ENERTRAG SA

HENDRINA GREEN HYDROGEN AND AMMONIA FACILITY

FINAL ENVIRONMENTAL SCOPING REPORT

MDARDLEA Reference: 1/3/1/16/1N-347

23 JANUARY 2023

FINAL

HENDRINA GREEN HYDROGEN AND AMMONIA FACILITY

FINAL ENVIRONMENTAL SCOPING REPORT

ENERTRAG SA

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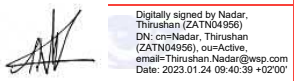
Signature		 Digitally signed by Nadar, Thirushan (ZATN04956) DN: cn=Nadar, Thirushan (ZATN04956), ou=Active, email=Thirushan.Nadar@wsp.com Date: 2023.01.24 09:40:39 +02'00'	
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APPLICANT

Enertrag SA

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Proposed Hendrina Green Hydrogen and Ammonia Facility, Mpumalanga, South Africa

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Final Environmental Scoping Report

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PRODUCTION TEAM

APPLICANT

Enertrag SA	Mercia Grimbeek

WSP

Project Manager	Olivia Allen
Project Director	Ashlea Strong
Consultant	Thirushan Nadar
Air Quality Specialist	Loren Dyer

SPECIALISTS

Heritage Specialist	Jaco van der Walt (Beyond Heritage)
Agriculture Specialist	Johan Lanz (Independent)
Ecology Specialist	David Hoare (David Hoare Consulting (Pty) Ltd
Surface Water & Wetland Specialist	Stephen Burton (Digby Wells)
Avifauna Specialist	Chris van Rooyen & Albert Froneman (Chris van Rooyen Consulting)
Bat Specialist	Werner Marias (Animalia Consulting (Pty) Ltd)
Social Specialist	Pierre van Jaarsveld (Urban-Econ Development Economists)
Visual Specialist	Kerry Schwartz (SLR Consulting (Pty) Ltd)
Geotechnical	Mohammad Osman (SLR Consulting (Pty) Ltd)
Traffic	Avheani Ramawa (JG Afrika (Pty) Ltd)

Geohydrological	Ockie Scholtz (Shangoni Management Services (Pty) Ltd)
Noise	Morné de Jager (Enviro-Acoustic Research cc)

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1 INTRODUCTION

1.1 PURPOSE OF THIS REPORT

All changes or additions made to this report have been underlined for your convenience.

This Final Scoping Report (FSR) documents the process and findings of the scoping phase of the Scoping and Environmental Impact Reporting (S&EIR) process for the proposed Hendrina Green Hydrogen and Ammonia (GH&A) Facility, located approximately 17km west of Hendrina in the Mpumalanga Province of South Africa.

The FSR 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 to be addressed in the environmental assessment, and the consultation process undertaken through the environmental impact assessment (EIA) process.

1.2 BACKGROUND INFORMATION

In order for the proposed project to proceed, it will require an Environmental Authorisation (EA) from the Competent Authority (CA) (i.e. the Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (MDARDLEA)).

1.3 KEY ROLE PLAYERS

1.3.1 PROJECT PROPONENT

Enertrag SA is the project proponent (Applicant) with regards to this application for the construction and operation of the Hendrina GH&A Facility and associated infrastructure. **Table 1-1** provides the relevant details of the project proponent.

Table 1-1: Details of Project Proponent

PROPONENT:	**ENERTRAG SA**
Contact Person:	Mercia Grimbeek
Postal Address	Suite 104, Albion Springs, 183 Main Road, Rondebosch, Cape Town, South Africa 7700
Telephone:	071 752 8033
Email:	Sandhisha.JayNarain@enertrag.co.za

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 CA 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 the Integrated Resource Plan (IRP) 2010 – 2030. Due to the fact that the Hendrina GH&A Facility is not an activity related to the IRP, the CA was confirmed to be the MDARDLEA.

The CA was confirmed during the Pre-Application Meeting held on **16 August 2022**.

Table 1-2 provides the relevant details of the competent authority on the Project.

Table 1-2: Competent Authority

ASPECT	COMPETENT / COMMENTING AUTHORITY	CONTACT DETAILS
Competent Authority: Environmental Authorisation	Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (MDARDLEA)	Case Officer: Dineo Tswai dtswai@mpg.gov.za MDARDLEA Reference: still to be issued

1.3.3 COMMENTING AUTHORITIES

The following commenting authorities have been identified for this application:

- Mpumalanga Agriculture, Rural Development, Land and Environmental Affairs (MDARDLEA);
- Department of Forestry, Fisheries and the Environment (DFFE): Biodiversity and Conservation;
- DFFE: Protected Areas;
- Department of Mineral Resources and Energy (DMRE);
- Department of Agriculture, Land Reform and Rural Development (DALRRD)
- Department of Water and Sanitation (DWS);
- Vaal Water Management Area (WMA) Authority;
- South African Heritage Resource Agency (SAHRA);
- Mpumalanga Heritage Resources Authority (MHRA);
- Mpumalanga Tourism and Parks Agency (MTPA);
- Civil Aviation Authority (CAA);
- Air Traffic and Navigation Services (ATNS);
- Department of Defence (SA Army) (DD);
- Astronomy Management Authority (AMA);
- South African Weather Services (SAWS);
- South African National Roads Agency Limited (SANRAL);
- National Energy Regulator of South Africa (NERSA)
- Nkangala District Municipality;
- Steve Tshwete Local Municipality

1.3.4 ENVIRONMENTAL ASSESSMENT PRACTITIONER

WSP Group Africa (Pty) Ltd (WSP) has been appointed in the role of Independent Environmental Assessment Practitioner (EAP) to undertake the S&EIR processes for the development of the 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** details the relevant contact details of the EAP. In order to adequately identify and assess potential environmental impacts, a number of specialists will support the EAP.

Table 1-3: Details of the Environmental Assessment Practitioner

ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)	WSP GROUP AFRICA (PTY) LTD
Contact Person:	Ashlea Strong
Postal Address:	House 1 Maxwell Office Park Magwa Crescent Building 1, West, Midrand, 1685
Telephone:	+27 11 361-1392
Fax:	011 361 1381
E-mail:	ashlea.strong@wsp.com

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 1-4** below. The specialist declarations are included in **Appendix C.**

Table 1-4: Details of Specialists

ASSESSMENT	NAME OF SPECIALIST	COMPANY	SECTIONS IN REPORT
Agriculture	Johann Lanz	Independent consultant	Section 5.1.5 Section 6.4 Section 7.5.1
Avifauna	Chris van Rooyen Albert Froneman	Chris van Rooyen Consulting	Section 5.2.7 Section 6.10 Section 7.5.4
Bats	Werner Marias	Animalia Consulting (Pty) Ltd	Section 5.2.8 Section 6.11 Section 7.5.11
Terrestrial Ecology	David Hoare	David Hoare Consulting (Pty) Ltd	Section 5.2 Section 6.9 Section 7.5.2
Surface Water & Wetland	Stephen Burton	Digby Wells Environmental (Pty) Ltd	Section 5.1.6 Section 6.5 Section 7.5.3
Groundwater/Geohydrological	Ockie Scholtz	Shangoni Management Services (Pty) Ltd	Section 5.1.7 Section 6.6

ASSESSMENT	NAME OF SPECIALIST	COMPANY	SECTIONS IN REPORT
Desktop Geotechnical	Mohammad Osman	SLR Consulting (Pty) Ltd	Section 5.1.4 Section 6.3
Heritage and Palaeontology	Jaco van der Walt	Beyond Heritage	Section 5.3.4 & 5.3.5 Section 6.13 and 6.14 Section 7.5.6
Socio-economic	Pierre van Jaarsveld	Urban-Econ Development Economists	Section 5.3.7 Section 6.16 Section 7.5.9
Traffic	Ahveani Ramawa	JG Afrika (Pty) Ltd	Section 5.3.3 Section 6.15 Section 7.5.7
Visual	Kerry Schwartz	SLR Consulting (Pty) Ltd	Section 5.3.6 Section 6.12 Section 7.5.8
Noise	Morné de Jager	Enviro-Acoustic Research cc	Section 5.3.2 Section 6.2 Section 7.5.5
Air Quality	Loren Dyer	WSP Group Africa (Pty) Ltd	Section 5.1.2 Section 6.1 Section 7.5.10

1.4 SCOPING TERMS OF REFERENCE

The 2014 Environmental Impact Assessment (EIA) Regulations (GNR 982), as amended, identifies the proposed Hendrina GH&A Facility development as an activity being subject to an S&EIR process due to the applicability of the EIA Listing Notices 1 and 2 (GNR 983 and 984, as amended).

As defined in Appendix 2 of GNR 982, as amended, the objective of the scoping process is to, through a consultative process:

— Identify the relevant policies and legislation relevant to the activity;
— Motivate the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
— Identify and confirm the preferred activity and technology alternative through an impact and risk assessment and ranking process;
— Identify and confirm the preferred site, through a detailed site selection process, which includes an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified alternatives focusing on the geographical, physical, biological, social, economic, and cultural aspects of the environment;
— Identify the key issues to be addressed in the assessment phase;
— Agree on the level of assessment to be undertaken, including the methodology to be applied, the expertise required as well as the extent of further consultation to be undertaken to determine the impacts and risks the activity will impose on the preferred site through the life of the activity, including the nature, significance, consequence, extent, duration and probability of the impacts to inform the location of the development footprint within the preferred site; and

— Identify suitable measures to avoid, manage or mitigate identified impacts and to determine the extent of the residual risks that need to be managed and monitored.

Public participation is a requirement of scoping; 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 FINAL SCOPING REPORT STRUCTURE

Table 2 cross-references the sections within the FSR with the legislated requirements as per Appendix 2 of GNR 982.

Table 1-5: Legislated Report Requirements as detailed in GNR 982

APPENDIX 2	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 and **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 2.1
	Where available, the physical address and farm name	Section 2.1
	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;	Section 3.1

APPENDIX 2	LEGISLATED REQUIREMENTS AS PER THE NEMA GNR 982	RELEVANT REPORT SECTION
	A description of the activities to be undertaken, including associated structures and infrastructure;	Section 2
(e)	A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process;	Section 3
(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 2.5
(h)	A full description of the process followed to reach the proposed preferred activity, site and location within the site, including-	
	Details of all the alternatives considered;	Section 2.4
	Details of the public participation undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	Section 4.6
	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;	**SER will be compiled**
	the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 5 Section 7
	the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated;	Section 6
	the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;	Section 4.5
	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 6
	the possible mitigation measures that could be applied and level of residual risk;	Section 6
	the outcome of the site selection matrix;	Section 2.4
	if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such and	N/A
	a concluding statement indicating the preferred alternatives, including preferred location of the activity;	Section 2.4
(i)	A plan of study for undertaking the environmental impact assessment process to be undertaken, including-	
	a description of the alternatives to be considered and assessed within the preferred site, including the option of not proceeding with the activity;	Section 7.3

APPENDIX 2	LEGISLATED REQUIREMENTS AS PER THE NEMA GNR 982	RELEVANT REPORT SECTION
	a description of the aspects to be assessed as part of the environmental impact assessment process;	Section 7.4
	aspects to be assessed by specialists;	Section 7.5
	a description of the proposed method of assessing the environmental aspects, including a description of the proposed method of assessing the environmental aspects including aspects to be assessed by specialists;	Section 7.6
	a description of the proposed method of assessing duration and significance;	Section 7.7
	an indication of the stages at which the competent authority will be consulted;	Section 7.9
	particulars of the public participation process that be conducted during the environmental impact assessment process; and	Section 7.9
	a description of the tasks that will be undertaken as part of the environmental impact assessment process;	Section 7
	identify suitable measures to avoid, reverse, mitigate or manage identified impacts and to determine the extent of the residual risks that need to be managed and monitored.	Section 6 Section 7.7
(j)	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 interested and affected parties; and	
	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;	
(k)	An undertaking under oath or affirmation by the EAP in relation to the level of agreement between the EAP and interested and affected parties on the plan of study for undertaking the environmental impact assessment;	**Appendix B**
(l)	Where applicable, any specific information required by the competent authority; and	N/A
(m)	Any other matter required in terms of section 24(4)(a) and (b) of the Act.	N/A

1.6 ASSUMPTION 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; and
- Based on the Pre-Application meeting and subsequent minutes, the CA would not require additional specialist input, in order to make a decision regarding the application.

Notwithstanding these assumptions and limitations, it is the view of WSP that this FSR provides a good description of the issues associated with the project, and a reasonable plan of study for the EIA phase.

2 PROJECT DESCRIPTION

2.1 SITE LOCATION

The proposed Hendrina GH&A Facility will be developed in an area of approximately 25 hectares (ha), 17km west of Hendrina, in Mpumalanga. The proposed Hendrina GH&A Facility falls within the Steve Tshwete Local Municipality of the Nkangala District Municipality.

The five projects of the Hendrina Renewable Energy Complex are located within the same geographical area and are inevitably linked and integrated. As such, the overall locality of the Hendrina Renewable Energy Complex is included in **Figure 2-1**. The Hendrina GH&A Facility (*project under consideration for this FSR*) project site, including associated alternatives, is indicated in **Figure 2-2**.

The details of the properties associated with the proposed Hendrina GH&A Facility, including the 21-digit Surveyor General (SG) codes for the cadastral land parcels are outlined in **Table 2-1.**

Each site option has three powerline options and one water supply option associated with it. The properties associated with the powerline and water supply pipeline alternatives are outlined in **Table 2-2, Table 2-3, Table 2-4** and **Table 2-5.**

Table 2-1: Hendrina GH&A Facility Affected Farm Portions

FARM NAME	21 DIGIT SURVEYOR GENERAL CODE OF EACH CADASTRAL LAND PARCEL
Site Alternative 1 (Preferred)	
Portion 3 of Dunbar Farm No. 189IS	T0IS00000000018900003
Site Alternative 2	
Portion 18 of Weltevreden Farm No. 193IS	T0IS00000000019300018
Portion 3 of Dunbar Farm No. 189IS	T0IS00000000018900003
Site Alternative 3	
Portion 14 of Weltevreden Farm No. 193IS	T0IS00000000019300014
Portion 15 of Weltevreden Farm No. 193IS	T0IS00000000019300015

Table 2-2: Site 1 Powerline Alternatives

FARM NAME	21 DIGIT SURVEYOR GENERAL CODE OF EACH CADASTRAL LAND PARCEL
Powerline Alternative 1 for Site 1 (Preferred)- 2km	
Portion 1 of Dunbar Farm No. 189IS	T0IS00000000018900001
Portion 3 of Dunbar Farm No. 189IS	T0IS00000000018900003
Powerline Alternative 2 for Site 1 -7km	
Portion 1 of Dunbar Farm No. 189IS	T0IS00000000018900001
Portion 3 of Dunbar Farm No. 189IS	T0IS00000000018900003
Portion 0 of Dunbar Farm No. 189IS	T0IS00000000018900000
Portion 3 of Hartebeestkuil Farm No. 185IS	T0IS00000000018500003
Powerline Alternative 3 for Site 1- 1.5km	
Portion 3 of Dunbar Farm No. 189IS	T0IS00000000018900003

Table 2-3: Site 2 Powerline Alternatives

FARM NAME	21 DIGIT SURVEYOR GENERAL CODE OF EACH CADASTRAL LAND PARCEL
Powerline Alternative 1 for Site 2 (Preferred)- 3km	
Portion 1 of Dunbar Farm No. 189IS	T0IS00000000018900001
Portion 3 of Dunbar Farm No. 189IS	T0IS00000000018900003
Powerline Alternative 2 for Site 2 -8km	
Portion 1 of Dunbar Farm No. 189IS	T0IS00000000018900001
Portion 3 of Dunbar Farm No. 189IS	T0IS00000000018900003
Portion 0 of Dunbar Farm No. 189IS	T0IS00000000018900000
Portion 3 of Hartebeestkuil Farm No. 185IS	T0IS00000000018500003
Powerline Alternative 3 for Site 2- 0.5km	

FARM NAME	21 DIGIT SURVEYOR GENERAL CODE OF EACH CADASTRAL LAND PARCEL
Portion 3 of Dunbar Farm No. 189IS	T0IS00000000018900003

Table 2-4: Site 3 Powerline Alternatives

FARM NAME	21 DIGIT SURVEYOR GENERAL CODE OF EACH CADASTRAL LAND PARCEL
Powerline Alternative 1 for Site 3 (Preferred)- 5km	
Portion 15 of Weltevreden Farm No. 193IS	T0IS00000000019300015
Portion 0 of Dunbar Farm No. 189IS	T0IS00000000018900000
Portion 1 of Dunbar Farm No. 189IS	T0IS00000000018900001
Powerline Alternative 2 for Site 3 -5km	
Portion 15 of Weltevreden Farm No. 193IS	T0IS00000000019300015
Portion 0 of Dunbar Farm No. 189IS	T0IS00000000018900000
Portion 3 of Hartebeestkuil Farm No. 185IS	T0IS00000000018500003
Powerline Alternative 3 for Site 3- 7km	
Portion 3 of Dunbar Farm No. 189IS	T0IS00000000018900003
Portion 15 of Weltevreden Farm No. 193IS	T0IS00000000019300015
Portion 0 of Dunbar Farm No. 189IS	T0IS00000000018900000
Portion 1 of Dunbar Farm No. 189IS	T0IS00000000018900001
Portion 6 of Dunbar Farm No. 189IS	T0IS00000000018900006

Table 2-5: Water Supply Pipeline Alternatives

FARM NAME	21 DIGIT SURVEYOR GENERAL CODE OF EACH CADASTRAL LAND PARCEL
Water Pipeline Alternative for site 1 (Preferred)	
Portion 1 of Bultfontein Farm No. 187IS	T0IS00000000018700001
Portion 2 of Bultfontein Farm No.87IS	T0IS00000000018700002
Portion 3 of Bultfontein Farm No.187IS	T0IS00000000018700003
Portion 4 of Bultfontein Farm No.187IS	T0IS00000000018700004
Portion 6 of Bultfontein Farm No. 187IS	T0IS00000000018700006
Portion 10 Bultfontein Farm No.187IS	T0IS00000000018700010
Portion 14 Bultfontein Farm No.187IS	T0IS00000000018700014
Portion 0 Dunbar Farm No.189IS	T0IS00000000018900000
Portion 1 Dunbar Farm No.189IS	T0IS00000000018900001
Portion 2 Dunbar Farm No.189IS	T0IS00000000018900002
Portion 4 Dunbar Farm No.189IS	T0IS00000000018900004
Portion 5 Dunbar Farm No.189IS	T0IS00000000018900005
Portion 6 Dunbar Farm No.189IS	T0IS00000000018900006
Portion 7 Dunbar Farm No.189IS	T0IS00000000018900007
Portion 6 Geluk Farm No.26IS	T0IS00000000002600006
Portion 7 Geluk Farm No.26IS	T0IS00000000002600007
Portion 3 Hartebeestkuil Farm No.185IS	T0IS00000000018500003
Portion 0 Komati Power Station Farm No.56IS	T0IS00000000005600000
Portion 1 Wilmansrust Farm No.47IS	T0IS00000000004700001
Portion 3 Wilmansrust Farm No.7IS	T0IS00000000004700003
Portion 9 Wilmansrust Farm No.47IS	T0IS00000000004700009

FARM NAME	21 DIGIT SURVEYOR GENERAL CODE OF EACH CADASTRAL LAND PARCEL
Water Pipeline Alternative for site 2	
Same portions as above	
Water Pipeline Alternative for site 3	
Portion 1 of Bultfontein Farm No. 187IS	T0IS00000000018700001
Portion 2 of Bultfontein Farm No.87IS	T0IS00000000018700002
Portion 3 of Bultfontein Farm No.187IS	T0IS00000000018700003
Portion 4 of Bultfontein Farm No.187IS	T0IS00000000018700004
Portion 6 of Bultfontein Farm No. 187IS	T0IS00000000018700006
Portion 10 Bultfontein Farm No.187IS	T0IS00000000018700010
Portion 14 Bultfontein Farm No.187IS	T0IS00000000018700014
Portion 0 Dunbar Farm No.189IS	T0IS00000000018900000
Portion 1 Dunbar Farm No.189IS	T0IS00000000018900001
Portion 2 Dunbar Farm No.189IS	T0IS00000000018900002
Portion 4 Dunbar Farm No.189IS	T0IS00000000018900004
Portion 5 Dunbar Farm No.189IS	T0IS00000000018900005
Portion 6 Dunbar Farm No.189IS	T0IS00000000018900006
Portion 7 Dunbar Farm No.189IS	T0IS00000000018900007
Portion 6 Geluk Farm No.26IS	T0IS00000000002600006
Portion 7 Geluk Farm No.26IS	T0IS00000000002600007
Portion 3 Hartebeestkuil Farm No.185IS	T0IS00000000018500003
Portion 0 Komati Power Station Farm No.56IS	T0IS00000000005600000
Portion 1 Wilmansrust Farm No.47IS	T0IS00000000004700001

FARM NAME	21 DIGIT SURVEYOR GENERAL CODE OF EACH CADASTRAL LAND PARCEL
Portion 3 Wilmansrust Farm No.7IS	T0IS00000000004700003
Portion 15 of Weltevreden Farm No. 193IS	T0IS00000000019300015

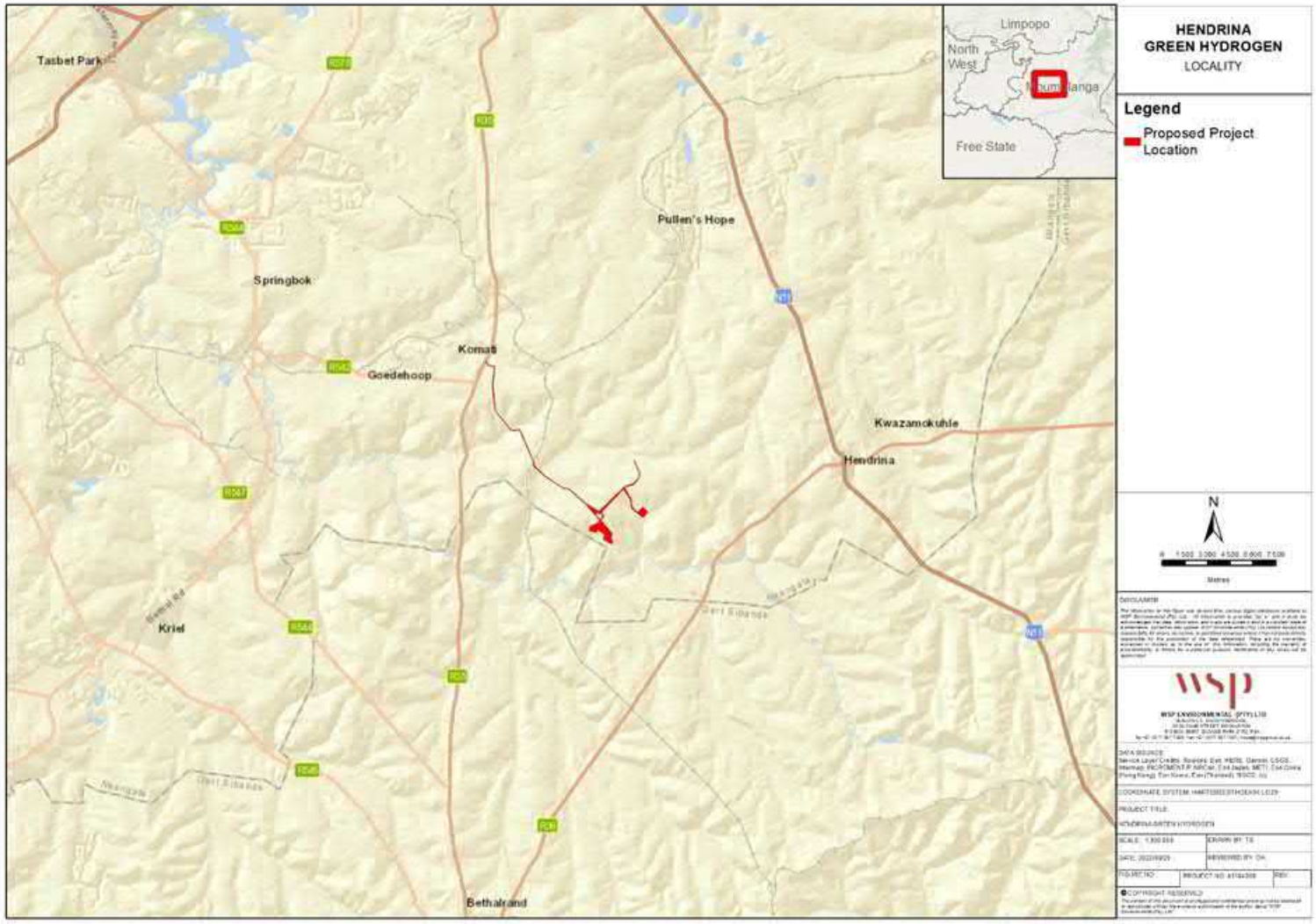


Figure 2-1: Locality map for the proposed Hendrina GH&A facility, in the Mpumalanga Province

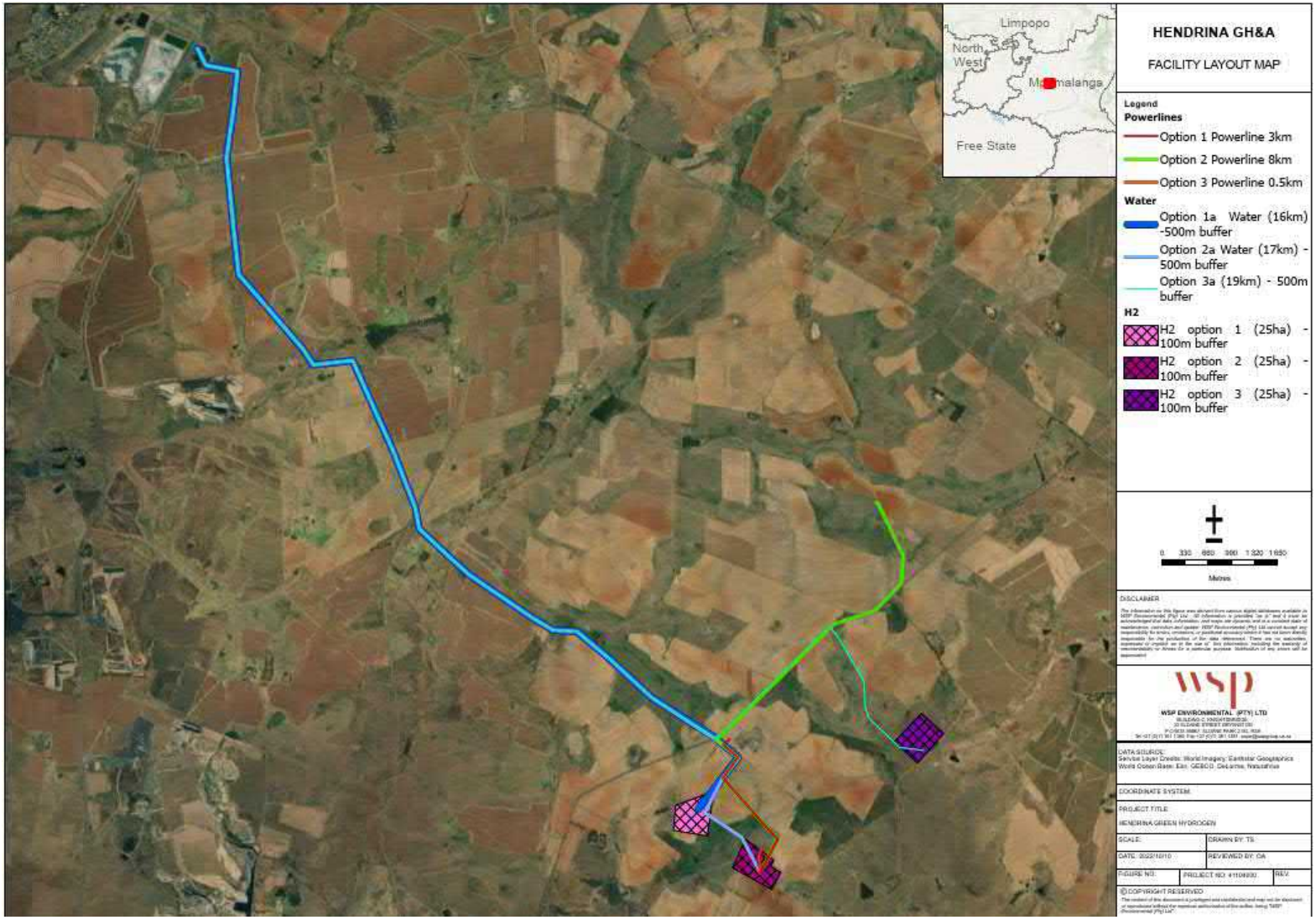


Figure 2-2: Proposed Hendrina GH&A Facility and associated main components

2.2 GREEN HYDROGEN AND AMMONIA PROCESS

ENERTRAG developed its first green hydrogen facility, Hybridkraftwerk, in Germany which is powered by wind energy. The Hybridkraftwerk was commissioned in October 2011 and produces 94 tons of hydrogen per year (**Figure 2-3** and **Figure 2-4**).

ENERTRAG SA, is proposing the development of up to 150MW green hydrogen and ammonia facility ('Facility'). The Facility will encompass approximately 25 hectares of land (three alternative locations being assessed), and the affected land parcels are shown in **Table 2-1.**

Figure 2-3: Enertrag Germany's Hybridkraftwerk

Figure 2-4: Closer View of Electrolyser Housing and Storage Tanks

'Green Ammonia' is ammonia (NH_3) made using renewable energy, air and water (**Figure 2-5**). The process uses electrolysis (direct electric current to drive an otherwise non-spontaneous chemical reaction) and air separation to split water and air into its primary components i.e. hydrogen (H) and oxygen (O_2) from water, and nitrogen (N) and oxygen from air. NH_3 is then synthesised from the separated components using the Haber-Bosch method (the standard industrial process used to make ammonia). The Haber-Bosch process combines stoichiometric amounts of hydrogen and nitrogen in a moderate temperature (~ 400 – 500 °C), high pressure (100 barg[1]) reactor. The process requires a catalyst (usually iron-based) promoting NH_3 mixture equilibrium. The NH_3 gas generated is rapidly cooled to form anhydrous (liquid) NH_3 for easy and safe storage and transport. Any unreacted nitrogen and hydrogen is recycled back into the reactor[2].

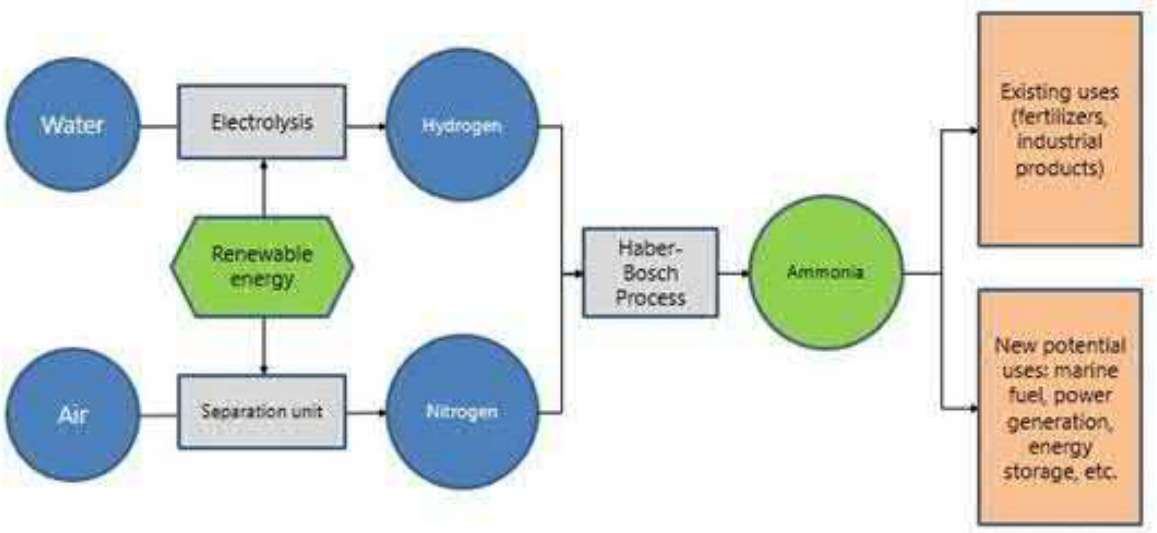


Figure 2-5: Green ammonia production and end uses[3]

Anhydrous NH_3 is easily stored in bulk tanks and used widely as an agricultural fertilizer as well as in industrial processes. When powered by renewable energy sources (i.e. wind or solar generated electricity) the production process is near carbon-free. NH_3 can also be used as a fuel in combustion engines (releasing nitrogen and water vapour as opposed to harmful emissions associated with the combustion of fossil fuels) or it can be cracked back into its components and the separated hydrogen used in other applications e.g. a fuel cell for charging battery powered electric vehicles. Hydrogen derived from renewable sources is also a viable substitute for fossil fuels, however, is difficult to store and transport in bulk. NH_3 is an effective and safe storage medium for hydrogen. Green Ammonia as a hydrogen carrier, thus presents an opportunity to capture renewable energy in a form that can be stored, safely transported and used in multiple applications[4].

The only solid waste stream is the production of brine from the water treatment plant. Ammonia spillages may occur however these will be accidental and mitigation measures will be developed and implemented, including amongst others suitable containment related to storage and emergency response measures.

A gaseous 'waste' (oxygen) is generated from the electrolyses process. Another source of gaseous 'wastes' is from the Air Separation Unit. This is where nitrogen is removed from the air and the other natural gases as expelled back to the environment.

A simplified flow process diagram is shown in **Figure 2-6** and **Figure 2-7**.

The production, storage and transport of hydrogen and ammonia is an industry undergoing in-depth research and developments. Consequently, technological solutions are constantly being improved and changing. Thus, the below Facility description is based on available technological solutions, however, the underlying fundamentals will remain.

[1] The unit of measurement of gauge pressure (i.e. absolute pressure minus atmospheric pressure)
[2] ENERTRAG (2021): Basis of Design – Doc no: 21004-ENT-PR-RPT-001
[3] Argus (2020): Green ammonia – Opportunity knocks (URL: https://www.argusmedia.com/en/blog/2020/may/28/green-ammonia-opportunity-knocks)
[4] Siemens Energy – The Green Ammonia Demonstration Programme (URL: https://www.siemens-energy.com/uk/en/offerings-uk/green-ammonia.html)

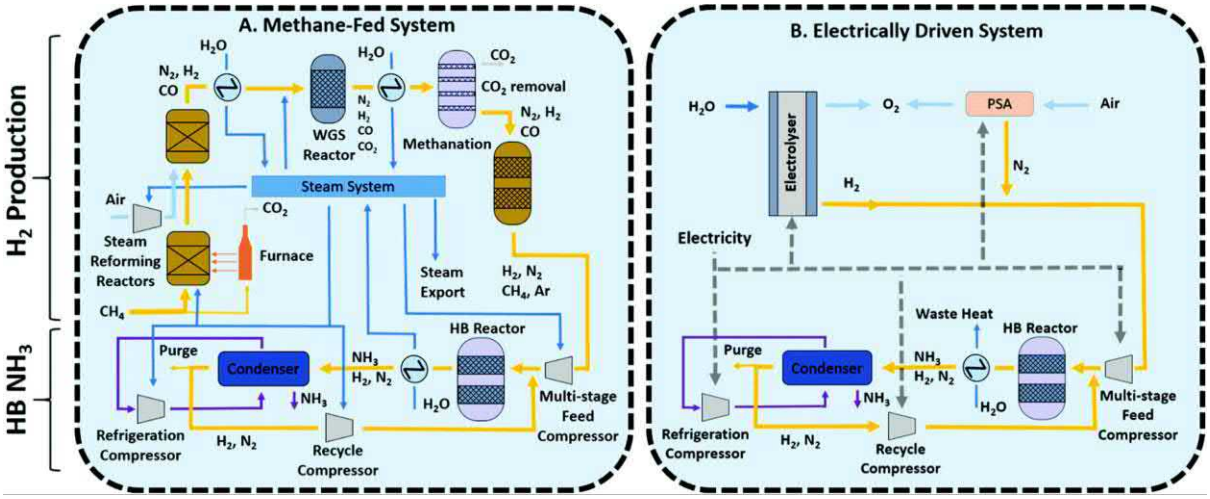


Figure 2-6: Simplified process flow diagram- traditional ammonia vs green ammonia production

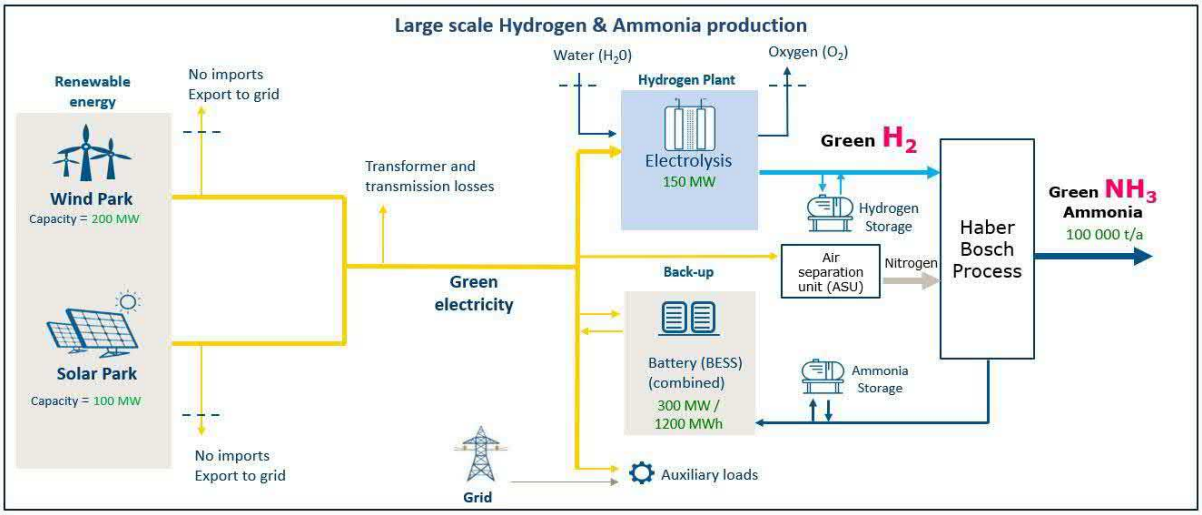


Figure 2-7: Simplified green hydrogen and ammonia production life cycle example

2.3 PROJECT INFRASTRUCTURE

The facility comprises the following components as summarised in **Table 2-6**, where the footprint and capacities are presented. An indicative block layout of the GH&A Facility is illustrated in **Figure 2-8**.

These parameters on based on the assumption that an up to 150MW electrolyser is installed (maximum). These components are detailed further below, but comprise the following general components:

- Water treatment.
- Electrolyser.
- Air separator.
- Ammonia processing unit.
- Liquid air energy system (LAES) for nitrogen storage.
- Feedstock and product storage.
- Utilities.
- Gantry and loading bay.

Associated infrastructure further includes:

- Temporary and permanent laydown areas required for temporary storage and assembly of components and materials.
- Access road/s to the site and internal roads between project components, with a width of up to up to 6m wide respectively.
- A temporary concrete batching plant (if necessary).
- Temporary staff accommodation.
- Fencing and lighting.
- Lightning protection.
- Telecommunication infrastructure.
- Stormwater channels.
- Water pipelines.
- Offices.
- Operational control centre.
- Operation and Maintenance Area / Warehouse / workshop.
- Ablution facilities.
- A gate house.
- Control centre, offices, warehouses.
- Security building.

Access to the site is possible primarily via an unnamed gravel road immediately off the R542 (North-West from the town of Hendrina). Existing roads will be used where feasible and practical.

Table 2-6: Summary of Facility Components[5]

NO.	COMPONENT	APPROXIMATE FOOTPRINT (HA)	STORAGE CAPACITY (M^3 / TONS)	MAXIMUM THROUGHPUT (M^3 / TONS PER ANNUM)	NOTE
1	Water Reservoir	2	6 800 / 6 800	800 / 800	Process and utilities water
2	Water Treatment Unit	1.5	N/A	192 000 / 192 000	Process and utilities water
3	Electrolyser Unit	1	N/A	(1 239 157 – 301 932 367) / 20 000	Hydrogen Output Oxygen Output
4	Air Separation Unit	0.5	N/A	92 905 405 / 110 000	Nitrogen Input
5	Ammonia Processing Unit	2	N/A	149 253 / 100 000	Ammonia Output
6	Liquid Air Storage System (LAES)	1	3 983/ 3 505	460 227 / 405 000	Nitrogen Storage
7	Liquid Ammonia Storage Tank	2	2 273/ 1 523	261 194 / 175 000	
8	Hydrogen and Oxygen Storage Tank Farm	12	59 566/ 800	5 576 208 / 90 000	Hydrogen and Oxygen storage (combined tank farm), i.e. feedstock storage
9	Ancillary infrastructure	3	n/a	n/a	Includes temporary and permanent laydown areas, parking, offices and other related infrastructure.
	Total Footprint	~ 25			

[5] These are Provisional Values which are subject to change, pending further layout revisions

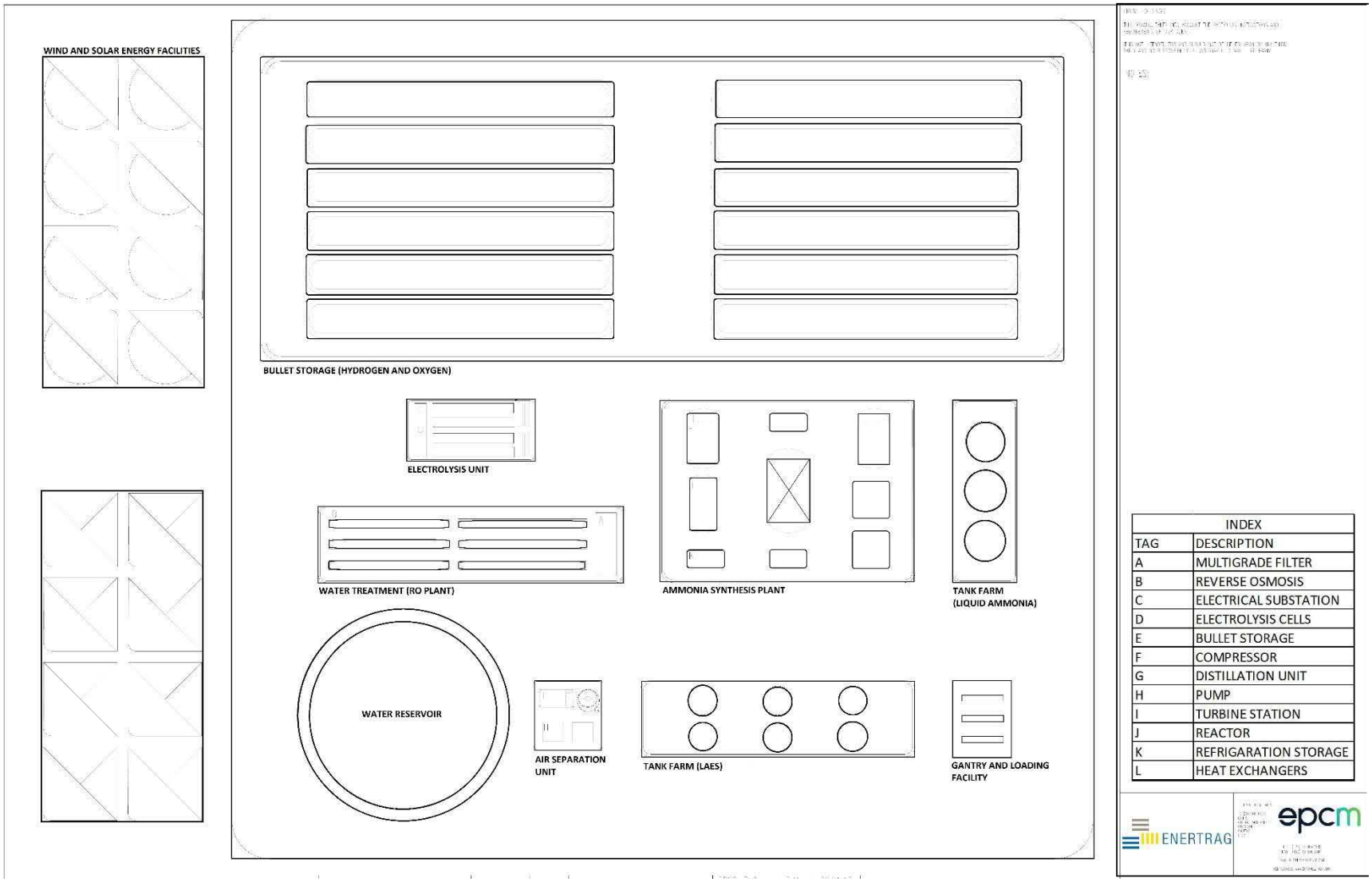


Figure 2-8: Indicative block layout of the proposed hydrogen and ammonia plant

2.3.1 WATER RESERVOIR

Water is required for the production of hydrogen and for heating and cooling purposes. Feedstock water will be stored in a water reservoir with a footprint of up to 1.5ha and a capacity of approximately 6800 m^3. It is proposed that three water reservoirs will be located on site. Each reservoir will have a diameter of up to 25m and a height of 6m (maximum height up to 15m), pending detailed design. The water reservoirs will consist of either reinforced concrete or steel cylindrical tanks (**Figure 2-9**). The precise design will be determined during the detailed design engineering phase.

A variety of water sources are being investigated for the broader development, and include the following:

— **Komati Power Station** (technical preferred option): Bulk water infrastructure from the Usuthu Water Scheme currently feeding the surrounding coal mines and power stations (specifically Eskom Komati Power Station) may be utilised for construction and operational water. Initial water results indicate good quality supply in sufficient quantities is available. This option is the preferred water sourcing for the development due to excess water being available at the Power Station's water reservoirs.

— **Groundwater:** Various boreholes may be utilised across the project site for extraction of construction and operational water requirements. The volumes will be dependent on the available groundwater and the quality thereof, which has not yet been determined.

— **Purified wastewater:** Wastewater from nearby commercial or mining facilities could be sourced to provide the facility with water. This would depend on availability of suitable quality wastewater and agreements with the respective entities involved. It is possible that water may be sourced from existing surrounding mining operations that are experiencing or anticipating mine water decant from their operations. Using this water in the green hydrogen and ammonia facility is potentially beneficial.

Figure 2-9: Typical water reservoir (left - concrete, right - steel)

WATER PIPELINE

As mentioned above, the preferred water source will be to connect to the Usutu Pipeline. Therefore, an above or below ground water pipeline will be constructed for the continuous or intermittent supply of water to the GH&A facility.

The pipeline will comprise a concrete pressure pipe, ductile iron pipe, galvanised iron or steel pipe, GRP/GRE pipe, Poly Vinyl Chloride Pipes, High Density Poly Ethylene pipes or other suitable material as required by the detailed design phase, situated (where buried) within a trench of up to 3m wide and up to 2m deep. The pipe will carry up to 928 880m^3 per annum at a throughput of ~40 litres per second (usage requirements varying between the construction and operational phases). The pipeline inner diameter will be up to 300mm. Major components will include:

— Pipeline segments comprising pipeline length of up to 9.5km.

— Concrete supports (where pipeline is located above ground)

— Pumps (including pump, electrical or oil engine and panel board) housed in pump house for security and safety

— Mains and sumps (if needed)
— Manholes for inspection, with concrete covers. To be spaced no further than 100 metres apart.
— Valves (various, for example sluice, air, scour etc.) as required
— Water and flow meters
— Pipe fitting pieces, joints, clamps, adaptors and couplings as needed
— Bedding material as needed (concrete, sand, tamped down soil) where trenched
— Electrical source for pumps
— Protection systems (pipeline inner liner and outer coating), cathodic protection, pressure meters).

Four water supply pipeline alternatives for each site are being considered, as follows:

— Alternative 1: Preferred Site to Usuthu Water Scheme (~16km);
— Alternative 2: Alternate Site to Usuthu Water Scheme (~17km);
— Alternative 3: Alternate Site to Usuthu Water Scheme (~19km); and

The surface area required for the trenching, assuming a 3m wide trench for the full length of the entire pipeline will be up to 3 ha.

2.3.2 WATER TREATMENT

Water required for the electrolysis must first be purified to acceptable standards for the electrolysis process. This purification is achieved through a Closed Circuit Reverse Osmosis (CCRO) process, including a forced-crystallisation unit. The reverse osmosis operation comprises of high pressure applied in order to drive water through semipermeable membranes that reject salt ions.

CCRO systems further work by recirculating pressurized feedwater until a desired recovery level is reached. Brine is replaced with fresh feed without stopping the flow of pressurized feed or permeate. CCRO systems achieve recovery by recirculation, not with multiple membrane elements and stages in series, and can therefore reach any desired recovery percentage in a single stage. CCRO technology has process has demonstrated recovery rates of up to 98% whilst saving more water and reducing more waste than traditional one-, two- and three-stage reverse osmosis systems. The RO system consumes between 10 - 16 litres of water per kg - of hydrogen.

Two by-products are produced by the RO process – brine and permeate. The permeate (purified water) must be of ASTM Type II quality, defined as having a resistivity of >1 MΩ-cm, a conductivity of <1 µS/cm and <50 ppb of TOCs. In contrast, the brine produced contains all rejected concentrated minerals which was separated through the RO process, which then acts as feedwater for the forced crystallisation unit forming part of the RO plant.

The water treatment facility is estimated to consume up to 192 000 tons per annum (tpa) of water per annum, with an additional estimated 2 000 tpa for utilities related to general running of the plant. This may increase, depending on the water source and qualities obtained, to approximately 320 000 tons per annum.

Purified water from the water treatment facility is the main input to the next step in the process, namely the electrolyser.

BRINE HANDLING

Water treatment is associated with the generation of concentrated wastes removed from the water, such as brine salt. The quantity of brine produced is directly related to the quality of the feedwater and efficiency of the RO process. Based on standard tap water, it can be assumed that for every 10 litres of purified water there will be 4 litres of bine produced. Liquid brine can be made into a solid through several available technologies such as, settlement tanks, cooling water circuits, and forced crystallization.

Based on the water samples taken to date and the quality of the Usutu pipeline feedwater, a total dissolved solids content of around 200mg/l is anticipated. Should the plant consume up to 192 000 tons of water, this would result in a maximum of 38 tons of sold salt being created per year (~105kg per day) assuming all salts are removed. This represents the worst-case scenario. This may increase, depending on the water source and qualities obtained, to approximately 320 000 tons per annum.

Liquid brine can be dewatered to recycle water and reduce the need for new input water. This dewatered, solid brine can be stored onsite in waste skips and can be readily disposed at the nearest suitably licenced waste disposal facility.

Alternatively, the wastewater can be used for irrigation water for the local famers by diluting the concentrated liquid brine with additional fresh water, or where possible re-used process water from the RO plant.

In addition, should sufficient quantities of feed water be available, brine can be diluted with fresh feedwater and used for dust suppression or similar use.

CRYSTALLIZATION

Crystallization is the production of a solid (crystal or precipitate) formed from a homogeneous, liquid which is concentrated to supersaturation levels (concentration > solubility) at that temperature. The crystallization processes utilised has not been selected and will be determined at detailed designed phase based on likely permeate constituents and concentration levels, however, may comprise any of the following:

— Supersaturation by cooling the solution with trivial evaporation;
— Supersaturation by evaporation of the solvent with little cooling;
— Evaporation by a combination of cooling and evaporation in adiabatic evaporators (vacuum crystallizers).

In addition, various crystalliser technologies may be utilised including steam driven, thermocompression driven, vapour compression cycling and calandria crystallisers, amongst others, depending on the final design.

Crystallisation essentially comprises three broad steps:

— Pre-concentration: Electrical, concentration-gradient or temperature gradient driven permeable membrane concentration step, which increases the TDS of the feedwater.
— Evaporation: Flash evaporation, multiple distillation or increased vapor pressure condensation of the concentrated brine to reduce the water content of the brine.
— Crystallization: achieving and promoting crystal development in the brine via heating or spray drying the until supersaturation is achieved.

Crystallisers typically comprise various interconnected modules placed on contained skid systems, which house heaters, evaporators, vapor washers, compressors, motors and zero liquid discharge packages. Ancillary equipment includes pumps, platforms and decking, instrumentation, control panels, insulation, valving, electrical systems and wiring, piping, and starter motors (if required). **Figure 2-10** and **Figure 2-11** provide a 3D rendering and simplified flow diagram of a typical Zero Liquid Discharge system respectively.

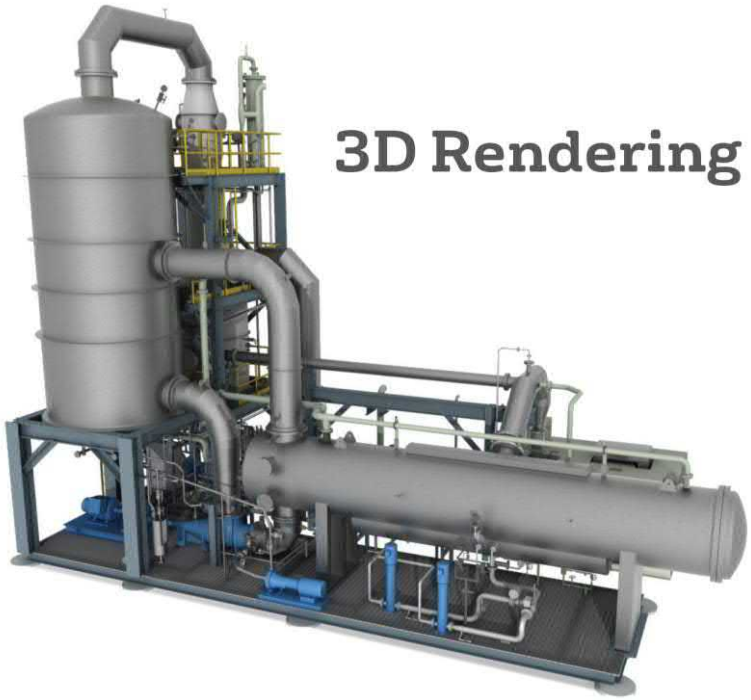


Figure 2-10: 3D Rendering of a typical Crystalliser (Source: Veolia)

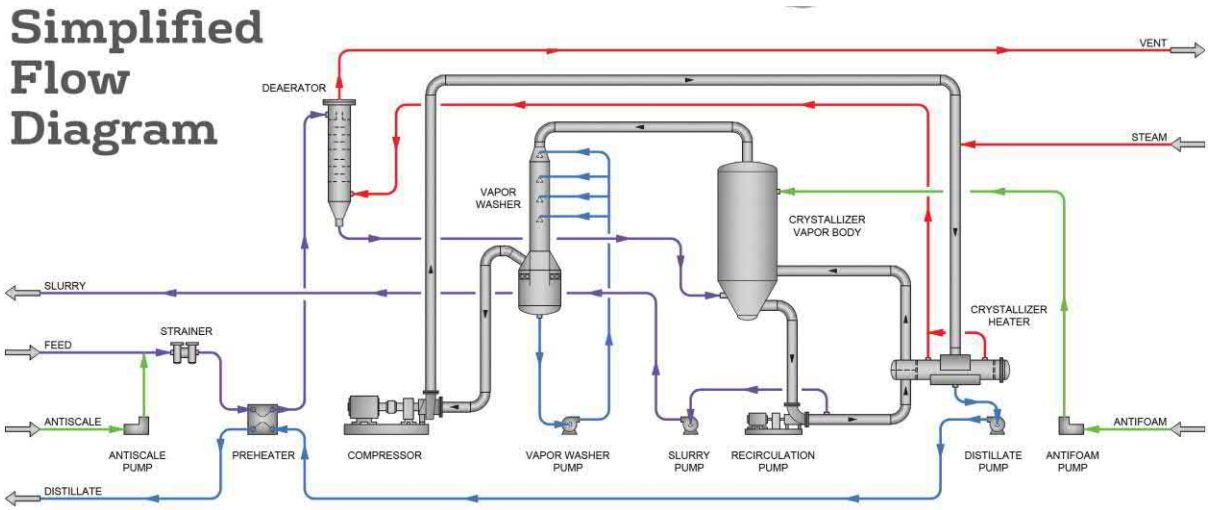


Figure 2-11: Simplified Flow Diagram of a typical Crystalliser (Source: Veolia)

The product of this zero liquid discharge (ZLD) crystallisation process is a salt 'cake' (i.e. solid block of typically mixed minerals and trace metals crystals of various sizes). The resulting cake is typically about 10% moisture. This can be somewhat controlled by adjusting the filtering and drying cycle times, reducing moisture content down to approximately 5%.

The resulting brine cake is then temporarily stored in a hazardous waste skip within a bund on-site which is then removed at regular intervals (no longer than two-weekly) by a third-party waste management company. This third-party waste management company will be suitably licenced for disposal and treatment of both general and hazardous waste. The waste contractor then treats the salt cake by addition of fly-ash to reduce the leachate concentration of the salt to within landfill-disposal regulatory requirements, thereafter, disposing of the modified salt cake to a suitably licenced waste disposal facility by road transport.

Given the above brine treatment and Zero Liquid Discharge system, as well as the use of a third-party contractor for treatment and disposal of the produced salt cake, and the relatively small temporary storage facility

envisaged and regular removal (<30m^3 at any one point in time), it is understood that no treatment of waste triggers as per the National Environmental Management: Waste Act (NEM:WA) are triggered, regardless of Category A, B or C triggers. In addition, it is further understood that no storage activities are triggered for these above activities.

Therefore, regardless of the classification of the salt cake (hazardous or general), and provided the above activities are implemented as described, no NEM:WA triggers apply and no Waste Management License is therefore necessary. The proponent will however comply with the general duties provided for at section 16 of NEM:WA relating to the management of waste as well as the legal requirements relating to the storage of waste as provided for at sections 21 and 22 respectively

2.3.3 ELECTROLYSER (UP TO 150MW)

The up to 150MW electrolyser will be housed in a warehouse building and will have a footprint of up to 1ha.

Purified water from the treatment plant will be fed through the electrolyser using electric current (renewable energy provided from the WEF) to separate water molecules ($2H_2O$) through a reduction-oxidation process, into hydrogen gas ($2H_2$ on that cathode side) and oxygen gas (O_2 on the anode side). Electrolysers are modular and currently range in size from 5MW – 20MW. It is proposed that 15 sets of 10 MW electrolysers (150 MW in total) be installed with the capacity to produce 20,000 tonnes per annum (tpa) of 'green' hydrogen and 100,000 tpa of 'green' ammonia. Each electrolyser unit will be powered through its own set of transformers and rectifiers. Oxygen will either be released to atmosphere or stored and sold as a by-product. Hydrogen will either be directed to the ammonia production plant or sold directly to interested parties

Two electrolysis technologies may be considered, namely alkaline- and polymer electrolyte membrane electrolysis ('PEM') (**Figure 2-12**). The most likely technology to be used in the PEM, however this will only be confirmed once detailed engineering design has been completed and EPC contractual arrangements concluded.

Figure 2-12: Example of an Electrolyser Unit (Nel Proton PEM)

2.3.4 AIR SEPARATOR UNIT

The air separation until will occupy a footprint of up to 0.5ha and the intake tower will have a maximum height of up to 40m (due to the height of the 'cold box' – the tallest vertical component of the air separation unit) (**Figure 2-13**).

Air from the atmosphere (approximately 78% nitrogen, 21% oxygen and 1% trace gases) is separated into mainly nitrogen and oxygen using cryogenics (air compression and temperature manipulation), pressure swing adsorption (pressure control) and membrane separation. The air separation unit will have a capacity of 110,000 tpa.

Alternative technologies exist (including Pressure Swing Adsorption (PSA) and Membrane Separation Technologies) and are being evaluated; the most efficient process will be implemented in the final project design.

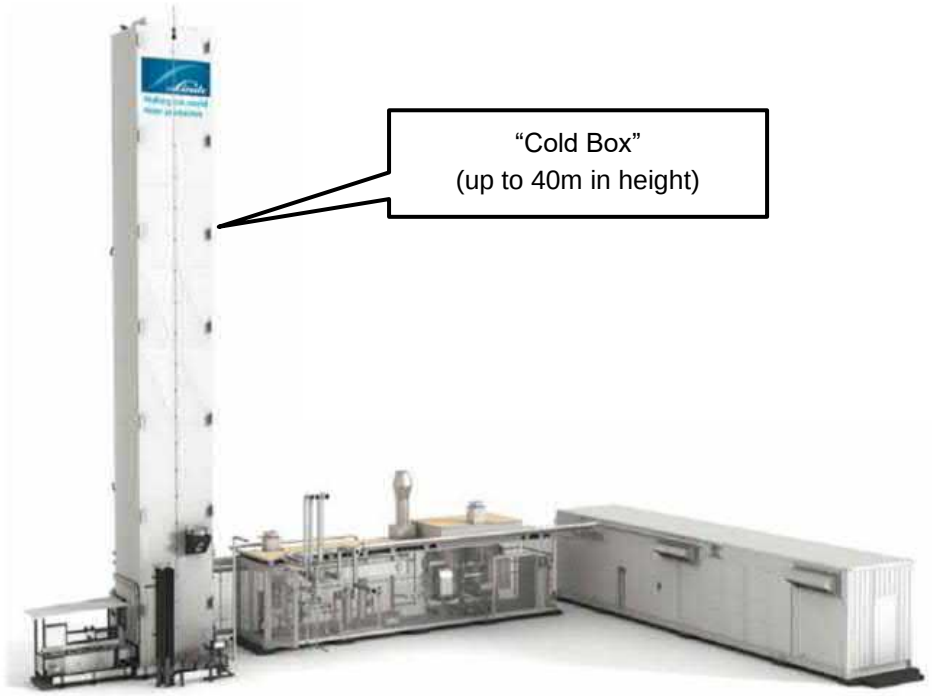


Figure 2-13: Example of an Air Separation Unit (Linde ECOGAN Containerized System)

2.3.5 LIQUID AIR ENERGY SYSTEM (LAES) FOR NITROGEN PRODUCTION:

Liquid air energy will be used to liquefy nitrogen for storage, energy and feedstock requirements. Liquid air energy is the use of liquefied air, nitrogen, oxygen and even hydrogen to store Energy. LAES consists of three main stages:

- cooling and separation of the air,
- storage (usually in insulated vessels at low pressure) and
- expanded for energy and/or production.

The first stage is the cooling of the air which is done by the air separation unit, the second stage is storage (usually in insulated vessel at low pressure) and the third stage is when extra energy is needed (the liquefied air is pumped and superheated to evaporate at atmospheric temperature). The change in pressure is used to turn gas turbines. These gas turbines produce electricity via the rotation of the generator shaft (mechanical energy is converted to electrical energy).

Components in the LAES include compressors, ambient and cryogenic heat exchangers, expansion valves, storage vessels, pumps, small turbines and generators.

2.3.6 AMMONIA PROCESSING UNIT

Nitrogen from the air separation unit and hydrogen from the electrolyser will be reacted over a bed of catalyst to form ammonia – as per the standard Haber-Bosch method. This is where stoichiometric amounts of nitrogen and hydrogen are reacted to produce ammonia. The conversion is typically achieved at 100 barg and between 400 - 500 °C to favour the formation of ammonia at equilibrium. A catalyst is also used to favour the production of ammonia.

The ammonia gas will be rapidly cooled to form anhydrous ammonia. Unreacted nitrogen and hydrogen will be recycled back to the reactor. If the full 20,000 tpa of green hydrogen generated by the electrolyser is directed to this process, this will produce up to 100,000 tpa of liquid, green ammonia for market.

Typical components of an ammonia production plant include compressors, filters, reactor chamber and beds, heat exchangers, water storage vessels, condensers, separators, circulators, absorbers and gas release valves (**Figure 2-14**).

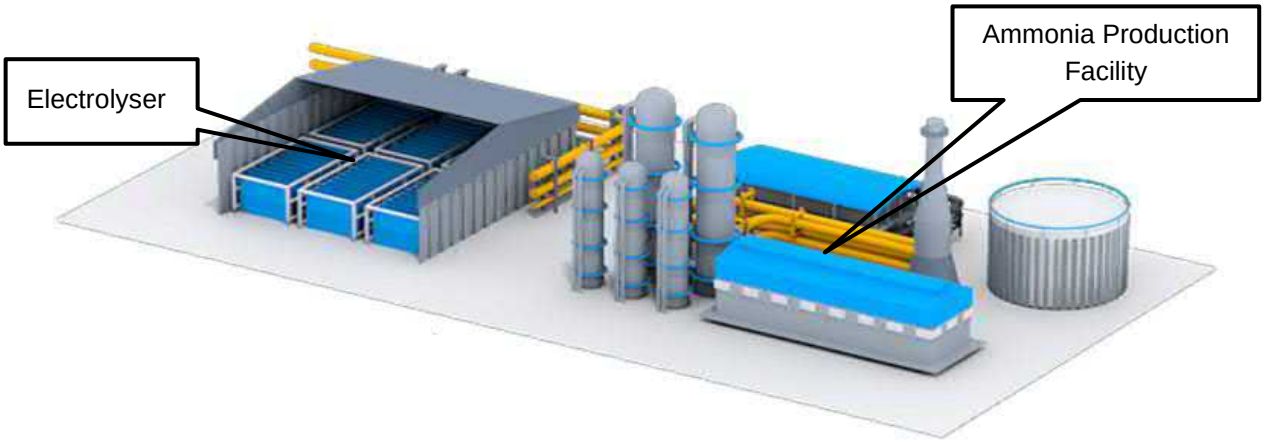


Figure 2-14: Example of integrated hydrogen and ammonia complex (ThyssenKrupp)

2.3.7 STORAGE TANKS – GENERAL

Storage Tanks can be stored in pressurised as or gas in liquid form through the utilisation of a variety of specialised tanks. There are different kinds of storage tanks designs to store anhydrous ammonia, these include but are not limited to:

- *Fixed roof tanks:* Fixed roof storage tanks are cylindrical storage containers that have flat or conical roofs joined to the shell. These storage tanks are often used to store large quantities of petroleum distillates, petrochemicals, and other liquid chemicals at atmospheric pressure. When the level of fluid in the tank rises and falls, air and vapor are pushed out and drawn into the tank headspace. Consequently, the vapor is lost into the atmosphere during the process of emptying the tank. A double-walled tank is designed to provide secondary containment by enhancing the protection against tank failure. It can be customized by adding ultrasonic level indicators, leak detectors, and tank ladder assemblies to identify and monitor in case of any leakage. Below are examples of fixed roof storage tanks
- *Floating roof tanks*: The roof of floating roof tanks floats above the liquid stored at atmospheric pressure. The roof rises and falls as the fluid does. Consequently, floating roof tanks reduce vapor loss, fire, and tank collapse hazards of fixed roof storage tanks.
- *Low-temperature storage tanks*: Low-pressure storage tanks are insulated tanks. These kinds of tanks are more suitable to store volatile liquids for atmospheric storage. They are often used to store ammonia, and liquified gases such as butane at a pressure set by their vapor pressure at the working temperature.
- *Pressure tanks:* Pressure tanks are horizontal-welded pressure vessels with elliptical or hemispherical heads known as bullet tanks (**Figure 2-15**). A bullet tank is a storage container that stores natural gas liquids. Bullet tanks are used for high-pressure fluids. Pressure tanks also include spherical pressure tanks known as Horton Spheres and are used to store large quantities of high-pressure fluids.

Figure 2-15: Bullet storage tank (ammonia storage)

2.3.8 STORAGE REQUIREMENTS FOR THE DEVELOPMENT

NITROGEN

Nitrogen will be stored (7-14 days) as a liquid with in large cylindrical cryogenic storage tanks with a combine volume of approximately 4 100 tons of nitrogen. A storage tank is usually considered to have 85% usable capacity, this is to allow 15% vapor space to allow for expansion. It is proposed that the facility will house up to two cylindrical cryogenic storage tanks. Each tank will have a diameter of up to 14m and a height of up to 15m with a capacity of up to 2032 tons.

AMMONIA

Green ammonia will be stored as anhydrous liquid ammonia, using similar storage equipment as that utilised for storage of Liquid Natural Gas (LNG), i.e. in a storage tank farm (**Figure 2-16**). Ammonia storage tanks are containers used to store ammonia as liquid or compressed gases. Anhydrous ammonia (gas or liquid) is a colourless gas with a sharp smell under atmospheric conditions. The temperature of anhydrous ammonia increases with the increase of surrounding temperature resulting in the vapor pressure in the tank to increase. Thus, it is important to store anhydrous ammonia in containers that can withstand the physical and chemical properties of the liquid form.

Figure 2-16: An example of a Liquid Ammonia Storage System (Source: Energas)

Anhydrous ammonia will be stored within large cylindrical cryogenic storage tanks with a combined volume of 3 750 tons of ammonia. A storage tank is usually considered to have 85% usable capacity, this is to allow 15% vapor space to allow for expansion.

It is proposed that the facility will house up to three cylindrical cryogenic storage tanks. Each tank will have a diameter of up to 14m and a height of up to 15m with a capacity of up to 1250 tons each.

HYDROGEN

Hydrogen is stored in vertical or horizontal storage bullets (**Figure 2-17**). Compressed hydrogen can be storage as a gas or in liquid form. Compressed hydrogen can be stored at ambient temperature. Up to 800 tons of hydrogen will be stored at the facility, in conjunction with that of the oxygen stored on site, in a tank farm of up to 12 ha. The facility will house up to 20 horizontal pressure bullets for the storage of hydrogen. Each bullet will have a diameter of up to 4m and a length of up to 15m.

Figure 2-17: Example of a compressed Hydrogen Storage – horizontal tank

OXYGEN

Oxygen will be stored in vertical or horizontal storage bullets and stored under high-pressures. The tanks have a vacuum-insulated double wall consisting of two concentric vessels, a steel inner tank and an outer jacket in carbon steel. Up to 800 tons of oxygen will be stored at the facility, in conjunction with that of the hydrogen stored on site, in a tank farm of up to 12 ha. It is proposed that the facility will house up to 16 vertical cryogenic

storage bullets for the storage of oxygen. Each bullet will have a diameter of up to 4m and a length of up to 15m.

2.3.9 GANTRY AND LOADING BAY

Ammonia is easily transported by truck and rail as a pressurized liquid. Three loading gantries were assumed where international organisation for standardisation (ISO) containers can be filled with anhydrous ammonia and trucked to an export port location, or similar consumer or off-take point (for example nearby railroad sidings). The following equipment forms part of these gantries:

— Custody transfer metering.
— Loading arm with coupling.
— Control valve.
— Control unit.

2.3.10 TRANSPORT

Liquid Ammonia may readily be transported via road, rail or a combination of the two

Standard 40ft pressurised road tanker trucks or ISOtainer (20ft length each) are being considered. Volumes will be up to 24 tons per truck load depending on pressured tanker or Isotainer, therefore 12 daily 24ton ISOtainer trucks envisaged. Depending on the final volumes transported, technical and financial feasibility, between 1 – 24 ton road tankers (pressured tanker trucks or ISOtainers) may be utilised.

Railway transport options are also being investigated.

2.4 GENERAL CONSTRUCTION ACTIVITIES

The construction process will follow industry standard methods and techniques. Key activities associated with the construction phase are described in **Table 2-7.**

Table 2-7: Construction Activities

ACTIVITY	DESCRIPTION
Site preparation and establishment	Site establishment will include clearing of vegetation and topsoil at the authorised site, including laydown area 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).
Transport of components and equipment to site	Bulk materials (aggregate, steel etc.), infrastructure components, 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. The infrastructure components may be defined as abnormal loads in terms of the Road Traffic Act (Act 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 and earthworks	Subject to the determination of founding specifications, earthworks will be required. This is likely to entail: — Excavation necessary for concrete foundations — Levelling of the plant area, construction camp area, substation area, and O&M building area, and excavation of foundations prior to construction. — Excavation of trenches for the installation of underground cables and material pipelines as needed.
Construction of GH&A facility	A large lifting crane will be required to lift the various components into place. The lifting crane/s will be brought on site.

ACTIVITY	DESCRIPTION
Establishment of ancillary infrastructure	Ancillary infrastructure will include construction site office, temporary laydown area and workshop area for contractor's equipment.
Rehabilitation	Once all construction is completed on site and all equipment and machinery has been removed from the site, the site will be rehabilitated.

2.5 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 alternatives; 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 in a comparative way, as suggested by Appendix 2 of the EIA Regulations of 2014 (as amended).

All alternatives outlined below are considered both feasible and reasonable with no apparent advantages or disadvantages at this stage of the project. All alternatives will be described and assessed in more detail during the EIA Phase.

