75MW THERMAL DUAL FUEL FACILITY AND ASSOCIATED INFRASTRUCTURE NEAR KATHU

Northern Cape Province

Final Scoping Report

November 2020

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PROJECT DETAILS

Title	:	Environmental Impact Assessment Process: Final Scoping Report for the 75MW Thermal Dual Fuel Facility and associated infrastructure, near Kathu, Northern Cape Province
Authors	:	Savannah Environmental (Pty) Ltd Arlene Singh Jo-Anne Thomas
Client	:	Hyperion Solar Development (Pty) Ltd
Report Revision	:	Final for authority review and acceptance
Date	:	November 2020

When used as a reference this report should be cited as: Savannah Environmental (2020) Final Scoping Report 75MW Thermal Dual Fuel Facility and associated infrastructure, near Kathu, Northern Cape Province.

PURPOSE OF THE SCOPING REPORT AND INVITATION TO COMMENT

Hyperion Solar Development (Pty) Ltd is proposing the development of a hybrid generation facility consisting of a dispatchable, dual fuel (liquid or gas) thermal generation plant that will work in combination with the authorised Hyperion 1 & 2 Solar PV Energy Facilities. The hybrid thermal power facility and, access road are located approximately 15km north of Kathu within in the Gamagara Local Municipality which falls within jurisdiction of the John Taolo Gaetsewe District Municipality, Northern Cape Province. The power generated by the Hyperion hybrid generation facility will feed into the national electricity grid via an overhead 132kV power line to the existing Eskom Kalbas substation located to the south-west of the hybrid generation facility site.

Hyperion Solar Development (Pty) Ltd appointed Savannah Environmental as the independent environmental consultant to undertake the Environmental Impact Assessment (EIA) for the proposed project. The EIA process is being undertaken in accordance with the requirements of the 2014 EIA Regulations, as amended, promulgated in terms of the National Environmental Management Act (NEMA; Act No. 107 of 1998).

This Scoping Report represents the findings of the Scoping Phase of the EIA process and contains the following chapters:

- **Chapter 1** provides background to the proposed project and the environmental impact assessment process.
- **Chapter 2** outlines the strategic legal context for energy planning in South Africa and the proposed project.
- **Chapter 3** provides a description of the thermal technology.
- **Chapter 4** provides a description of the proposed project, including feasible alternatives identified and considered.
- **Chapter 5** outlines the need and desirability of the proposed project.
- **Chapter 6** describes the existing biophysical and socio-economic environment affected by the proposed project t.
- **Chapter 7** outlines the process which was followed during the Scoping Phase of the EIA Process.
- **Chapter 8** provides a description and evaluation of the potential issues and impacts associated with the proposed project
- **Chapter 9** provides the conclusions of the Scoping report
- **Chapter 10** presents the Plan of Study for the EIA Phase
- **Chapter 11** provides a list of all references used in the compilation of the Scoping Report.

The Scoping Report was made available for review from the **17 October 2020 – 17 November 2020** at www.savannahSA.com. All comments received and recorded during the 30-day review period have been included, considered and addressed within this final Scoping report for the consideration of the National Department of Environment, Forestry and Fisheries (DEFF).

EXECUTIVE SUMMARY

Hyperion Solar Development (Pty) Ltd is proposing the development of a hybrid generation facility consisting of a dispatchable, dual fuel (liquid or gas) thermal generation plant that will work in combination with the authorised Hyperion 1 & 2 Solar PV Energy Facilities.

The hybrid thermal power facility, access road, and associated grid connection infrastructure are located approximately 22km north of Kathu within in the Gamagara Local Municipality which falls within jurisdiction of the John Taolo Gaetsewe District Municipality, Northern Cape Province. The power generated by the Hyperion hybrid generation facility will feed into the national electricity grid via an overhead 132kV power line to the existing Eskom Kalbas substation located to the south-west of the hybrid generation facility site.

It is the developer's intention to bid the Hyperion hybrid facility (i.e. PV and thermal dual fuel facility together with the associated power line) into the procurement process initiated by the Independent Power Producer Office (IPP Office) for the procurement of up to 2000MW of dispatchable generation capacity from a range of technologies. This allocation is in accordance with the new generation capacity required as specified in the Integrated Resource Plan 2019 and accompanying ministerial determination from the Minister for the Department of Mineral Resources and Energy (DMRE) to which the National Energy Regulator of South Africa (NERSA) has concurred. The IPP Office has initiated procurement for the 2000MW of capacity under the Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP). The RMIPPPP has been designed as a Strategic Integrated Project (SIP).

