	Low	Very Low
	Environment - emissions to water	O	(-)	Low	Low
	Environment - emissions to earth	O	(-)	Low	Very Low
	Environment - waste of resources e.g., water, power etc	O	(-)	Low	Very Low
	Public - Aesthetics	O	(-)	Moderate	Low
	Investors - Financial	O	(-)	Moderate	Low
	Employees and investors - Security	O	(-)	Moderate	Low
	Employees and investors - Security	O	(-)	Moderate	Low
	Emergencies	O	(-)	Moderate	Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Investors - Legal	O	(-)	Moderate	Low
	Human Health - chronic exposure to toxic chemical or biological agents	D	(-)	N/A	N/A
	Human Health - exposure to noise	D	(-)	N/A	N/A
	Human Health - exposure to temperature extremes and/or humidity	D	(-)	N/A	N/A
	Human Health - exposure to psychological stress	D	(-)	N/A	N/A
	Human Health - exposure to ergonomic stress	D	(-)	N/A	N/A
	Human and Equipment Safety - exposure to fire radiation	D	(-)	N/A	N/A
	Human and Equipment Safety - exposure to explosion over pressures	D	(-)	N/A	N/A
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents	D	(-)	N/A	N/A
	Human and Equipment Safety - exposure to violent release of kinetic or potential energy	D	(-)	N/A	N/A
	Human and Equipment Safety - exposure to electromagnetic waves	D	(-)	N/A	N/A
	Environment - emissions to air	D	(-)	N/A	N/A
	Environment - emissions to water	D	(-)	N/A	N/A
	Environment - emissions to earth	D	(-)	Moderate	Low
	Environment - waste of resources e.g., water, power etc	D	(-)	N/A	N/A
	Public - Aesthetics	D	(-)	N/A	N/A
	Investors - Financial	D	(-)	N/A	N/A
	Employees and investors - Security	D	(-)	N/A	N/A
	Emergencies	D	(-)	N/A	N/A
	Investors - Legal	D	(-)	Moderate	Low

Mitigation measures for the construction, operation and decommissioning phases includes:

- The construction phase will be managed according to all the requirements of the Occupational Health and Safety Act No. 85 of 1993 specifically the Construction Regulations.
- SHEQ policy in place.
- A detailed construction Risk Assessment prior to work.
- SHE procedure in place.
- PPE to be specified.
- SHE appointees in place.
- Contractor's safety files in place and up to date.
- All necessary health controls/ practices to be in place, e.g., ventilation of welding and painting areas.
- SHE monitoring and reporting programs in place.
- Emergency response plan to be in place prior to beginning construction and to include aspects such as appointment of emergency controller, provision of first aid, first responder contact numbers.
- Health Risk Assessment to determine if equipment noise exceeds 85dB at workstation and 61dB at boundary of the site
- Employees to be provided with hearing protection if working near equipment that exceeds the noise limits.
- Construction site facilities to comply with Occupational Health and Safety Act No. 85 of 1993 specifically the thermal, humidity, lighting and ventilation requirements of the Environmental Regulations for Workplaces.
- Adequate potable water for employees to be provided during all phases of the project. Bore hole, bowser and tank or small water treatment plant may be required to provide potable water for the BESS installation staff during all phases of the project.
- Training in lifting techniques.
- Ensure that despite the isolated location all the necessary equipment is available (and well maintained) during construction. Otherwise employees may revert to unsafe practices. Isolated location, maintenance of construction equipment to ensure safe operation is critical. Ensure this is in place prior to project beginning.
- Fuels stored on site in dedicated, demarcated and bunded areas.
- Suitable fire-fighting equipment on site near source of fuel, e.g., diesel tank, generators, mess, workshops etc.
- Solid state battery design includes abuse tests such as drop test, impact, rapid discharge etc. Propagation tests for systems, e.g., heat insulating materials between cells/modules. Factory acceptance test prior to prior to leaving manufacture. Batteries are usually stored at 50% charge to prolong life but may be shipped fully discharged. This level of detail should be understood to assess the risk during transport and storage.
- The company responsible for the battery installation should ensure suitably competent transport companies are appointed.
- Prior to bringing any containers into the country, the company responsible for the battery installation (possibly via appointed contractors) should ensure that an Emergency response plan is in place for the full route from the ship to the site. Drivers trained in the hazards of containerized batteries.

- All necessary good hygiene practices to be in place, e.g., provision of toilets, eating areas, infectious disease controls.
- Policies and practice for dealing with known vectors of disease such as Aids, TB, COVID 19 and others.
- Awareness training for persons on site, safety induction to include animal hazards.
- First aid and emergency response to consider the necessary anti-venom, anti-histamines, topical medicines etc.
- Due to isolated locations some distance from town, the ability to treat with anti-venom and extreme allergic reactions on site is critical to mitigate the impacts
- Appointed transport company to ensure transport in accordance with Regulation 8 of the National Road Traffic Act 93 of 1996, Dangerous Goods. Not permitted to transport prescribed goods in manner not consistent with the prescriptions, e.g., consignor and consignee responsibilities. Prescription found in SANS 10228/29 and international codes for battery transport etc.
- Transport in sealed packages that are kept upright, protected from movement damage etc.
- Also packaged to ensure no short-circuiting during transport.
- Transport to prevent excessive vibration considerations as battery internal may be damaged leading to thermal run-away during commissioning.
- Pre-assembled containers will most likely be supplied. These will be fitted with the necessary protective measures by the supplier considering marine and road transport as well as lifting, setting down etc.
- Route selection to consider possible incidents along the way and suitable response, e.g., satellite tracking, mobile communication, 24/7 helpline response.
- Standard dangerous goods requirements for Hazmat labels, Trem cards, driver trained in the hazards of the load.
- There will be packaging materials that will need to be disposed of after the entire system is connected and commissioned as well as after regular maintenance.
- There will need to be waste segregation (e.g., electronic equipment, chemicals) and management on the site.
- Water usage to be monitored on site during construction.
- Handling protocols to be provided by battery supplier.
- End of Life plan needs to be in place before any battery containers enter the country as there may be damaged battery unit from day 1.
- Water management plan and spill containment plans to be in place.
- Fencing around electrical infrastructure to SANS standard and Eskom Guidelines.
- The hazardous nature of the electrical and battery equipment should be clearly indicated – e.g., Skull and Cross Bones or other signs.
- Night lighting to be provided both indoors and outdoors where necessary.
- If batteries are stored at 50% charge, thermal run away can happen while in storage on site waiting for installation. In addition, if involved in an external fire thermal run away can happen even with uncharged batteries. Except during shipping, ideally the units should not be stored any closer to each other than they would be in the final installation so that propagation is prevented, i.e. laydown area needs to be considered.
- The company in charge of the containers at each stage in the transport process needs to be very clear so that responsibility for the integrity of the load and protection of the persons involved in transfer and coordination of emergency response on-route. E.g., if purchased from Tesla where does hand over occur to the South African contractor / owner, at the factory door in USA, at the

port in RSA, at the site fence. For example, who will be accountable if there's thermal runway event on a truck with a container that stops in a small town for driver refreshments.

- Use only internationally reputable battery suppliers who comply with all known regulations/guideline at the time of purchasing.
- Ensure only state of the art battery systems are used and not old technologies prone to fires/explosions etc.
- The operation and maintenance phase will be managed according to all the requirements of the Occupational Health and Safety Act 85 of 1993.
- A detailed Risk Assessment of all normal operating and maintenance activities on site to be compiled, and form the basis of operating instructions, prior to commencing commissioning.
- All necessary health controls/ practices to be in place, e.g., ventilation of confined areas, occupational health monitoring if required and reporting programs in place.
- Emergency response plan for full operation and maintenance phase to be in place prior to beginning commissioning
- Maintenance procedures will be in place should equipment need to be opened, e.g., pumps drained and decontaminated prior to repair in workshop etc.
- PPE will be specified for handling battery parts and other equipment on site.
- Training of staff in hazards of chemicals on site.
- Possible detectors with local alarms if regulated occupational exposure limits are exceeded etc prior to entry for inspection of battery containers.
- Labelling of all equipment.
- Confined space entry procedures if entering tanks.
- There needs to be careful thought given to procedures to be adopted before entering into the BESS or a container particularly after a BMS shut down where there may be flammable or toxic gases present, a fire etc.
- Safety Data Sheets (SDSs) to be available on site.
- Operating manuals to be provided including start-up, shut-down, steady state, monitoring requirements.
- Maintenance manuals with make safe, decontamination and repair procedures.
- Proposed maintenance schedules e.g., checklists for weekly, monthly, annual etc.
- Provided portable equipment for calibration and for testing/verification of defective equipment, e.g., volt/current meters, infrared camera
- Ensure containers are temperature controlled as required to remain within the optimal battery operating temperature range.
- Lighting to be provided inside any buildings, inside the containers, possibly linked to the door opening and outdoors where necessary.
- Adequate potable water to be provided during all phases of the project.
- Suitable lighting to be provided including emergency lighting for safe building exit in the event of power failure.
- PPE for operations and maintenance staff to be suitable for the weather conditions.
- Staff rotation to other activities within the site may be necessary.
- Performance monitoring of inspections / maintenance tasks in particular will be necessary.
- Working at height procedure to be in place.
- Grass cutting and fire breaks around the BESS installations to prevent veld fires. No combustible materials to be stored in or near the batteries or electrical infrastructure. Separation of site diesel tank, transformers from BESS and vice versa.

- There are BESS design codes from the USA and standards of practice that can be used e.g., UL9540, NFPA 855 and DNV GL RP 43.
- Detailed FMEA/Hazop/Bowtie to done during design at the component level and system levels. Safety integrity level rating of equipment (failure probably) with suitable redundancy if required. Site Acceptance Testing as part of commissioning of each unit and the overall system. Abuse tests conducted by supplier.
- BMS should be checking individual cell voltage as well as stack, module, container, system voltages/current etc. BMS tripping the cell and possibly the stack/ building unit or module/rack/container, if variations in voltage. Diagnostics easily accessible. Diagnostics able to distinguish cell from stack or cell from module faults. Protective systems are only as good as their reliability and functionality testing is important, e.g., testing that all battery trips actually work. Fire resistant barrier between the batteries and the PCS side if in the same container, or separate containers.
- Suitable ingress protection level provided for electrical equipment, e.g., IP55 - 66. If air cooling into container, suitable dust filters to be provided. Smoke detectors linked to BMS & alerts in control room.
- Effects of battery aging to be considered. Solid state battery life starts to be impacted above 40 °C and significant impacts above 50 °C with thermal run away starting at 65-70 °C. BMS trips system at 50 °C. Temperature monitoring to be in place. Regular infrared scanning. Data needs to be stored for trend analysis.
- Data indicates an event frequency of 0.001 per installation and with up to 200 units this would mean an event once 5 years, i.e. a high probability event. Most events will be small not resulting in injuries, but this is possible if the event is not controlled.
- Prior to commencement of cold commissioning, emergency plan from transport and construction phase to be extended to operational phase and to include the hazards of the electrically live system. Procedure to address solid state container fires - extinguishing, ventilating, entering as appropriate or not. PPE for container firefighting include fire retardant, chemically resistant, nitrile gloves, antistatic acid resistant boots, fill face shields, BA sets.
- A planned fire response to prevent escalation to an explosion or an environmental event.
- Suitable supply of fire extinguishing medium and cooling medium
- Consider fire water for cooling adjacent equipment – BESS units.
- Can use fogging nozzles to direct smoke.
- Ensure procedures in place for clean up after event Lingering HF and other toxic residues in the soil and on adjacent structures.
- Procedures to be in place for IR scanning (or other suitable method) to determine if batteries are still smouldering / are sufficient cooled to handle as batteries may still be active some weeks after an event.
- Smoke or gas detector systems that are not part of the original battery container package, need to be linked to the main control panel for the entire system so that issues can be detected and responded to rapidly..
- Undertake a hazardous area classification of the inside of the container to confirm the rating of electrical equipment, due to possible leaks of electrolyte or generation of flammable gases under thermal run away. Emergency response plan and employee training referred to above is critical.
- Suitable training of selected emergency responders who may be called out to the facilities is critical.
- Apart from pumps, no major moving parts during operation.

- Maintenance equipment to be serviced and personnel suitably trained in the use thereof.
- Normally just small vehicles on site, bakkies, grass cutting, cherry-pickers etc. Possibly large cranes if large equipment or elevated structure removed/replaced.
- Traffic signs, rules etc. in place on site.
- All normal working at heights, hot work permits, confined space entry, cordon off unsafe areas/works etc. to be in place.
- Emergency response plan.

For a full list of mitigation measures refer to the EMPr (**Appendix I**) and Specialist Study (**Appendix H.11**).

9.15 NOISE ASSESSMENT

9.15.1 PLANNING AND DESIGN PHASE

Activities that relate to the planning and design phases are normally limited to surveying and site visits. These activities are normally limited to the daytime period, with the activities having temporary noise impacts of a minor consequence. The significance of the noise impact for the planning and design phase will be negative low and will not be considered in this assessment.

9.15.2 CONSTRUCTION PHASE

- **Construction of access roads:**

  Daytime ambient sound levels could range from 27 dBA to 78 dBA, averaging at 48.2 dBA. Daytime ambient sound levels are thus typical of a rural noise district most of the times, though it is expected that introduced noises will be audible over large distances during quiet periods (during low wind conditions). Road construction activities might increase ambient sound levels due to air-borne noise.

Table 9-102 - Construction Impacts from the construction of access roads

Potential Impact: construction of access roads	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	2	1	1	1	5	Very low	(-)
With Mitigation	1	2	1	1	1	5	Very low	(-)
Mitigation and Management Measures	▪ The potential significance of the noise impact is "Very Low" for access road construction activities and mitigation measures are not required.							

- **Construction traffic noises:**
  Daytime ambient sound levels could range from 27 dBA to 78 dBA, averaging at 48.2 dBA. Daytime ambient sound levels are thus typical of a rural noise district most of the times, though it is expected that introduced noises will be audible over large distances during quiet periods (during low wind

conditions). Construction traffic passing NSR will increase ambient sound levels due to air-borne noise.