2.5.1 SITE ALTERNATIVES

There are three site alternatives for the Hendrina GH&A Facility within the Hendrina Renewable energy complex project area (**Figure 2-18**). All sites will be investigated in the EIA phase. The corner co-ordinates for the preferred site are outlined in **Table 2-8.**

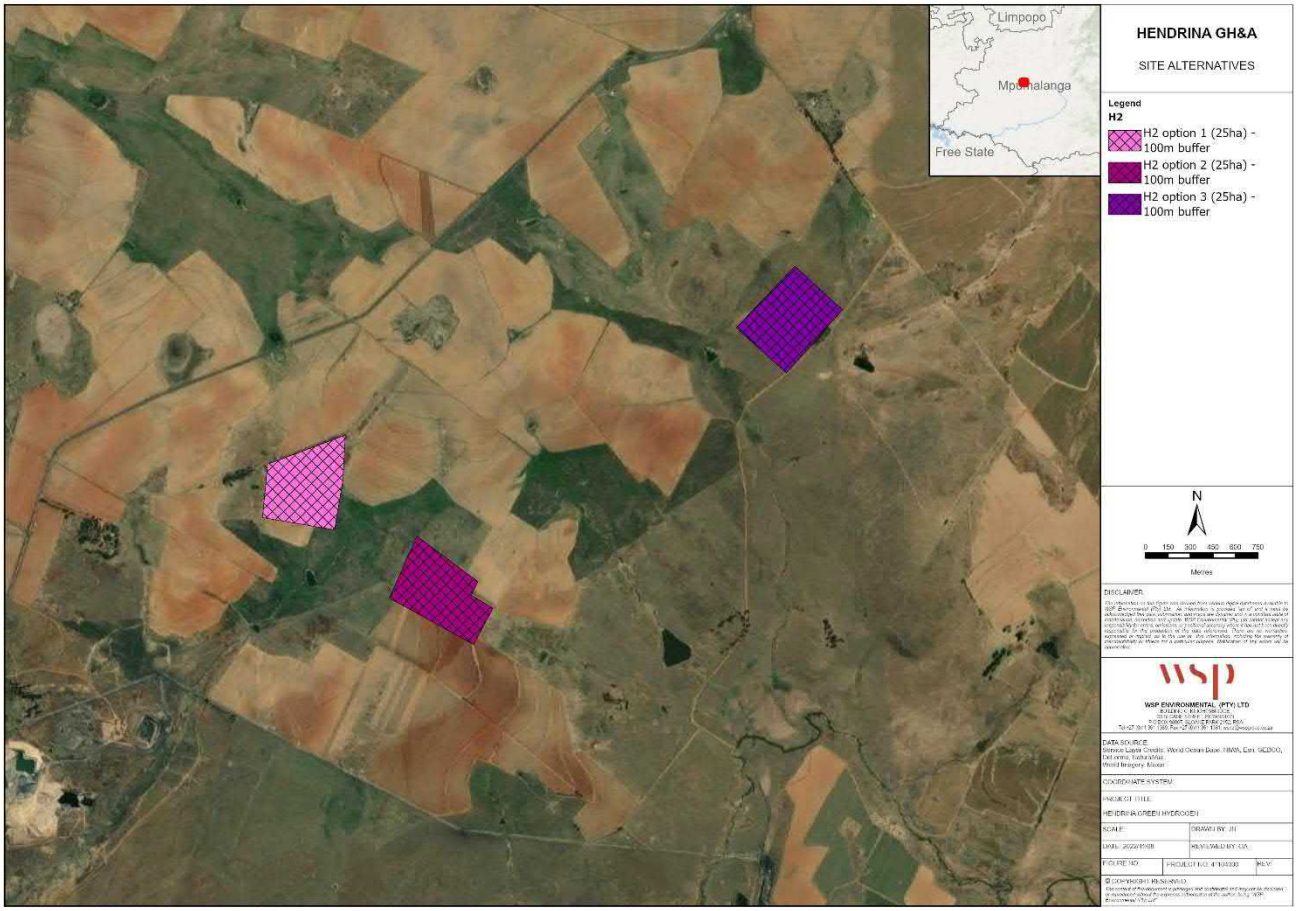


Figure 2-18: Hendrina GH&A Site Alternatives

Table 2-8: Hendrina GH&A Alternative Site – Co-ordinates

POINT	LATITUDE	LONGITUDE
Site Alternative 1- Preferred		

POINT	LATITUDE	LONGITUDE
A1-A	26°11'41.88"S	29°33'16.03"E
A1-B	26°11'48.25"S	29°32'57.42"E
A1-C	26°11'59.83"S	29°32'56.24"E
A1-D	26°12'2.38"S	29°33'13.52"E
A-1-E	26°11'51.52"S	29°33'15.50"E
Alternative 2		
		
A2-A	26°12'3.74"S	29°33'33.37"E
A2-B	26°12'17.06"S	29°33'26.78"E
A2-C	26°12'27.16"S	29°33'47.13"E
A2-D	26°12'19.30"S	29°33'51.76"E
A2-E	26°12'16.45"S	29°33'46.51"E
A2-F	26°12'13.49"S	29°33'48.09"E
Alternative 3		

POINT	LATITUDE	LONGITUDE
		
A3-A	26°11'18.18"S	29°34'50.02"E
A3-B	26°11'27.92"S	29°35'2.04"E
A3-C	26°11'14.12"S	29°35'15.49"E
A3-D	26°11'4.84"S	29°35'4.02"E

2.5.2 WATER SUPPLY ALTERANTIVES

There is one water pipeline being considered for the supply of water to the three proposed Hendrina GH&A Facility sites (**Figure 2-19**). The alternatives being considered are as follows:

- Alternative 1: Preferred Site to Usutu Scour 2 (~16km) (Preferred Alignment);
- Alternative 2: Alternate Site to Usutu Scour 2 (~17km);
- Alternative 3: Alternate Site to Usutu Scour 2 (~19km); and

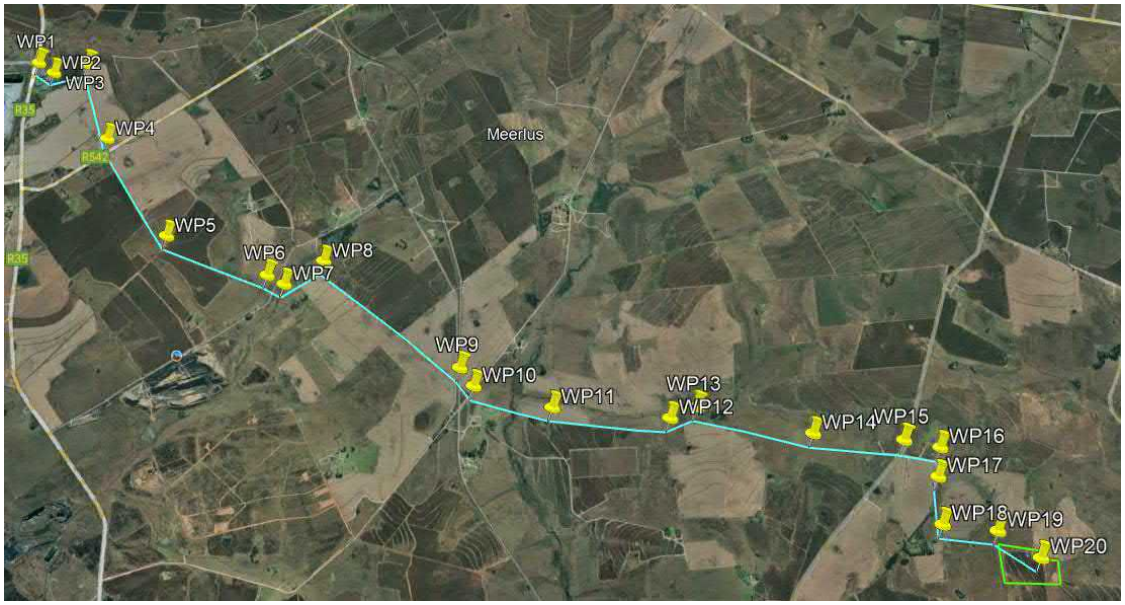
All three alignments will be investigated in the EIA phase. The co-ordinates for the alignments are outlined in **Table 2-9.**

Figure 2-19: Hendrina GH&A Water Pipeline Alternatives

Table 2-9: Hendrina Water Supply Pipeline Alternative Sites – Co-ordinates

POINT	LATITUDE	LONGITUDE
Water Pipe Alternative for Site 1 (Preferred)		

POINT	LATITUDE	LONGITUDE
WP1	26° 5'56.52"S	29°28'49.09"E
WP2	26° 6'4.43"S	29°28'53.68"E
WP3	26° 6'7.11"S	29°29'9.59"E
WP4	26° 6'47.00"S	29°29'4.29"E
WP5	26° 7'41.63"S	29°29'11.03"E
WP6	26° 8'16.65"S	29°29'44.31"E
WP7	26° 8'23.47"S	29°29'49.43"E
WP8	26° 8'21.50"S	29°30'9.72"E
WP9	26° 9'30.08"S	29°30'42.55"E
WP10	26° 9'39.44"S	29°30'44.32"E
WP11	26°10'1.52"S	29°31'10.46"E
WP12	26°10'26.67"S	29°31'53.50"E
WP13	26°10'27.37"S	29°32'6.03"E
WP14	26°10'57.84"S	29°32'44.66"E
WP15	26°11'16.52"S	29°33'17.58"E
WP16	26°11'25.49"S	29°33'29.50"E
WP17	26°11'49.99"S	29°33'9.05"E
Water Pipe Alternative for Site Alternative 2		

POINT	LATITUDE	LONGITUDE
		
WP1	26° 5'56.52"S	29°28'49.09"E
WP2	26° 6'4.43"S	29°28'53.68"E
WP3	26° 6'7.11"S	29°29'9.59"E
WP4	26° 6'47.00"S	29°29'4.29"E
WP5	26° 7'41.63"S	29°29'11.03"E
WP6	26° 8'16.65"S	29°29'44.31"E
WP12	26° 8'23.47"S	29°29'49.43"E
WP13	26° 8'21.50"S	29°30'9.72"E
WP14	26° 9'30.08"S	29°30'42.55"E
WP15	26° 9'39.44"S	29°30'44.32"E
WP16	26°10'1.52"S	29°31'10.46"E
WP17	26°11'35.01"S	29°33'21.75"E
WP18	26°11'51.57"S	29°33'12.35"E
WP19	26°12'3.26"S	29°33'31.43"E
WP20	26°12'19.33"S	29°33'41.05"E

POINT	LATITUDE	LONGITUDE
Water Pipe Alternative for Site Alternative 3		
		
WP1	26° 5'56.52"S	29°28'49.09"E
WP2	26° 6'4.43"S	29°28'53.68"E
WP3	26° 6'7.11"S	29°29'9.59"E
WP4	26° 6'47.00"S	29°29'4.29"E
WP5	26° 7'41.63"S	29°29'11.03"E
WP6	26° 8'16.65"S	29°29'44.31"E
WP7	26° 8'23.47"S	29°29'49.43"E
WP8	26° 8'21.50"S	29°30'9.72"E
WP9	26° 9'30.08"S	29°30'42.55"E
WP10	26° 5'56.52"S	29°28'49.09"E
WP11	26° 6'4.43"S	29°28'53.68"E
WP12	26° 6'7.11"S	29°29'9.59"E
WP13	26° 6'47.00"S	29°29'4.29"E

POINT	LATITUDE	LONGITUDE
WP14	26° 7'41.63"S	29°29'11.03"E
WP15	26°11'16.47"S	29°33'17.42"E
WP16	26°10'24.31"S	29°34'16.28"E
WP17	26°10'29.47"S	29°34'20.65"E
WP18	26°10'50.18"S	29°34'34.17"E
WP19	26°11'1.53"S	29°34'34.87"E
WP20	26°11'7.07"S	29°34'36.77"E
WP21	26°11'20.78"S	29°34'52.73"E
WP22	26°11'22.05"S	29°35'4.99"E

2.5.3 POWERLINE ALTERNATIVES

There are three powerline alternatives for each proposed site being considered for the supply of electricity to the Hendrina GH&A Facility sites (**Figure 2-20**). A up to 132kV transmission line (either single or double circuit) between the Facility and the onsite substation.

The alternatives being considered are as follows:

Site 1

- Alternative Powerline 1: Approximately 2km
- Alternative Powerline 2: Approximately 7km
- Alternative Powerline 3: Approximately 1.5km

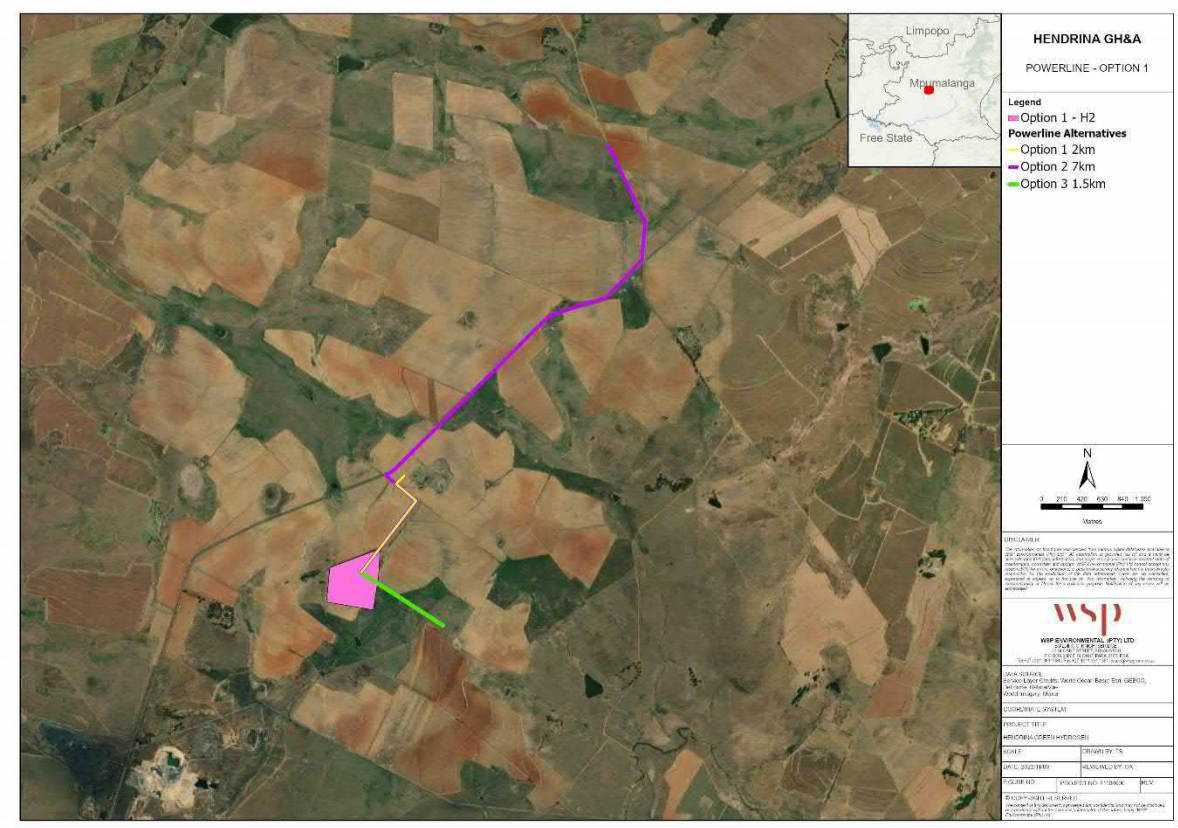


Figure 2-20: Site Alternative 1 powerline options

All these alignments will be investigated in the EIA phase. The co-ordinates for the alignments are outlined in **Table 2-10, Table 2-11** and **Table 2-12** below.

Table 2-10: Powerline Alternatives for Site 1

POINT	LATITUDE	LONGITUDE
Site 1- Powerline Alternative 1 (Preferred)- Approx.2km		

POINT	LATITUDE	LONGITUDE
PL1-A	26°11'49.93"S	29°33'8.97"E
PL1-B	26°11'25.68"S	29°33'29.36"E
PL1-C	26°11'20.21"S	29°33'21.93"E
PL1-D	26°11'17.48"S	29°33'24.93"E
Site 1- Powerline Alternative 2- Approx.7km		
		
PL2-A	26°11'49.93"S	29°33'8.97"E
PL2-B	26°11'25.68"S	29°33'29.36"E
PL2-C	26°11'17.25"S	29°33'18.26"E
PL2-D	26°11'15.50"S	29°33'21.13"E
PL2-E	26°10'23.44"S	29°34'18.65"E
PL2-F	26°10'17.00"S	29°34'40.19"E
PL2-G	26°10'4.20"S	29°34'53.15"E
PL2-H	26° 9'51.75"S	29°34'54.34"E
PL2-I	26° 9'26.71"S	29°34'40.93"E
PL2-J	26° 9'26.75"S	29°34'40.01"E
Site 1- Powerline Alternative 3- Approx. 1.5km		

POINT	LATITUDE	LONGITUDE
		
PL2-A	26°11'49.93"S	29°33'8.97"E
PL2-B	26°12'7.48"S	29°33'39.62"E

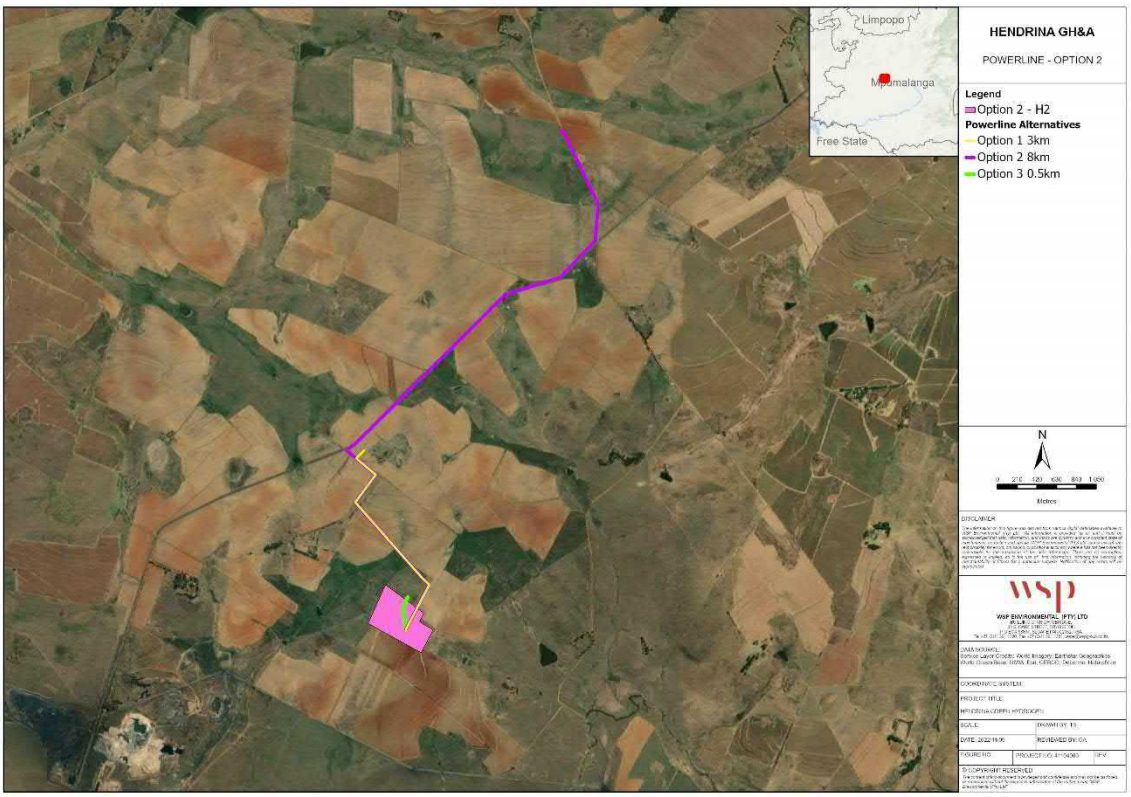
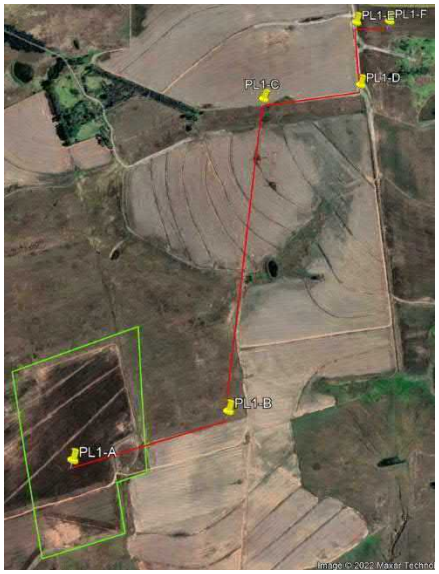


Figure 2-21: Site Alternative 2 Powerline Options

Site 2

— Alternative Powerline 1: Approximately 3km
— Alternative Powerline 2: Approximately 8km
— Alternative Powerline 3: Approximately 0.5km

Table 2-11: Powerline Alternatives for Site 2

POINT	LATITUDE	LONGITUDE
Site 2- Powerline Alternative 1 (Preferred)- Approx.3km		
		
PL1-A	26°12'19.20"S	29°33'41.35"E
PL1-B	26°12'3.63"S	29°33'49.99"E
PL1-C	26°11'35.49"S	29°33'21.66"E
PL1-D	26°11'25.87"S	29°33'29.33"E
PL1-E	26°11'20.24"S	29°33'21.94"E
PL1-F	26°11'17.23"S	29°33'25.04"E
Site 2- Powerline Alternative 2- Approx.8km		

POINT	LATITUDE	LONGITUDE
		
PL2-A	26°12'19.20"S	29°33'41.35"E
PL2-B	26°12'3.63"S	29°33'49.99"E
PL2-C	26°11'35.49"S	29°33'21.66"E
PL2-D	26°11'25.87"S	29°33'29.33"E
PL2-E	26°11'17.29"S	29°33'18.17"E
PL2-F	26°11'15.28"S	29°33'21.24"E
PL2-G	26°10'23.42"S	29°34'18.70"E
PL2-H	26°10'16.91"S	29°34'39.86"E
PL2-I	26°10'4.27"S	29°34'53.25"E
PL2-J	26° 9'51.75"S	29°34'54.34"E
PL2-K	26° 9'26.71"S	29°34'40.93"E
PL2-L	26° 9'26.75"S	29°34'40.01"E
Site 2- Powerline Alternative 3- Approx. 0.5km		

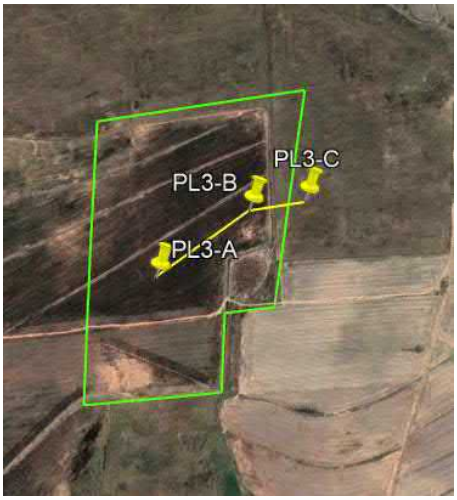
POINT	LATITUDE	LONGITUDE
		
PL3-A	26°12'19.20"S	29°33'41.35"E
PL3-B	26°12'11.56"S	29°33'40.30"E
PL3-C	26°12'8.02"S	29°33'41.93"E

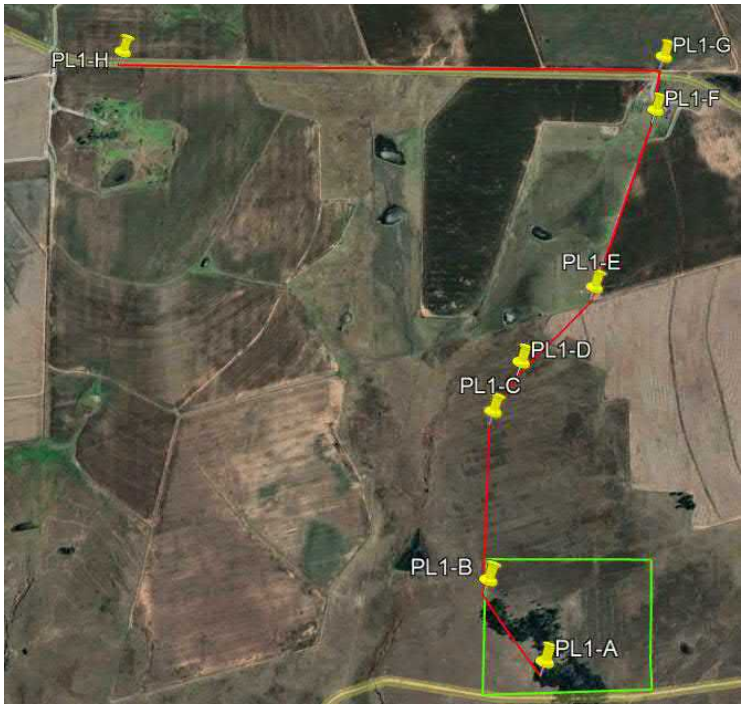
Figure 2-22: Site Alternative 3 Powerline Options

Site 3

- Alternative Powerline 1: Approximately 5km
- Alternative Powerline 2: Approximately 5km
- Alternative Powerline 3: Approximately 7km

Table 2-12: Powerline Alternatives for Site 3

POINT	LATITUDE	LONGITUDE
Site 3- Powerline Alternative 1 (Preferred)-Approx.5km		

POINT	LATITUDE	LONGITUDE
		
PL1-A	26°11'22.15"S	29°35'5.24"E
PL1-B	26°11'20.95"S	29°34'53.12"E
PL1-C	26°11'8.21"S	29°34'37.43"E
PL1-D	26°11'2.07"S	29°34'35.02"E
PL1-E	26°10'49.97"S	29°34'34.06"E
PL1-F	26°10'29.77"S	29°34'21.24"E
PL1-G	26°10'24.28"S	29°34'16.19"E
PL1-H	26°11'12.17"S	29°33'25.23"E
Site 3- Powerline Alternative 2- Approx.5km		

POINT	LATITUDE	LONGITUDE

PL2-A	26°11'22.15"S	29°35'5.24"E
PL2-B	26°11'20.95"S	29°34'53.12"E
PL2-C	26°11'8.21"S	29°34'37.43"E
PL2-D	26°11'2.07"S	29°34'35.02"E
PL2-E	26°10'49.97"S	29°34'34.06"E
PL2-F	26°10'29.77"S	29°34'21.24"E
PL2-G	26°10'24.28"S	29°34'16.19"E
PL2-H	26°10'16.91"S	29°34'39.86"E
PL2-I	26°10'16.60"	29°34'39.91"E
PL2-J	26°10'4.31"S	29°34'53.29"E
PL2-K	26° 9'51.50"S	29°34'54.07"E
PL2-L	26° 9'26.64"S	29°34'40.80"E
PL2-M	26° 9'26.70"S	29°34'39.98"E

POINT	LATITUDE	LONGITUDE
Site 3- Powerline Alternative 3- Approx.7km		
		
PL3-A	26°11'22.15"S	29°35'5.24"E
PL3-B	26°11'20.95"S	29°34'53.12"E
PL3-C	26°11'8.21"S	29°34'37.43"E
PL3-D	26°11'2.07"S	29°34'35.02"E
PL3-E	26°10'49.97"S	29°34'34.06"E
PL3-F	26°10'29.77"S	29°34'21.24"E
PL3-G	26°10'24.28"S	29°34'16.19"E
PL3-H	26°11'16.62"S	29°33'18.41"E
PL3-I	26°11'20.59"S	29°33'7.49"E
PL3-J	26°11'59.33"S	29°33'45.78"E
PL3-K	26°12'5.64"S	29°33'41.06"E

2.5.4 TECHNOLOGY ALTERNATIVES

The project is being developed on the basis that a GH&A facility will be established on this site. Therefore, no technology alternatives are being considered for this project. The motivation behind the development of this facility is outlined in Section 2.6 below.

2.5.5 LAYOUT ALTERNATIVES

A conceptual layout of the Hendrina GH&A Facility has been compiled and is included in **Figure 2-8** above**.** The layout is likely to be updated and refined as the project engineering progresses, and depending on the sensitivity and technical inputs from the specialists during the EIA phase studies. The developed layout of the Hendrina GH&A Facility layout is not yet final.

2.5.6 'NO PROJECT' ALTERNATIVE

In the "no project" alternative, the Hendrina GH&A Facility project will not be developed. In this scenario, there could be a missed opportunity to address the need for the green production of hydrogen and ammonia for commercial use 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 global call to reduce GHG emissions in the industrial sector. Conversely, negative environmental impacts of the project (as outlined in **Section 6**) associated with the development of the Hendrina GH&A Facility would be avoided.

The "no project" alternative will be considered in the EIA phase as a baseline against which the impacts of the Hendrina GH&A Facility project will be assessed.

2.6 NEED AND DESIRABILITY

In October 2021, at the second Sustainable Infrastructure Development Symposium, President Cyril Ramaphosa said that green energy had the potential to drive industrialisation and establish a whole new industrial reality. Furthermore, the President stated that "We stand ready to be a major exporter in this market, to use hydrogen to rapidly decarbonise our existing industries, and attract industrial investment from across the globe seeking to meet new standards of green power in the production process".

The proposed development of the Hendrina GH&A Facility directly addresses the President's statements and the need to implement renewable energy technologies and green fuels and/or products in Mpumalanga.

2.6.1 WHAT IS GREEN HYDROGEN AND AMMONIA PRODUCTION

Green hydrogen is hydrogen fuel that is created using renewable energy instead of fossil fuels. It has the potential to provide clean power for manufacturing, transportation, and more and its only by-product is water.

Hydrogen energy is very versatile, as it can be used in gas or liquid form, be converted into electricity or fuel, and there are many ways of producing it. Approximately 70 million metric tons of hydrogen are already produced globally every year for use in oil refining, ammonia production, steel manufacturing, chemical and fertilizer production, food processing, metallurgy, and more.

Hydrogen is the most abundant chemical in the universe. Two atoms of hydrogen paired with an atom of oxygen creates water. Alone, though, hydrogen is an odourless and tasteless gas, and highly combustible.

There are three types of Hydrogen, namely brown, grey, and green hydrogen. These are named based on the process used to make them, and the emissions each process emits:

— **Brown hydrogen** requires the burning of fossil fuels (coal) in order to complete the gasification process. This processes releases vast greenhouse gases (GHG) emissions into the atmosphere.
— **Grey hydrogen** is extracted from natural gases through a process known as steam reforming. This process also releases GHG emissions into the atmosphere.

— **Green hydrogen and ammonia production** differs from traditional production technologies in that the process relies exclusively on renewable resources (renewable energy) and for input air and water (feedstock), to produce commercially usable green hydrogen and ammonia. This method has **no associated GHG emissions.**

WHAT ARE HYDROGEN AND AMMONIA USED FOR?

Commercially, hydrogen is used as a fuel for transport in hydrogen fuel cells. Alternatively, hydrogen is used for welding and in the production of other chemicals such as methanol and hydrochloric acid and also has other commercial uses like the filling of balloons. It is also a primary input to the production of ammonia. Ammonia in turn is primarily used in the production of ammonium nitrate (fertiliser) and is also used as refrigerant gas and the manufacture of plastics, explosives, textiles, pesticides and other chemicals. Ammonia can also be used as a stable 'carrier' of hydrogen, allowing hydrogen to be readily stored and transported.

ADVANTAGES AND DISADVANTAGES OF GREEN HYDROGEN[6]

The green hydrogen energy source has advantages and disadvantages that we must be aware of. The most notable advantages include:

— **100 % sustainable:** green hydrogen does not emit polluting gases either during combustion or during production.
— **Storable**: hydrogen is easy to store, which allows it to be used subsequently for other purposes and at times other than immediately after its production.
— **Versatile:** green hydrogen can be transformed into electricity or synthetic gas and used for domestic, commercial, industrial or mobility purposes.
— **Transportable:** it can be mixed with natural gas at ratios of up to 20 % and travel through the same gas pipes and infrastructure - increasing this percentage would require changing different elements in the existing gas networks to make them compatible.

However, green hydrogen also has negative aspects, including:

— **High cost**: energy from renewable sources, which are key to generating green hydrogen through electrolysis, is more expensive to generate, which in turn makes hydrogen more expensive to obtain.
— **High energy consumption**: the production of hydrogen in general and green hydrogen in particular requires more energy than other fuels.
— **Safety issues**: hydrogen is a highly volatile and flammable element and extensive safety measures are therefore required.

2.6.2 GREEN ECONOMY

THE PARIS AGREEMENT

Climate change is a global emergency that goes beyond national borders. It is an issue that requires international cooperation and coordinated solutions at all levels. To tackle climate change and its negative impacts, world leaders at the UN Climate Change Conference (COP21) in Paris reached a breakthrough on 12 December 2015: the historic Paris Agreement.

The Agreement sets long-term goals to guide all nations:

— substantially reduce global greenhouse gas emissions to limit the global temperature increase in this century to 2 degrees Celsius while pursuing efforts to limit the increase even further to 1.5 degrees;
— review countries' commitments every five years;
— provide financing to developing countries to mitigate climate change, strengthen resilience and enhance abilities to adapt to climate impacts.

[6] https://www.iberdrola.com/sustainability/green-hydrogen

The Agreement is a legally binding international treaty. It entered into force on 4 November 2016. Today, 192 Parties (191 countries plus the European Union) have joined the Paris Agreement.

The Agreement includes commitments from all countries to reduce their emissions and work together to adapt to the impacts of climate change, and calls on countries to strengthen their commitments over time. The Agreement provides a pathway for developed nations to assist developing nations in their climate mitigation and adaptation efforts while creating a framework for the transparent monitoring and reporting of countries' climate goals.

The Paris Agreement provides a durable framework guiding the global effort for decades to come. It marks the beginning of a shift towards a net-zero emissions world. Implementation of the Agreement is also essential for the achievement of the Sustainable Development Goals.

Most experts agree that green hydrogen will be essential to meeting the goals of the Paris Agreement, since there are certain portions of the economy whose emissions are difficult to eliminate such as transportation, electricity generation and industry.

NATIONAL PERSPECTIVE

The Project will aid in the increase of exports from South Africa through the production of green hydrogen that has become popular globally. Hydrogen has become one of the latest buzzes for meeting the world's growing energy needs and a vital component for meeting the global decarbonization goals. Hydrogen is a clean fuel; however, the manufacturing of hydrogen fuel is energy-intensive and traditionally uses fossil fuels to power the production plant. There are four types of hydrogen and are classified in the manufacturing process. These types are brown, blue, grey and green hydrogen. Brown hydrogen is created through coal gasification, blue hydrogen uses carbon capture and storage for the greenhouse gases produced in the creation of grey hydrogen, producing grey hydrogen from natural gas produces carbon waste, and green hydrogen production uses renewable energy to create hydrogen fuel without carbon input.

The Project will produce green hydrogen of which can be used for various purposes and products which include fertilizers, shipping fuel, aviation fuel, and green steel. The Project can help contribute towards South Africa's exports and tap into the emerging multi-billion market, which is predicted to grow exponentially over the next few decades. The production of green hydrogen also requires a large solar and wind power input (both at the Project site). It is estimated that with the growth of the green hydrogen industry half a million jobs in the solar and wind industry will be created. Furthermore, in South Africa, green hydrogen has been identified by the Presidency as the first of the five "Big Frontier' strategic investment opportunities and will be involved in the finalization of the much anticipated 'Hydrogen Strategy and investor Roadmap'. It has been estimated that the green hydrogen industry in South Arica will be producing more than 3.8-million tonnes per anum and reducing the countries greenhouse gas emissions by 75%- by 2050 and could support the creation of around 370 000 additional direct and indirect jobs.

Studies have shown that the manufacturing and use of hydrogen, using the available low-carbon technologies, will substantially support South Africa to progress to deeper decarbonization than current policies envisage. The production of green hydrogen will support greater domestic decarbonization and allow the country to meet its international obligations by (not limited to):

- Reforming carbon dioxide emissions in coal- and gas-to-liquids synthetic fuels refineries in Mossel Bay and Secunda and potentially supporting the use of biogenic, non-fossil, or direct-air-capture sources of CO2 to be used to source sustainable synthetic fuels;
- Replacing the use of coking and other coal in steel production;
- Displacing the existing unabated gas use for chemicals and refinery hydrogen;
- Supporting the roll-out of fuel cells for remote and heavy-duty vehicles where battery solutions are not viable; and
- Fuelling industrial processes where electrification cannot meet the specific combustion or heat needs.

With South Africa being ranked in the top ten globally for its wind and solar potential- there is high potential for green hydrogen production. South Africa has excellent resources of land, wind, and sun that are fundamental to the large-scale development of renewable electricity— and are also the key inputs for green hydrogen. Based on having these key resources allowing for the construction of the hydrogen facility will ensure the country is taking the right steps towards the Presidency 2050 aspirations. This Project will serve as one of the anchor or foundation projects to the establishment of the South African green hydrogen industry

2.6.3 DESIRABILITY OF THE SITE

ENVIRONMENT

The environment is a key factor when it comes to the development of its projects. It is critical to ensure that its projects are developed in a sustainable manner. All the environmental factors were considered in the area when potential sites were being considered. After a thorough evaluation of the regional farms, the specific farms were selected because they were already heavily disturbed by agricultural and coal mining activities. Thus, it was concluded that the development of these farms would have a minimal impact on the region's flora, fauna and water resources.

TOPOGRAPHY AND SITE ACCESS

The surrounding landscape has a rolling hill topography which is suitable for the development of a GH&A facility. The Project site can be accessed easily via the tarred R542 road which run along the eastern boundary of the site. There is an existing road that goes through the land parcels to allow for direct access to the project development area. The site is also situated close to the renewable energy projects that are being proposed in parallel with this facility and therefore, the GH&A facility will be close to a reliable source of electricity.

LAND AVAILABILITY

With this region being home to some of the biggest coal power stations in the country (Komati and Camden among many others), most land parcels have been given mining rights for coal beneficiation to provide fuel stock supply these power stations. Thus, there is very limited land available for the development of the GH&A facility. However, sufficient land has been secured for the development of the proposed project with landowners within the respective cadastral portions comprising the development footprint indicating their support and willingness for the project to proceed to development via entering into agreement with the developer.

2.6.4 NEED AND DESIRABILITY FOR GREEN HYDROGEN AND AMMONIA

Sustainable energy conversion requires zero emissions of greenhouse gases and criteria pollutants using primary energy sources that the earth naturally replenishes quickly, like renewable resources. Solar and wind power conversion technologies have become cost effective recently, but challenges remain to manage electrical grid dynamics and to meet end-use requirements for energy dense fuels and chemicals.

Renewable hydrogen provides the best opportunity for a zero emissions fuel and is the best feedstock for production of zero emission liquid fuels and some chemical and heat end-uses. Renewable hydrogen can be made at very high efficiency using electrolysis systems that are dynamically operated to complement renewable wind and solar power dynamics.

Hydrogen can be stored within the existing natural gas system to provide low-cost massive storage capacity that (1) could be sufficient to enable a 100% zero emissions grid; (2) has sufficient energy density for end-uses including heavy duty transport; (3) is a building block for zero emissions fertilizer and chemicals; and (4) enables sustainable primary energy in all sectors of the economy.

2.6.5 NEED AND DESIRABILITY FOR RENEWABLE ENERGY

As the Hendrina GH&A facility will be powered by renewable energy, the need and desirability of renewable energy is therefore linked to the project as a whole. The GH&A Facility will serve to support these proposed neighbouring renewable facilities through guaranteed off-take.

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 Hendrina GH&A Facility has been considered from an international, national and regional perspective.

INTERNATIONAL PERSPECTIVE

The proposed project will align with internationally recognised and adopted agreements, protocols and conventions. This includes the Kyoto Protocol (1997) which calls for countries internationally to reduce their greenhouse gas emissions through cutting down on their reliance on fossil fuels and investing in renewable energy technologies for electricity generation.

The project will also 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.

The authorization of the Project will further align with South Africa's National Climate Response White Paper which outlines the countries efforts to manage the impacts of climate change and to contribute to the global efforts to stabilize the Greenhouse gases concentrations in the atmosphere.

NATIONAL PERSPECTIVE

The South African Government, through the IRP, has set a target to secure 17 800 MW of renewable energy by 2030. This is an effort to diversify the country's energy mix in response to the growing electricity demand and promote access to clean sources of energy.

The National Development Plan (NDP) is aimed at reducing and eliminating poverty in South Africa by 2030. The NDP also outlines the need to increase electricity production by 2030, with 20 000 MW of electricity capacity generated from renewable sources in order to move to less carbon-intensive electricity production. The Plan also envisages that South Africa will have an energy sector that provides reliable and efficient energy service at competitive rates, while supporting economic growth through job creation.

The authorisation of the Hendrina GH&A Facility will further align with South Africa's National Climate Response White Paper which outlines the countries efforts to manage the impacts of climate change and to contribute to the global efforts to stabilize the greenhouse gases concentrations in the atmosphere.

The proposed Hendrina Renewable Energy Complex, which includes the Hendrina GH&A Facility, will pave the way for the Just Energy Transition (JET)[7] in South Africa and promote the transition from a fossil fuel-based economy to a low carbon economy. The proposed Hendrina Renewable Energy Complex aims towards the aforementioned national energy targets of diversification of energy supply and the promotion of clean energy. Wind and solar energy developments contribute to reduced emissions and subsequently climate change whilst promoting industrial development and job creation.

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.

REGIONAL AND LOCAL PERSPECTIVE

JUST ENERGY TRANSITION

Coal power stations and the coal mining industry play a vital component in the economic and social components of the local Mpumalanga economy. Shifting to a low carbon economy will thus need to offset or exceed the benefits being realized by fossil fuels in the province. Thus, a key factor to ensuring the success of the Just Energy Transition is not only to focus on the transition from fossil fuels to renewable energy resources but to simultaneously ensure the Just Transition of jobs and skills.

[7] The Just Transition is described as the transition towards a low-carbon and climate-resilient economy that maximizes the benefits of climate action while simultaneously improving the welfare of the workers and their communities.

The transition towards renewable energy will improve the socio-economic conditions of the Nkangala District Municipality. The Nkangala District Municipality recorded an unemployment rate of 28.21% in 2019 with the majority of its employed in the trade and community services sectors. The Project will aid in solving two of the leading challenges faced by the Nkangala District Municipality, namely the cost of electricity and lack of adequate employment opportunities. As various career opportunities are presented by the wind industry, and these are divided into four pillars that are aligned with the value chain. These four pillars are project development, component manufacturing, construction, and operation & maintenance as shown in **Figure 2-23**.

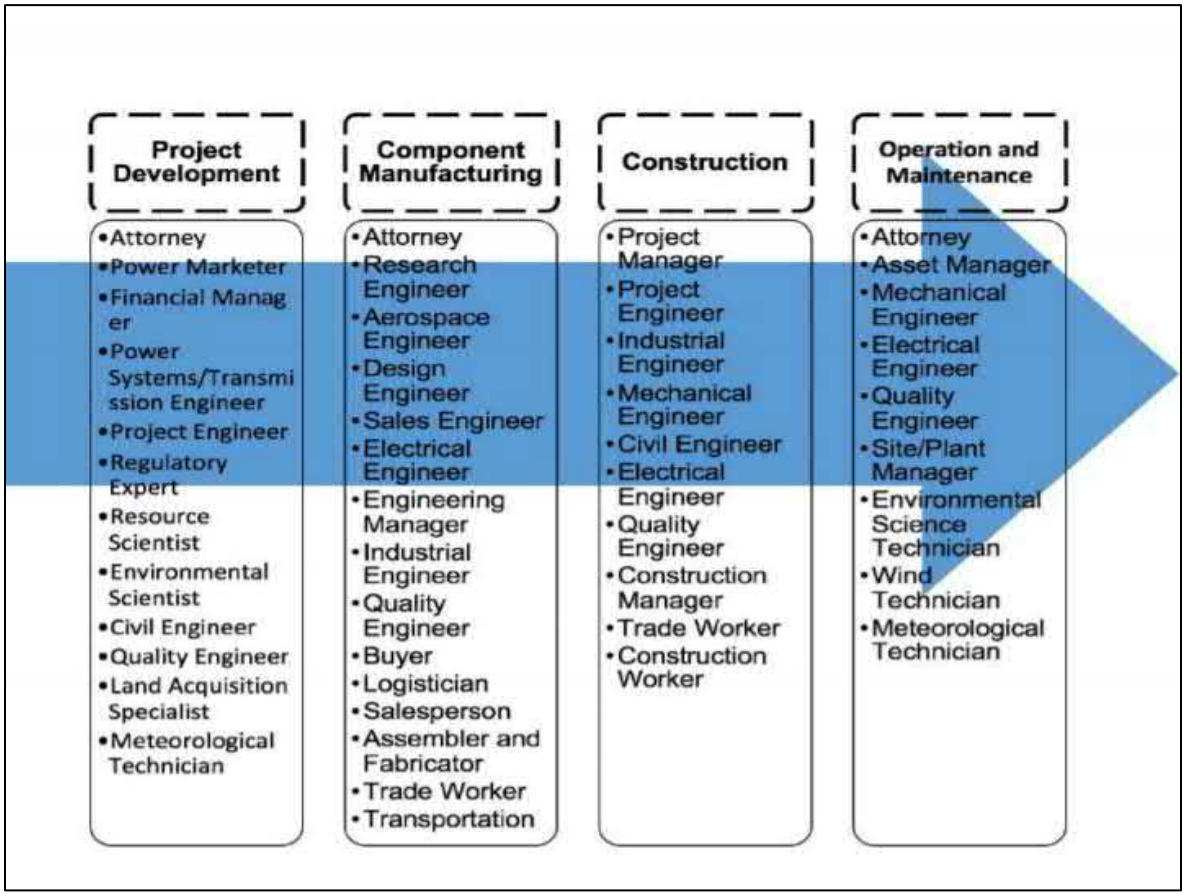


Figure 2-23: Career Opportunities presented by the Wind Industry (Source: https://www.res4africa.org/wp-content/uploads/2020/09/RES4Africa-Foundation-A-Just-Energy-Transition-in-South-Africa.pdf)

Figure 2-23 shows that the wind industry will create job opportunities throughout the supply chain. The wind industry will contribute to the Just transition in South Africa to ensure that there are no job losses but rather job transfers and skill exchange. For these opportunities to arise, renewable energy projects need to be approved in Mpumalanga to ensure that the transition from fossil fuels to renewable energy happens gradually and takes off effectively.

3 GOVERNANCE FRAMEWORK

3.1 NATIONAL ENVIRONMENTAL LEGAL 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 3-1**.

Table 3-1: Applicable National Legislation[8]

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 will be applied for with the MDARDLEA.
Listing Notice 1: GNR 983	***Activity 9(i)*** *The development of infrastructure exceeding 1 000 metres in length for the bulk transportation of water or storm water—* *(i) with an internal diameter of 0,36 metres or more; or* *(ii) with a peak throughput of 120 litres per second or more;* *excluding where—* *(a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve or railway line reserve; or* *(b) where such development will occur within an urban area.* **Description**:

[8] 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
	The Facility is located outside an urban area and will require, depending on the water source and water quality obtained, an above or below ground water supply pipeline exceeding 1 000 metres in length, of internal diameter in excess of 0,36m towards feed water supply of the Facility. The exact pipeline specifications will be confirmed once final designs have been provided.
	Activity 10(i) *The development and related operation of infrastructure exceeding 1 000 metres in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes –* *(i) with an internal diameter of 0,36 metres or more; or* *(ii) with a peak throughput of 120 litres per second or more;* *excluding where—* *(a) such infrastructure is for the bulk transportation of sewage, effluent, process* *water, waste water, return water, industrial discharge or slimes inside a road reserve or railway line reserve; or* *(b) where such development will occur within an urban area.* **Description**: The Facility is located outside an urban area and road/railway line reserve, and will require infrastructure exceeding 1000m in length for the bulk transportation of effluent/process water for crystalisation, associated with the Reverse Osmosis plant. The exact pipeline specifications will be confirmed once final designs have been provided.
	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; or* *(ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more;* **Description**: The Facility is located outside urban areas and will be supplied with electricity by a single up to 132kV overhead or underground power line from a common Collector Substation. In addition, electrical substation infrastructure associated with the Facility is rated at 33/132kV whilst being located outside urban areas or industrial complexes.
	Activity 12(ii)(a)(c) *The development of—* *(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or* *(ii) infrastructure or structures with a physical footprint of 100 square metres or more;* *where such development occurs—* *(a) within a watercourse;* *(b) in front of a development setback; or*

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; **Description**: The physical footprint of access roads, stormwater control infrastructure, electrical cabling and water supply pipelines related to the Facility will exceed 100m^2 within delineated watercourses on site, or within 32m of the outer extent of the delineated watercourses on site. The exact footprint will be confirmed once final designs have been provided.
	Activity 16 *The development and related operation of facilities for the desalination of water with a design capacity to produce more than 100 cubic metres of treated water per day.* **Description**: The Facility's Reverse Osmosis (RO) infrastructure (with a design capacity to produce ~3182 m^3 purified/treated water per day) will be required to supply the electrolysis process with sufficient quality feed water.
	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;* **Description**: Access roads, stormwater control infrastructure, electrical cabling and water supply pipelines related to the Facility will collectively require the excavation, infilling or removal of soil exceeding 10m^3 from delineated watercourses on site. The exact values will be confirmed once final designs have been provided.
	Activity 24(ii) *The development of a road—* *(i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or* *(ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;* **Description**: Internal and access roads required by the Facility will be between 5m and 6m wide, and exceed 1km in length in a rural area. Where required for turning circle/bypass areas, however, access or internal roads may be up to 20m to allow for larger component transport. The exact values will be confirmed once final designs have been provided.
	Activity 25 *The development and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage with a daily throughput capacity of more than 2 000 cubic metres but less than 15 000 cubic metres.*

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	Description: Depending on the water source and water quality obtained, an evaporator / crystaliser for the treatment of more than 2 000m^3 effluent at any one time will be constructed and operated as part of the Facility.
	Activity 27 *The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation* **Description**: The power lines, water pipelines and access/internal roads related to the Facility are considered linear activities and therefore is excluded from this activity. However, the respective infrastructure components related to the Facility individually require in excess of 1 ha but not more than 20ha of indigenous vegetation clearance. The exact values will be confirmed once final designs have been provided.
	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:* *(i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or* *(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;* **Description**: The Facility development footprint is collectively approximately 30ha (subject to finalisation based on technical and environmental requirements). As part of this buildable area, infrastructure such as the individual components will have footprints of between 1 ha and 12ha, all located outside an urban area and which is currently used for agriculture.
	Activity 30 *Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).* **Description:** The Facility and associated infrastructure is located within, and will require vegetation clearance or disturbance of Eastern Highveld Grassland this ecosystem is listed in the National List of Ecosystems That Are Threated And In Need of Protection (GNR 1002 of 9 December 2011), and subsequently listed in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).
	Activity 48(i)(a)(c) *The expansion of—* *(i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more; or* *(ii) dams or weirs, where the dam or weir, including infrastructure and water surface area, is expanded by 100 square metres or more;* *where such expansion occurs—*

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	(a) within a watercourse; *(b) in front of a development setback; or* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;* **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 100m^2 or more beyond existing road or road reserves located within delineated watercourses on site, or within 32m of the outer extent of the delineated watercourses on site. The exact values will be confirmed once final designs have been provided.
	Activity 56(i)(ii) *The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre—* *(i) where the existing reserve is wider than 13,5 meters; or* *(ii) where no reserve exists, where the existing road is wider than 8 metres;* **Description**: The Facility is located within a rural area. Transport of large infrastructure components related to the facility will require the widening of existing access and/or internal roads where no reserve exists and where such road is wider than 8 metres.
Listing Notice 2: GNR 984	***Activity 4*** *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 more than 500 cubic metres.* **Description**: Dangerous goods product stores related to the operation of the Facility include Nitrogen, Oxygen, Hydrogen and Ammonia storage tanks (of varying sizes, pressures and temperatures) in excess of 500m^3. In addition, fuel, cement, transformer oil and other chemicals will be stored onsite. Collectively all storage and handling of dangerous goods on site will exceed 500m^3.
	Activity 6 *The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent,* *excluding—* *(i) activities which are identified and included in Listing Notice 1 of 2014;* *(ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies;* *(iii) the development of facilities or infrastructure for the treatment of effluent, polluted water, wastewater or sewage where such facilities have a daily throughput capacity of 2 000 cubic metres or less; or*

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	(iv) where the development is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will not exceed 50 cubic metres per day. **Description**: The Facility will produce up to 100,000 tons per annum of liquid ammonia and therefore potentially requires licensing in terms of the NEM: AQA (specifically Category 7, subcategory 7.1: "Production and or Use in Manufacturing of Ammonia, Fluorine, Fluorine Compounds, Chlorine, and Hydrogen Cyanide", with a threshold trigger value of greater than 100 tons per annum). The activity identified in the NEM: AQA however relates to the production of Ammonia, regardless of the nature of the process undertaken in production. During operation of the Facility, gases purged are: — Not altered in the process; — Not considered ambient pollutants; and — Not regulated by the Minimum Emissions Standards (MES); The applicant is therefore seeking exemption from Atmospheric Emissions Licensing (AEL) requirements. However, should the AELA consider an AEL required under the NEM:AQA regulations for this project, this activity will be triggered and is therefore applied for.
	Activity 7(ii) *The development and related operation of facilities or infrastructure for the bulk transportation of dangerous goods—* *(i) in gas form, outside an industrial complex, using pipelines, exceeding 1 000 metres in length, with a throughput capacity of more than 700 tons per day;* *(ii) in liquid form, outside an industrial complex, using pipelines, exceeding 1 000 metres in length, with a throughput capacity of more than 50 cubic metres per day; or* *(iii) in solid form, outside an industrial complex, using funiculars or conveyors with a throughput capacity of more than 50 tons per day.* **Description**: Liquid ammonia of up to ~402 m^3 per day will be produced by the Facility, which will be transported within the Facility as a liquid in pipelines exceeding 1000m in length. In addition, up to 800 m^3 per day of liquid hydrogen will be produced by the Facility, which will be transported within the Facility as a liquid in pipelines exceeding 1000m in length. Both Hydrogen and Ammonia are substances listed in SANS10234.
	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 non-linear infrastructure components of the development footprint (buildable area) is approximately 25ha (subject to finalisation based on technical, final design and environmental requirements), within areas containing indigenous vegetation.

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
Listing Notice 3: GNR 985	***Activity 4(f)(i)(cc)(ee)*** *The development of a road wider than 4 metres with a reserve less than 13,5 metres.* *f. Mpumalanga* *i. Outside urban areas:* *(aa) A protected area identified in terms of NEMPAA, excluding disturbed areas;* *(bb) National Protected Area Expansion Strategy Focus areas;* *(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;* *(dd) Sites or areas identified in terms of an international convention;* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* *(ff) Core areas in biosphere reserves; or* *(gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas, where such areas comprise indigenous vegetation; or* *ii. Inside urban areas:* *(aa) Areas zoned for use as public open space; or* *(bb) Areas designated for conservation use in Spatial Development Frameworks* *adopted by the competent authority or zoned for a conservation purpose.* **Description**: Internal and access roads required by the Facility will be between 5m and 6m wide, and exceed 1km in length in a rural area. Where required for turning circle/bypass areas, however, access or internal roads may be up to 20m to allow for larger component transport. The exact values will be confirmed once final designs have been provided. Furthermore, roads required for the Facility will be located within, and will require vegetation clearance or disturbance of, Eastern Highveld Grassland, this ecosystem is listed in the National List of Ecosystems That Are Threated And In Need of Protection (GNR 1002 of 9 December 2011), and subsequently listed in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004). Similarly, roads required for the Facility will be located within, and will require vegetation clearance or disturbance within Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA).
	Activity 10(f)(i)(bb)(cc)(ee)(hh) *The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres.* *f. Mpumalanga* *i. Outside urban areas:* *(aa) A protected area identified in terms of NEMPAA, excluding conservancies;* *(bb) National Protected Area Expansion Strategy Focus areas;* *(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;* *(dd) Sites or areas identified in terms of an international convention;*

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; *(ff) Core areas in biosphere reserves;* *(gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, where such areas comprise indigenous vegetation; or* *(hh) Areas within a watercourse or wetland, or within 100 metres of a watercourse or wetland;* **Description**: Dangerous goods product stores related to the operation of the Facility include Nitrogen, Oxygen, Hydrogen and Ammonia storage tanks (of varying sizes, pressures and temperatures) in excess of $500m^3$. In addition, fuel, cement, transformer oil and other chemicals will be stored onsite. Collectively all storage and handling of dangerous goods on site will exceed $500m^3$,however individual component capacities may be between 30 - $80m^3$. Furthermore, storage contemplated above will be located within, and will require vegetation clearance or disturbance of, Eastern Highveld Grassland, this ecosystem is listed in the National List of Ecosystems That Are Threated And In Need of Protection (GNR 1002 of 9 December 2011), and subsequently listed in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004). Similarly, storage contemplated above will be located within, and will require vegetation clearance or disturbance within CBA and ESA as well as being located within delineated watercourses on site, or within 32m of the outer extent of the delineated watercourses on site. The exact footprint will be confirmed once final designs have been provided.
	Activity 12(f)(i)(ii) *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.* *f. Mpumalanga* *i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004;* *ii. Within critical biodiversity areas identified in bioregional plans; or* *iii. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning or proclamation in terms of NEMPAA.* **Description**: The clearance required for the Facility will be up to approximately 30ha (subject to finalisation based on technical, final design and environmental requirements) of indigenous vegetation. Such clearance will therefore be in excess of $300m^2$ and be partly located within Eastern Highveld Grassland, this ecosystem is listed in the National List of Ecosystems That Are Threated And In Need of Protection (GNR 1002 of 9 December 2011), and subsequently listed in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004). Similarly, vegetation clearance required for the Facility and associated infrastructure will be located within CBA and ESA, in excess of $300m^2$. The exact values will be confirmed once final designs have been provided.

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	Activity 14(ii)(a)(c)(f)(i)(bb)(dd)(ff) *The development of—* *(i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or* *(ii) infrastructure or structures with a Physical footprint of 10 Square metres or more;* *where such development occurs—* *(a) within a watercourse;* *(b) in front of a development setback; or* *(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;* *f. Mpumalanga* *i. Outside urban areas:* *(aa) A protected area identified in terms of NEMPAA, excluding conservancies;* *(bb) National Protected Area Expansion Strategy Focus areas;* *(cc) World Heritage Sites;* *(dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;* *(ee) Sites or areas identified in terms of an international convention;* *(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* *(gg) Core areas in biosphere reserves; or* *(hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve, where such areas comprise indigenous vegetation;* **Description**: The physical footprint of internal and access roads, stormwater control infrastructure, electrical cabling and water supply pipelines related to the Facility will exceed 10m^2 within delineated watercourses on site, or within 32m of the outer extent of the delineated watercourses on site. Furthermore, the physical footprint of internal and access roads, stormwater control infrastructure, electrical cabling and water supply pipelines related to the Facility will exceed 10m2 within delineated watercourses on site, or within 32m of the outer extent of the delineated watercourses on site, which infrastructure will be located within Eastern Highveld Grassland, this ecosystem is listed in the National List of Ecosystems That Are Threated And In Need of Protection (GNR 1002 of 9 December 2011), and subsequently listed in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004). Finally, the physical footprint of internal and access roads, stormwater control infrastructure, electrical cabling and water supply pipelines related to the Facility will exceed 10m^2 within delineated watercourses on site, or within 32m of the outer extent of the delineated watercourses on site, located within CBA and ESA. The exact footprint will be confirmed once final designs have been provided.
	Activity 18(f)(i)(bb)(cc)(ee)

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre. *f. Mpumalanga* *i. Outside urban areas:* *(aa) A protected area identified in terms of NEMPAA, excluding conservancies;* *(bb) National Protected Area Expansion Strategy Focus areas;* *(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;* *(dd) Sites or areas identified in terms of an international convention;* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* *(ff) Core areas in biosphere reserves; or* *(gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve, where such areas comprise indigenous vegetation;* **Description**: Transport of large infrastructure components related to the Facility will require the widening of existing access and/or internal roads by more than 4 metres or in excess of 1km within the Mpumalanga Province and outside urban areas. Furthermore, such widening will occur within Eastern Highveld Grassland, this ecosystem is listed in the National List of Ecosystems That Are Threated And In Need of Protection (GNR 1002 of 9 December 2011), and subsequently listed in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004). Finally, such widening will be located within CBA and ESA. The exact footprint will be confirmed once final designs have been provided.
	Activity 23(ii)(a)(c)(f)(i)(bb)(cc)(ee) *The expansion of—* *(i) dams or weirs where the dam or weir is expanded by 10 square metres or more; or* *(ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more;* *where such expansion occurs —* *(a) within a watercourse;* *(b) in front of a development Setback adopted in the prescribed manner; or* *(c) if no development setback has been adopted,* *within 32 metres of a watercourse, measured* *from the edge of a watercourse;* *f. Mpumalanga* *i. Outside urban areas:* *(aa) A protected area identified in terms of NEMPAA, excluding conservancies;* *(bb) National Protected Area Expansion Strategy Focus areas;* *(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;*

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	(dd) Sites or areas identified in terms of an international convention; *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* *(ff) Core areas in biosphere reserves;* *(gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve, where such areas comprise indigenous vegetation;* **Description**: The physical footprint of internal and access roads, stormwater control infrastructure, electrical cabling and water supply pipelines related to the Facility will exceed 10m^2 within delineated watercourses on site, or within 32m of the outer extent of the delineated watercourses on site. Furthermore, the physical footprint of internal and access roads, stormwater control infrastructure, electrical cabling and water supply pipelines related to the Facility will exceed 10m2 within delineated watercourses on site, or within 32m of the outer extent of the delineated watercourses on site, which infrastructure will be located within Eastern Highveld Grassland, this ecosystem is listed in the National List of Ecosystems That Are Threated And In Need of Protection (GNR 1002 of 9 December 2011), and subsequently listed in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004). Finally, the physical footprint of internal and access roads, stormwater control infrastructure, electrical cabling and water supply pipelines related to the Facility will exceed 10m^2 within delineated watercourses on site, or within 32m of the outer extent of the delineated watercourses on site, located within Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA). The exact footprint will be confirmed once final designs have been provided.
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). Three Screening Reports were generated for the project one for each site and its associated infrastructure. The following environmental themes were applicable to the Hendrina GH&A project: — Agricultural Theme — Animal Species Theme — Aquatic Biodiversity Theme — Archaeological and Cultural Heritage Theme — Civil Aviation Theme — Defence Theme — Palaeontology Theme — Plant Species Theme — Terrestrial Biodiversity Theme
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 water treatment process is associated with the generation of concentrated wastes removed from the water, such as brine salt. Liquid brine can be made into a solid through several available technologies such as, settlement tanks, cooling water circuits, and forced crystallization.

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	Given the proposed brine treatment and Zero Liquid Discharge system, as well as the use of a third-party contractor for the treatment and disposal of the produced salt cake, and the relatively small temporary storage facility envisaged and regular removal (< 80m^3 at any one point in time), it is understood that no waste activities are triggered for either the treatment or storage of waste. It is however noted that the proponent will be required to comply with the general duties provided for at section 16 of NEM:WA relating to the management of waste as well as the legal requirements relating to the storage of waste as provided for at sections 21 and 22 respectively. The proposed project (Hendrina GH&A Facility) does not constitute a Listed Activity requiring a Waste Management Licence (WML) as defined in GNR 921. The contents of this Scoping Report will include reasonable measures for the prevention of pollution and good international industry practice (GIIP).
National Environmental Management: Air Quality Act (Act 39 of 2004) (NEM:AQA)	Until 2004, South Africa's approach to air pollution control was driven by the Atmospheric Pollution Prevention Act 45 of 1965 (APPA) which was repealed with the promulgation of NEM:AQA . NEM:AQA represents a shift in South Africa's approach to air quality management, from source-based control to integrated effects-based management. The objectives of NEM:AQA are to: — Protect the environment by providing reasonable measures for: — The protection and enhancement of air quality; — The prevention of air pollution and ecological degradation; — Securing ecologically sustainable development while promoting justifiable economic and social development; and — Give effect to everyone's right "to an environment that is not harmful to their health and well-being" Significant functions detailed in NEM:AQA include: — The National Framework for Air Quality Management ; — Institutional planning matters, including: — The establishment of a National Air Quality Advisory Committee; — The appointment of Air Quality Officers (AQOs) at each level of government; and — The development, implementation and reporting of Air Quality Management Plans (AQMP) at national, provincial and municipal levels; — Air quality management measures including: — The declaration of Priority Areas where ambient air quality standards are being, or may be, exceeded; — The listing of activities that result in atmospheric emissions and which have the potential to impact negatively on the environment and the licensing thereof through an Atmospheric Emissions License (AEL); — The declaration of Controlled Emitters; — The declaration of Controlled Fuels; — Procedures to enforce Pollution Prevention Plans or Atmospheric Impact Reporting for the control and inventory of atmospheric pollutants of concern; and — Requirements for addressing dust and offensive odours Ammonia production in excess of 100 tons per annum triggers listed activity Subcategory 7.1: Production and or use in Manufacturing of Ammonia, Fluorine, Fluorine Compounds, Chlorine and Hydrogen Cyanide of Government Notice Regulation 893 of 2013, promulgated in line with Section 21 of the NEM:AQA. As per Section 22 of NEM:AQA, all activities listed by Section 21 require an Atmospheric Emissions License (AEL). The licensing of the proposed green ammonia facility as a listed activity is not considered relevant for the following reasons:

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	— The proposed green ammonia production process using renewable energy for water and air separation is demonstrated to be a pollutant free process unlike conventional ammonia synthesis using catalytic steam reforming powered by fossil fuel combustion; — According to the national department's Section 21 Companion Document , atmospheric emissions from Subcategory 7.1. are expected to be primarily by-products of the chemical reaction. In the proponent's case, the 'by-product' of the chemical reaction is NH3 (i.e. the primary product for market), which is captured, cooled and stored as a liquid. It is highlighted that it would not make business sense for the proponent to release NH3 to atmosphere at any point of the process, be it during manufacture, storage or dispatch; — Mandatory licensing conditions include isokinetic stack emissions testing to demonstrate and regulate a facility's compliance with MES. There will be no flue gas stacks associated with NH3 synthesis at the Hendrina GH&A operations. Gases purged during air separation include process irrelevant gases present in the ambient air feedstock (e.g. carbon dioxide) which are a) not evolved in the process, b) not considered ambient pollutants; and c) not regulated by MES; and — Fugitive emissions (specifically evaporation losses) of NH3 from temperature controlled bulk storage tanks under a normal operating scenario is not possible and evaporation during truck loading for dispatch is anticipated to be negligible (if any) As such, WSP believe it is not the intention of the law for such a facility to trigger as a listed activity.
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 biodiversity assessment identifies CBAs which represent biodiversity priority areas which should be maintained in a natural to near natural state. The CBA maps indicate the most efficient selection and classification of land portions requiring safeguarding in order to meet national biodiversity objectives. The following areas were identified at a scoping level by the specialist study (**Appendix G-4**): — CBA: Optimal: Various drainage lines and its associated grassland areas in the project area are within a "CBA: Optimal" area. — Other Natural Areas (ONA): There are patches throughout the site mapped as ONA. — Heavily or moderately modified: Remaining areas on site, associated primarily with cultivation. According to the description for the MBSP Terrestrial Assessment categories, CBAs are areas that are required to meet biodiversity targets (for biodiversity pattern and ecological process features). The policy is that they should remain in a natural state. CBAs are areas of high biodiversity value which are usually at risk of being lost and usually identified as important in meeting biodiversity targets, except for Critically Endangered Ecosystems or Critical Linkages. CBAs in the Province can be divided into two sub-categories: — Irreplaceable (parts of the site are within this sub-category), and — Optimal (northern parts of the site are within this sub-category). Supplementary baseline terrestrial ecology studies will be undertaken during the EIA phase to inform the assessment of impacts and will include flora and faunal surveys of the project footprint to determine the presence of flora and fauna species of concern (SoC). The Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA) Regulations with regards to alien and invasive species have been superseded by the National Environmental Management: Biodiversity Act, 2004 (Act no. 10 of 2004) – Alien and Invasive Species (AIS)

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	Regulations which became law on 1 October 2014. Specific management measures for the control of alien and invasive plants will be included in the Environmental Management Programme (EMPr).
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 (WULA) 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 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 Camden I GH&A Facility, a permit

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	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 desktop Heritage Scoping Report (**Appendix D**) has been carried out by a suitably qualified specialist, revealing: — The Project area is characterised by extensive cultivated fields and is considered to be of low archaeological potential. This was confirmed during the field survey and no archaeological sites of significance were noted and finds were limited to the ephemeral remains of demolished dwellings and burial sites. — The recorded ruins' potential to contribute to aesthetic, historic, scientific, and social aspects are non-existent, and it is therefore of low heritage significance unless associated with burial sites (e.g., still born graves) in which case the burial sites are of high social significance. The graves are of high significance and should be avoided. — Based on the current lay out the ruins at Waypoint 067 – 071 will be directly impact on by Option 1 and although of low significance the possible presence of graves is a risk, and the impact is high. Option 3 is from a heritage point of view not a preferred option due to the occurrence of ruins (based on aerial photographs and Topographical maps) of the Weltevreden Farmstead. This option is not preferred from a heritage point of view as the associated water pipeline will also have a high impact on the burial site at Waypoint 088 — According to the SAHRA Paleontological sensitivity map the study area is of very high paleontological significance and an independent study was conducted for this aspect. — Bamford (2022) concluded that it is extremely unlikely that any fossils would be preserved in the loose soils and sands of the Quaternary. There is a very small chance that fossils may occur in the shales and siltstones of the early Permian Vryheid Formation, but only more than 5m below the surface, therefore, a Fossil Chance Find Protocol should be added to the EMPr — The impact to heritage resources can be mitigated to an acceptable level provided that the recommendations in this report are adhered to, based on the South African Heritage Resource Authority (SAHRA) 's approval The proposed project will be loaded onto the SAHRIS portal for comment by SAHRA
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 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 –*

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	(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.
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 DEA Screening Tool Report identified Civil Aviation as having high-medium sensitivity for the proposed Hendrina GH&A Facility, and as being located between 8 and 15km of other civil aviation arerodrome. SACAA and ATNS will be included on the project stakeholder database. They will be informed of the proposed Project, and comment will be sought from these authorities as applicable.
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.

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	The ammonia and hydrogen facilities as well as oxygen facilities will be Major Hazard Installations (MHI) and will require a fill quantitative risk assessment (QRA) and emergency response plan (ERP). Under the current MHI Regulations notification of various authorities and the public is required. Should the proposed new MHI Regulations be promulgated prior to commencement of construction of this facility it is possible that in addition to a QRA and ERP, the hydrogen, ammonia and oxygen facilities will necessitate an application for a Licence to Operate from the Department of Employment and Labour. There will likely be a requirement for implementation of a Process Safety Management Systems and submission of a Safety Report providing evidence of the effectiveness of this management system.

3.2 POLICIES AND PLANS

Table 5 summarised key policies and plans as an outline of the governance framework for the project.

Table 3-2: 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 will contribute proportionately less to primary-energy needs, while gas and renewable energy resources, will play a much larger role.

APPLICABLE POLICY	DESCRIPTION OF POLICY
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 photovoltaic (PV), wind and concentrated solar power (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 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.

APPLICABLE POLICY	DESCRIPTION OF POLICY
	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 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.

APPLICABLE POLICY	DESCRIPTION OF POLICY
National Protected Area Expansion Strategy, 2010	The National Protected Area Expansion Strategy 2010 (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, 2010). According to the NPAES, there are no areas within the study area that have been identified as priority areas for inclusion in future protected areas. The study area is therefore **outside the NPAES focus area**.

3.3 PROVINCIAL AND MUNICIPAL LEGAL AND REGULATORY FRAMEWORK

Table 3-3: Provincial Plans

APPLICABLE PLAN	DESCRIPTION OF PLAN
Mpumalanga Growth and Development Path	The primary objective of the Mpumalanga Economic Growth and Development Path (MEGDP) (2011) is to foster economic growth that creates jobs, reduce poverty and inequality in the Province. The MEGDP identifies supporting the development of clean forms of energy such as wind and hydro power generation opportunities, as well as opportunities including gas production from landfill and organic waste, as one of the key interventions to facilitate growth and job creation in the manufacturing sector. A focal point of the MEGDP is massive investments in infrastructure as a key driver of job creation across the economy, with alternative energy production identified as one of the key opportunities in the Mpumalanga Economic sectors.
Mpumalanga Spatial Development Framework (MSDF), 2019	The Mpumalanga Spatial Development Framework (SDF) (2019) identifies that tourism is an important economic sector and has emerged as a robust driver of growth for emerging economies. The SDF also notes that a significant portion of Mpumalanga's land area is classified as Moderate to High-Very High agricultural potential which can be utilised for agricultural production. However, there are other factors affecting the agricultural sector including loss of agricultural land to other activities, availability of water, contamination of the water used for irrigation by other economic activities, and access to the market. The SDF further notes that mining is the largest economic sector in the province and has assisted other sectors such as manufacturing and power generation, to grow in the province. However, the mining sector has posed some key challenges, including soil and water contamination and environmental pollution, development of mines on good agricultural soil thus threatening food security, restriction of animal movement due to open cast mining thus affecting the ecosystem etc. It also notes that Mpumalanga's manufacturing plants and coal fired power plants are the key polluters of air, with climate change also identified as a key challenge in the province. Therefore, the province must carefully design interventions that provide a gradual shift from mining oriented sectors to the sustainable economic sectors to maintain sustained growth of the provincial economy. The SDF notes that a significant amount of the country's electricity comes from coal-fired stations in Mpumalanga. It also observes that there is a steady increase in the demand for electricity in the province, mostly attributed to residential, commercial and industrial development, including mining and heavy industry. The Provincial SDF also notes that the abundance of coal has led to the development of many coal-fired power stations in the province, however these coalfields are depleting, therefore making it necessary to consider renewable power sources in Mpumalanga. The SDF also recognises that Mpumalanga's Coal Mining and Coal Fired Power Plant region (mainly the Highveld area) will be under immense pressure for environmental considerations and as a result, the region will witness a

APPLICABLE PLAN	DESCRIPTION OF PLAN
	possible decline in demand of coal and large-scale employment. The SDF proposes to diversify the regional economy and facilitate the gradual transition of economic activities in the region.
Mpumalanga Industrial Development Plan	In terms of industry, the purpose of the Mpumalanga Industrial Development Plan (MIDP) (2016) is to promote the establishment of new industries and promote growth of existing industries in the province. It is however noted that the Nkangala Municipality (within which the project falls under) is not directly impacted by the 2025 MIDP and its proposed priority hubs
Mpumalanga Conservation Act (No. 10 of 1998)	This Act provides for the sustainable utilization of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project: — Various species are protected; — The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species. The Act provides lists of protected species for the Province. According to the Mpumalanga Nature Conservation Act, a permit is required for the removal of any species on this list.