In response to the growing electricity demand and increasing grid constraints (i.e. Load shedding) within South Africa, and the need to promote energy generation and sustainability within the Northern Cape Province, the development of a 75MW thermal generation plant on the Remainder of the Farm Lyndoch 432 (refer to locality map) is proposed. The proposed project is proposed in response to the Request for Proposal from the DMRE for the RMIPPPP, which requires projects to be fully dispatchable to assist Eskom in reducing Load Shedding.

The development footprint for the thermal facility is located within the area considered for the Hyperion 1 & 2 PV facilities and is anticipated to be approximately 5ha in extent. Infrastructure associated with the proposed project will include:

- Gas turbines or Reciprocating Engines
- Access road
- Truck entrance and parking facility
- Regasification plant and fuel preparation plant
- Dry cooling system for operating oils/chemicals
- Fuel off-loading facility
- Fuel storage facility
- Water demineralisation plant
- Substation, cabling, O&M building, fencing, warehouses and workshops

The thermal facility is proposed on Remainder of the Farm Lyndoch 432 and is intended to operate using Liquified Petroleum Gas (LPG) or diesel. Fuel will be delivered to the site by road via the R380. A new access road will be constructed to the facility and will cross Portion 1 of Farm 464.

Potential impacts associated with the development of the thermal generation facility are expected to occur during both the construction and operation phases. The conclusion of the findings of the Scoping Study is that the potential impacts identified to be associated with the construction and operation of the thermal generation facility are anticipated to be at the site or localised level, with few impacts extending from a local to national extent which includes both positive and negative impacts. The following provides a summary of the findings of the specialist studies undertaken:

» ***Ecology:*** Potential impacts on ecology are expected to occur mainly during the construction phase. The study area falls within an ecosystem of least concern, namely the Kathu Bushveld. The study area is not located within a protected area, however, is situated within a 10 km radius of the Kathu Forest Nature Reserve. According to the Northern Cape Critical Biodiversity Areas (2016) database, the study area does not fall within any Critical Biodiversity Areas (CBAs). However, most of the study area falls within an area categorised as Other Natural Areas, although small sections (in both the northeast and the southwest) of the study area fall within Ecological Support Areas (ESAs). As per the Northern Cape Province Spatial Development Framework (NCPSDF), the study area is located within the Griqualand West Centre (GWC) of plant endemism. According to the National web based environmental screening tool (2020), the terrestrial biodiversity theme for the study area is considered to have a very high sensitivity. The triggered sensitivity features include an Ecological Support Areas (ESA). The Plant Species Theme was identified to be of low sensitivity whereas the Animal Species Theme was identified as having a medium sensitivity, which is triggered by the presence of *Sagittarius serpentarius* (Secretary Bird) which is considered vulnerable. Due to the potential occurrence of floral and faunal species of conservation concern (SCC) as listed for the province, permits will be required to move or destroy these species if they are identified on site. It was determined that a full biodiversity assessment will need to be undertaken to determine the sensitivity of the site and the potential impacts to the study areas should the proposed development receive Environmental Authorisation. It is the opinion of the ecologists that this study provides the relevant information required in order to implement Integrated Environmental Management (IEM) and to ensure that the best long-term use of the ecological resources in the study area will be made in support of the principle of sustainable development.

» ***Freshwater Features:*** No watercourses are located within the focus area. However, several watercourses are within the investigation area, namely the episodic Vlermuisleegte River, a natural depression, an artificial unchanneled valley bottom wetland an artificial flat as well as a natural flat wetland. In addition to these wetlands, a pan was identified in the southern portion of the investigation area, around the 300 m corridor for the access road. Based on digital signatures, two additional cryptic wetlands and a pan was identified within the investigation area. These will be verified and refined accordingly during the EIA Phase. Since no watercourses are located within the focus area, no direct impacts from the construction of the thermal generation facility and related infrastructure are expected to occur on the watercourses outside of the focus area. Nevertheless, the potential occurrence of impacts associated with edge effects on the watercourses must be considered. If these edge effects are managed accordingly, the impact significance on the watercourses is expected to be low to very low. During the EIA Phase of this project, a site assessment will be undertaken during which the watercourses will be assessed in detail and the delineation

thereof verified on-site, in order to accurately determine the potential occurrence and significance of potential impacts on the watercourses resulting from the proposed development.