Table 9-103 - Construction Impacts from the construction traffic noises

Potential Impact: construction traffic noises	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	2	1	2	1	**6**	**Very low**	(-)
With Mitigation	1	2	1	2	1	**6**	**Very low**	(-)
Mitigation and Management Measures	▪ The potential significance of the noise impact is "Very Low" for access road construction activities and mitigation measures are not required.							

- **Daytime WTG construction activities:**

  Daytime ambient sound levels could range from 27 dBA to 78 dBA, averaging at 48.2 dBA. Daytime ambient sound levels are thus typical of a rural noise district most of the times, though it is expected that introduced noises will be audible over large distances during quiet periods (during low wind conditions). Various construction activities (development of laydown areas and the hard standing areas, excavation of foundations, concreting of foundations and the assembly of the wind turbines tower and components, as well as construction of other infrastructure) taking place simultaneously during the day will increase ambient sound levels due to air-borne noise.

Table 9-104 - Construction Impacts from daytime WTG construction activities

Potential Impact: daytime WTG construction activities	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	1	2	1	**7**	**Very low**	(-)
With Mitigation	2	2	1	2	1	**7**	**Very low**	(-)
Mitigation and Management Measures	▪ The potential significance of the noise impact is "Very Low" for access road construction activities and mitigation measures are not required.							

- **Night-time WTG construction activities:**

  Night-time ambient sound levels could range from 31 dBA to 68 dBA, averaging at 44.4 dBA. Night-time ambient sound levels are thus typical of a rural noise district most of the times, though it is expected that introduced noises will be audible over large distances during quiet periods (during low wind conditions). Various construction activities (likely limited to the pouring of concrete as well as erection of WTG components) taking place simultaneously at night will increase ambient sound levels due to air-borne noise, using the criteria of the author.

Table 9-105 - Construction Impacts from Night-time WTG construction activities

Potential Impact: Night-time WTG construction activities	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	1	2	4	36	Moderate	(-)
With Mitigation	2	3	1	2	3	24	Low	(-)
Mitigation and Management Measures	▪ The potential significance of the noise impact is "Moderate" for potential night-time construction activities in vicinity of NSR and mitigation measures are required and recommended as follows: • Plan construction schedule that simultaneous activities are only required at one WTG location (located within 1,000m from an NSR). Other simultaneous construction activities can continue, but should take place further than 1,000m from NSR (especially activities near NSR12); and • Minimise active equipment at night, planning the completion of noisiest activities (though unlikely, could include activities such a pile driving, rock breaking and excavation) during the daytime period.							

9.15.3 OPERATIONAL PHASE

- **Daytime operation of selected WTG:**
  WTG will only operate during period with increased winds, when ambient sound levels are higher than periods with no or low winds. Ambient sound levels will likely be higher, with this assessment assuming an ambient sound level of 42.5 dBA (ambient sound level measurements indicate that actual ambient sound levels may be higher). Numerous WTG of the Igolide WEF operating simultaneously during the day will increase ambient sound levels due to air-borne noise from the WTG.

Table 9-106 - Operational Impacts from Daytime operation of selected WTG

Potential Impact: Night-time WTG construction activities	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	1	4	2	22	Low	(-)
With Mitigation	5	2	1	4	2	24	Low	(-)

Mitigation and Management Measures	▪ The significance of the noise impact is "Low" for daytime operational activities and additional mitigation measures may not be required. It should be noted that the low daytime significance is based on the assumption that daytime ambient sound levels would be higher around NSR, and that NSR are less likely to desire a quieter environment.

- **Night-time operation of selected WTG:**
  WTG will only operate during period with increased winds, when ambient sound levels are higher than periods with no or low winds. Ambient sound levels will likely be higher, with this assessment assuming an ambient sound level of 42.5 dBA (though ambient sound level measurements indicate that actual ambient sound levels may be higher). Numerous WTG of the Igolide WEF operating simultaneously at night will increase ambient sound levels due to air-borne noise from the WTG.

Table 9-107 - Operational Impacts from Night-time operation of selected WTG

Potential Impact: Night-time WTG construction activities	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	3	1	4	4	48	Moderate	(-)
With Mitigation	4	3	1	4	2	22	Low	(-)
Mitigation and Management Measures	▪ The significance of the potential noise impact is "High" for night-time operational activities and additional mitigation measures are recommended and required when considering the SPL of the selected WTG. Noise levels at various NSR is higher than 45 dBA and mitigation is recommended to reduce the noise levels if these structures will be used for residential purposes in the future. Potential options to reduce the noise impact which could include (one or a combination of): • The applicant can implement a NAP to ensure that noise levels are less than 45 dBA at all NSR. This allows the use of any WTG available on the market, subject to the condition that the selected WTG have noise control strategies that will ensure the design of a NAP; or • The applicant can select to use a WTG with a lower SPL (e.g., a WTG with a SPL less than 104.9 dBA re 1 pw) within 2,500m of these NSR; or							

	• The applicant can agree with landowners that certain locations will not be used for residential purposes.

9.15.4 DECOMMISSIONING PHASE

The potential significance of the noise impact would be similar as the construction phase (low significance) and no further mitigation is recommended or required for the decommissioning phase.

9.16 BAT ASSESSMENT

9.16.1 CONSTRUCTION PHASE

- **Loss of foraging habitat by clearing of vegetation:**

Table 9-108 – Construction Impacts from Loss of foraging habitat by clearing of vegetation

Potential Impact: Loss of foraging habitat by clearing of vegetation	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	1	3	2	4	28	Low	(-)
With Mitigation	1	1	3	2	3	21	Low	(-)
Mitigation and Management Measures	▪ Adhere to the sensitivity map criteria (already implemented). Rehabilitate cleared vegetation where possible at areas such as laydown yards.							

- **Roost destruction during earthworks:**

Table 9-109 – Construction Impacts from Roost destruction during earthworks

Potential Impact: Roost destruction during earthworks	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	1	3	2	2	20	Low	(-)
With Mitigation	4	1	3	2	1	10	Very Low	(-)
Mitigation and Management Measures	▪ Adhere to the sensitivity map criteria (already implemented).							

9.16.2 OPERATIONAL PHASE

- **Bat mortalities (collision and/or barotrauma) during foraging (resident bats)**

Table 9-110 – Operational Impacts from mortalities (collision and/or barotrauma) during foraging (resident bats)

Potential Impact: at mortalities (collision and/or barotrauma) during foraging (resident bats)	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	4	5	65	High	(-)
With Mitigation	4	2	3	4	3	39	Moderate	(-)
Mitigation and Management Measures	▪ Turbine layout adjustments to adhere to the sensitivity map (already implemented), and where needed, reducing blade movement at selected turbines during high-risk bat activity times/weather conditions. Acoustic deterrents are developed well enough to be trialled. The WEF should measure its bat mortality impact during operation and ensure that the WEF impact remain within sustainable levels.							

- **Bat mortalities during migration**

Table 9-111 – Operational Impacts from Bat mortalities during migration

Potential Impact: Bat mortalities during migration	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	4	4	4	4	64	High	(-)
With Mitigation	4	4	4	2	3	32	Moderate	(-)
Mitigation and Management Measures	▪ Reducing blade movement at selected turbines if a migration route is discovered. Acoustic deterrents are developed well enough to be trialled.							

- **Increased bat mortalities (collision and/or barotrauma) due to light attraction and habitat creation:**

Table 9-112 – Operational Impacts from Increased bat mortalities due to light attraction and habitat creation

Potential Impact: Increased bat mortalities due to light attraction and habitat creation	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	4	5	65	High	(-)
With Mitigation	4	2	3	4	2	26	Low	(-)
Mitigation and Management Measures	▪ Only use lights with low sensitivity motion sensors that switch off automatically when no persons are nearby, to prevent the creation of regular insect gathering pools. This will be at turbine bases (if applicable, and other infrastructure buildings). For buildings, avoid tin roofs and roof structures that offer entrance holes into the roof cavity. The stormwater management plan should prevent the creation of any artificial wetlands and open water sources within 300m of any turbine bases.							

10 CUMULATIVE IMPACT ASSESSMENT

Although the objective of the NEMA process is to undertake an impact and risk assessment process, inclusive of cumulative impacts, which is essential to assessing and managing the environmental and social impacts of projects, it may be insufficient for identifying and managing the incremental impacts on areas or resources used or directly affected by a given development from other existing, planned, or reasonably defined developments at the time the risks and impacts are identified.

IFC PS 1 recognizes that, in some instances, cumulative effects need to be considered in the identification and management of environmental and social impacts and risks. For private sector management of cumulative impacts, IFC considers good practice to be two pronged:

- Effective application of and adherence to the mitigation hierarchy in environmental and social management of the specific contributions by the project to the expected cumulative impacts; and
- Best efforts to engage in, enhance, and/or contribute to a multi-stakeholder, collaborative approach to implementing management actions that are beyond the capacity of an individual project proponent.

Even though Performance Standard 1 does not expressly require, or put the sole onus on, private sector clients to undertake a cumulative impact assessment (CIA), in paragraph 11 it states that the impact and risk identification process "*will take into account the findings and conclusions of related and applicable plans, studies, or assessments prepared by relevant government authorities or other parties that are directly related to the project and its area of influence" including "master economic development plans, country or regional plans, feasibility studies, alternatives analyses, and cumulative, regional, sectoral, or strategic environmental assessments where relevant*."

Cumulative impacts are those that result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones. For practical reasons, the identification and management of cumulative impacts are limited to those effects generally recognized as important on the basis of scientific concerns and/or concerns of affected communities (IFC GPH).

Evaluation of potential cumulative impacts is an integral element of an impact assessment. In reference to the scope for an impact assessment, IFC's Performance Standards specify that "*Risks and impacts will be analysed in the context of the project's area of influence. This area of influence encompasses…areas potentially impacted by cumulative impacts from further planned development of the project, any existing project or condition, and other project-related developments that are realistically defined at the time the Social and Environmental Assessment is undertaken; and (iv) areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location.*" (IFC 2006).

A cumulative impact assessment is the 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 Valued Environmental and Social Components (VECs) over time, and (b) proposing concrete measures to avoid, reduce, or mitigate such cumulative impacts and risk to the extent possible (IFC GPH).

Cumulative impacts with existing and planned facilities may occur during construction and operation of the proposed project. While one project may not have a significant negative impact on sensitive resources or receptors, the collective impact of the projects may increase the severity of the potential impacts.

Renewable energy developments within the surrounding area which have submitted applications for environmental authorisation have been included in this cumulative impact assessment. It is important to note that the existence of an approved EA does not directly equate to actual development of the project. Only one projects within 30 km of the proposed project site was identified:

- South African Renewable Energy EIA Application Database from DFFE (REEA_OR_2023_Q1) records only one approved renewable energy project within 30kms of the Igolide WEF project area, namely a 200MW Solar Photovoltaic (PV) facility located adjacent to Sibanye Gold Mine. This project is however located 6.5 km north-east of the Igolide WEF project area.

Other planned or existing projects that can interact with the project will be identified during stakeholder engagement and finalisation of the S&EIA process. Since the final grid route for the Igolide WEF has not yet been determined, this cumulative assessment does not consider the grid project.

The existing surrounding project is included in **Figure 10-1**.

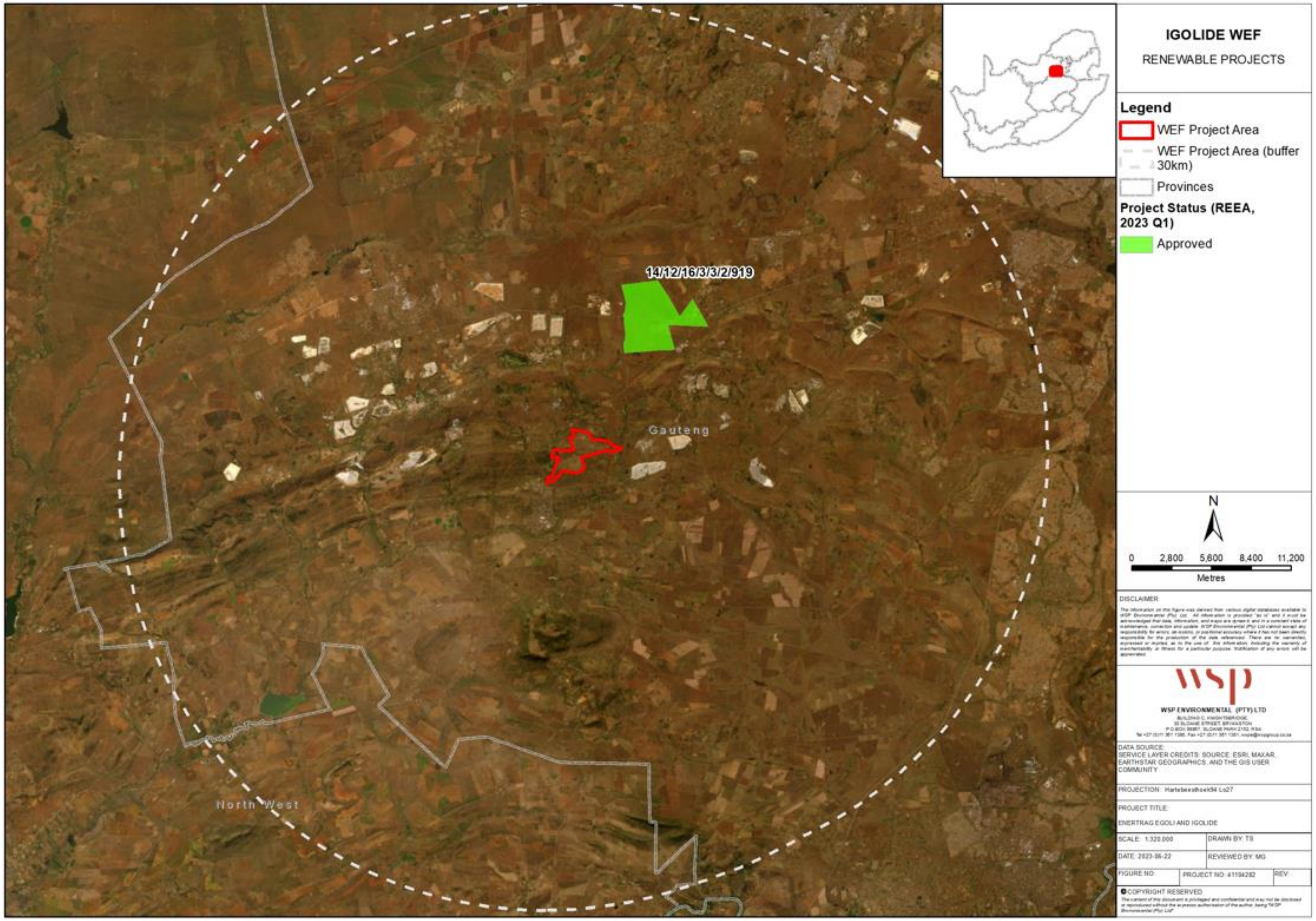


Figure 10-1 - Renewable Energy Projects with 30km of the Igolide WEF

10.1 AGRICULTURAL POTENTIAL

This cumulative impact assessment determines the quantitative loss of agricultural land if all renewable energy project applications within a 30 km radius become operational. These projects are listed in Appendix 4 of this report. In quantifying the cumulative impact, the area of land taken out of agricultural use as a result of all the projects listed in Appendix 4 (total generation capacity of 300 MW) will amount to a total of approximately 530 hectares. This is calculated using the industry standards of 2.5 and 0.3 hectares per megawatt for solar and wind energy generation respectively, as per the Department of Environmental Affairs (DEA) Phase 1 Wind and Solar Strategic Environmental Assessment (SEA) (2015). As a proportion of the total area within a 30 km radius (approximately 282,700 ha), this amounts to only 0.19% of the surface area. This is well within an acceptable limit in terms of loss of low potential agricultural land which is only suitable for grazing, and of which there is no scarcity in the country. This is particularly so when considered within the context of the following point.