Table 3-4: District and Local Municipality Plans

APPLICABLE PLAN	DESCRIPTION OF PLAN
Nkangala Municipality Integrated Development Plan (IDP)	According to the Municipal Systems Act (Act 32 of 2000) (MSA), all municipalities have to undertake an Integrated Development Plan (IDP) process. The IDP is a legislative requirement thus it has legal status and supersedes all other plans that guide development at local government level. The Nkangala District Municipality (NDM) IDP Final IDP (2020/2021) has identified the following development priorities: — An economy that will create more jobs — Improving infrastructure — Transition to a low-carbon economy — An inclusive and integrated rural economy — Reversing the spatial effect of apartheid — Improving quality of education, training and innovation — Quality health care for all — Social protection — Building safer communities — Reforming the public service — Fighting corruption — Transforming society and uniting the country The main goal and strategic objective of the Basic Service Delivery and Infrastructure Development priority is a reliable and sustainable service. One of the main strategic objectives for reaching the goal is the provision of basic services such as water and electricity to an approved minimum level of standards in a sustainable manner; as per the national guidelines.

APPLICABLE PLAN	DESCRIPTION OF PLAN
Steve Tshwete Local Municipality IDP	The Steve Tshwete Local Municipality Revised IDP (2022) has identified the following key Municipal priorities: — Water, electricity and sanitation and Housing — Clean environment — Employment — Safety and security — Recreation and leisure — Safe and reliable public transport — Quality education and skills development — Quality health care — Social protection — Adequate nutrition One of the main strategic objectives for the access to basic services priority is to provide sustainable and reliable services to communities. Most of the basic services are rendered within the municipality, however some rural areas are still faced with some challenges in the provision water, sanitation and electricity. The Municipality, through the IDP, aims to facilitate the provision of electricity, with a number of key projects planned to be implemented over the period of five years linked to the Municipal IDP.
Steve Tshwete Spatial Development Framework (SDF)	The Steve Tshwete SDF is informed by a number of spatial objectives, including: — Sustainable land use; — Improved environmental management; — Integrated development; and — Efficient land development. The provision of space of the diversification of the local economy is of specific relevance to the proposed development.

3.4 INTERNATIONAL ENVIRONMENTAL AND SOCIAL STANDARDS

3.4.1 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 3-5.**

Table 3-5: IFC Performance Standards Applicability to the Project

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 Second deliverable from the Scoping and EIA process 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 will be compiled during the EIA phase of 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.		
Objectives	— 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.		

REFERENCE		REQUIREMENTS	PROJECT SPECIFIC APPLICABILITY
Aspects	2.1	— 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	The construction activities will require contractors for completion. A safe working environment and fair contractual agreements must be in place. The operational phase will have permanent employees for day-to-day activities as well as contractors who will all need a safe working environment and fair contractual agreements. Whilst PS2 will be applicable to the Project, it is not intended to be addressed in detail at the ESIA 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 will incorporate the requirements for compliance with local and international Labour and Working legislation and good practice on the part of the contractors.
	2.2	— Protecting the Workforce — Child Labour — Forced Labour	
	2.3	Occupational health and Safety	
	2.4	Workers Engaged by Third Parties	
	2.5	Supply Chain	
Performance Standard 3: Resource Efficiency and Pollution Prevention			
Overview	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.		
Objectives	— 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.		
Aspects	3.1	— Policy Resource Efficiency — Greenhouse Gases — Water Consumption	PS3-related impacts, such as the management of construction waste, hazardous substances, and stormwater are assessed in **Section 6** of this report. There are no material resource efficiency issues associated with the Project. The EMPr will include general resource efficiency measures. The project is not GHG emissions intensive and a climate resilience study or a GHG emissions-related assessment is not deemed necessary for a project of this nature. However, the Hendrina GH&A Facility seeks to facilitate resource efficiency and pollution prevention by contributing to the South African green economy. Dust air pollution in the construction phase will be addressed in the EMPr. The Project will not result in the release of industrial effluents. Potential pollution associated with brine and sanitary wastewater is low and mitigation measures will be included in the EMPr.
	3.2	— Pollution Prevention — Air Emissions — Stormwater — Waste Management — Hazardous Materials Management — Pesticide use and Management	

REFERENCE	REQUIREMENTS		PROJECT SPECIFIC APPLICABILITY
			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 will be included in EMPr. The ammonia and hydrogen facilities as well as oxygen facilities will likely be Major Hazard Installations and will require a full quantitative risk assessment (QRA) that complies with SANS 1461: MHI QRA as well as an emergency response plan (ERP) that complies with SANS 1514: MHI Emergency Response Planning. Under the current MHI Regulations notification of various authorities and the public is required. The EMPr will also take anticipated hazardous materials into account and recommend relevant mitigation and management measures.
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 — Community Exposure to Disease — Emergency Preparedness and Response	The requirements included in PS 4 will be addressed in the S&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 will be qualitatively evaluated in the S&EIA process and the clients' standard safety and security measures, as well as potential additional measures recommended by WSP, will be detailed in the EMPr.
	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.		

REFERENCE	REQUIREMENTS		PROJECT SPECIFIC APPLICABILITY
	— 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 Hendrina GH&A Facility as no physical or economic displacement or livelihood restoration will be required. The proposed Hendrina GH&A Facility is located on privately owned land that 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.
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 Project Area is traversed by CBAs (Irreplaceable and Optimal) and wetland areas. A Biodiversity Impact Assessment as well as an Avifaunal Impact Assessment and Freshwater Ecology Impact Assessment have been included in the proposed scope. 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 will be determined and mitigation and management measures will be included in the EMPr.
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	

REFERENCE	REQUIREMENTS		PROJECT SPECIFIC APPLICABILITY
		— 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. The Project does not involve displacement. PS7 will not be triggered.
	7.2	Circumstances Requiring Free, Prior, and Informed Consent — Impacts on Lands and Natural Resources Subject to Traditional Ownership or Under Customary Use — 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 desktop Heritage Scoping Report (**Appendix G-8**) has been carried out by a suitably qualified specialist, revealing that archaeological sites (Stone Age and Historic Archaeological), cultural heritage sites, burial grounds or isolated artifacts are unlikely to be present on the affected landscape. A Chance Find Procedure will be included in the EMPr during the EIA phase of the project.

3.4.2 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* (2007) – 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 ESIA report. Some of the more relevant sub-sections include:
  - *Section 1.1 - Air Emissions and Ambient Air Quality* - This guideline applies to facilities or projects that generate emissions to air at any stage of the project life-cycle. This guideline provides an approach to the management of significant sources of emissions, including specific guidance for assessment and monitoring of impacts. It is also intended to provide additional information on approaches to emissions management in projects located in areas of poor air quality, where it may be necessary to establish project-specific emissions standards.
  - *Section 1.5 - Hazardous Materials Management* - These guidelines apply to projects that use, store, or handle any quantity of hazardous materials (Hazmats), defined as materials that represent a risk to human health, property, or the environment due to their physical or chemical characteristics. Hazmats can be classified according to the hazard as explosives; compressed gases, including toxic or flammable gases; flammable liquids; flammable solids; oxidizing substances; toxic materials; radioactive material; and corrosive substances. Guidance on the transport of hazardous materials is covered in Section 3 of this document.
  - *Section 2 - Occupational Health and Safety* - Employers and supervisors are obliged to implement all reasonable precautions to protect the health and safety of workers. This section provides guidance and examples of reasonable precautions to implement in managing principal risks to occupational health and safety. Although the focus is placed on the operational phase of projects, much of the guidance also applies to construction and decommissioning activities.
  - *Section 3.5 - Community Health and Safety – Transport of Hazardous Materials* - This section complements the guidance provided in the preceding environmental and occupational health and safety sections, specifically addressing some aspects of project activities taking place outside of the traditional project boundaries, but nonetheless related to the project operations, as may be applicable on a project basis.

3.4.3 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 3-6**.

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 3-6: 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 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.	Based upon the significance and scale of the Project's environmental and 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 assessment may be appropriate, applying applicable risk management standards relevant to the risks or impacts identified during the categorisation process.	This document is the second deliverable (i.e. Final Scoping Report) from the S&EIA process undertaken for the proposed Project. The impact assessment will be undertaken during the next phase of the S&EIA process. The assessment will comprehensively assess the key environmental and social impacts and complies with the requirements of the South African EIA Regulations. In addition, an EMPr will also be compiled.

REQUIREMENT		PROJECT SPECIFIC APPLICABILITY
	The client is expected to include assessments of potential adverse Human Rights impacts and climate change risks as part of the ESIA or other Assessment, with these included in the Assessment Documentation.	
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 outlines 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 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. All Projects affecting Indigenous Peoples will be subject to a process of Informed Consultation and Participation, and will need to comply with the rights and protections for Indigenous Peoples contained in relevant national law, including those laws implementing host country obligations under international law.	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, 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 4.6.**
Principle 6: Grievance Mechanism		

REQUIREMENT		PROJECT SPECIFIC APPLICABILITY
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 will include 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 that the project is developed in the future.
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.

4 SCOPING METHODOLOGY

The scoping process was initiated in accordance with Appendix 2 of GNR 982, as amended, pertaining to applications subject to an S&EIR process.

4.1 S&EIR PROCESS AND PHASING

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 (current phase), (iii) an Impact Assessment Phase and (iv) Authorisation and Appeal Phase. The S&EIR process is shown in **Figure 4-1**.

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

- Pre-Application Phase:
  - 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:
  - Compile and submit application forms to the CA and pay the relevant application fees;
  - Compile a Draft Scoping Report (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 a 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 Final Scoping Report (FSR), following the consultation period, to the relevant authorities, in this case the MDARDLEA, for acceptance/rejection.
- Impact Assessment Phase:
  - 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 FSR;
  - 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;
  - Authorisation and Appeal Phase;
  - The MDARDLEA 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.

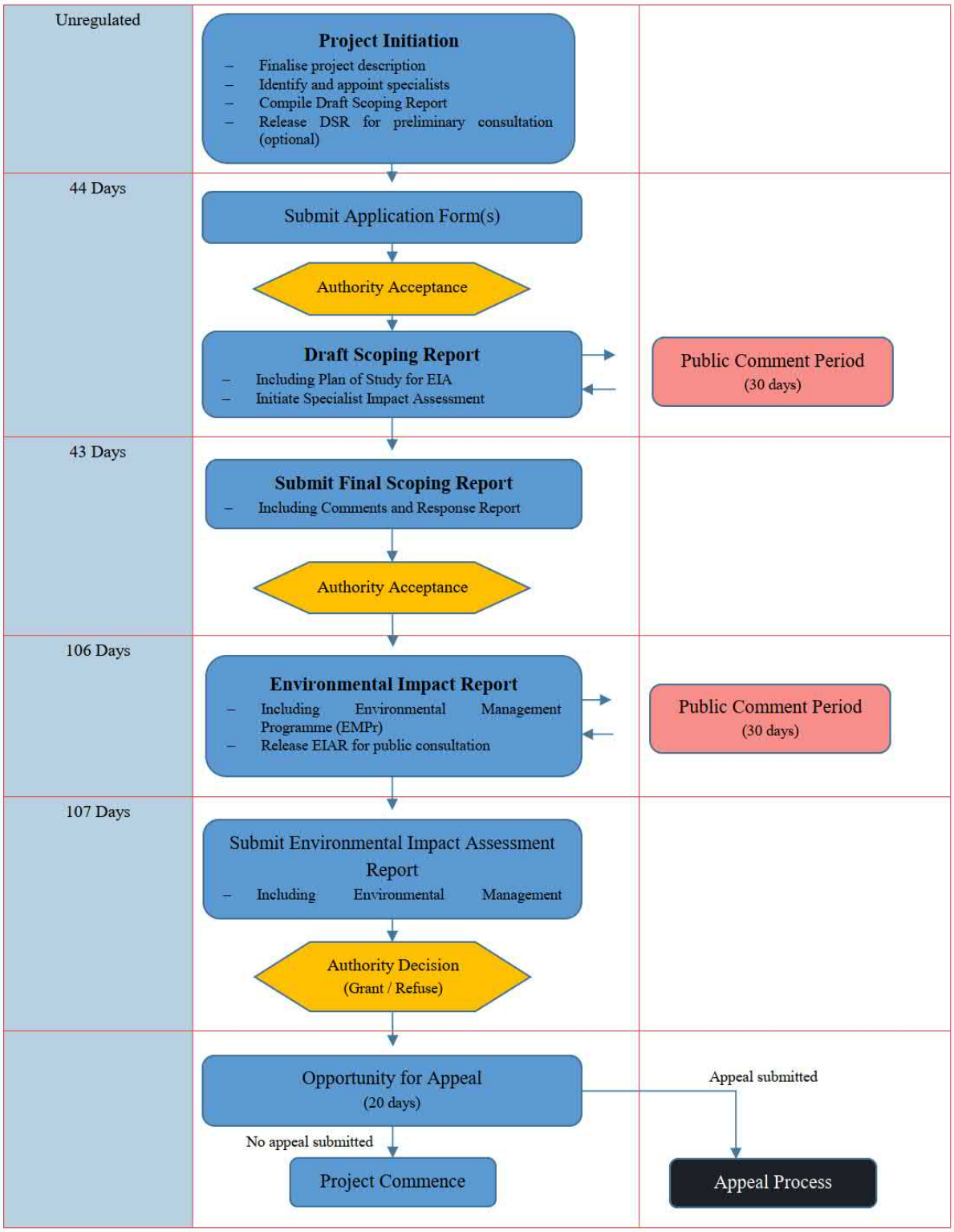


Figure 4-1: S&EIR Process

4.2 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 of 04 October 2019.

The Screening Reports 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.

Three Screening reports for the proposed Hendrina GH&A Facility were generated on 1 & 2 August 2022 and are attached as **Appendix D,** one for each alternative all with the same outcome. The screening report included the entire development footprint for all infrastructure. The Screening Reports for the project identified various sensitivities for the site. The reports also generated a list of specialist assessments that should form part of the 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 4-1 below provides a summary of the sensitivities identified for the development footprint.

Table 4-1: Sensitivities identified in the screening report for the Hednrina GH&A Facility

THEME	VERY HIGH SENSITIVITY	HIGH SENSITIVITY	MEDIUM SENSITIVITY	LOW SENSITIVIY
Agricultural Theme		✓		
Animal Species Theme			✓	
Aquatic Biodiversity Theme	✓			
Archaeological and Cultural Heritage Theme				✓
Civil Aviation Theme		✓		
Defence Theme				✓
Palaeontology Theme	✓			
Plant Species Theme			✓	
Terrestrial Biodiversity Theme	✓			

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 (please refer to Section 4.2.1 below for the EAP motivation applicable to this list):

- Agricultural Impact Assessment
- Archaeological and Cultural Heritage Impact Assessment
- Palaeontology Impact Assessment
- Terrestrial Biodiversity Impact Assessment
- Freshwater Impact Assessment (including aquatic biodiversity and hydrology)
- Social Impact Assessment
- A Geotechnical Assessment
- Plant Species Assessment
- Animal Species Assessment

4.2.1 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."

As summarised in **Table 1-4** above, the following specialist assessments have been commissioned for the project based on the environmental sensitivities identified by the Screening Report:

- Soils and Agricultural Potential Assessment;
- Archaeological and Cultural Heritage Assessment;
- Palaeontology Impact Assessment;
- Visual Impact Assessment;
- Biodiversity Impact Assessment (inclusive of terrestrial biodiversity, plant species and animal species);
- Freshwater Assessment;
- Avifauna Impact Assessment;
- Environmental Acoustic (Noise) Impact Assessment;
- Social Impact Assessment;
- Qualitative Risk Assessment ;
- Desktop Geotechnical Assessment; and
- Desktop Traffic Assessment.

Three of the identified specialist studies will not be undertaken as part of the S&EIA process for the proposed Hendrina GH&A Facility. Motivation for the exclusion of these specialist studies is provided below:

- **Detailed Geotechnical**

  A desktop Geotechnical Assessment has been commissioned and has been incorporated into the FSR. However, a detailed Geotechnical Assessment will not be undertaken as part of the S&EIA Process as this will be undertaken during the detailed design phase.

- **Civil Aviation**

  According to the DFFE Screening Tool Report, civil aviation is regarded as having high-medium sensitivity. The proposed development site is located between 8 and 15 km of civil aviation aerodromes. A formal Civil Aviation Assessment will not be undertaken as part of the S&EIA Process. Nevertheless, the relevant Authorities will be included on the project stakeholder database.

- **Defence**

  The Department of Defence will be included on the project stakeholder database. They will be informed of the proposed Project, and comment will be sought from this authority as applicable.

4.3 APPLICATION

The application phase consists of the completion of the appropriate application form by the EAP and the Proponent as well as the subsequent submission and registration of the application for EA with MDARDLEA.

A virtual pre-application meeting was held on **16 August 2022** with the MDARDLEA to discuss the proposed Hendrina GH&A Facility project. The minutes of the meeting (inclusive of the proposed public participation plan) are included in **Appendix E**.

4.4 BASELINE ENVIRONMENTAL ASSESSMENT

The description of the baseline environment has been compiled through a combination of site investigations, desktop reviews, georeferenced data and information obtained from the specialist assessments.

An understanding of the receiving environment is critical in order to identify aspects that may be affect by the project and in turn how the surrounding environment may affect project design considerations.

4.5 IDENTIFICATION AND EVALUATION OF POTENTIALLY SIGNIFICANT IMPACTS

The potential impacts associated with the proposed development were determined at both a desktop level based on existing information, as well as the field assessment. The following methodology was used:

— Identify potential sensitive environments and receptors that may be impacted on by the proposed development;
— Identify the type of impacts that are most likely to occur (including cumulative impacts);
— Determine the nature and extent of the potential impacts during the various developmental phases, including, construction, operation and decommissioning;
— Identify potential No-Go areas (if applicable); and
— Summarise the potential impacts that will be considered further in the EIA phase through detailed specialist studies.

Appendix 2 of GNR 982, as amended, requires the identification of the significance of potential impacts during scoping. To this end, an impact screening tool has been used in the scoping phase. The screening tool is based on two criteria, namely probability; and, consequence (**Table 4-4**) where the latter is based on general consideration to the intensity, extent, and duration.

The scales and descriptors used for scoring probability and consequence are detailed in **Table 4-2** and Table 4-3 respectively.

Table 4-2: Significance Screening Tool

CONSEQUENCE SCALE

PROBABILITY SCALE		1	2	3	4
	1	Very Low	Very Low	Low	Medium
	2	Very Low	Low	Medium	Medium
	3	Low	Medium	Medium	High
	4	Medium	Medium	High	High

Table 4-3: Probability Scores and Descriptors

SCORE	DESCRIPTOR
4	**Definite**: The impact will occur regardless of any prevention measures
3	**Highly Probable**: It is most likely that the impact will occur
2	**Probable**: There is a good possibility that the impact will occur
1	**Improbable:** The possibility of the impact occurring is very low

Table 4-4: Consequence Score Descriptions

SCORE	NEGATIVE	POSITIVE
4	Very severe: An irreversible and permanent change to the affected system(s) or party(ies) which cannot be mitigated.	Very beneficial: A permanent and very substantial benefit to the affected system(s) or party(ies), with no real alternative to achieving this benefit.
3	Severe: A long term impacts on the affected system(s) or party(ies) that could be mitigated. However, this mitigation would be difficult, expensive or time consuming or some combination of these.	Beneficial: A long term impact and substantial benefit to the affected system(s) or party(ies). Alternative ways of achieving this benefit would be difficult, expensive or time consuming, or some combination of these.
2	Moderately severe: A medium to long term impacts on the affected system(s) or party (ies) that could be mitigated.	Moderately beneficial: A medium to long term impact of real benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are equally difficult, expensive and time consuming (or some combination of these), as achieving them in this way.
1	Negligible: A short to medium term impacts on the affected system(s) or party(ies). Mitigation is very easy, cheap, less time consuming or not necessary.	Negligible: A short to medium term impact and negligible benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are easier, cheaper and quicker, or some combination of these.

The nature of the impact must be characterised as to whether the impact is deemed to be positive (+ve) (i.e. beneficial) or negative (-ve) (i.e. harmful) to the receiving environment/receptor. For ease of reference, a colour reference system (**Table 4-5**) has been applied according to the nature and significance of the identified impacts.

Table 4-5: Impact Significance Colour Reference System to Indicate the Nature of the Impact

Negative Impacts (-ve)	Positive Impacts (+ve)
Negligible	**Negligible**
Very Low	**Very Low**
Low	**Low**

Negative Impacts (-ve)	Positive Impacts (+ve)
Medium	Medium
High	High

4.6 STAKEHOLDER ENGAGEMENT

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 Stakeholder Engagement Report (SER) will be compiled detailing the projects' compliance with Chapter 6 of the NEMA EIA Regulations 2014, as amended.

4.6.1 PUBLIC PARTICIPATION PLAN

As part of the pre-application consultation meeting held with MDARDLEA on 16 August 2022, the proposed plan for public participation was discussed and agreed. The public participation plan presented to MDARDLEA is included Appendix C-1 of the SER **(Appendix E)**

4.6.2 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;
— 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 will also be included in the SER.

4.6.3 STAKEHOLDER NOTIFICATION

DIRECT NOTIFICATION

Notification of the proposed Project was issued to potential Stakeholders, via direct correspondence (i.e. site notices and e-mail) on **23 November 2022**. The notification letter which was circulated will be included Appendix B-3 of the SER (**Appendix E**). Proof of notification is included in Appendix B-4 of the SER (**Appendix E**)

NEWSPAPER ADVERTISEMENTS

In accordance with the requirements of GNR 982, as amended, the proposed project was advertised in two local newspapers. 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 has been included in Appendix B-1 of the SER **(Appendix E).** The relevant scoping phase advertisement dates are listed in **Table 4-6**.

Table 4-6: Dates on which the Adverts were published

NEWSPAPER	PUBLICATION DATE	LANGUAGE
Middelburg Herald	25 November 2022	English and Zulu
Middelburg Observer	25 November 2022	Afrikaans

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, will be placed at various locations in and around the project area. A copy of the site notice has been included in Appendix B-2 of the SER **(Appendix E)**

4.6.4 PUBLIC REVIEW

The DSR was placed on public review for a period of 30 days from **25 November 2022** to **16 January 2022**, at the following public places:

- Gerard Sekoto Library;
- Hendrina Public Library;
- Steve Tshwete Local Municipality Office;
- Middleburg District Municipality office
- WSP website (https://www.wsp.com/en-ZA/services/public-documents); and
- Datafree Website (https://wsp-engage.com/)

4.6.5 COMMENT AND RESPONSE REPORT

All concerns, comments, viewpoints and questions (collectively referred to as 'issues') received during the comment period will be documented and responded to adequately in a Comment and Response Report (CRR) included the SER (**Appendix E**). Where comments are project specific, this will be noted in the Comments and Response Report (CRR). The CRR records the following:

- List of all issues raised;

— Record of who raised the issues;
— Record of where the issues were raised;
— Record of the date on which the issue was raised; and
— Response to the issues.

4.6.6 WAY FORWARD

FINAL SCOPING REPORT SUBMISSION

All issues raised during the scoping phase of the proposed project have been incorporated into this final SR and will be addressed during the EIR Phase.

The MDARDLEA has been allocated 43 days to review the FSR. This FSR will be placed on stakeholder review for a reasonable time period during the MDARDLEA's final review and decision-making process. The delegated CA must within this specified timeframe issue a decision on whether to proceed onto the next phase, the EIR phase.

ONGOING CONSULTATION AND ENGAGEMENT

In addition to the public documents distributed to stakeholders, there will be ongoing communication between the proponent, the WSP and stakeholders throughout the S&EIR process. These interactions include the following:

— In addition to the project announcement letters, a letter will be sent out to all registered stakeholders providing them with an update of the proposed project once the FSR has been approved;
— Interactions with stakeholders will take place in English, Afrikaans and Zulu;
— Feedback to stakeholders, individually and collectively;
— Written responses (email, faxes or letters) will be provided to stakeholders acknowledging issues and providing information requested (dependent on availability); and
— As per the GNR 982, as amended, particular attention will be paid to landowners, and neighbouring communities, specifically where literacy levels and language barriers may be an issue.

5 DESCRIPTION OF BASELINE ENVIRONMENT

5.1 PHYSICAL ENVIRONMENT

5.1.1 CLIMATE AND METEOROLOGY

LOCAL METEOROLOGY OVERVIEW

According to the Köppen-Geiger Classification, the Hendrina area is defined as having a temperate climate with warm summers and dry winters26. Meteorological variables, including hourly temperature, rainfall, humidity, wind speed and wind direction, were obtained from the nearest ambient air quality monitoring station (AQMS)27. The Hendrina AQMS (approximately 17 km to the east-northeast of the study site, **Figure 5-1**) is owned and managed by SAWS and was analysed for the period January 2018 - December 2020 (i.e. three calendar years as required by the Modelling Regulations). Station details and data recovery for the Hendrina AQMS is given in **Table 5-1.**

Although this station is at distance from the study site, the local topography is not complex and thus the meteorological data is considered representative of regional weather conditions that would prevail at the proposed development sites.

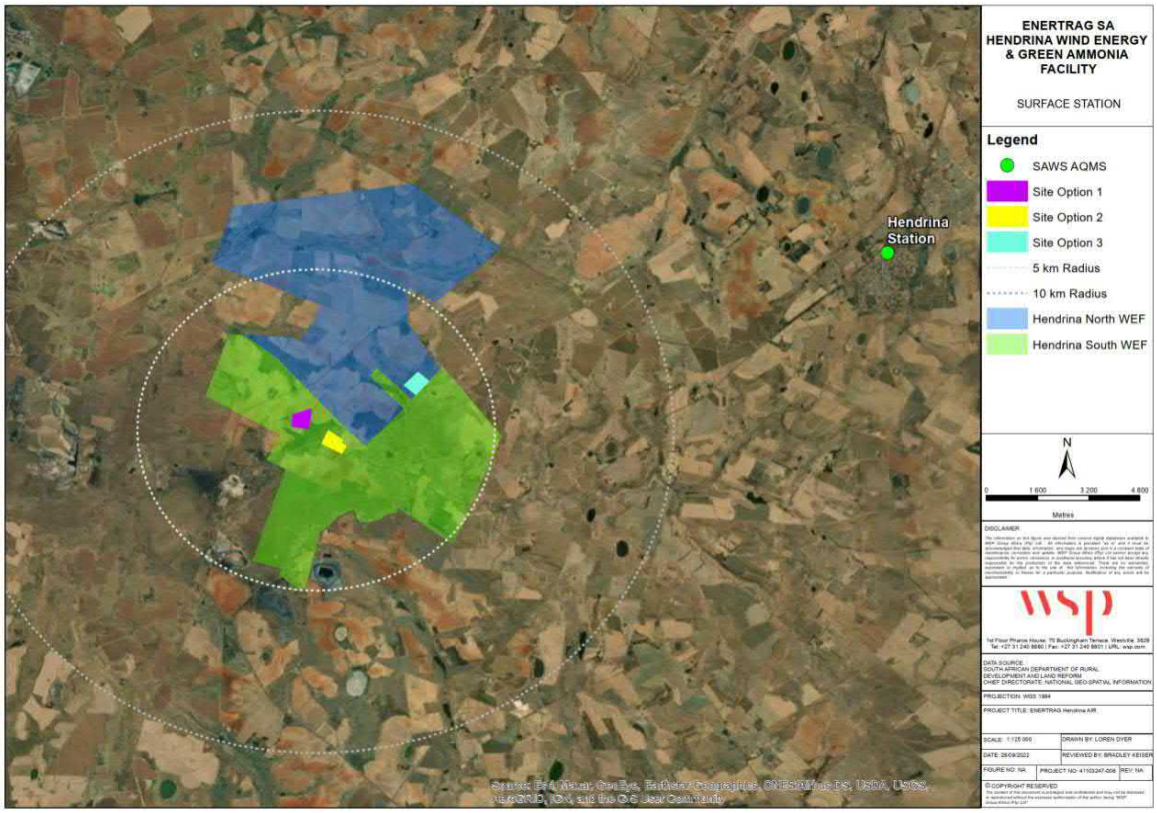


Figure 5-1: Hendrina AQMS proximity to the site

Table 5-1 Details of the Hendrina AAQMI station

STATION NAME	LATITUDE (°S)	LONGITUDE (°E)	ALTITUDE (M)	DATA RECOVERY		
				Temperature	Rainfall	Wind field
Hendrina	-26.151200°	29.716484°	1,675	97%	97%	97%

TEMPERATURE, HUMIDITY AND RAINFALL

Ambient air temperature influences plume buoyancy as the higher the plume temperature is above the ambient air temperature, the higher the plume will rise. Further, the rate of change of atmospheric temperature with height influences vertical stability (i.e. formation of mixing or inversion layers). Rainfall is an effective removal mechanism of atmospheric pollutants and thus also relevant in the assessment of pollution potential.

Figure 5-2 presents the average monthly temperature range, humidity and rainfall recorded at the Hendrina station. Higher rainfall occurs during the warmer, summer months (December, January and February) with drier conditions during the cooler, winter months (June, July and August). Summer temperatures for the region average at 19.5°C while winter temperatures average at 11.1°C. Hendrina received on average 570 mm of rainfall each year, with approximately 49% of that during the summer months (December, January and February) and only 3% during winter (June, July and August).

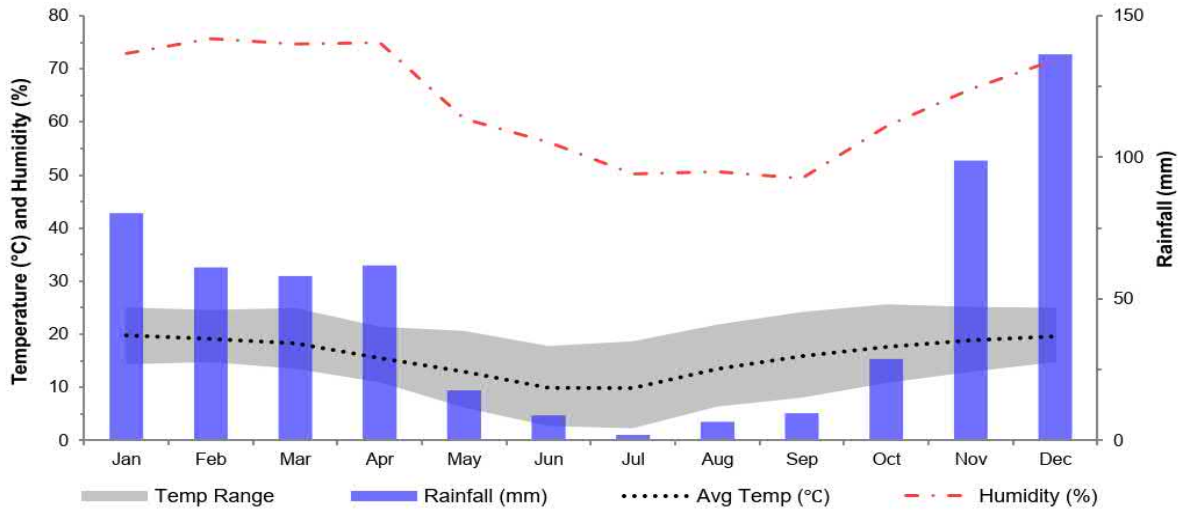


Figure 5-2 Meteorological summary for Hendrina (January 2018 - December 2020)

WIND

Wind roses (**Figure 5-3**) summarize wind speed and directional frequency at a location. Each directional branch on a wind rose represents wind originating from that direction. Each directional branch is divided into segments of colour, representative of different wind speeds. Calm conditions are defined by the Beaufort Wind Force Scale28 as wind speeds less than 0.5 m/s.

Typical wind fields have been analysed using Lakes Environmental WRPlot Freeware (Version 7.0.0) for the full period (January 2018 – December 2020); diurnally for early morning (00h00 – 06h00), morning (06h00 – 12h00), afternoon (12h00 – 18h00) and night (18h00 – 00h00); and seasonally for summer (December, January and February), autumn (March, April and May), winter (June, July and August) and spring (September, October and November):

- Calm conditions (wind speeds <0.5 m/s) occurred 29.9% of the time.
- Light to fresh easterlies prevailed in the region.
- Peak wind speeds occurred from the east-northeast (11.2 m/s) and highest average wind speeds occurred from the east (3.0 m/s).
- Easterly winds prevailed during the early morning (00h00-06h00), morning (06h00-12h00) and night-time (18h00-00h00) hours.
- Winds from the west-northwest prevailed in the afternoon (12h00-18h00).
- Diurnal peak (10.3 m/s) and highest average (2.0 m/s) wind speeds occurred during the afternoon.
- Winds from the east prevailed during the spring, summer and autumn months.
- Higher directional variability in the wind field is observed during winter.
- Seasonal peak (10.4 m/s) wind speeds occur during spring and highest average (1.6 m/s) wind speeds occur during both summer and spring.

Figure 5-3: Local Wind Conditions at Hendrina

5.1.2 BACKGROUND AIR QUALITY

An evaluation of the existing air pollution situation provides an understanding of the potential risk for health impacts. The Department of Forestry, Fisheries and Environment (DFFE) has identified District and Metropolitan Municipalities of concern with respect to air quality based on the prevalence of sources of emissions for each source category. The National Framework for Air Quality Management in the Republic of South Africa (hereafter referred to as 'The National Framework') has rated the Nkangala District, as having "poor" air quality. The district area is thus identified as being in either the upper range of prevalence for one or more emission source categories or middle range in two or more categories relative to other Districts. Municipalities that are classified as having poor air quality require priority attention in terms of air quality management planning.

The Air Quality Management Plan (AQMP) for the HPA identifies the Steve Tshwete Local Municipality as one of the HPA's nine air quality hot spot areas. This classification is based on atmospheric dispersion modelling outputs verified by ambient air quality monitoring data. The Hendrina area is identified in the AQMP for modelled SO_2 exceedances and measured O_3 exceedances. Elevated O3 concentrations is attributed to secondary chemical formation resulting from the presence of NOx and volatile organic compounds (VOC), which is noted by the assessment as being a 'regional scale phenomenon'. It is highlighted that the HPA AQMP's assessment is limited to criteria pollutants (specifically, SO_2, NO_2, PM10 and O_3) none of which are relevant to the proposed ENERTRAG renewable energy complex. The only mention of NH_3 emissions in the AQMP is reference to trace amounts (not quantified) associated with biomass burning, with some agricultural burning for field clearing recognised as relevant in the Steve Tshwete area.

The nearest AQMS to the study site is the Hendrina station owned and managed by SAWS (**Figure 5-1**), approximately 17 km to the east-northeast of the study site. Pollutants measured by this station include PM10, PM2.5, CO, NO_2, SO_2 and O_3. None of these pollutants are relevant to the proposed ENERTRAG renewable energy complex. Since the Hendrina monitoring station does not measure NH_3 and is located too far away for ambient air quality measurements to be considered representative of ambient pollution concentrations at site, this data is not considered further.

5.1.3 TOPOGRAPHY

The Based on a desk study assessment, the project area consists of the non-perennial Leeufonteinspruit River traversing further North and the perennial Olifants River further South. There are various non-perennial tributaries situated across the proposed footprint which are observed to drain into agricultural farm dams.

Slope variation analysis undertaken for the proposed area in its entirety indicates that the topography is characterised by flat to gentle terrain, comprising slope angles ranging between 0° and 14°. Spot heights indicate that the elevation across the site ranges between 1572 m and 1691 m above mean sea level, with a difference in elevation of approximately 119 m.

The elevation and slopes within and in the immediate vicinity of the Hendrina GH&A Facility area are indicated in **Figure 5-4** and **Figure 5-5** respectively.

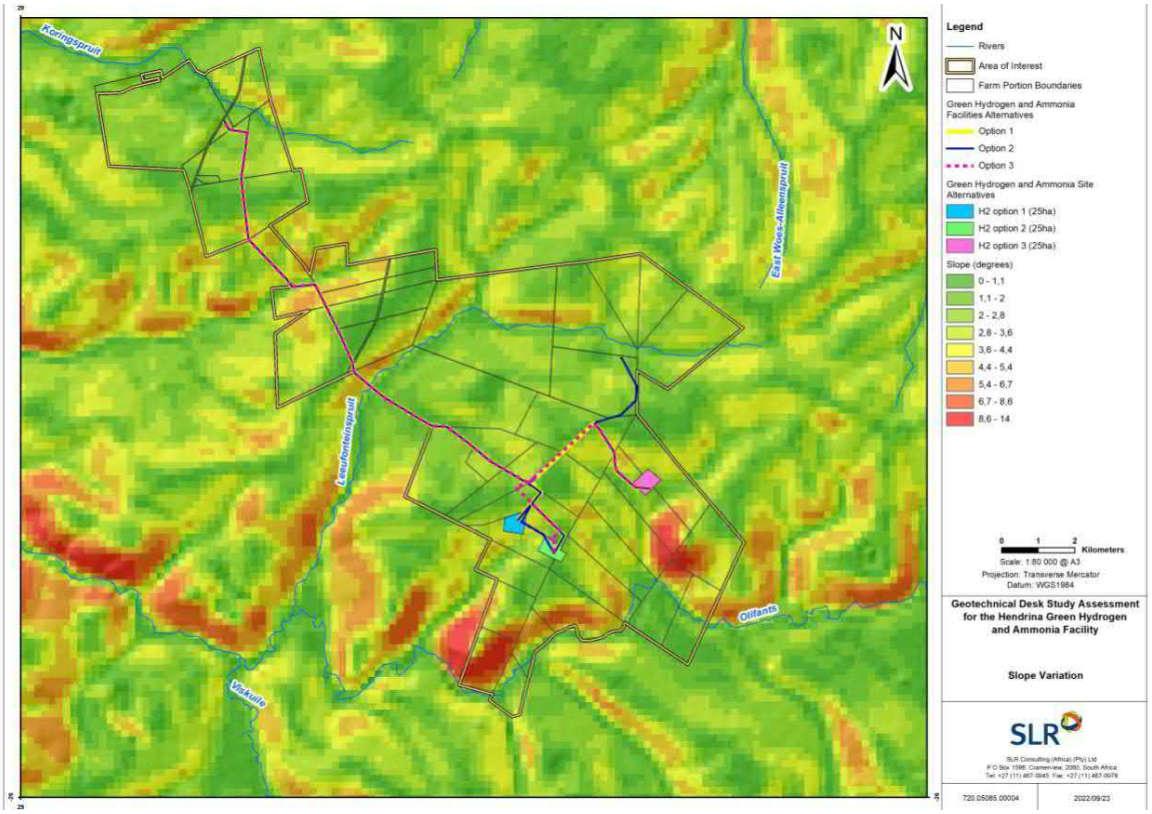


Figure 5-4: Slope Variation in Degrees and Drainage Features (SLR, 2022)

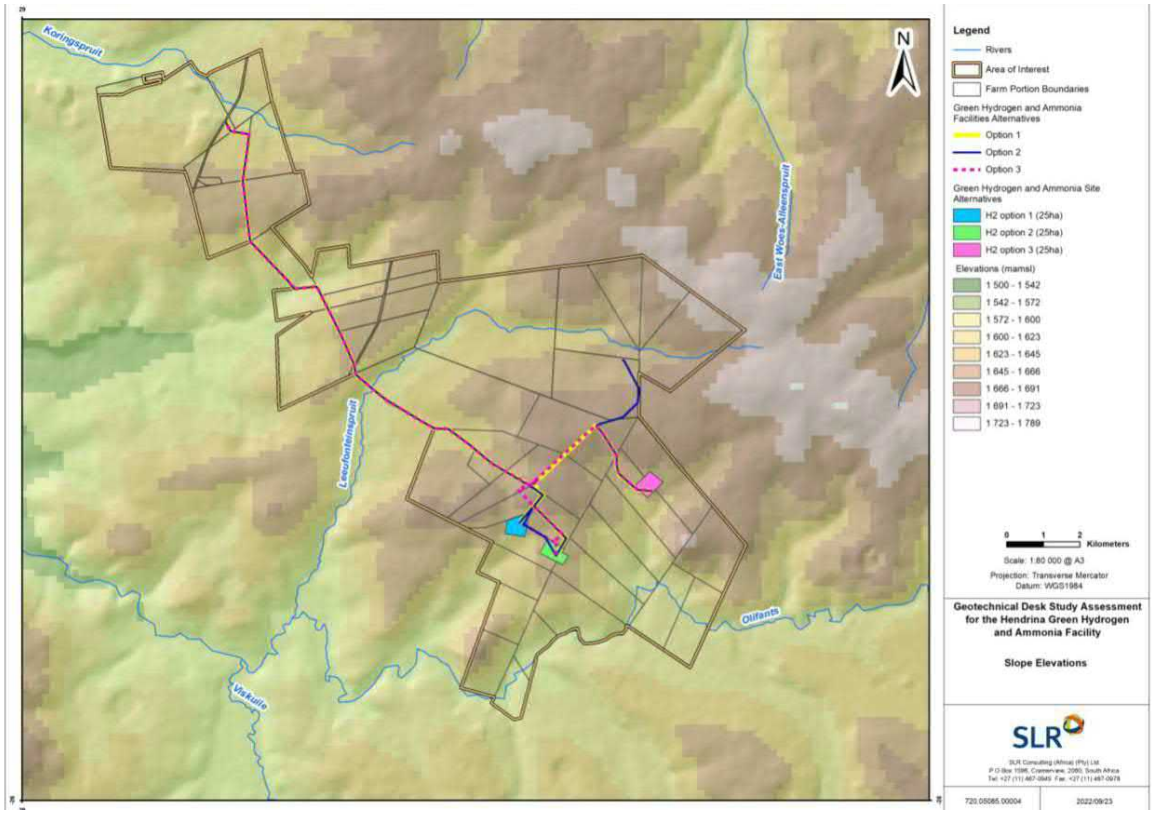


Figure 5-5: Elevation (mamsl) and Drainage Features (SLR, 2022)

5.1.4 GEOLOGY

A desktop review of the geology of the proposed development area indicates that site is predominantly underlain by lithological units of the Ecca Group (**Figure 5-6**) which is represented by sandstones, shales and coal seams of the Vryheid Formation, all deposited in a shallow marine environment. The Vryheid Formation has been extensively intruded by Jurassic aged dolerite, becoming relatively more prevalent further south of the proposed study area.

Sandstones comprise a larger portion of the Karoo sediments and are generally closely intercalated with mudrocks, resulting in alternating bands of arenaceous and argillaceous sediments. The Vryheid Formation sandstones may typically occur as arkosic to greywacke, ranging from a generally coarse grained, poorly sorted material to a fine grained, well sorted material, with an abrupt upward transition.

Of significant economic importance is the presence of coal seams located stratigraphically between the sandstone and mudrock bedding partings, at the base of the Vryheid Formation. The lower coal seams attain thicknesses of approximately 18 m which progressively diminishes upwards through the formation, due to various depositional and post-depositional factors (Brink, 1983).

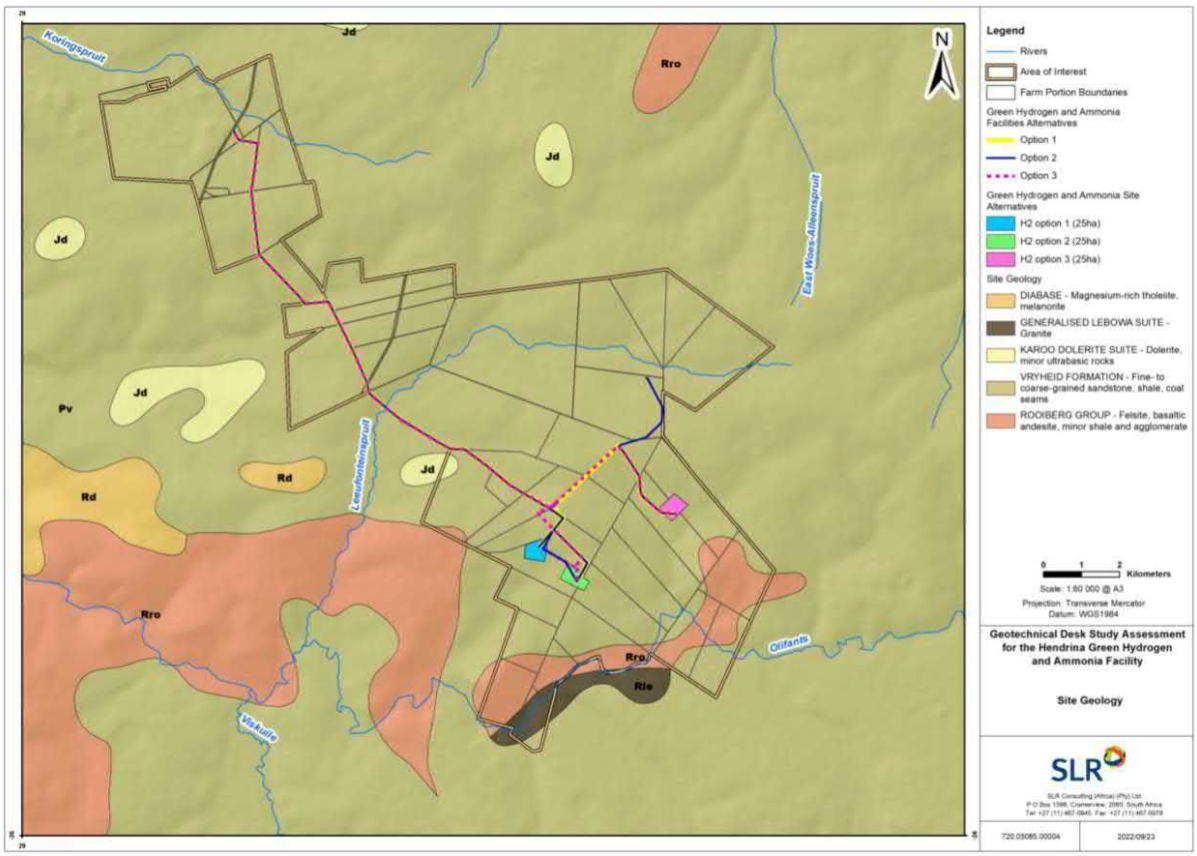


Figure 5-6: Geological Map of the Proposed Development Area (SLR, 2022)

In respect of sourcing construction materials for roads and laydown areas consideration could be given to natural gravely or crushed sandstone bedrock. Selective usage must be exercised to avoid using sandstone containing excessive pyrite and muscovite, which can cause distress when used as basecourse (Brink, 1983).

In addition, where chemical stabilization is required the clay matrix of sandstones make them suitable for stabilization with lime (Brink, 1983). The occurrence, nature, material quality and quantity of sandstone and other potential construction materials will have to be assessed during the detailed geotechnical investigation. It is recommended that provision be made to procure aggregates for use in upper pavement layer works construction and the manufacture of concrete from commercial sources.

On the contrary, mudrocks such as siltstone, mudstone and “mud-shales” are not considered suitable for use as construction materials, due to their swelling characteristics, excessive absorption of water and poor engineering

performance. Slope stability issues can arise in areas where closely intercalated sandstones and mudrock co-exist. When mudrocks slake or disintegrate the exposed sandstone layers are undercut, which can result in rockfalls (Brink, 1983).

The site is considered suitable for the proposed development provided that the recommendations presented in the desktop Geotechnical report are adhered to, which needs to be verified by more detailed geotechnical investigations during the detailed design stage.

5.1.5 SOILS LAND AND AGRICULTURAL POTENTIAL

All three alternative locations fall within one land type, Bb4. The geology is predominantly shale and sandstone of the Ecca Group of the Karoo Supergroup and includes dolerite. The land type includes a fairly high proportion of deep, red and yellow, reasonably-drained, loamy soils of the Avalon, Hutton and Glencoe soil forms that are good for crop production. It also includes other soils that have various limitations for crop production, which are predominantly the result of poor drainage or limited depth due to underlying clay or bedrock. These soils are of the Mispah and Glenrosa soil forms (shallow bedrock) and the Westleigh, Longlands, Rensburg, Estcourt, and Katspruit soil forms (poor drainage and underlying clay).

The development is in grain and cattle farming agricultural regions, but the soils vary in their suitability for crop production. Crops in the area include mainly maize and soya beans. Farmers generally utilise all suitable soil as cropland. Only soil that is not suitable for crop production is used for grazing of cattle and sheep. Limitations that render the soil unsuitable for crop production are poor drainage and depth limitations due to rock or dense clay in the subsoil.

Alternatives 1 and 2 are on cropland while alternative 3 is on land not used for crops and therefore presumed to be unsuitable. Coal-fired electricity generation and mining take place in the surrounding area.

Because of the favourable climate and suitable soils on the croplands, crop yields are fairly high with average maize yields of around 7 to 8 tons per hectare according to the farmers on site. The long-term grazing capacity of the area is fairly high at 5 hectares per large stock unit (DAFF, 2018).

The only impact of this development is the loss of 25 hectares of agricultural land on the site of the facility. The proposed pipeline, because it is linear infrastructure and runs only between and on the edges of croplands, instead of through them, has minimal agricultural impact. The proposed overhead power lines have negligible agricultural impact, regardless of their route and design and the agricultural potential of the land they traverse. All agricultural activities can continue completely unhindered underneath the power lines. This is because their direct, permanent, physical footprint that has any potential to interfere with agriculture (pylon bases), is insignificantly small and the pylons can easily be located on the edges of cropland where they do not interfere with it. There will therefore be no reduction in future agricultural production potential underneath the power lines.

5.1.6 SURFACE WATER AND WETLANDS

HYDROLOGICAL CACHMENT

The Project area is situated within the primary catchment of the Olifants River, and the quaternary catchments referred to as the B11B and B11A draining regions as defined by the Department of Water and Sanitation. The applicable water management area is the Olifants water management area and the responsibility of the Mpumalanga Regional DWS. **Figure 5-7** below for the quaternary catchments associated with the Project area. According to the Water Research Commission of South Africa (WR, 2012), the northern section of the study area (i.e., quaternary catchment B11B) has a mean annual runoff ("MAR') of 23.6 mm and the southern section (i.e., B11A quaternary catchment) has a mean annual runoff of 59.6 mm. The majority of the study area has a mean annual evaporation ("MAE") rate of between 1 800 – 2 000 mm as measured from a A-class pan.

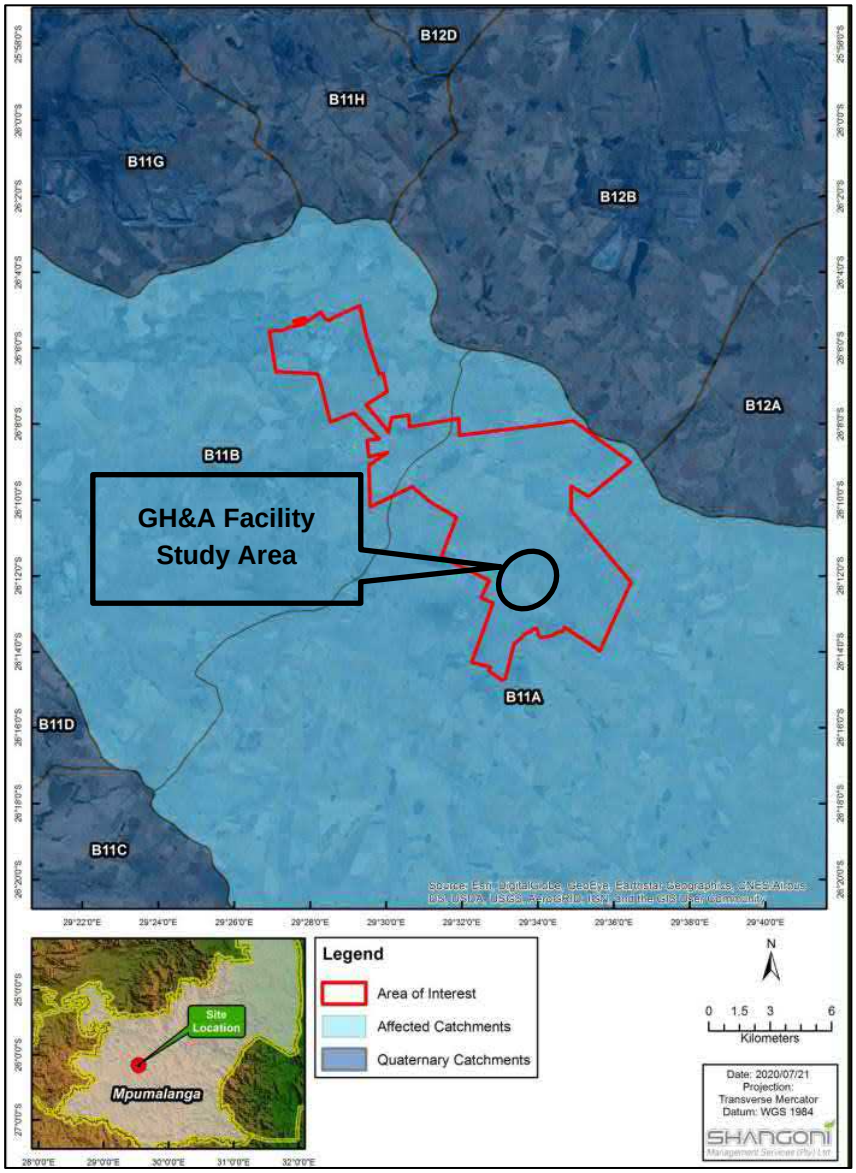


Figure 5-7: Catchments within the study area (Shangoni, 2021)

LOCAL AQUATIC FEATURES

According to the Wetland Assessment Report (Digby Wells, 2021), the study area is dominated by a variety of aquatic features shown in **Figure 5-8**, characterised as follows:

- Mainstem Rivers: Olifants River
- Hillslope Seep wetlands (Agriculture) (Fragmented) (Unimpacted)
- Floodplains
- Unchanneled Valley Bottom wetlands (UBVs)
- Channelled Valley Bottom wetlands (CVBs)
- Unchanneled Valley Bottom wetlands (UBVs) (fragmented)
- Channelled Valley Bottom wetlands (CVBs) (fragmented)

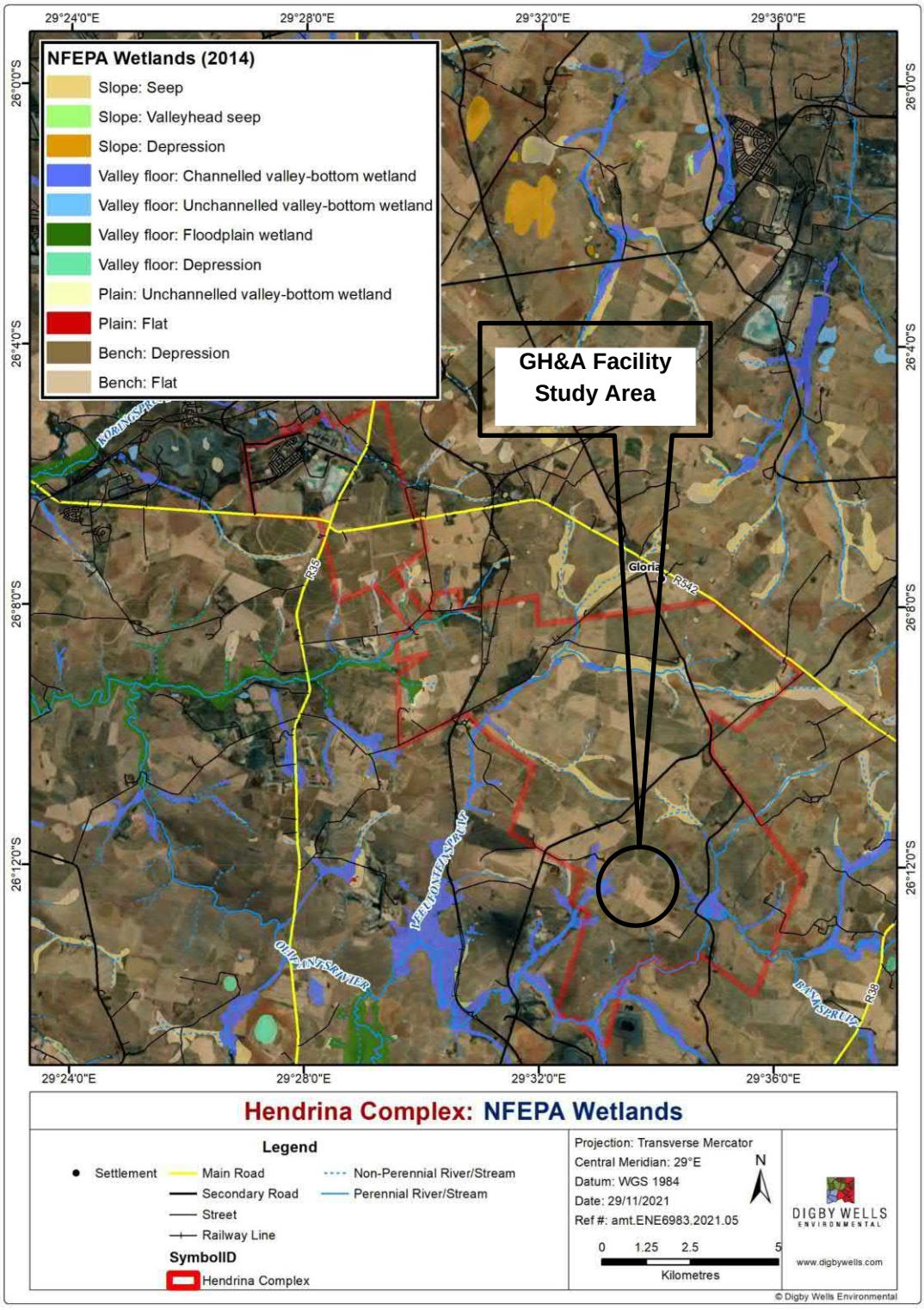


Figure 5-8: Wetlands Associated with the project area (Digby Wells, 2021)

There are numerous surface water resources associated with the Project study area (**Figure 5-9** below). The main watercourse is the Olifants River located at the southern boundary of the study area that flows in an east to west direction. The Leeufonteinspruit traverses the North of the study area and confluences with the Olifants River south-west of the Facility. There are also several unnamed drainage lines and NFEPA wetland areas that traverse the study area. Runoff generated south of the southern water divide will drain in a southerly direction via unnamed drainage lines into the Olifants River.

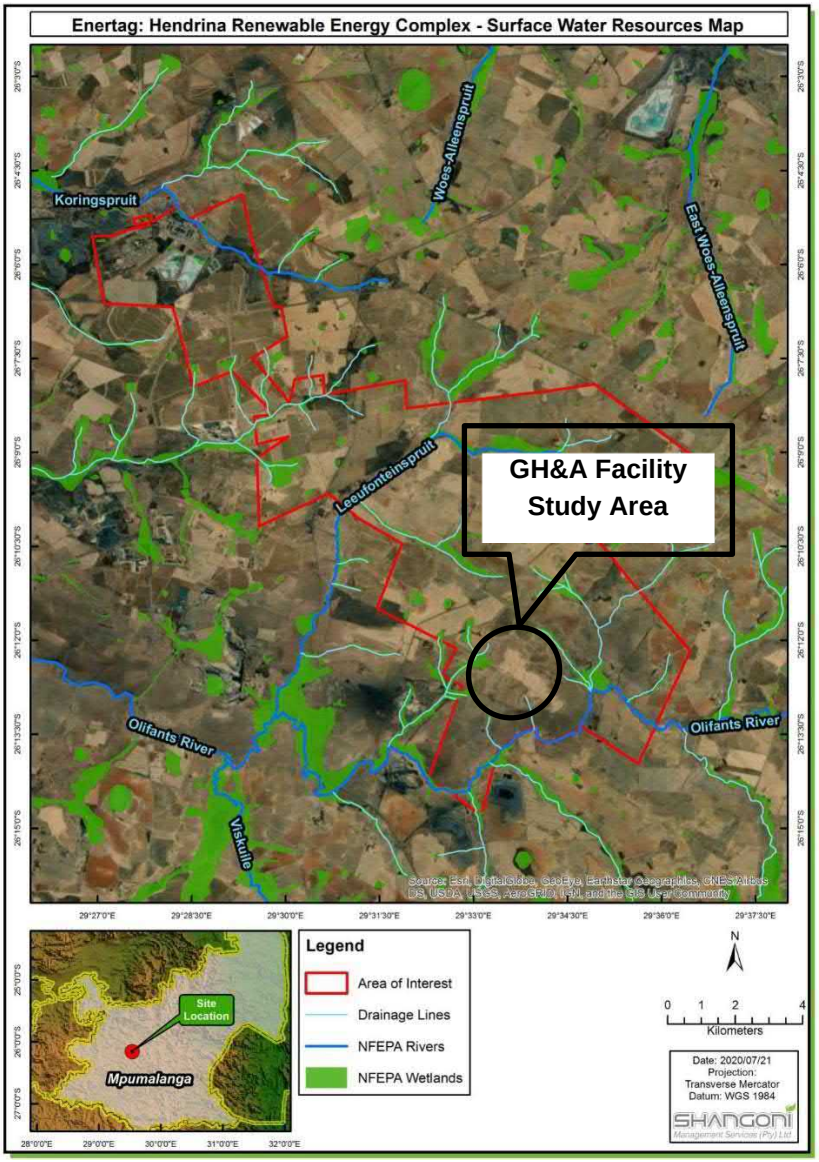


Figure 5-9: Surface Water Resources in the project area (Shangoni, 2021)

PRESENT ECOLOGICAL STATE AND CONSERVATION IMPORTANCE

The Present Ecological State (PES) of a river, watercourse or wetland represents the extent to which it has changed from the reference or near pristine condition (Category A) towards a highly impacted system where there has been an extensive loss of natural habit and biota, as well as ecosystem functioning (Category E).

The PES scores have been revised for the country and based on the new models, aspects of functional importance as well as direct and indirect impacts have been included (DWS, 2014). The new PES system incorporates Ecological Importance (EI) and Ecological Sensitivity (ES) separately as opposed to Ecological Importance and Sensitivity (EIS) in the old model, although the new model is still heavily centred on rating rivers using broad fish, invertebrate, riparian vegetation and water quality indicators. The Recommended Ecological Category (REC) is still contained within the new models, with the default REC being B, when little or no information is available to assess the system or when only one of the above-mentioned parameters are assessed or the overall PES is rated between a C or D.

The **PES** of the seven Hydrogeomorphic units were rated to have an ecological state of **'Moderately Modified' to 'Largely Modified.** According to the integrity (health) method described by Kotze et al. (2007):

— A **Category C** wetland has Moderate changes to its ecosystem processes, and loss of natural habitat has taken place; however, the natural habitat remains predominantly intact.

— A **Category D** wetland has Large modifications to the natural ecosystem processes and loss of natural habitat and biota.

The UVBs Fragmented, HS Agriculture, and Hill Seeps Fragmented were regarded as **'Moderate (C)'**. This specifies that the wetlands are ecologically important, however sensitive on a provincial and local scale. The integrity and biodiversity of these wetlands are sensitive to low flow and habitat modifications as a result of decades of mining, agriculture, and the introduction of AIPs. These wetlands play a small role in moderating the quantity and quality of water; and

The CVBs, CVBs Fragmented, UVBs, and Hill Seeps Unimpacted were considered **'High (B)'**. This suggests that these systems are of ecological importance and are sensitive. The biodiversity of the systems is sensitive to modifications to the habitat and low flows.

These systems play an important role in moderating the quality and quantity of water in larger systems. The Hydrogeomorphic units assessed play an important role in moderating the quantity and quality of water of major rivers and tributaries. However, the river system has been modified by anthropological activities, specifically mining and agropastoral activities. The outcomes are changes in the water input volumes and pattern as well as water distribution and retention patterns of water passing through the wetlands. Additionally, linear infrastructure, such as roads, power lines, and fences change runoff and stormwater as well as causing fragmentation of the natural habitat. Agricultural deposits in a form of phosphates and nitrates using fertilisers or pesticides decrease the quality of water in the wetlands. Roads that have been built within the wetlands increases run-off from these hardened surfaces.

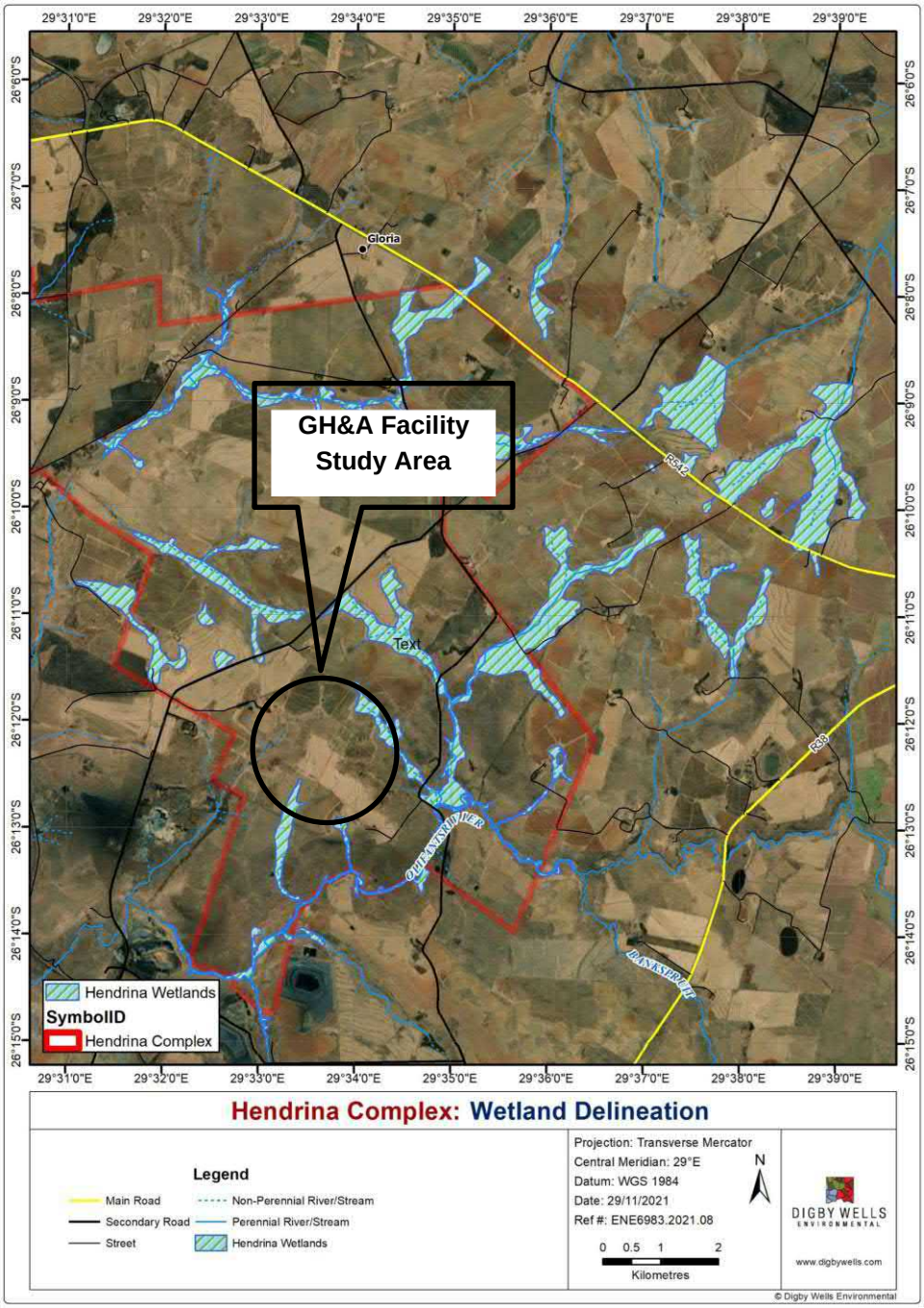


Figure 5-10: Wetland delineations on the project area (Digby Wells, 2021)

5.1.7 GROUNDWATER

The green hydrogen and ammonia facility within the Hendrina Renewable Energy Complex is underlain by Karoo sedimentary rocks and dolerite intrusions, as mentioned in Section 5.1.4, and the hydrogeological characteristics of the study area is a function of the geological formations. The aquifers of the Karoo Supergroup display characteristics of intergranular and fractured rock. The borehole yielding potential of the aquifer is classified as D2, which implies an average borehole yield varying between 0.1 and 0.5 l/s.

According to Barnard (2000), there are typically six different modes of groundwater occurrence associated with these formations:

— Weathered and fractured sedimentary rocks not associated with dolerite intrusions.
— Indurated and jointed sedimentary rocks alongside dykes.
— Narrow weathered and fractured dolerite dykes.
— Basins of weathering in dolerite sills and highly jointed sedimentary rocks enclosed by dolerite.
— Weathered and fractured upper contact zones of dolerite sills.
— Weathered and fractured lower contact zones of dolerite sills.

Numerous springs occur at lithological contacts such as where sandstone overlies an impervious shale horizon, along fault zones or along impermeable dolerite dykes. Groundwater seepage in lower lying areas contributes substantially to sustaining the dry season flow in the stream systems that drain these landscapes.

A detailed Hydrogeological Map illustrating the aquifer types and borehole yielding potential across the study area is presented in **Figure 5-11** below.

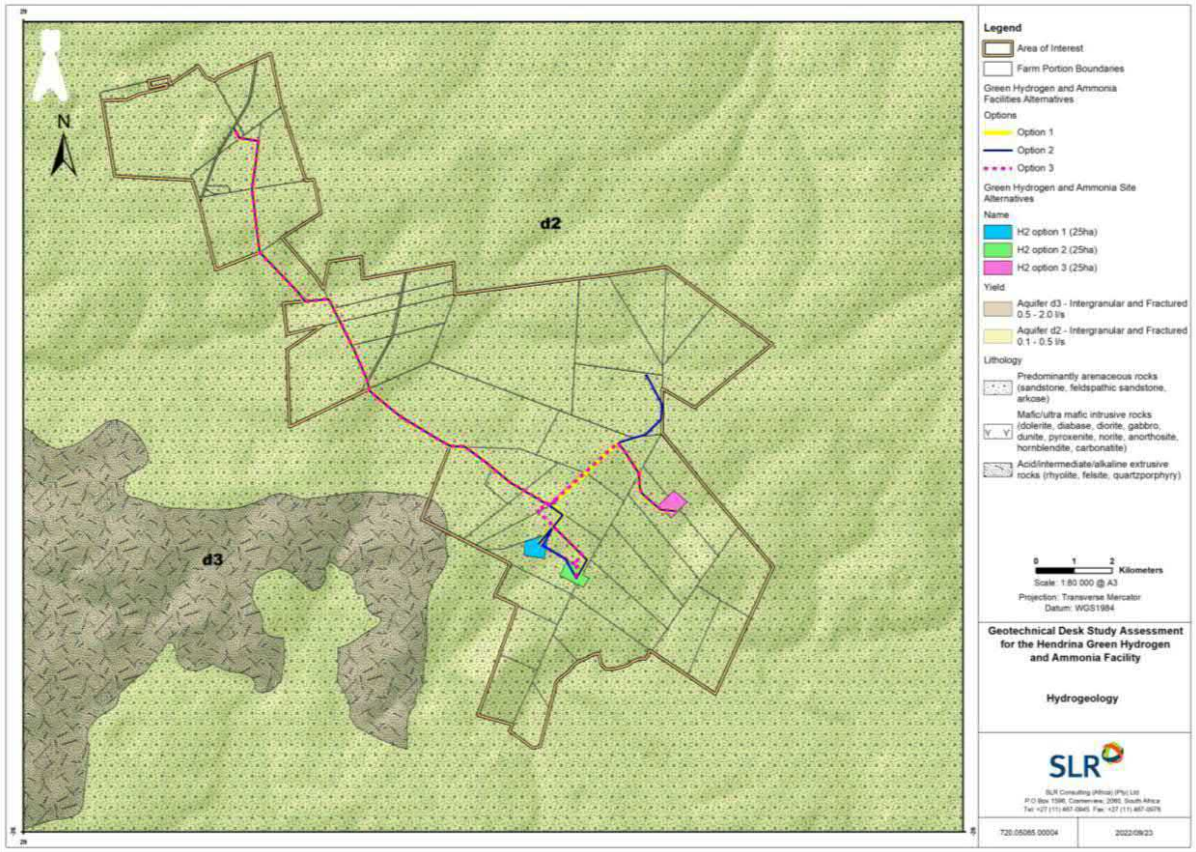


Figure 5-11: Hydrogeological Map of the Proposed Development Area (SLR, 2022)

5.2 BIOLOGICAL ENVIRONMENT

5.2.1 REGIONAL VEGETATION

Based on the preliminary desktop and site-specific field study Terrestrial Ecology Scoping Report (David Hoare Consulting, November 2022), one regional vegetation type occurring in the broader study area, namely Eastern Highveld Grassland, (**Figure 5-12**). There is one additional unit that occurs in nearby areas, namely Eastern Temperate Freshwater Wetlands, but this is not mapped at a scale that reflects local vegetation patterns. The vegetation type that occurs in the GH&A Facility study area and nearby areas are briefly described below.