» ***Soils and Agricultural Potential:*** the proposed development of the Hyperion power dual fuel facility and supporting infrastructure will affect land with low to medium soil and agricultural sensitivity. No no-go areas have been identified for the proposed project from the perspective of soil and agricultural resource conservation. It is anticipated that the proposed project will have very limited impact on the soil properties and land capability while the land use will change from livestock farming to generation of energy. Potential for soil contamination has been identified due to storage of oils, grease, diesel/LPG and the potential for spillage of hazardous substances during construction and operational phases of the project. The detailed assessment and subsequent reporting will provide in-depth detail on all these aspects.

» ***Heritage Resources:*** Fossil localities are unknown in the area aside from Kathu Pan. There is a small chance of finding fossils in the Kalahari Group sediments due to construction of the thermal generation facility. Previous studies in the immediate area (including at the generator site) have shown that in sandy and calcrete-covered areas archaeological materials are virtually absent from the surface. Graves are an ever-present but very unlikely type of heritage resource that could be present. The main issue for this project will be the potential to intersect archaeological resources during excavations for the thermal facility and, to a lesser degree, the road. However, with appropriate mitigation, the impacts can be easily managed and a scientific benefit could even be derived with successful description and rescue of heritage materials. It is especially important to the archaeology of the region, and Grade I Kathu Complex, to understand both the vertical and horizontal distribution of buried archaeological resources and development projects allow opportunities to gain such insights. It is recommended that the proposed development proceed to the EIA Phase because no fatal flaws have been identified and all impacts can be readily managed and/or mitigated. Indeed, some benefit is likely to accrue with application of the correct archaeological mitigation measures. A sensitivity of low-medium has been determined for the majority of the site.

» ***Air Quality and climate change***: The construction of the thermal generation facility has the potential to impact on the ambient air quality of the area through elevated ambient concentrations of particulate and gaseous atmospheric pollutants. During the operation phase, the thermal generation facility is likely to contribute sulfur dioxide, nitrogen dioxide and carbon monoxide to the existing baseline concentrations (including greenhouse gasses). The impact is expected to be of a medium significance. A detailed Air Quality Impact Assessment is recommended to assess the potential impacts on air quality as a result of the project. Climate change impacts associated with the development of the thermal generation facility and the hybrid facility relate to the combustion of fuel (diesel or LPG) at the thermal generation plant which will produce greenhouse gas emissions that will contribute to the global phenomenon of anthropogenic climate change. Climate change is projected to effect many environmental changes across the globe. It is expected that the thermal generation facility will contribute to South Africa's national emissions inventory. The significance of this impact must be quantified in the impact assessment phase of the project.

» **Noise:** Based on the questionnaire as proposed by SANS 10328:2008 and the resulting negative answer, it is unlikely that the planned development will present a noise disturbance during construction and operation. As recommended by SANS 10328:2008, a scoping investigation and an environmental noise impact investigation may not be required. Considering the location of the

proposed thermal generation facility, it would be further than 1 000 m from the closest identified NSD, with the closest NSD 1.95 km away. While the thermal facility may be audible during quiet periods, noise levels are unlikely to significantly change the ambient sound levels at this distance. It was determined that there was a low potential for a noise impact and that no further Scoping or other acoustical studies would be required for the proposed thermal generation facility. No specific mitigation measures regarding noise or additional noise measurements were recommended and no additional conditions regarding noise are recommended for inclusion in the EMPr.

» ***Visual:*** Impacts from a visual perspective are expected to occur during the construction and operation phases of the thermal generation facility on homesteads in close proximity and roads in the vicinity including the N14 and the R308. Potential impacts associated with roads and homesteads relate to visual intrusion and the general industrialisation of a semi-natural rural landscape. Glimpses of the proposed development could be visible from sections of the affected roads. However, these views are likely to be mitigated by distance, the fact that the project will be seen in a flat landscape meaning that there will be no overview and existing vegetation is likely to provide a high degree of screening. There is therefore only likely to be a low level of impact experienced by users of the identified roads. The closest homestead is approximately 2.7km from the proposed development. The orientation of the building, existing mature vegetation around the homestead, the flat landscape and intervening vegetation are all likely to help mitigate impacts. The initial assessment therefore indicates that levels of visual impacts are likely to be low.