In order for South Africa to develop the renewable energy generation that it urgently needs, agriculturally zoned land will need to be used for renewable energy generation. It is far more preferable to incur a cumulative loss of grazing land in a region such as the one being assessed, than to lose agricultural land that has a higher potential, and that is much scarcer, to renewable energy development elsewhere in the country.

All of the projects contributing to cumulative impact for this assessment have the same agricultural impacts in a very similar agricultural environment, and therefore the same mitigation measures apply to all.

It should also be noted that renewable energy development can only be located in fairly close proximity to a substation that has available capacity. This creates cumulative impact in such places. However, this is acceptable because it also effectively protects most agricultural land in the country from renewable energy development because only a small proportion of the country's total land surface is located in close enough proximity to an available substation to be viable for renewable energy development.

The loss of agricultural potential by soil degradation can effectively be prevented for renewable energy developments by generic mitigation measures that are all inherent in the project engineering and/or are standard, best-practice for construction sites. Soil degradation does not therefore pose a cumulative impact risk.

Due to all of the considerations discussed above, the cumulative impact of loss of future agricultural production potential is assessed as low. It will not have an unacceptable negative impact on the agricultural production capability of the area, and it is therefore recommended, from a cumulative agricultural impact perspective, that the development be approved.

10.2 AQUATIC BIODIVERSITY

The presence of the project infrastructure within the study area may overall PES score and category of the wetlands, as the Level 1B assessment is based on catchment and wetland landuses which may impact on wetland’s hydrology, vegetation, geomorphology and water quality. Although the turbines and access roads avoids the wetlands, there close proximity to wetlands (within a 500m buffer) will contribute to the increased hardened surfaces within the study area catchment which will ultimately reduce the wetland’s PES category reduced PES category of the wetlands, since the wet-health tool is based on changes in land uses within the wetland HGM and the wetland catchment of the affected wetlands.

Loss of landscape connectivity and disruption of broad-scale ecological processes

The presence of the wind turbines in the

The moderate PES category of the wetland based on the assessment of land uses within the wetland's catchment.

Changes in land uses have occurred within the wetlands and their catchments, which has resulted in the moderate PES category of the wetlands. The presence of the wind turbines and access roads within the wetlands catchments will contribute to the changes in land uses in the catchment which would ultimately impact on the hydrology of the wetlands and contribute towards a change in PES score

Increased stress on wetland catchment?

The landscape within which the proposed infrastructure is located is almost completely modified and fragmented as a consequence of the existing surrounding land uses (i.e. power station, mining, agricultural practices, residential areas, and informal settlement).

- While the currently proposed project infrastructure largely avoids the loss of significant areas of natural habitat due to active avoidance of these areas as part of the ongoing planning process, vegetation clearing would result in loss of additional 24.5 ha of moderately/largely modified seep habitats (Seep 1), contributing to cumulative impacts in terms of direct loss of seep wetlands at the landscape level.

10.3 WETLAND AQUATIC BIODIVERSITY

Presently, the primary land-use activities within the Project boundary are those associated with game farming and those of the larger study area include agriculture (along the immediate Project boundary); mining (with the nearest operations being the Sibanye Driefontein approximately 1.5 km to the north, Kloof Gold Mine approximately 1.2 km to the east); and the Fochville township at the south west tip of the Project boundary. Several other mines occur within the broader Project area, namely Sibanye Stillwater, Mponeng Gold Plant and the Harmony Kusasalethu Gold Mine.

Potential impacts associated with the above-mentioned land use activities include water quantity alterations (water abstraction for irrigation, presence of farm dams and the discharge of treated sewage and mine water), water quality deteriorations (chemical contamination due to diffuse surface runoff), vegetation clearing and the introduction of exotic species, and solid waste disposal.

Consequently, major impacts within the assessed Loopspruit reach were increased sedimentation and invasive species encroachment within the riparian zones. Similarly, within the Kraalkopspruit, major impacts were high sediment load and water quality deterioration evidenced by the high abundance of algae at the downstream reaches.

10.4 TERRESTRIAL BIODIVERSITY

The existing and proposed developments within 30 km from the site that were taken into consideration for cumulative impacts include:

- **Renewable energy projects:**

  Only one renewable energy development occurs in the region within a 30 km radius from the Igolide site: (DFFE EGIS; REEA Quarter 1, 2023)

  EAP: Aurecon SA Pty Ltd
  Applicant: Sibanye Gold Limited Development: Solar PV 200 MW Status: Approved
  DEA Reference: 14/12/16/3/3/2/919

  This Sibanye Gold Limited development falls in the Gauteng Shale Mountain Bushveld vegetation type that has a status of "Least Concern".

  Since the final grid route has not yet been determined, the cumulative assessment does not consider the grid.

- **Vegetation loss and habitat destruction:**

  Vegetation loss, habitat destruction and possibly loss of SCC and protected species, can occur when considering all developments. The habitat destruction will lead to changes in the physical features of the habitat, with concomitant changes in ecological processes. Secondary vegetation may develop at sites where the vegetation was cleared or the soil compacted. The species composition may change and alien species might invade. Vegetation loss will also constitute the loss of animal habitat. It should however be noted that in the case of wind energy facilities vegetation loss due to habitat destruction is far more contained than in the case of solar facilities. The contribution by the Igolide site to the cumulative impact will likely be small.

Table 10-1 – Impact on Vegetation loss and habitat destruction during the operational phase

Potential Impact: Vegetation loss and habitat destruction	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	33	4	3	39	Moderate	(-)
With Mitigation	2	3		4	2	24	Low	(-)
Mitigation and Management Measures	▪ All projects should adhere to the site-specific recommendations of the ecologists to ensure that impacts are mitigated where possible. ▪ Placement of infrastructure should be done in such a way that no SCC or protected species are affected and CBAs avoided and therefore a walkthrough before construction is commenced is required. ▪ Positioning of the wind turbines (i.e. avoiding CBAs and wherever possible ESAs) in the most environmentally responsible manner is crucial.							

- **Compromising integrity of CBA, ESA and NPAES**

  According to the mapping of CBAs in Gauteng, all turbines fall outside the CBA2 (Important area) and NPAES. Development within a CBA should not be allowed as such development may result in biodiversity loss and therefore compromise the integrity of the CBA. Since ESAs have also been awarded a 'Very High' sensitivity in the Screening Tool, the micrositing or repositioning of those turbines within ESAs should be considered. The on-site substation/BESS as well as the other ancillary areas (batching plant, construction camp and laydown) avoid CBAs and ESAs. Thus, the contribution of Igolide WEF to the cumulative impact will likely be small. It is assumed that authorisation would only be granted to projects that have similarly avoided CBAs and NPAES.

Table 10-2 – Impact on Compromising integrity of CBA, ESA and NPAES during the operational phase

Potential Impact: Compromising integrity of CBA, ESA and NPAES	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	33	4	3	39	Moderate	(-)
With Mitigation	2	3		4	2	24	Low	(-)
Mitigation and Management Measures	▪ A walkthrough would be needed prior to construction to inform permit applications for protected plants pecies. ▪ Avoid placing turbines and other large infrastructure in CBAs and wherever possible ESAs. ▪ Minimise the development footprint as far as possible. ▪ Stringent construction-phase monitoring of activities at the site to ensure that mitigation measures areadhered to and that the overall ecological impact of the development is maintained at a low level. ▪ Align roads and other infrastructure so that transformation within the CBAs and ESAs is minimised. ▪ The use of structures which may inhibit movement of fauna, e.g., mesh or electric fencing should be avoided where feasible.								

- **Reduced ability to meet conservation obligations & targets**
  The loss of unprotected vegetation types on a cumulative basis from the area may impact. The loss of unprotected vegetation types on a cumulative basis from the area may impact.

Table 10-3 – Impact of reduced ability to meet conservation obligations & targets during the operational phase

Potential Impact: reduced ability to meet conservation obligations & targets	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	33	4	3	**39**	**Moderate**	(-)
With Mitigation	2	3		4	2	**24**	**Low**	(-)
Mitigation and Management Measures	▪ A walkthrough would be needed prior to construction to inform permit applications for protected plant species. ▪ Ensure that habitats with a high to very high sensitivity are avoided. ▪ Minimise the development footprint as far as possible. ▪ •Minimise placement of infrastructure within the Vulnerable Rand Highveld Grassland.							

- **Loss of landscape connectivity and disruption of broad-scale ecological processes:**

The presence of the facility and the associated transformation of intact vegetation, could pose a threat to the connectivity of the landscape. For fauna the disruption is largely due to the hardened surfaces of the facility which also create open areas. Subterranean species that have to emerge from the soil to cross roads will be most affected. The severity of any these impacts for faunal species is likely to be relatively low as the roads required for operation are likely to still be of a natural surface such as gravel and would experience low traffic volumes. Because of the relatively small footprint of the wind turbines, the facility is unlikely to disrupt pollination and dispersal processes that could cause spatial fragmentation of plant populations. The facility would still allow grazing by wildlife and livestock to continue. Fire would need to be controlled and this could affect the vegetation dynamics. In the long-term the facility is not likely to create significant local or regional population-level impact on fauna or vegetation.

Table 10-4 – Impact of landscape connectivity and disruption of broad-scale ecological processes during the operational phase

Potential Impact: reduced ability to meet conservation obligations & targets	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	3	4	2	26	Low	(-)
With Mitigation	2	3	3	4	2	24	Low	(-)
Mitigation and Management Measures	▪ Minimising the development footprint wherever possible. ▪ Revegetation of all cleared and bare areas created by the facility with local species. ▪ Fences and other structures which impede faunal movement should be avoided. ▪ Roads should not have steep curbs.							

10.5 PLANT SPECIES

The existing and proposed developments within 30 km from the site that were taken into consideration for cumulative impacts include the renewable energy project linked with Sibanye Gold Limited. This development falls in the Gauteng Shale Mountain Bushveld vegetation type that has a status of "Least Concern".

Vegetation loss and habitat destruction

Vegetation loss, habitat destruction and possibly loss of SCC and protected species, can occur when considering all developments. The habitat destruction will lead to changes in the physical features of the habitat, with concomitant changes in ecological processes. Secondary vegetation may develop at sites where the vegetation was cleared or the soil compacted. The species composition may change and alien species might invade. Vegetation loss will also constitute the loss of animal habitat. It should however be noted that in the case of wind energy facilities vegetation loss due to habitat destruction is far more contained than in the case of solar facilities. The contribution by the Igolide site to the cumulative impact will likely be small.

Compromising integrity of CBA, ESA and NPAES

According to the mapping of CBAs in Gauteng, one of the turbines (01) is located on the boundary of the CBA and NPAES and could be microsited to avoid the CBA and NPAES. Development within a CBA should not be allowed as such development may result in biodiversity loss and therefore compromise the integrity of the CBA. Since ESAs have also been awarded a 'Very High' sensitivity in the Screening Tool, the micro-siting or repositioning of those turbines within ESAs should be considered. The on-site substation/BESS as well as Ancillary area 1 and 2 avoid CBAs and ESAs. Thus, the contribution of Igolide to the cumulative impact will likely be small. It is assumed that authorisation would only be granted to projects that have similarly avoided CBAs and NPAES.

Reduced ability to meet conservation obligations & targets

The loss of unprotected vegetation types on a cumulative basis from the area may impact the countries' ability to meet its conservation targets. The 'Vulnerable' Rand Highveld Grassland is a large national vegetation type but only 1.8% is currently conserved, with a conservation target of 24%. However, the direct physical impact of the Igolide WEF on the vegetation type will be small in extent (estimated at 50 ha by Enertrag) and the Igolide site is not located in a protected area but it does fall within the protected area expansion strategy (NPAES). No Special Conservation Zone occurs in the region (GDARD, 2011).

Loss of landscape connectivity and disruption of broad-scale ecological processes

The presence of the facility and the associated transformation of intact vegetation could pose a threat to the connectivity of the landscape. Because of the relatively small footprint of the wind turbines, the facility is unlikely to disrupt pollination and dispersal processes that could cause spatial fragmentation of plant populations. Fire would need to be controlled and this could affect the vegetation dynamics.

In the long-term the facility is not likely to create significant local or regional population-level impact.

10.6 ANIMAL SPECIES

The assessment of the Project's potential contribution to cumulative impacts as they relate to animal species, summarised from the terrestrial impact assessment (Ekotrust, 2023), is presented in the sections that follow.

The existing and proposed developments within 30 km from the site that were taken into consideration for cumulative impacts include the renewable energy project linked with Sibanye Gold Limited.