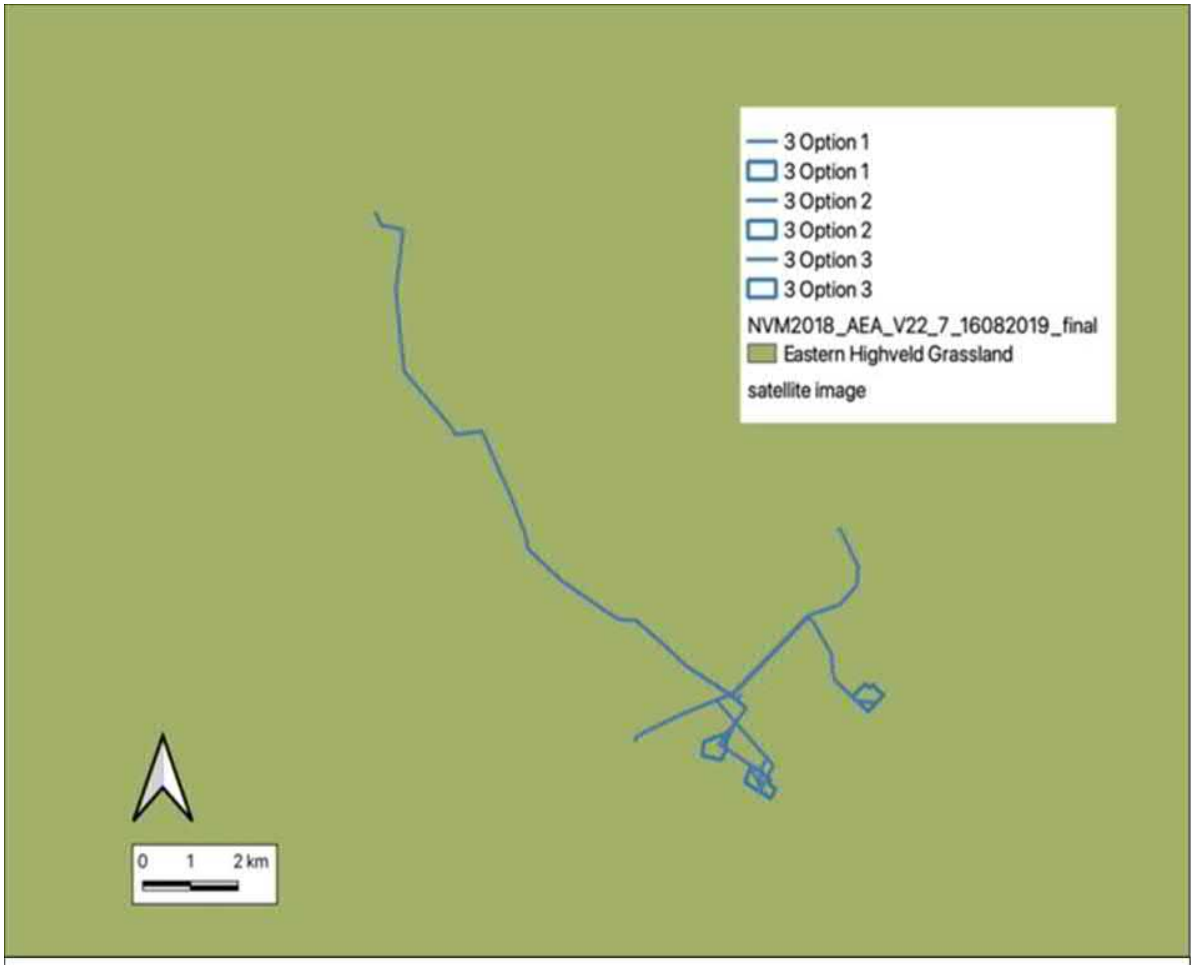


Figure 5: Regional vegetation types of the study area.

Figure 5-12: Regional Vegetation Types of the Study Area

EASTERN HIGHVELD GRASSLAND

DISTRIBUTION

Found in Mpumalanga and Gauteng Provinces, on the plains between Belfast in the east and the eastern side of Johannesburg in the west and extending southwards to Bethal, Ermelo and west of Piet Retief. The vegetation type occurs at an altitude of between 1 520–1 780 m.

VEGETATION & LANDSCAPE FEATURES

The vegetation occurs on slightly to moderately undulating plains, including some low hills and pan depressions. The vegetation is short dense grassland dominated by the usual highveld grass composition (*Aristida, Digitaria, Eragrostis, Themeda, Tristachya,* etc.) with small, scattered rocky outcrops with wiry, sour grasses and some woody species (*Acacia caffra, Celtis africana, Diospyros lycioides subsp lycioides, Parinari capensis, Protea caffra, P. welwitschii and Searsia magalismontanum*).

GEOLOGY & SOILS

Red to yellow sandy soils of the Ba and Bb land types found on shales and sandstones of the Madzaringwe Formation (Karoo Supergroup). Land types Bb (65%) and Ba (30%).

CLIMATE

Strongly seasonal summer rainfall, with very dry winters. MAP 650–900 mm (overall average: 726 mm), MAP relatively uniform across most of this unit, but increases significantly in the extreme southeast. The coefficient of variation in MAP is 25% across most of the unit but drops to 21% in the east and southeast. Incidence of frost from 13–42 days, but higher at higher elevations.

IMPORTANT TAXA

Low Shrubs	*Anthospermum rigidum* subsp. *pumilum*, *Stoebe plumosa*..
Herbs	*Berkheya setifera* (d), *Haplocarpha scaposa* (d), *Justicia anagalloides* (d), *Pelargonium luridum* (d), *Acalypha angustata*, *Chamaecrista mimosoides*, *Dicoma anomala*, *Euryops gilfillanii, E. transvaalensis* subsp. *setilobus, Helichrysum aureonitens*, *H. caespititium*, *H. callicomum*, *H. oreophilum*, *H. rugulosum*, *Ipomoea crassipes*, *Pentanisia prunelloides* subsp. *latifolia*, *Selago densiflora*, *Senecio coronatus*, *Vernonia oligocephala*, *Wahlenbergia undulata*.
Geophytic Herbs	*Gladiolus crassifolius*, *Haemanthus humilis* subsp. *hirsutus*, *Hypoxis rigidula* var. *pilosissima*, *Ledebouria ovatifolia*.
Succulent Herbs	*Aloe ecklonis*
Graminoids	*Aristida aequiglumis* (d), *A. congesta* (d), *A. junciformis* subsp. *galpinii* (d), *Brachiaria serrata* (d), *Cynodon dactylon* (d), *Digitaria monodactyla* (d), *D. tricholaenoides* (d), *Elionurus muticus* (d), *Eragrostis chloromelas* (d), *E. curvula* (d), *E. plana* (d), *E. racemosa* (d), *E. sclerantha* (d), *Heteropogon contortus* (d), *Loudetia simplex* (d), *Microchloa caffra* (d), *Monocymbium ceresiiforme* (d), *Setaria sphacelata* (d), *Sporobolus africanus* (d), *S. pectinatus* (d), *Themeda triandra* (d), *Trachypogon spicatus* (d), *Tristachya leucothrix* (d), *T. rehmannii* (d), *Alloteropsis semialata* subsp. *eckloniana*, *Andropogon appendiculatus*, *A. schirensis*, *Bewsia biflora*, *Ctenium concinnum*, *Diheteropogon amplectens*, *Eragrostis capensis*, *E. gummiflua*, *E. patentissima*, *Harpochloa falx*, *Panicum natalense*, *Rendlia altera*, *Schizachyrium sanguineum*, *Setaria nigrirostris*, *Urelytrum agropyroides*.

Vegetation patterning in the form of concentric belts ('rings') is often found in pans. Pan size and depth may be a factor limiting vegetation, as large water bodies with shallow water may experience wave action. This limits the presence of species with floating leaves as well as some submerged and marginal macrophytes. The situation is more complex in vleis as these often have variable microtopography and soil types within a single wetland. It is possible for seasonally inundated zones to occur embedded inside the permanently inundated zone of a vlei, if this zone is present.

CONSERVATION STATUS OF THE REGIONAL VEGETATION TYPES

On the basis of a scientific approach used at national level by SANBI (Driver *et al*., 2005), vegetation types can be categorised according to their conservation status which is, in turn, assessed according to the degree of transformation relative to the expected extent of each vegetation type. The status of a habitat or vegetation type is based on how much of its original area still remains intact relative to various thresholds. The original extent of a vegetation type is as presented in the most recent national vegetation map (Mucina, Rutherford & Powrie 2005) and is the extent of the vegetation type in the absence of any historical human impact. On a national scale the thresholds are as depicted in **Figure 5-13**, as determined by best available scientific approaches (Driver *et al*., 2005). The level at which an ecosystem becomes Critically Endangered differs from one ecosystem to another and varies from 16% to 36% (Driver *et al*., 2005).

According to scientific literature (Driver *et al*., 2005; Mucina *et al*., 2006), as shown in **Table 5-2**, Eastern Highvbeld Grassland is listed as Endangered, Amersfoort Highveld Clay Grassland as Vulnerable and Eastern Temperate Freshwater Wetlands as Least Threatened.

Determining ecosystem status (Driver *et al*., 2005). *BT = biodiversity target (the minimum conservation requirement).

Habitat remaining (%)		
80–100	least threatened	LT
60–80	vulnerable	VU
*BT–60	endangered	EN
0–*BT	critically endangered	CR

Figure 5-13: Ecosystem Status (Driver et al. 2005)

Table 5-2: Conservation status of different vegetation types occurring in the study area

VEGETATION TYPE	TARGET (%)	CONSERVED (%)	TRANSFORMED (%)	CONSERVATION STATUS	
				DRIVER *ET AL.* 2005; MUCINA *ET AL.*, 2006	NATIONAL ECOSYSTEM LIST (NEM:BA)
Eastern Highveld Grassland	24	0.3	44	Endangered	Vulnerable
Eastern Temperate Freshwater Wetlands	24	5	15	Least threatened	Not listed

According to scientific literature (Driver et al., 2005; Mucina et al., 2006), as shown in Table 5-2, Eastern Highvbeld Grassland is listed as Endangered and Eastern Temperate Freshwater Wetlands as Least Threatened. The National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004), lists national vegetation types that are afforded protection on the basis of rates of transformation. The thresholds for listing in this legislation are higher than in the scientific literature, which means there are fewer ecosystems listed in the National Ecosystem List versus in the scientific literature. Eastern Highveld Grassland is listed as Vulnerable in the National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011).

5.2.2 BIODIVERSITY CONSERVATION PLANS

The Mpumalanga Biodiversity Sector Plan (MBSP) (Mpumalanga Parks and Tourism Agency,2014) classifies the natural vegetation of the Province according to the following categories:

- Protected Areas (sub-divided into three categories);
- Critical Biodiversity Areas (sub-divided into “Irreplaceable” and “Optimal”);
- Other natural areas;
- Ecological Support Area (sub-divided into four categories); and
- Modified (sub-divided into Heavily or Moderately modified

Figure 5-14 shows the features in the study area within three of the classes listed above:

- Critical Biodiversity Areas (CBA): Optimal: Various drainage lines and its associated grassland areas in the project area are within a “CBA: Optimal” area.
- Other Natural Areas (ONA): There are patches throughout the site mapped as ONA.
- Heavily or moderately modified: Remaining areas on site, associated primarily with cultivation.

According to the description for the MBSP Terrestrial Assessment categories, Critical Biodiversity Areas are areas that are required to meet biodiversity targets (for biodiversity pattern and ecological process features). The policy is that they should remain in a natural state. CBAs are areas of high biodiversity value which are usually at risk of being lost and usually identified as important in meeting biodiversity targets, except for Critically Endangered Ecosystems or Critical Linkages. CBAs in the Province can be divided into two sub-categories, which are described in more detail below:

CBA Irreplaceable (south-eastern parts of the site are within this sub-category),

- This category comprises areas considered critical for meeting biodiversity targets and thresholds, and which are required to ensure the persistence and of species and the functioning of ecosystems. Such biodiversity or landscape facets is usually at risk of being lost due to the remaining distribution being below target. For example, only known sites for certain threatened species, or areas of high connectivity value which have high risk of having connectivity disrupted (i.e. critical corridor linkages in the landscape).
- In the MBSP, the “CBA: Irreplaceable” category has Level 3 sub-categories (not provided in the data that accompanies the CBA map):

— CBA: Irreplaceable (100% irreplaceable).
— CBA: High Irreplaceability (80-100% irreplaceable).
— CBA: Critical linkages. These are areas of the natural landscape that represent the only remaining and highly constrained linkages which, if lost, would result in the breakage of the large corridor network as a whole (i.e. pinch point on corridor). These areas are thus vital in maintaining the linkage of the corridor and its associated biodiversity related processes.
— Critically Endangered Threatened Ecosystems (gazetted).

CBA Optimal (north-western parts of the site are within this sub-category).

— The "CBA Optimal" areas, previously referred to as "Important & Necessary in MBCPv1", are the best localities out of a larger selection of available PUs as they are optimally located to meet both the various biodiversity targets and the criteria defined by either the Marxan design or cost layers. These areas have a irreplaceability (or frequency selection score) of less than 80%. In Marxan, this is categorised as the "Best" solution and is essentially the most efficient and thus optimal solution to meet all biodiversity conservation targets while avoiding high cost areas as much as possible.
— Even though these areas may display a lower Irreplaceability value or selection frequency score than the previous categories, it must be noted that these areas collectively reflect the smallest area required to meet the feature targets and as such, they are also regarded as CBAs.

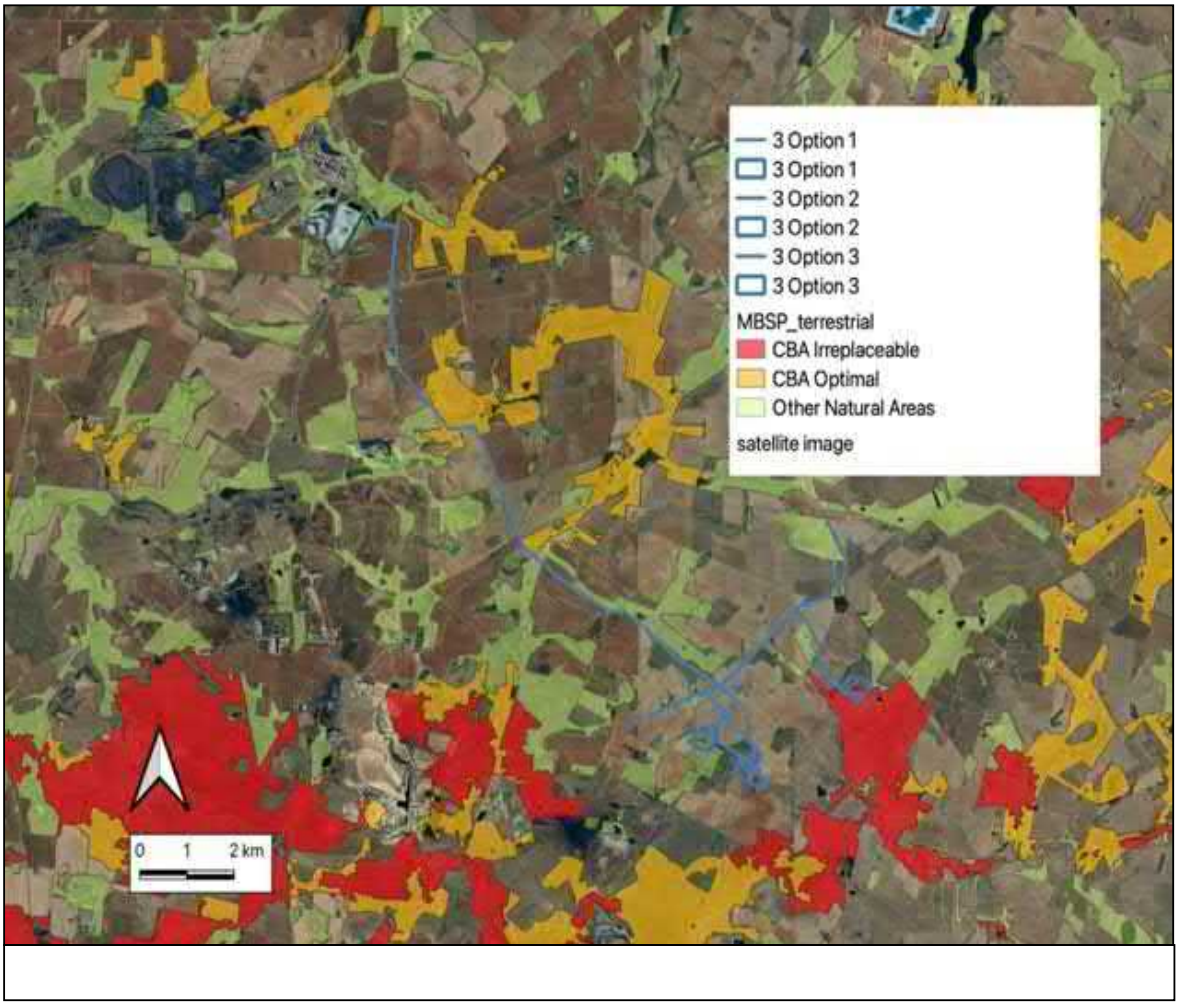


Figure 5-14: Biodiversity Map of the Project Area according to the MBSP (David Hoare Consulting, 2022)

5.2.3 PROTECTED AREAS

According to the National Parks Area Expansion Strategy 2008 (NPAES, 2008), there are no areas within the study area that have been identified as priority areas for inclusion in future protected areas. The study area is therefore outside the NPAES focus area. A draft National Protected Areas Expansion Strategy was published for public comment in 2018 but is not available as a spatial dataset. It does, however, reference the Mpumalanga Protected Area Expansion Strategy, in which priority areas are identified in terms of High, Medium and Low priorities. A map within this PDF document shows areas around Hendrina within the Low priority class that may include the site, but a spatial dataset to confirm this could not be sourced at the time of producing this report. On the basis of the Screening Tool output, which identifies "Protected Areas Expansion Strategy" as a factor within the study area, it is assumed that natural areas within the study area fall within this category (Low Priority - Mpumalanga Protected Area Expansion Strategy).

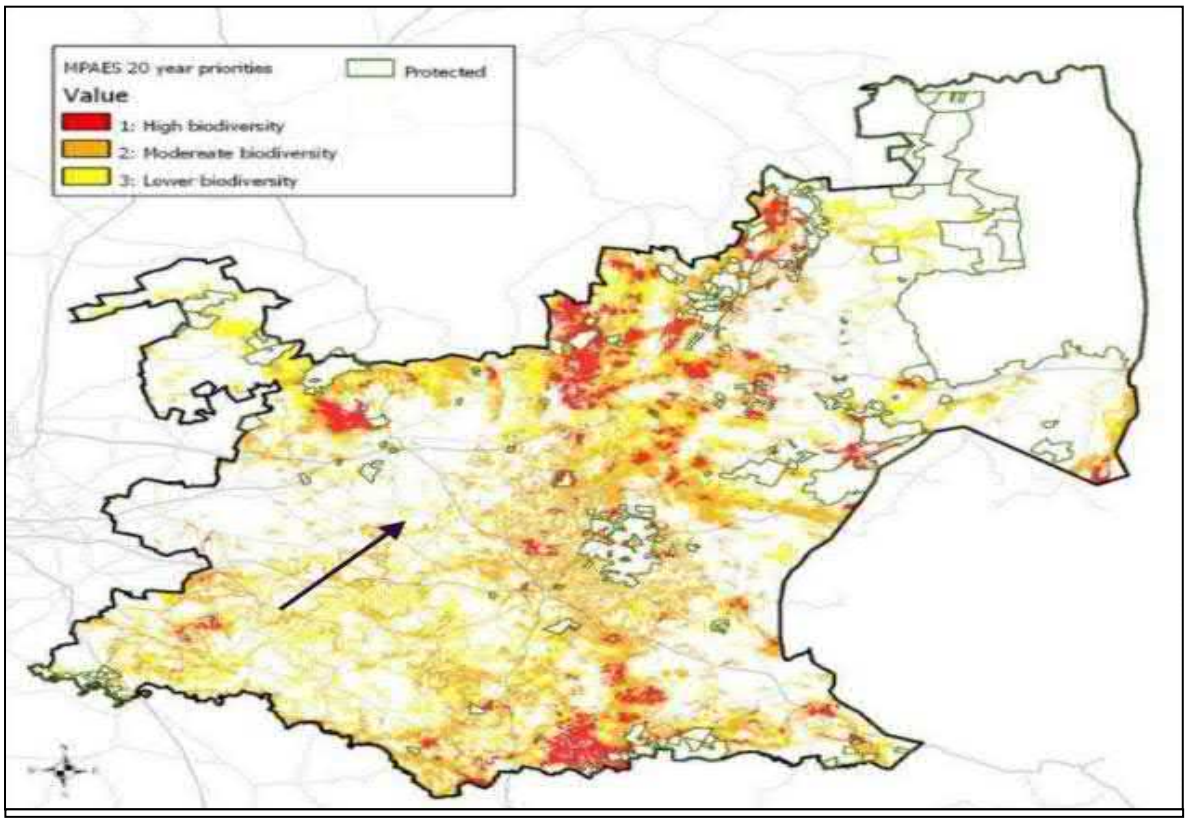


Figure 5-15: Mpumalanga Protected Area Expansion Strategy (Lotter 2015), arrow points to site.

5.2.4 PLANT SPECIES

Lists of plant species previously recorded in the study area were obtained from the South African National Biodiversity Institute (SANBI) website (http://newposa.sanbi.org/). These are listed in Appendix 3 of the Ecological Scoping Report. In order to ensure that all possible species were considered for the area, a much larger area was searched for potential species of concern and the total Red and Orange list flora of Mpumalanga was considered here. Despite this broader search, there are a relatively small number of species that were identified of conservation concern that could potentially occur in the broad area that includes the project area.

The list contains 18 species listed in an IUCN threat category (Critically Endangered, Endangered or Vulnerable) or Near Threatened category of which **10 have a high possibility of occurring in the general area** and in the type of habitats available in the study area. This does not mean that they will occur there, only that the review has identified that these are species that should be assessed as possibly occurring in the area. None of these species were encountered on site, but a more detailed survey of specific habitats would be required to

detect them, if they occurred there. None of the species recorded on site, see Appendix 3, of Ecological Scoping Report are listed in any threat category.

Plant species protected under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) are listed in Appendix 6 of the Ecological Scoping Report. None of the species on this list were encountered on site and none are considered likely to occur there, although some have a geographical distribution that includes the study area.

All plant species protected under the Northern Cape Nature Conservation Act, 2009 (Act 9 of 2009) are listed in Appendix 5 of the Ecological Scoping Report. A number of species were found on site that are protected according to the Mpumalanga Nature Conservation Act, 2009 (Act 9 of 2009). From the field survey, this includes the following: *Aloe bergeriana, Boophone disticha, Crinum bulbispermum, Gladiolus crassifolius, Gladiolus papilio and Habenaria filicornis*. Note that these plants were recorded during a general reconnaissance survey. It is likely that other individuals of these species, as well as individuals potentially from other protected species could potentially occur on site. Despite not being threatened, any impacts on these species will require a permit from the relevant authorities.

Tree species protected under the National Forest Act are listed in Appendix 2 of the Ecological Scoping Report. There are none with a geographical distribution that includes the region in which the proposed project is located. There are five species that have a geographical distribution that ends south of the study area, namely *Boscia albitrunca, Curtisia dentata, Elaeodendron croceum, Prunus africana* and *Pittosporum viridiflorum*.

No trees or woody plants of significant size were found on site, with the exception of the exotic Eucalyptus trees in two groves on site, and scattered Salix babylonica along the banks of the Olifants River. For all five species listed above, there was a distribution gap associated with the southern Highveld part of Mpumalanga, even if the species occurred in all surrounding areas. This partially reflects an absence of indigenous forest patches in this area, the habitat in which many of these protected trees occur.

In summary, no species of protected trees were found or are likely to occur in the geographical area that includes the site.

5.2.5 TERRESTRIAL FAUNA SPECIES

Vertebrate species (mammals, reptiles, amphibians) with a geographical distribution that includes the broader study area are listed in Appendix 4 of the Ecological Scoping Report. All threatened (Critically Endangered, Endangered or Vulnerable) or near threatened vertebrate animals that could occur in the study area and have habitat preference that includes habitats available in the study area, are discussed further below.

MAMMALS

There are 81 mammal species that have a geographical distribution that includes the study area, of which fourteen are listed in a conservation category of some level (Appendix 3 of the Ecological Scoping Report). This is a relatively moderate diversity of mammals compared to other parts of South Africa. Based on the natural state of the study area and surrounding areas, it is considered likely that some of these species could occur on site.

Of the species currently listed as threatened or protected (Appendix 5 of the Ecological Scoping Report for list of protected species), eight of those listed in **Table 5-3** are considered to have a medium to high probability of occurring on site and being potentially negatively affected by proposed activities associated with the proposed projects.

Table 5-3: Mammal species of conservation concern with a likelihood of occurring on site

SCIENTIFIC NAME	COMMON NAME	STATUS	LIKELIHOOD OF OCCURRENCE
Ourebia ourebi	Oribi	Endangered	Low
Pelea capreolus	Grey Rhebok	Near Threatened, protected	Medium
Felis nigripes	Black-footed Cat	Vulnerable, protected	High
Panthera pardus	Leopard	Vulnerable, protected	Low
Aonyx capensis	Cape Clawless Otter	Near Threatened, protected	Medium
Hydrictus maculicollis	Spotted-necked Otter	Vulnerable, protected	Medium
Poecilogale albinucha	African Striped Weasel	Near Threatened	Medium
Parahyaena brunnea	Brown hyaena	Near Threatened	Low
Atelerix frontalis	South African Hedgehog	Near Threatened, protected	High
Crocidura maquassiensis	Maquassie Musk Shrew	Vulnerable	Low
Crocidura mariquensis	Swamp Musk Shrew	Near Threatened	High
Amblysomus septentrionalis	Highveld Golden Mole	Near Threatened	Medium
Mystromys albicaudatus	White-tailed Rat	Vulnerable	Low
Otomys auratus	Vlei Rat	Near Threatened	High

REPTILES

A total of 60 reptile species have a geographical distribution that includes the broader study area in which the project site is found (Alexander & Marais 2007, Bates *et al*. 2014, Branch 1988, Marais 2004, Tolley & Burger 2007). This is a moderate diversity compared to average diversity in other parts of the country. Of the reptile species that could potentially occur in the study area, four have been listed in a threat category (**Table 5-4**). There are three reptile species of conservation concern that could potentially occur in the study area and that may therefore be affected by the proposed projects.

Table 5-4: Reptile species of conservation concern with a likelihood of occurring on site.

SCIENTIFIC NAME	COMMON NAME	STATUS	LIKELIHOOD OF OCCURRENCE
Chamaesaura aenea	Coppery grass lizard	Near Threatened	Medium to High
Chamaesaura macrolepis	Large-scaled Grass Lizard	Near Threatened	Low
Tetradactylus breyeri	Breyer's Long-tailed Seps	Vulnerable	Low

SCIENTIFIC NAME	COMMON NAME	STATUS	LIKELIHOOD OF OCCURRENCE
Homoroselaps dorsalis	Striped Harlequin Snake	Near Threatened	Medium to High

AMPHIBIANS

A total of 24 frog species have a geographical distribution that includes the general study area in which the project site is found (Du Preez & Carruthers, 2009). Some of these species are only marginally present in the study area due to the fact that their distribution range ends close to the study area. Of the frog species that could potentially occur in the study area, none are listed in a threat category, but one species is listed as protected, according to National legislation, the Giant Bullfrog.

It is concluded that the site contains habitat that is suitable for various frog species, although only one species of conservation concern is likely to occur in the study area. One frog species of concern is therefore potentially likely to be affected by development in the study area, as shown in **Table 5-5**.

Table 5-5: Amphibian species of conservation concern with a likelihood of occurring on site.

SCIENTIFIC NAME	COMMON NAME	STATUS	LIKELIHOOD OF OCCURRENCE
Pyxicephalus adspersus	Giant Bullfrog	Protected	Medium

PROTECTED ANIMALS

There are a number of animal species protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (Appendix 6 of the Ecological Scoping Report). According to this Act, "*a person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7*". Such activities include any that are "*of a nature that may negatively impact on the survival of a listed threatened or protected species*". This implies that any negative impacts on habitats in which populations of protected species occur or are dependent upon would be restricted according to this Act.

Those species protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) that have a geographical distribution that includes the site are listed in Appendix 4 of the Ecological Scoping Report, marked with the letter "N". This includes the following species:

- Black Wildebeest (doesn't occur on site),
- Oribi (unlikely to occur on site),
- White Rhinoceros (doesn't occur on site),
- Black-footed Cat,
- Serval,
- Leopard (probably does not occur on site),
- Cape Clawless Otter,
- Spotted-necked Otter,
- Cape Fox,
- Honey Badger,
- South African Hedgehog,
- Brown Hyena
- Giant Bullfrog.

There are additional species protected under the Mpumalanga Nature Conservation Act (Act No. 10 of 1998) (Appendix 5 of the Ecological Scoping Report). These include the following that have a geographical distribution that includes the site:

- Giant Bullfrog,

- South African Hedgehog,
- Honey Badger,
- Aardwolf,
- Brown Hyaena,
- Mountain Reedbuck,
- Black Wildebeest,
- Klipspringer,
- Orbi,
- Steenbok,
- Eland,
- Cape Clawless Otter
- Spotted-necked Otter,
- All species of reptiles, except the water leguaan, rock leguaan and all species of snakes, of which the following have a geographical distribution that includes the site:
  - Marsh terrapin
  - Leopard tortoise
  - Common dwarf gecko
  - Spotted dwarf gecko
  - Van Son's gecko
  - Delalande's sandveld lizard
  - Burchell's sand lizard
  - (Spotted sand lizard)
  - Coppery grass lizard
  - Cape grass lizard
  - Large-scaled grass lizard
  - Common girdled lizard
  - Common crag lizard
  - Yellow-throated plated lizard
  - Breyer's long-tailed seps
  - Short-headed legless skink
  - Thin-tailed legless skink
  - Wahlberg's snake-eyed skink
  - Cape skink
  - Red-sided skink
  - Speckled rock skink
  - Variable skink
  - Montane dwarf burrowing skink
  - Common flap-necked chameleon
  - Eastern ground agama
  - Southern rock agama.

5.2.6 HABITATS

The site is within an area of natural grassland. The grassland contains variation due to changes in topography, slope inclination, surface rockiness and the influence of water-flow and water retention in the landscape. A broad classification of the natural habitat units on site, which also reflects relatively uniform plant species compositional units, is as follows:

— Grassland (open grassland on undulating plains);
— Wetlands (seasonal wetlands in drainage valleys);
— Pans (seasonally inundated areas on the river floodplain);
— Secondary wetlands (cultivated or previously cultivated wetland areas);
— Secondary grassland (secondary grasslands on old lands);
— Cultivation (areas currently cultivated and fallow lands);
— Alien trees (stands of exotic trees);
— Degraded areas (disturbed areas with weeds or waste ground).
— Transformed (mines, buildings, bare areas).

A preliminary map of habitats within the study area, this shows only natural habitats, namely grassland and wetlands **Figure 5-16**.

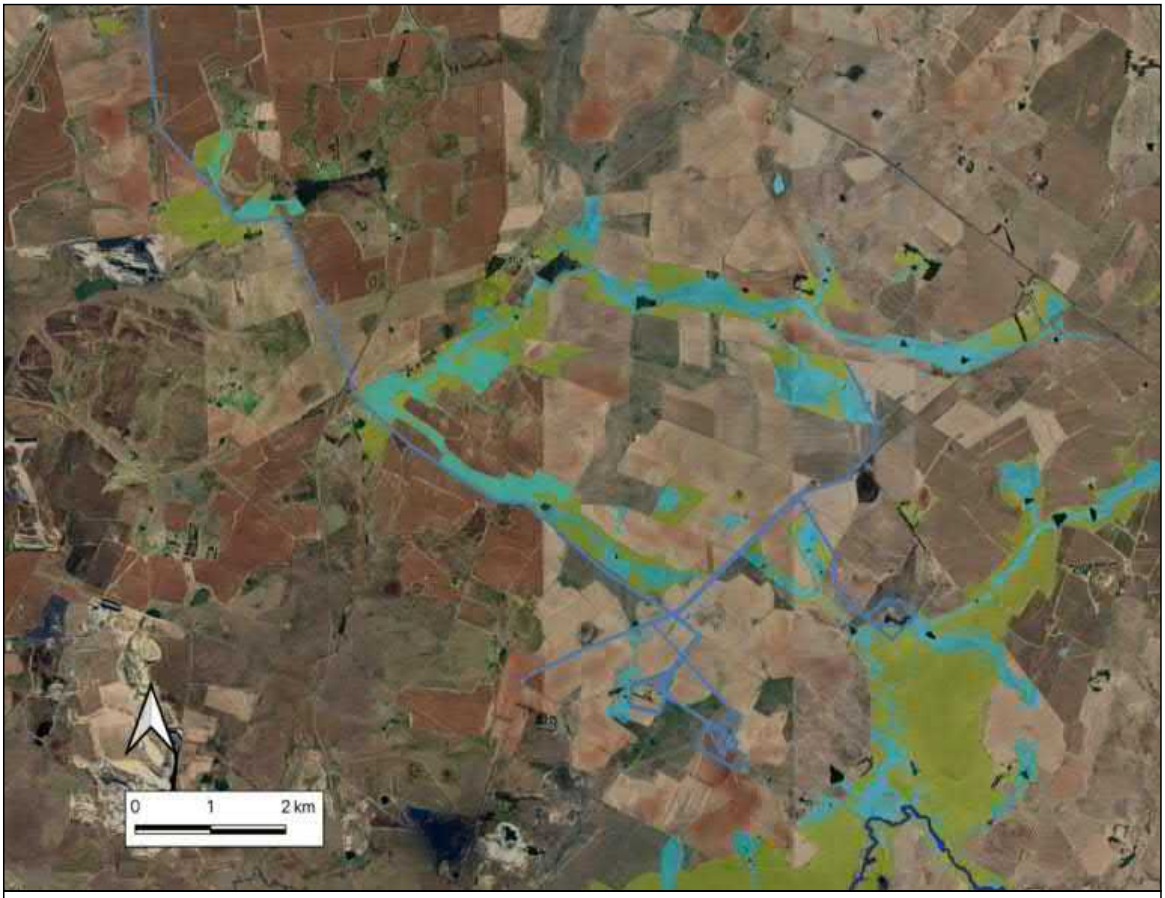


Figure 5-16: Main habitats of the study area (David Hoare Consulting, 2022)

To determine ecological sensitivity in the study area, local and regional factors were taken into account. There are some habitats in the study area that have been described as sensitive in their own right, irrespective of regional assessments. This includes primarily the stream beds and associated riparian zones and adjacent floodplains.

At a regional level, the CBA map for Mpumalanga indicates various parts of the study area as being important for conservation. There are large parts of the study area that fall within CBAs. Much of the remainder of the study area is heavily modified. The CBA map therefore corresponds with the distribution of remaining natural habitat on site.

In terms of other species of concern, including both plants and animals, the preferred habitat of each of these can be determined or has been described. They are, however, distributed amongst different habitats on site, which means that no single habitat is primarily important as habitat for species of concern.

A summary of sensitivities that occur on site and that may be vulnerable to damage from the proposed project are as follows:

- **CBA "Irreplaceable" areas**: The Mpumalanga Biodiversity Sector Plan (MBSP) (Mpumalanga Parks and Tourism Agency, 2014) shows areas on site within various conservation planning categories, including areas designated as "CBA: Irreplaceable". These are areas that are required to meet biodiversity targets (for biodiversity pattern and ecological process features), the implication being that there are no other areas that meet the biodiversity criteria for meeting these conservation planning objectives. The Provincial policy is that they should remain in a natural state. Where possible, impacts on these areas should be minimised.
- **Wetlands**: These are described here only in terms of being a unique botanical habitat and not in the sense of a formal wetland delineation, which is normally assessed in a separate specialist study. The wetlands must be delineated according to "DWAF, 2003: A Practical Guideline Procedure for the Identification and Delineation of Wetlands and Riparian Zones". Restrictions in terms of infrastructure within these areas should be according to the National Water Act (Act 36 of 1998), except where the wetlands fall within a CBA "Irreplaceable" area, in which case they should be considered to be "No-Go" areas.
- **Listed ecosystems**: Eastern Highveld Grassland and Eastern Temperate Freshwater Wetlands are both listed as Vulnerable in the National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011). However, the first is included almost entirely within a CBA: Irreplaceable area on site, so is already discussed in point 1 above. The second is a wetland vegetation type and is covered in point 2 above.
- **Grasslands**: Grassland vegetation, in a general sense has been identified as threatened nationally as a habitat type. Indications are that loss of any grassland habitat is permanent in an ecological and biodiversity sense, and it is not possible to restore grassland to a natural state after they have been disturbed. They should therefore be treated as sensitive and all efforts made to minimize impacts on any area of grassland. If possible, the footprint of any proposed infrastructure should be kept to a minimum within any natural grasslands, especially those in a moderate to good condition.
- **Plant species of concern**: There are a number of listed plant species that could potentially occur on site. The key habitats are grasslands and wetlands. There are also various protected species that could potentially occur on site

Based on this information, a map of habitat sensitivity on site is provided in **Figure 5-17**. This shows main habitat sensitivity classes on site, as follows:

- LOW for all transformed areas.
- MEDIUM-LOW for secondary grasslands in previously cultivated areas.
- MEDIUM for cultivated wetlands.
- MEDIUM-HIGH for all remaining natural habitat on site.
- HIGH for remaining natural habitat within "CBA: Irreplaceable" and "CBA: Optimal" areas.
- VERY HIGH for intact natural wetlands

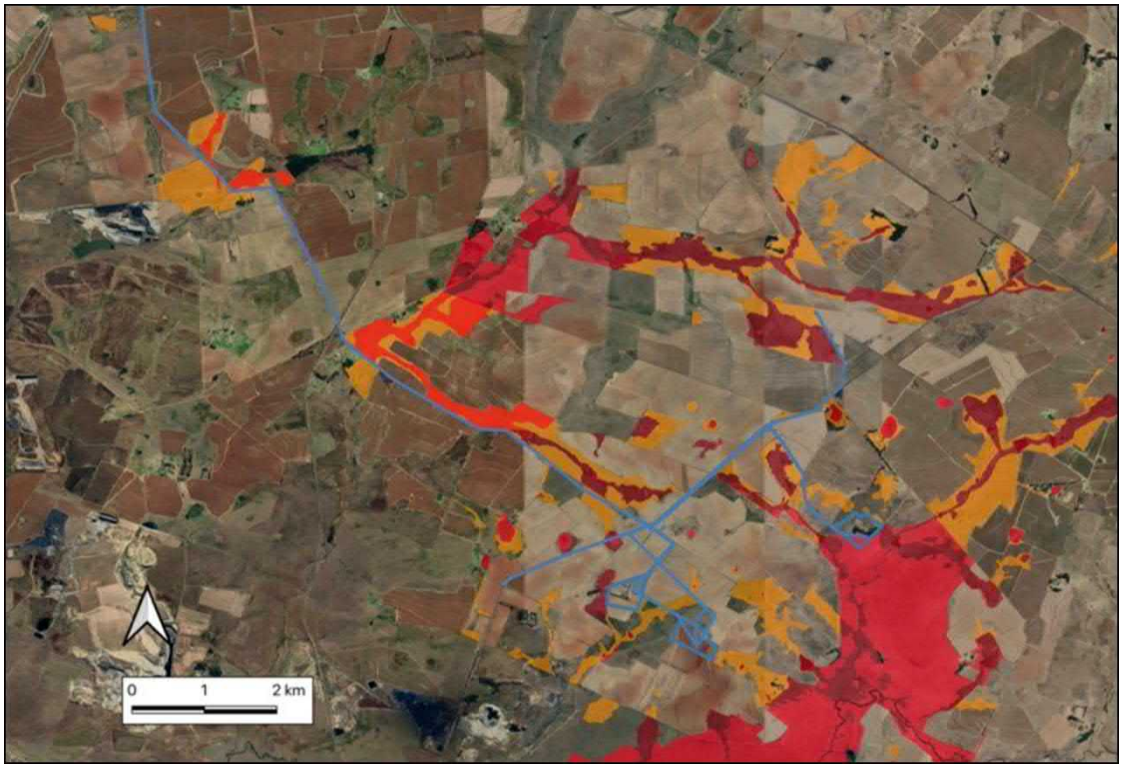


Figure 5-17: Habitat Sensitivity of the Study Area, including CBAs

5.2.7 AVIFAUNA

IMPORTANT BIRD AREAS

The project area is not located in an Important Bird Area (IBA). The closest IBA to the site is the Amersfoort-Bethal-Carolina IBA SA018, which is located approximately 3.5km to the east of the project area. The key species within this IBA is the globally threatened Botha's Lark, but the species was not recorded in the project area during four seasons of monitoring for the proposed wind energy facilities. However, due to the close proximity of the sites to the IBA, it is possible that some highly mobile target species which are also IBA trigger species, and which occur either permanently or sporadically in the IBA, might be impacted by the project when they leave to forage or breed beyond the borders of the IBA. Species that were recorded in the broader area and fall within this category are the following:

- Secretary bird — Sagittarius serpentarius
- Denham's Bustard — Neotis denhami
- Martial Eagle — Polemaetus bellicosus
- Black Harrier — Circus maurus
- African Grass Owl — Tyto capensis
- Lanner Falcon — Falco biarmicus
- Southern Bald Ibis — Geronticus calvus

BIRD HABITAT

Whilst much of the distribution and abundance of the bird species in the project area can be explained by the dominant biomes and vegetation types, it is also important to examine the modifications which have changed the natural landscape, and which may have an effect on the distribution of avifauna. These are sometimes evident at a much smaller spatial scale than the biome or vegetation types and are determined by a host of factors such as topography, land use and man-made infrastructure. The target species for the project area is defined as the

Species of Conservation Concern (SCC) together with the powerline sensitive species (susceptible to collisions or electrocutions).

The following bird habitat classes were identified in the project site.

GRASSLAND

The majority of the habitat in the project site comprises natural grassland. The grassland varies from dense stands of relatively high grass to areas of heavily grazed short grass. The priority species which could potentially use the natural grassland in the project site on a regular basis are the following:

- African Grass Owl (SCC)
- Denham's Bustard (SCC)
- Lanner Falcon (SCC)
- Secretary bird (SCC)
- Southern Bald Ibis (SCC)
- Blue Korhaan (SCC)
- Martial Eagle (SCC)
- African Harrier Hawk
- Amur Falcon
- Black-chested Snake Eagle
- Black-headed Heron
- Black-winged Kite
- Common Buzzard
- Greater Kestrel
- Helmeted Guineafowl
- Long-crested Eagle
- Marsh Owl
- Montagu's Harrier
- Pied Crow
- Rock Kestrel
- Spotted Eagle-Owl
- Western Barn Owl
- Western Cattle Egret
- White Stork

DRAINAGE AND WETLANDS

There are a number of wetlands in the project area, most of which are associated with drainage lines. The target species which could potentially use the wetlands in the project are the following:

- African Grass Owl (SCC)
- Grey Crowned Crane (SCC)
- African Black Duck
- African Sacred Ibis
- African Spoonbill
- African Swamphen
- Black-headed Heron
- Cape Shoveler
- Common Moorhen
- Egyptian Goose
- Glossy Ibis
- Great Egret

- Grey Heron
- Hadada Ibis
- Hamerkop
- Intermediate Egret
- Little Egret
- Marsh Owl
- Purple Heron
- Red-billed Teal
- Spur-winged Goose
- Squacco Heron
- White-faced Whistling Duck
- Yellow-billed Duck

AGRICULTURAL LANDS

The project area contains a patchwork of agricultural fields. Some fields are lying fallow or are in the process of being re-vegetated by grass. The target species which could potentially use the agricultural fields in the area are the following:

- Lanner Falcon (SCC)
- Southern Bald Ibis (SCC)
- Grey Crowned Crane (SCC)
- Martial Eagle (SCC)
- Amur Falcon
- Black-headed Heron
- Common Buzzard
- Egyptian Goose
- Hadada Ibis
- Helmeted Guineafowl
- Pied Crow
- Spur-winged Goose
- Western Barn Owl
- Western Cattle Egret

ALIEN TREES

The area contains few trees. Most trees are alien species, particularly Eucalyptus, Australian Acacia (Wattle), and Salix (Willow) species. Trees are often planted as wind breaks next to agricultural lands and around homesteads. Some of the drainage lines also have trees growing in them. The target species which could potentially use the alien trees in the area are the following:

- Lanner Falcon (SCC)
- Secretary bird (SCC)
- Southern Bald Ibis (SCC)
- Grey Crowned Crane (SCC)
- Martial Eagle (SCC)
- African Fish Eagle
- African Harrier Hawk
- African Sacred Ibis
- African Spoonbill
- Amur Falcon
- Black Sparrowhawk

- Black-chested Snake Eagle
- Black-headed Heron
- Black-winged Kite
- Common Buzzard
- Greater Kestrel
- Grey Heron
- Hadada Ibis
- Helmeted Guineafowl
- Long-crested Eagle
- Pied Crow
- Rock Kestrel
- Spotted Eagle-Owl
- Western Cattle Egret
- White Stork
- White-breasted Cormorant

DAMS AND PANS

The project area contains many earth dams located in drainage lines. There are also a number of small pans which are a potential drawcard for many target species. Lesser and Greater Flamingos could use pans for foraging and roosting. Large raptors could use the dams and pans for bathing and drinking. The target species which could potentially use the pans and dams in the area are the following:

- Lanner Falcon (SCC)
- Secretary bird (SCC)
- Greater Flamingo
- Maccoa Duck
- Martial Eagle (SCC)
- Yellow-billed Stork
- African Black Duck
- African Darter
- African Fish Eagle
- African Spoonbill
- Black-chested Snake Eagle
- Black-necked Grebe
- Cape Shoveler
- Cape Teal
- Common Moorhen
- Egyptian Goose
- Goliath Heron
- Great Crested Grebe
- Great Egret
- Grey Heron
- Hamerkop
- Intermediate Egret
- Little Egret
- Little Grebe
- Long-crested Eagle
- Purple Heron
- Red-billed Teal

— Red-knobbed Coot
— Reed Cormorant
— South African Shelduck
— Southern Pochard
— Spur-winged Goose
— Squacco Heron
— White-backed Duck
— White-breasted Cormorant
— White-faced Whistling Duck
— Yellow-billed Duck

HIGH VOLTAGE LINES

The project areas are intersected by two high voltage transmission lines, i.e. Camden Duvha 1 400kV line and the Camden Komati 1 275kV, as well as several reticulation lines. The target species which could potentially perch, and roost on the transmission towers and powerlines in the project area are the following:

— Lanner Falcon (SCC)
— Southern Bald Ibis (SCC)
— Martial Eagle (SCC)
— Amur Falcon
— Black-chested Snake Eagle
— Black-headed Heron
— Black-winged Kite
— Common Buzzard
— Egyptian Goose
— Greater Kestrel
— Hadada Ibis
— Helmeted Guineafowl
— Long-crested Eagle
— Pied Crow
— Rock Kestrel
— White Stork

PRIORITY SPECIES

The South African Bird Atlas Project 2 (SABAP2) data indicates that a total of 173 bird species could potentially occur within the broader area. Appendix 1 of the Avifaunal Scoping report provides a comprehensive list of all the species. Of these, 63 species are classified as target species. Of the target species, 57 are likely to occur regularly in the project area (see **Table 5-6** and **Table 5-7** below).

Table 5-6 below lists all the SCC that could occur in the project area and the possible impact by the proposed hydrogen and ammonia facility.

The following abbreviations and acronyms are used:

— NT = Near threatened
— VU = Vulnerable
— EN = Endangered

Table 5-6: Priority species potentially occurring at the development area

Species name	Scientific name	Abundance and status				Occurrence in the Project area		Habitat						Potential impacts	
		SABAP 2 Full protocol reporting rate	SABAP 2 Ad hoc protocol reporting rate	Global status	Regional status	Recorded during monitoring	Likelihood of occurrence in the project area	Grassland	Agriculture	Alien trees	Pans and dams	Drainage lines and wetlands	High voltage lines	Displacement - habitat transformation: A & H Facility	Displacement - disturbance (breeding): A & H Facility
African Grass Owl	*Tyto capensis*	0.0		-	VU		M	x				x		x	
Blue Korhaan	*Eupodotis caerulescens*	20.00	0.00	NT	LC	x	H	x						x	x
Denham's Bustard	*Neotis denhami*	4.00	3.03	NT	VU	x	H	x						x	
Greater Flamingo	*Phoenicopterus roseus*	22.67	3.03	-	NT	x	L				x				
Grey Crowned Crane	*Balearica regulorum*	0.00	3.03	EN	EN	x	L		x	x		x		x	
Lanner Falcon	*Falco biarmicus*	4.00	0.00	-	VU	x	M	x	x	x	x		x	x	x
Lesser Flamingo	*Phoeniconaias minor*	9.33	0.00	NT	NT	x	M								
Maccoa Duck	*Oxyura maccoa*	13.33	0.00	VU	NT		M				x				
Martial Eagle	*Polemaetus bellicosus*	1.33	0.00	EN	EN		L	x	x	x	x		x	x	
Secretarybird	*Sagittarius serpentarius*	8.00	0.00	EN	VU	x	H	x		x	x			x	x
Southern Bald Ibis	*Geronticus calvus*	2.67	0.00	VU	VU	x	M	x	x	x			x	x	
Yellow-billed Stork	*Mycteria ibis*	4.00	0.00	-	EN	x	M				x				

Table 5-7 lists the same for the powerline sensitive species and the impacts that could be caused by the powerline. The following abbreviations and acronyms are used:

— NT = Near threatened
— VU = Vulnerable
— EN = Endangered

Table 5-7: Powerline sensitive species potentially occurring at the project area and potential impacts by the proposed 132kV grid connection on them

		Abundance and status				Occurrence in the project area		Habitat						Potential impacts		
Species name	Scientific name	SABAP 2 Full protocol reporting rate	SABAP 2 Ad hoc protocol reporting rate	Global status	Regional status	Recorded during monitoring	Likelihood of occurrence in the project area	Grassland	Agriculture	Alien trees	Pans and dams	Drainage lines and wetlands	High voltage lines	Displacement - habitat transformation: Powerline	Displacement - disturbance: Powerline	Collision mortality: Powerline
African Grass Owl	*Tyto capensis*	0.0		-	VU		M	x				x		x	x	x
Blue Korhaan	*Eupodotis caerulescens*	20.00	0.00	NT	LC	x	H	x						x	x	x
Denham's Bustard	*Neotis denhami*	4.00	3.03	NT	VU	x	H	x						x	x	x
Greater Flamingo	*Phoenicopterus roseus*	22.67	3.03	-	NT	x	L				x					x
Grey Crowned Crane	*Balearica regulorum*	0.00	3.03	EN	EN	x	L		x	x		x				x
Lanner Falcon	*Falco biarmicus*	4.00	0.00	-	VU	x	M	x	x	x	x		x		x	
Lesser Flamingo	*Phoeniconaias minor*	9.33	0.00	NT	NT	x	M									x
Maccoa Duck	*Oxyura maccoa*	13.33	0.00	VU	NT		M				x					x
Martial Eagle	*Polemaetus bellicosus*	1.33	0.00	EN	EN		L	x	x	x	x		x			
Secretarybird	*Sagittarius serpentarius*	8.00	0.00	EN	VU	x	H	x		x	x			x	x	x
Southern Bald Ibis	*Geronticus calvus*	2.67	0.00	VU	VU	x	M	x	x	x			x	x		x
Yellow-billed Stork	*Mycteria ibis*	4.00	0.00	-	EN	x	M				x					x
African Black Duck	*Anas sparsa*	1.33	3.03	-	-		L				x	x				x
African Darter	*Anhinga rufa*	26.67	6.06	-	-	x	M				x					x

Species name	Scientific name	Abundance and status				Occurrence in the project area		Habitat						Potential impacts		
		SABAP 2 Full protocol reporting rate	SABAP 2 Ad hoc protocol reporting rate	Global status	Regional status	Recorded during monitoring	Likelihood of occurrence in the project area	Grassland	Agriculture	Alien trees	Pans and dams	Drainage lines and wetlands	High voltage lines	Displacement - habitat transformation: Powerline	Displacement - disturbance: Powerline	Collision mortality: Powerline
African Fish Eagle	*Haliaeetus vocifer*	5.33	0.00	-	-	x	M			x	x					
African Harrier Hawk	*Polyboroides typus*	5.33	0.00	-	-	x	M	x		x						
African Sacred Ibis	*Threskiornis aethiopicus*	45.33	6.06	-	-	x	H			x		x				x
African Spoonbill	*Platalea alba*	32.00	21.21	-	-	x	H			x	x	x				x
African Swamphen	*Porphyrio madagascariensis*	4.00	0.00	-	-		M					x				x
Amur Falcon	*Falco amurensis*	5.33	0.00	-	-	x	M	x	x	x			x			
Black Sparrowhawk	*Accipiter melanoleucus*	12.00	0.00	-	-	x	M			x						
Black-chested Snake Eagle	*Circaetus pectoralis*	6.67	0.00	-	-	x	M	x		x	x		x			
Black-headed Heron	*Ardea melanocephala*	65.33	9.09	-	-	x	H	x	x	x		x	x			x
Black-necked Grebe	*Podiceps nigricollis*	9.33	0.00	-	-		M				x					x
Black-winged Kite	*Elanus caeruleus*	82.67	21.21	-	-	x	H	x		x			x			
Cape Shoveler	*Spatula smithii*	52.00	6.06	-	-	x	H				x	x				x
Cape Teal	*Anas capensis*	16.00	0.00	-	-		M				x					x
Common Buzzard	*Buteo buteo*	22.67	3.03	-	-	x	H	x	x	x			x			
Common Moorhen	*Gallinula chloropus*	21.33	6.06	-	-		H				x	x				
Egyptian Goose	*Alopochen aegyptiaca*	88.00	24.24	-	-	x	H		x		x	x	x			x
Glossy Ibis	*Plegadis falcinellus*	24.00	6.06	-	-	x	H					x				x
Goliath Heron	*Ardea goliath*	6.67	0.00	-	-		M				x					x
Great Crested Grebe	*Podiceps cristatus*	10.67	3.03	-	-	x	M				x					x
Great Egret	*Ardea alba*	5.33	3.03	-	-	x	M				x	x				x
Greater Kestrel	*Falco rupicoloides*	1.33	0.00	-	-	x	L	x		x			x		x	

Species name	Scientific name	Abundance and status				Occurrence in the project area		Habitat						Potential impacts		
		SABAP 2 Full protocol reporting rate	SABAP 2 Ad hoc protocol reporting rate	Global status	Regional status	Recorded during monitoring	Likelihood of occurrence in the project area	Grassland	Agriculture	Alien trees	Pans and dams	Drainage lines and wetlands	High voltage lines	Displacement - habitat transformation: Powerline	Displacement - disturbance: Powerline	Collision mortality: Powerline
Grey Heron	*Ardea cinerea*	36.0	9.1	-	-	x	H			x	x	x				x
Hadada Ibis	*Bostrychia hagedash*	86.67	15.15	-	-	x	H		x	x		x	x			x
Hamerkop	*Scopus umbretta*	9.33	6.06	-	-	x	M				x	x				x
Helmeted Guineafowl	*Numida meleagris*	54.67	15.15	-	-	x	H	x	x	x			x	x	x	
Intermediate Egret	*Ardea intermedia*	30.67	6.06	-	-	x	H				x	x				x
Little Egret	*Egretta garzetta*	17.33	6.06	-	-	x	M				x	x				x
Little Grebe	*Tachybaptus ruficollis*	61.33	15.15	-	-	x	H				x					x
Long-crested Eagle	*Lophaetus occipitalis*	4.00	3.03	-	-	x	M	x		x	x		x			
Marsh Owl	*Asio capensis*	20.00	0.00	-	-	x	H	x				x				x
Montagu's Harrier	*Circus pygargus*	1.33	0.00	-	-	x	M	x								
Pied Crow	*Corvus albus*	14.67	3.03	-	-	x	H	x	x	x			x		x	
Purple Heron	*Ardea purpurea*	13.33	9.09	-	-		M				x	x				x
Red-billed Teal	*Anas erythrorhyncha*	58.67	12.12	-	-	x	H				x	x				x
Red-knobbed Coot	*Fulica cristata*	78.67	27.27	-	-	x	H				x					x
Reed Cormorant	*Microcarbo africanus*	73.33	21.21	-	-	x	H				x					x
Rock Kestrel	*Falco rupicolus*	4.00	0.00	-	-	x	M	x		x			x		x	
South African Shelduck	*Tadorna cana*	10.67	0.00	-	-		M				x					x
Southern Pochard	*Netta erythrophthalma*	21.33	3.03	-	-	x	H				x					x
Spotted Eagle-Owl	*Bubo africanus*	2.67	0.00	-	-	x	M	x		x						x
Spur-winged Goose	*Plectropterus gambensis*	58.67	0.00	-	-	x	H		x		x	x				x
Squacco Heron	*Ardeola ralloides*	5.33	9.09	-	-		M				x	x				x

Species name	Scientific name	Abundance and status				Occurrence in the project area		Habitat						Potential impacts		
		SABAP 2 Full protocol reporting rate	SABAP 2 Ad hoc protocol reporting rate	Global status	Regional status	Recorded during monitoring	Likelihood of occurrence in the project area	Grassland	Agriculture	Alien trees	Pans and dams	Drainage lines and wetlands	High voltage lines	Displacement - habitat transformation: Powerline	Displacement - disturbance: Powerline	Collision mortality: Powerline
Western Barn Owl	*Tyto alba*	2.67	0.00	-	-		L	x	x							x
Western Cattle Egret	*Bubulcus ibis*	62.67	18.18	-	-	x	H	x	x	x						x
White Stork	*Ciconia ciconia*	5.33	0.00	-	-	x	H	x		x			x			x
White-backed Duck	*Thalassornis leuconotus*	8.00	3.03	-	-		M				x					x
White-breasted Cormorant	*Phalacrocorax lucidus*	26.67	15.15	-	-	x	M			x	x					x
White-faced Whistling Duck	*Dendrocygna viduata*	9.33	3.03	-	-	x	M				x	x				x
Yellow-billed Duck	*Anas undulata*	81.33	18.18	-	-	x	H				x	x				x

AVIFAUNA SENSITIVITY

— **100m all infrastructure exclusion zone (barring essential roads and grid line crossings) around drainage lines and associated wetlands.** Wetlands are important breeding, roosting and foraging habitat for a variety of Red List priority species, most notably for African Grass Owl (SA status Vulnerable), Grey Crowned Crane (SA status Endangered).

— According to the Terrestrial Animal Species Protocol, confirmed habitat, or the presence SCC within the project area, triggers a High sensitivity classification. The classification should therefore be High sensitivity for the project area, based on actual conditions recorded on the ground during surveys at the proposed wind energy facilities, which included the area covered by the project area. The following SCC were recorded in the project area: Secretary bird (Globally Endangered, Locally Vulnerable), Southern Bald Ibis (Locally and Globally Vulnerable), Blue Korhaan (Globally Near-threatened), Denham's Bustard (Globally Near-threatened, Regionally Vulnerable) Lanner Falcon (Regionally Vulnerable) and Lesser Flamingo (Globally and Regionally Near threatened).

The area where the avifaunal pre-construction monitoring for the Hendrina GH&A Facility are shown in **Figure 5-18.**

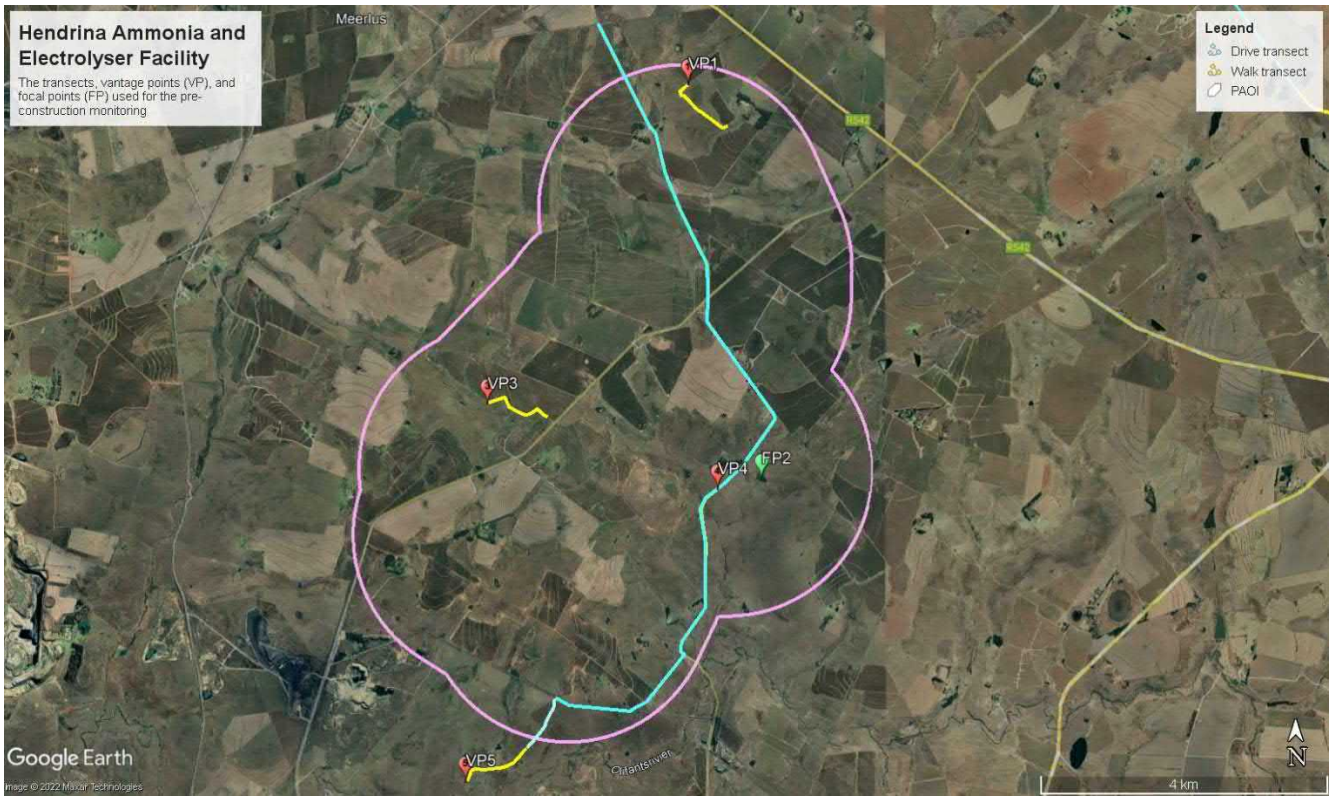


Figure 5-18: Area where monitoring is taking place, with position of Vantage points, focal points, drive transects, walk transects and the project area.

5.2.8 BATS

Currently there is no evidence of GH&A facilities posing a direct threat of fatality impact on bats during operation. However, roosting and foraging habitats may be destroyed during the construction phase. This is primarily due the fact that such facilities require areas of land to be cleared, and in some cases, earthworks are required for levelling purposes. This can result in habitat that is suitable for micro roosts, such as rocky outcrops, clumps of trees and certain vegetation being destroyed, which can also be fatal to bats residing in such roosts. Natural vegetation can support higher insect food quantities and diversity than cleared land, therefore foraging habitat can also be displaced.

The presence of security lights on and around these facilities creates significant light pollution that can impact bat feeding habits and species compositions negatively, by artificially discouraging photophobic (light averse)

species and favouring species that readily forage around insect-attracting lights. Additionally, if the buildings and associated infrastructure for these facilities are placed close to wind turbines, the light pollution at these buildings can attract photophilic bat species, thereby significantly increasing their chances of being killed by moving blades of turbines within close proximity.

Google Earth satellite imagery and verifications during site visits were used to spatially demarcate areas of the site with high and moderate sensitivities relating to bat species ecology and habitat preferences, where high sensitivities are no-go zones for certain GHA infrastructure. **Figure 5-19** depicts the sensitive areas of the site, based on features identified to be important for foraging and roosting of the species that are most likely to occur on site. Shaded red = high sensitivity; Red line = 200m high sensitivity buffer; Shaded orange = medium sensitivity; Orange line = 150m medium sensitivity buffer. The three options for the GHA facility are indicated in green.

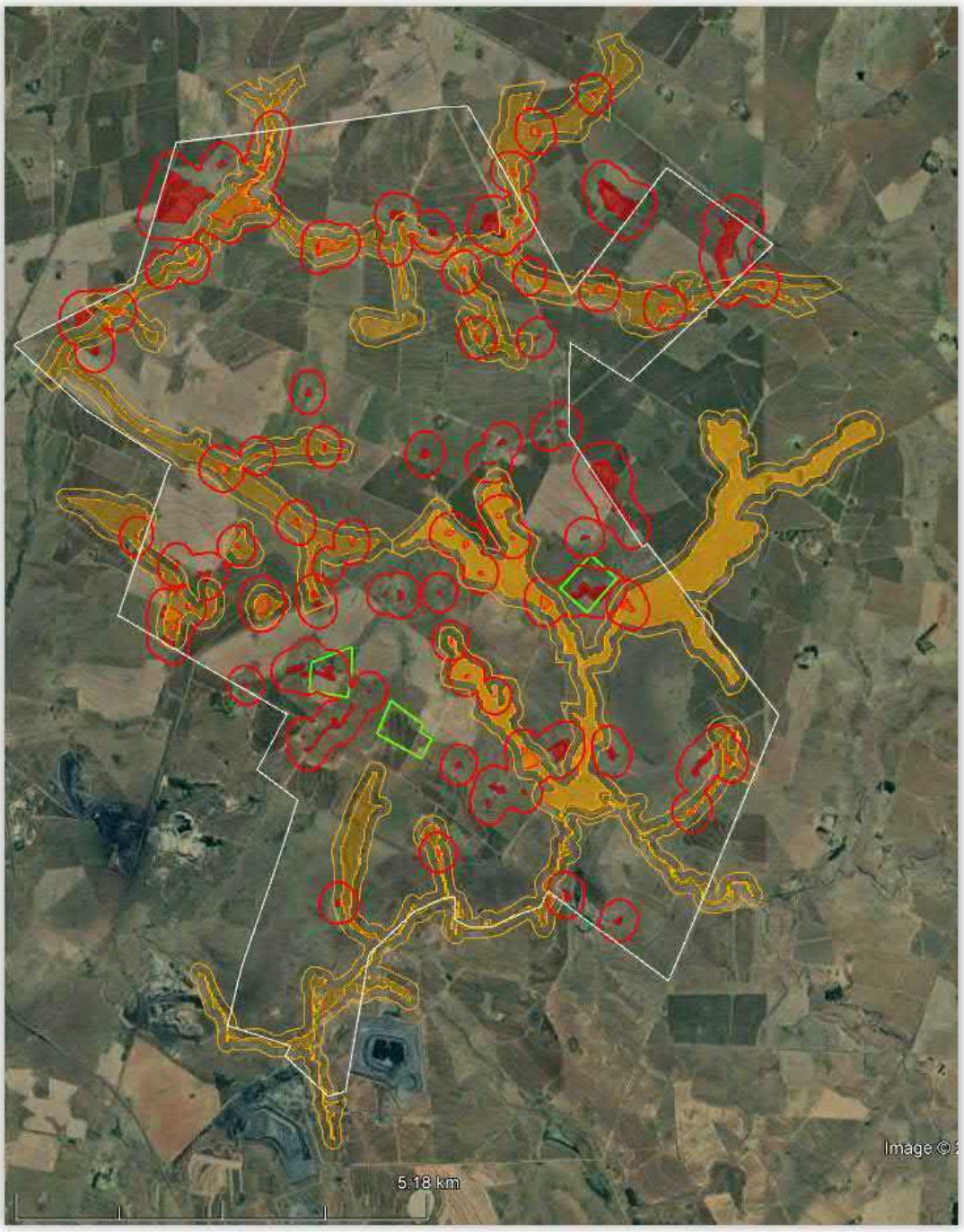


Figure 5-19: Bat Site Sensitivity of the area (Animalia, 2022)

Table 5-8 below indicates the species of bat which have been confirmed to occur on site, those unconfirmed species which may potentially occur on site, as well as those occurring in the broader area of the site based on literature review. For each species, the risk of impact by wind energy infrastructure was assigned by MacEwan et al. (2020) based on their distributions, altitudes at which they fly, and foraging ecology. The predicted risk of impact incurred by substations is inferred by literature-based foraging ecology for each species.

Table 5-8: Species currently confirmed on site, previously recorded in the area, or potentially occurring. Roosting and foraging habitats in the study area, conservation status and risk of impact are also briefly described per species (Monadjem et al. 2020).

SPECIES	COMMON NAME	OCCURRENCE IN AREA*	CONSERVATION STATUS (SANBI & EWT, 2016)	POSSIBLE ROOSTING HABITAT IN THE LARGER AREA OF THE SITE	POSSIBLE FORAGING HABITAT IN THE LARGER AREA OF THE SITE	RISK OF IMPACT FOR GHA
Tadarida aegyptiaca	Egyptian free-tailed bat	Confirmed on site	Least Concern (2016 Regional Listing)	Hollows in trees, and behind the bark of dead trees. The species has also taken to roosting in roofs of buildings.	It forages over a wide range of habitats; its preferences of foraging habitat seem independent of vegetation. It seems to forage in all types of habitats.	Medium to Low (GHA)
Sauromys petrophilus	Robert's flat-headed bat	Confirmed on site	Least Concern (2016 Regional Listing)	Crevices in rocks, expansion joints in bridges and crevices in buildings.	Open air forager that will forage over grassland and other open terrain on site.	Medium to Low (GHA)
Mops midas	Midas free-tailed bat	Confirmed in 100km radius	Least Concern (2016 Regional Listing)	Hollows in trees, and behind the bark of dead trees. The species has also taken to roosting in roofs of buildings.	It forages over a wide range of habitats; its preferences of foraging habitat seem independent of vegetation. It seems to forage in all types of habitats.	Medium to Low (GHA)
Laephotis (Neoromicia) capensis	Cape serotine	Confirmed on site	Least Concern (2016 Regional Listing)	Roosts in the roofs of houses and buildings, and also under the bark of trees.	It appears to tolerate a wide range of environmental conditions from arid semi-desert areas to montane grasslands, forests, and savannahs. But is predominantly a medium height clutter edge forager on site.	High (GHA)
Laephotis zuluensis	Zulu serotine	Confirmed in 100km radius	Least Concern (2016 Regional Listing)	Roosts under the bark of trees, and possibly roofs of buildings.	Predominantly a medium height clutter edge forager on site.	Medium to Low (GHA)
Pipistrellus hesperidus	Dusky pipistrelle	Confirmed in 100km radius	Least Concern (2016 Regional Listing)	Roosts under the bark of trees, and possibly roofs of buildings.	Prefers vegetation edges and clutter with open water sources.	Medium to Low (GHA)
Pipistrellus rusticus	Rusty pipistrelle	Confirmed in 100km radius	Least Concern (2016 Regional Listing)	Roosts under the bark of trees, and possibly roofs of buildings.	Prefers vegetation edges and clutter with open water sources.	Medium to Low (GHA)
Miniopterus natalensis	Natal long-fingered bat	Confirmed on site	Least Concern (2016 Regional Listing)	Caves and mine tunnels present in the larger area, may also take residence in suitable hollows such as culverts under roads.	Clutter-edge forager. May forage in more open terrain during suitable weather.	Medium (GHA)
Miniopterus fraterculus	Lesser long-fingered bat	Confirmed in 100km radius	Least Concern (2016 Regional Listing)	Caves and mine tunnels present in the larger area.	Clutter-edge forager. May forage in more open terrain during suitable weather.	Medium (GHA)

Eptesicus hottentotus	Long-tailed serotine	Confirmed on site	Least Concern (2016 Regional Listing)	It is a crevice dweller roosting in rock crevices in the larger area, as well as other crevices in buildings.	It generally seems to prefer woodland habitats, and forages on the clutter edge. But may still forage over open terrain occasionally.	Medium to Low (GHA)
Myotis tricolor	Temmink's myotis	Confirmed in 100km radius	Least Concern (2016 Regional Listing)	Caves and mine tunnels present in the larger area, may also take residence in suitable hollows such as culverts under roads.	Clutter-edge forager. May forage in more open terrain during suitable weather.	Medium (GHA)
Myotis welwitschii	Welwitsch's myotis	Confirmed in 100km radius	Least Concern (2016 Regional Listing)	Caves and mine tunnels present in the larger area, may also take residence in suitable hollows such as culverts under roads.	Clutter-edge forager, unlikely on site due to preference for mountains/hillsides.	Medium (GHA)
Taphozous mauritianus	Mauritian tomb bat	Confirmed in 100km radius	Least Concern (2016 Regional Listing)	Roost against the walls of buildings under roof overhangs or on large tree trunks. Often vigilant and conspicuous during daytime.	Open terrain forager may forage over open grasslands on site.	Medium (GHA)
Rhinolophus blasii	Blasius's horseshoe bat	Confirmed in 100km radius	Near Threatened (2016 Regional Listing)	Caves and mine tunnels present in the larger area.	Vegetation clutter forager, clumps of trees on site.	Medium (GHA)
Rhinolophus clivosus	Geoffroy's horseshoe bat	Confirmed in 100km radius	Least Concern (2016 Regional Listing)	Caves and mine tunnels present in the larger area.	Vegetation clutter forager, clumps of trees on site.	Medium (GHA)
Rhinolophus swinnyi	Swinny's horseshoe bat	Confirmed in 100km radius	Vulnerable (2016 Regional Listing)	Caves and mine tunnels present in the larger area.	Vegetation clutter forager, clumps of trees on site.	Medium (GHA)
Rhinolophus simulator	Bushveld horseshoe bat	Confirmed in 100km radius	Least Concern (2016 Regional Listing)	Caves and mine tunnels present in the larger area.	Vegetation clutter forager, clumps of trees on site.	Medium (GHA)
Scotophilus dinganii	Yellow-bellied house bat	Confirmed on site	Least Concern (2016 Regional Listing)	Roofs of buildings and other suitable hollows.	Clutter-edge forager. May forage in more open terrain during suitable weather.	Medium to Low (GHA)
Nycteris thebaica	Egyptian slit-faced bat	Confirmed in 100km radius	Least Concern (2016 Regional Listing)	Suitable hollows such as culverts under roads, vacant buildings and hollow tree trunks.	Vegetation clutter forager, clumps of trees on site.	High (GHA)
Cloeotis percivali	Percival's short-eared trident bat	Confirmed in 100km radius	Endangered (2016 Regional Listing)	Caves and mine tunnels present in the larger area.	Vegetation clutter forager, clumps of trees on site.	High (GHA)
Hipposideros caffer	Sundevall's leaf-nosed bat	Confirmed in 100km radius	Least Concern (2016 Regional Listing)	Caves and mine tunnels present in the larger area. Possibly hollows such as road culverts.	Vegetation clutter forager, clumps of trees on site.	High (GHA)
Epomophorus wahlbergi	Wahlberg's epauletted fruit bat	Confirmed in 100km radius	Least Concern (2016 Regional Listing)	Roosts in dense foliage of large, leafy trees in the larger area, and may travel several kilometres each night to reach fruiting trees.	Feeds on fruit, nectar, pollen and flowers. If and where available on or near site.	Low (GHA)

5.3 SOCIAL ENVIRONMENT

5.3.1 LAND USE

According to the South African National Land Cover dataset (Geoterraimage 2020), much of the visual assessment area is classified as “Cultivated Land” interspersed with significant areas of “Grassland”. Small tracts of forested land and numerous water bodies are scattered throughout the study area (**Figure 5-20**).