» ***Social aspects:*** The findings of the Social Baseline Scoping Report indicate that the proposed Hyperion hybrid thermal dual fuel project will result in several social and socio-economic benefits, including creation of employment and business opportunities during both the construction and operational phase. The project will also contribute to local economic development though socio-economic development (SED) contributions. In addition, the development will improve energy security and reduce the carbon footprint associated with energy generation by merging thermal with solar hybrid solutions. The potential positive impacts are likely to be moderate to high. The potential negative impacts associated with both the construction and operational phases are likely to include safety risks, loss of farm land, increase risk of grass fires, impacts resulting from heavy vehicles and visual impacts. and will be low negative with mitigation. The potential negative impacts can therefore be effectively mitigated if the recommended mitigation measures are implemented. This will be confirmed during the Assessment phase.

» ***Cumulative Impacts****:* The project site is located within the footprint of the authorised Hyperion 1 & 2 PV SEFs and located in the vicinity of several other energy generation projects. Due to the development plans for the site and its unsuitable soil conditions it is considered unlikely that it would be used for agricultural purposes. Other similar facilities within the area include the operational Kalahari Solar Power CSP Project located south west of the project site. As a result, there is the potential for cumulative impacts to occur. The significance of these impacts must be assessed within the impact assessment phase of the EIA process.

No environmental fatal flaws or impacts of very high significance were identified to be associated with the development of the thermal generation facility and associated infrastructure on the identified project site at this stage in the process. This conclusion must however be confirmed through a detailed investigation of the development footprint within the EIA Phase of the process.