Loss of fauna habitat

Vegetation loss, habitat destruction and possibly loss of SCC and protected species, can occur when considering all developments. The habitat destruction will lead to changes in the physical features of the habitat, with concomitant changes in ecological processes. Vegetation loss will also constitute the loss of animal habitat. The contribution of the Igolide project (residual impact of fauna habitat loss) to the cumulative impact will likely be small.

Compromising integrity of CBA, ESA and NPAES

According to the mapping of CBAs in Gauteng, one of the turbines (WTG04) is located on the boundary of the CBA and NPAES and could be microsited to avoid the CBA and NPAES. Development within a CBA should not be allowed as such development may result in biodiversity loss and therefore compromise the integrity of the CBA.

Since ESAs have been assigned a 'Very High' sensitivity in the Screening Tool, the micro-siting or repositioning of those turbines within ESAs should be considered. The on-site substation/BESS as well as Ancillary area 1 and 2 avoid CBAs and ESAs. Thus, the contribution of Igolide to the cumulative impact will likely be small. It is assumed that authorisation would only be granted to projects that have similarly avoided CBAs and NPAES.

Reduced ability to meet conservation obligations & targets

The loss of unprotected vegetation types on a cumulative basis from the area may impact the countries' ability to meet its conservation targets. The 'Vulnerable' Rand Highveld Grassland is a large national vegetation type but only 1.8% is currently conserved, with a conservation target of 24%. However, the direct physical impact of the Igolide WEF on the vegetation type will be small in extent (estimated at 50 ha by Enertrag) and the Igolide site is not located in a protected area, although it does fall within the protected area expansion strategy (NPAES). No Special Conservation Zone occurs in the region (GDARDE 2011).

With the full application of the mitigation hierarchy (i.e. compensation for significant residual impacts on undisturbed areas of Vulnerable vegetation communities, the Igolide project's contribution to cumulative impacts in this regard, would be reduced.

Loss of landscape connectivity and disruption of broad-scale ecological processes

The presence of the facility and the associated transformation of intact vegetation could pose a threat to the connectivity of the landscape. For fauna, the disruption is largely due to the hardened surfaces of the facility which also create open areas. Subterranean species that have to emerge from the soil to crossroads will be most affected.

The severity of these impacts for faunal species is likely to be relatively low as the roads required for operation are likely to still be of a natural surface such as gravel and would experience low traffic volumes. Because of the relatively small footprint of the wind turbines, the facility is unlikely to disrupt pollination and dispersal processes that could cause spatial fragmentation of plant populations. The facility would still allow grazing by wildlife and livestock to continue. Fire would need to be controlled and this could affect the vegetation dynamics.

In the long-term the facility is not likely to create significant local or regional population-level impact on fauna

10.7 AVIFUANA

- Total or partial displacement due to disturbance and habitat transformation associated with the construction and decommissioning of the WEF and associated infrastructure.
- Total or partial displacement due to habitat transformation associated with the operation of the wind turbines.
- Collisions with the wind turbines.
- Electrocutions and collisions with the on-site substations and internal 33kV network.

10.8 ARCHAEOLOGICAL AND CULTURAL HERITAGE

In relation to an activity, cumulative impact "means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may be significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities" (NEMA EIA Reg GN R982 of 2014). Although only one only other renewable energy facility has been approved in the surrounding area, heritage impacts are likely to have resulted from many other developments, foremost among them are mining projects. Note that the Igolide powerline (to be the subject of a separate application) is also considered here even though its routing has yet to be finalised. The powerline is not expected to influence the assessment of cumulative impacts as presented here.

Cumulative impacts to archaeological resources could be of concern since there is no doubt that other archaeological sites have been lost due to agricultural activities and mining in the wider area. Some of these impacts are visible on aerial photography. Given the relatively small impact expected from this WEF project, it is expected that its contribution to cumulative impacts to archaeology will be low negative.

Graves are commonly encountered on the landscape and, again, other activities are likely to have resulted in impacts in the past. The contribution of the present project to cumulative impacts on graves is expected to be very low negative because of the small overall footprint and high degree of survey coverage of the footprint.

Cumulative impacts to the landscape are not expected to be of much concern because of the many gold mines occurring in the area. The mines undoubtedly result in higher magnitude visual intrusions and have effectively established an industrial component to the landscape into which the wind turbines would fit fairly easily. However, the proposed turbines are very tall. The contribution to cumulative impacts is rated as low negative.

10.9 PALAEONTOLOGICAL

As far as the palaeontology is concerned, there are no cumulative impacts because each site is unique and may or may not have fossils. Stromatolites may be scattered over the landscape, but their distribution is erratic and unpredictable. If a stromatolite outcrop occurs this would be an aerially small concentration of fossils and very unlikely to extend beyond tens of metres. Therefore, projects on adjacent land parcels are unlikely to result in a cumulative impact on the palaeontology of the area. It is important to note that the final grid route associated with the WEF has not yet been confirmed and as such, the cumulative assessment does not consider the grid.

10.10 TRAFFIC

Table 10-5 – Cumulative impact of increase in development trips during the construction phase

Potential Impact: Increase in Development Trips	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	4	2	2	4	44	Moderate	(-)
With Mitigation	3	4	1	2	3	30	Low	(-)
Mitigation and Management Measures	▪ Same as for the Construction phase. ▪ Stagger components delivery to site. ▪ Reduce the construction period where possible. ▪ Stagger the construction phase. ▪ Use of mobile batch plants and quarries in close proximity to the site to decrease the impact on the surrounding road network. ▪ Staff and general trips should occur outside of peak traffic periods as much as possible.							

	- Maintenance of haulage routes. - Design and maintenance of internal roads. Possibly provide two access points to the site to split construction vehicle trips and reduce the risk of congestion

10.11 VISUAL ASSESSMENT

- Additional renewable energy developments in the broader area will alter the natural character of the study area towards a more industrial landscape and expose a greater number of receptors to visual impacts.
- Visual intrusion of multiple renewable energy developments may be exacerbated, particularly in more natural undisturbed settings.
- Additional renewable energy facilities in the area would generate additional traffic on gravel roads thus resulting in increased impacts from dust emissions and dust plumes.
- The night time visual environment could be altered as a result of operational and security lighting at multiple renewable energy facilities in the broader area.

Table 10-6 – Cumulative impact associated with visual

Potential Impact: Visual Impacts	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	3	3	4	4	56	Moderate	(-)
With Mitigation	4	3	3	4	4	56	Moderate	(-)
Mitigation and Management Measures	- Implementation of the mitigation measures as per construction, operational and decommissioning phases.							

10.12 SOCIAL

10.12.1 SENSE OF PLACE

The findings of the VIA (SLR, 2023) indicated that the South African Renewable Energy EIA Application Database from DFFE (REEA_OR_2023_Q1) records only one approved renewable energy project within 30kms of the Igolide WEF project area, namely a 200MW Solar Photovoltaic (PV) facility located adjacent to Sibanye Gold Mine. This project is however located 6.5 km north-east of the Igolide WEF project area, in close proximity to extensive, well-established mining developments and as such it is not anticipated that this development will result in any significant cumulative impacts affecting the landscape or the visual receptors within the visual assessment zone for the Igolide WEF. The VIA also notes that existing mining / quarrying and associated industrial development have already resulted in large scale visual impacts, especially to the north and east of the Igolide WEF project area. These developments have significantly altered the sense of place and visual character in the broader region. From a visual perspective, the concentration of renewable energy facilities in close proximity to existing mining development as proposed will further change the visual character of the area on the periphery of Fochville and alter the inherent sense of place, extending an increasingly industrial character into the broader area, and resulting in significant cumulative impacts. It is however anticipated that these impacts could be mitigated to acceptable levels with the implementation of the recommended mitigation measures.

The cumulative impacts on sense of place and the landscape are indicated in **Table 10-7**.

Table 10-7 – Cumulative impact on regional employment and household income

Potential Impact: Sense of place	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Overall impact of the proposed project considered in isolation	2	3	3	4	3	**36**	**Moderate**	(-)
Cumulative impact of the project and other projects in the area	2	3	3	4	3	**36**	**Moderate**	(-)
Mitigation and Management Measures	▪ The recommendations contained in the VIA should be implemented.							

10.12.2 LOCAL SERVICES AND ACCOMMODATION

The establishment of a number of REFs has the potential to place pressure on local services and accommodation, specifically during the construction phase. The objective will be to source as many low and semi-skilled workers for the construction phase from the MCLM, specifically Fochville and Carletonville. This will reduce the potential pressure on local services and accommodation in Fochville and Carletonville. In addition, due to the size of the town of Fochville and Carletonville the potential impact on local services is likely to be limited.

The potential impact should also be viewed within the context of the potential positive cumulative impacts for the local economy associated with the establishment of the proposed facility and other potential renewable energy projects in the MCLM. These benefits will create opportunities for investment in the MCLM, including the opportunity to up-grade and expand existing services and the construction of new houses.

The cumulative impact on local services is included in **Table 10-8**.

Table 10-8 – Cumulative impacts on local services

Potential Impact: Local Services	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Overall impact of the proposed project considered in isolation	2	3	N/A	2	2	**12**	**Low**	(-)

Cumulative impact of the project and other projects in the area	3	3	N/A	3	2	**18**	**Low**	(-)
Mitigation and Management Measures	▪ The proponent should liaise with the LM to address potential impacts on local services as part of the IDP process.							

10.12.3 LOCAL ECONOMY

In addition to the potential negative impacts, the establishment of renewable energy facilities and associated infrastructure, including the proposed WEF, will also create several socio-economic opportunities for the MCLM. The positive cumulative opportunities include creation of employment, skills development and training opportunities, and downstream business opportunities.

The review of the REIPPPP (December 2021) indicates that to date (across BW1-4) a total contribution of R22.8 billion has been committed to SED initiatives. Assuming an even, annual revenue spread, the average contribution per year would be R1.1 billion. Of the total commitment, R18.5 billion is specifically allocated for local communities where the IPPs operate. With every new IPP on the grid, revenues and the respective SED contributions will increase.

The potential cumulative benefits for the local and regional economy are therefore associated with both the construction and operational phase of renewable energy projects and associated infrastructure and extend over a period of 20-25 years. However, steps must be taken to maximise employment opportunities for members from the local communities in the area and support skills development and training programmes.

The cumulative impact on local economy is indicated in **Table 10-9**.

Table 10-9 – Cumulative impacts on local economy

Potential Impact: Local Economy	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Overall impact of the proposed project considered in isolation	2	3	N/A	4	4	**32**	**Moderate**	(+)
Cumulative impact of the project and other projects in the area	4	3	N/A	4	5	**55**	**Moderate**	(+)
Enhancement	▪ The proponent should liaise with the LM to identify potential opportunities for the local economy and businesses as part of the IDP process.							

10.13 GEOTECHNICAL POTENTIAL

Table 10-10 - Cumulative Impacts from Soil Erosion

Potential Impact: The displacement of natural earth material and overlying vegetation leading to: • Exposure of upper soil layer • Increase in stormwater velocity • Soil washed downslope into drainage channels leading to sedimentation. •The erosion of these slopes will be exacerbated during periods of heavy rainfall	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	3	4	**44**	**Moderate**	(-)
With Mitigation	2	1	1	2	2	**12**	**Very low**	(-)
Mitigation and Management Measures	▪ Where possible, use existing road network and access tracks. ▪ Use temporary berms and drainage channels to divert surface water. ▪ Minimize earthworks and demolish footprints. ▪ Rehabilitate affected areas (such as revegetation). ▪ Develop a chemical spill response plan. ▪ Reinstate channelized drainage features.							

Table 10-11 Cumulative Impacts from Oil spillages

Potential Impact: • Contamination of ground and surface water resources from heavy plant leading to quality deterioration of the water resources	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	3	3	4	**48**	**Moderate**	(-)
With Mitigation	2	1	3	1	2	**14**	**Very low**	(-)
Mitigation and Management Measures	▪ Vehicle and construction machinery repairs to be undertaken in designated areas with proper soil protection. ▪ Frequent checks of vehicles and construction machinery for oil leaks.							

Table 10-12 - Cumulative Impacts from disturbance to fauna and flora

Potential Impact: The displacement of natural earth material and overlying vegetation leading to erosion	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	3	3	3	30	Low	(-)
With Mitigation	2	1	1	2	2	12	Very low	(-)
Mitigation and Management Measures	▪ Limit excavations where possible.							

Table 10-13 - Decommissioning Impacts from Slope instability

Potential Impact: Slope instability around structures.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	3	3	2	18	Low	(-)
With Mitigation	1	1	3	2	2	14	Very low	(-)
Mitigation and Management Measures	▪ Avoid steep slope areas. ▪ Design cut slopes according to detailed geotechnical analysis.							

Table 10-14 –Construction Impacts on Seismic activity

Potential Impact: Damage of proposed development.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	3	3	4	3	42	Moderate	(-)
With Mitigation	2	2	3	3	3	30	Low	(-)
Mitigation and Management Measures	▪ Design all infrastructure according to SANS 10160-4 to ensure the proposed development meets the minimum requirements for infrastructure in a seismic zone.							

10.14 NOISE

There is a very low risk of cumulative noises during the construction and operational phases because there are no other WEF projects proposed within 5,000m from the Igolide WEF project.

10.15 BATS

We know that wind and solar energy prospecting has been taking place within 30km of the current project . There are also numerous powerlines (existing/authorised/under application) within 30km of the Igolide WEF. It should be noted that the wind energy project is unlikely to proceed (Pers. comm., WSP) and that solar (PV) technology will have limited direct cumulative consequences on the current wind energy project, although we assess the cumulative impacts below as though these two projects would be authorised. It should also be noted that the cumulative impact assessment does not consider the grid connection infrastructure associated with the Igolide WEF as it is still to be determined.

- **Bat mortalities (collision and/or barotrauma) during foraging**

Table 10-15 – Construction Impacts from Bat mortalities (collision and/or barotrauma) during foraging

Potential Impact: Bat mortalities (collision and/or barotrauma) during foraging	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	3	3	4	4	56	Moderate	(-)
With Mitigation	4	3	3	4	3	42	Moderate	(-)
Mitigation and Management Measures	- The WEF must adhere to the sensitivity map criteria. Turbine layout adjustments to adhere to the sensitivity maps, and where needed reducing blade movement at selected turbines and high-risk bat activity times/weather conditions. Acoustic deterrents are developed well enough to be trialled. The WEF should measure its bat mortality impact during operation and ensure that the WEF impacts remain within sustainable levels.							