Commercial agriculture is the dominant activity in the study area, with the main focus being maize cultivation and livestock grazing. There are multiple farm portions in the study area, resulting in a relatively moderate density of rural settlement with many scattered farmsteads in evidence. Built form in much of the study area comprises farmsteads, ancillary farm buildings and workers’ dwellings, gravel access roads, telephone lines, fences and windmills.

High levels of human influence are however visible in the south-western sector of the study area, where coal mining activities, along with some very prominent spoil heaps occur.

Other evidence of significant human influence includes road, rail, telecommunications and high voltage electricity infrastructure.

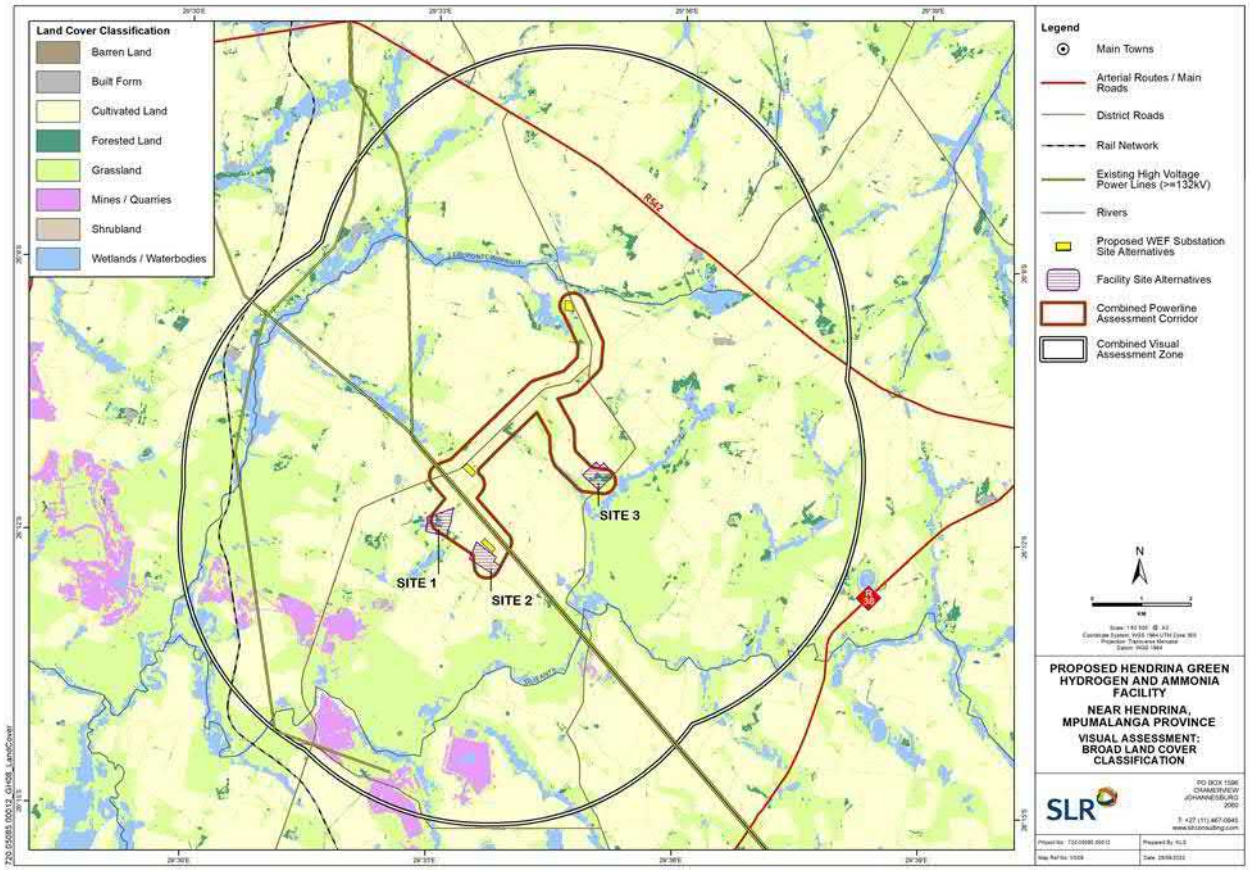


Figure 5-20: Broad land cover classification (SLR, 2022)

SURROUNDING AREAS

Mining activity in parts of the study area have altered the natural topography significantly with mine dumps forming prominent features in the landscape. Slopes across the study area are relatively gentle to moderate, with

steeper slopes being largely associated with the more incised river valleys. The main water course in the study area is the Olifants River which traverses the study area in a west-east direction.

5.3.2 NOISE CLIMATE

The existing noise climate surrounding the Hendrina GH&A Facility is predominantly rural with very low baseline noise levels anticipated. Most dwellings featuring in the vicinity of the project focus area are scattered in a heterogeneous fashion, typical of a rural area. Croplands, animal husbandry and subsistence farming are predominant in the study area.

Noise sources may include birds, insects, livestock and activities of resident farmers. Anthropogenic influences may include traffic on local roads.

Ambient (background) noise levels were measured during the week of 30 July to 6 August 2021 in accordance with the South African National Standard SANS 10103:2008, with the ambient sound levels measured at two different locations. The measurements indicate that the ambient sound levels are elevated at all the measurement locations.

The two measurement locations had different soundscapes, with the one location being very quiet, being located away from typical human habitation, animals or vegetation, with the second location within 300 m of the R542 road. The R542 is used as a coal transport

The ambient sound levels concluded that, excluding locations up to an estimated distance of 1,000 m from the R542 road, that ambient sound levels are expected to be low and would be typical of a rural noise district. The acceptable zone sound level (noise rating level) during low and no-wind conditions would be typical of a rural noise district are

— 45 dBA for the daytime period; and,
— 35 dBA for the night-time period.

Residential areas and potential noise-sensitive developments/receptors/communities (NSRs) were identified using aerial images as well as a physical site visit. Based on information gained during the site visit by the noise specialists the site, Alternative 1 has two (NSR29 & NSR 28) possible receptors that are within a range of encountering 35dbA of noise from the proposed facility. It should be noted that the upper limit for noise receptors is 45dbA:

— NSR 29 represents a caravan. There was no access to the site and the noise sensitive receptor is assumed noise-sensitive.
— NSR 28 is an old farm dwelling, currently used by the employees of the Overlooked Coal mine. An employee confirmed that the offices are not used for residential activities

Sensitive receptors are identified as areas that may be impacted negatively due to noise associated with the proposed GH&A Facility. Being such a remotely located site, dominant receptors in the area surrounding the site include small farmsteads and farmhouses. The specific sensitive receptors considered in this study are presented in **Figure 5-21 & Figure 5-22.**

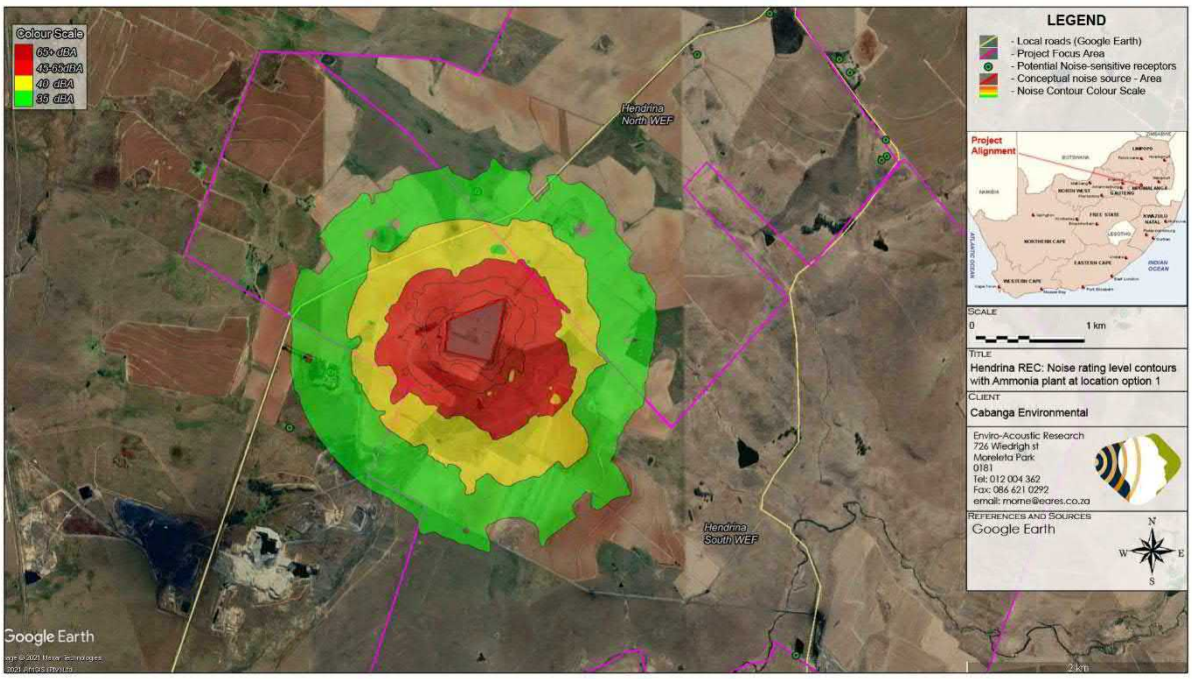


Figure 5-21: Sensitive receptors 28 & 29 surrounding the Hendrina GH&A Facility Alternative 1(Preferred) (Enviro-Acoustic Research, 2021)

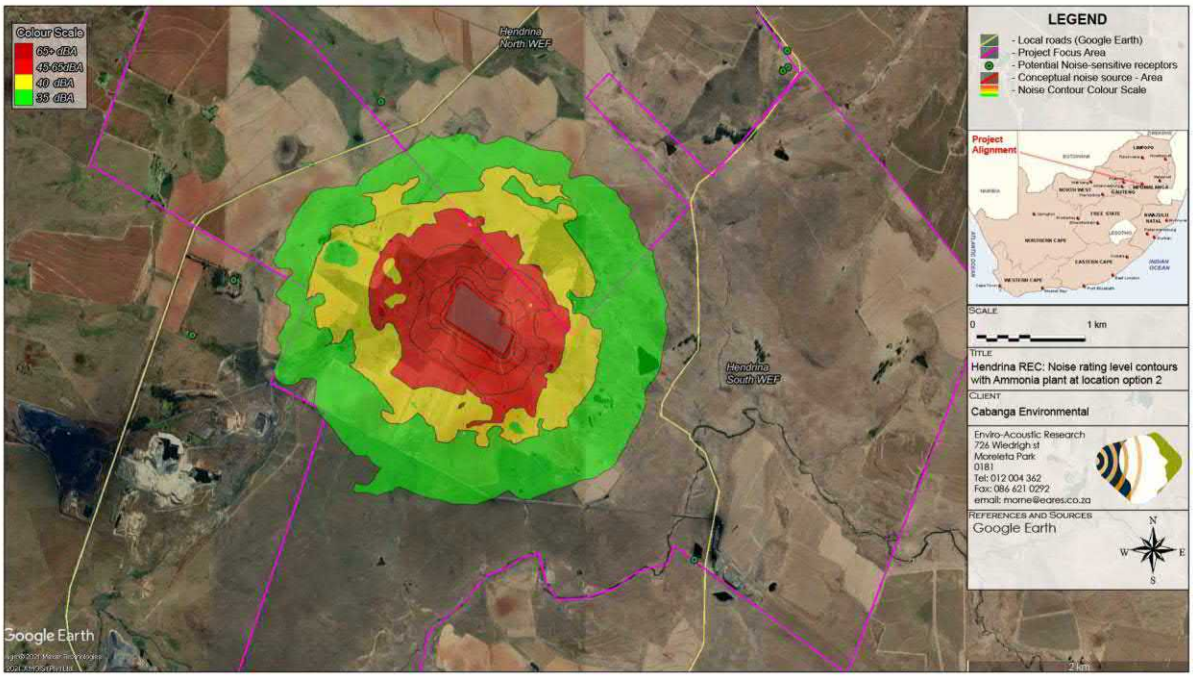


Figure 5-22: Sensitive receptors surrounding the Hendrina GH&A Facility Alternative 2 (Enviro-Acoustic Research, 2021)

Considering the ambient sound levels measured on-site, the projected noise rating levels will be similar or less than the on-site ambient sound levels. It is slightly possible that the noise rating levels could exceed the ambient sound levels during certain periods although it is unlikely to impact on the quality of living (at night) for the closest receptors. The closest receptors should not lose the peace or quiet that they are used to.

5.3.3 TRANSPORT NETWORK

The Hendrina green hydrogen facilities are located on farm portions that connect to rural collector roads. The Site option 1 and 2 can be accessed off an existing gravel (see access point 1 in **Figure 5-23**) while the Site option 3 site shows no sign of a definitive farm access road. The access will therefore need to be determined during design stage. The gravel access roads may need to be upgraded to accommodate vehicle access needs during construction and operation of the site.

The nearest towns in relation to the proposed project site are Hendrina, Komati, Bethal, Middelburg and Emalahleni. It is envisaged that most materials, water, plant, services and people will be procured within a 50km radius of the proposed site.

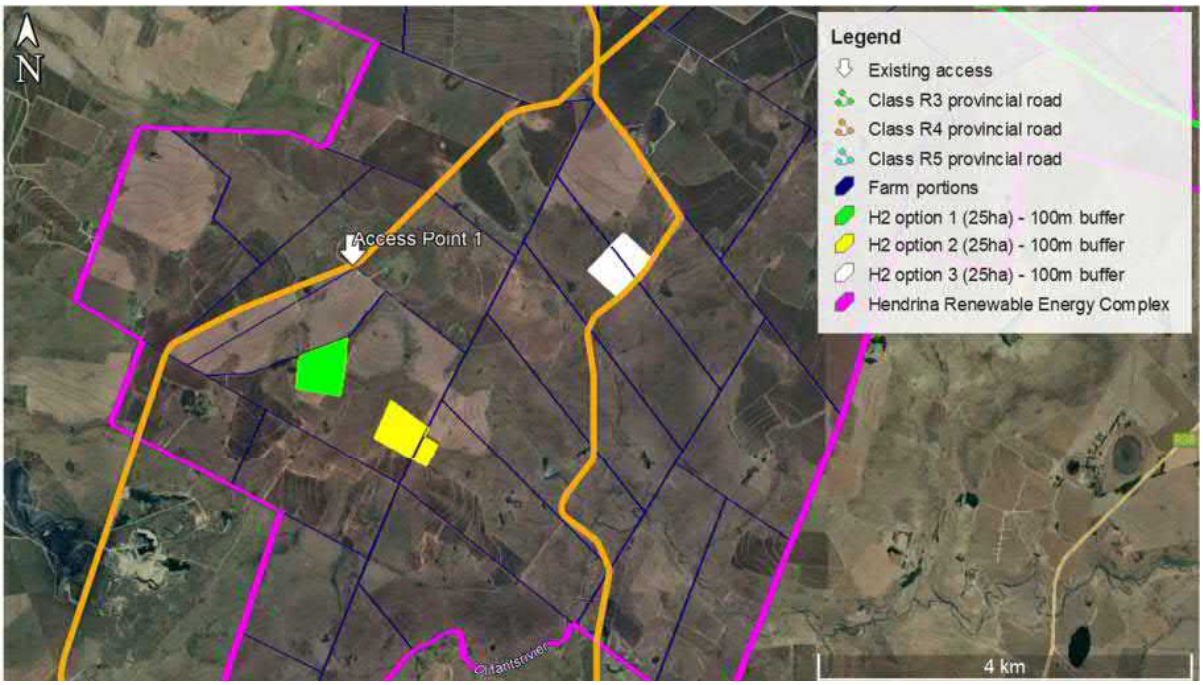


Figure 5-23: Site Access Points

5.3.4 HERITAGE AND CULTURAL RESOURCES

The study area is situated 17km west from the town of Hendrina in Mpumalanga. The archaeological record for the greater study area consists of the Stone Age and Iron Age.

STONE AGE

The Stone Age is divided in Early; Middle and Late Stone Age and refers to the earliest people of South Africa who mainly relied on stone for their tools.

Very few Early Stone Age sites are on record for Mpumalanga and no sites dating to this period are expected for the study area. An example in Mpumalanga is Maleoskop on the farm Rietkloof where ESA tools have been found. This is one of only a handful of such sites in Mpumalanga.

The MSA has not been extensively studied in Mpumalanga but evidence of this period has been excavated at Bushman Rock Shelter, a well-known site on the farm Klipfonteinhoek in the Ohrigstad district. This cave was excavated twice in the 1960's by Louw and later by Eloff. The MSA layers show that the cave was repeatedly visited over a long period. Lower layers have been dated to over 40 000 BP (Before Present) while the top layers date to approximately 27 000 BP (Esterhuizen & Smith in Delius, 2007; Bergh, 1998). Some isolated finds were recorded close to Witbank as well by Huffman (1999) on the farm Rietfontein.

The Later phases of the Stone Age began at around 20 000 years BP. This period was marked by numerous technological innovations and social transformations within these early hunter-gatherer societies. These people

may be regarded as the first modern inhabitants of Mpumalanga, known as the San or Bushmen. They were a nomadic people who lived together in small family groups and relied on hunting and gathering of food for survival. Evidence of their existence is to be found in numerous rock shelters throughout the Eastern Mpumalanga where some of their rock paintings are still visible. A number of these shelters have been documented throughout the Province (Bornman, 1995; Schoonraad in Barnard, 1975; Delius, 2007). These include areas such as Witbank, Ermelo, Barberton, Nelspruit, White River, Lydenburg and Ohrigstad.

Three late Stone Age sites are on record in the greater area. The sites are Welgelegen Skuiling close to Ermelo, Chrissiesmeer (also known for rock art) and lastly Groenvlei close to Carolina, this area is also known for rock art (Bergh 1999).

IRON AGE

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: Most of the first millennium AD.
— The Middle Iron Age: 10th to 13th centuries AD
— The Late Iron Age: 14th century to colonial period.

The Iron Age is characterised by the ability of these early people to manipulate and work Iron ore into implements that assisted them in creating a favourable environment to make a better living. No Early Iron Age sites are on record in the greater region. Around 220 Late Iron Age stone walled sites are on record to the east of the study area (Bergh 1999) and is also associated with numerous pre-difaqane and difaqane wars that took place during the last quarter of the 18th century and during the first three decades of the 19th century. The sites are located close to Bethal. The study area was most probably inhabited by the Phuting group (Berg 1999). Around the study area the Phuting moved south due to the Ndebele migration (Difaqane). These wars led to the displacement of large numbers of Tswana clans on the Highveld where Mzilikazi's Ndebele caused chaos and havoc.

Late Iron Age settlements are characterised by extensive dry stonewalls and dates back to the 17th century. Late Iron Age communities who contributed to this stone walled architecture were the Sotho, Pedi, Ndebele and Swazi. The stone building tradition that these indigenous groups established many decades before the first colonial settlers arrived, may have influenced the colonial farmers to utilize these same resources as building material for the first farmsteads which arose on the Eastern Highveld (Pistorius 2006). Late Iron Age sites that have been identified in the larger geographical area is to the west of Bronkhorstspruit and in the vicinity of Bethal (Bergh 1999).

HISTORICAL CONTEXT OF HENDRINA

White settlers moved into the area during the first half of the 19th century. They were largely self-sufficient, basing their survival on cattle/sheep farming and hunting. Few towns were established, and it remained an undeveloped area until the discovery of coal and later gold. The establishment of the Nederlandsche Zuid-Afrikaansche Spoorweg Maatschapij railway line in the 1880s, linking Pretoria with Lourenço Marques (Maputo) and the world at large, brought much infra-structural and administrative development to the area. This railway line also became the scene of many battles during the Anglo-Boer War, for example at Berg-en Dal and Signal Hill more to the east (Van Schalkwyk, 2012).

Sites dating to the historic period occur sporadically in the study area. These are mostly farming related, although some mining sites also occur. The farming related sites are usually farmsteads and farm cemeteries, either belonging to the landowners or their labourers. Mining related sites are for example the old Albion Colliery, dating to the 1940's.

The town of Hendrina was founded in 1914 on the farm Grasfontein and was named after Hendrina Beukes, wife of the owner of the farm. The Hendrina Power Station came online in 1970, making it one of Eskom's oldest operating stations (Van Schalkwyk, 2012).

GRAVES AND BURIAL SITES

No graves were identified for the immediate study area, however there were multiple grave and burial sites identified in the surrounding areas. Most of these cemeteries, irrespective of the fact that they are for landowner or farm labourers (with a few exceptions where they were integrated), are family orientated. They therefore serve as important 'documents' linking people directly by name to the land (Van Schalkwyk, 2012).

CULTURAL LANDSCAPE

The site consists of multiple degraded and broken-down structures. These structures could possibly have been part of a farmstead with various buildings such as a house and accompanying infrastructure. The site is surrounded by large trees (pine and eucalyptus). The area is fairly overgrown with grass and weeds.

Farmsteads are complex features in the landscape, being made up of different yet interconnected elements. Typically, these consist of a main house, gardens, outbuildings, sheds and barns, with some distance from that labourer housing and various cemeteries. In addition, roads and tracks, stock pens and windmills complete the setup (Van Schalkwyk, 2012).

The greater area is mostly cultivated, and forms part of a landscape characterised by wide scale cultivation and mining activities. Development in the study area is limited to farming infrastructure such as access roads, fences, and agricultural developments. The cultural landscape qualities of the region essentially consist of one component. The first is a rural area in which the human occupation is made up of a pre-colonial element (Iron Age) as well as a much later colonial (farmer and industrial) component

5.3.5 PALAEONTOLOGICAL SENSITIVITY

According to the SAHRA Paleontological map the study area is of very high paleontological significance (**Figure 5-24**) and an independent study was conducted for this aspect. Bamford (2022) concluded that it is extremely unlikely that any fossils would be preserved in the loose soils and sands of the Quaternary.

Figure 5-24: SAHRA Palaeontological sensitivity map (approximate project area in yellow)

There is a very small chance that fossils may occur in the shales and siltstones of the early Permian Vryheid Formation, but only more than 5m below the surface, therefore, a Fossil Chance Find Protocol should be added to the EMPr.

5.3.6 VISUAL CHARATER AND SENSITIVITY

VISUAL CHARACTER AND CULTURAL VALUE

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, electricity infrastructure and mining activity, particularly in the south-western areas, 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 elements of the Project 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 Project. 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 rolling hills 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. The presence of small towns, such as Hendrina, engulfed by an otherwise rural / pastoral environment, form an integral part of the wider landscape.

In light of this, it is important to assess whether the introduction of the Facility as proposed 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.

VISUAL CONTRAST

The visual contrast of a development refers to the degree to which the development would be congruent with the surrounding environment. This is based on whether or not the development would conform to the land use, settlement density, structural scale, form and pattern of natural elements that define the structure of the surrounding landscape. Visual compatibility is an important factor to be considered when assessing the impact of the development on receptors within a specific context. A development that is incongruent with the surrounding area could change the visual character of the landscape and have a significant visual impact on sensitive receptors.

In order to determine the likely visual compatibility of the proposed development, the study area was classified into the following zones of visual contrast:

High

— undeveloped / natural / rural areas.

Moderate

— areas within 500m of existing power lines (>=88kV);
— areas within 500m of main roads;
— areas within 500m of railway infrastructure;
— cultivated land.

Low

— areas within 500m of urban / built-up areas;
— areas within 500m of mines / quarries etc.

These zones are depicted in **Figure 5-25** below:

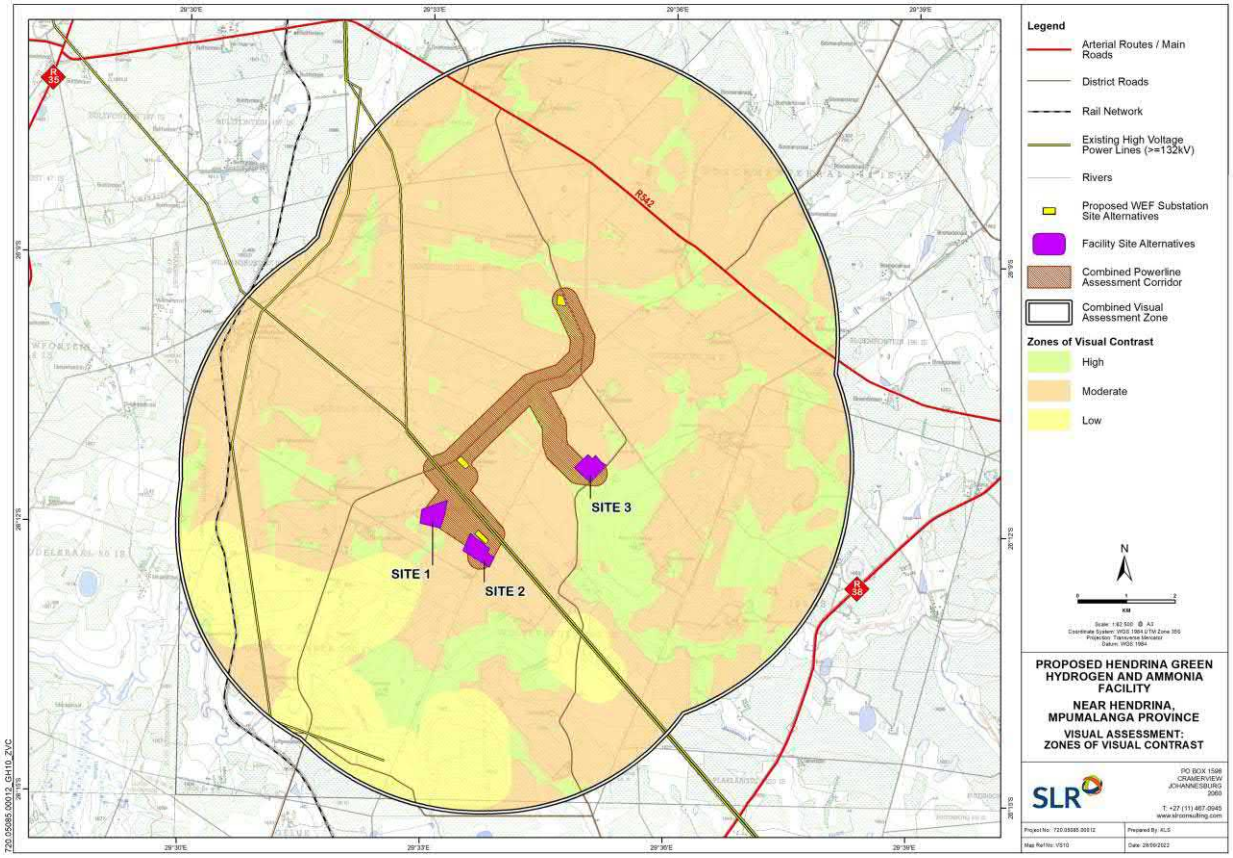


Figure 5-25: Zones of visual contrast (SLR, 2022)

VISUAL RECEPTOR IDENTIFICATION

The preliminary desktop visual assessment did not identify any formal protected areas or leisure-based tourism activities in the study area. The desktop assessment did however identify multiple farmsteads and residences within the study area. While these homesteads and residences could be considered to be receptors, not all of them would be sensitive to the proposed development and given the number of farmsteads, it was not possible to confirm the presence of receptors at all the identified locations. Notwithstanding these limitations, all the identified receptor locations were assessed as part of the VIA as they are still regarded as being potentially sensitive to the visual impacts associated with the proposed development. None of these receptor locations was found to be sensitive.

Although all of the receptor locations are believed to be farmsteads, they are regarded as potentially sensitive visual receptors as the proposed development could potentially alter natural or semi-natural vistas experienced

from these locations. At this stage however, little information has been received regarding local sentiments towards the proposed development.

In many cases, roads along which people travel, are regarded as sensitive receptors. The primary thoroughfare in the study area is the R542 main road. This road and the other thoroughfares in the study area are primarily used as local access roads and do not form part of any scenic tourist routes. These roads are not specifically valued or utilised for their scenic or tourism potential and are therefore not regarded as visually sensitive.

The identified potentially sensitive visual receptor locations for the proposed facility and OHL are indicated in **Figure 5-26** and **Figure 5-27** below.

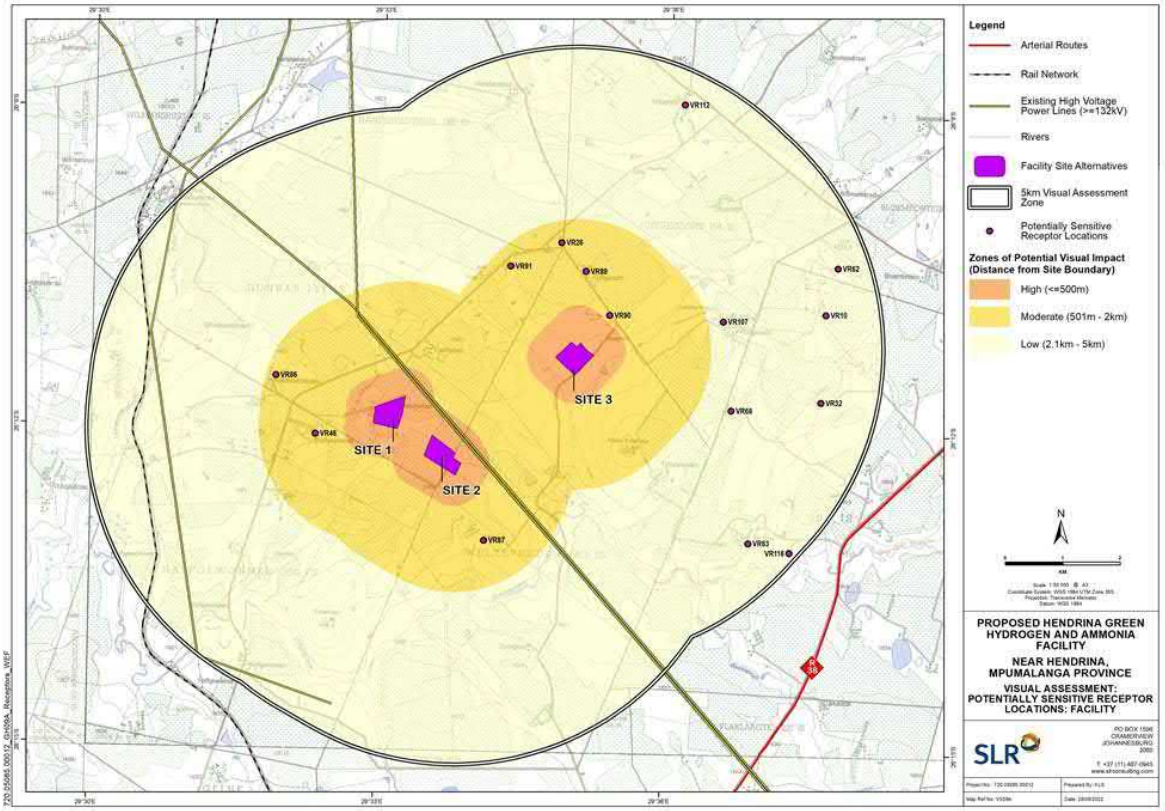


Figure 5-26: Visual receptor locations within 5km of the GH&A site alternatives

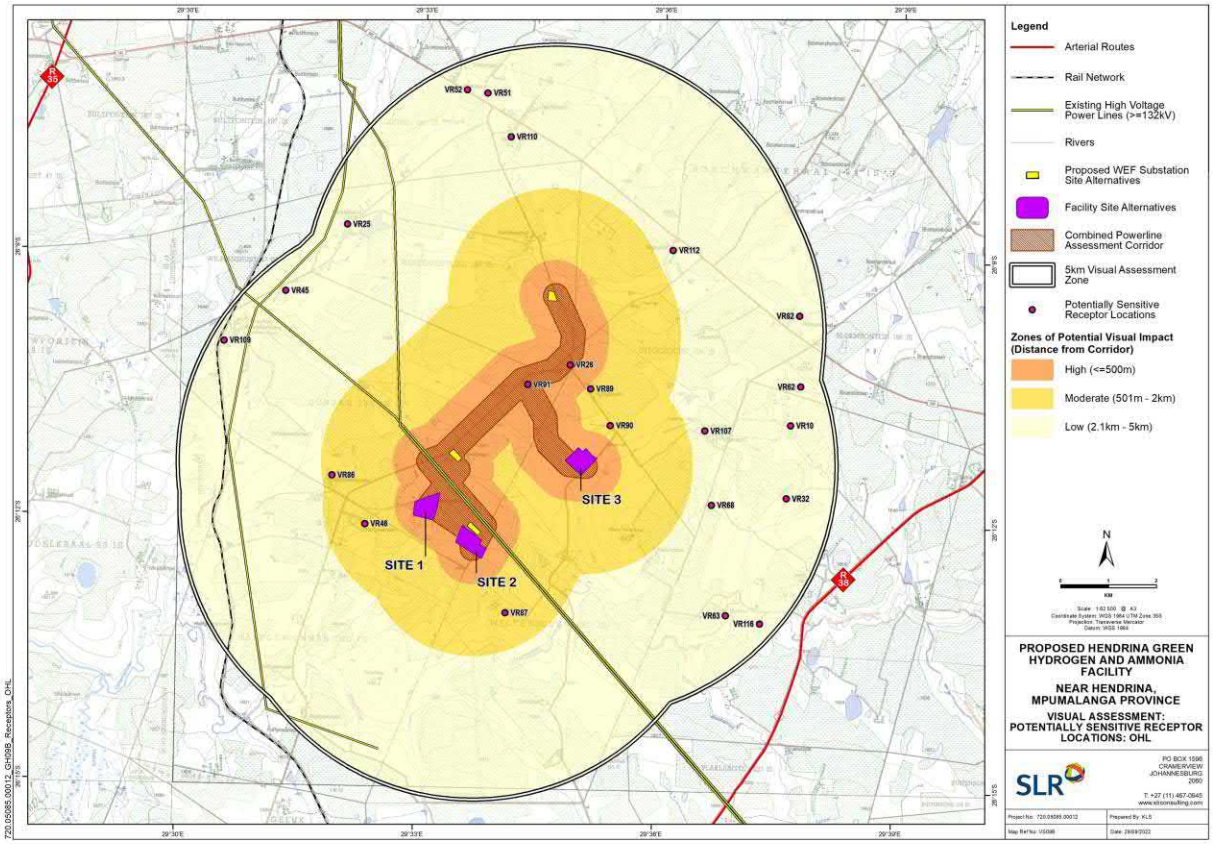


Figure 5-27: Receptor locations within 5kms of the OHL combined assessment corridor

5.3.7 SOCIO-ECONOMIC

SOCIAL OVERVIEW OF THE STUDY AREA

Mpumalanga has a youthful population with approximately 64% of the population consisting of economically active people (15 to 34 years of age). This provides significant human resources for future economic growth and sustainability. The project will promote infrastructure and create employment opportunities.

The land portions on which the proposed Complex will be located are currently used for agriculture (predominant use). This farming is in the form of livestock farming with the predominant form of livestock being beef (50% of respondents). Most of the farms earmarked for development indicated crop farming (drylands). None of the farms are utilised for tourism related activities, such as hunting.

According to the Socio-Economic Impact Assessment report, undertaken by Urban Econ (2021), from the data obtained from surveyed landowners, it is estimated that agricultural operations in the directly affected area employ approximately 102 people, the majority of whom are permanent employees (71 people). Most of the employees live on the farm and those who do not, live on the adjacent farms and Kwazamakuhle in Hendrina. It is recognised that the majority farms in the area practice a combination of crop and livestock activity. As such, most farms are involved in both land uses as indicated previously. The following observations were made regarding land use:

— Three of the four respondents operate as commercial farmers
— Beef was the largest portion of livestock, approximately 350 cattle, followed by sheep, with approximately 30 sheep. One of the farmers indicated that they farm with pigs (10 pigs)
— The average size of property owned was 624 and ranged between 120 and 1 823 ha
— The majority of labourers live on the farms they work on with their family members

— Livestock animals reared for sale and kept for production of food products include goats, sheep and cattle
— Most of the farms are the primary residence of the farm owner

Given the small number of responses received from owners in the area, it has not been possible through primary research to estimate the total contribution of the agricultural industry to the local economy.

ADMINISTRATIVE CONTEXT

The study area is located within the Steve Twhwete Local Municipality within the Mpumalanga Province. This is one of the six Local Municipalities that make up the Nkangala District Municipality (**Figure 5-28**). The town of Middleburg is the administrative seat of the Steve Twhwete Local Municipality.

Figure 5-28: Location of Steve Tshwete Municipality within the Nkangala District Municipality and Mpumalanga Province

DEMOGRAPHIC OVERVIEW

POPULATION

The Steve Tshwete Local Municipality falls within the Nkangala District Municipality and collectively account for 17% of the population, and 18% of the households in the district. Population growth between 2009 and 2019 was 2,7% year-on-year for the LM which compared favourably to the DM (2,3%) and Mpumalanga (1,6%) over the same period. The overview of both the local and district municipalities are outlined in **Table 5-9** below.

Table 5-9: Overview of the Local and District Municipalities population structure (*Standardised Regional (2021); Stats SA (2011) forecast to 2021*)

INDICATOR	MPUMALANGA	NKANGALA DISTRICT MUNICIPALITY	STEVE TSHWETE LOCAL MUNICIPALITY
Area (km2)	76 494	16 758	3 976
Population	4 743 580	1 645 654	284 370

INDICATOR	MPUMALANGA	NKANGALA DISTRICT MUNICIPALITY	STEVE TSHWETE LOCAL MUNICIPALITY
Number of Households	1 265 985	451 045	81 034
Population density (km2)	62	98	71
Average household size	3-8	3-7	3-6
Annual population growth (2009-2019)	1.6%	2.3%	2.7%
Average monthly household income	**R6 812**	**R 8 425**	**R 13 297**

The disposable average monthly income of households in the LM was R 13 297 which was 57% higher than the average for DM (R 8 425) and 95% higher than the average for the Mpumalanga.

HOUSEHOLDS AND HOUSE TYPES

The following infrastructure categories are amongst the key within the municipality; water and sanitation, waste and electricity. The municipality provide services at household level rather than individual level. The number of households in Steve Tshwete increased from 64 971 in 2011 to 86 713 households (almost 22 000 households increase) in 2016 representing 20.6% of the Nkangala household figure. The household size declined from 3.5 to 3.2 in the same period. The community survey 2020 results indicates that the housing backlog for the municipality is at 51 570 and 14.4% of the households live in informal settlements.

HOUSEHOLD INCOME

According to Census 2011, the average annual household income increased from R 55 369 per annum in 2001 to R134 026 per annum in 2011. This represents an absolute increase in nominal terms over the 10-year period, which was the highest among the eighteen local municipalities in the province. This is closely related to its higher education levels and employment rates.

Household income levels are likely to have been impacted by the COVID-19 pandemic. The number of households in the Steve Tshwete Local Municipality that live close to or below the poverty line is likely to have increased over the last 18 months. This, coupled with the high dependency ratio, is a major cause of concern for the area.

EMPLOYMENT

The review of the employment profile of the LM indicates that 22% of the economically active population within the municipality is formally unemployed (**see Table 5-10**). The unemployment rate and labour force participation rate in the LM were also notably better than that of the DM (Unemployment rate: 33,3%; Labour force participation rate: 39,3%).

The relatively lower unemployment rate and higher labour force participation relative to the district averages further suggests that the LM is subject to inward migration due to the employment opportunities available within the local municipality

The largest employing industries in Steve Tshwete trade (including tourism), community services, finance and mining. Concern about the high-unemployed youth & especially females relatively low level of education and inadequate skills impact negatively on their employability. Importance of quality and relevant education and training in line with the economic needs of the province – important role of the University of Mpumalanga & TVETs.

Table 5-10: Employment profile of the study areas (*Quantec Standardised Regional, 2021*)

INDICATOR	MPUMALANGA	NKANGALA DISTRICT MUNICIPALITY	STEVE TSHWETE LOCAL MUNICIPALITY
Employed	1 184 438	419 698	100 313
Unemployment Rate	33,3%	33,3%	22,4%
Not Economically Active	1 249 023	438 287	64 215
Labour force participation rate	39,8%	39,3%	51,9%

EDUCATION

Steve Tshwete's grade 12 pass rates deteriorated slightly from 85.6% in 2014 to 84.7% in 2020 but was still the 2nd best/highest in the province. Steve Tshwete's pass rate also declined/deteriorated between 2019 and 2020 by 4.3 percentage points – very much Covid-19 related factors. The area achieved an admission rate to university/degree studies of 42.0% in 2020, which was the highest of the 17 municipal areas in the province.

The challenge is to accommodate the educated young people in the area – inadequate economic opportunities. Provision of adequate educational, recreational infrastructure, and skills development activities to meet the needs of the community. Steve Tshwete's functional literacy is improving, and it is the 2nd highest in the province.

MUNICIPAL SERVICES

ELECTRICITY

The 2016 community survey figures depicted that there were 86713 households in the municipal area of which 90.1% households had access to electricity. This backlog is made up of backyard dwellers, rural and farm dweller homes.

ACCESS TO WATER AND SANITATION

According to the Steve Tshwete IDP (2022), 81.9% of households had access to potable water (household connections and communal stands) and 85.4% had flush and chemical toilets.

The rural areas of the municipality is about 39.7% which is the lowest levels of households provided by the local water scheme by the municipality and water service provider, at least 41.1% use boreholes and water tankers whilst 10.1% utilize source of water. Most of the households located within the functional areas (Middelburg (68.2%) and Steve Tshwete Mining Area (71.1%)) piped water within the dwelling (36.2%) and access to piped water within the yard (26.2%)

REFUSE COLLECTION

Waste collection from residential premises is carried out on a weekly or bi- weekly basis. The total percentage of households with access to waste removal services is 85% as per 2016 community survey (Steve Tshwete IDP, 2022). The municipal service has extended the services to all the municipal towns but excluded the mining towns which are self-served, Kranspoort, Somaphepha, Mafube and rural areas. The areas are currently serviced with either communal skips or through waste transfer stations.

Waste disposal is centralized, and all waste collected in the various centres (including garden waste and builder's rubble) is transported to the permitted Middelburg landfill site for disposal. The haulage of waste from Hendrina and surrounding areas creates a huge financial burden on the operating budget due to fuel and maintenance costs, and the landfill is reaching its lifespan earlier than it was expected.

ECONOMIC DEVELOPMENT

Steve Tshwete can be regarded as one of the commercial hubs in Mpumalanga with a 14.3% contribution to the Mpumalanga economy – 3rd largest ranked economy in the province for 2019. In the District the municipality contributes 36.0% to the economy making it the 2nd largest economy in the Nkangala District Municipality. The dominating economic sectors are Mining, Manufacturing, Trade and Agriculture.

Steve Tshwete's economy and Growth Domestic Product (GDP) continues to grow steadily. The average annual economic growth was 2.4% over the period 1996 to 2019. For the period 2014 to 2019, the economy only expanded by 0.8% p.a. as a result of the weak economic climate in the country and the impact of Covid-19 lockdown in 2019/2020

Manufacturing, Mining, tourism, energy generation and agriculture are the main drivers of the municipal economy in Steve Tshwete. These industries generate mass employment and procurement opportunities and are mainly in rural parts of this local municipality. The two main economic drivers and dominant industries are the mining and metal and steel manufacturing industries.

HEALTH, EDUCATION AND COMMUNITY FACILITIES

The healthcare sector is developing through the expansion of both the public and private health facilities. Midmed hospital has expanded to increase its capacity. The new regional public hospital is under construction and is scheduled to be completed by end of 2020. New clinics have been built in Sikhululiwe village and Rockdale and an additional one planned for Newtown.

5.4 CONSOLODATED SITE SENSITIVITY

Environmental sensitivities have been compiled based on the sensitivities and buffers outlined in the following specialist studies:

- Aquatic Scoping Study
  - Wetlands and associated buffers (See **Section 5.1.6**)
- Terrestrial Scoping Study
  - CBAs (See **Section 5.2.2**)
  - Habitats (See Section **5.2.2** and **5.2.5**)
  - Listed Ecosystems (See **Section 5.2.1**)
  - Wetlands (See **Section 5.2.5**)
  - Transformed Areas (S**ee Section 5.2.2** and **5.2.5**) etc
- Avifauna Scoping Study.
  - Avifauna Sensitivities (consisting of drainage lines and associated wetlands, pans and grasslands) (See **Section 5.2.6**)
- Bats Scoping Study
  - Bat sensitive areas (See **Section 5.2.8**)
- Heritage and Palaeontology
  - Heritage and palaeontological sensitive areas identified (see **Section 5.3.5 & 5.3.6**)

6 IDENTIFICATION OF POTENTIAL IMPACTS

The scoping phase of a S&EIR process is aimed to identify potential impacts that are most likely to be significant and which need to be assessed as part of the S&EIR process. The determination of anticipated impacts associated with the proposed development is a key component to the S&EIR process. This Chapter identifies the anticipated environmental and social impacts associated with the proposed project.

The issues identified stem from those aspects presented in **Section 5: Description of Baseline Environment** and the description of project components and phases as outlined in **Section 2: Project Description**. Each significant issue identified is to be investigated further during the S&EIR process. Non-significant issues will be scoped out of the study with reasonable consideration given within the Scoping Report.

6.1 AIR QUALITY

Construction Phase Impacts

Dust Emissions

Construction is a source of dust emissions that can have a temporary impact on the local air quality situation. Emissions during construction are associated with land clearing, drilling and blasting, ground excavation and cut and fill operations. Dust emissions vary substantially on a daily basis, depending on the level of activity, the specific operations and the prevailing meteorological conditions. A large portion of dust emissions results from movement of equipment and traffic over temporary roads at the construction site. The use of project-related vehicles and machinery can also result in an increase of gaseous emissions and potentially contributing to reduced ambient air quality.

Operational Phase Impacts

Bulk Storage Tank Emissions

The proposed facility will store synthesised NH_3 product in bulk, however in a liquid state. Since NH_3 has a very low boiling point, NH_3 requires either temperature or pressure control to maintain a liquid phase and prevent product loss through evaporation.

Storage of NH_3

An insulated, temperature-controlled (i.e. -33.34°C) storage tank solution is proposed for the storage of NH_3. The temperature of the liquid will be maintained below boiling point to prevent evaporation of the product. The liquid vapour pressure of NH_3 at a temperature of -33.34 °C is zero

Mitigation Considerations

— Implementation of standard construction phase mitigation measures (such as wet suppression) to be outlined in the EMPr will assist in controlling dust emissions and minimising impacts.

— Relevant emissions monitoring

Recommended EIA Phase Studies

A detailed Air Quality Impact Assessment will be undertaken during the EIA phase including findings of the preliminary modelling, associated impacts, as well as detailed recommendations, including mitigation measures if deemed necessary. Refer to **Section 7** of this Report for the Plan of Study for the Air Quality Impact Assessment.

6.2 NOISE AND VIBRATIONS

Construction Phase Impacts

Noise and Vibration Emissions

The following construction-related activities are likely to generate vibrations and additional noise into the environment:

- Presence of workforce
- Land clearing
- Drilling and blasting
- Cut and fill operations
- Vehicle activities associated with transport of equipment
- Use of equipment and machinery
- Concrete mixers and cranes

Vibrations and audible increase in noise can lead to the disturbance and nuisance to sensitive receptors. A receptor is defined by the WBG (April 2007) as “any point on the premises occupied by persons where extraneous noise and/or vibration are received”. Being such a remotely located site, dominant receptors in the area surrounding the site include small farmsteads and farmhouses.

Operational Phase Impacts

Noise Emissions

Based on the great distance between the proposed site and the surrounding receptors, noise impacts are not anticipated to be strong. Potential sources of noise at the proposed site include:

- The electrolyser units and associated transformers;
- Intermittent vehicle activity.
- Blowers and compressors, used to compress the air and the process at optimal pressure;
- Various motors and pumps to move liquid material around in the process;
- Potential steam safety release valves;
- Fans for potential forced cooling of ammonia and process gasses;
- Aerodynamic noises from the exhaust stacks.

Cumulative Impacts

Cumulative impacts might occur due to the presence of the Hendrina Renewable Energy Complex proposed in proximity to the study area. The footprint of these developments will likely be cumulative.

Mitigation Considerations

- Implementation of standard construction phase mitigation measures to be outlined in the EMPr will assist in controlling noise emissions and minimising impacts.
- Minimise active equipment at night, planning the completion of noisiest activities (such a pile driving, rock breaking and excavation) during the daytime period.
- Ensure that equipment is well maintained and fitted with the correct and appropriate noise abatement measures. Engine bay covers over heavy equipment could be pre-fitted 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;
- The applicant includes 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 1,000m) to NSRs at night;

— Where practicable, mobile equipment should be fitted with broadband (white-noise generators/alarms), rather than tonal reverse alarms; and
— The use of vehicle horns should be minimized where possible.

Recommended EIA Phase Studies

An Environmental Acoustic Impact Assessment will be undertaken during the EIA phase including findings of the preliminary modelling, associated impacts, any inputs into micro-siting, as well as detailed recommendations, including mitigation measures if deemed necessary. Refer to **Section 7** of this Report for the Plan of Study for the Environmental Acoustic Impact Assessment.

6.3 TOPOGRAPHY AND GEOLOGY

Construction Phase Impacts

The impact of the project alternatives on the geological environment will predominantly relate to the removal and displacement of soil, boulders and bedrock referred to in this report as "subsoils". The levelling of areas to create building platforms will also result in the displacement and exposure of subsoils. These impacts will have a negative visual impact on the environment, which in some cases can be remediated.

The risk of soil erosion is also increased during construction activities, by the removal of vegetation and by possible disturbance to the natural drainage environment, subsequently leading to the prevention of infiltration of rainwater and increased surface run-off. Areas of concentrated surface flow can be anticipated at the energy facilities, resulting in gradual erosion of unconsolidated soil during the operational life of the facilities. This can result in the creation of preferential drainage features, unless remediated through proper engineering design (i.e., stormwater drainage).

Operational Phase Impacts

No impacts anticipated.

Mitigation Considerations

— Implementation of erosion management measures in line with the Erosion Management Plan and Rehabilitation Plan to be included in the EMPr.
— All cleared areas must be revegetated with indigenous vegetation.
— Implement an effective stormwater runoff control system, including runoff control features to direct and dissipate water flow from roads and other hardened surfaces.
— Progressive rehabilitation will be essential to reduce the potential for soil erosion and sedimentation.

Recommended EIA Phase Studies

No further studies are recommended.

6.4 SOILS, LAND CAPABILITY AND AGRICULTURAL POTENTIAL

Construction Phase Impacts

Loss of agricultural potential by soil degradation

During the construction phase there is potential for soil degradation. Soil can be degraded by impacts of erosion; impeded drainage; topsoil loss; and contamination. Erosion can occur as a result of the alteration of the land surface run-off characteristics, which can be caused by construction related land surface disturbance, vegetation removal, and the establishment of hard surface areas including roads. Compacted roads and crane platforms can impede natural, lateral drainage through the soil and result in water logging. Loss of

topsoil can result from poor topsoil management during construction related excavations. Hydrocarbon spillages from construction activities can contaminate soil. Soil degradation will reduce the ability of the soil to support agricultural production.

Loss of agricultural potential by occupation of land

The agricultural protocol requires an indication of the potential losses in production and employment from the change of the agricultural use of the land as a result of the proposed development. The development will result in production losses of up to 25 hectares of annual crops. No losses of agricultural employment are expected because the site occupies only a small proportion of a much larger farming operation and the cessation of cropping on the site will not significantly reduce the farm's labour requirement.

Operational Phase Impacts

Enhanced agricultural potential through increased financial security for farming operations

Reliable income will be generated by the farming enterprises through the lease of the land to the energy facility. This is likely to increase their cash flow and financial security and thereby could improve farming operations.

Interference with farming operations

Construction (and decommissioning) activities have some nuisance impact for farming operations but are highly unlikely to have an impact on agricultural production

Cumulative Impacts

Cumulative impacts might occur due to the presence of the Hendrina Renewable Energy Complex proposed in proximity to the study area. The footprint of these developments will likely be cumulative. This development is an integral part of the Hendrina wind energy facilities. A cumulative impact assessment needs to consider it as such and not in isolation. DFFE compliance for this project requires considering all renewable energy project applications within a 30 km radius. According to the DFFE database, there are a total of two other renewable energy projects within a 30 km radius of the Hendrina wind energy facilities. In quantifying the cumulative impact, the area of land taken out of agricultural use as a result of these projects (total generation capacity of 490 MW) will amount to a total of approximately 344 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 30km radius (approximately 282,700 ha), this amounts to only 0.12% of the surface area. That is considered to be within an acceptable limit in terms of loss of agricultural land.

Mitigation Considerations

- Implementation of erosion management measures in line with the Erosion Management Plan and Rehabilitation Plan to be included in the EMPr.
- All cleared areas must be revegetated with indigenous vegetation.
- Implement an effective stormwater runoff control system, including runoff control features to direct and dissipate water flow from roads and other hardened surfaces.
- Progressive rehabilitation will be essential to reduce the potential for soil erosion and sedimentation.
- Areas of construction should be (practically) limited in extent, and activities outside of the project area should be kept to a minimum.
- Vegetation removal should be kept to a minimum and limited to the area of development.
- To mitigate disturbance to croplands it is recommended that pylons not be placed within any croplands, but instead be located on the edges of them.
- The overhead power lines can cross croplands, but they should span across them with the pylons being placed on either side.
- Where excavation is done to bury the pipeline, the upper 30 cm of topsoil must be kept separate from the rest of the excavation spoils and stored in a separate stockpile.

— When the excavation is back-filled, the topsoil must be back-filled last, so that it remains at the surface, as it originally was.

— Impacts that are expected to lead to long term degradation of soil quality (i.e. soil contamination) need to be limited through appropriate on-site management measures. This includes the proper handling and storage of hazardous materials, the use of hardstanding in areas where spillages are possible, the use of bunding around storage of hazardous materials and proper upkeep of machinery and vehicles.

Recommended EIA Phase Studies

A detailed Agricultural Agro-Ecosystem Specialist Assessment would need to be undertaken during the EIA phase of the assessment. Refer to **Section 7** of this Report for the Plan of Study for the Agricultural Agro-Ecosystem Specialist Assessment.

6.5 SURFACE WATER

Construction Phase Impacts

Overall, the construction phase of the Project is anticipated to have the most substantial impacts on surface water resources in the area. As part of the construction phase, numerous sites will be graded, vegetation will be cleared, and soil will be stripped.

There may be a deterioration in surface water quality when any surface water runoff comes into contact with dust, eroded soil, or other pollutants generated during the construction phase of the Project. The sediment load within surface water runoff may increase or the chemistry of surface water may be altered if not prevented or mitigated.

All surface water runoff generated upstream of the Project is expected to reach the receiving environment as no infrastructure is expected to collect, contain, or prevent runoff from flowing downstream, with no impact on surface water quantity anticipated.

There is also a possibility of the deterioration of water quality due to chemical contamination from the hazardous chemicals used on site, affecting the use of surface water as a natural resource.

Operational Phase Impacts

There are certain components of the Facility that may impact surface water quality if not prevented or mitigated. Erosion rates may be increased along all concrete and / or heavily compacted surface areas throughout the Facility where runoff is concentrated, and flow velocity is increased. Increased erosion rates will elevate the sediment load contained in surface water runoff and lead to a deterioration in quality.

Surface water encountering brine produced at the Water Treatment Unit may alter its chemical composition and lead to a deterioration in quality. Similarly, ammonia spills may occur accidentally at the Ammonia Processing Unit and negatively impact on the quality of surface water resources if not prevented or mitigated.

Mitigation Considerations

— Disturbed areas to be limited to the footprint as depicted in the layout plan.

— The laydown areas for the construction site must be kept as small as reasonably possible.

— All vehicle and equipment usage should be limited to designated areas only.

— Where possible, construction activities should be scheduled to coincide with the dry season.

— Effluent from the septic tanks should be treated and disposed accordingly.

— It is recommended that small temporary diversion berms be constructed upstream of all construction sites to prevent runoff from draining through these sites and becoming contaminated. (Such to be undertaken in consideration of any drainage lines or proximity to water courses)

— Once construction is complete, vegetation growth should be encouraged in areas where vegetation was cleared, and soil was stripped in order to stabilise the ground and prevent erosion.

- Activities that fall within the regulated area of a watercourse will require a water use licence in terms of Section 21 of the NWA (No. 36 of 1998).
- Treat all hydrocarbon spills as hazardous waste and dispose of accordingly.
- Emergency spill kits should be available, and spills should be cleaned up quickly with an approved absorbent material.
- All mixing practices should be conducted on impermeable surfaces.
- Regular maintenance should be conducted on all vehicles and equipment used during the construction phase to ensure they are always in a good working order.
- Store fuel, oil, and other hazardous substances in designated bunded areas able to contain 110% of the storage capacity.
- Refuelling of vehicles to take place on an impermeable surface fitted with a sump to contain any spillages
- Due to the brine produced in the Water Treatment Unit and its potential to pollute surface water resources, this area should be bunded to prevent surface water from draining through it and becoming contaminated. A collection sump should be installed at the lowest point to collect runoff generated in the bunded area. Affected water can then either be disposed of or left to evaporate.
- The Ammonia Processing Unit should be regarded as an affected area due to the pollution potential of the ammonia being produced and the potential for spillages to occur. The facility should be bunded to prevent runoff generated in the bunded area from draining downstream A collection sump should be installed at the lowest point to collect runoff generated in the bunded area. Affected water can then either be disposed of or left to evaporate.
- A spill clean-up and maintenance procedure should be implemented to clean-up and dispose of any brine and ammonia spills.
- Erosion prevention measures (e.g., grassing) should be implemented along all access roads and concrete and / or heavily compacted surface areas. These measures may include promoting vegetation growth to stabilise the surrounding soils and constructing of storm water channels to collect and convey runoff in a controlled manner towards the receiving environment.

Recommended EIA Phase Studies

A detailed Surface water assessment, including wetland assessment, would need to be undertaken during the EIA phase of the assessment. This will include the associated potential impacts and corresponding mitigation measures. Following comments from the relevant stakeholders, the final report will be updated and submitted with the final EIA report. Refer to **Section 7** of this Report for the Plan of Study for the Surface water assessment.

6.6 GROUNDWATER

Construction Phase Impacts

Soil clearing and construction of infrastructure

The impacts on groundwater quality during the construction phase are primarily related to the management of materials, wastes and spills and unauthorised disposal of contaminated substances. Contamination of groundwater may also arise due to incorrect handling and disposal of waste materials. This risk is considered low. Due to the short exposure and small scale of these potential spills, the impacts will be negligible during the construction phase.

Except for the lesser oil and diesel spills and sewage from generated from construction campsites there are no activities expected that could impact on regional groundwater quality. This phase should thus cause very little additional impacts. It is expected that the current status quo will be maintained. A very limited groundwater quality impact is expected during the construction phase.

Water uses

During the construction phase a temporary water supply for construction will need to be installed that will make use of existing or new boreholes and will comprise of over-ground water pipelines and tanks to the construction camp. Over abstraction of groundwater can result in aquifer depletion and loss of resource for farmers.

Operational Phase Impacts

Ground contamination

During the operational phase there is potential for soil contamination associated with potential release of environmental contaminants and hazardous substances.

Product and raw material transport will be required and it has been assumed that vehicle maintenance and refuelling maybe undertaken onsite. Therefore, hydrocarbon contamination from fuel storage, fuel distribution and oil handling facilities is considered potential groundwater risk. The above contaminants have potential to be transported into the groundwater through a process of percolation.

Highly pure RO water is needed for hydrogen production. Water treatment is associated with the generation of concentrated wastes removed from the water, such as brine salt. Liquid brine can contain up to 50 g/l salts. Production, storage and disposal of the brine waste pose potential groundwater contamination.

Mitigation Considerations

- Chemicals, hydrocarbon materials and hazardous substances maintained onsite must be managed in accordance with the Hazardous Substances Act (No. 15 of 1973) and its relevant regulations.
- All machinery and equipment should be inspected regularly for faults and possible leaks; these should be serviced off-site or in appropriately bunded areas.
- Spill kits must be available at all locations where hazardous substances are stored, handled or used, and spills must be cleaned up immediately in accordance with an established protocol applicable to the material.
- The design, construction and maintenance of all infrastructure must ensure that the quality of the groundwater that feeds sensitive receptors (groundwater abstractions and groundwater dependant terrestrial ecosystems) downstream from any infrastructure does not significantly change and the development does not act as a preferential pathway to groundwater flow.
- Contain spillage, excavate and dispose of soil if required. Utilisation of spill kits and/or excavation of affected soil with subsequent disposal at an accredited disposal site is crucial.
- Uncontrolled discharges from the construction camp/s should not be permitted.
- All vehicles must be properly maintained and serviced so that no oil leaks occur on site.
- Diesel fuel storage tanks should be above ground on an impermeable concreted surface in a bunded area.
- Identified boreholes should be subjected to pump tests overseen by a professional geohydrologist.
- Boreholes should not be pumped more than its sustainable use allows as recommended by the geohydrologist.
- Contain brine in fit-for-purpose facilities and prevent seepage, spills and groundwater contamination.
- All facilities constructed to contain brine should be constructed according to water balance so as not to allow overflow of the facilities.
- Brine must be contained on the sites in facilities constructed for this specific purpose.
- Brine facilities should be lined to limit seepage and a leak detection system must be installed.
- A minimum freeboard of 0.8 meters be maintained for brine ponds facilities above the expected maximum water level.

— Runoff water may not be discharged to a watercourse and/or the environment unless it complies with the quality requirements.
— Liquid brine must not be discharged into the natural environment.
— Where feasible or practical, liquid brine can be made into a solid through several available technologies such as, settlement tanks, cooling water circuits, and forced crystallization.
— Dispose solid salt at a licenced fit for purpose hazardous waste facility or sell to third parties depending on its chemical make-up.

Recommended EIA Phase Studies

No further studies are recommended.

6.7 HAZARDOUS SUBSTANCES AND POLLUTANTS

Construction Phase Impacts

Soil, groundwater and surface water contamination

Potential exists for soil, groundwater and surface water contamination associated with potential releases of small quantities of environmental contaminants and hazardous substances. Sources of pollutants and release mechanisms include:

— Leakages of hydrocarbons (diesel and oil) from construction vehicles and heavy machinery (e.g. excavators and bulldozers).
— Loss of containment and accidental spillage associated with storage and handling of hydrocarbons, chemicals, and concrete.

Runoff creates a preferential pathway and exposure of the above contaminants into the subsurface and water resources leading to a deterioration in water quality and secondary health impacts on aquatic ecosystems and water users.

Operational Phase Impacts

Soil, groundwater and surface water contamination

Potential exists for soil, groundwater and surface water contamination associated with potential releases of small quantities of environmental contaminants and hazardous substances.

Major Hazardous Installation

The following hazards will be considered in the assessment:

— Water treatment:
  — suitable secondary spill containment.
— Electrolysers:
  — internal explosions,
  — leaks, fires.
— Hydrogen compression, liquefaction, storage and transport:
  — fire and explosions,
  — domino impacts on other facilities,
  — occupied building locations on site.
— Oxygen compression, liquefaction storage and transport:
  — enhanced flammability.
— LAES – air separation plant:
  — asphyxiation, enhance flammability and internal explosions.
— Nitrogen compression, liquefaction storage and transport:
  — asphyxiation.

— Ammonia production, liquefaction storage and transport:
  — toxic vapour clouds – proximity to occupied areas,
  — fire and explosions.

Mitigation Considerations

— Chemicals, hydrocarbon materials and hazardous substances maintained onsite must be managed in accordance with the Hazardous Substances Act (No. 15 of 1973) and its relevant regulations.
— All machinery and equipment should be inspected regularly for faults and possible leaks; these should be serviced off-site or in appropriately bunded areas.
— Spill kits must be available at all locations where hazardous substances are stored, handled or used, and spills must be cleaned up immediately in accordance with an established protocol applicable to the material.

Recommended EIA Phase Studies

A qualitative risk assessment has been recommended.

6.8 WASTE MANGAEMENT

Construction Phase Impacts

Generation of General Waste

The table below provides a summary of the typical general waste types that are likely to be generated on site during construction. The presence of construction workers has the potential to increase litter on site in the absence of adequate waste receptacles. This results in an unsightly working environment and possible entry into surrounding environment. Furthermore, waste materials may attract pest species / vectors into working areas leading to potential health implications for construction staff and community members.

Spoil material unsuitable for reuse as backfill and bedding material has the potential to disrupt land use and habitats if inappropriately manage or disposed illegally.

Waste generation (domestic waste, mixed industrial and metal waste) and a lack of appropriate separation, temporary storage and recycling (i.e. not aligned with the Waste Hierarchy) has the potential to result in unnecessary waste material to landfill.

Waste Category	*Waste Type*	*Typical Constituents*
General Waste	Domestic Waste	Paper and cardboard packaging, empty plastic and metal containers (non-hazardous original contents) etc.
	Organic Waste	Canteen, food and cooking waste
	Mixed Industrial	Wood, plastic, packaging etc.
	Metal Waste	Ferrous and non-ferrous scrap and stainless steel, metal cuttings, electrode stubs from welding.
	Spoil Material	Excavations, trenching and terracing will result in the generation of spoil material
	Building rubble	Wasted flooring material, paint containers, wall tiles, timber, piping etc.
	Biomass	Cleared vegetation

Generation of Hazardous Waste

The table below provides a summary of the typical hazardous waste types that are likely to be generated on site during construction. Hazardous waste generation and inappropriate

management and disposal has the potential to lead to contamination of soil, groundwater and surface water.

Waste Category	Waste Type	Typical Constituents
Hazardous Waste	Oily Waste	Used lubricant and hydraulic oils and hydrocarbon based solvents
	Oil Contaminated Waste	Solid material (rags etc.) that has come into contact with and contains traces of oil or grease
	Hazardous Chemical Containers	From temporary storage and use of chemicals on site
	Sanitary Waste	Sewerage / faecal matter generated at the contractor's camp

Sanitation Waste

Sanitation services are required to accommodate workers on site, contractor's yard and at site camps along the route. Temporary ablution facilities (chemical toilets) are proposed to appropriately contain and treat waste for offsite disposal. The incorrect siting of chemical toilets (i.e. within 100m of a watercourse or stream) and loss of containment could lead to pollution of the receiving environment (soil, groundwater and surface water), leading to secondary health impact to ecosystems and communities (ground and surface water users).

Sanitary waste, if not correctly contained, has the potential to enter surface water via runoff and increase organic matter loading in water systems.

Operational Phase Impacts

Generation of General Waste

The table below provides a summary of the typical general waste types that are likely to be generated on site during operation. Waste generation (domestic waste and mixed industrial) and a lack of appropriate separation, temporary storage and recycling (i.e. not aligned with the Waste Hierarchy) has the potential to result in unnecessary waste material to landfill. However, it is noted that only small volumes of waste are anticipated to be generated by the facility during operations.

Waste Category	Waste Type	Typical Constituents
General Waste	Domestic Waste	Paper and cardboard packaging, empty plastic and metal containers (non-hazardous original contents) etc.
	Organic Waste	Canteen, food and cooking waste
	Mixed Industrial	Wood, plastic, packaging etc.

Generation of Hazardous Waste

The table below provides a summary of the typical hazardous waste types that are likely to be generated on site during construction. Hazardous waste generation and inappropriate management and disposal has the potential to lead to contamination of soil, groundwater and surface water.

Waste Category	Waste Type	Typical Constituents
Hazardous Waste	Oily Waste	Used lubricant and hydraulic oils and hydrocarbon based solvents
	Oil Contaminated Waste	Solid material (rags etc.) that has come into contact with and contains traces of oil or grease
	Brine (pending classification)	Dewatered brine from water treatment facility

Sanitation Waste

Sewage and other wastewater generated from washrooms, etc. are similar to domestic wastewater. It is anticipated that the sewage will be discharged into conservancy tank.

Mitigation Considerations

- Despite the modest volumes of waste anticipated to be generated by the Project, recycling opportunities should be sought in order to reduce the volume of waste to landfill and harness commercial benefits for both the project team and local community.
- Provisions of suitable waste receptacles for temporary storage of general and hazardous waste (in compliance with Material Safety Data Sheets).
- Collection and disposal of hazardous waste at appropriately licences landfills and proof of disposal to be retained by contractors and facility operators.

Recommended EIA Phase Studies

No further studies are recommended.

6.9 TERRESTRIAL ECOLOGY

The key activities associated with development activities that may affect the ecology of the area include vegetation clearance for the GH&A facility and associated infrastructure, roads and other hard infrastructure. The following impacts have been identified:

Construction Phase Impacts

Loss and Fragmentation of Habitat

- Direct loss of habitat within the footprint of the proposed facility, and associated impacts on CBAs. This would mostly be very localised and limited in extent, based on the current location of infrastructure.
- Temporary fragmentation of vegetation communities can lead to disturbance and potential loss of portion of certain vegetation types and associated floral species assemblages (habitat destruction). Permanent loss of floral Species of Conservation Concern (SCC) may occur if the proposed site footprint and construction activities takes place within sensitive habitat units.
- Impacts on specific habitats of biodiversity value, including riparian areas, floodplain grasslands, rocky grasslands, and wetlands.
- Impacts on threatened and/or protected plant species. This could possibly occur within any areas of natural habitat, as specified for the previous impact.

Loss and Displacement of Fauna

- The construction of project infrastructure will require the clearance vegetation (possibly providing refuge or breeding grounds to fauna). These activities will cause disturbance and displacement of local fauna (including possible threatened or protected species) due to habitat loss; and/or direct mortalities. Although it is assumed that the majority of fauna species will move to different areas because of disturbance, some protected fauna species have very specific habitat requirements, and the disturbance of sensitive habitats will result in displacement to less optimal habitats.
- Secondary impacts associated include the destruction and disturbance to local breeding grounds and nesting sites; leading to potential decrease in population densities of threatened and protected species. If development takes place within the sensitive habitats permanent loss of faunal SCC carrying capacity will potentially occur.
- Some mammals and reptiles would be vulnerable to illegal collection or poaching during the construction phase as a result of the large number of construction personnel that are likely to be present.

Proliferation of alien invasive plant species

— The disturbance associated with the construction phase of the project will render the disturbed areas vulnerable to alien plant invasion. Some alien plant invasion is inevitable and regular alien plant clearing activities would be required to limit the extent of this problem. Once the natural vegetation has returned to the disturbed areas, the site will be less vulnerable to alien plant invasion, however, the roadsides and pipeline areas are likely to remain the focus of alien plant invasion for years.

Operational Phase Impacts

Proliferation of alien invasive plant species

Proliferation of alien invasive plant species has the potential to manifest during the operational phase. In addition, daily operational activities at the site may deter certain species from the area, resulting in a loss in broad-scale landscape connectivity.

Cumulative Impacts

Cumulative impacts might occur due to the presence of the Hendrina Renewable Energy Complex proposed in proximity to the study area. The footprint of these two developments will likely be cumulative, with the ecological impact of all facilities operating in combination likely to exceed the sum of individual parts.

Mitigation Considerations

— The preferred project layout must avoid sensitive habitats as far as possible.
— Minimise development footprint within high sensitivity areas and ensure that final development layout takes account of areas identified as sensitive during the field survey. Some avoidance and changes to the layout may be required if some areas with a high abundance of species of concern are shown to occur within the preferred development areas.
— Sensitive faunal habitats such as drainage lines and wetlands must be avoided as far as possible.
— Detailed biodiversity assessment is required to determine sensitivity, quantify potential impacts to flora and fauna, and provide for recommendation of mitigation measures.
— Alien and invasive vegetation control should take place throughout the duration of the construction and operation phases. An alien management plan must be part of the EMPr.

The main mitigation measures, other than required Management Plans for plant rescue, rehabilitation, and alien plant management, are related to infrastructure location, which is a planning phase measure. Specific recommendations will form part of the outcome of the EIA.

Recommended EIA Phase Studies

A detailed terrestrial ecological assessment will be carried out in the EIA phase. Refer to **Section 7** of this Report for the Plan of Study for the Terrestrial Ecology Assessment.

6.10 AVIFAUNA

Construction Phase Impacts

Displacement due to habitat transformation associated with the construction of the GH&A facility.

The construction of the facility will impact on birds breeding, foraging and roosting in facility footprint through transformation of habitat, which could result in permanent displacement. Unfortunately, very little mitigation can be applied to reduce the significance of this impact as the total permanent transformation of the habitat within the construction footprint of the facility is unavoidable. However, the impact of habitat loss for SCC due to direct habitat transformation associated with the construction of the proposed facility is likely to be limited, due to the relatively small size of the footprint (25 ha), and the fact that almost no natural grassland will be affected, which is the most important habitat type for SCC. In the case of Site Alternatives 2 and 3, it will result in the removal

of stands of alien trees, which could potentially serve as a nest location for Secretary bird and Lanner Falcon, although no such breeding was recorded during the year of pre-construction monitoring for the proposed wind energy facilities

It is highly unlikely that SCC will be significantly affected by this potential impact, but species that are potentially vulnerable to this impact are African Grass Owl, Blue Korhaan, Denham's Bustard, Grey Crowned Crane, Lanner Falcon, Martial Eagle, Secretary bird, Southern Bald Ibis.

Displacement of SCC due to disturbance of breeding birds associated with the construction of the GH&A facility.

In the case of Site Alternatives 2 and 3, it will necessitate the removal of stands of alien trees, which could potentially serve as a nest location for Secretary bird and Lanner Falcon, although no such breeding was recorded during the year of pre-construction monitoring for the proposed wind energy facilities. There is a possibility that Blue Korhaan could use natural grassland in the project area for breeding, but very little of this habitat is impacted by the proposed facilities, therefore the likelihood of breeding birds being disturbed by construction activities are remote.

SCC which are potentially vulnerable to this impact are Secretary bird, Lanner Falcon, Blue Korhaan

Displacement due to habitat transformation associated with the construction of the 132kV grid connection power line.