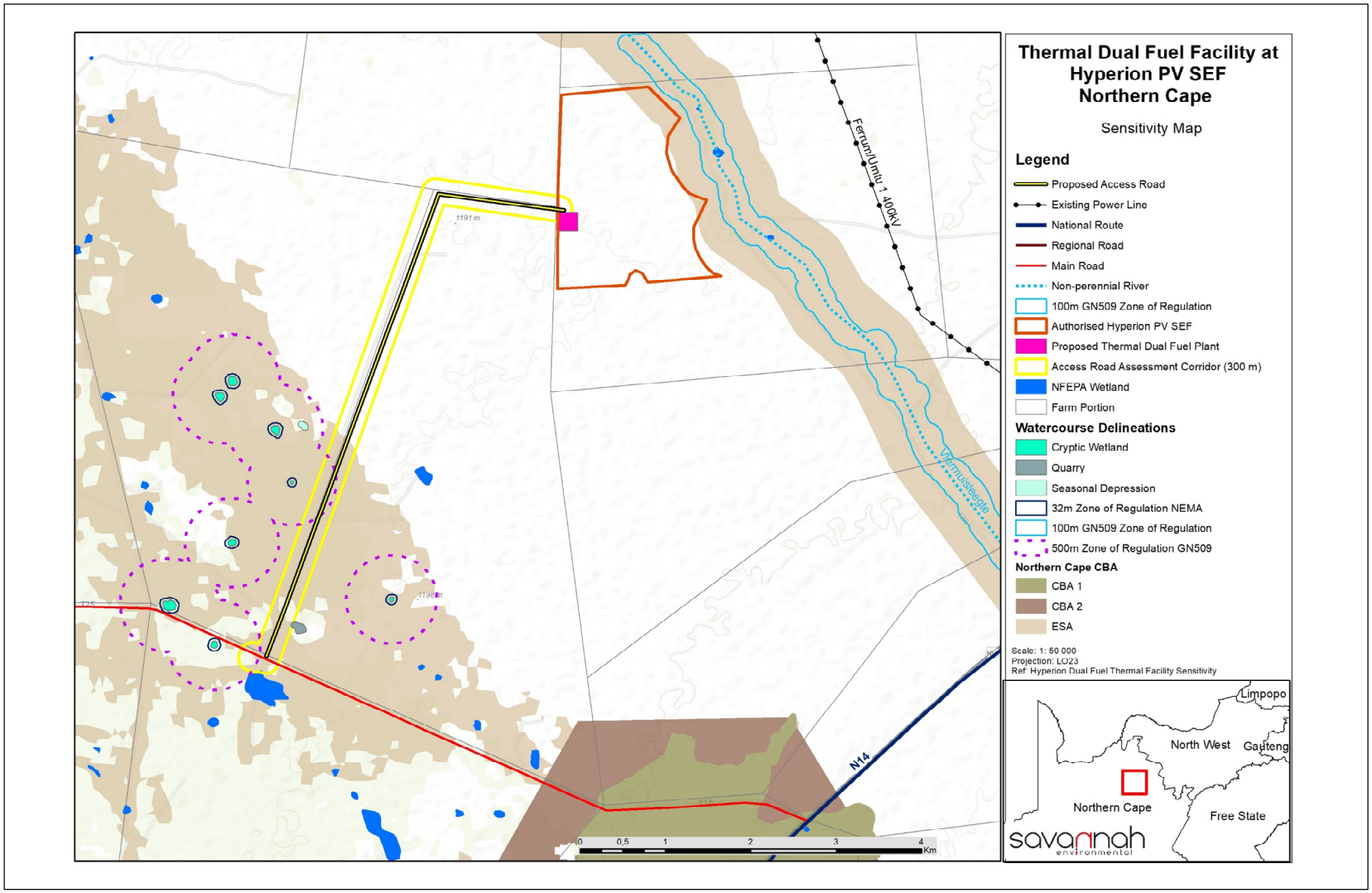

Figure 1: Thermal generation facility and associated infrastructure Scoping Phase Environmental Sensitivity Map (updated to indicate delineated watercourse features)

TABLE OF CONTENTS

APPENDICES LIST

CHAPTER 1: INTRODUCTION

Hyperion Solar Development (Pty) Ltd is proposing the development of a hybrid generation facility consisting of a fully dispatchable, dual fuel (liquid or gas) thermal generation plant that will operate in combination with the authorised Hyperion 1 & 2 Solar PV Energy Facilities. The 75 MW thermal generation plant combined with the already authorised solar PV facilities project will be known as the Hyperion Hybrid Facility. The Thermal Facility will be located within the footprint of the authorised Hyperion 1 & 2 Solar PV project site, Remainder of Farm Lyndoch 432, located approximately 15km north of Kathu within the Gamagara Local Municipality which falls within jurisdiction of the John Taolo Gaetsewe District Municipality, Northern Cape Province.

The addition of the Thermal Facility and associated infrastructure to the authorised Hyperion Solar PV facilities to create a hybrid facility has been initiated by Hyperion Solar Development (Pty) Ltd in response to the procurement process initiated by the Independent Power Producer Office (IPP Office) in August 2020 for the procurement of up to 2000MW of dispatchable generation capacity from a range of technologies. This allocation is in accordance with the new generation capacity required as specified in the Integrated Resource Plan 2019 and accompanying ministerial determination from the Minister for the Department of Mineral Resources and Energy (DMRE) to which the National Energy Regulator of South Africa (NERSA) has concurred. The aim of the hybrid facility is to meet the RMIPPPP requirement of being 100% dispatchable between the hours of 05h00 and 21h30.

As the project has the potential to impact on the environment, an Environmental Impact Assessment process is required to be completed in support of an application for Environmental Authorisation prior to the commencement of construction and operation of the hybrid project. The Hyperion 1 & 2 Solar PV Energy Facilities are already authorised (DEFF Reference Nos.: 14/12/16/3/3/2/1109 and 14/12/16/3/3/2/1110). Therefore, the nature and extent of only the 75MW Thermal Dual Fuel Facility and associated infrastructure, as well as potential environmental impacts associated with the construction, operation and decommissioning phases of this infrastructure are explored in more detail in this Scoping Report.

This Scoping Report consists of the following chapters:

- **Chapter 1** provides background to the proposed project and the environmental impact assessment process.
- **Chapter 2** outlines the strategic legal context for energy planning in South Africa and the proposed project.
- **Chapter 3** provides a description of the technology for the thermal facility and how it will function as a hybrid facility together with the authorised Hyperion 1 & 2 Solar PV facility.
- **Chapter 4** provides a description of the proposed project, including feasible alternatives identified and considered.
- **Chapter 5** outlines the need and desirability of the proposed project and the hybrid facility as a single operating unit.
- **Chapter 6** describes the existing biophysical and socio-economic environment affected by the proposed project.
- **Chapter 7** outlines the process which was followed during the Scoping Phase of the EIA Process.
- **Chapter 8** provides a description and evaluation of the potential issues and impacts associated with the proposed project
- **Chapter 9** provides the conclusions of the Scoping report

» **Chapter 10** presents the Plan of Study for the EIA Phase
» **Chapter 11** provides a list of all references used in the compilation of the Scoping Report.