- **Bat mortalities (collision and/or barotrauma) during migration**

Table 10-16 – Construction Impacts from Bat mortalities (collision and/or barotrauma) during foraging

Potential Impact: Bat mortalities (collision and/or barotrauma) during foraging	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	4	3	4	4	60	Moderate	(-)
With Mitigation	4	4	3	4	2	30	Moderate	(-)
Mitigation and Management Measures	- The WEF must adhere to the sensitivity map criteria. Turbine layout adjustments to adhere to the sensitivity							

	maps, and where needed reducing blade movement at selected turbines and high-risk bat activity times/weather conditions. Acoustic deterrents are developed well enough to be trialled. The WEF should measure its bat mortality impact during operation and ensure that the WEF impacts remain within sustainable levels.

- **Increased bat mortalities due to light attraction and habitat creation**

Table 10-17 – Construction Impacts from Increased bat mortalities due to light attraction and habitat creation

Potential Impact: Increased bat mortalities due to light attraction and habitat creation	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	3	3	4	3	**42**	**Moderate**	(-)
With Mitigation	4	3	3	4	2	**28**	**Moderate**	(-)
Mitigation and Management Measures	- The WEF must only use lights with low sensitivity motion sensors that switch off automatically when no persons are nearby, to prevent the creation of regular insect gathering pools. This will be at turbine bases (if applicable and other infrastructure buildings). For buildings, avoid tin roofs and roof structures that offer entrance holes into the roof cavity. The stormwater management plan should prevent the creation of any artificial wetlands and open water sources within 300m of any turbine bases.							

11 ENVIRONMENTAL IMPACT STATEMENT

The essence of any impact assessment process is aimed at ensuring informed decision-making, environmental accountability, and to assist in achieving environmentally sound and sustainable development. In terms of NEMA, the commitment to sustainable development is evident in the provision that "development must be socially, environmentally and economically sustainable…. and requires the consideration of all relevant factors…". NEMA also imposes a duty of care, which places an obligation on any person who has caused, is causing, or is likely to cause damage to the environment to take reasonable steps to prevent such damage. In terms of NEMA's preventative principle, potentially negative impacts on the environment and on people's environmental rights (in terms of the Constitution of the Republic of South Africa, Act No. 108 of 1996) should be anticipated and prevented, and where they cannot be prevented altogether, they must be minimised and remedied in terms of "reasonable measures".

In assessing the environmental feasibility of the proposed construction of the proposed Project, the requirements of all relevant legislation have been considered. The identification and development of appropriate mitigation measures that should be implemented to minimise potentially significant impacts associated with the project, has been informed by best practice principles, past experience, and the relevant legislation (where applicable).

The conclusions of this Draft EIA Report are the result of comprehensive assessments. These assessments were based on issues identified through the S&EIA process and public participation undertaken to date. The Draft EIA will be subject to public review, which will be undertaken according to the requirements of NEMA with every effort made to include representatives of all stakeholders within the process. The Draft EIA will be updated and finalised taking into consideration all comments received during the public review period before being submitted to the CA for consideration.

11.1 IMPACT SUMMARY

A summary of the identified impacts and corresponding significance ratings for the proposed project is provided in **Table 11-1**.

Table 11-1 – Impact Summary

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
Aquatic Biodiversity	River water quality modifications	C	(-)	Very Low	Very Low
	Increased sediment load and loss of habitat	C	(-)	Very Low	Very Low
	Increased river flows altering the natural flow regime	C	(-)	Low	Very Low
	Loss of indigenous species and reduced availability of water	C	(-)	Low	Very Low
	Increased sediment load and loss of habitat	O	(-)	Low	Very Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Increased river flows altering the natural flow regime	O	(-)	Low	Very Low
	Loss of indigenous species and reduced availability of water	O	(-)	Low	Very Low
Wetland Aquatic Biodiversity	Loss of Wetland Habitat	C	(-)	Moderate	Low
	Changes in wetland health/functioning	C	(-)	Moderate	Low
	Contamination of watercourses:	C	(-)	Moderate	Very Low
	Soil Erosion	C	(-)	Moderate	Low
	Establishment and spread of alien invasive species	C	(-)	Moderate	Very Low
	Spread of alien invasive species	O	(-)	Moderate	Very Low
	soil erosion	O	(-)	Moderate	Low
	spread of alien invasive species	D	(-)	Moderate	Very Low
Terrestrial Biodiversity	Loss of vegetation/habitat	C	(-)	Moderate	Low
	loss of threatened, SCC, protected & endemic plant species	C	(-)	Low	Very low
	Loss of faunal habitat	C	(-)	Moderate	Low
	faunal mortalities	C	(-)	Low	Low
	Increased dust deposition	C	(-)	Low	Very low
	Increased human activity, noise and light levels	C	(-)	Low	Very low
	Impacts of roads	C	(-)	Moderate	Low
	Establishment of alien vegetation	C	(-)	Moderate	Low
	Increased water run-off and erosion	C	(-)	Moderate	Low
	Changes in animal behaviour	C	(-)	Low	Very low
	Direct faunal mortalities	O	(-)	Moderate	Low
	light and noise levels	O	(-)	Moderate	Low
	Establishment of alien vegetation	O	(-)	Moderate	Low
	Increased water run-off and erosion	O	(-)	Moderate	Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	faunal mortalities	D	(-)	Low	Very low
	Increased dust deposition	D	(-)	Low	Very low
	Establishment of alien vegetation	D	(-)	Moderate	Very low
	Increased water run-off and erosion	D	(-)	Moderate	Low
Plant Species	Loss of vegetation/ habitat	C	(-)	Moderate	Moderate
	The potential loss of threatened, SCC, protected & endemic plant species	C	(-)	Low	Very Low
	Increased dust deposition	C	(-)	Low	Very Low
	Establishment of alien vegetation	C	(-)	Moderate	Low
	Increased water run-off and erosion	C	(-)	Moderate	Low
	Establishment of alien vegetation	O	(-)	Moderate	Low
	Increased dust deposition	D	(-)	Low	Very Low
Animal Species habitat and diversity	Loss of faunal habitat	C	(-)	Moderate	Low
	Direct faunal mortalities due to construction and increased traffic	C	(-)	Low	Very Low
	Increased dust deposition	C	(-)	Low	Very Low
	Increased human activity, noise and light levels.	C	(-)	Low	Very Low
	Impacts of roads	C	(-)	Moderate	Low
	Changes in animal behaviour	C	(-)	Low	Very Low
	Direct faunal mortalities	O	(-)	Moderate	Low
	Increased light and noise levels and changes in animal behaviour.	O	(-)	Moderate	Low
	Faunal mortalities	D	(-)	Low	Very Low
	Increased dust deposition	D	(-)	Low	Very Low
Avifauna	Displacement of priority species	C	(-)	Moderate	Low
	Displacement of priority species	O	(-)	Moderate	Low
	Mortality of priority species	O	(-)	Moderate	Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Electrocution of priority species	O	(-)	Moderate	Low
	Collisions of priority species	O	(-)	Moderate	Low
	Noise pollution	D	(-)	Moderate	Low
Archaeological and Cultural Heritage	Archaeological resources	C	(-)	Moderate	Low
	Graves	C	(-)	Moderate	Low
	Cultural landscape	C	(-)	Moderate	Moderate
	Cultural landscape	O	(-)	Moderate	Moderate
	Cultural landscape	D	(-)	Moderate	Moderate
Palaeontology	Palaeontological resources	C	(-)	Low	Very low
Traffic	Increase in Development Trips	C	(-)	Moderate	Low
	Noise and dust pollution	O	(-)	Low	Very Low
	Increase in Development Trips	D	(-)	Moderate	Low
Visual	Visual Impacts	C	(-)	Moderate	Low
	Visual Impacts	O	(-)	Moderate	Moderate
	Visual Impacts	D	(-)	Moderate	Low
Social	Creation of employment and business opportunities	C	(+)	Low	Moderate
	Presence of construction workers in the area on local communities	C	(-)	Moderate	Low
	Influx of job seekers	C	(-)	Low	Low
	Risk to safety, livestock, and damage to farm infrastructure	C	(-)	Low	Low
	Increased risk of grass fires	C	(-)	Moderate	Very Low
	Construction related activities	C	(-)	Moderate	Low
	Loss of farmland	C	(-)	Moderate	Low
	Improving energy security and support renewable sector	O	(+)	Moderate	High
	Creation of employment opportunities	O	(+)	Very Low	Moderate

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Benefits associated with socio-economic development contributions	O	(+)	Low	Moderate
	Visual impact and impact on sense of place	O	(-)	Moderate	Moderate
	Impact on property values	O	(-)	Low	Very Low
	Tourism	O	(-)	Very Low	Very Low
	Social impacts associated with decommissioning	D	(-)	Low	Very Low
Geotechnical	Soil erosion	C	(-)	Moderate	Very low
	Oil spillages	C	(-)	Moderate	Very low
	Disturbance of fauna and flora	C	(-)	Low	Very low
	Slope stability	C	(-)	Low	Very low
	Seismic activity	C	(-)	Very Low	Very low
	Soil Erosion	O	(-)	Low	Very low
	Potential Oil Spillages	O	(-)	Moderate	Very low
	Soil erosion	D	(-)	Moderate	Very low
	Oil spillages	D	(-)	Moderate	Very low
	Disturbance of fauna and flora	D	(-)	Low	Very low
	Slope stability	D	(-)	Low	Very low
High Level Safety, Health and Environmental Risk Assessment	Human Health - chronic exposure to toxic chemical or biological agents	C	(-)	Moderate	Low
	Human Health - exposure to noise	C	(-)	Moderate	Low
	Human Health - exposure to temperature extremes and/or humidity	C	(-)	Low	Very Low
	Human Health - exposure to psychological stress	C	(-)	Low	Low
	Human Health - exposure to ergonomic stress	C	(-)	Low	Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Human and Equipment Safety - exposure to fire radiation	C	(-)	Moderate	Low
	Human Health - chronic exposure to toxic chemical or biological agents	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to explosion over pressures	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to violent release of kinetic or potential energy	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to electromagnetic waves	C	(-)	Moderate	Low
	Environment - emissions to air	C	(-)	Low	Very Low
	Environment - emissions to water	C	(-)	Low	Low
	Environment - emissions to earth	C	(-)	Low	Low
	Environment - waste of resources e.g., water, power etc	C	(-)	Low	Very Low
	Public - Aesthetics	C	(-)	Low	Low
	Investors - Financial	C	(-)	Moderate	Low
	Employees and investors - Security	C	(-)	Moderate	Low
	Emergencies	C	(-)	Moderate	Low
	Investors - Legal	C	(-)	Moderate	Low
	Human Health - chronic exposure to toxic chemical or biological agents	O	(-)	Moderate	Low
	Human Health - chronic exposure to toxic chemical or biological agents	O	(-)	Moderate	Low
	Human Health - exposure to noise	O	(-)	Moderate	Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Human Health - exposure to temperature extremes and/or humidity	O	(-)	Low	Very Low
	Human Health - exposure to psychological stress	O	(-)	Low	Very Low
	Human Health - exposure to ergonomic stress	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to fire radiation	O	(-)	High	Low
	Human and Equipment Safety - exposure to fire radiation	O	(-)	High	Low
	Human and Equipment Safety - exposure to explosion over pressures	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents	O	(-)	Low	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to violent release of kinetic or potential energy	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to electromagnetic waves	O	(-)	Moderate	Low
	Environment - emissions to air	O	(-)	Low	Very Low
	Environment - emissions to water	O	(-)	Low	Low
	Environment - emissions to earth	O	(-)	Low	Very Low
	Environment - waste of resources e.g., water, power etc	O	(-)	Low	Very Low
	Public - Aesthetics	O	(-)	Low	Low
	Investors - Financial	O	(-)	Moderate	Low
	Employees and investors - Security	O	(-)	Moderate	Low
	Employees and investors - Security	O	(-)	Moderate	Low
	Emergencies	O	(-)	Moderate	Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Investors - Legal	O	(-)	Moderate	Low
	Human Health - chronic exposure to toxic chemical or biological agents	D	(-)	N/A	N/A
	Human Health - exposure to noise	D	(-)	N/A	N/A
	Human Health - exposure to temperature extremes and/or humidity	D	(-)	N/A	N/A
	Human Health - exposure to psychological stress	D	(-)	N/A	N/A
	Human Health - exposure to ergonomic stress	D	(-)	N/A	N/A
	Human and Equipment Safety - exposure to fire radiation	D	(-)	N/A	N/A
	Human and Equipment Safety - exposure to explosion over pressures	D	(-)	N/A	N/A
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents	D	(-)	N/A	N/A
	Human and Equipment Safety - exposure to violent release of kinetic or potential energy	D	(-)	N/A	N/A
	Human and Equipment Safety - exposure to electromagnetic waves	D	(-)	N/A	N/A
	Environment - emissions to air	D	(-)	N/A	N/A
	Environment - emissions to water	D	(-)	N/A	N/A
	Environment - emissions to earth	D	(-)	Moderate	Low
	Environment - waste of resources e.g., water, power etc	D	(-)	N/A	N/A
	Public - Aesthetics	D	(-)	N/A	N/A
	Investors - Financial	D	(-)	N/A	N/A
	Employees and investors - Security	D	(-)	N/A	N/A
	Emergencies	D	(-)	N/A	N/A
	Investors - Legal	D	(-)	Moderate	Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
Noise	Construction of access roads	C	(-)	Very Low	Very Low
	Construction traffic noises	C	(-)	Very Low	Very Low
	Daytime WTG construction activities	C	(-)	Very Low	Very Low
	Night-time WTG construction activities	C	(-)	Moderate	Low
	Daytime operation of selected WTG	O	(-)	Low	Low
	Night-time operation of selected WTG	O	(-)	Moderate	Low
Bats	Loss of foraging habitat	C	(-)	Low	Low
	Roost destruction during earthworks	C	(-)	Low	Very Low
	Bat mortalities	O	(-)	High	Moderate
	Bat mortalities during migration	O	(-)	High	Moderate
	Increased bat mortalities due to light attraction	O	(-)	High	Low

11.2 SPECIALIST CONCLUSIONS

11.2.1 AGRICULTURAL POTENTIAL

The overall conclusion of this assessment is that the proposed development is desirable from an agricultural perspective because it offers a valuable, win-win opportunity for a renewable energy facility to be integrated with agricultural production in a way that provides benefits to agriculture and leads to very little loss of future agricultural production potential.