These activities could impact on birds breeding, foraging and roosting in in the powerline servitude through transformation of habitat, which could result in temporary or permanent displacement. The loss of habitat for SCC due to direct habitat transformation associated with clearing of vegetation in the servitude is likely to be minimal due to the nature of the vegetation and the small footprint of the poles.

The powerline sensitive species which could occur in the project area and are potentially vulnerable to displacement due to habitat transformation are African Grass Owl, Blue Korhaan, Denham's Bustard, Secretary bird, Southern Bald Ibis, Helmeted Guineafowl.

Displacement due to disturbance associated with the construction of the 132Kv grid connection power line.

Apart from direct habitat destruction, construction activities also impact on birds through displacement caused by disturbance; this could lead to breeding failure if the disturbance happens during a critical part of the breeding cycle. Construction activities in close proximity to breeding locations could be a source of disturbance and could lead to temporary breeding failure or even permanent abandonment of nests. A potential mitigation measure is the timeous identification of nests and the timing of the construction activities to avoid disturbance during a critical phase of the breeding cycle, although in practice that can admittedly be very challenging to implement due to demanding construction schedules. Terrestrial species and owls, and raptors and crows breeding on existing high voltage lines running next to the proposed alignments, are most likely to be affected by displacement due to disturbance associated with the construction of the 132kV grid line.

The powerline sensitive species which could occur in the PAOI and are potentially vulnerable to displacement due to disturbance are African Grass Owl, Blue Korhaan, Denham's Bustard, Lanner Falcon. Secretary bird, Greater Kestrel, Helmeted Guineafowl, Pied Crow, Rock Kestrel.

Operational Phase Impacts

Collisions

Collisions could the biggest threat posed by overhead powerlines to birds in southern Africa. Most heavily impacted upon are bustards, storks, cranes and various species of waterbirds, and to a lesser extent, vultures. These species are mostly heavy-bodied birds

with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with transmission lines.

The priority species which are potentially vulnerable to this impact are the following: African Grass Owl (SCC), Blue Korhaan (SCC), Denham's Bustard (SCC), Greater Flamingo (SCC), Grey Crowned Crane (SCC), Lesser Flamingo (SCC), Maccoa Duck (SCC), Secretary bird (SCC), Southern Bald Ibis (SCC), Yellow-billed Stork (SCC), African Black Duck, African Darter, African Sacred Ibis, African Spoonbill, African Swamphen, Black-headed Heron, Black-necked Grebe, Cape Shoveler, Cape Teal, Egyptian Goose, Glossy Ibis, Goliath Heron, Great Crested Grebe, Great Egret, Grey Heron, Hadada Ibis, Hamerkop, Intermediate Egret, Little Egret, Little Grebe, Marsh Owl, Purple Heron, Red-billed Teal, Red-knobbed Coot, Reed Cormorant, South African Shelduck, Southern Pochard, Spotted Eagle-Owl, Spur-winged Goose, Squacco Heron, Western Barn Owl, Western Cattle Egret, White Stork, White-backed Duck, White-breasted Cormorant, White-faced Whistling Duck, Yellow-billed Duck.

Cumulative Impacts

Cumulative impacts might occur due to the presence of the Hendrina Renewable Energy Complex proposed in proximity to the study area. The footprint of these two developments will likely be cumulative, with the ecological impact of all facilities operating in combination likely to exceed the sum of individual parts.

Mitigation Considerations

- Vegetation clearance should be limited to what is necessary.
- The mitigation measures proposed by the biodiversity specialist must be strictly enforced.
- Development in high sensitivity grassland must be limited as far as possible
- Conduct a pre-construction inspection to identify Red List species that may be breeding within the project footprint to ensure that the impacts to breeding species (if any) are adequately managed.
- Construction activity should be restricted to the immediate footprint of the infrastructure as far as possible.
- Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species.
- Measures to control noise and dust should be applied according to current best practice in the industry.
- Development in high sensitivity grassland must be limited as far as possible.
- Eskom approved Bird flight diverters should be installed on the entire line for the full span length on the earthwire (according to Eskom guidelines – five metres apart). Light and dark colour devices must be alternated to provide contrast against both dark and light backgrounds respectively.
- A raptor-friendly pole design must be used, and the pole design must be approved by the avifaunal specialist.

Recommended EIA Phase Studies

The EIA Phase will entail the implementation of one avifaunal surveys and a full assessment of the likely impacts and available mitigation options, based on the results of systematic and quantified monitoring, in line with the monitoring protocols. Refer to **Section 7** of this Report for the Plan of Study for the Avifauna Assessment.

6.11 BATS

Construction Phase Impacts

Loss of foraging habitat by clearing of vegetation.

Roost destruction during earthworks.

Operational Phase Impacts

Increased bat mortalities due to light attraction and habitat creation.

Mitigation Considerations

- Adhere to the sensitivity map criteria.
- Rehabilitate cleared vegetation where possible at areas such as laydown yards.
- Only use lights with low sensitivity motion sensors that switch off automatically when no persons are nearby while still adhering to safety and security requirements, to prevent the creation of regular insect gathering pools. For buildings, avoid tin roofs and roof structures that offer entrance holes into the roof cavity.

Recommended EIA Phase Studies

A field-based Bat Impact Assessment will be undertaken during the EIA phase of the assessment. Refer to **Section 7** of this Report for the Plan of Study for the Bat Impact Assessment.

6.12 VISUAL AND LANDSCAPE

Construction Phase Impacts

During the construction phase of the proposed Hendrina GH&A Facility and associated infrastructure, there will be some visual impacts on motorists and inhabitants during the construction and decommissioning periods resulting from laydown areas, construction vehicles, dust and equipment. These impacts will be transitory in nature for the duration of construction /decommissioning and include the following:

- Potential visual intrusion resulting from large construction vehicles and equipment;
- Potential visual effect of construction laydown areas and material stockpiles.
- Potential impacts of increased dust emissions from construction activities and related traffic;
- Potential visual scarring of the landscape as a result of site clearance and earthworks; and
- Potential visual pollution resulting from littering on the construction site.

Operational Phase Impacts

The operation of the Hendrina GH&A Facility will have a visual impact on the following receptors:

- Potential alteration of the visual character of the area;
- Potential visual intrusion resulting from the various components of the Facility;
- Potential visual clutter caused by substation and other associated infrastructure on-site.
- Potential visual effect on surrounding farmsteads; and
- Potential visual impact on the night time visual environment.

Cumulative impacts

- Combined visual impacts from mining, industrial, infrastructural and renewable energy development in the broader area could potentially alter the sense of place and visual character of the area; and
- Combined visual impacts from mining, industrial, infrastructural and renewable energy development in the broader area could potentially exacerbate visual impacts on visual receptors.

Mitigation Considerations

- Carefully plan to minimise the construction period and avoid construction delays.
- Position laydown areas and related storage/stockpile areas in unobtrusive positions in the landscape, where possible.
- Minimise vegetation clearing and rehabilitate cleared areas as soon as possible.
- Vegetation clearing should take place in a phased manner.
- Make use of existing gravel access roads where possible.

- Limit the number of vehicles and trucks travelling to and from the proposed sites, where possible.
- Maintain a neat construction site by removing litter, rubble and waste materials regularly.
- Restrict vegetation clearance on the site to that which is required for the correct operation of the facility.
- 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.
- 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.
- Mounting heights of lighting fixtures should be limited, or alternatively, foot-light or bollard level lights should be used.
- If economically and technically feasible, make use of motion detectors on security lighting.

Recommended EIA Phase Studies

The scoping phase Visual Impact Assessment (VIA) report has adequately assessed the visual impacts of the proposed Hendrina GH&A Facility and no further field investigation will be required. The EIA Phase study will entail updating the scoping phase VIA report and will include a review of the findings of the VIA in accordance with detailed site layouts and a comparative assessment of the layout alternatives provided. Following comments from the relevant stakeholders, the final report will be updated and submitted with the final EIA report. Refer to **Section 7** of this Report for the Plan of Study for the Visual Impact Assessment.

6.13 HERITAGE AND CULTURAL RESOURCES

Construction Phase Impacts

Disturbance to Known Cultural Resources

Construction activities may lead to disturbance or destruction of cultural resources (archaeological and historical remains and sacred sites e.g. graves) should the development footprint encroach on identified cultural/heritage sites.

Chance find of Cultural Resources

Earthworks may accidentally expose unidentified subsurface fossil remains. This will result in a lost opportunity to preserve local cultural heritage and historical records should appropriate management measures not be in place (e.g. Chance Find Procedure).

Operational Phase Impacts

No impacts anticipated.

Mitigation Considerations

- Chance Find Procedure must be included in the EMPr.
- Areas of potential heritage sensitivities that are identified in the EIA phase, should be demarcated.

Recommended EIA Phase Studies

A field-based Heritage Impact Assessment, as defined in section 38 of the NHRA, will be undertaken during the EIA phase of the assessment. Refer to **Section 7** of this Report for the Plan of Study for the Heritage Impact Assessment.

6.14 PALAEONTOLOGY

Construction Phase Impacts

The construction phase will entail surface clearance as well as excavations into the superficial sediment cover and underlying bedrock. The development may adversely affect potential fossil heritage within the study area by destroying, damaging, disturbing or permanently sealing-in fossils preserved at or beneath the surface of the ground that are then no longer available for scientific research or other public good.

Operational Phase Impacts

No impacts anticipated.

Mitigation Considerations

— If a chance find is made then all work must cease in the immediate vicinity of the find. The Environmental Control Officer must report the find to the relevant Heritage Agency (South African Heritage Research Agency, SAHRA). Mitigation of chance fossil finds reported by the Environmental Control Officer would involve the recording, sampling and / or collection of chance fossil finds and associated geological data by a professional palaeontologist during the construction phase of the development. The palaeontologist concerned with potential mitigation work would need a valid fossil collection permit from the relevant Heritage Agency and any material collected would have to be curated in an approved depository (e.g. museum or university collection).

Recommended EIA Phase Studies

The study area is of insignificant to moderate to very high paleontological sensitivity and according to the SAHRA palaeontological sensitivity map must be subjected to a palaeontological assessment in the EIA phase. Refer to **Section 7** of this Report for the Plan of Study for the Palaeontological Impact Assessment.

6.15 TRAFFIC

Construction Phase Impacts

Increased traffic generation around the study area by construction vehicles

The construction phase is expected to generate additional traffic volumes on the local road network due to the transport of raw materials and machinery to site.

Deterioration of the surrounding road network due to an increase of traffic around the site

Raw materials and machinery will be transported to the study area during the construction phase. This may result in potential damage to the existing road network. It is expected that the bulk of the construction plant would remain on site during construction. The impact of the heavy vehicles on the surrounding roads is considered to be negligible.

Transportation of abnormal loads during the construction phase

The construction phase will result in impacts on roads users due to the need to transport over-sized components to site. It is anticipated that the transport route(s) between the origin of the components and the facility may include national, provincial and local roads.

Operational Phase Impacts

The operational phase of the facility will require very presence of staff personnel, except for those undertaking inspection, maintenance and repair works. Furthermore, the operational phase will require the regular transport of product from the facility. The traffic impact on the surrounding roads is anticipated to increase.

Nature of impact:

The nature of the impact expected to be generated at this stage would be traffic congestion and delays on the surrounding road network, and the associated noise, dust and exhaust pollution, as well as road surface impact due to the increase in traffic.

Estimated peak hour traffic generated by the site:

Operational Staff traffic: It is estimated that 40 permanent employment opportunities will be created during the operational phase. If it is further assumed that 20-40% of the average daily traffic occurs during the peak hour. An estimated 16 peak hour traffic trips are assumed for staff commuter trips.

Hydrogen and oxygen gas delivery trips: up to 20,000 tons per annum (tpa) of green hydrogen and up to 40 000 tpa of green oxygen are estimated for production. The oxygen obtained as part of the hydrogen production process may be released or stored and sold as a by-product. The hydrogen may be directed to the Ammonia production plant (see "ammonia processing" below) or be stored and sold to interested parties directly.

Up to 800 tons of both oxygen and hydrogen will be stored at the facility. The oxygen capacities that could be sold off are unknow at this stage as such, vehicle trips resulting from the transport of oxygen and hydrogen cannot be estimated at this stage.

Ammonia gas delivery trips: Liquid Ammonia may readily be transported via road, rail or a combination of the two by means of Standard pressurised road tanker or ISOtainer (for road transport options), or via pressured rail container (ISOtank).

Use of 40ft pressured tanker trucks or trucks with ISOtainer capability (20ft length each). Volumes will be up to 24 tons per truck load depending on pressured tanker or Isotainer, therefore 12 daily 24-ton ISOtainer truck trips are envisaged.

If it is further assumed that 20-40% of the average daily traffic occurs during the peak hour. An estimated 5 peak hour traffic trips are assumed for ammonia delivery.

Total estimated peak hour trips (operational phase): The total estimated peak hour trips during the operational phase cannot be estimated at this stage due to the gaps in knowledge regarding truck volume for the delivery of oxygen and hydrogen.

Mitigation Considerations

The potential mitigation measures mentioned in the construction and decommissioning phases are:

- The delivery of components to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.
- Dust suppression of all impacted gravel roads during the construction phase, as required.
- The use of mobile batch plants and quarries near the site would decrease impacts of
- material delivery trips.
- Manufacturing some components on site
- Use of on-site borrow pits for material sourcing
- Staff and general trips can occur outside of peak traffic periods as far as possible.
- Use of high occupancy vehicles to transport workers can reduce traffic volumes
- The preferred abnormal load travel routes should be surveyed to identify problem areas (e.g., intersections with limited turning radii and sections of the road with sharp horizontal curves or steep gradients, that may require modification). This can reduce traffic delays by allowing ease of travel.
- Accommodating on site storage for components and materials to allow for practical scheduled delivery outside of peak hours.
- Periodic maintenance of the gravel roads utilized during the construction phase. This maintenance will require liaising with the provincial authority charged with maintaining the road to determine the appropriate maintenance level, extent and frequency.

The potential mitigation measures mentioned in the operational phase are:

— During the operational phase transport of oxygen, hydrogen, and ammonia can be
— staggered, and trips can be scheduled to occur outside of peak traffic periods.
— Dust suppression of internal gravel roads as required.
— Maintenance of internal roads to maintain good riding quality.

Recommended EIA Phase Studies

A Traffic Impact Statement will form part of the EIA phase. The Traffic Specialist study will assess potential impacts of the proposed route during the construction phase and identify potential and suitable alternatives for construction vehicle access to the site. Refer to **Section 7** of this Report for the Plan of Study for the Traffic Impact Statement.

6.16 SOCIO-ECONOMIC

Construction Phase Impacts

During the construction phase, the proposed facility will have both positive and negative effects on the socio-economic environment.

The facility is anticipated to make a prominent contribution towards the national and local economy. It is estimated that new business sales, a positive GDP contribution and various employment positions will be generated by the project in the national economy through multiplier effects. Aside from the above positive effects, the project will contribute to skills development in the country, specifically as far as construction of the hydrogen and ammonia facility is concerned as well as increasing household earnings. The increase in household earnings is also likely to improve the standards of living of the affected households albeit temporarily.

Aside from the positive impacts though, the project will be creating negative direct, secondary and cumulative impacts on the local communities, specifically areas surrounding the site where the proposed facility is to be built. The main factors that will cause this negative impact are the influx of workers and job seekers from outside of the local community and visual and noise disturbances that would be created by the construction activities as the footprint of the facility grows.

Operational Phase Impacts

During the operation of the facility the socio-economic impacts are likely to last longer when compared to those observed during the construction phase. This is the case for both positive and negative effects.

The operation of the proposed Complex will generate new business sales, contribute positively to the GDP and create sustainable employment positions. The developer's intended spend will also notably contribute towards local employment, skills development and various conservation enterprises within the immediate area.

Negative impacts include the potential loss of sense of place and potential loss of income from agriculture-based businesses. These potential losses may, however, be mitigated by the rental that will be paid to landowners where the facility will be erected.

As in the case with the impacts observed during construction, negative effects can be mitigated, and positive impacts enhanced. Mitigation of the negative impacts though will not result in their complete elimination as visual disturbance of the nature inherent to the project are difficult to eradicate entirely.

Nevertheless, the significance ratings of the negative impacts are expected to be somewhat reduced.

Cumulative Impacts

Cumulative impact on sense of place & visual nature

The potential cumulative impacts on the areas sense of place will be largely linked to potential visual impacts. As indicated above, the potential impact of the proposed facility and associated infrastructure on the areas sense of place is likely to be limited. The cumulative impacts are also likely to be low with mitigation. This will be confirmed during the assessment phase.

Mitigation Considerations

- Ensuring local communities (through formal channels such as ward councillors and Department of Labour) are made aware of the potential opportunities available during construction in order for expectations to be managed appropriately.
- Prioritisation of local labour through implementing contractor policies.
- Undertake a survey of industries and businesses in the local area to identify potential suppliers.
- The developer and contractors must make HIV/AIDS awareness and prevention program development and implementation a condition of contract for all suppliers and sub-contractors.

Recommended EIA Phase Studies

Based on the Scoping Assessment, the majority of social issues have been identified. A site visit will be undertaken during the EIA Phase of the Scoping Impact Assessment. The site visit will include interviews with key stakeholders and interested and affected parties. Refer to **Section 7** of this Report for the Plan of Study for the Social Impact Assessment (SIA).

6.17 SHE RISK

Construction Phase Impacts

Human Health chronic exposure to toxic chemical or biological agents

Human and Equipment Safety exposure to violent release of kinetic or potential energy Fires, explosions, noxious smoke, large spills, traffic accidents, equipment/structural collapse.

Inadequate emergency response to small event leads to escalation. Injuries turn to fatalities, small losses become extended down time.

Operational Phase Impacts

Human Health chronic exposure to toxic chemical or biological agents

Human and Equipment Safety - exposure to violent release of kinetic or potential energy Fires, explosions, noxious smoke, large spills, traffic accidents, equipment/structural collapse.

Inadequate emergency response to small event leads to escalation.

Consequences could be Injuries turn to fatalities, small losses become extended down time.

Mitigation Considerations

- Major Hazard Installation Registration and compliance with all emergency response requirements.
- Full on-site Emergency Response Plan to be in place as per SANS 1514, e.g. emergency co-ordinator, first responder team, equipment (BA sets, hazmat suits), Command Centre etc.
- Ensure information is provided for the off-site emergency response plant to be compiled and implemented by local authorities.
- Emergency plan to be tested and fully operational before cold commissioning Annual MHI Emergency Drill. Monthly small emergency drills.
- Evacuation siren, audible at closest neighbouring farms, to be in place and tested weekly.
- Gas escape Shelter-in-place rooms to be designed and installed. Integrity levels to vary depending on location.
- Control room to be suitably located or made explosion proof, to also be airtight as a gas escape room.
- Firefighting systems to suitable international codes, e.g. NFPA.
- First aid facilities and due to isolated location on-site clinic / medical stabilization facilities ((e.g. medical oxygen, burn treatment, defibrillator).

— Escape doors open outwards.
— More than one exit to be provided from buildings.
— 24/7 helpline response available for customers of hazardous goods.
— Standard dangerous goods requirements for Hazmat labels.
— Shelter-in-place facilities to be provided for all persons on site.
— Offsite - closest potentially affected neighbours to be provided with emergency response information (i.e. shelter in place).
— Suitable PPE (e.g. overalls, gloves, eyeglasses) to be specified for all operations in process areas.
— PPE to be increased (e.g. full-face shield, aprons, chemical suits) for operations that involve opening equipment and potential exposure, e.g. sampling, maintenance.

Recommended EIA Phase Studies

A Qualitative SHE risk assessment will form part of the EIA phase. The Risk Specialist study will assess potential impacts of the proposed facility during the construction, operational and decommissioning phase and identify potential and suitable mitigation measures for them. Refer to **Section 7** of this Report for the Plan of Study for the QRA

6.18 CLIMATE CHANGE

Construction Phase Impacts

Greenhouse Gas Emissions

A GHG is any gaseous compound in the atmosphere that is capable of absorbing infrared radiation, thereby trapping and holding heat in the atmosphere. By increasing the heat in the atmosphere, greenhouse gases are responsible for the greenhouse effect, which ultimately leads to global warming and contributes to the negative effects of climate change.

The manufacturing of the materials associated with the project, and associated transportation of materials to and from the construction areas will result in indirect GHG emissions. The exhaust emissions will contribute to the presence of GHGs in the atmosphere.

Measures could be considered in respect of the construction phase i.e. attempting to implement GHG emissions reductions measures within the EPC contractor's activities. However, given the site locality, it is anticipated that typical measures (such as stipulating that the EPC contractor measure and report on their GHG emissions during construction and try to incentivise a reduction via the use of energy efficient trucks etc.) are unlikely to be practical or worth the effort (or cost).

Climate Risks and Vulnerability

Loss of topsoil and vegetation community due to soil erosion can be exacerbated by climate change as soil erosion is mostly the result of extreme but short rainfall events. Therefore, changes of precipitation intensity and frequency could exacerbate soil erosion processes.

Operational Phase Impacts

Reduced Greenhouse Gas Emissions

Carbon dioxide (CO_2) is one of the major GHGs under the UN Framework Convention on Climate Change, and a priority GHG in terms of the National Environmental Management: Air Quality Act - Declaration of Greenhouse Gases as Priority Air Pollutants (GN. R710, 2017). CO_2 is emitted from the combustion of fossil fuels. There will be no GHG emissions directly associated with the facility in the operational phase due to the nature of the technology.

Mitigation Considerations	Due to the fact that the proposed development will have no impact on climate, mitigation measures are not deemed necessary. The implementation of the project can be regarded as having a mitigatory effect in terms of contributing to the curbing of South African's CO2 emission increases.
Recommended EIA Phase Studies	No further studies are recommended.

6.19 SUMMARY OF IMPACT SIGNIFICANCE SCREENING

This section provides an overview of the likely significance of construction phase (Table 6-1:), operational phase (Table 6-2:) and initial cumulative impacts (**Table 6-3**) presenting the results of the impact screening tool based on two criteria, namely probability and consequence (outlined in **Section 4.5**). This is used as a guide to determine whether additional assessment may be required in the EIA phase.

Table 6-1: Construction Phase Impacts

ASPECT	IMPACT	NATURE	PROBABILITY	CONSEQUENCE	SIGNIFICANCE (BEFORE MITIGATION)	FURTHER ASSESSMENT REQUIRED
Air Quality	Dust Emissions	Negative	3	1	**Low**	**Yes**
Noise emissions	Noise and Vibration from construction activities	Negative	3	1	**Low**	**Yes**
Topography, & Geology	Risk of soil erosion is increased resulting in the prevention of infiltration of rainwater thereby increasing surface run-off	Negative	4	3	**High**	**No**
Soils, Land Capability and Agricultural Potential	Loss of agricultural potential by soil degradation	Negative	3	3	**Medium**	**Yes**
	Loss of agricultural potential by occupation of land	Negative	3	3	**Medium**	
Surface water	Deterioration of surface water quality due to an increase in sediment or other pollutants, from Grading, vegetation clearing and soil stripping	Negative	3	3	**Medium**	**Yes**

ASPECT	IMPACT	NATURE	PROBABILITY	CONSEQUENCE	SIGNIFICANCE (BEFORE MITIGATION)	FURTHER ASSESSMENT REQUIRED
	Deterioration of surface water quality due to poor management of hazardous materials.	Negative	3	3	**Medium**	
Groundwater	Soil clearing and construction of infrastructure	Negative	3	2	**Medium**	**No**
	Water use- Over abstraction of groundwater can result in aquifer depletion and loss of resource for farmers.	Negative	3	2	**Medium**	
Hazardous Substances and Pollutants	Soil, groundwater and surface water contamination	Negative	4	3	**High**	**Yes**
Waste Generation	Generation of General Waste	Negative	3	2	**Medium**	**No**
	Generation of Hazardous Waste	Negative	3	2	**Medium**	
	Sanitation Waste	Negative	3	2	**Medium**	
Terrestrial Ecology	Loss and Fragmentation of Vegetation and Habitat	Negative	4	3	**High**	**Yes**
	Impacts on CBAs and broad-scale ecological processes	Negative	4	3	**High**	
	Loss and Displacement of Fauna	Negative	4	3	**High**	
	Proliferation of alien invasive plant species	Negative	4	3	**High**	
Avifauna	Displacement of SCC due to habitat transformation associated with the construction of the facility.	Negative	1	3	**Low**	**Yes**

ASPECT	IMPACT	NATURE	PROBABILITY	CONSEQUENCE	SIGNIFICANCE (BEFORE MITIGATION)	FURTHER ASSESSMENT REQUIRED
	Displacement of SCC due to disturbance of breeding birds associated with the construction of the facility.	Negative	1	2	**Very low**	
	Displacement due to habitat transformation associated with the construction of the 132kV grid connection power line.	Negative	1	1	**Very low**	
	Displacement due to disturbance associated with the construction of the 132Kv grid connection power line.	Negative	2	2	**Low**	
Bats	Loss of foraging habitat by clearing of vegetation.	Negative	4	1	**Medium**	**Yes**
	Roost destruction during earthworks	Negative	2	3	**Medium**	
Visual and Landscape	Potential visual intrusion resulting from large construction vehicles and equipment	Negative	3	2	**Medium**	**Yes**
	Potential visual effect of construction laydown areas and material stockpiles.	Negative	3	2	**Medium**	
	Potential impacts of increased dust emissions from construction activities and related traffic	Negative	3	2	**Medium**	
	Potential visual scarring of the landscape as a result of site clearance and earthworks	Negative	3	2	**Medium**	

ASPECT	IMPACT	NATURE	PROBABILITY	CONSEQUENCE	SIGNIFICANCE (BEFORE MITIGATION)	FURTHER ASSESSMENT REQUIRED
	Potential visual pollution resulting from littering on the construction site	Negative	3	1	**Low**	
Heritage and Cultural Resources	Clearing, levelling and construction activities resulting in Disturbance to known Cultural Resources	Negative	4	2	**High**	**Yes**
	Destruction of ruins	Negative	4	2	**High**	
	Clearing, levelling and construction activities will permanently destroy heritage features.	Negative	3	1	**Low**	
Palaeontology	Chance Find of Palaeontological resources	Negative	3	2	**Medium**	**Yes**
Traffic	Increased traffic generation around the study area by construction vehicles	Negative	4	2	**Medium**	**Yes**
	Deterioration of the surrounding road network due to an increase of traffic around the site	Negative	4	2	**Medium**	
	Transportation of abnormal loads during the construction phase	Negative	4	2	**Medium**	
Socio-Economic	Temporary increase in the GDP and production of the national and local economies during construction	Positive	4	3	**High**	**Yes**
	Temporary increase employment in the national and local economies	Positive	3	2	**Medium**	

ASPECT	IMPACT	NATURE	PROBABILITY	CONSEQUENCE	SIGNIFICANCE (BEFORE MITIGATION)	FURTHER ASSESSMENT REQUIRED
	Contribution to skills development in the country and local economy	Positive	3	3	**Medium**	
	Temporary increase in household earnings	Positive	3	3	**Medium**	
	Temporary increase in government revenue	Positive	3	1	**Low**	
	Negative changes to the sense of place	Negative	3	3	**Medium**	
	Impact on the agriculture operations	Negative	3	1	**Low**	
	Temporary increase in social conflicts	Negative	3	3	**Medium**	
	Impact on economic and social infrastructure	Negative	3	2	**Medium**	
	Impact on property and land value in the immediately affected area during construction	Negative	2	2	**Low**	
Climate Change	Greenhouse Gas Emissions	Negative	2	1	**Very Low**	**No**
	Climate Risks & Vulnerabilities	Negative	2	1	**Very Low**	
SHE Risk	Human Health chronic exposure to toxic chemical or biological agents	Negative	3	2	**Medium**	**Yes**
	Human and Equipment Safety - exposure to violent release of kinetic or potential energy	Negative	4	3	**High**	

ASPECT	IMPACT	NATURE	PROBABILITY	CONSEQUENCE	SIGNIFICANCE (BEFORE MITIGATION)	FURTHER ASSESSMENT REQUIRED
	Fires, explosions, noxious smoke, large spills, traffic accidents, equipment/structural collapse. Inadequate emergency response to small event leads to escalation. Consequences - Injuries turn to fatalities, small losses become extended down time.	Negative	3	2	**Medium**	

Table 6-2: Operational Phase Impacts

ASPECT	IMPACT	NATURE	PROBABILITY	CONSEQUENCE	SIGNIFICANCE (BEFORE MITIGATION)	FURTHER ASSESSMENT REQUIRED
Air Quality	Potential degradation of ambient air quality due to NH_3 emissions	Negative	1	1	**Very Low**	**Yes**
Noise emissions	Noise Emissions from operating GH&A facility	Negative	3	1	**Low**	**Yes**
Traffic	Increased traffic generation around the study area by construction vehicles	Negative	2	2	**Low**	**Yes**
	Deterioration of the surrounding road network due to an increase of traffic around the site	Negative	2	2	**Low**	
	Transportation of abnormal loads during the construction phase	Negative	2	2	**Low**	
Soils, Land Capability and Agricultural Potential	Permanent loss of agricultural land	Negative	4	3	**Medium**	**Yes**

ASPECT	IMPACT	NATURE	PROBABILITY	CONSEQUENCE	SIGNIFICANCE (BEFORE MITIGATION)	FURTHER ASSESSMENT REQUIRED
Surface Water	Deterioration of surface water due to contact with Brine or Ammonia produced at the facility	Negative	3	3	**Medium**	**Yes**
	Increased sedimentation due to increased erosion in concreted or compacted surfaces.	Negative	3	3	**Medium**	
Groundwater	Production, storage and disposal of the brine waste pose potential groundwater contamination	Negative	4	3	**High**	**No**
Hazardous Substances and Pollutants	Soil, groundwater and surface water contamination	Negative	3	3	**Medium**	**No**
	Major Hazardous Installation	Negative	3	3	**Medium**	**Yes**
Waste Generation	Generation of General Waste	Negative	3	2	**Medium**	**Yes**
	Generation of Hazardous Waste	Negative	3	3	**Medium**	
	Sanitation Waste	Negative	3	2	**Medium**	
Terrestrial ecology	Proliferation of alien invasive plant species	Negative	3	3	**Medium**	**Yes**
Avifauna	Mortality of priority species due to collisions with 132kV grid connection power line.	Negative	3	2	**Medium**	**Yes**
Bats	Increased bat mortalities due to light attraction and habitat creation.	Negative	4	3	**High**	**Yes**
Visual	Potential alteration of the visual character of the area;	Negative	3	3	**Medium**	**Yes**

ASPECT	IMPACT	NATURE	PROBABILITY	CONSEQUENCE	SIGNIFICANCE (BEFORE MITIGATION)	FURTHER ASSESSMENT REQUIRED
	Potential visual intrusion resulting from the various components of the Facility	Negative	3	3	**Medium**	
	Potential visual clutter caused by substation and other associated infrastructure on-site	Negative	3	3	**Medium**	
	Potential visual effect on surrounding farmsteads	Negative	3	3	**Medium**	
	Potential alteration of the night-time visual environment	Negative	3	3	**Medium**	
	Potential visual effect of OHL	Negative	3	1	**Low**	
Social	Sustainable increase in the GDP and production of the national and local economies	Positive	4	3	**High**	**Yes**
	Creation of sustainable employment positions nationally and locally	Positive	3	3	**Medium**	
	Skills development of permanently employed workers	Positive	3	3	**Medium**	
	Improved standards of living for benefiting households	Positive	4	3	**High**	
	Sustainable increase in national and local government revenue	Negative	4	3	**High**	
	Local economic and social development benefits derived from the project's operations	Negative	3	3	**Medium**	

ASPECT	IMPACT	NATURE	PROBABILITY	CONSEQUENCE	SIGNIFICANCE (BEFORE MITIGATION)	FURTHER ASSESSMENT REQUIRED
	Sustainable rental revenue for farms where the facility is located	Negative	3	3	**Medium**	
	Sustainable increase in hydrogen and ammonia available for the local region and South Africa	Positive	4	3	**High**	
	Negative changes to the sense of place	Negative	3	2	**Medium**	
	Impact on the agriculture operations	Negative	3	1	**Low**	
Climate Change	Reduced GHG Emissions	Positive	4	3	**High**	**No**
SHE Risk	Human Health chronic exposure to toxic chemical or biological agents	Negative	3	2	**Medium**	**Yes**
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents	Negative	4	3	**High**	
	Fires, explosions, noxious smoke, large spills, traffic accidents, equipment/structural collapse. Inadequate emergency response to small event leads to escalation. Consequences - Injuries turn to fatalities, small losses become extended down time.	Negative	3	2	**Medium**	

Table 6-3: Initial Cumulative Impacts

RECEPTOR	DESCRIPTION	NATURE	PROBABILITY	CONSEQUENCE	SIGNIFICANCE (BEFORE MITIGATION)	FURTHER ASSESSMENT REQUIRED
Noise and Vibrations	Cumulative Noise Emissions	Negative	3	3	**Medium**	**Yes**
Soils, Land Capability and Agricultural Potential	Cumulative Agricultural Impacts	Negative	4	3	**High**	**Yes**
Terrestrial Ecology	Cumulative impacts on biodiversity	Negative	4	3	**High**	**Yes**
Avifauna	Displacement of SCC due to disturbance of breeding birds associated with the decommissioning of the facility	Negative	1	3	**Medium**	**Yes**
	Cumulative collision Impacts	Negative	4	3	**Medium**	
Visual	Combined visual impacts from mining, industrial, infrastructural and renewable energy development in the broader area could potentially alter the sense of place and visual character of the area	Negative	3	3	**Medium**	**Yes**
	Combined visual impacts from mining, industrial, infrastructural and renewable energy development in the broader area could potentially exacerbate visual impacts on visual receptors	Negative	3	3	**Medium**	
Social	Cumulative impact on sense of place	Negative	4	3	**High**	**Yes**
Bats	Loss of foraging habitat by clearing of vegetation.	Negative	4	1	**Medium**	**Yes**

RECEPTOR	DESCRIPTION	NATURE	PROBABILITY	CONSEQUENCE	SIGNIFICANCE (BEFORE MITIGATION)	FURTHER ASSESSMENT REQUIRED
	Roost destruction during earthworks.	Negative	2	2	**Low**	
	Increased bat mortalities due to light attraction and habitat creation.	Negative	4	3	**High**	

7 PLAN OF STUDY FOR EIA

7.1 PLAN OF STUDY FOR EIA TERMS OF REFERENCE

Table 7-1: outlines the structure of the plan of study as required in terms of Annexure 2 of GNR 982.

Table 7-1: Plan of Study Requirements

PLAN OF STUDY CHAPTER	INFORMATION REQUIREMENT AS PER GNR 982
Description of EIA Tasks	— A description of the tasks that will be undertaken as part of the environmental impact assessment process.
Description of Alternatives	— A description of the alternatives to be considered and assessed within the preferred site, including the option of not proceeding with the activity.
Aspects to be Assessed in the EIA Process	— A description of the aspects to be assessed as part of the environmental impact assessment report process.
Specialist Studies	— Aspects to be assessed by specialists.
Impact Assessment Methodology	— A description of the proposed method of assessing the environmental aspects, including a description of the proposed method of assessing the environmental aspects including aspects to be assessed by specialists. — A description of the proposed method of assessing duration and significance.
Environmental Impact Report	— Contents of EIAR as specified in GNR 982 (as amended) Annexure 2
Stakeholder and Authority Engagement	— An indication of the stages at which the competent authority will be consulted. — Particulars of the public participation process that will be conducted during the environmental impact assessment process.

7.2 OVERVIEW OF THE EIA PHASE TASKS

The EIA phase will consist of the following tasks; each of these tasks is detailed separately in the following sub-sections:

— Specialist studies;
— Continuation of authority and stakeholder engagement;
— Assessment of the significance of potential impacts; and
— Preparation of the EIA Report.

7.3 DESCRIPTION OF ALTERNATIVES

The EIA process identifies two types of project alternatives:

— Concept Level Alternatives, which relate to the site, technology and process alternatives
— Detailed Level Alternatives which relate to working methods and mitigation measures

The feasibility of the higher-level concept alternatives have been considered and assessed within **Section 2.4** of the FSR. The Detailed Level Alternatives will be addressed within the EIA Report.

7.4 ASPECTS TO BE ASSESSED IN THE EIA PROCESS

Table 7-2 outlines the key aspects that were identified in the scoping phase; these aspects will be subject to further assessment in the EIA Phase

Table 7-2: Summary of aspects to be addressed in the EIA Phase

ENVIRONMENTAL ASPECT	IMPACT
Air Quality	Dust Emissions
	Bulk Storage Tank Emissions
	Storage of NH_3
Noise and vibrations	Noise and vibration emissions during construction
	Noise disturbance and nuisance to sensitive receptors during operational phase
	Cumulative impacts
Soils, Land Capability and agricultural Potential	Loss of agricultural potential by soil degradation
	Loss of agricultural potential by occupation of land
	Reduction in land available for cultivation and grazing animals
	Enhanced agricultural potential through increased financial security for farming operations
	Cumulative impacts
Wetland and Surface water	Loss of aquatic species of special concern
	Damage or loss of riparian and wetlands systems and disturbance of the waterbodies during construction
	Potential impact on localised surface water quality
	Impact on habitat change and fragmentation related to hydrological regime changes
	Impact on aquatic systems through the possible increase in surface water runoff on form and function - Increase in sedimentation and erosion.
	Cumulative impacts
Hazardous Substances and Pollutants	Qualitative SHE Risk Assessment
	Major Hazardous Installations

ENVIRONMENTAL ASPECT	IMPACT
Biodiversity	Loss and Fragmentation of Vegetation and Habitat
	Impacts on CBAs and broad-scale ecological processes
	Loss and Displacement of Fauna
	Proliferation of alien invasive plant species
	Impact on provincial Conservation
	Cumulative impacts
Avifauna	Displacement due to disturbance during construction
	Displacement due to habitat transformation during construction
	Collisions
	Cumulative impacts
Bats	Loss of foraging habitat by clearing of vegetation.
	Roost destruction during earthworks.
	Increased bat mortalities due to light attraction and habitat creation.
	Cumulative impacts
Visual and Landscape	Visual impact during construction and decommissioning
	Potential alteration of the visual character of the area
	Potential visual intrusion resulting from the various components of the Facility
	Potential visual clutter caused by substation and other associated infrastructure on-site.
	Potential visual effect on surrounding farmsteads
	Potential alteration of the night time visual environment
	Cumulative visual impacts
Heritage and Cultural Resources	Disturbance or destruction of cultural resources
Palaeontology	Physical disturbance of palaeontological sites

ENVIRONMENTAL ASPECT	IMPACT
Traffic	Increased traffic generation around the study area by construction vehicles
	Deterioration of the surrounding road network due to an increase of traffic around the site
	Transportation of abnormal loads during the construction phase
Socio-economic	Creation of local employment, training, and business opportunities
	Impact of construction workers on local communities
	Influx of job seekers
	Risk to safety, livestock, and farm infrastructure
	Increased risk of grass fires
	Nuisance impacts associated with construction related activities
	Impacts associated with loss of farmland
	Generate income for affected landowners
	Produce green hydrogen and ammonia for the South Africa economy
	Visual impact and impact on sense of place
	Potential impacts associated with noise and odours
	Potential health and safety risks associated with plant incidents
	Cumulative impact on sense of place

7.5 SPECIALIST STUDIES TO BE UNDERTAKEN

The following specialist assessments have been commissioned for the EIA Phase:

- Air quality Impact Assessment
- Soils and Agricultural Potential Assessment;
- Archaeological and Cultural Heritage Assessment;
- Palaeontology Impact Assessment;
- Visual Impact Assessment;
- Biodiversity Impact Assessment (inclusive of terrestrial biodiversity, plant species and animal species);
- Surface water and Wetland Assessment;
- Avifauna Impact Assessment;

— Bat Impact Assessment
— Environmental Acoustic (Noise) Impact Assessment;
— Social Impact Assessment;
— Qualitative Risk Assessment;
— Desktop Geotechnical Assessment; and
— Traffic Assessment.

It should be noted that the specialist studies will be undertaken according to the procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of Sections 24(5)(a) and (h) and Section 44 of the NEMA (GNR 320, dated 20 March 2020), where applicable.

7.5.1 AGRICULTURAL IMPACT ASSESSMENT

The terms of reference for the EIA phase is to produce Agricultural Agro-Ecosystem Specialist Assessment that complies with all the requirements of the agricultural protocol. These assessments will require fieldwork and collection of agricultural data.

7.5.2 TERRESTRIAL BIODIVERSITY ASSESSMENT

The relative sensitivity of habitats in different parts of the study area differs from location to location. The sensitivity assessment was done as a screening exercise primarily through interpretation of aerial imagery in combination with habitat assessments that were not within specific footprint areas. Although footprint areas have been designated as sensitive in some cases, it is important to assess footprint areas in detail to ascertain whether local conditions justify the sensitivity categorisation or not. It is therefore important that all footprint areas within mapped sensitive areas (MEDIUM-HIGH, HIGH and VERY HIGH) are assessed in the field to confirm sensitivity.

A detailed terrestrial ecology assessment will be carried out in the EIA phase and will include the following:

— Confirmation of sensitivities, buffers and the presence of ESAs and CBAs on site.
— A comprehensive site visit and field assessment in order to characterise the vegetation and plant communities present at the site in greater detail. This includes habitat mapping, developing species lists and descriptions of the typical and dominant species within the site and the potential impact of the development on these habitats and plant communities.
— Identification and quantification of the abundance and distribution of species of conservation concern within the site and especially within the development footprint.
— Evaluate the possible impact of the development on landscape connectivity in the field based on the likely use of the area as a corridor for movement by fauna as well as any local impacts on faunal communities. This should include the identification of any corridors that should be kept clear of development at the site and any buffers required around such features.
— Identify sensitive faunal habitats that should be avoided and measures that should be implemented to reduce impacts on fauna in general.
— Consider the potential impact of the development on CBAs and broad-scale ecological processes at the site. This should consider the habitats affected by the current development as well as the overall impact of renewable energy development in the area at a broader scale.
— Evaluate, based on the site attributes, what the most applicable mitigation measures to reduce the impact of the development on the site would be and if there are any areas where specific precautions or mitigation measures should be implemented.
— Assess the impacts identified above in light of the site-specific findings and the layout to be provided by the developer.

7.5.3 SURFACE WATER AND WETLAND IMPACT ASSESSMENT

The assessment will include the following aspects related to aquatic features associated with the site:

- A detailed assessment of the study area. This will cover the development footprint in relation to available information related to wetland / riverine ecosystems functioning, river classification, flow regime, water quality, physical, biota, and riparian habitat within the region.
- Identification of aquatic features and assessing impacts on, specifically, NFEPA features, important wetlands and rivers.
- Undertake a wetland delineation and classification.
- A functional assessment of the identified wetlands.
- A risk assessment of the identified wetlands.
- Wetland Mitigation measures.
- A map demarcating the relevant local drainage area of the respective waterbodies, and the respective catchments within a 500m radius of the study area. This will demonstrate, from a holistic point of view the connectivity between the site and the surrounding regions, i.e. the zone of influence.
- The determination of the ecological state of any aquatic systems, estimating their biodiversity, conservation and ecosystem function importance with regard ecosystem services.
- Recommend buffer zones and No-go areas around any delineated wetland areas based on the relevant legislation, e.g. Conservation Plan guidelines or best practice.
- Assess the potential impacts, based on the supplied methodology.
- Provide mitigations regarding project related impacts on the identified aquatic features
- Provide the relevant aspects with regard compiling the Environmental Management / Monitoring Plans.
- Supply geo-referenced GIS shape files of the aquatic areas.

The Freshwater Impact Assessment must be undertaken to align with the requirements for a WULA/GA.

7.5.4 AVIFAUNA IMPACT ASSESSMENT

The following are proposed for the EIA Phase:

The implementation of at least one avifaunal survey in the high season to inform the assessment of the potential impacts of the planned infrastructure within the development footprint. The monitoring protocol is guided by the following:

Procedures for the Assessment and Minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of NEMA when applying for Environmental Authorisation (Gazetted October 2020). The Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species was published on 30 October 2020. This protocol applies also for the assessment of all impacts requiring authorisation.

The avifaunal specialists report will be structured around the following terms of reference:

- Description of the affected environment from an avifaunal perspective.
- Discussion of gaps in baseline data and other limitations.
- Description of the methodology that was used for the field surveys.
- Comparison of the site sensitivity recorded in the field with the sensitivity classification in the DFFE National Screening Tool and adjustment if necessary.
- Provision of an overview of all applicable legislation.
- Provision of an overview of assessment methodology.
- Identification and assessment of the potential impacts of the proposed development on avifauna including cumulative impacts.
- Provision of sufficient mitigation measures to include in the Environmental Management Programme (EMPr).
- Conclusion with an impact statement whether the project is fatally flawed or may be authorised.

7.5.5 ACOUSTIC (NOISE) IMPACT ASSESSMENT

The environmental acoustic specialist study for the Hendrina GH&A Facility as part of the EIA phase will comprise the following:

BASELINE ASSESSMENT

To contextualise the study, a baseline assessment will be conducted comprising the following:

- An assessment of the existing noise climate in the vicinity of the site through baseline noise monitoring:
- Day and night-time noise monitoring will be conducted at the two identified sensitive receptor locations. All sound level measurement procedures will be undertaken according to the relevant South African Code of Practice, South African National Standards (SANS) 10103:2008 as well as in line with the International Finance Corporation (IFC) Environmental Health and Safety Guidelines for Noise.
- Sound level measurements will be undertaken using a CasellaTM Type 1 Integrating Sound Level Meter. Monitoring will be conducted in fifteen-minute intervals, with the day-time monitoring occurring between 07:00 and 22:00, and the night-time monitoring between 22:00 and 07:00, as per the IFC Guidelines.
- As per the recently published GNR 320 of the National Environmental Management Act , night-time monitoring will take place over a minimum of two nights, with each sample taken at two different times of the night in order to record the typical ambient sound levels at the different time of night.
- Assessment of monitored results against the relevant South Africa and IFC guideline rating levels.

DESKTOP ASESSSMENT

A desktop assessment of the proposed project will be undertaken. This will include assessment of potential sources related to the facility and their potential for creating noise in relation to surrounding receptors. This assessment will not comprise any calculations or modelling, but rather a literature-based assessment determining potential impacts.

ENVIRONMENTAL ACOUSTIC DESKTOP REPORT

A detailed Environmental Acoustic Desktop report will be provided detailing findings of the baseline assessment (monitoring) and desktop assessment, together with any recommendations determined.

7.5.6 HERITAGE AND PALAEONTOLOGICAL IMPACT ASSESSMENT

The scoping study did not identify any fatal flaws for the proposed Hendrina GH&A Facility. To comply with the National Heritage Resources Act (Act 25 of 1999) it is recommended that a Phase 1 HIA must be undertaken for the study area.

During the HIA the potential impact on heritage resources will be determined as well as levels of significance of recorded heritage resources. The HIA will also provide management and mitigation measures should any significant sites be impacted upon, ensuring that all the requirements of the SAHRA are met.

The study area is of very high paleontological sensitivity and according to the SAHRA palaeontological sensitivity map must be subjected to a palaeontological assessment in the impact assessment phase.

During the Public participation and stakeholder consultation process (advertisements & site notices) must reference the National Heritage Resources Act and include heritage concerns from stakeholders.

Cumulative impacts considered as an effect caused by the proposed action that results from the incremental impact of an action when added to other past, present, or reasonably foreseeable future actions. (Cornell Law School Information Institute, 2020). Cumulative impacts occur from the combination of effects of various impacts on heritage resources. The importance of identifying and assessing cumulative impacts is that the whole is greater than the sum of its parts. In the case of this project, impacts can be mitigated to an acceptable level. However, this and other projects in the area can have a negative impact on heritage sites in the area where these sites have been destroyed unknowingly.

7.5.7 TRAFFIC IMPACT ASSESSMENT

The Traffic Impact Assessment will be conducted as follows during the EIA phase:

- Trip generation based on the activities related to traffic movement for the construction and operation (maintenance) phases of the facility.
- Access assessment based on the preferred access point.
- Impact assessment and further mitigation measures
- Cumulative impact assessment

7.5.8 VISUAL IMPACT ASSESSMENT

The scoping phase VIA report has adequately assessed the visual impacts of the proposed Hendrina GH&A Facility and the associated overhead powerline infrastructure and no further field investigation will be required. The focus of the EIA phase assessment will be to update the scoping phase VIA report. This will entail:

- A review of the findings of the VIA in accordance with detailed site layouts;
- A comparative assessment of the layout alternatives provided;
- Addressing any comments or concerns arising from the public participation process

7.5.9 SOCIAL IMPACT ASSESSMENT

The approach to undertaking the SIA study is based on the Western Cape Department of Environmental Affairs and Development Planning Guidelines for Social Impact Assessment (February 2007). These guidelines are based on international best practice. The key activities in the SIA process embodied in the guidelines include:

- Describing and obtaining an understanding of the proposed intervention (type, scale, and location), the settlements, and communities likely to be affected by the proposed project.
- Collecting baseline data on the current social and economic environment.
- Identifying the key potential social issues associated with the proposed project (construction, operational, and decommissioning phase). This requires a site visit to the area and consultation with affected individuals and communities.
- Assessing and documenting the significance of social impacts associated with the proposed development. Annexure B summarises the assessment methodology that will be used to assign significance ratings during the assessment process.
- Identifying alternatives and enhancement and mitigation measures.

The site visit will be undertaken during the assessment phase of the SIA. The site visit will include interviews with key stakeholders and interested and affected parties.

7.5.10 AIR QUALITY IMPACT ASSESSMENT

EMISSIONS CHARACTERISATION

An emissions inventory is a list of air pollution sources, their physical and chemical parameters, as well as the quantification of emissions. Emissions are calculated using emission factors or mass balance approaches, requiring chemical and activity data inputs.

ACTIVITY DATA

Activity data (i.e. storage tank specifications, forecasted throughputs, etc.) for this inventory was provided by the proponent. Unit processes and operating hours are presented in **Table 7-3**. Raw material throughputs, production rates and energy source consumption is presented in **Table 7-4**.

Table 7-3: Unit processes and operational times

Unit process	Function	Hours per day	Days per week	Days per year
Electrolyser	Separation of water into hydrogen and oxygen	24	7	365
Air separation	Separation of air into nitrogen and oxygen	24	7	365
Ammonia synthesis	Haber-Bosch synthesis of green ammonia	24	7	365
Bulk storage	Storage of hydrogen in pressure vessels and green anhydrous ammonia in bulk temperature-controlled storage tanks	24	7	365
Loading gantries	Filling of containers for dispatch by truck/rail	24	7	365

Table 7-4: Raw materials, products and energy sources

Category	Item	Consumption / Production rate	Unit
Raw materials	Water	320 000	tonnes/annum
Products	Green hydrogen	20 000	tonnes/annum
	Green ammonia	100 000	tonnes/annum
Energy	Renewable electricity	Not applicable – renewable energy supplied by the WEF and SEF (i.e. facility self-sustaining)	

EMISSIONS QUANTIFICATION

Emission factors are used to estimate emissions where actual emission data is not available. In most cases, these factors are averages of available data of acceptable quality and are generally assumed to be representative of long-term averages for all facilities in the source category. An emission factor is a value representing the relationship between an activity and the rate of emissions of a specified pollutant. Emission factors are always expressed as a function of the weight, volume, distance or duration of the activity emitting the pollutant. The general equation used for the estimation of emissions is:

$$E = A \times EF \times \left(1 - \frac{ER}{100}\right)$$

Where:

E = emission rate
A = activity rate
EF = emission factor
ER = overall emission reduction efficiency (%)

The *Modelling Regulations* recommend the use of published emission factors for national consistency, e.g. United States Environmental Protection Agency (USEPA) AP-42 emission factors[9]. As per the process description (**Section 2**), the only pollutant associated with the proposed processes that is relevant to Section 21 MES *Subcategory 7.1* is NH_3. As such, only potential sources of NH_3 are discussed in the sections that follow.

STORAGE TANKS

The proposed facility will store synthesised NH_3 product in bulk, however in a liquid state. Since NH_3 has a very low boiling point, NH_3 requires either temperature or pressure control to maintain a liquid phase and prevent product loss through evaporation.

[9] USEPA (1995): Compilation of Air Pollutant Emission Factors (AP-42)

PRINCIPLES OF BULK STORAGE TANK EMISSIONS

Evaporation is a natural process whereby a volatile liquid is converted into a vapour. The liquid's vapour pressure is the driving force causing evaporation. Vapour pressure is a measure of the force required to convert any volatile liquid into a gas. Molecular motion within the liquid is responsible for this force which is related to the composition of the liquid. Smaller molecule substances are more active and thus have higher vapour pressures. Higher temperatures increase molecular motion, increasing the vapour pressure with increasing temperature. As such, liquids with smaller molecular mass (i.e. g/mol) also have lower boiling points[10].

When vapour pressure causes the molecules of a liquid to vaporise (i.e. leave the liquid as a gas), the vapours disperse through the air space above the liquid surface, known as the 'vapour space'. Vapour molecules also condense and return to the liquid. A state of equilibrium is reached when the vapour space becomes saturated, with molecules leaving and returning to the liquid at the same rate. Due to diffusion, the composition of the vapour space becomes uniform throughout. At equilibrium, the percentage of the volatile compound (as a vapour) in the vapour space depends on the vapour pressure of the liquid[11].

Liquid temperature changes brought about by atmospheric conditions, can result in expansion or contraction of the tank contents. This change in the tank's vapour space causes the tank to 'breathe'. During the day, solar radiation heats the roof and walls of the tank, increasing the liquid temperature, resulting in expansion of the tank contents, as well as an increase in evaporation. The vapour within the vapour space above the liquid is also heated, increasing its volume, and resulting in an 'exhalation' of vapour through the tank vents. At night, the reverse processes condense the vapour and cause an intake of ambient air into the tank[12].

Evaporation loss only occurs when vapours are expelled from the vapour space and released to atmosphere. Two conditions must be present for evaporation loss to occur[13]:

1. Heat must be applied; and
2. The vapour evolved must be able to escape the vapour space.

Total atmospheric emissions (i.e. the emission rate) from a tank is thus a function of the rate of evaporation and the duration that vapour is released from the vapour space. The primary factors affecting the emission rate include the vapour pressure of the liquid at the liquid storage temperature (i.e. higher vapour pressure accelerates the rate of evaporation into the vapour space), temperature changes in the tank (i.e. higher temperatures increase the liquid vapour pressure and vapour volume within the vapour space), tank design and condition (i.e. mechanical conditions control the exposure of tank contents to rapid pressure changes or turbulence inside the tank), and operating schedule (i.e. the number of times a tank is filled and emptied over the assessment period) [14].

Evaporative losses can thus be classified into three categories[15]:

1. Filling losses – vapour present in the vapour space is expelled when the tank is refilled, irrespective of the mechanism by which the vapours evolve. This type of loss is applicable to all tank types except floating roof tanks and closed system pressure vessels (i.e. bullets).
2. Breathing losses – vapour is expelled from the tank due to thermal expansion of the vapours within the vapour space when pressure or volume changes exceed the limits of containment (e.g. due to barometric pressure changes and/or an increase in the volume of vapour in the vapour space). Tanks installed underground or fitted with reflective coatings, insulation or shading mitigate breathing losses better.
3. Standing losses – vapour emission resulting from causes other than breathing or changing liquid levels, such as exposure of the liquid to the atmosphere due to improper seal fitment or open vents.

Therefore, the solution to reduce/limit/prevent atmospheric emissions from a storage tank includes reducing the heat applied to the liquid (i.e. sustaining the liquid temperature below the boiling point of the compound) and containing evolved vapours within the vapour space (i.e. prevent the release of vapours to atmosphere).

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[10] TI-3 Petroleum Committee (1971): Control of Atmospheric Emissions from Petroleum Storage Tanks, in Journal of the Air Pollution Control Association, 21:5, 260 – 268 (URL: https://doi.org/10.1080/00022470.1971.10469526)
[11] TI-3 Petroleum Committee (1971): Control of Atmospheric Emissions from Petroleum Storage Tanks, in Journal of the Air Pollution Control Association, 21:5, 260 – 268 (URL: https://doi.org/10.1080/00022470.1971.10469526)
[12] TI-3 Petroleum Committee (1971): Control of Atmospheric Emissions from Petroleum Storage Tanks, in Journal of the Air Pollution Control Association, 21:5, 260 – 268 (URL: https://doi.org/10.1080/00022470.1971.10469526)
[13] TI-3 Petroleum Committee (1971): Control of Atmospheric Emissions from Petroleum Storage Tanks, in Journal of the Air Pollution Control Association, 21:5, 260 – 268 (URL: https://doi.org/10.1080/00022470.1971.10469526)
[14] TI-3 Petroleum Committee (1971): Control of Atmospheric Emissions from Petroleum Storage Tanks, in Journal of the Air Pollution Control Association, 21:5, 260 – 268 (URL: https://doi.org/10.1080/00022470.1971.10469526)
[15] TI-3 Petroleum Committee (1971): Control of Atmospheric Emissions from Petroleum Storage Tanks, in Journal of the Air Pollution Control Association, 21:5, 260 – 268 (URL: https://doi.org/10.1080/00022470.1971.10469526)

STORAGE OF NH_3 AT THE PROPOSED FACILITY

The proponent proposes an insulated, temperature-controlled (i.e. -33.34°C) storage tank solution. The temperature of the liquid will be maintained below boiling point to prevent evaporation of the product. The liquid vapour pressure of NH_3 at a temperature of -33.34 °C is zero[16]. Storage tank vents will remain closed to sustain this low liquid temperature and prevent any mechanically induced turbulence inside the tanks. Given that the vapour pressure is zero at the intended storage temperature, evaporation of the product will not occur. Therefore, emissions from the bulk storage of NH_3 at the proposed facility is not anticipated under normal operating conditions.

EMISSIONS MODELLING

South Africa's *Modelling Regulations* recommend the use of the US EPA and American Petroleum Industry (API) TANKS 4.0.9d model for estimating emissions from bulk liquid storage tanks. TANKS is Windows-based software created on the emission estimation procedures from the US EPA's AP-42 emission estimation manual. TANKS uses chemical, meteorological, roof fitting and rim seal data to generate breathing and working loss estimates for various types of storage tanks.

While the US EPA considers the use of TANKS 4.0.9d to be appropriate for quantifying NH_3 emissions from bulk storage (if the proper constants are applied)[17], the software is inherently flawed in its ability to simulate liquid temperatures below 0°F (i.e. -28.12°C). As such, TANKS could not be used in this case to demonstrate the null emissions associated with the proponent's proposed refrigerated storage design.

MATERIAL LOADING/OFFLOADING

Emission factors for material loading/offloading operations have been established by the US EPA and Australian National Pollutant Inventory (NPI). These are however, flagged by both organisations as only applicable to organic liquids and specifically stated as "*not suitable for estimating emissions from ammonia, mineral acids or other inorganic compounds…*"[18]. As such, emissions from loading activities cannot be quantified.

RECOMMENDATIONS

It is recommended that, once operational, a mass balance approach be used to account for facility wide evaporative losses (if any).

MODELLING PROCEDURES

Atmospheric dispersion modelling mathematically simulates the transport and fate of pollutants emitted from a source to the atmosphere. Algorithms incorporate source criteria, surface topography, land use and meteorology to predict the downwind concentrations of these pollutants. These provide a useful tool to ascertain the spatial and temporal patterns of ground level pollutant concentrations arising from various point, line, area and volume sources. These outputs are primarily used in environmental and health impact assessments, risk assessments and to determine monitoring requirements, including spatial and temporal resolution.

As per the Regulations Prescribing the Format of the AIR (hereafter referred to as the 'AIR Regulations') an AIR must typically include an assessment of impacts on human health and the environment using dispersion modelling. However, as explained in Section 6.2 and Section 6.3.1, of the Air Quality Scoping Report, no evaporative losses are anticipated from the bulk storage of NH_3 (under normal operating conditions), and no suitable methodology for estimating emission rate inputs required for dispersion modelling, is currently available. As such, emissions cannot be quantified ahead of the proposed facility's operational phase and thus a dispersion modelling assessment cannot be conducted at this time.

In line with the Regulations Regarding Air Dispersion Modelling (hereafter referred to as 'the Modelling Regulations') a Plan of Study was submitted to the licensing authority (in this case, the Environmental Management Unit for Nkangala District Municipality (NDM)) on 19 January 2022. The Plan of Study and the

[16] Tanner Industries (1998): Customer Manual – Anhydrous Ammonia (URL: https://www.tannerind.com/PDF/blue-anhy-amm.pdf)
[17] USEPA (1994): Development and Selection of Ammonia Emission Factors – Final Report (URL: https://nepis.epa.gov/Exe/ZyPDF.cgi/P100ERTR.PDF?Dockey=P100ERTR.PDF)
[18] NPI (2004): Inorganic Chemicals Manufacturing 2.0, pg 38 (URL: http://www.npi.gov.au/system/files/resources/5a02d47b-2130-ea94-a59b-e85965eae307/files/inorganic-chemical.pdf)

case specific limitations around quantitative assessment at this time (as described in the sections above) were presented to the NDM atmospheric licensing officers on 11 March 2022. It was agreed that the AIR for ENERTRAG's proposed green NH_3 facility in Hendrina will thus comprise a qualitative impact assessment with further quantitative assessment conducted when operational information and site monitoring data is available to do so and will form part of the Provisional Atmospheric Emissions License (PAEL) review process. Recommendations in this regard will be provided in the AIR.

WAY FORWARD

THE APPLICABILITY OF SECTION 21 LICENSING

It is acknowledged that Section 22 of NEM:AQA requires any person operating an activity listed under Section 21 within the Republic of South Africa, to hold either a provisional atmospheric emissions license (PAEL) or AEL.

Conventional ammonia production is listed as *Subcategory 7.1*. The threshold trigger for this subcategory is the quantity of the relevant compound being manufactured (i.e. 100 tons per annum of NH_3 in this case) regardless of the process specifics or whether the pollutants regulated by this subcategory's MES apply. The licensing of the proposed green ammonia facility as a listed activity is not considered relevant for the following reasons:

— The proposed green ammonia production process using renewable energy for water and air separation is demonstrated to be a pollutant free process unlike conventional ammonia synthesis using catalytic steam reforming powered by fossil fuel combustion;

— According to the national department's *Section 21 Companion Document*[19], atmospheric emissions from *Subcategory 7.1.* are expected to be primarily by-products of the chemical reaction. In the proponent's case, the 'by-product' of the chemical reaction is NH_3 (i.e. the primary product for market), which is captured, cooled and stored as a liquid. It is highlighted that it would not make business sense for the proponent to release NH_3 to atmosphere at any point of the process, be it during manufacture, storage or dispatch;

— Mandatory licensing conditions include isokinetic stack emissions testing to demonstrate and regulate a facility's compliance with MES. There will be no flue gas stacks associated with NH_3 synthesis at the Hendrina GH&A operations. Gases purged during air separation include process irrelevant gases present in the ambient air feedstock (e.g. carbon dioxide) which are a) not evolved in the process, b) not considered ambient pollutants; and c) not regulated by MES; and

— Fugitive emissions (specifically evaporation losses) of NH_3 from temperature-controlled bulk storage tanks under a normal operating scenario is not possible and evaporation during truck loading for dispatch is anticipated to be negligible (if any)[20].

As such, WSP believe it is not the intention of the law for such a facility to trigger as a listed activity.

7.5.11 SHE RISK ASSESSMENT

The qualitative SHE risk assessment will consider each technology type separately and in detail. However, considering the general risks posed by each technology, each of the possible locations will be assessed with respect to advising on preferred locations from a SHE perspective.

Risk is made up of two components:

— The probability of a certain hazardous event or incident occurring.

— The severity of the consequences of that hazardous event / incident.

Therefore, the assessment of risk will comprise:

— Identification of the likely hazards and hazardous events related to the operation of the installation.

— Estimation of the likelihood/probability of these hazardous events occurring.

— Estimation of the consequences of these hazardous events.

[19] DEA (2012): S21 Companion Document – Category 7 (URL: https://saaqis.environment.gov.za/Pagesfiles/S21%20Companion%20Document%20-%20Category%207_2012.PDF)

[20] Emission rates cannot be quantified due to methodological limitations and thus the volume of product loss during dispatch cannot be estimated as part of this Plan of Study

— Estimation of the risk and comparison against certain acceptability criteria.

7.5.12 BAT IMPACT ASSESSMENT

The bat impact assessment for the EIA phase of the project will include the following:

— A description of the baseline characteristics and conditions of the receiving environment (e.g., site and/or surrounding land uses including urban and agricultural areas).
— An evaluation of the predicted impacts of the project on the receiving environment.
— An assessment of the probability of each impact occurring, the reversibility of each impact and the level of confidence in each potential impact.
— Consideration and evaluation of the cumulative impacts in terms of the current and proposed activities in the area.
— Recommendations to avoid negative impacts, as well as feasible and practical mitigation, management and/or monitoring options to reduce negative impacts that can be included in the Environmental Management Programme.
— A reasoned opinion as to whether the proposed activity, or portions of the activity should be authorised.
— Presentation of the findings regarding bat species assemblage and abundance on the site.
— Details regarding the types of mitigation measures that are possible if bat mortality rates are found to be unacceptable, including the potential times/circumstances which may result in higher mortality rates.

7.6 IMPACT ASSESSMENT METHODOLOGY

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,[21] indirect,[22] secondary[23] as well as cumulative[24] 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[25] presented in **Table 7-5**.

Table 7-5: Impact Assessment Criteria 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

[21] Impacts that arise directly from activities that form an integral part of the Project.
[22] Impacts that arise indirectly from activities not explicitly forming part of the Project.
[23] Secondary or induced impacts caused by a change in the Project environment.
[24] Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.
[25] 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
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
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	0 – 30		31 to 60		61 – 100
Significance Rating (Negative (-)	**Low (-)**		**Moderate (-)**		**High (-)**
Significance Rating (Positive (+)	**Low (+)**		**Moderate (+)**		**High (+)**

7.6.1 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 mitigation sequence/hierarchy is shown in **Figure 7-1** below.

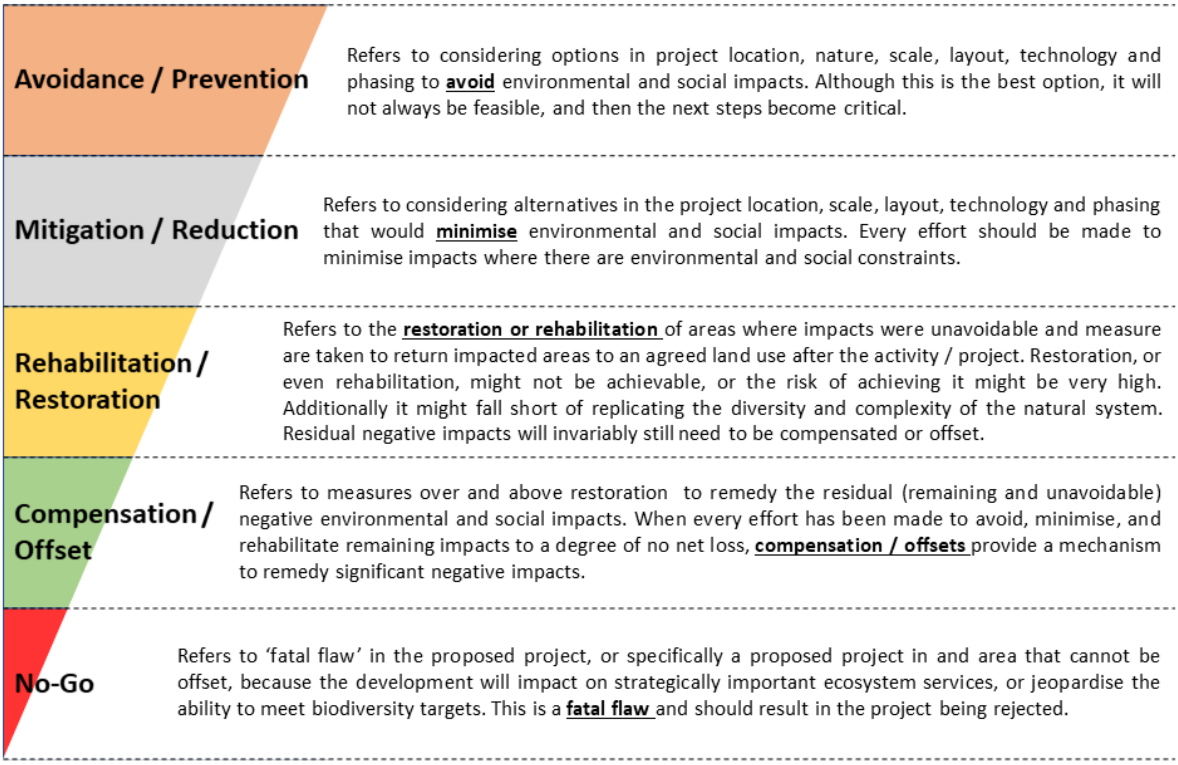


Figure 7-1: Mitigation Sequence/Hierarchy

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.

7.7 ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Once the FSR has been approved the proposed project will proceed into detailed EIA phase, which involves the detailed specialist investigations.

WSP will produce a Draft EIAR after the completion of the required specialist studies. The Draft EIAR will provide an assessment of all the identified key issues and associated impacts from the Scoping phase. All requirements as contemplated in the EIA Regulations, 2014 (GNR 982, as amended) will be included in the Draft EIAR.

The Draft EIAR will contain, inter alia, the following:

— Details of the EAP who prepared the report and the expertise of the EAP to carry out the S&EIR process, including a curriculum vitae;
— The location of the activity, including the 21 digit Surveyor General code of each cadastral land parcel, where available, the physical address and farm name; and the coordinates of the boundary of the property or properties;
— A plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale;

- A description of the scope of the proposed activity, including all listed and specified activities triggered and being applied for; and a description of the associated structures and infrastructure related to the proposed project;
- 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;
- 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;
- A motivation for the preferred development footprint within the approved site;
- A full description of the process followed to reach the proposed development footprint within the approved site;
- Details of the public participation process undertaken;
- 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;
- The environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;
- The impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts;
- The methodology used in determining and ranking of potential environmental impacts and risks;
- Positive and negative impacts;
- An assessment of each identified potentially significant impact and risk;
- The possible mitigation measures that could be applied;
- An environmental impact statement;
- A description of any assumptions, uncertainties and gaps in knowledge;
- A reasoned opinion as to whether the proposed activity should or should not be authorised;
- An undertaking under oath or affirmation by the EAP; and
- An EMPr.

7.8 STAKEHOLDER AND AUTHORITY ENGAGEMENT

Public participation during the EIA phase revolves around the review of the environmental impact assessment findings, which will be presented in the Draft EIA Report. All stakeholders will be notified of the progress to date and availability of the Draft EIA Report, via mail, email and/or SMS. A legislated period of 30 consecutive days will be allowed for public comment. Reports will be made available in the following way:

- Distribution for comment at central public places, which were used during the Scoping phase (subject to Covid 19 status quo);
- The document will be made available to download from the WSP website; and
- Copies of CDs will be made available on request.

The EIA phase will provide the following information to I&APs:

- Initial Site Plan;
- Alternatives;
- A description of activities and operations to be undertaken;
- Baseline information;
- Specialist studies;
- Impact assessment;
- Management measures;
- Monitoring and measuring plan; and
- Closure details.

The information outlined above will be presented in one or more of the following:

— Notifications;
— Scoping Report;
— EIA Report; and
— EMPr.

All comments received during the EIA phase will be recorded in the comments and response report (CRR), which will be included in the draft and final EIA Reports. The final EIA Report will incorporate public comment received on the Draft EIA Report and will be made available for public review with hard copies distributed mainly to the authorities and key stakeholders.

All stakeholders will receive a letter notifying them of the authority's decision.

7.9 ADDITIONAL PERMITS AND AUTHORISATIONS

Table 7-6 outlines the additional permits and authorisations required for the proposed development, as well as the relevant Competent Authorities responsible.

Table 7-6: Additional Permits and Authorisations required for the proposed development

PERMITS/AUTHORISATION	LEGISLATION	RELEVANT AUTHORITY	STATUS
Water Use Licence / General Authorisation	National Water Act (Act No. 36 of 1998)	Department of Water and Sanitation	Application process will run concurrently with the EIA Phase.
Atmospheric Emissions License	National Environmental Management: Air Quality Act (Act 39 of 2004)	Nkangala District Municipality	Application process will run concurrently with the EIA Phase. **Refer to Section 7.5.10** for further details on the AEL process
Section 38 Notification	National Heritage Resource Act (Act No. 25 of 1999)	Mpumalanga Heritage Resources Authority	Application process will be undertaken should it be deemed necessary prior to project commencement
Section 53 Approval	Minerals and petroleum Resources Development Act (No. 28 of 2002)	Department of Mineral Resources and Energy	Application process will run concurrently with the EIA Phase.

8 WAY FORWARD

This FSR contains:

- A description of the existing and proposed activities;
- A description of the alternatives considered to date;
- An outline of the proposed process to be followed;
- Information on the EAP and stakeholders who have chosen to participate in the project;
- An outline of the environment in which the project falls;
- Information on the potential environmental impacts to be studied in more detail during the EIAR phase of the project; and
- Information on the proposed specialist studies to be undertaken.

A number of environmental impacts have been identified as requiring some more in-depth investigation and the identification of detailed mitigation measures. Therefore, a detailed EIA is required to be undertaken in order to provide an assessment of these potential impacts and recommend appropriate mitigation measures.

The recommendation of this report is that detailed specialist studies as outlined in **Section 7.4** are undertaken.

All issues and comments that are submitted to WSP during the scoping phase will be incorporated in the CRR which will form part of the SER. The Final Scoping Report will be submitted to the MDARDLEA, as the competent authority.

If you have any further enquiries, please feel free to contact:

WSP Group Africa

Attention: Thirushan Nadar

Tel: +27 11 300-6185

Fax: 011 361 1381

E-mail: thirushan.nadar@wsp.com

9 REFERRENCES

- W, Marias (2022) Bat Pre-Application (Scoping) Impact Assessment Report, Animalia Consultants
- Lanz, J, (2022) Site Sensitivity Verification and agricultural Agro-Ecosystem Specialist Assessment for the Proposed Hendrina Green Hydrogen and Ammonia Facility near Hendrina in Mpumalanga Province
- Dyer, L (2022) Hendrina Wind Energy and Green Ammonia Facility Air Quality Scoping Report, WSP
- Hoare, D (2022) Terrestrial Ecology Scoping Hendrina Green Ammonia Project near Hendrina in Mpumalanga Province, David Hoare Consulting (Pty) Ltd
- Patel, A (2022) Geotechnical Desk Study for The Hendrina Green Hydrogen and Ammonia Facility, Hendrina, Mpumalanga, SLR Consulting (South Africa) (Pty) Ltd
- Ramawa, A (2022) Hendrina Green Hydrogen and Ammonia Facility Mpumalanga Transport Impact Assessment (Scoping phase), JG Afrika (Pty) Ltd
- Schwartz, K (2022) Visual Impact Assessment for The Proposed Hendrina Green Hydrogen and Ammonia Facility, Mpumalanga Province, SLR Consulting (South Africa) (Pty) Ltd
- Scholtz, O (2021) Draft Geohydrological Impact Assessment for the Hendrina Renewable Energy Complex, Hendrina, Mpumalanga, Shangoni Pty (Ltd)
- van Jaarsveld, P (2021) Draft Socio-Economic Impact Assessment Report for Hendrina Renewable Energy Complex, Urban-Econ Development Economists
- Burton, S (2021) Hendrina Renewable Energy Complex Wetland Assessment Wetland Ecological Baseline Assessment, Digby Wells Environmental.
- van der Walt, J (2022) Heritage Impact Assessment for The Proposed Hendrina Green Hydrogen and Ammonia Facility, Mpumalanga Province, Beyond Heritage
- Schutte, F.H (2021) Cabanga Environmental (Pty) Ltd: Hendrina Renewable Energy Complex Surface Water Assessment Report, Shangoni Pty (Ltd)
- de Jager, M (2021) Environmental Noise Impact Assessment for the proposed Hendrina Renewable Energy Complex and Associated Infrastructure Near Hendrina, Mpumalanga, EARES Enviro Acoustic Research
- Nkangala District Municipality IDP, 2021
- Steve Tshwete Local Municipality IDP, 2022
- Integrated Resource Plan 2010 – 2030
- Mpumalanga Economic Growth and Development Path (MEGDP), 2011
- Mpumalanga Spatial Development Framework (MSDF), 2019/2020
- Mpumalanga Industrial Development Plan, 2016
- Steve Tshwete Spatial Development Framework, 2010
- Mpumalanga Parks and Tourism Agency, 2014
- Technical Report for the Mpumalanga Biodiversity Sector Plan – MBSP,2015, Mpumalanga Tourism & Parks Agency, Mbombela (Nelspruit).

APPENDIX

A EAP CV

ASHLEA STRONG, MEM, EAP

Principal Consultant (Planning & Advisory Services), Environment & Energy

Years with the firm

8

Years of experience

18

Professional qualifications

EAPASA

Areas of expertise

Auditing

Energy

ESIR

Environmental Control

Infrastructure

Mining

Training

Waste Management

CAREER SUMMARY

Ashlea is a Principal Consultant with 18 years' experience in the environmental field. She currently provides technical and strategic expertise on a diverse range projects in the environmental management field, including environmental scoping and impact assessment studies, environmental management plans, waste and water management, as well as the provision of environmental management solutions and mitigation measures

Ashlea has been involved in the management of a number of large EIAs specifically within the energy sector such as the Medupi Power Station, and Pebble-Bed Modular Reactor (PBMR) and numerous Transmission Powerlines. She also has significant environmental auditing experience and expertise having undertaken over 70 compliance audits.

Ashlea holds a Masters in Environmental Management; a BTech (Nature Conservation), and a National Diploma (Nature Conservation). She is also a Registered Environmental Assessment Practitioner.

EDUCATION

Masters in Environmental Management, University of the Free State, South Africa	2006
B Tech, Nature Conservation, Technikon SA, South Africa	2001
National Diploma in Nature Conservation, Technikon SA, South Africa	1999

ADDITIONAL TRAINING

Conduct outcomes based assessment (NQF Level 5), South African Qualifications Authority (SAQA)	2009

PROFESSIONAL MEMBERSHIPS

Registered Environmental Assessment Practitioner (Registration Number: 2019/1005)	2020

PROFESSIONAL EXPERIENCE

Energy Sector

- 100MW Solar Photovoltatic (PV) Plant (2021). Project Director. This project involved the compilation of a Basic Assessment and Environmental Management Plan for a 100MW Solar PV Plant near Springs in Gauteng, South Africa. Client: Calodex (Pty) Ltd.
- Erica 400kV Loop-in-Loop-out (LILO) Powerline (2020). Compilation of an environmental screening assessment for the Erica 400kV LILO Powerline in Cape Town, Western Cape, South Africa. Client: Eskom Holdings SOC Limited
- Nakonde and Mpika Wind Energy Projects (2018): Project Manager. Compilation of two Environmental Project Briefs for the establishment of meteorological masts at the Proposed Nakonde and Mpika Wind Project Sites in Zambia. Client: Globeleq
- Mozambique – Zambia Interconnector Powerline (2018): Project Manager. This project involved the compilation of the Environmental and Social Impact Assessment and Environmental and Social Management Plan for a 300km 400kV

powerline between Tete, in Mozambique, and Chipata, in Zambia. Client: Southern African Power Pool (SAPP).

- Proposed Solar and Wind Projects located in the Northern and Western Cape Provinces (2015) Project Manager. This project involved the compilation of 15 Environmental Impact Assessments and Environmental Management Plans for 2 Solar and 2 Wind energy Projects near Aggenys and Sutherland respectively. Client: BioTherm Energy (Pty) Ltd.
- Proposed Tabor - Nzhelele 400kV Transmission Lines and associated infrastructure, Limpopo Province, South Africa (2012): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for a 100km 400kV powerline between Louis Trichardt and Musina in the Limpopo Province. Client: Eskom Transmission.
- Pebble Bed Modular Reactor Demonstration Plant and Associated Infrastructure, Western Cape, South Africa (2008): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for the proposed Pebble Bed Modular Reactor Demonstration Plant and Associated Infrastructure in the Western Cape Province. Client: Eskom Generation.
- Proposed Bantamsklip – Kappa 765 kV Transmission Lines and associated infrastructure, Western and Northern Cape, South Africa (2008): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for four 260km 765kV powerlines between the Bantamsklip Nuclear Power Station Site and the proposed new Kappa Substation in the Karoo, Western Cape Province. Client: Eskom Transmissions.
- Proposed Bantamsklip – Bacchus, Bacchus - Kappa and Bacchus – Muldersvlei 400 kV Transmission Lines and associated infrastructure, Western and Northern Cape, South Africa (2008): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for a number of 400kV powerlines between the Bantamsklip Nuclear Power Station Site and a number of substations, including Bacchus, Kappa and Muldersvlei, in the Western Cape Province. Client: Eskom Transmission.
- Proposed Concentrated Solar Thermal Plant in the Northern Cape, South Africa (2006): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for the proposed Concentrated Solar Thermal Plant near Upington in the Northern Cape Province. Client: Eskom Holdings SOC Limited.
- Proposed Underground Coal Gasification plant, Eskom, Mpumalanga, South Africa (2006): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for the proposed Underground Coal Gasification plant near the Majuba Power Station in the Mpumalanga Province. Client: Eskom Holdings SOC Limited.
- Proposed new Coal-fired Power Station in the Lephalale Area for Eskom, Limpopo, South Africa (2005): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for the proposed new Coal-fired Power Station in the Lephalale Area in the Limpopo Province. Client: Eskom Generation.

Infrastructure Sector

- Proposed Kraft Paper Mill in Frankfort, Frankfort, Free State, South Africa (2013): Project Manager. This project involved the undertaking of an Environmental Impact Assessment, including the compilation of an Environmental Management Programme, for the proposed establishment of a

KRAFT paper mill in Frankfort in the Free State Province. Client: Industrial Development Corporation of SA (Pty) Ltd.

Mining Sector

- Establishment of the Proposed Rietvlei Opencast Coal Mine, Mpumalanga, South Africa (2013): Project Manager. This project involves the undertaking of an integrated environmental authorisation process, including an Environmental Impact Assessment, Environmental Management Programme Report, Waste Management License Application and Water Use License Application, for the establishment of an opencast coal mine north of Middelburg. Client: Rietvlei Mining Company.
- Inyanda Mine Pegasus South Expansion, Mpumalanga, South Africa (2011): Project Manager. This project included the compilation of an Environmental Impact Assessment, Environmental Management Plan, the Amendment of the existing Environmental Management Programme Report and the amendment of the existing Water Use License for the Inyanda Mine Pegasus South Expansion project, north of Middelburg in the Mpumalanga Province. Client: Exxaro Coal (Pty) Ltd.
- Sishen Infrastructure Program, Northern Cape, South Africa (2010): Project Manager. This project involved the compilation of an Environmental Impact Assessment and an Environmental Management Plan for the infrastructure expansion programme proposed by the Sishen Mine in the Northern Cape. Client: Sishen Iron Ore (Pty) Ltd.

Waste Management Projects

- Proposed continuous Ashing at Majuba Power Station, Mpumalanga, South Africa (2012): Project Manager. This project entailed the compilation Environmental Impact Assessment and Waste Management License Application for the proposed continuous ashing project at the Majuba Power Station in Mpumalanga. Client: Eskom Holdings SOC Limited.
- Proposed continuous Ashing at Tutuka Power Station, Mpumalanga, South Africa (2012): Project Manager. This project entailed the compilation Environmental Impact Assessment and Waste Management License Application for the proposed continuous ashing project at the Tutuka Power Station in Mpumalanga. Client: Eskom Holdings SOC Limited.
- Proposed extension of Ash Dams at Hendrina Power Station, Mpumalanga, South Africa (2011): Project Manager. This project entailed the compilation Environmental Impact Assessment and Waste Management License Application for the proposed extension of the ash dams at the Hendrina Power Station in Mpumalanga. Client: Hendrina Power Station.
- Phase 1 of the Environmental Impact Assessment for the Proposed Regional General and Hazardous Waste Processing Facility, Eastern Cape (2005). Project Manager. This project entailed the compilation Environmental Impact Assessment for the Proposed Regional General and Hazardous Waste Processing Facility in the Eastern Cape. Client: Coega Development Corporation.

Specialist Projects

- Strategic Environmental Assessment for the Development. Master Plan Greater Port Harcourt, Rivers State, Nigeria, Africa (2008): Senior Environmental Consultant. This project entailed the compilation of a Strategic Environmental Assessment for the City of Port Harcourt as part of the development of the Master Plan for the Greater Port Harcourt Area. Client: Port Harcourt Government

Auditing

- Sasol Regulation 34 Audits (2019): Lead Auditor. Environmental compliance audits for 13 authorisations for the Sasol Owned Petrol Filling Stations. Client: Sasol Oil (Pty) Ltd

- Regulation 34 Audits at Mogalakwena Mine (2019). Project Manager. Environmental compliance audits of the EMPR and various environmental authorisations at the Mogalakwena Mine in the Limpopo Province. Client: Anglo American Platinum.
- Sasol Environmental Authorisations and Environmental Management Plans for the Secunda Operations (2019): Lead Auditor. Environmental compliance audits for 49 authorisations for the Sasol Secunda. Client: Sasol Secunda Operations
- Waste Management Licence Compliance Audit and PCB Plan Close Out Audit, Phalaborwa, Limpopo, South Africa (2019): Project Manager. Environmental compliance audit of a WML and the PCB Plan for the Palabora Mine. Client: Palabora Company
- Waste Management Licence Compliance Audit and PCB Plan Close Out Audit, Phalaborwa, Limpopo, South Africa (2019): Project Manager. Environmental compliance audit of a WML and the PCB Plan for the Palabora Mine. Client: Palabora Company
- Sasol Mining Water Use Licence Compliance, South Africa (2018): Project Manager. Environmental compliance audit of six WULs held by mining operations in Secunda. Client: Sasol Mining
- BioTherm Round 4 Lenders Technical Advisor (2018). Project Manager – Environmental. Environmental monitoring of the construction of the Konkoonsies II and Aggeneys Photovoltaic Solar Plants against the IFC Performance Standards. Client: Nedbank
- Waste Management License Audits for the Sasol Waste Ash Site, Secunda, Mpumalanga, South Africa (2014 - 2018): Lead Auditor. These projects involve the annual and biannual environmental compliance auditing of the Waste Management licenses for various waste facilities at the Secunda Site in Mpumalanga Province. Client: Sasol Chemical Industries: Secunda Synfuels Operations
- Compliance Audits at Kriel Colliery (2018): Project Manager. This project involved the environmental compliance audits of the Water Use Licenses held by Kriel Colliery in Mpumalanga. Client: Seriti Coal
- Compliance Audits at South 32 (2016 – 2017): Project Manager. This project involved the environmental compliance audits of the Water Use Licenses for the BMK, Douglas, Klipfontein and Middelburg Mine North and South Sections at South 32 in Mpumalanga. Client: South 32
- EMPR Performance Assessment Report at South 32 (2016): Project Manager. This project involved the formal assessment and verification of the Environmental Management Programme Report for the BMK, Douglas, Klipfontein and Middelburg Mine North and South Sections at South 32 in Mpumalanga. Client: South 32
- Compliance Audit for the Bokpoort Concentrating Solar Power (CSP) Facility, Groblershoop, Northern Cape, South Africa (2016): Lead Auditor. This project involved the environmental compliance auditing of the Waste Management License, Environmental Authorisation and Water Use License for the Bokpoort CSP Facility near Groblershoop in the Northern Cape Province. Client: ACWA Power Solafrica Bokpoort CSP Power Plant (Pty) Ltd.

APPENDIX

B EAP DECLARATION

10.2 The Environmental Assessment Practitioner (EAP)

I Ashlea Strong ....., as the appointed environmental assessment practitioner ("EAP") hereby declare/affirm the correctness of the information provided or to be provided as part of the application, and that I:

- in terms of the general requirement to be independent (tick which is applicable):

X	other than fair remuneration for work performed/to be performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity; or

	~~am not independent, but another EAP that is independent and meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review EAP must be submitted);~~

- have expertise in conducting environmental impact assessments, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- will ensure compliance with the EIA Regulations 2014;
- will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the application;
- will take into account, to the extent possible, the matters listed in regulation **18** of the regulations when preparing the application and any report, plan or document relating to the application;
- will disclose to the proponent or applicant, registered interested and affected parties and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority or the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority (unless access to that information is protected by law, in which case I will indicate that such protected information exists and is only provided to the competent authority);
- will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
- declare that all the particulars furnished by me in this form are true and correct;
- am aware that it is an offence in terms of Regulation 48 to provide incorrect or misleading information and that a person convicted of such an offence is liable to the penalties as contemplated in section 49B(2) of the National Environmental Management Act, 1998 (Act 107 of 1998).

Signature of the environmental assessment practitioner

WSP Group Africa (Pty) Ltd

Name of company

18 November 2022

Date

APPENDIX

C SPECIALIST DECLARATIONS

10.4 The Specialist

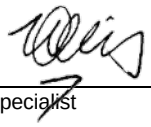
Note: Duplicate this section where there is more than one specialist.

I Werner Marais……, as the appointed specialist hereby declare/affirm the correctness of the information provided as part of the application, and that I:

- in terms of the general requirement to be independent (tick which is applicable):

X	other than fair remuneration for work performed/to be performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity; or
	am not independent, but another EAP that is independent and meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review specialist must be submitted);

- have expertise in conducting specialist work as required, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- will ensure compliance with the EIA Regulations 2014;
- will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the application;
- will take into account, to the extent possible, the matters listed in regulation **18** of the regulations when preparing the application and any report, plan or document relating to the application;
- will disclose to the proponent or applicant, registered interested and affected parties and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority or the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority (unless access to that information is protected by law, in which case I will indicate that such protected information exists and is only provided to the competent authority);
- declare that all the particulars furnished by me in this form are true and correct;
- am aware that it is an offence in terms of Regulation 48 to provide incorrect or misleading information and that a person convicted of such an offence is liable to the penalties as contemplated in section 49B(2) of the National Environmental Management Act, 1998 (Act 107 of 1998).



Signature of the specialist

Animalia Consultants (Pty) Ltd

Name of company

10 November 2022

Date

10.4 The Specialist

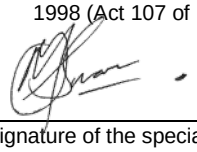
Note: Duplicate this section where there is more than one specialist.

I Muhammad Osman ……, as the appointed specialist hereby declare/affirm the correctness of the information provided as part of the application, and that I:

- in terms of the general requirement to be independent (tick which is applicable):

X	other than fair remuneration for work performed/to be performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity; or
	am not independent, but another EAP that is independent and meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review specialist must be submitted);

- have expertise in conducting specialist work as required, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- will ensure compliance with the EIA Regulations 2014;
- will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the application;
- will take into account, to the extent possible, the matters listed in regulation **18** of the regulations when preparing the application and any report, plan or document relating to the application;
- will disclose to the proponent or applicant, registered interested and affected parties and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority or the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority (unless access to that information is protected by law, in which case I will indicate that such protected information exists and is only provided to the competent authority);
- declare that all the particulars furnished by me in this form are true and correct;
- am aware that it is an offence in terms of Regulation 48 to provide incorrect or misleading information and that a person convicted of such an offence is liable to the penalties as contemplated in section 49B(2) of the National Environmental Management Act, 1998 (Act 107 of 1998).



Signature of the specialist

SLR CONSULTING (SOUTH AFRICA) (PTY) LTD

Name of company

10/11/2022

Date

10.4 The Specialist

Note: Duplicate this section where there is more than one specialist.

I Debra Catherine Mitchell……, as the appointed specialist hereby declare/affirm the correctness of the information provided as part of the application, and that I:

- in terms of the general requirement to be independent (tick which is applicable):

X	other than fair remuneration for work performed/to be performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity; or
	am not independent, but another EAP that is independent and meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review specialist must be submitted);

- have expertise in conducting specialist work as required, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- will ensure compliance with the EIA Regulations 2014;
- will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the application;
- will take into account, to the extent possible, the matters listed in regulation **18** of the regulations when preparing the application and any report, plan or document relating to the application;
- will disclose to the proponent or applicant, registered interested and affected parties and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority or the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority (unless access to that information is protected by law, in which case I will indicate that such protected information exists and is only provided to the competent authority);
- declare that all the particulars furnished by me in this form are true and correct;
- am aware that it is an offence in terms of Regulation 48 to provide incorrect or misleading information and that a person convicted of such an offence is liable to the penalties as contemplated in section 49B(2) of the National Environmental Management Act, 1998 (Act 107 of 1998).

D C Mitchell

Signature of the specialist

ISHECON cc

Name of company

10th November 2022

Date

10.4 The Specialist

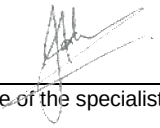
Note: Duplicate this section where there is more than one specialist.

I ADRIAN JOHNSON……, as the appointed specialist hereby declare/affirm the correctness of the information provided as part of the application, and that I:

- in terms of the general requirement to be independent (tick which is applicable):

X	other than fair remuneration for work performed/to be performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity; or
	am not independent, but another EAP that is independent and meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review specialist must be submitted);

- have expertise in conducting specialist work as required, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- will ensure compliance with the EIA Regulations 2014;
- will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the application;
- will take into account, to the extent possible, the matters listed in regulation **18** of the regulations when preparing the application and any report, plan or document relating to the application;
- will disclose to the proponent or applicant, registered interested and affected parties and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority or the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority (unless access to that information is protected by law, in which case I will indicate that such protected information exists and is only provided to the competent authority);
- declare that all the particulars furnished by me in this form are true and correct;
- am aware that it is an offence in terms of Regulation 48 to provide incorrect or misleading information and that a person convicted of such an offence is liable to the penalties as contemplated in section 49B(2) of the National Environmental Management Act, 1998 (Act 107 of 1998).



Signature of the specialist

JG AFRIKA (PTY)LTD

Name of company

11/11/2022

Date

10.4 The Specialist

Note: Duplicate this section where there is more than one specialist.

I ……Ockie Scholtz……, as the appointed specialist hereby declare/affirm the correctness of the information provided as part of the application, and that I:

- in terms of the general requirement to be independent (tick which is applicable):

X	other than fair remuneration for work performed/to be performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity; or
	am not independent, but another EAP that is independent and meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review specialist must be submitted);

- have expertise in conducting specialist work as required, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- will ensure compliance with the EIA Regulations 2014;
- will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the application;
- will take into account, to the extent possible, the matters listed in regulation **18** of the regulations when preparing the application and any report, plan or document relating to the application;
- will disclose to the proponent or applicant, registered interested and affected parties and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority or the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority (unless access to that information is protected by law, in which case I will indicate that such protected information exists and is only provided to the competent authority);
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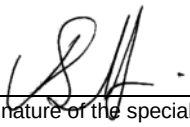

Signature of the specialist

Shangoni Management Services (Pty) Ltd

Name of company

10 November 2022

Date

10.4 The Specialist

Note: Duplicate this section where there is more than one specialist.

I Morné de Jager……, as the appointed specialist hereby declare/affirm the correctness of the information provided as part of the application, and that I:

- in terms of the general requirement to be independent (tick which is applicable):

X	other than fair remuneration for work performed/to be performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity; or
	am not independent, but another EAP that is independent and meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review specialist must be submitted);

- have expertise in conducting specialist work as required, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- will ensure compliance with the EIA Regulations 2014;
- will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the application;
- will take into account, to the extent possible, the matters listed in regulation **18** of the regulations when preparing the application and any report, plan or document relating to the application;
- will disclose to the proponent or applicant, registered interested and affected parties and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority or the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority (unless access to that information is protected by law, in which case I will indicate that such protected information exists and is only provided to the competent authority);
- declare that all the particulars furnished by me in this form are true and correct;
- am aware that it is an offence in terms of Regulation 48 to provide incorrect or misleading information and that a person convicted of such an offence is liable to the penalties as contemplated in section 49B(2) of the National Environmental Management Act, 1998 (Act 107 of 1998).

Signature of the specialist

Enviro-Acoustic Research CC

Name of company

2022 - 11 - 10

Date

10.4 The Specialist

Note: Duplicate this section where there is more than one specialist.

I ……PJ van Jaarsveld……., as the appointed specialist hereby declare/affirm the correctness of the information provided as part of the application, and that I:

- in terms of the general requirement to be independent (tick which is applicable):

X	other than fair remuneration for work performed/to be performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity; or
	am not independent, but another EAP that is independent and meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review specialist must be submitted);

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- am aware that it is an offence in terms of Regulation 48 to provide incorrect or misleading information and that a person convicted of such an offence is liable to the penalties as contemplated in section 49B(2) of the National Environmental Management Act, 1998 (Act 107 of 1998).

PVJaarveld

Signature of the specialist

Urban-Econ Development Economists (Pty) Ltd

Name of company

14 November 2022

Date

APPENDIX

D

DFFE SCREENING REPORTS

SCREENING REPORT FOR AN ENVIRONMENTAL AUTHORIZATION AS REQUIRED BY THE 2014 EIA REGULATIONS – PROPOSED SITE ENVIRONMENTAL SENSITIVITY

EIA Reference number:

Project name: Hendrina Renewable Energy Complex

Project title: Hendrina Green Hydrogen & Ammonia Facility

Date screening report generated: 01/08/2022 19:41:22

Applicant: ENERTRAG SA

Compiler: WSP

Compiler signature:

.....

Application Category: Infrastructure|Localised infrastructure|Storage|Dangerous Goods|Chemicals

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Proposed Project Location

Orientation map 1: General location

General Orientation: Hendrina Renewable Energy Complex

Map of proposed site and relevant area(s)

Cadastral details of the proposed site

Property details:

No	Farm Name	Farm/ Erf No	Portion	Latitude	Longitude	Property Type
1	GELUK	26	0	26°5'52.64S	29°30'18.3E	Farm
2	HARTEBEESTKUIL	185	0	26°9'1.67S	29°33'33.9E	Farm
3	WILMANSRUST	47	0	26°8'20.04S	29°27'56.65E	Farm
4	BULFONTEIN	187	0	26°7'37.97S	29°30'12.46E	Farm
5	KOMATI POWER STATION 56	27	0	26°5'57.82S	29°27'49.26E	Farm
6	DUNBAR	189	0	26°10'44.16S	29°32'23.68E	Farm
7	UITGEZOCHT	194	0	26°9'58.73S	29°36'2.37E	Farm
8	BULFONTEIN	187	10	26°8'35.31S	29°29'52.79E	Farm Portion
9	DUNBAR	189	7	26°11'8.2S	29°32'3.66E	Farm Portion
10	GELUK	26	7	26°6'29.9S	29°28'45.35E	Farm Portion
11	WILMANSRUST	47	3	26°9'24.39S	29°30'4.31E	Farm Portion
12	DUNBAR	189	1	26°11'25.73S	29°33'30.79E	Farm Portion
13	DUNBAR	189	4	26°9'56.06S	29°32'6.95E	Farm Portion
14	KOPPIES KRAAL HS	56	0	26°5'57.94S	29°27'55.33E	Farm Portion
15	DUNBAR	189	3	26°11'59.3S	29°33'22.31E	Farm Portion
16	BULFONTEIN	187	4	26°7'5.57S	29°29'31.24E	Farm Portion
17	BULFONTEIN	187	3	26°7'57.47S	29°29'40.17E	Farm Portion
18	BULFONTEIN	187	14	26°8'29.04S	29°30'42.83E	Farm Portion
19	GELUK	26	6	26°6'18.27S	29°29'25.29E	Farm Portion
20	WILMANSRUST	47	14	26°9'36.32S	29°30'40.34E	Farm Portion
21	BULFONTEIN	187	2	26°7'20.94S	29°28'41.77E	Farm Portion
22	DUNBAR	189	6	26°11'14.51S	29°33'0.34E	Farm Portion
23	DUNBAR	189	0	26°10'31.78S	29°33'59.19E	Farm Portion
24	UITGEZOCHT	194	2	26°10'25.62S	29°35'30.87E	Farm Portion
25	KOPPIES KRAAL HS	56	12	26°6'4.95S	29°28'42.81E	Farm Portion
26	DUNBAR	189	5	26°10'47.18S	29°32'46.17E	Farm Portion

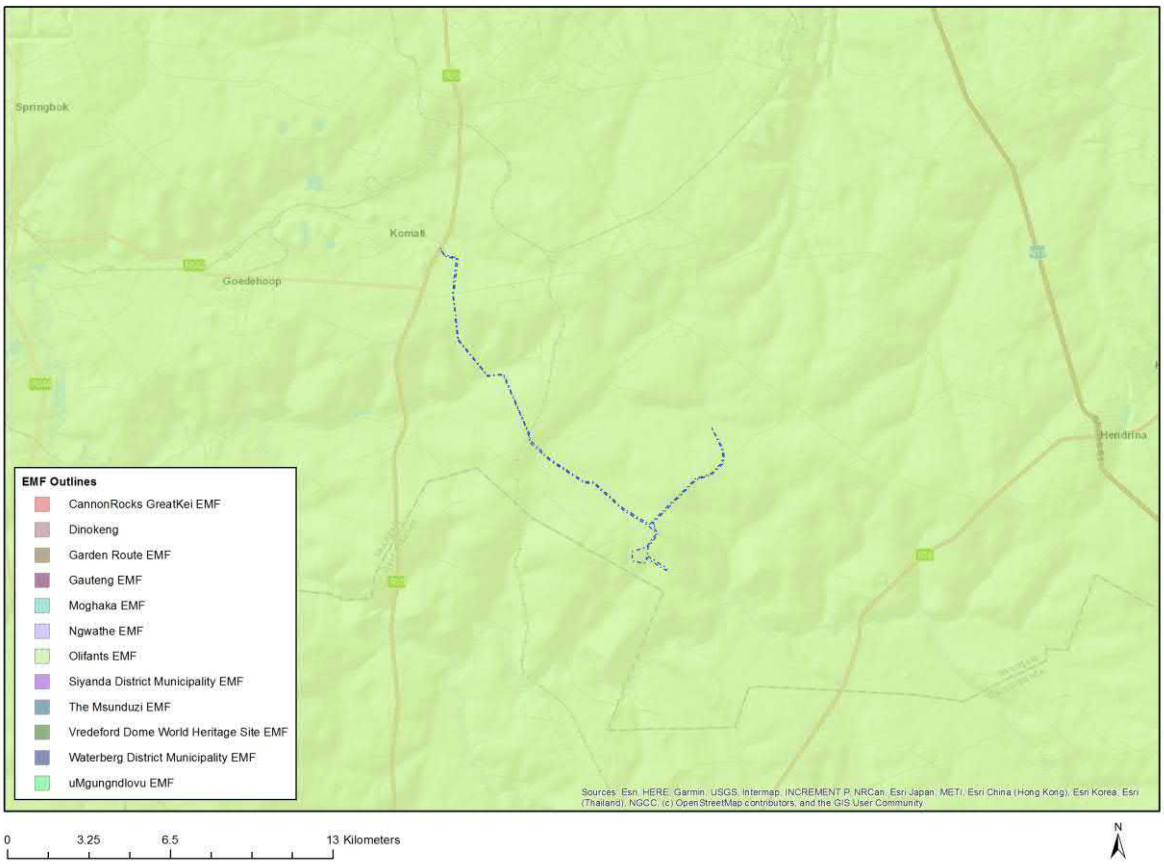
27	WILMANSRUST	47	13	26°9'12.07S	29°30'53.74E	Farm Portion
28	WILMANSRUST	47	1	26°9'8.07S	29°30'45.46E	Farm Portion
29	WILMANSRUST	47	3	26°9'36.7S	29°30'42.83E	Farm Portion
30	HARTEBEESTKUIL	185	3	26°9'47.34S	29°34'17.1E	Farm Portion
31	BULFONTEIN	187	6	26°8'8.41S	29°30'34.87E	Farm Portion
32	DUNBAR	189	2	26°10'35.26S	29°31'5.54E	Farm Portion
33	BULFONTEIN	187	1	26°8'9.22S	29°29'6.52E	Farm Portion

Development footprint[1] vertices:
No development footprint(s) specified.

Wind and Solar developments with an approved Environmental Authorisation or applications under consideration within 30 km of the proposed area

No	EIA Reference No	Classification	Status of application	Distance from proposed area (km)
1	14/12/16/3/3/2/759	Solar PV	Approved	21.6

Environmental Management Frameworks relevant to the application



[1] "development footprint", means the area within the site on which the development will take place and incudes all ancillary developments for example roads, power lines, boundary walls, paving etc. which require vegetation clearance or which will be disturbed and for which the application has been submitted.

Environmental Management Framework	LINK
Olifants EMF	https://screening.environment.gov.za/ScreeningDownloads/EMF/Zone_46,_67,_78,_80,_92,_103,_122,_129.pdf

Environmental screening results and assessment outcomes

The following sections contain a summary of any development incentives, restrictions, exclusions or prohibitions that apply to the proposed development site as well as the most environmental sensitive features on the site based on the site sensitivity screening results for the application classification that was selected. The application classification selected for this report is: **Infrastructure|Localised infrastructure|Storage|Dangerous Goods|Chemicals**.

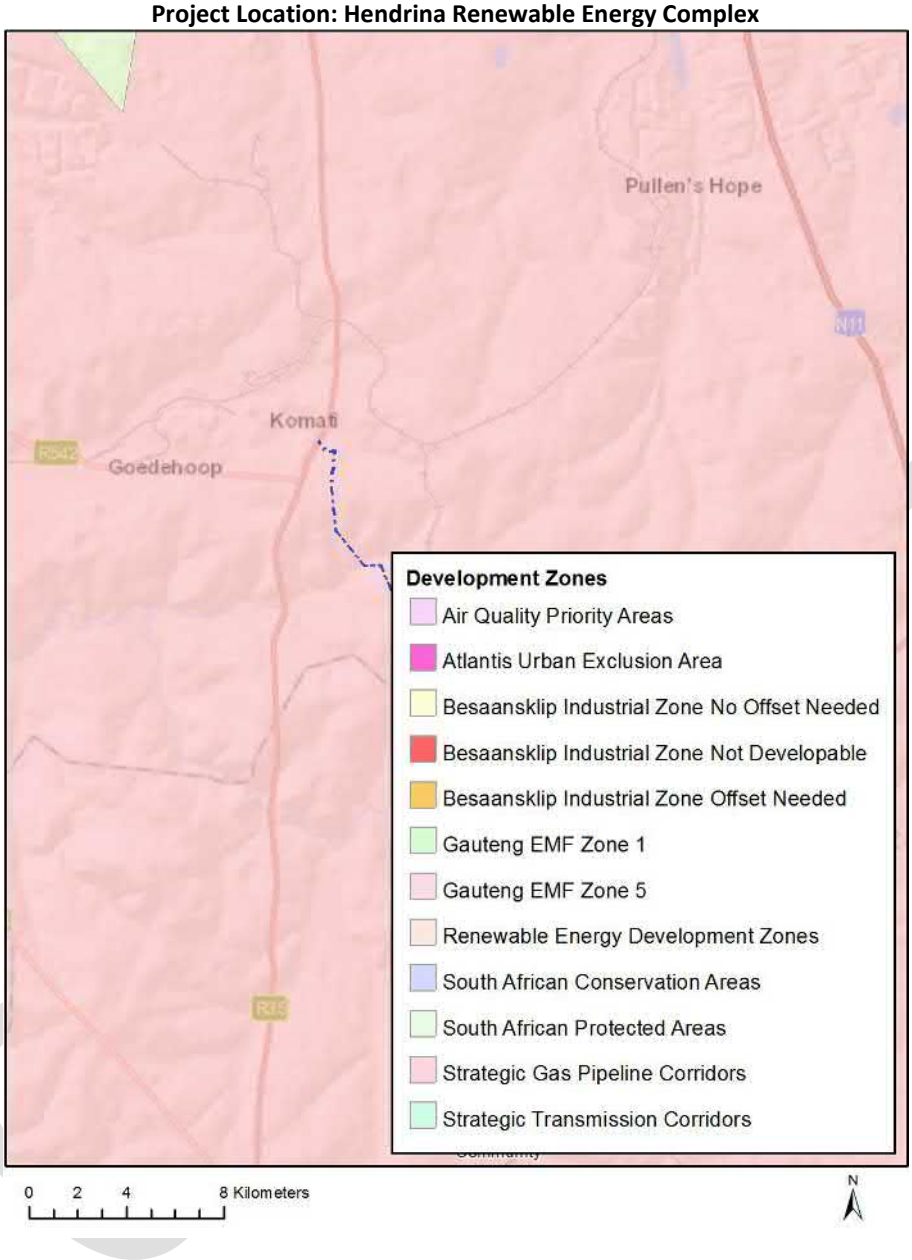
Relevant development incentives, restrictions, exclusions or prohibitions

The following development incentives, restrictions, exclusions or prohibitions and their implications that apply to this site are indicated below.

Incentive, restriction or prohibition	Implication
Air Quality-Highveld Priority Area	https://screening.environment.gov.za/ScreeningDownloads/DevelopmentZones/HIGHVELD_PRIORITY_AREA_AQMP.pdf
Strategic Gas Pipeline Corridors -Phase 8: Rompco Pipeline Corridor	https://screening.environment.gov.za/ScreeningDownloads/DevelopmentZones/Combined_GAS.pdf

Map indicating proposed development footprint within applicable development incentive, restriction, exclusion or prohibition zones

Project Location: Hendrina Renewable Energy Complex



Proposed Development Area Environmental Sensitivity

The following summary of the development site environmental sensitivities is identified. Only the highest environmental sensitivity is indicated. The footprint environmental sensitivities for the proposed development footprint as identified, are indicative only and must be verified on site by a suitably qualified person before the specialist assessments identified below can be confirmed.

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
Civil Aviation Theme		X		
Defence Theme				X
Paleontology Theme	X			
Plant Species Theme			X	
Terrestrial Biodiversity Theme	X			

Specialist assessments identified

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. 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 site situation.

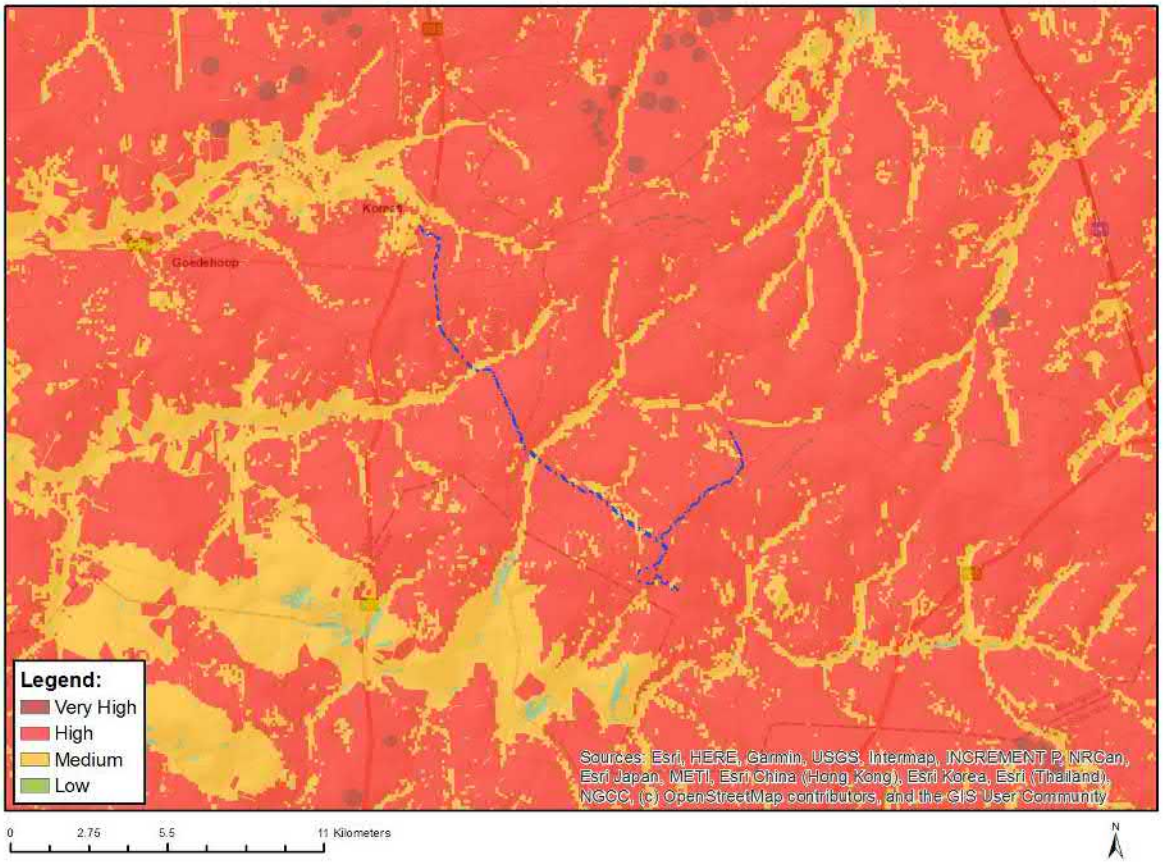
No	Specialist assessment	Assessment Protocol
1	Agricultural Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Agriculture_Assessment_Protocols.pdf
2	Archaeological and Cultural Heritage Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
3	Palaeontology Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
4	Terrestrial Biodiversity Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Terrestrial_Biodiversity_Assessment_Protocols.pdf
5	Aquatic Biodiversity Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Aquatic_Biodiversity_Assessment_Protocols.pdf
6	Hydrology Assess	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf

	ment	
7	Noise Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Noise_Impacts_Assessment_Protocol.pdf
8	Traffic Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
9	Geotechnical Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
10	Socio-Economic Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
11	Plant Species Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Plant_Species_Assessment_Protocols.pdf
12	Animal Species Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Animal_Species_Assessment_Protocols.pdf

Results of the environmental sensitivity of the proposed area.

The following section represents the results of the screening for environmental sensitivity of the proposed site for relevant environmental themes associated with the project classification. It is the duty of the EAP to ensure that the environmental themes provided by the screening tool are comprehensive and complete for the project. Refer to the disclaimer.

MAP OF RELATIVE AGRICULTURE THEME SENSITIVITY

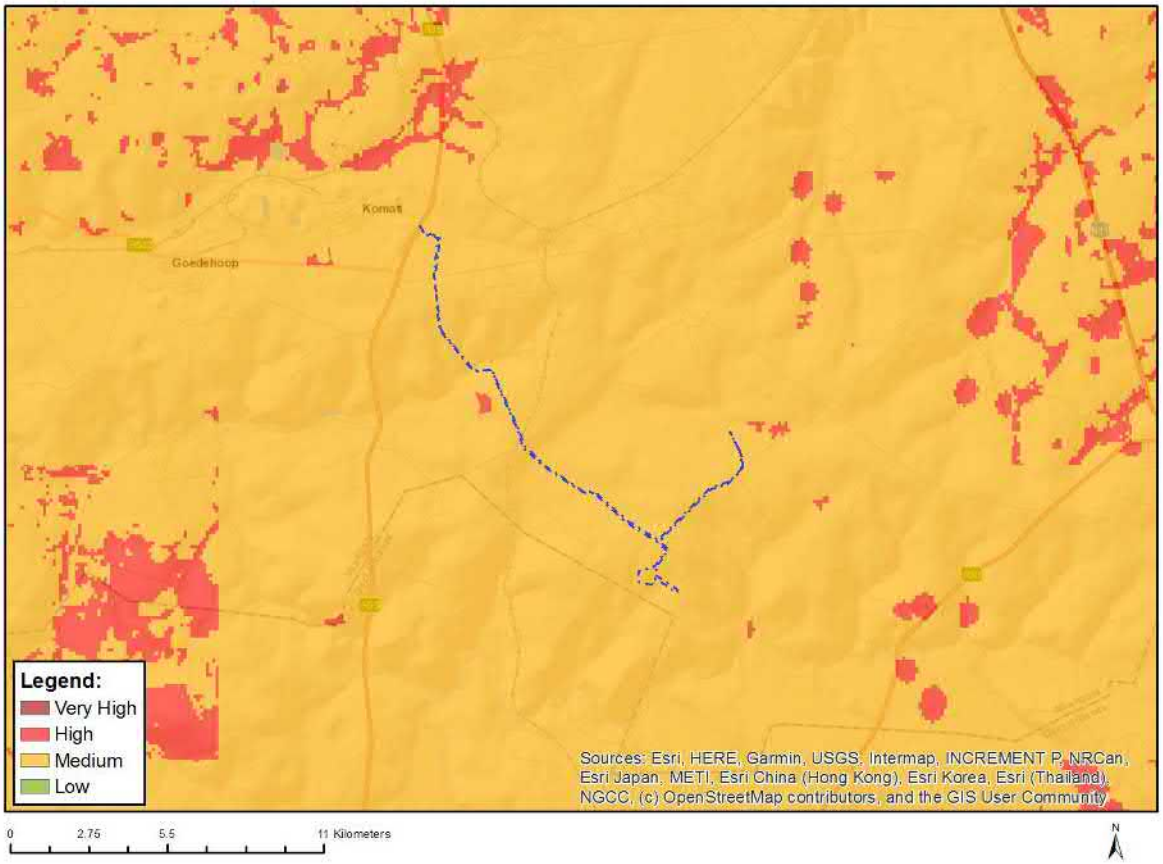


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Land capability;09. Moderate-High/10. Moderate-High
High	Annual Crop Cultivation / Planted Pastures Rotation;Land capability;06. Low-Moderate/07. Low-Moderate/08. Moderate
High	Annual Crop Cultivation / Planted Pastures Rotation;Land capability;09. Moderate-High/10. Moderate-High
Medium	Land capability;06. Low-Moderate/07. Low-Moderate/08. Moderate

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



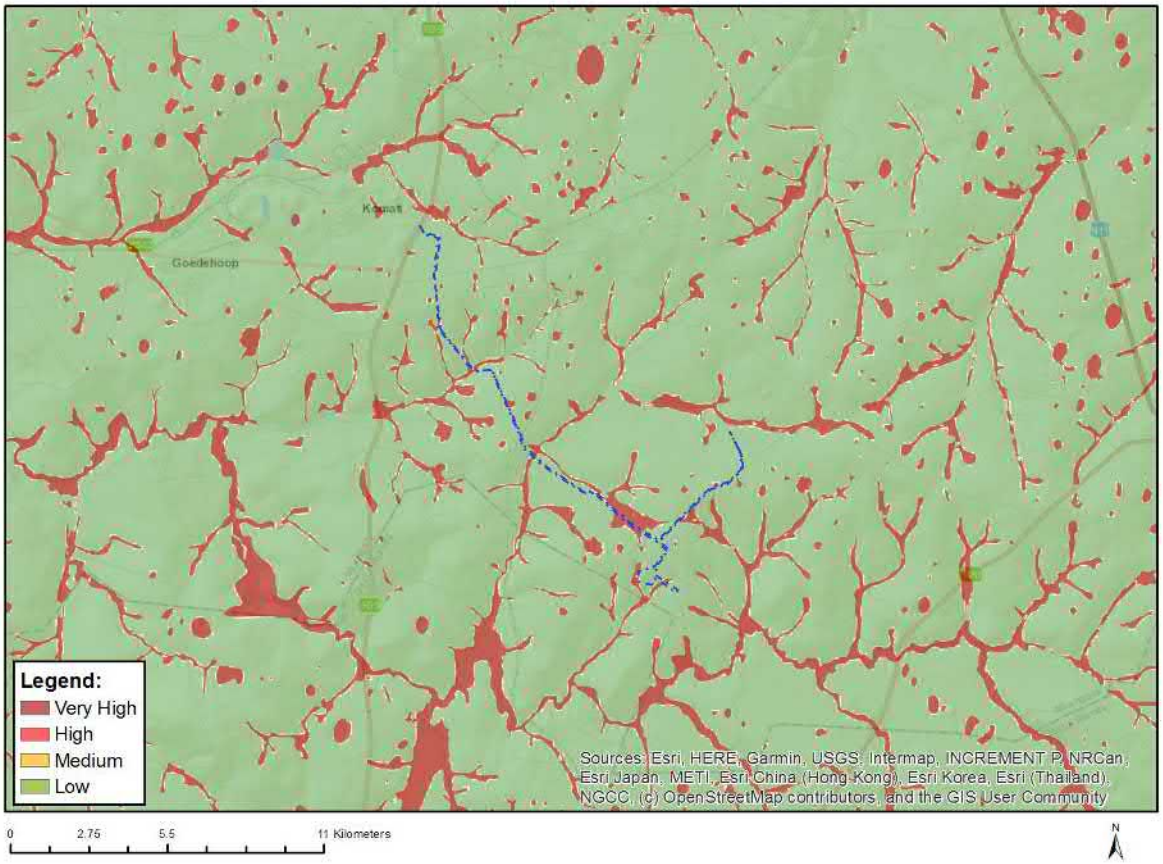
Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Medium	Aves-Hydroprogne caspia
Medium	Aves-Eupodotis senegalensis
Medium	Aves-Tyto capensis
Medium	Mammalia-Crocidura maquassiensis
Medium	Mammalia-Hydrictis maculicollis
Medium	Mammalia-Ourebia ourebi ourebi

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	Wetlands and Estuaries

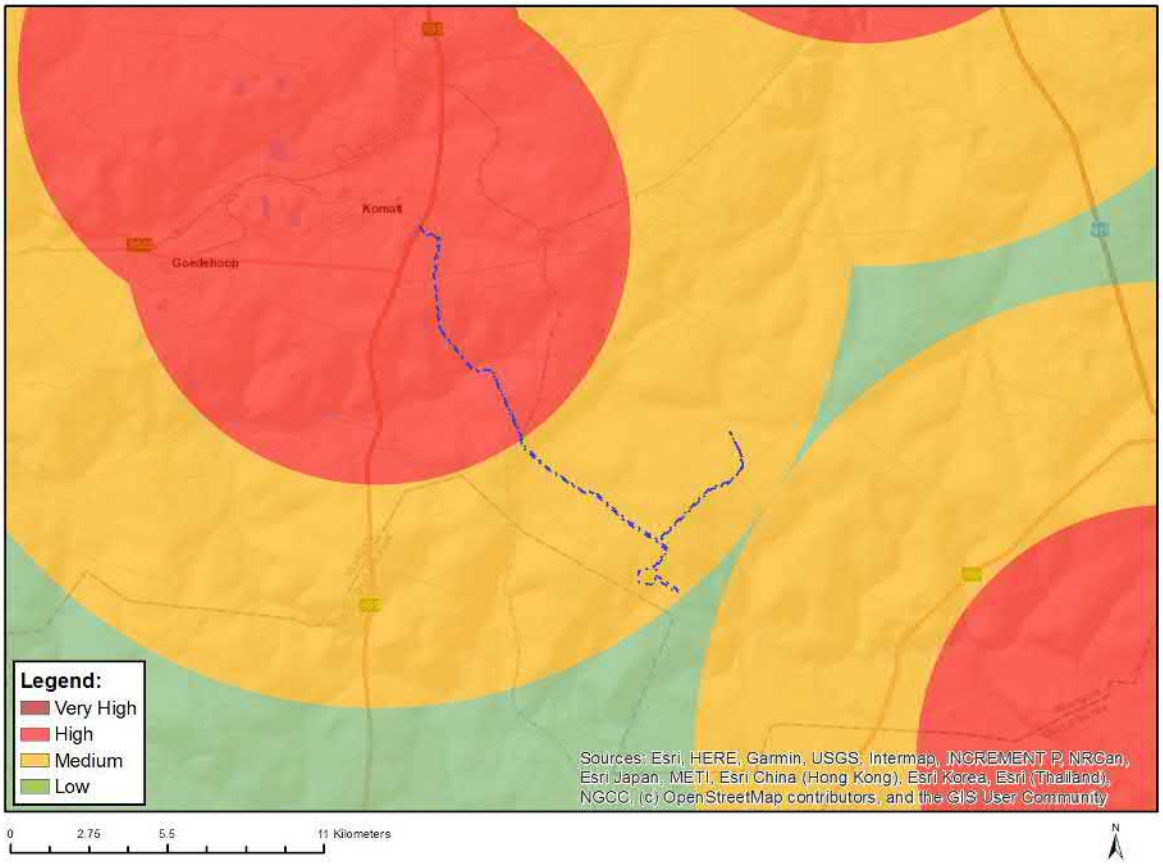
MAP OF RELATIVE ARCHAEOLOGICAL AND CULTURAL HERITAGE THEME SENSITIVITY

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
			X

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low sensitivity

MAP OF RELATIVE CIVIL AVIATION 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
Medium	Between 8 and 15 km of other civil aviation aerodrome

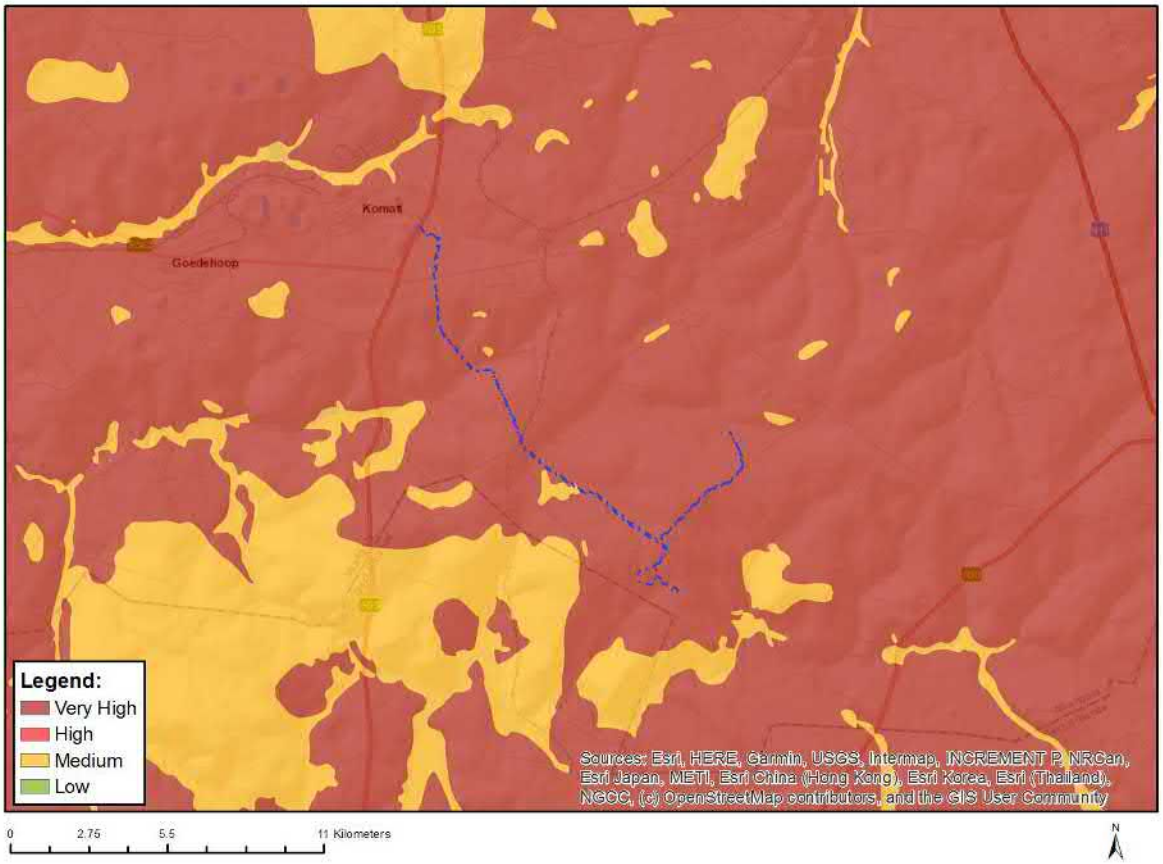
MAP OF RELATIVE DEFENCE THEME SENSITIVITY

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
			X

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity

MAP OF RELATIVE PALEONTOLOGY THEME SENSITIVITY

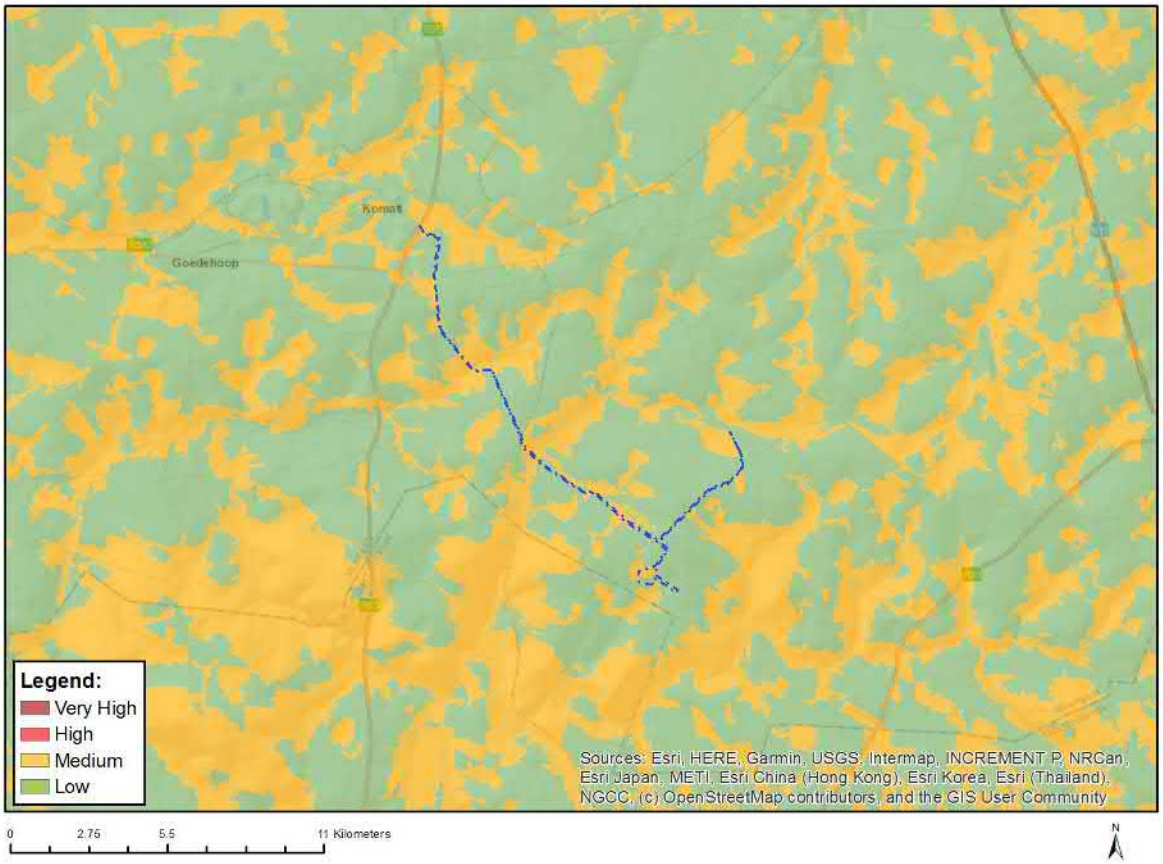


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Medium	Features with a Medium paleontological sensitivity
Very High	Features with a Very High paleontological sensitivity

MAP OF RELATIVE PLANT SPECIES THEME SENSITIVITY



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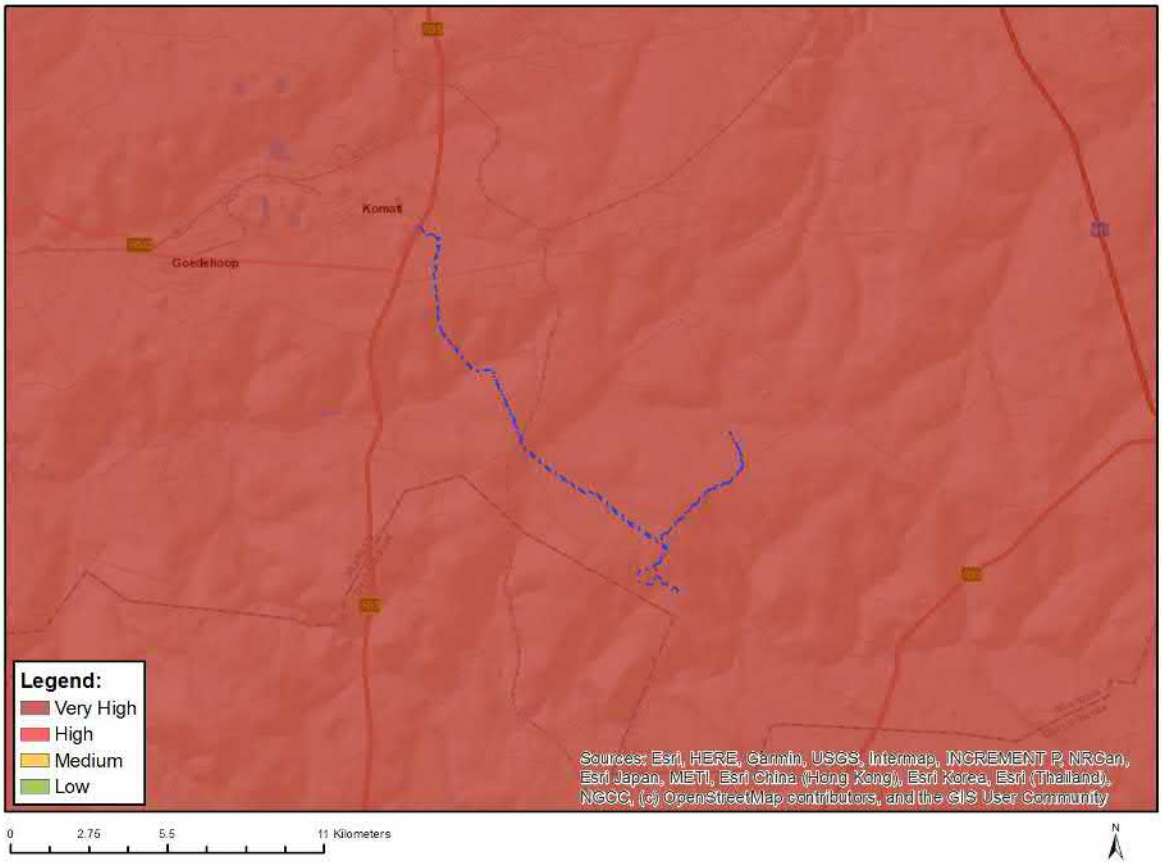
Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Medium	Sensitive species 41
Medium	Sensitive species 691
Medium	Pachycarpus suaveolens

MAP OF RELATIVE TERRESTRIAL BIODIVERSITY THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Very High	Critical biodiveristy area 2
Very High	Protected Areas Expansion Strategy
Very High	Vulnerable ecosystem

SCREENING REPORT FOR AN ENVIRONMENTAL AUTHORIZATION AS REQUIRED BY THE 2014 EIA REGULATIONS – PROPOSED SITE ENVIRONMENTAL SENSITIVITY

EIA Reference number:

Project name: Hendrina Renewable Energy Complex

Project title: Hendrina Green Hydrogen & Ammonia Facility- Alternative 2

Date screening report generated: 02/08/2022 08:39:39

Applicant: Enertrag SA

Compiler: WSP

Compiler signature:

.....

Application Category: Infrastructure|Localised infrastructure|Storage|Dangerous Goods|Chemicals

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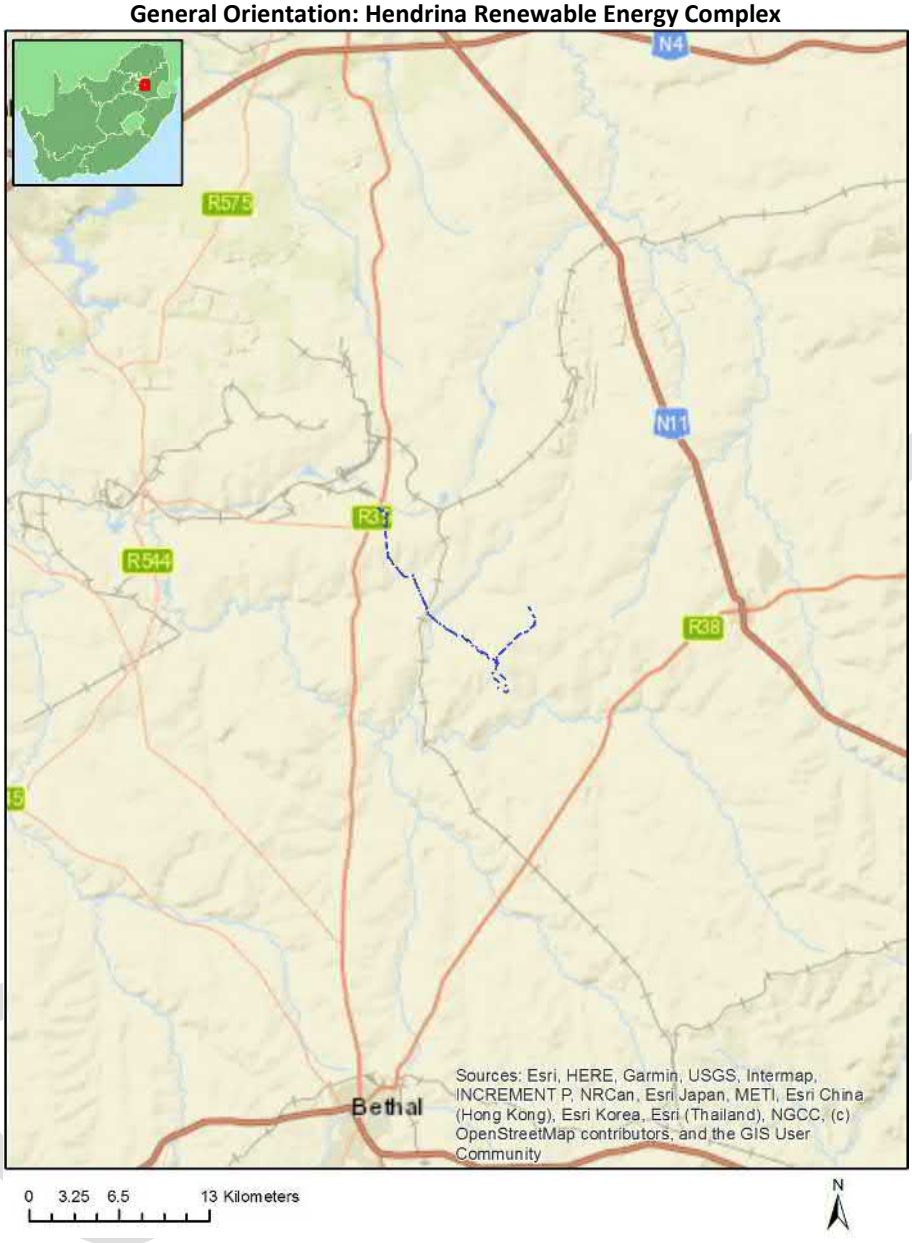
Proposed Project Location

Orientation map 1: General location

General Orientation: Hendrina Renewable Energy Complex



Map of proposed site and relevant area(s)

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3	WILMANSRUST	47	0	26°8'20.04S	29°27'56.65E	Farm
4	WELTEVREDEN	193	0	26°13'11.63S	29°34'35.21E	Farm
5	BULFONTEIN	187	0	26°7'37.97S	29°30'12.46E	Farm
6	KOMATI POWER STATION 56	27	0	26°5'57.82S	29°27'49.26E	Farm
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12	GELUK	26	6	26°6'18.27S	29°29'25.29E	Farm Portion
13	WILMANSRUST	47	14	26°9'36.32S	29°30'40.34E	Farm Portion
14	BULFONTEIN	187	2	26°7'20.94S	29°28'41.77E	Farm Portion
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19	DUNBAR	189	3	26°11'59.3S	29°33'22.31E	Farm Portion
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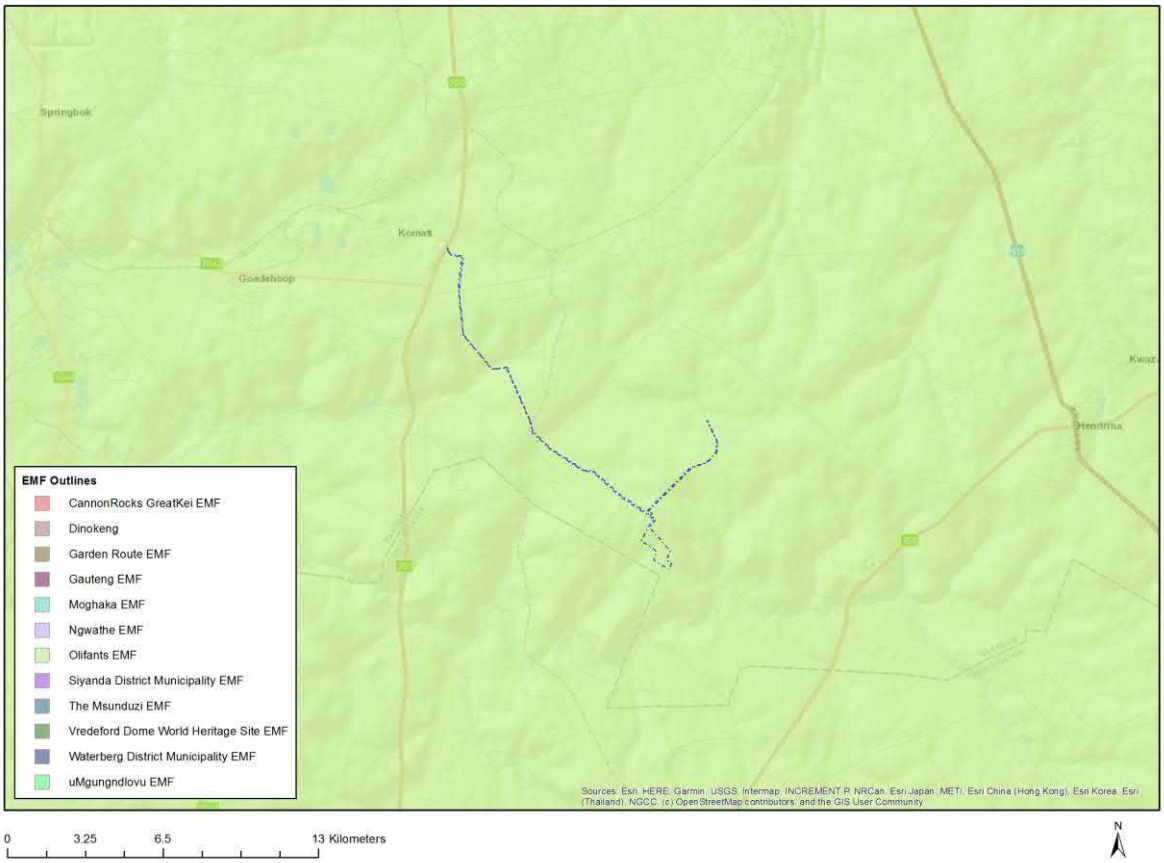
Development footprint[1] vertices:
No development footprint(s) specified.

Wind and Solar developments with an approved Environmental Authorisation or applications under consideration within 30 km of the proposed area

No	EIA Reference No	Classification	Status of application	Distance from proposed area (km)
1	14/12/16/3/3/2/759	Solar PV	Approved	21.6

[1] "development footprint", means the area within the site on which the development will take place and incudes all ancillary developments for example roads, power lines, boundary walls, paving etc. which require vegetation clearance or which will be disturbed and for which the application has been submitted.

Environmental Management Frameworks relevant to the application



Environmental Management Framework	LINK
Olifants EMF	https://screening.environment.gov.za/ScreeningDownloads/EMF/Zone_46,_67,_78,_80,_92,_103,_122,_129.pdf

Environmental screening results and assessment outcomes

The following sections contain a summary of any development incentives, restrictions, exclusions or prohibitions that apply to the proposed development site as well as the most environmental sensitive features on the site based on the site sensitivity screening results for the application classification that was selected. The application classification selected for this report is: **Infrastructure|Localised infrastructure|Storage|Dangerous Goods|Chemicals**.

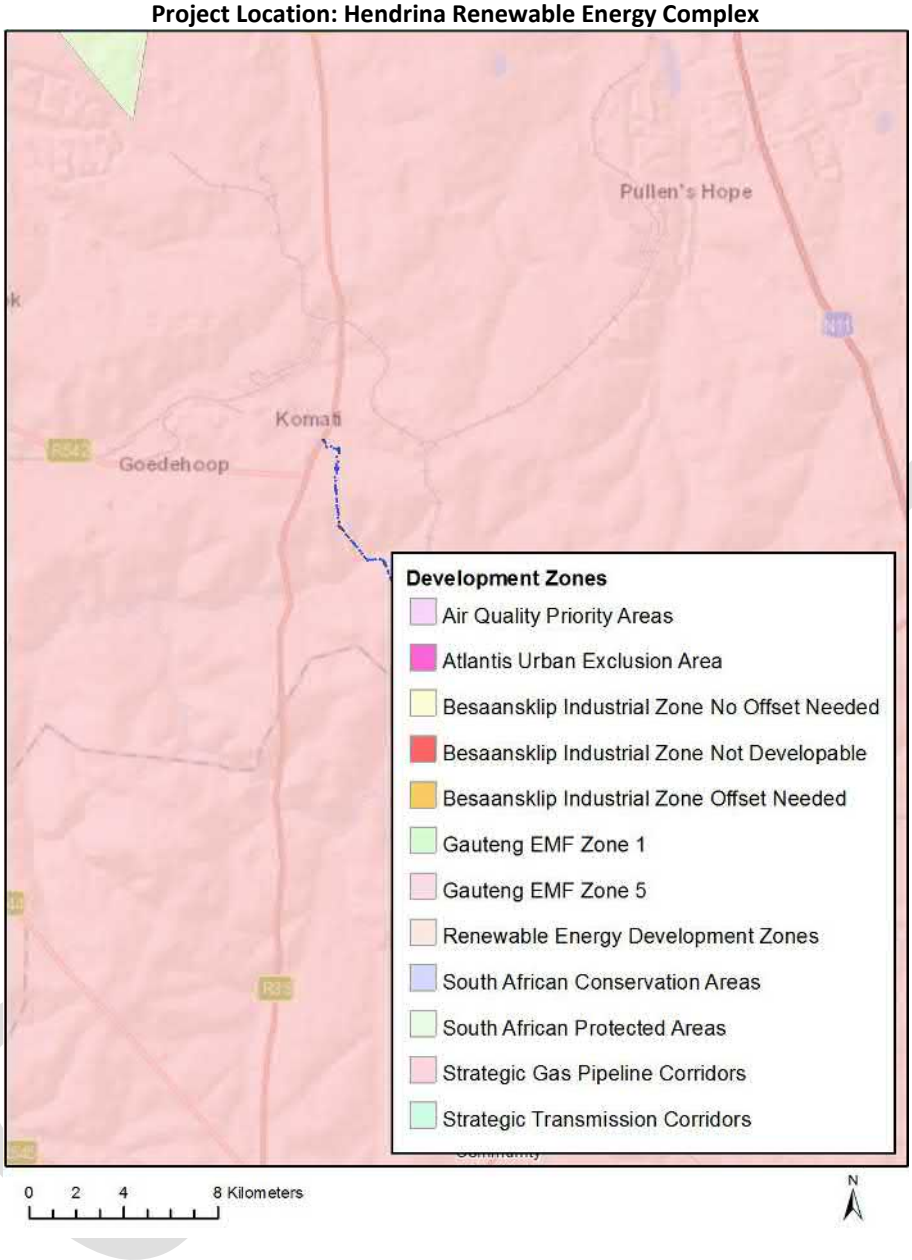
Relevant development incentives, restrictions, exclusions or prohibitions

The following development incentives, restrictions, exclusions or prohibitions and their implications that apply to this site are indicated below.