The cropping potential of the site is limited predominantly by shallow, rocky soils that dominate the higher lying land on the ridge line where the turbines are situated. Cropping on the site is no longer economically viable. The marginal agricultural potential of the site limits its agricultural use to grazing only.

The screening tool rating of the agricultural sensitivity of the assessment area is disputed and is verified in this assessment as being of medium agricultural sensitivity.

An agricultural impact is a temporary or permanent change to the future agricultural production potential of land. By far the most important agricultural impact is a loss of agricultural land due to a change in land use. The significance of the agricultural impact is directly proportional to the extent of the change in production potential, which is a function of:

- The total footprint of land that will be lost.
- The baseline production potential (particularly cropping potential) of the land that will be lost.
- The length of time for which the land will be lost to agriculture.

In the case of wind farms, the first factor, amount of land loss, is so small that the total extent of the loss of future agricultural production potential is insignificantly small, regardless of how much production potential the land has. All agricultural activities are able to continue unaffectedly on all parts of the farmland other than turbine hardstands, roads, and the substation hub which includes battery energy storage system, buildings, etc. The actual loss of production potential is therefore insignificant.

Furthermore, the production potential of that land is limited to only being suitable as grazing land. The loss of a very small, widely distributed area of grazing land, of which there is no particular scarcity in the country, represents negligible loss of agricultural production potential in terms of national food security and for the affected farm.

Although the development will occupy land that is currently zoned for agriculture, it will lead to minimal loss of both current production and of future agricultural production potential. The agricultural impact of the proposed development is assessed as being of low significance and as acceptable. From an agricultural impact point of view, it is recommended that the proposed development be approved. The conclusion of this assessment on the acceptability of the proposed development and the recommendation for its approval is not subject to any conditions.

11.2.2 AQUATIC BIODIVERSITY

Based on the findings of the current aquatic biodiversity and impact assessment study, potential negative impacts upon the main receiving receptor (the Kraalkopspruit), are likely to occur following rainfall events due to the distance between the river and the proposed activities. Impacts are predicted to range between very low to low and significantly reduced upon implementation of mitigation measures. Furthermore, there are no aquatic species of conservation concern expected to occur within the study area. Therefore, no fatal flaws were identified during the current study, and thus, the proposed Project may proceed. Immediate implementation of the mitigation measures and the aquatic biomonitoring programme must be adhered to pre-construction, and throughout the operation phase to ensure that no deterioration of the associated watercourses occurs.

11.2.3 WETLAND AQUATIC BIODIVERSITY

Provided that recommended mitigation measures are implemented, the proposed project development is not expected to result in any negative changes in the current PES and EIS of the wetlands.

In accordance with the outcomes of the impact assessment, and taking cognisance of the baseline conditions presented herein, as well as the impact management measures, the proposed Project, is not deemed to present significant negative ecological issues or impacts, and it should thus be authorised.

11.2.4 TERRESTRIAL BIODIVERSITY

The low impact significance after mitigation and low sensitivity rating for many of the habitats means the project could go ahead without major constraints, provided the mitigation measures and management actions proposed to conserve protected fauna and flora on the site are applied. We thus recommend authorisation of the project provided all mitigation measures are implemented.

11.2.5 PLANT SPECIES

None of the SCC highlighted by the Screening Tool were found on site, and large parts of the site were degraded due to previous cultivation; based on these findings, the site sensitivity verification process indicated that the Project area's site sensitivity in terms of the Plant Species theme should be rated as Low. A plant species compliance statement was therefore considered appropriate, in line with the gazetted protocol for the specialist assessment and minimum report content requirements for impacts on plant species for activities requiring environmental authorisation.

While several potential impacts on plant species/vegetation communities were identified as a result of the proposed development, the low residual impact significance (i.e. after mitigation), and low sensitivity rating for many of the habitats means the project could go ahead without major constraints, provided the mitigation measures and management actions proposed to conserve any protected flora that occur in the study area are applied.

11.2.6 ANIMAL SPECIES

The low residual impact significance (after mitigation), means the project could proceed without major constraints, provided the recommended mitigation measures and management actions proposed to conserve protected fauna on the site are applied.

11.2.7 AVIFAUNA

The proposed Igolide WEF will have a medium impact on avifauna which, in most instances, could be reduced to a low impact through the appropriate mitigation measures. The current proposed 10-turbine layout which was assessed in this report avoids all the recommended avifaunal turbine exclusion zones and is therefore deemed acceptable. The development is supported, provided the mitigation measures and exclusion areas are strictly applied and adhered to.

11.2.8 HERITAGE

The Igolide WEF layout is generally acceptable subject to the implementation of the recommended mitigation measures. If these measures are successfully implemented in the final layout then there is no objection to the project and it is the opinion of the heritage specialists that it may be authorised in full.

11.2.9 PALAEONTOLOGY

The impact on the palaeontological heritage would be low, therefore as far as the palaeontology is concerned the project should be authorised. There is no preferred site and there is no no-go are.

11.2.10 TRAFFIC

Traffic impact assessments are generally assessed for the operation phase of a development. Based on similar studies, wind energy facilities have a low peak hour traffic impact with less than 50 peak hour trips expected to be generated. Considering the envisaged low traffic demand posed by the development during the operation phase, the development is supported from a transport perspective provided that the recommendations made in this study are adhered to.

11.2.11 VISUAL

It's the specialists opinion that the potential visual impacts associated with the proposed Igolide WEF are negative and of moderate significance. Given the absence of sensitive receptors and the significant level of human transformation and landscape degradation in areas near the proposed Igolide WEF, the project is deemed acceptable from a visual perspective and the EA should be granted. SLR Consulting is of the opinion that the impacts associated with the construction, operation and decommissioning phases can be mitigated to acceptable levels provided the recommended mitigation measures are implemented.

11.2.12 SOCIAL

The findings of the SIA indicate that the proposed Igolide WEF will result in several social and socio-economic benefits, including creation of employment and business opportunities during both the construction and operational phases. The project will also contribute to local economic development though socio-economic development (SED) contributions. In addition, the development will improve energy security and reduce the carbon footprint associated with energy generation. The findings of the SIA also indicate that most of the potential negative impacts associated with both the construction and operational phases are likely to be Minor Negative with mitigation. The potential negative impacts can therefore be effectively mitigated if the recommended mitigation measures are implemented.

The establishment of the proposed Igolide WEF and associated infrastructure is supported by the findings of the SIA. The recommendations listed above should however be addressed.

11.2.13 DESKTOP GEOTECHNICAL

The desktop assessment of the geotechnical conditions at the proposed development site for Igolide WEF has shown the site to be generally suitable for the proposed development. A "negative low to moderate" impact was assessed, from a geotechnical perspective, for the pre-mitigation situation. Post-mitigation, the assessed impact decreases to "negative very low to low".

A geotechnical site investigation must be undertaken to provide detailed and site-specific geotechnical information for the design of the proposed structures and roads. The proposed development should, from a geotechnical impact perspective, be authorized. The most significant geotechnical condition that will affect the development is the possibility of hard excavation conditions as shallow rock is anticipated. Your attention is drawn to Appendix C of the geotechnical study: Document Limitations

The statements presented in this document are intended to advise you of what your realistic expectations of this report should be, and to present you with recommendations on how to minimize the risks associated with the groundworks for this project. The document is not intended to reduce the level of responsibility accepted by WSP, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

11.2.14 BATS

Information from bat activity data from site confirms that the five bat species detected on site were: *Eptesicus hottentotus*, *Tadarida aegyptiaca, Myotis tricolor*, *Laephotis capensis*, and *Miniopterus natalensis.* Additionally, bat passes were recorded that are classified up to family level for the Vespertilionidae and Rhinolophidae.

It must be noted that the species *Laephotis capensis* (Cape Serotine bat) is very well-represented in the data for this site. *L. capensis* (part of Medium risk category) displayed an abnormally high peak of activity during the autumn of 2022 at 110m on the Met Mast, this is unusual since this species is not generally utilising the higher airspaces frequently. A smaller peak was observed during late winter and early spring is 2022. These activity peaks may be due to the mating season of this species being in autumn and birth of young being in late winter and spring (generally October).

However, bat activity was still overall higher on low microphones than higher microphones, as expected. Since the Medium risk category dominated at all systems and at all heights, with L. capensis displaying the highest activity levels at both masts. And L. capensis, that forages on the edge of vegetation clutter, made up the majority of the Medium risk category.

Miniopterus natalensis is a cave dwelling species within the High-Medium risk category, but may also take residence in smaller numbers in culverts and other suitable man-made hollows, this species did not show any abrupt peaks of activity that may indicate that the site is on any migration route. The species was not particularly frequently recorded on the systems, although it was present in the data from each system.

Average hourly activity is useful since it considers only the nights on which the systems recorded successfully, and are therefore a true indication of monthly activity levels. The seasons of autumn and spring had the highest average activity levels across all systems on site. These higher activity months are important to consider in case mitigation may be required during the operational phase.

The SEA assigns 20km high sensitivity and 50km medium sensitivity buffers to large bat roosts for wind energy. Based on museum records of cave bats in the area there may be a possible cave within 20km of the site (called Possible Cave 1). However, the bat activity data collected over 12 months do not indicate abnormally high levels of cave bat activity that may indicate activity of this cave to be overlapping with the site.

Other caves, some with large bat roosts and most with the potential to house large roosts, within the 50km and 100km radius include: Nash's Cave, Bat's Cave, Bakwena/Irene Cave, Skurweberg Caves, Gladysvale Mine, American Cave, Monument Cave, Fountains Cave, Scramblers, Sterkfontein, Gladysvale Mine, Kromdraai Mine, Minaar's Cave, Wondercave, Silwer Myn, Grobler's Cave, Porcupine Cave, Mamelodi Cave, Groenkloof, Swartkop cave.

It must be noted that these caves are grouped to the North of the site and movement between these caves will not be affected by the WEF. Only movement between Possible Cave 1, 2 and 3 may be affected by the WEF, although the passive data did not indicate migration movements. However, the prevalence of cave forming dolomite within 6km from the site increases the likelihood of undiscovered caves significantly, and the possibility of future bat migrations during the operational phase must be accounted for in reactive mitigation measures.

A bat sensitivity map has been compiled to include probable roosting and important foraging habitats. Considering the current layout, and a blade length of 100m, no turbines are proposed within any No-go (High Sensitivity) areas and are acceptable from a bat perspective. Mitigation through avoidance must be considered as the first layer of mitigation and must be applied as far as possible given the current knowledge of the site.

According to available information consulted during this study and up to date, there are no fatal flaws from a bat sensitivity perspective. If the proposed mitigation measures are adhered to and included into the EMPr and conditions of Environmental Authorisation, Animalia has no objection to the project proceeding to the stage of Environmental Authorisation.

11.2.15 HIGH LEVEL SAFETY, HEALTH AND ENVIRONMENT RISK ASSESSMENT

- General:

This Risk Assessment has found that with suitable preventative and mitigative measures in place, none of the identified potential risks are excessively high, i.e., from a Safety, Health and Environment (SHE) perspective no fatal flaws were found with either type of technology for the proposed BESS installation at the Igolide Wind Energy Facility near Fochville, Gauteng.

At a large facility, without installation of the state-of-the art battery technology that includes protective features, there can be significant risks to employees and first responders. The latest battery designs include many preventative and mitigative measures to reduce these risks to tolerable levels. (Refer to tables in section 4 under preventative and mitigative measures). State-of-the-art technology should be used, i.e., not old technology that may have been prone to fire and explosion risks.

The design should be subject to a full Hazard and Operability Study (HAZOP) prior to commencement of procurement. A HAZOP is a detailed technical systematic study that looks at the intricacies of the design, the control system, the emergency system etc. and how these may fail under abnormal operating conditions. Additional safeguards may be suggested by the team doing the study.

- Lithium Soil State Containerized Batteries:
  - With lithium solid-state batteries, the most significant hazard with battery units is the possibility of thermal runaway and the generation of toxic and flammable gases. There have been numerous such incidents around the world with batteries at all scales and modern technology providers include many preventative and mitigative features in their designs. This type of event also generates heat which may possibly propagate the thermal runaway event to neighbouring batteries if suitable state of the art technology is not employed.
  - The flammable gases generated may ignite leading to a fire which accelerates the runaway process and may spread the fire to other parts of the BESS or other equipment located near-by.
  - If the flammable gases accumulate within the container before they ignite, they may eventually ignite with explosive force. This type of event is unusual but has happened with an older technology container installed at McMicken in the USA in 2019.
  - Due to a variety of causes, thermal runaway could happen at any point during transport to the facility, during construction or operation/ maintenance at the facility or during decommissioning and safe making for disposal.
  - Due to the containerized approach as well as the usual good practice of separation between containers, which should be applied on this project, and therefore the likely restriction of events to one container at a time, the main risks are close to the containers i.e., to transport drivers, employees at the facilities and first responders to incidents.
  - In terms of a worst conceivable case container fires, the significant impact zone is likely to be limited to within 10m of the container and mild impacts to 20m. Based on the current proposed layout, impacts at the closest isolated farmhouses are not expected.
  - In terms of a worst conceivable case explosion, the significant impact zone is likely to be limited to with 10m of the container and minor impacts such as debris within 50m. Based on the current proposed layout, impacts at the closest isolated farmhouses are not expected.
  - In terms of a worst reasonably conceivable toxic smoke scenario, provided the units are placed suitably far apart to prevent propagation from one unit to another and large external fires are prevented, the amount of material burning should be limited to one container at any one time. In this case, beyond the immediate vicinity of the fire, the concentrations of harmful gases within the smoke should be low. The proposed BESS installation location is over 500m from any occupied development/ farmhouse and therefore the risks posed by BESS are negligible.
- Vanadium Redox flow battery installations
  - The most significant hazard with VRF battery units is the possibility of spills of corrosive and environmentally toxic electrolyte. Many preventative and mitigative features will be included in

the design and operation, e.g., full secondary containment, level control on tanks, leak detection on equipment etc. (Refer to tables in section 4 under preventative and mitigative measures).