Incentive, restriction or prohibition	Implication
Air Quality-Highveld Priority Area	https://screening.environment.gov.za/ScreeningDownloads/DevelopmentZones/HIGHVELD_PRIORITY_AREA_AQMP.pdf
Strategic Gas Pipeline Corridors -Phase 8: Rompco Pipeline Corridor	https://screening.environment.gov.za/ScreeningDownloads/DevelopmentZones/Combined_GAS.pdf

Map indicating proposed development footprint within applicable development incentive, restriction, exclusion or prohibition zones

Project Location: Hendrina Renewable Energy Complex



Proposed Development Area Environmental Sensitivity

The following summary of the development site environmental sensitivities is identified. Only the highest environmental sensitivity is indicated. The footprint environmental sensitivities for the proposed development footprint as identified, are indicative only and must be verified on site by a suitably qualified person before the specialist assessments identified below can be confirmed.

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
Civil Aviation Theme		X		
Defence Theme				X
Paleontology Theme	X			
Plant Species Theme			X	
Terrestrial Biodiversity Theme	X			

Specialist assessments identified

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. 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 site situation.

No	Specialist assessment	Assessment Protocol
1	Agricultural Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Agriculture_Assessment_Protocols.pdf
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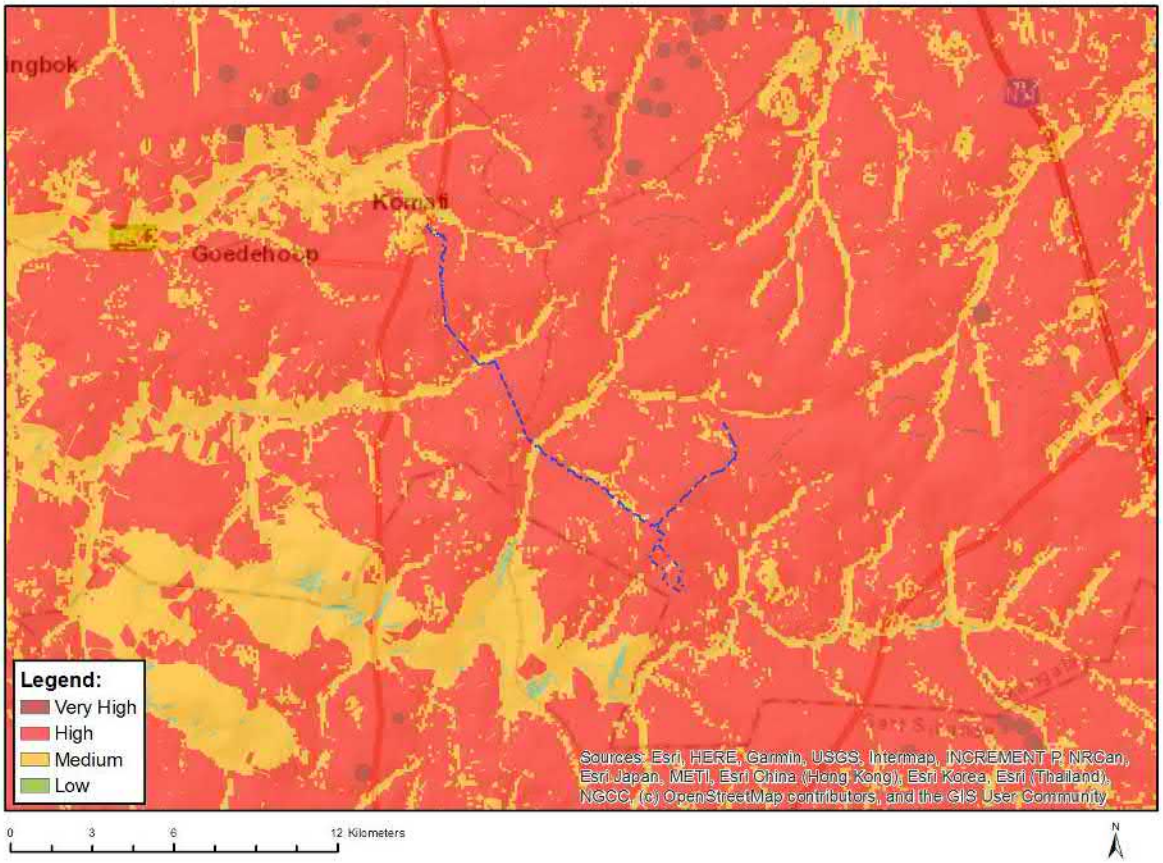
3	Palaeontology Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
4	Terrestrial Biodiversity Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Terrestrial_Biodiversity_Assessment_Protocols.pdf
5	Aquatic Biodiversity Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Aquatic_Biodiversity_Assessment_Protocols.pdf
6	Hydrology Assess	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf

	ment	
7	Noise Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Noise_Impacts_Assessment_Protocol.pdf
8	Traffic Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
9	Geotechnical Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
10	Socio-Economic Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
11	Plant Species Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Plant_Species_Assessment_Protocols.pdf
12	Animal Species Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Animal_Species_Assessment_Protocols.pdf

Results of the environmental sensitivity of the proposed area.

The following section represents the results of the screening for environmental sensitivity of the proposed site for relevant environmental themes associated with the project classification. It is the duty of the EAP to ensure that the environmental themes provided by the screening tool are comprehensive and complete for the project. Refer to the disclaimer.

MAP OF RELATIVE AGRICULTURE THEME SENSITIVITY

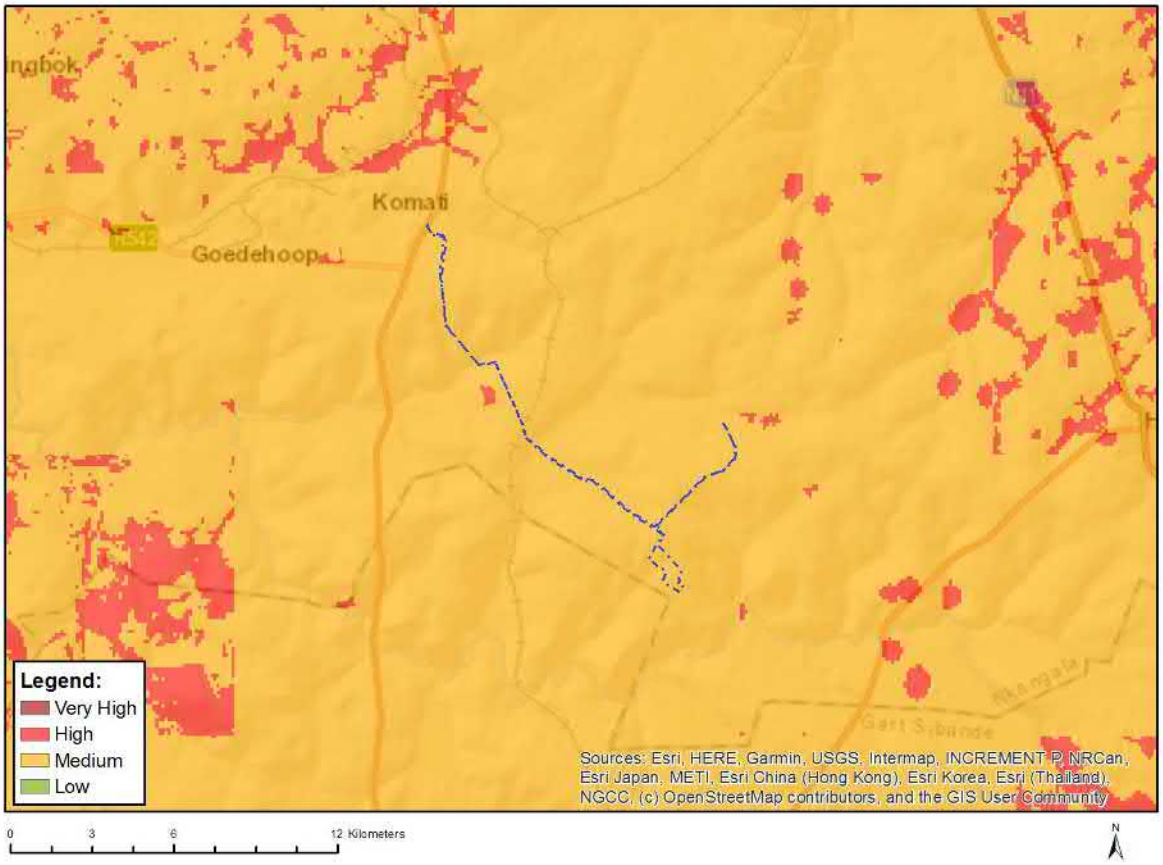


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Land capability;09. Moderate-High/10. Moderate-High
High	Annual Crop Cultivation / Planted Pastures Rotation;Land capability;06. Low-Moderate/07. Low-Moderate/08. Moderate
High	Annual Crop Cultivation / Planted Pastures Rotation;Land capability;09. Moderate-High/10. Moderate-High
Medium	Land capability;06. Low-Moderate/07. Low-Moderate/08. Moderate

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



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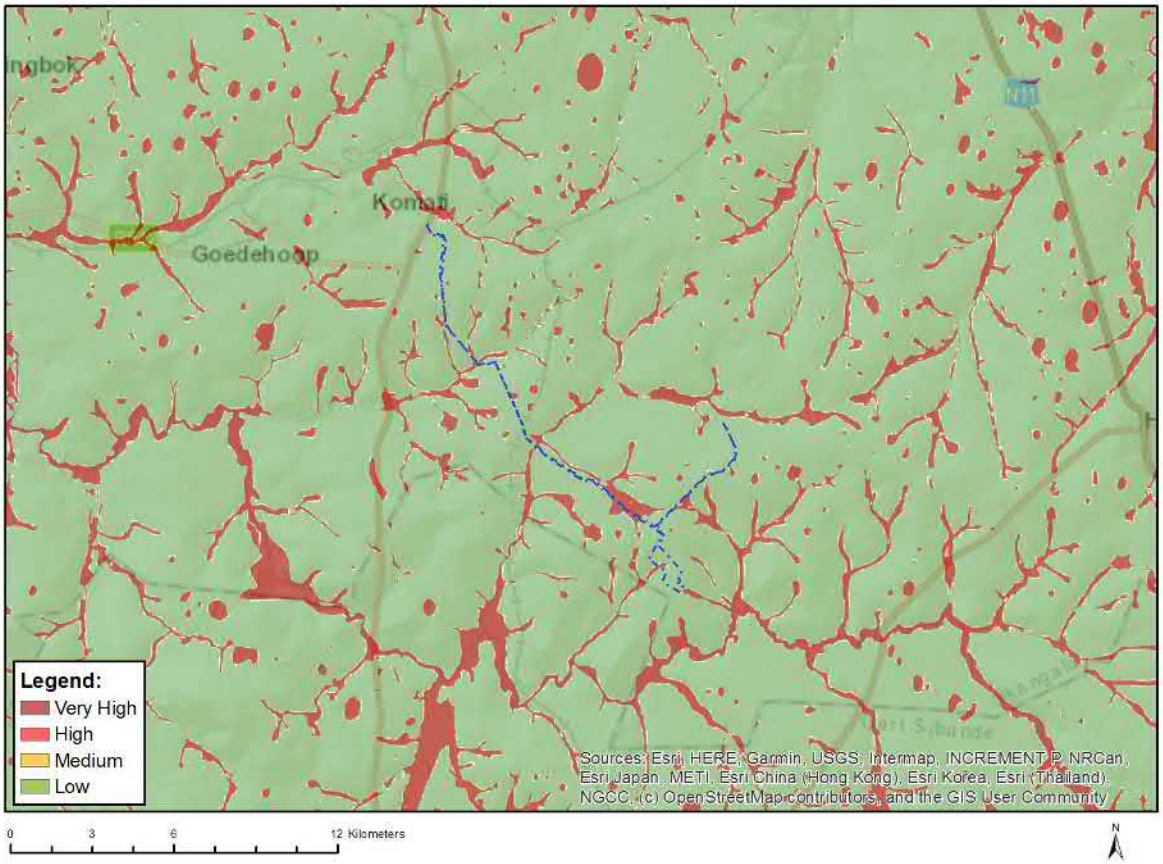
Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Medium	Aves-Hydroprogne caspia
Medium	Aves-Eupodotis senegalensis
Medium	Aves-Tyto capensis
Medium	Mammalia-Crocidura maquassiensis
Medium	Mammalia-Hydrictis maculicollis
Medium	Mammalia-Ourebia ourebi ourebi

MAP OF RELATIVE AQUATIC BIODIVERSITY THEME SENSITIVITY

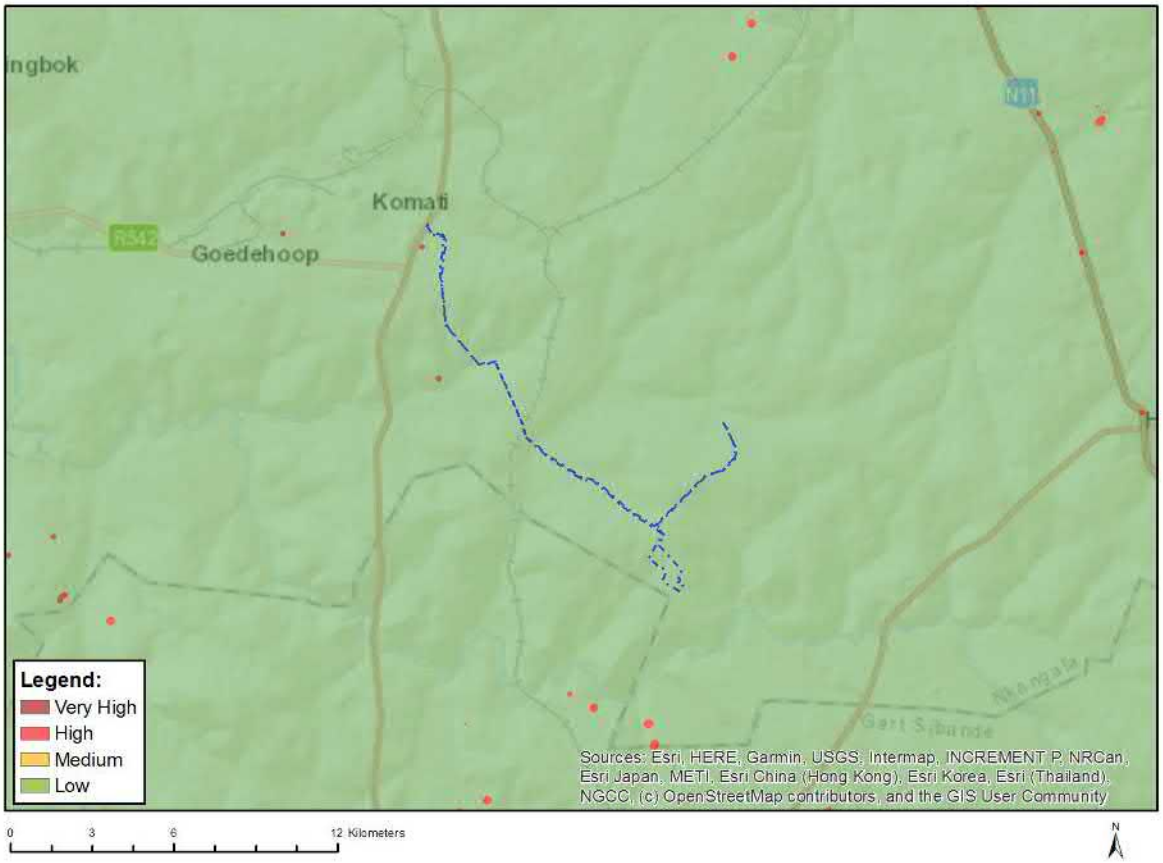


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

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

MAP OF RELATIVE ARCHAEOLOGICAL AND CULTURAL HERITAGE THEME SENSITIVITY

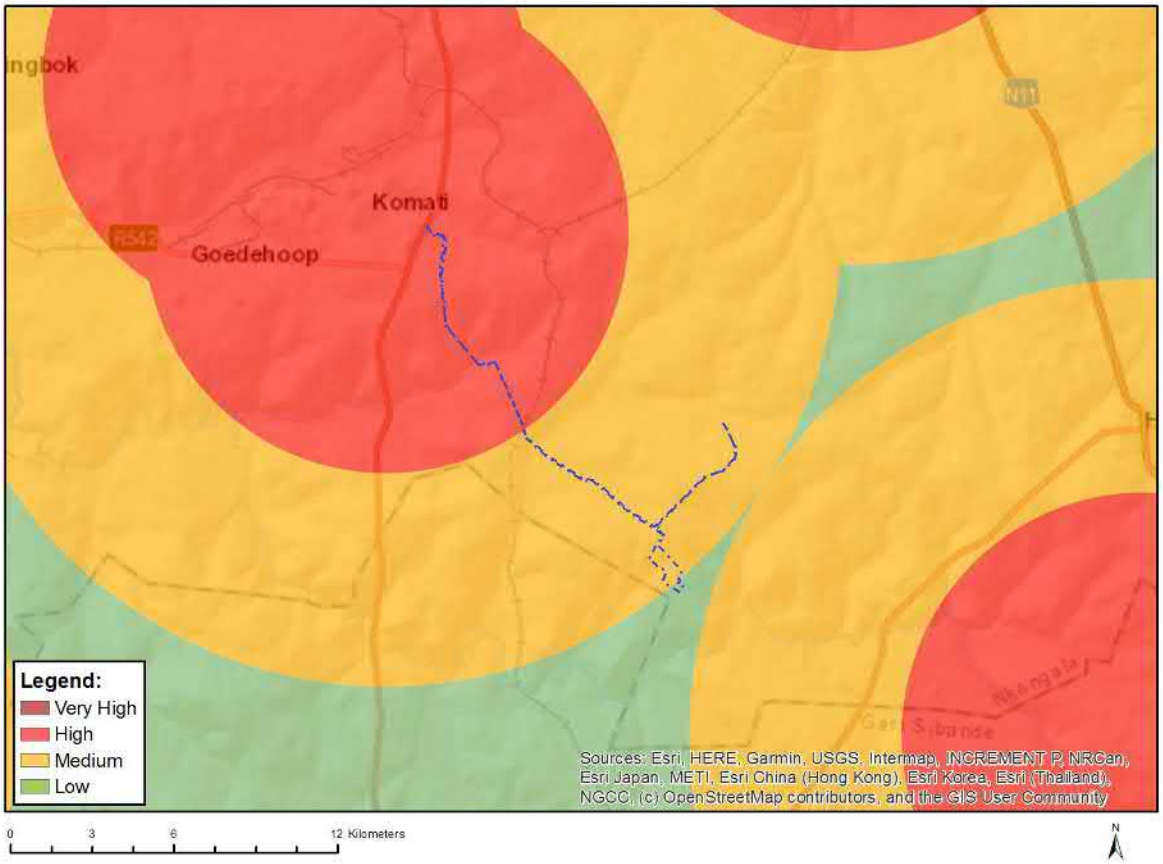


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
			X

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low sensitivity

MAP OF RELATIVE CIVIL AVIATION THEME SENSITIVITY

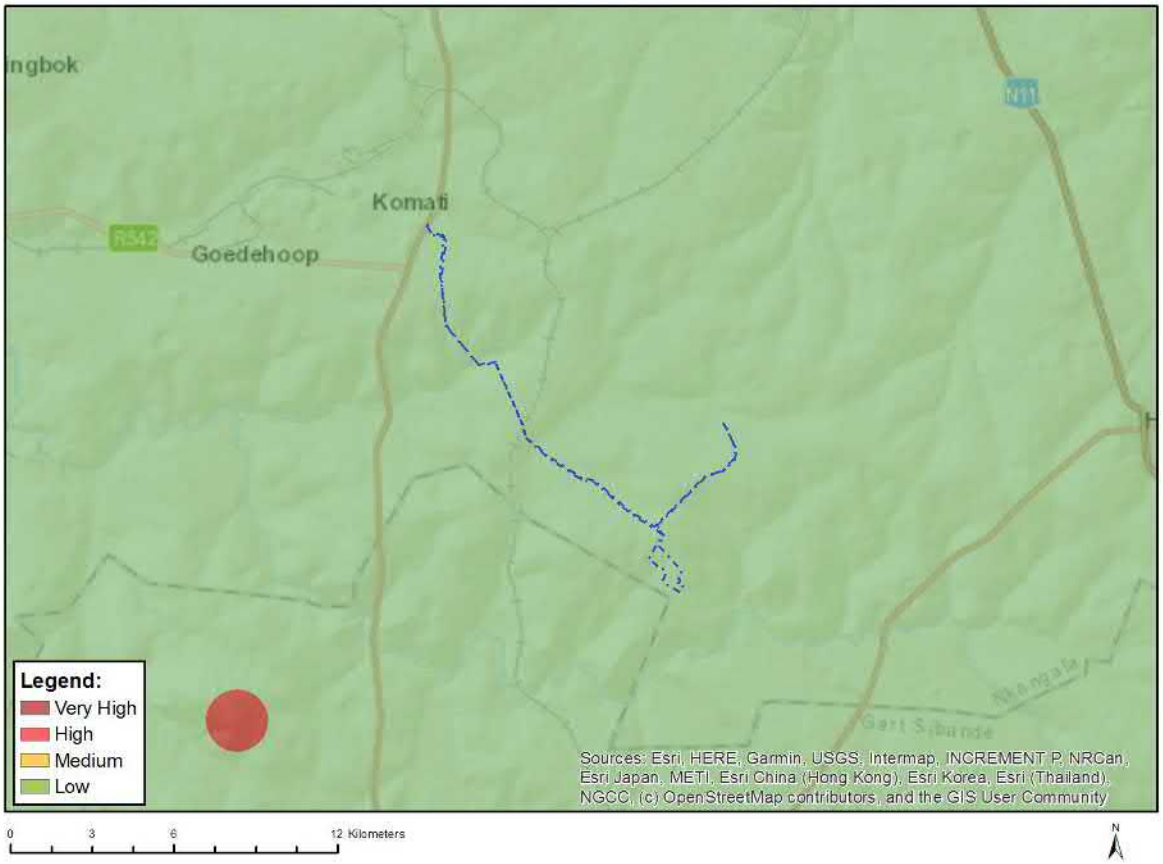


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Within 8 km of other civil aviation aerodrome
Low	Low sensitivity
Medium	Between 8 and 15 km of other civil aviation aerodrome

MAP OF RELATIVE DEFENCE THEME SENSITIVITY

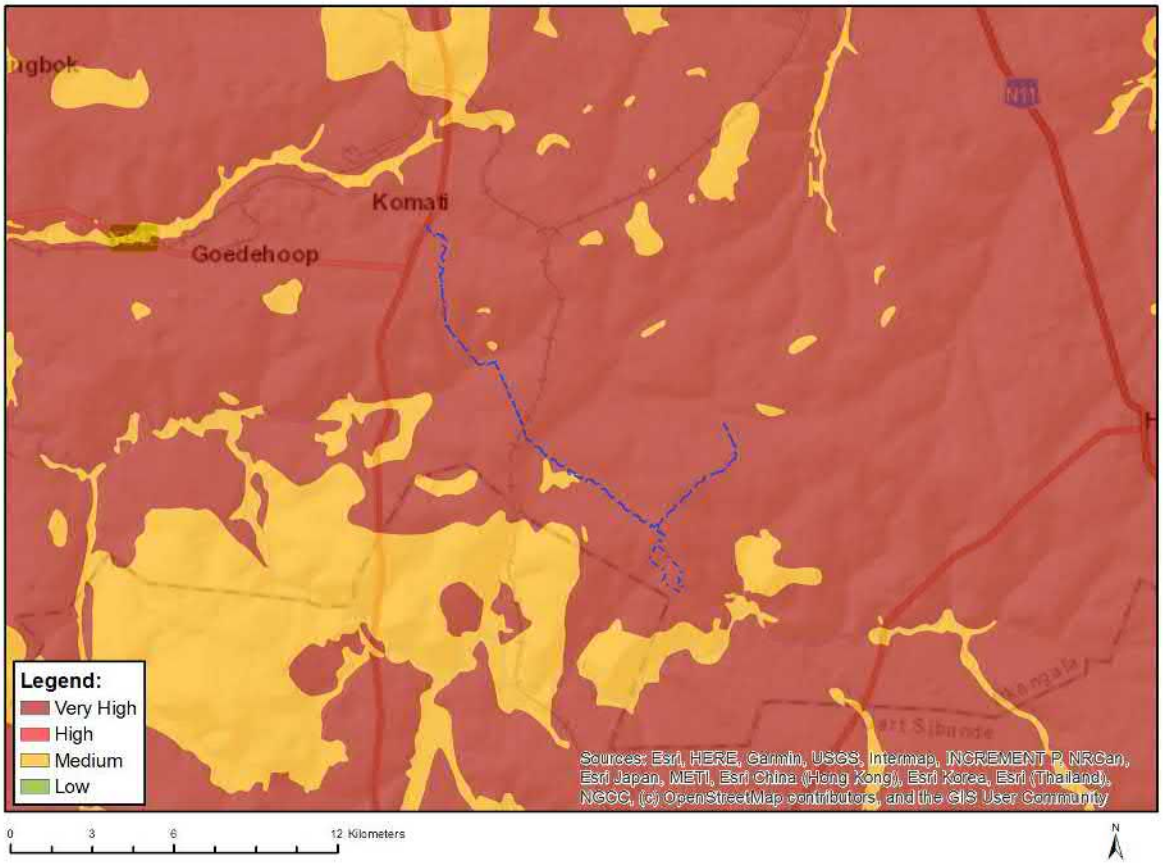


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
			X

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity

MAP OF RELATIVE PALEONTOLOGY THEME SENSITIVITY

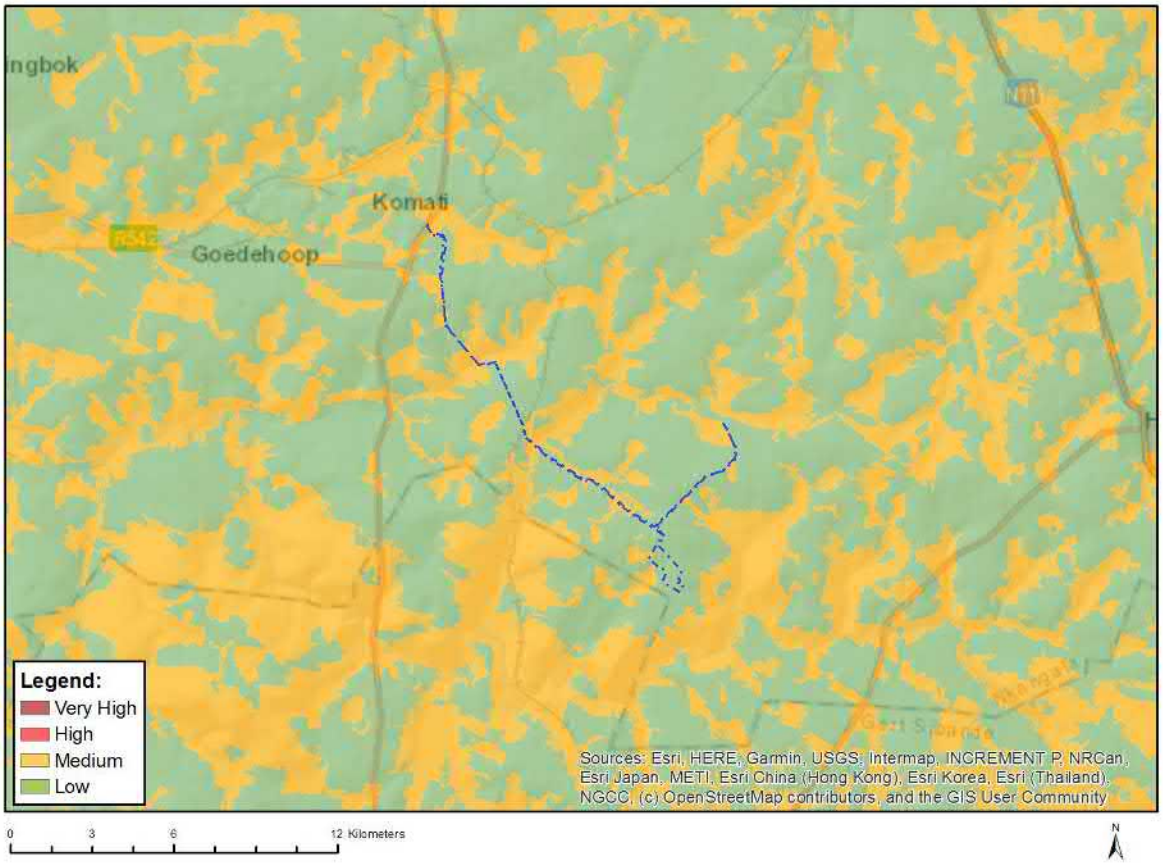


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Medium	Features with a Medium paleontological sensitivity
Very High	Features with a Very High paleontological sensitivity

MAP OF RELATIVE PLANT SPECIES THEME SENSITIVITY



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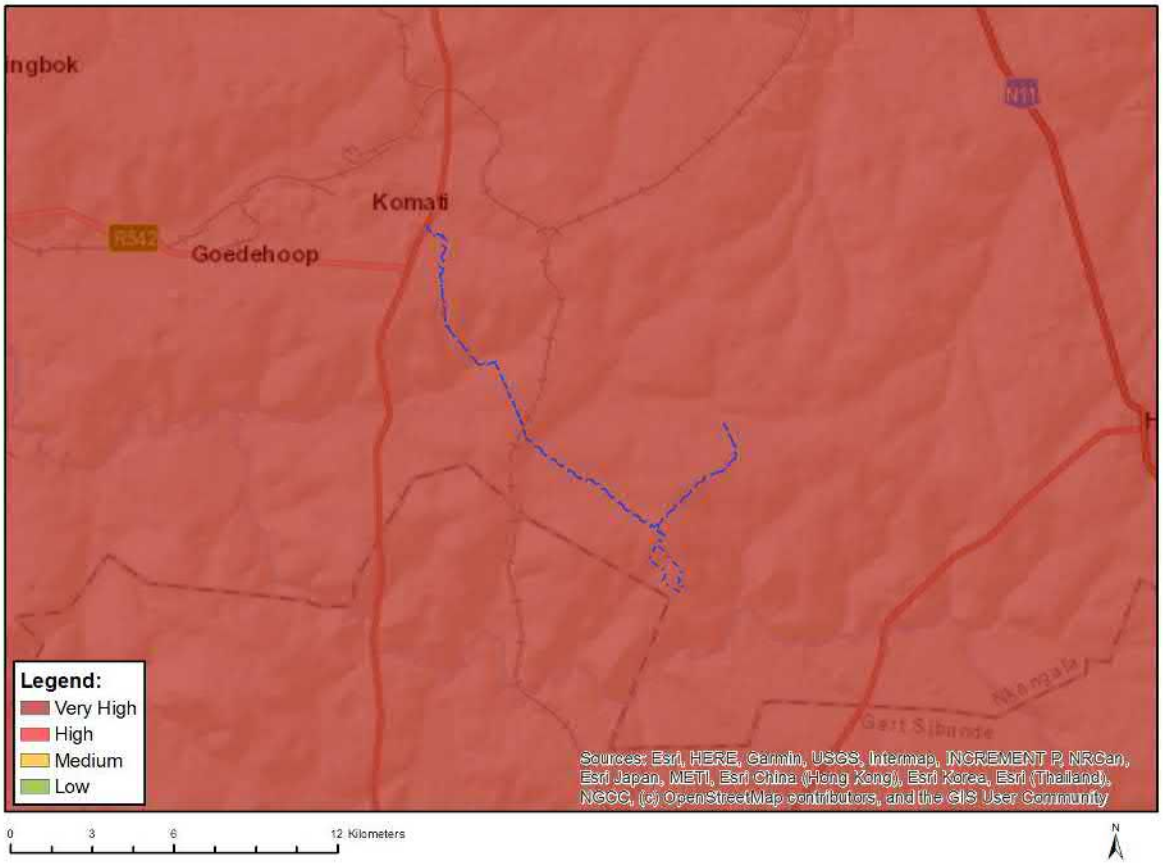
Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Medium	Sensitive species 41
Medium	Sensitive species 691
Medium	Pachycarpus suaveolens

MAP OF RELATIVE TERRESTRIAL BIODIVERSITY THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Very High	Critical biodiveristy area 2
Very High	Protected Areas Expansion Strategy
Very High	Vulnerable ecosystem

SCREENING REPORT FOR AN ENVIRONMENTAL AUTHORIZATION AS REQUIRED BY THE 2014 EIA REGULATIONS – PROPOSED SITE ENVIRONMENTAL SENSITIVITY

EIA Reference number:

Project name: Hendrina Renewable Energy Complex

Project title: Hendrina Green Hydrogen & Ammonia Facility - Alternative 3

Date screening report generated: 02/08/2022 09:29:40

Applicant: Enertrag SA

Compiler: WSP

Compiler signature:

.....

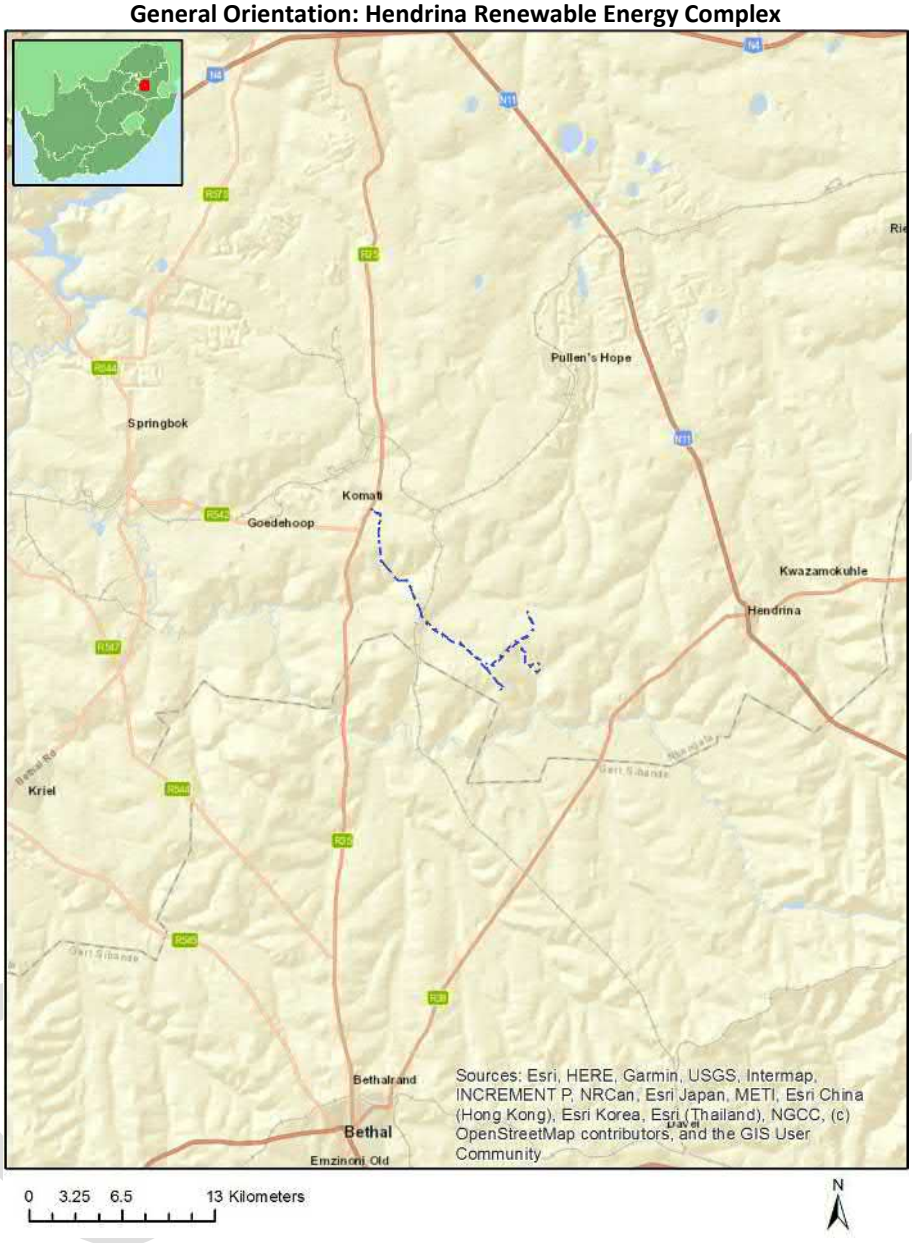
Application Category: Infrastructure|Localised infrastructure|Storage|Dangerous Goods|Chemicals

Table of Contents

Proposed Project Location

Orientation map 1: General location

General Orientation: Hendrina Renewable Energy Complex



Map of proposed site and relevant area(s)

Cadastral details of the proposed site

Property details:

No	Farm Name	Farm/ Erf No	Portion	Latitude	Longitude	Property Type
1	WILMANSRUST	47	0	26°8'20.04S	29°27'56.65E	Farm
2	WELTEVREDEN	193	0	26°13'11.63S	29°34'35.21E	Farm
3	BULFONTEIN	187	0	26°7'37.97S	29°30'12.46E	Farm
4	HARTEBEESTKUIL	185	0	26°9'1.67S	29°33'33.9E	Farm
5	GELUK	26	0	26°5'52.64S	29°30'18.3E	Farm
6	KOMATI POWER STATION 56	27	0	26°5'57.82S	29°27'49.26E	Farm
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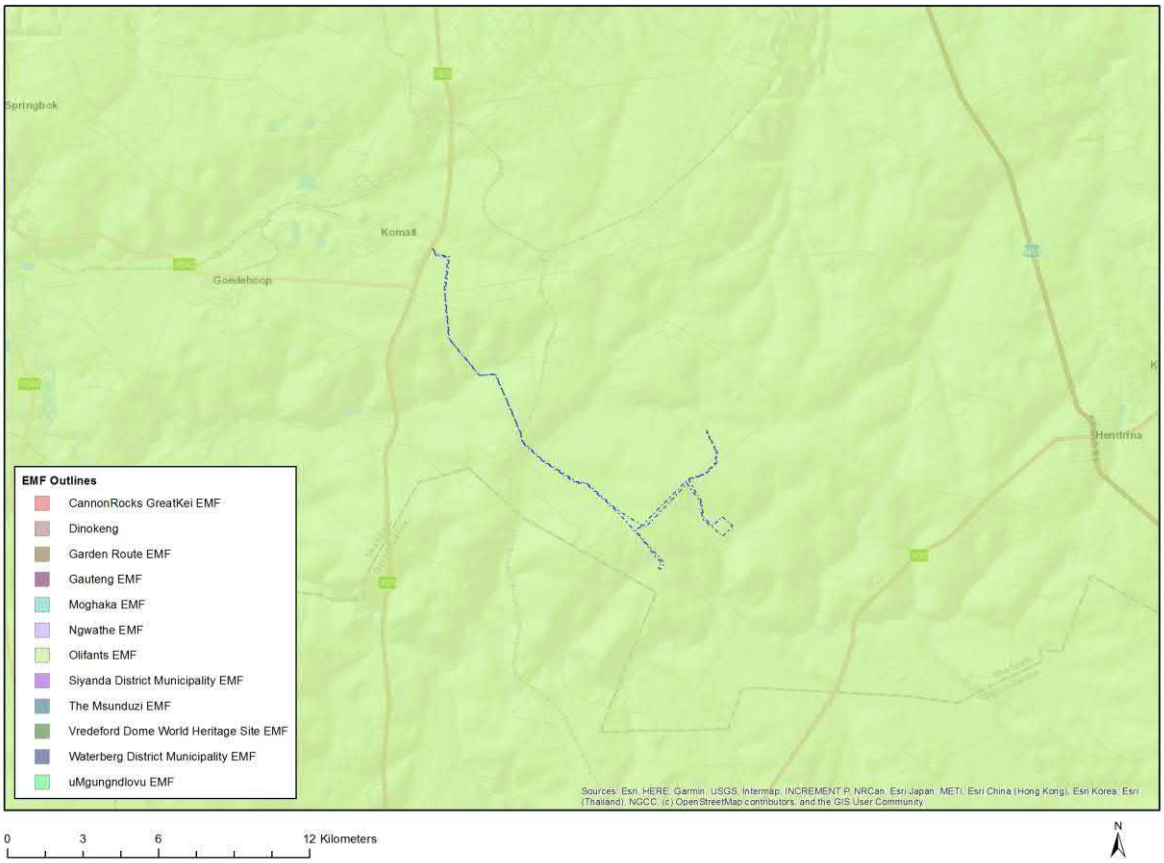

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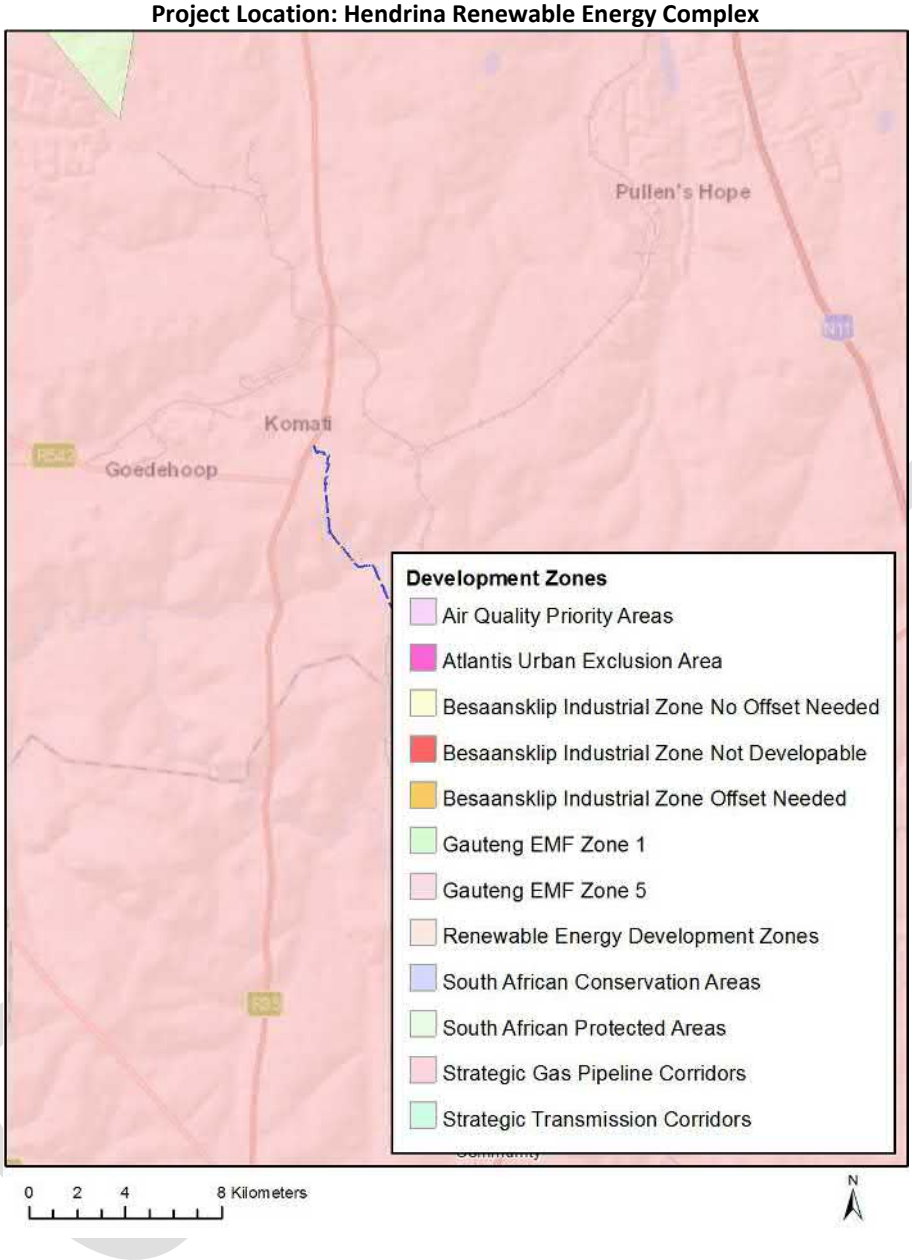
Map indicating proposed development footprint within applicable development incentive, restriction, exclusion or prohibition zones

Project Location: Hendrina Renewable Energy Complex



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5	Aquatic Biodiversity Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Aquatic_Biodiversity_Assessment_Protocols.pdf
6	Hydrology Assess	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf

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7	Noise Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Noise_Impacts_Assessment_Protocol.pdf
8	Traffic Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
9	Geotechnical Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
10	Socio-Economic Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
11	Plant Species Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Plant_Species_Assessment_Protocols.pdf
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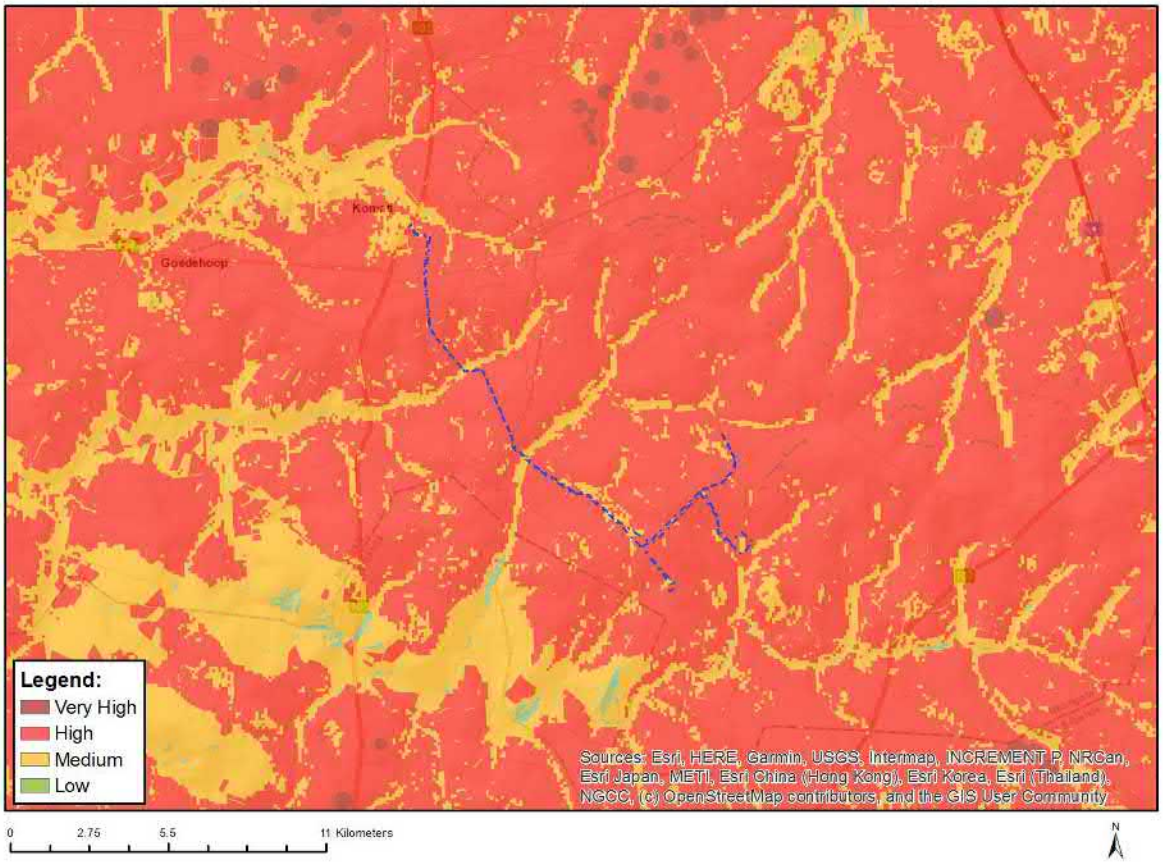

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
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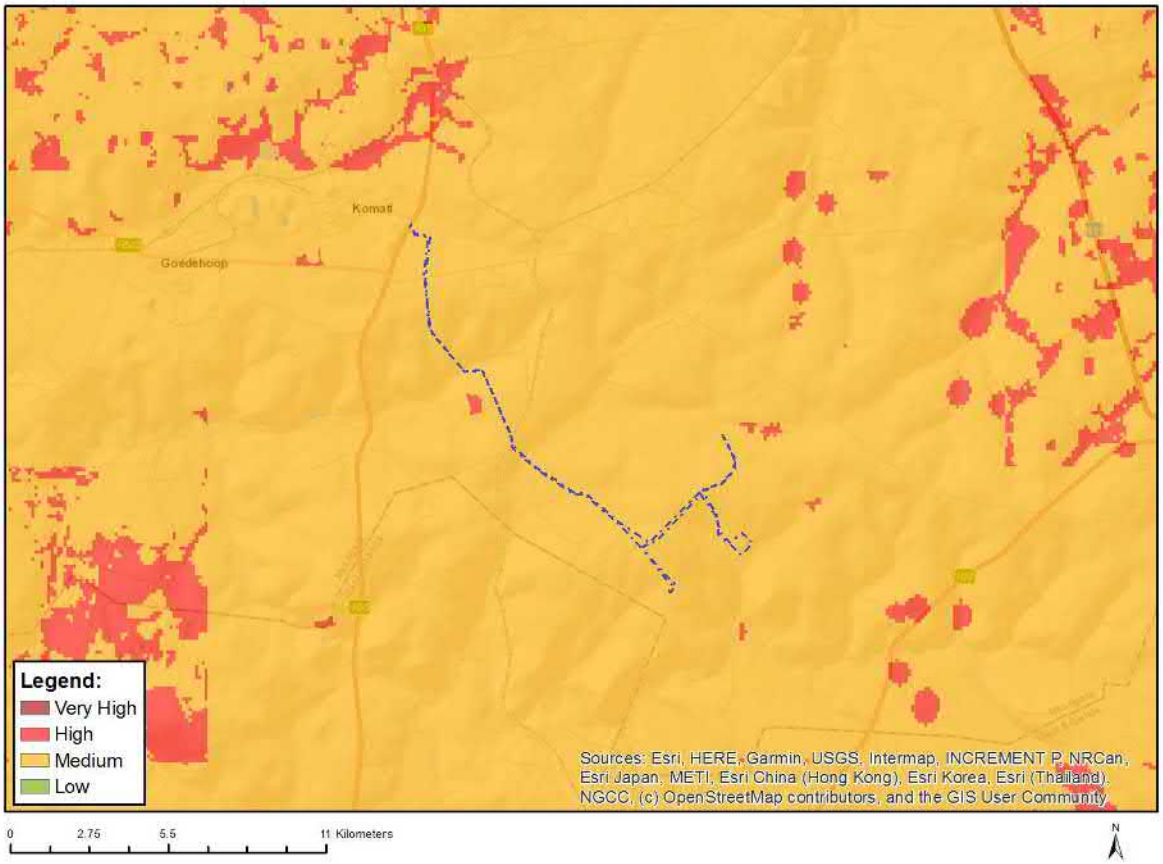
Medium	Land capability;06. Low-Moderate/07. Low-Moderate/08. Moderate

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



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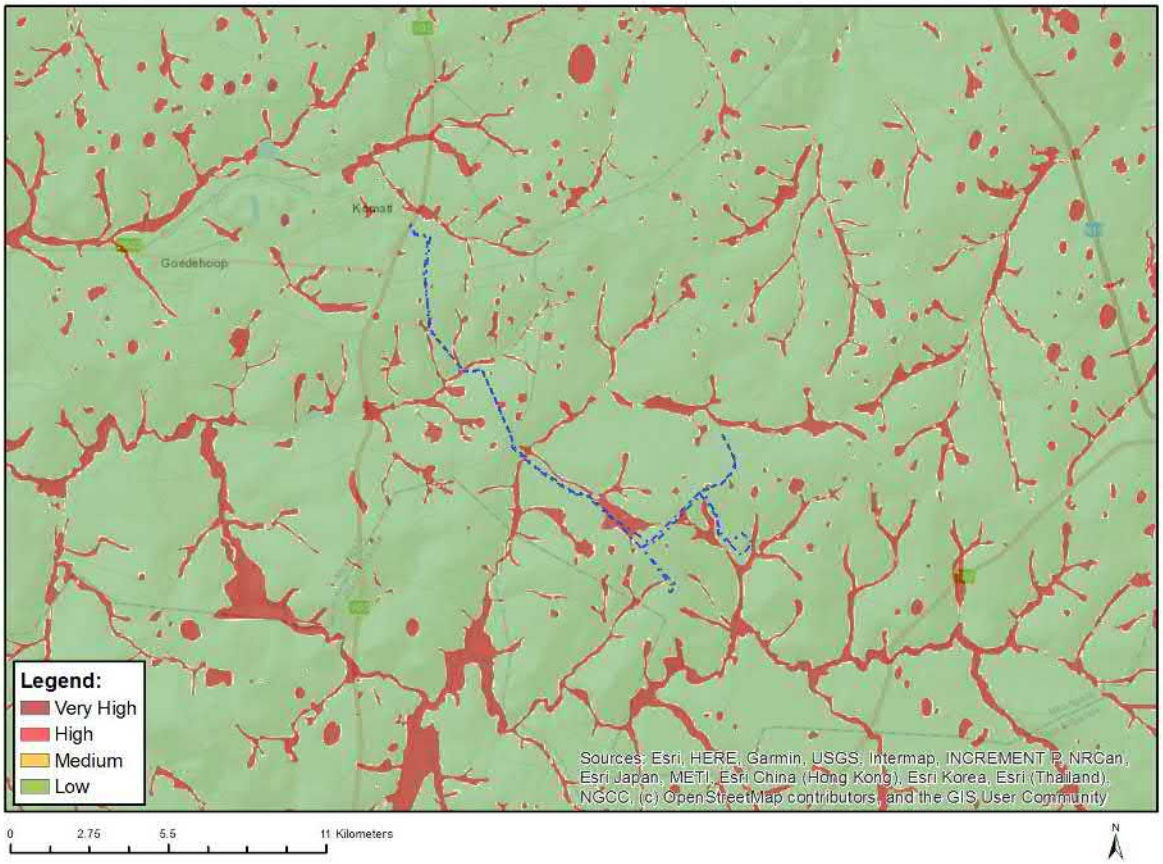
Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Medium	Aves-Hydroprogne caspia
Medium	Aves-Eupodotis senegalensis
Medium	Aves-Tyto capensis
Medium	Mammalia-Crocidura maquassiensis
Medium	Mammalia-Hydrictis maculicollis
Medium	Mammalia-Ourebia ourebi ourebi

MAP OF RELATIVE AQUATIC BIODIVERSITY THEME SENSITIVITY

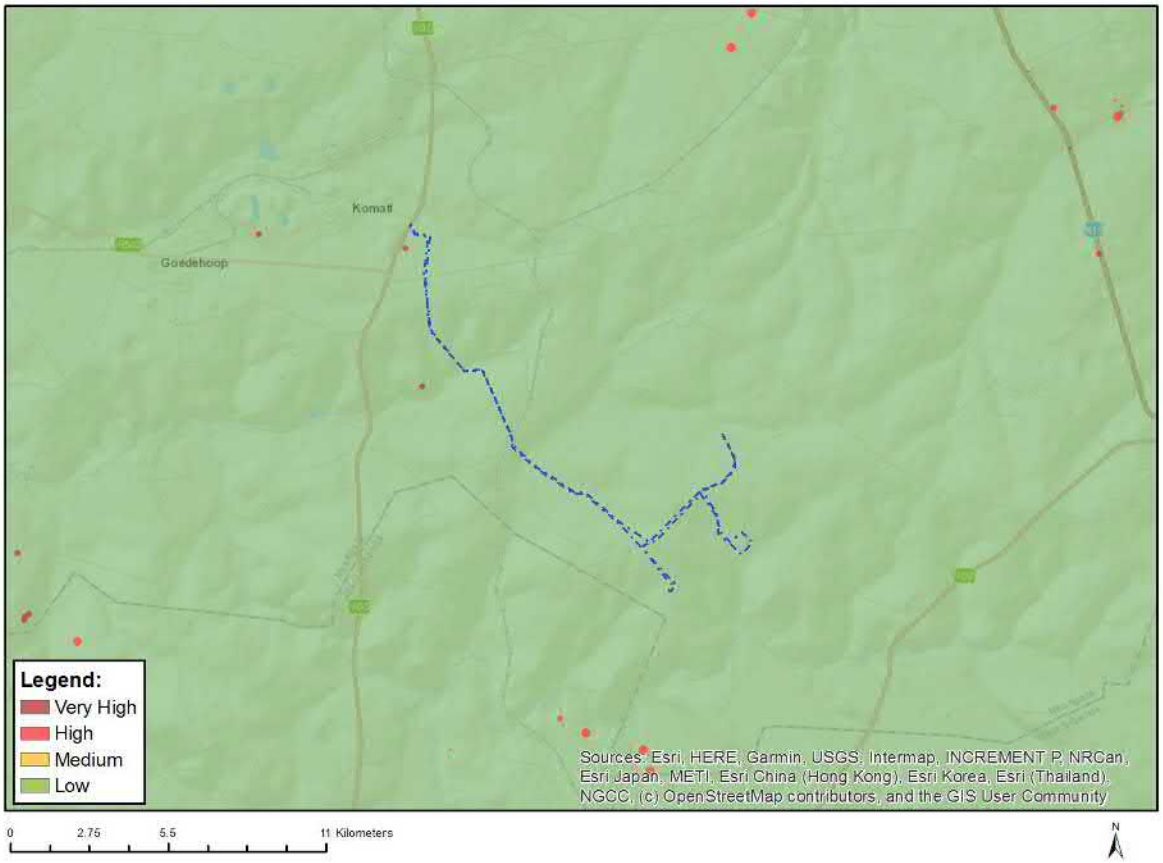


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

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

MAP OF RELATIVE ARCHAEOLOGICAL AND CULTURAL HERITAGE THEME SENSITIVITY

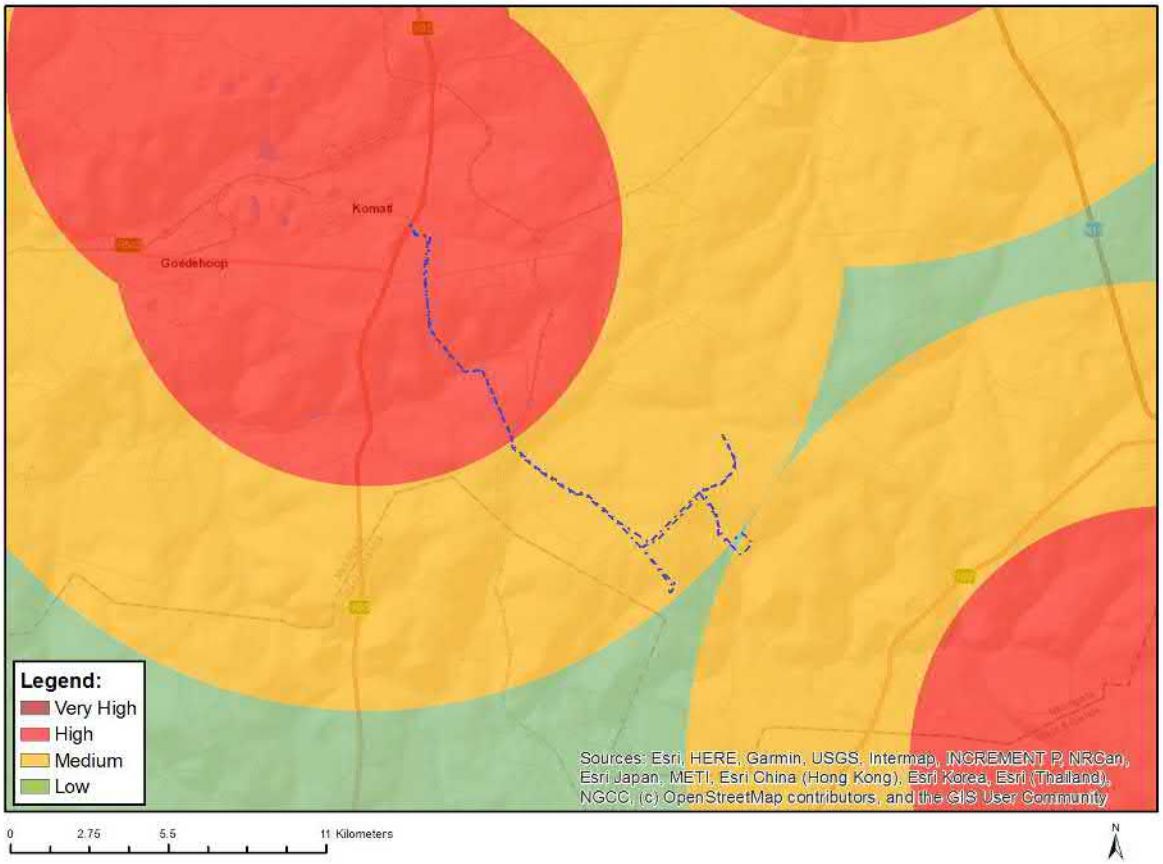


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
			X

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low sensitivity

MAP OF RELATIVE CIVIL AVIATION THEME SENSITIVITY

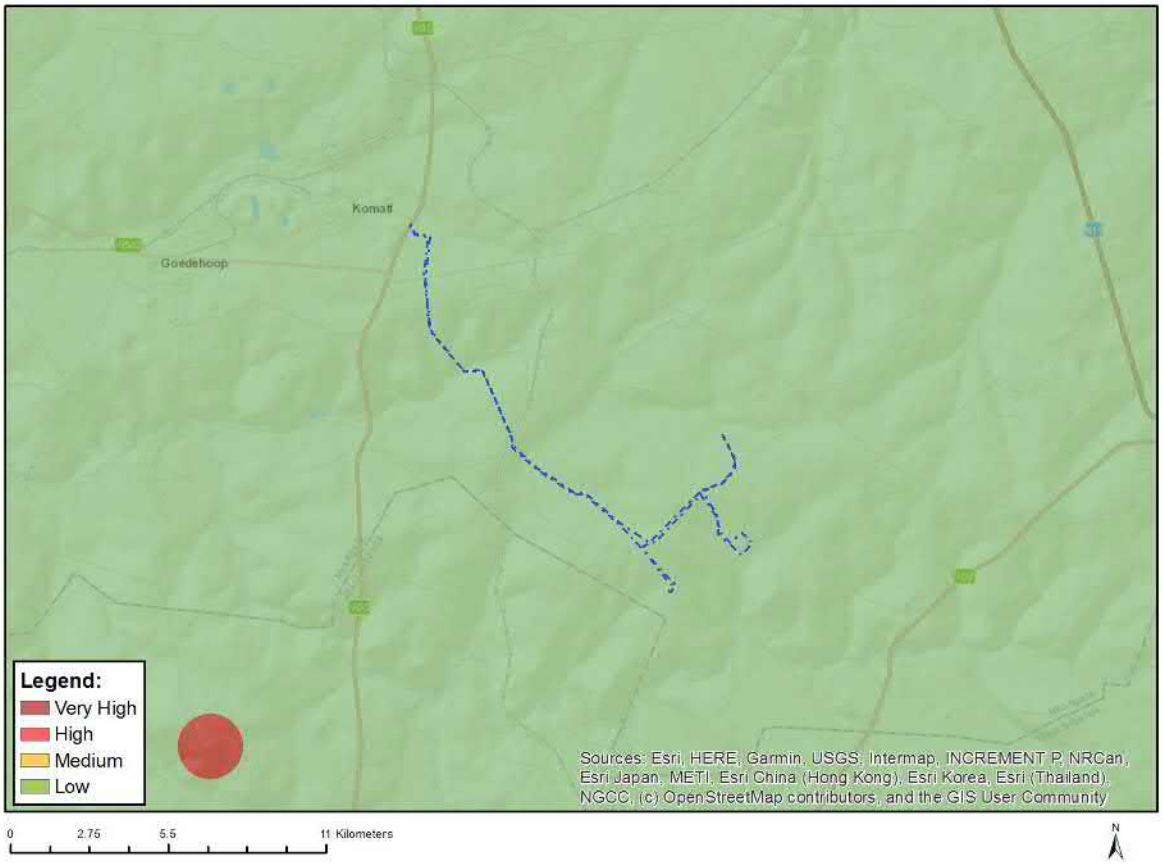


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Within 8 km of other civil aviation aerodrome
Low	Low sensitivity
Medium	Between 8 and 15 km of other civil aviation aerodrome

MAP OF RELATIVE DEFENCE THEME SENSITIVITY

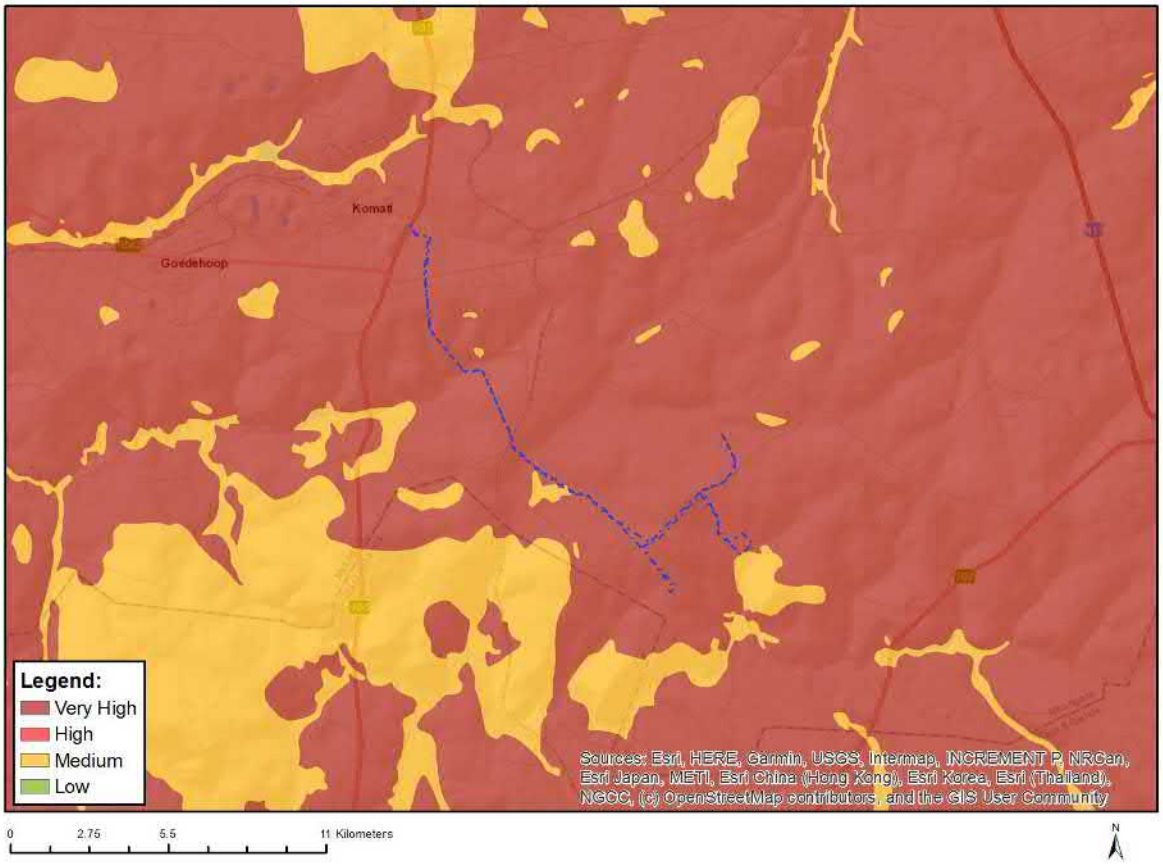


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
			X

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity

MAP OF RELATIVE PALEONTOLOGY THEME SENSITIVITY

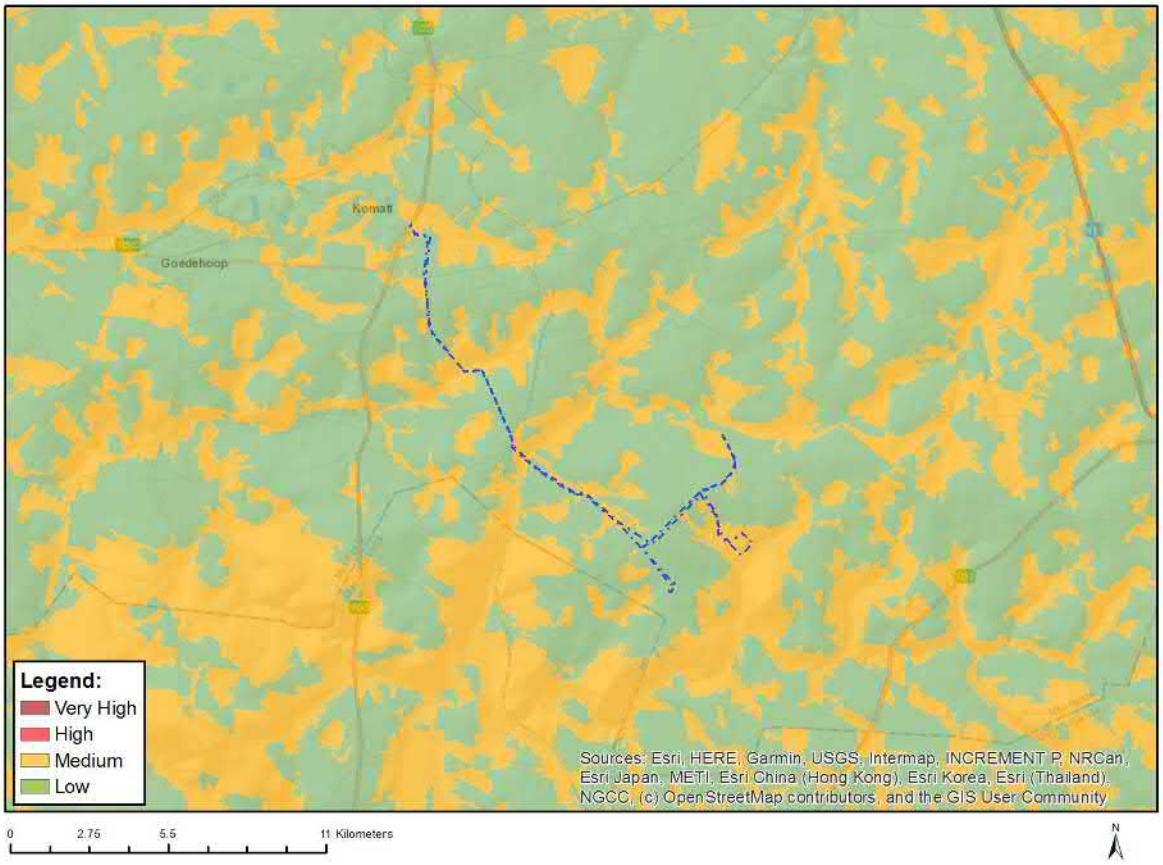


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Low	Features with a Low paleontological sensitivity
Medium	Features with a Medium paleontological sensitivity
Very High	Features with a Very High paleontological sensitivity

MAP OF RELATIVE PLANT SPECIES THEME SENSITIVITY



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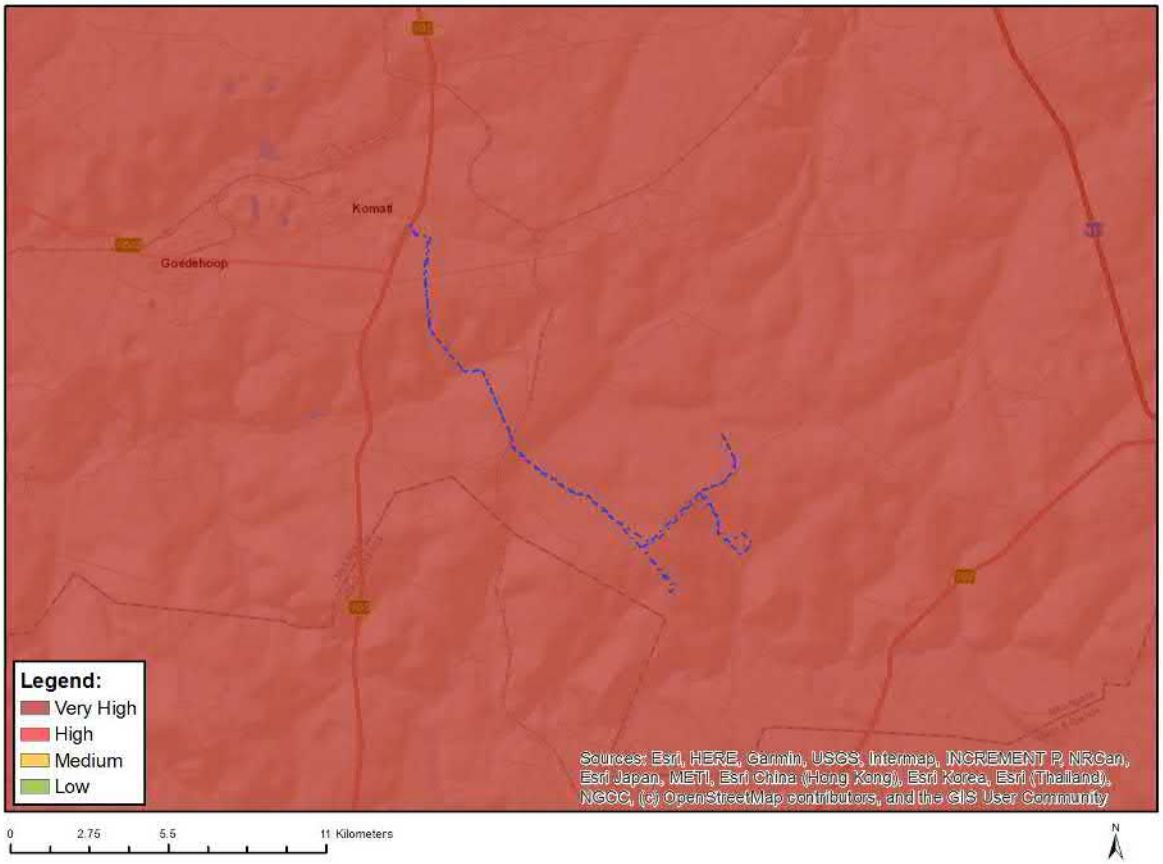
Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Medium	Sensitive species 41
Medium	Sensitive species 691
Medium	Pachycarpus suaveolens

MAP OF RELATIVE TERRESTRIAL BIODIVERSITY THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Very High	Critical biodiveristy area 1
Very High	Critical biodiveristy area 2
Very High	Protected Areas Expansion Strategy
Very High	Vulnerable ecosystem