- VRF batteries do not present significant fire and electrical arcing hazards provided they are correctly designed, operated, maintained and managed. Suitable Battery Management System (BMS), safety procedures, operating instructions, maintenance procedures, trips, alarms and interlocks should be in place. (Refer to tables in section 4 under preventative and mitigative measures).

- Technology and location of BESS facilities
  - From a safety and health point of view, the above Risk Assessment shows that risks posed by VRFB systems may be slightly lower than those of SSL facilities, particularly with respect to fire and explosion risks. From an environmental spill and pollution point of view the VRFB systems present higher short-term risks than the SSL systems. However, the above conclusions may be due to the fact that the VRFB technology is not as mature as SSL technology and therefore there is not as much operating experience and accident information available for the VRFB. Overall, from and SHE RA points of view, there is no specific preference for a type of technology.
  - From a SHE risks assessment point of view, where there is a choice of location that is further from public roads, water courses or isolated farmhouses/occupied developments, this would be preferred. VRFB hazards are mostly related to possible loss of containment of electrolyte and SSL batteries to fires producing toxic smoke and fire fighting which may result in contaminated of firewater runoff. One would not want these liquids to enter water courses nor the smoke to pass close to houses/ public traffic.

11.3 ALTERNATIVES ASSESSMENT

Project alternatives in terms of activity, technology, location and layout were considered as part of this EIAR process. The revised layout avoids sensitivities as much as possible.

Table 11-2 outlines the preferred alternatives considered feasible and preferred from an environmental perspective (that is, as per the input from the Specialists).

Table 11-2 – Preferred Site Alternatives

Alternative	Preferred	Comment
Site	Igolide WEF Development Area: ▪ Portion 14 of Farm 147 Kraalkop ▪ Portion 20 of Farm 147 Kraalkop ▪ Portion RE/22 of Farm 147 Kraalkop ▪ Portion 8 of Farm 356 Leeuwpoort ▪ Portion 57 of Farm 356 Leeuwpoort ▪ Portion 65 of Farm 356 Leeuwpoort ▪ Portion 66 of Farm 356 Leeuwpoort	There is no site alternative for the Igolide WEF. The location of the project infrastructure was subjected to a site selection process as described in **Section 5**.
Activity	Wind Technology	Wind technology has been identified as the preferred activity in terms of generating electricity from a renewable resource.
Layout and Design	Revised Layout (10 turbines)	The Igolide WEF layout, including the associated infrastructure was revised during

Alternative	Preferred	Comment
		the Scoping Phase, from the initial 12 turbines to 10 turbines. The turbine layout was revised in order to avoid sensitive features and buffer areas. Based on the current revised layout: ▪ Design and layout alternatives are unlikely to make any material difference to the significance of the agricultural impacts. The same applies to technology alternatives, and there are therefore no preferred alternatives from an agricultural impact perspective. All alternatives are considered acceptable. ▪ No new residential dwellings will be developed within areas enveloped by the 42 dBA noise level contour, and ▪ Structures located within the 45 dBA noise level contour should not be used for residential use. ▪ From a visual perspective, there are no fatal flaws associated with EIA Phase WEF development footprint. ▪ According to available information consulted during this study and up to date, there are no fatal flaws from a bat sensitivity perspective. ▪ From a SHE risks assessment point of view, where there is a choice of location (not applicable on this project) that is further from public roads, water courses or isolated farmhouses/occupied developments, this would be preferred. ▪ From a visual perspective therefore, it would be preferred if wind turbines are not located on the areas of highest elevation within the WEF development area, although it is understood that these locations are often the most suitable in terms of wind yield. Considering the low visual sensitivity of the broader area however, the ridges are not considered to be "no go areas", but rather should be viewed as zones where turbine placement would be least preferred.
IPP Substation and BESS	Vanadium Redox flow – Alternative 1Lithium Battery Technologies – Alternative 2	▪ From a visual perspective, no fatal flaws were identified for either of the proposed site alternatives for the substation / BESS

Alternative	Preferred	Comment
		for Igolide WEF and both alternatives were found to be favourable. ▪ From a SHE risks assessment point of view, risks posed by VRFB systems may be slightly lower than those of SSL facilities. Overall, from and SHE RA points of view, there is no specific preference for a type of technology. ▪ It is requested that both technologies are authorised for use.

11.3.1 NO-GO ALTERNATIVE

In the "no project" alternative, the proposed project will not be developed. In this scenario, there could be a missed opportunity to address the need for increase in renewable energy generation in an effort to mitigate against concerns of climate change and exploitation of non-renewable resources. The no-go alternative would not assist in responding to the growing electricity demand in South Africa and would not contribute to the reliability of electricity supply at a national scale. Conversely, negative environmental impacts of the project (as outlined in Section 9) associated with the development of the Igolide WEF would be avoided, and the current status quo will continue. This includes continued use of the land for agriculture.

Specialists have considered the no-go alternative and the following has been concluded:

- Agriculture:
  The no-go alternative considers impacts that will occur to the agricultural environment in the absence of the proposed development. The development compliments agriculture by providing an additional income source, without excluding agriculture from the land, or decreasing production. Therefore, the negative agricultural impact of the no-go alternative is more significant than that of the development, and so, from an agricultural impact perspective, the proposed development is the preferred alternative. In addition, the no-go option would prevent the proposed development from contributing to the environmental, social and economic benefits associated with the development of renewable energy in South Africa.
- Traffic:
  The no-go alternative implies that the proposed development of the WEF does not proceed. This would mean that there will be no negative environmental impacts and no traffic impact on the surrounding network during the construction and decommissioning phases of the proposed WEF. However, this would also mean that there would be no socio-economic benefits to the surrounding communities, and it will not assist government in meeting its' targets for renewable energy. Hence, the no-go alternative is not a preferred alternative.
- Social:
  There is no impact as the current status quo would be maintained.
- Noise:
  The ambient sound levels will remain as is and the area would keep the rural noise character.
- Heritage:

If the project were not implemented then the site would stay as it currently is (impact significance of moderate negative). The heritage impacts with implementation would not be greater than the existing impacts, and the loss of potential socio-economic benefits would be of concern. This suggests that the No-Go option is less desirable in heritage terms.

- Palaeontological:
  There are no-go areas because the fossils, if present, can be removed and curated in a recognised institution such as a museum or university that has the facilities to store and research the fossil material.
- Visual:
  The 'no-go' alternative is the option of not undertaking the proposed project. Hence, if the 'no-go' option is implemented, there would be no development. The area would thus retain its visual character and sense of place and no visual impacts would be experienced by any locally occurring receptors.
- Bats:
  The 'no-go' alternative is the option of not undertaking the proposed project. Hence, if the 'no-go' option is implemented, there would be no development. The area would thus retain its status quo and no impacts on bats would be experienced.

11.4 FINALISED LAYOUT

During the course of the EIA phase, the optimised layout was finalised based on the specialist inputs. These inputs included the following recommendations:

- Terrestrial Biodiversity:
  - Relocation of Turbine 04 such it falls outside of the NPAES area.
- Heritage:
  - The project road past the graveyard at Site 23 should be shifted north to allow a 30 m no-go buffer around the graveyard;
  - The project road passing through the Late Iron Age site at Site 05 should be rerouted towards the south. It is recognised that the project site boundary provides a constraint in terms of buffer width (30 m would be ideal) and the road should thus be placed as far south as possible;
  - Turbines 1, 3 and 5 and their associated roads should be shifted to the north to allow a 30 m no-go buffer between them and the Late Iron Age and historical Sites 01, 02 and 16;
  - The project infrastructure at Turbine 7 must be placed far enough east to allow a 30 m no-go buffer around the Late Iron Age Site 07; and
  - The project road passing the north-eastern part of Late Iron Age Site 08 should be shifted towards the northeast to allow a 30 m no-go buffer between it and the site
- Social:
  - The developers should liaise with the owners of the property to identify an alternative location for the substation and BESS. The owners have proposed an area on the northernmost site property, Leeuwpoort 356/65.

The optimised Layout outlined in Section 8.2 has been revised and finalised based on the above recommendations and illustrated in **Figure 11-1** and **Figure 11-2**. It should be noted that **Figure 11-1** is the final layout we are putting forward to authorisation/approval.

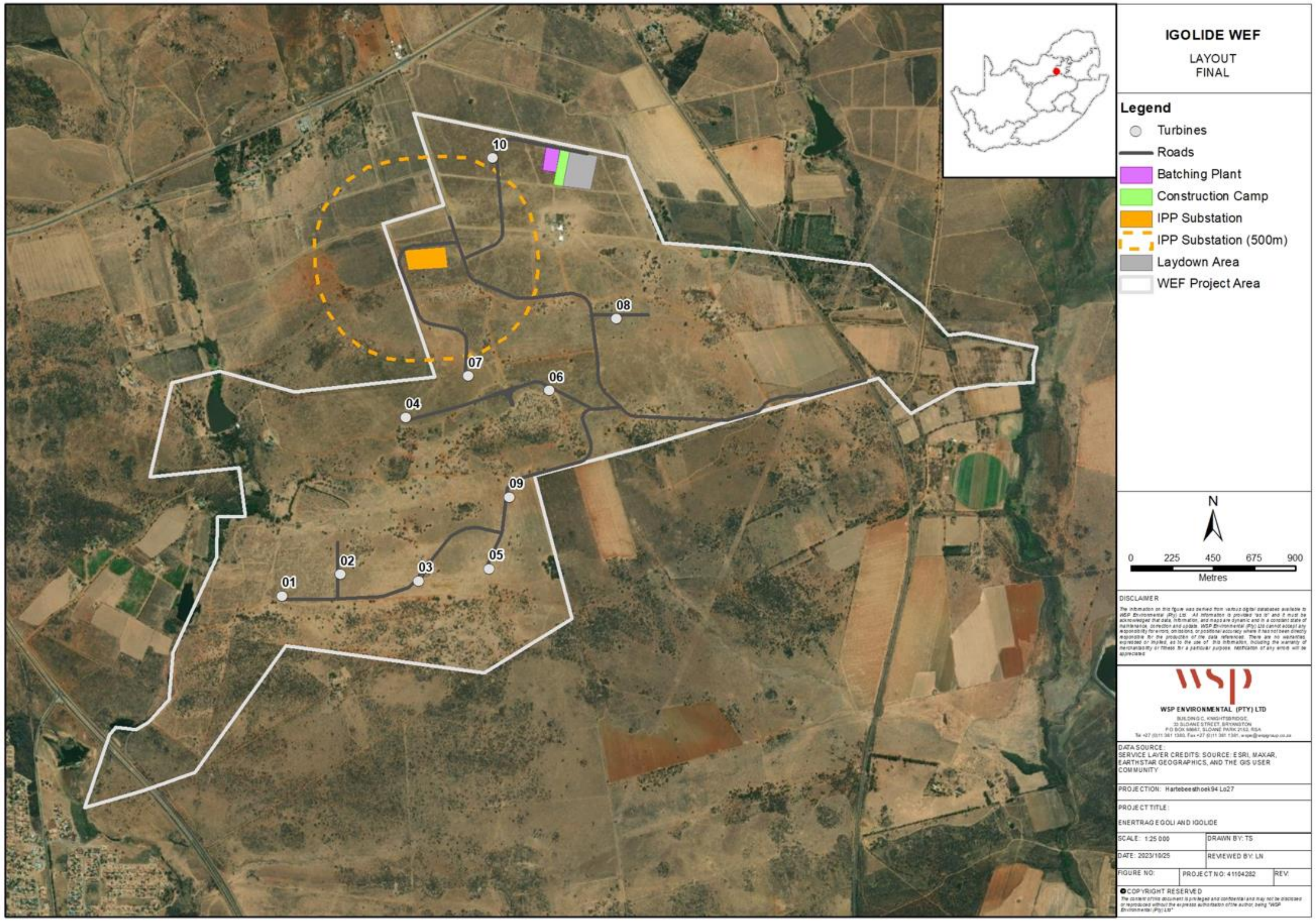


Figure 11-1 –Final Layout

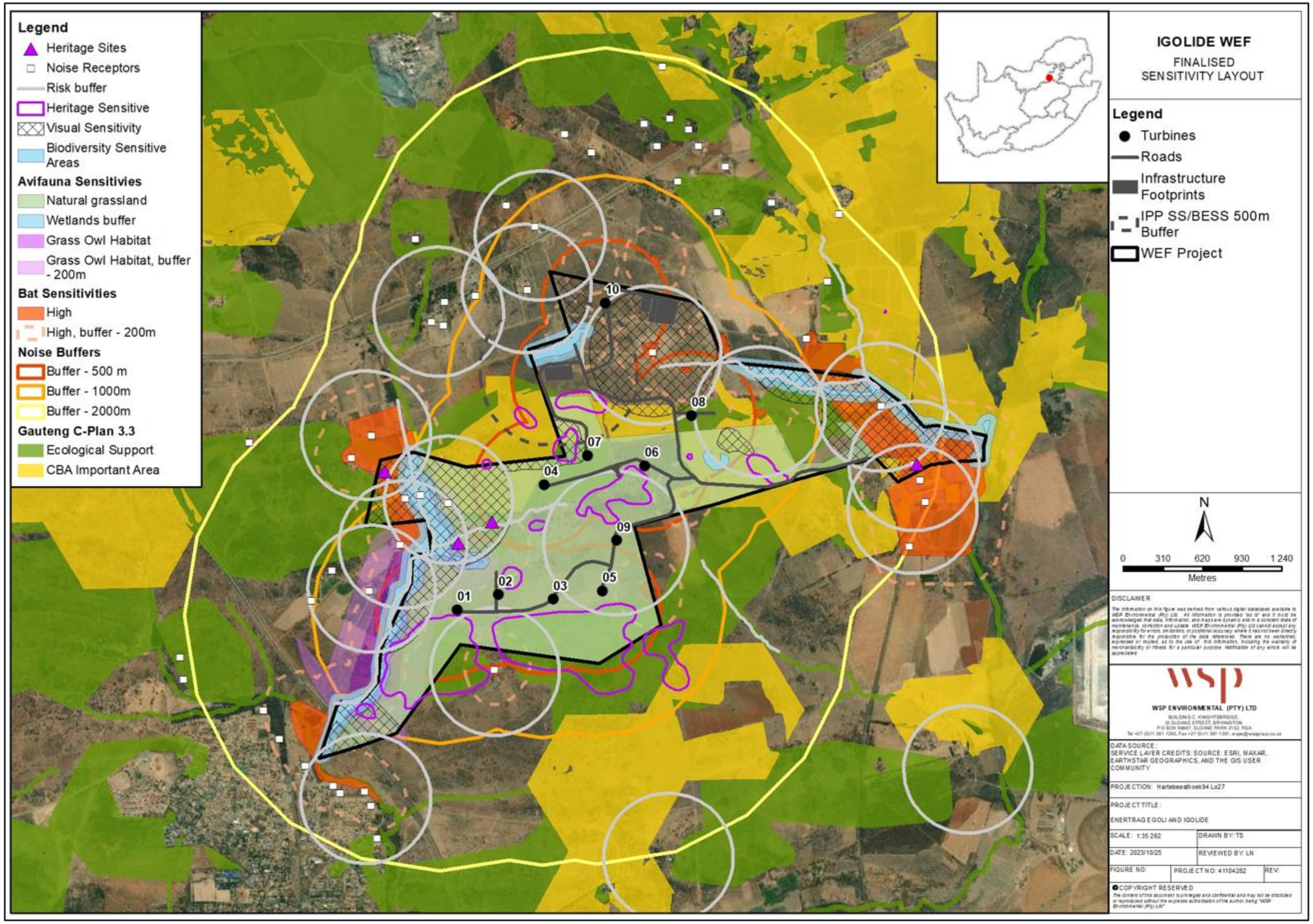


Figure 11-2 - Final Layout Sensitivity Map

11.5 RECOMMENDATIONS

The following key aspects are recommended to be included as conditions of authorisation:

- The Development Envelope and associated layout must avoid all the no-go areas identified by the specialists;
- The EMPr and EIA mitigation measures must be adhered to;
- The final EMPr must form part of all contractual documents with contractors during construction and operational phases of the project. Furthermore, a dedicated Environmental Control Officer (ECO) must be appointed to ensure compliance to all EA conditions and EMPr commitments throughout the construction phase;
- Appropriate permits in terms of the Transvaal Nature Conservation Ordinance (No. 12 of 1983) must be obtained before commencement; and
- Where required, water use authorisation under NWA is to be obtained from the Department of Water and Sanitation prior to construction.

The following specialist recommendations have been made in respect of the project and have been included in the EMPr (**Appendix I**):

- Aquatic biodiversity assessment
  - Placement of the WTGs should be outside of the aquatic ecosystem and associated riparian zone.
  - The developed Aquatic Biomonitoring Programme must be adopted on a biannual basis. This programme should continue for at least two years following the completion of the Construction Phase.
  - The proposed Project should adopt a water and habitat quality preservation mindset throughout the life of the Project to prevent the deterioration of the aquatic ecosystems. At least 100 m buffer zone of regulation must be implemented as a no-go zone between the aquatic systems and construction activities.
- Noise Assessment

  It is recommended that the project applicant:

  - Re-evaluate the noise impact should the layout be revised (as part of an amendment process post Environmental Authorization ("EA")) where:
    - Any WTG, located within 2,500 m from a confirmed NSR, are moved closer to the NSR.
    - Any new WTG are introduced within 2,500m from an NSR.
    - Ahe number of WTG within 2,500m from an NSR are increased.
  - Re-evaluate the noise impact should the applicant make use of a wind turbine with a maximum SPL exceeding 109.0 dBA re 1 pW.
  - Develop and implement an environmental noise monitoring programme at selected NSR living within the 42 dBA noise contour.
  - Ensure that equipment is well maintained and fitted with the correct and appropriate noise abatement measures. Engine bay covers over heavy equipment could be prefitted with sound absorbing material. Heavy equipment that fully encloses the engine bay should be considered, ensuring that the seam gap between the hood and vehicle body is minimised.
  - Include a component covering environmental noise in the Health and Safety Induction to sensitize all employees and contractors about the potential impact from noise, especially those

employees and contractors that have to travel past receptors at night or might be required to do work close (within 1,500m) to NSR at night. This should include issues such as minimising the use of vehicle horns.

- Investigates any reasonable and valid noise complaint if registered by a receptor staying within 2,000 m from the location where construction activities are taking place, or where night-time construction activities are required, or where an operational WTG are located. A complaint register, keeping a full record of the complaint, must be kept by the applicant.
- With regard to unavoidable noisy night-time construction activities in the vicinity of
- NSR (closer than 1,000 m from any identified NSR), the contractor and Environmental Control Officer (ECO) must liaise with local NSR on how best to minimise impact and the NSR must be kept informed of the nature and duration of intended activities; and
- Where practicable, mobile equipment should be fitted with broadband (white-noise generators/alarms), rather than tonal reverse alarms.

▪ Terrestrial biodiversity

- A walkthrough would be needed prior to construction to inform permit applications for protected plant species.
- Ensure that the placing of infrastructure takes the sensitivity mapping of the ecological assessment into account to avoid and reduce impacts on species and habitats of conservation concern.
- Demarcate all infrastructure sites clearly to avoid unnecessary clearance of the vegetation.
- Avoid or minimise impacts that could potentially affect animal behaviour.
- Trenches should not be left open for long periods of time. Trenches should be inspected regularly for the presence of trapped animals.
- Construction crew, in particular the drivers, should undergo environmental training (induction) to increase their awareness of environmental concerns.
- Proper waste management procedures should be in place to avoid waste lying around and to remove all waste material from the site.
- Speed limits should be strictly adhered to.
- Dust control measures should be implemented.
- Permits have to be obtained for the removal of GDARDE protected species.
- Implement a monitoring program for the early detection of alien invasive plant species.
- Employ a control program to combat declared alien invasive plant species.

▪ Heritage Assessment

Given the high density of archaeological sites, a heritage management plan should be compiled to ensure adequate protection of the sites both during and after construction;

- No roads are permitted to cross Late Iron Ages sites;
- A 30m no-go buffer must be applied around all archaeological sites and graves;
- The portion of the graveyard falling within the site must be fenced (farm-style fence with pedestrian gate);
- No-go signage should be placed along the margins of Sites 01, 02, 05, 07, 08, 16, 17, 18, 20, 23 and 25, adjacent to the project infrastructure and the ECO should monitor compliance;

- Should the layout be revised as part of an amendment process post Environmental Authorisation, an archaeologist must check the revised layout before grubbing commences to ensure that no-go areas are avoided and that No-Go signage is in place;
- No stones may be removed from any archaeological sites;
- An early warning system to allow the red aircraft warning lights to remain off until required should be considered for use;
- Buildings to be painted in earthy colours where feasible;
- Ensure effective rehabilitation of all disturbed areas not required during operation;
- Ensure effective rehabilitation of all disturbed areas after decommissioning; and
- If any archaeological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

- Geotechnical

  A detailed intrusive site investigation is recommended to further characterize site conditions, to better understand the key geotechnical risks characteristics and optimise the design of the WEF operations.

  Based on the current lack of previous geotechnical investigation data, the primary objectives of the proposed intrusive investigation must include:

  - Determination of the founding conditions, especially the depth to rock, for all structures. The scope of the intrusive investigation should comprise the excavation of test pits with an excavator and possibly the drilling of a representative number of boreholes.
  - Laboratory testing to determine the behavioural characteristics of the in situ materials.
  - Investigation of subgrade conditions for service roads.
  - Investigation of materials to be used during construction.
  - Non-intrusive investigation techniques, such as geophysical surveys including thermal and electrical resistivity for ground earthing requirement.

- High Level Safety, Health and Environment risk assessment

  - There are numerous different battery technologies but using one consistent battery technology system for the BESS installations associated with all the developments in the Igolide area associated with the Igolide Project would allow for ease of training, maintenance, emergency response and could significantly reduce risks.
  - Where reasonably practicable, state-of-the-art battery technology should be used with all the necessary protective features e.g., draining of cells during shutdown and standby-mode, full BMS with deviation monitoring and trips, leak detection systems.
  - There are no fatal flaws associated with the proposed Wind Energy battery installation for either technology type.
  - The tables in Section 4 of the study contains technical and systems suggestions for managing and reducing risks. Ensure the items listed in these tables under preventative and mitigative measures are included in the design.
  - The overall design should be subject to a full Hazop prior to finalization of the design.

- For the VRFB systems an end of life (and for possible periodic purging requirements) solution for the large quantities of hazardous electrolyte should be investigated, e.g., can it be returned to the supplier for re-conditioning.
- Prior to bringing any solid-state battery containers into the country, the contractor should ensure that:
- An Emergency Response Plan is in place that would be applicable for the full route from the ship to the site. This plan would include details of the most appropriate emergency response to fires both while the units are in transit and once they are installed and operating.
- An End-of-Life plan is in place for the handling, repurposing or disposal of dysfunctional, severely damaged batteries, modules and containers.
- The site layout and spacing between lithium solid-state containers should be such that it mitigates the risk of a fire or explosion event spreading from one container to another.
- Under certain weather conditions, the noxious smoke from a fire in a lithium battery container could travel some distance from the unit. The smoke will most likely be acrid and could cause irritation, coughing, distress etc. Close to the source of the smoke, the concentration of toxic gases may be high enough to cause irreversible harmful effects. Location of the facilities needs to ensure a suitable separation distance from public facilities/residences etc. The proposed BESS location is over 500m from isolated farmhouses/developments and are therefore suitable in this context.
- VRFB hazards are mostly related to possible loss of containment of electrolyte and solid-state systems may experience fires that may result in loss of containment of liquids or the use of large amounts of fire water which could be contaminated. One would not want these run-offs to enter water courses directly and a BESS Location that is far from water courses would be preferred. The buffer distance between water bodies and the facilities containing chemicals should be set in consultation with a water specialist and is therefore not specified in this SHE RA. It is noted that there are no tributaries of the main water courses in the area within 350m of the proposed BESS Location.
- Finally, it is suggested once the technology has been chosen and more details of the actual design are available, the necessary updated Risk Assessments should be in place.

11.6 EA AUTHORISATION PERIOD

Appendix 1(3)(1)(q) of the NEMA EIA Regulations 2014, as amended requires "where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised" must be included in the EIA Report.

The EA is required to be valid for a period of 10 years from the date of issuance of the EA. This is considered a reasonable period to allow the Applicant time to conduct relevant internal processes which can only begin after issuance of the EA.

12 CONCLUSION

The overall objective of the S&EIA Process is to provide sufficient information to enable informed decision-making by the authorities. This was undertaken through consideration of the proposed Project components, identification of the aspects and sources of potential impacts and subsequent provision of mitigation measures.

It is the opinion of WSP that the information contained in this document (read in conjunction the EMPr) is sufficient for DFFE to make an informed decision for the environmental authorisation being applied for in respect of this Project.

Mitigation measures have been developed, where applicable, for the above aspects and are presented within the_site specific and generic EMPrs (**Appendix I**). It is imperative that all impact mitigation recommendations contained in the EMPr, of which the environmental impact assessment took cognisance, are legally enforced.

Considering the findings of the respective studies, no fatal flaws were identified for the proposed Project. Should the avoidance and mitigation measures prescribed be implemented, the significance of the considered impacts for all negative aspects pertaining to the environmental aspects is expected to be acceptable. It is thus the opinion of the EAP that the Project can proceed, and that all the prescribed mitigation measures and recommendations are considered by the issuing authority.

WAY FORWARD

Igolide Wind (Pty) Ltd is proposing the development of the 100 MW Igolide WEF located near Fochville in the Gauteng Province. This report provides a description of the proposed Project and details the aspects associated with the construction and operation. The report also includes the methodology followed to undertake the S&EIA process. A detailed description on the existing environment (biophysical as well as socio-economic) is provided based on findings from the specialist surveys and existing information. Stakeholder engagement undertaken from the onset of the assessment to date, has been conducted in a transparent and comprehensive manner.

This draft EIAR is available for public review from **27 October 2023** to **27 November 2023**.

All issues and comments submitted to WSP during the scoping phase have been incorporated in the SER (**Appendix D**). The Final EIR will be submitted to the DFFE, as the competent authority, following the public review and addressing of comments, where necessary.

If you have any further enquiries, please feel free to contact:

WSP Group Africa (Pty) Ltd

Attention: Jashmika Maharaj

(T) 011 552 4300

(E): Jashmika.maharaj@wsp.com

Appendix A

EAP CV

Appendix B

EAP DECLARATION

Appendix C

SPECIALIST DECLARATIONS AND CVS

Appendix D

STAKEHOLDER ENGAGEMENT REPORT

Appendix E

MAPS

Appendix F

DFFE SCREENING TOOL REPORT

Appendix G

DFFE ACCEPTANCE OF FINAL SCOPING REPORT

Public

Appendix H

SPECIALIST STUDIES

Appendix H.1

TERRESTRIAL BIODIVERSITY ASSESSMENT

Public

Appendix H.2

AGRICULTURAL COMPLIANCE ASSESSMENT

Appendix H.3

AQUATIC BIODIVERSITY ASSESSMENT

Appendix H.4

AVIFAUNAL ASSESSMENT

Appendix H.5

BAT PRE-CONSTRUCTION ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Appendix H.6

HERITAGE IMPACT ASSESSMENT

Appendix H.7

TRAFFIC IMPACT ASSESSMENT

Appendix H.8

VISUAL IMPACT ASSESSMENT

Appendix H.9

SOCIAL IMPACT ASSESSMENT

Appendix H.10

GEOTECHNICAL DESKTOP STUDY

Appendix H.11

HIGH LEVEL SAFETY, HEALTH AND ENVIRONMENTAL RISK ASSESSMENT

Appendix H.12

PLANT THEME ASSESSMENT

Appendix H.13

ANIMAL THEME ASSESSMENT

Appendix H.14

PALAEONTOLOGICAL ASSESSMENT

Appendix H.15

WETLAND ASSESSMENT

Appendix H.16

NOISE IMPACT ASSESSMENT

Appendix I

EMPR

Building 1, Maxwell Office Park
Magwa Crescent West, Waterfall City
Midrand, 1685
South Africa

wsp.com

PUBLIC