1.1. Legal Requirements as per the EIA Regulations for the undertaking of a Scoping Report, 2014 (as amended)

The Scoping Report has been prepared in accordance with the requirements of the EIA Regulations published on 08 December 2014 (and amended on 07 April 2017) promulgated in terms of Chapter 5 of the National Environmental Management Act (Act No 107 of 1998). This chapter of the Scoping Report includes the following information required in terms of Appendix 2: Content of the Scoping Report:

Requirement	Relevant Section
(a)(i) the details of the EAP who prepared the report and (ii) the expertise of the EAP to carry out scoping procedures; including a curriculum vitae	The details of the EAP and the expertise of the EAP have been included in section 1.4 and **Appendix A**.
(b) the location of the activity, including (i) the 21 digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name and (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties	The location of the project site proposed for the development of the thermal dual fuel facility and associated infrastructure is included as **Figure 1.1** and in **Appendix B**. The details of the affected properties including the property names and numbers, as well as the SG-codes are included in Table 1.1.
(c) a plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken	The locality of the project site is illustrated on a locality map included as **Figure 1.1** and in **Appendix B**. The corner point co-ordinates of the project site are included in **Appendix B**.

1.2. Project Overview

The Integrated Resource Plan (IRP) 2019 developed by the Department of Energy indicates that South Africa continues to pursue a diversified energy mix that reduces reliance on a single or a few primary energy sources. The IRP includes provision for a power purchase programme to assist with the acquisition of capacity needed to supplement Eskom's declining plant performance and to reduce the extensive utilisation of diesel peaking generators in the immediate to medium term. This is to be achieved by the procurement of additional generation capacity of between 2000MW and 3000MW from technologies to be determined. Ministerial determinations in this regard were gazetted on 7 July 2020. The Minister of Mineral Resources and Energy (DMRE) in consultation With the National Energy Regulator of South Africa (NERSA) has determined that the department is to procure 2000 MW of new generation capacity from a range of energy source technologies. The Risk Mitigation IPP Procurement Programme has been designed by the DMER in order to fulfil the Minister's directive.

In response to the requirements of this procurement programme, Hyperion Solar Development (Pty) Ltd is proposing the development of a 75MW Thermal Dual Fuel facility that will be operated in combination with the authorised Hyperion 1 and 2 Solar PV facilities as a hybrid facility consisting of thermal generation technology and photovoltaic technology. The hybrid facility will aim to meet the Emergency Power Procurement bid requirements of being 100% dispatchable between the hours of 05h00 and 21h30. Where possible and where available, solar power will be utilised to meet the demand. Where solar power is not

available (typically between the hours of 5h00 and 07h00 and again between 18h00 and 21h30), thermal generation will be utilised. It is currently estimated that between 50 – 65% of the demand will be met utilising solar power with the remaining 35 – 50 % being met with thermal generation. The facility will be controlled by a joint controller that will have the capability of assessing the demand and regulating the power supply from the solar and thermal facilities accordingly.

The thermal facility is proposed to be located within the footprint of the authorised Hyperion 1 & 2 Solar PV facility on Remainder of the Farm Lyndoch 432, an area of 340 ha, and is anticipated to be approximately 5ha in extent. A new access road to the thermal facility is proposed to be established from the gravel main road to the south of the site and traverse Portion 1 of Farm 464. All of the affected properties of the proposed thermal facility and access road are privately owned. The thermal generation facility will initially make use of either LPG or diesel which can be readily trucked to the site. The overarching objective for the hyrbid facility is to introduce a technology solution that is 100% dispatchable at short notice (within 15 minutes), able to provide electricity supply into the grid as and when is required to avert electricity disruptions and is flexible and that is capable of operating across a wide variety of dispatch profiles, from base load to peaking and providing ancillary services to aid grid stability.

The main infrastructure associated with the facility includes the following:

- Gas turbines or Reciprocating Engines, utilising either Liquified Petroleum Gas (LPG) or diesel as a fuel source
- Access road
- Truck entrance and parking facility
- Regasification plant and fuel preparation plant
- Dry cooling system for operating oils/chemicals
- Fuel off-loading facility
- Fuel storage facility
- Water demineralisation plant
- Substation, cabling, O&M building, fencing, warehouses and workshops

The power generated by the Hyperion hybrid generation facility will feed into the national electricity grid via an overhead 132kV power line to the existing Eskom Kalbas substation located to the south-west of the hybrid generation facility site. This power line is the subject of a separate Application for Authorisation.

Table 1.1 provides a summary of properties associated with proposed thermal facility and associated infrastructure. A comprehensive description of the key infrastructure components associated with the development of the thermal dual fuel facility to enable the functioning of the Hyperion Hybrid Facility is provided in **Chapter 4** of this Scoping Report.

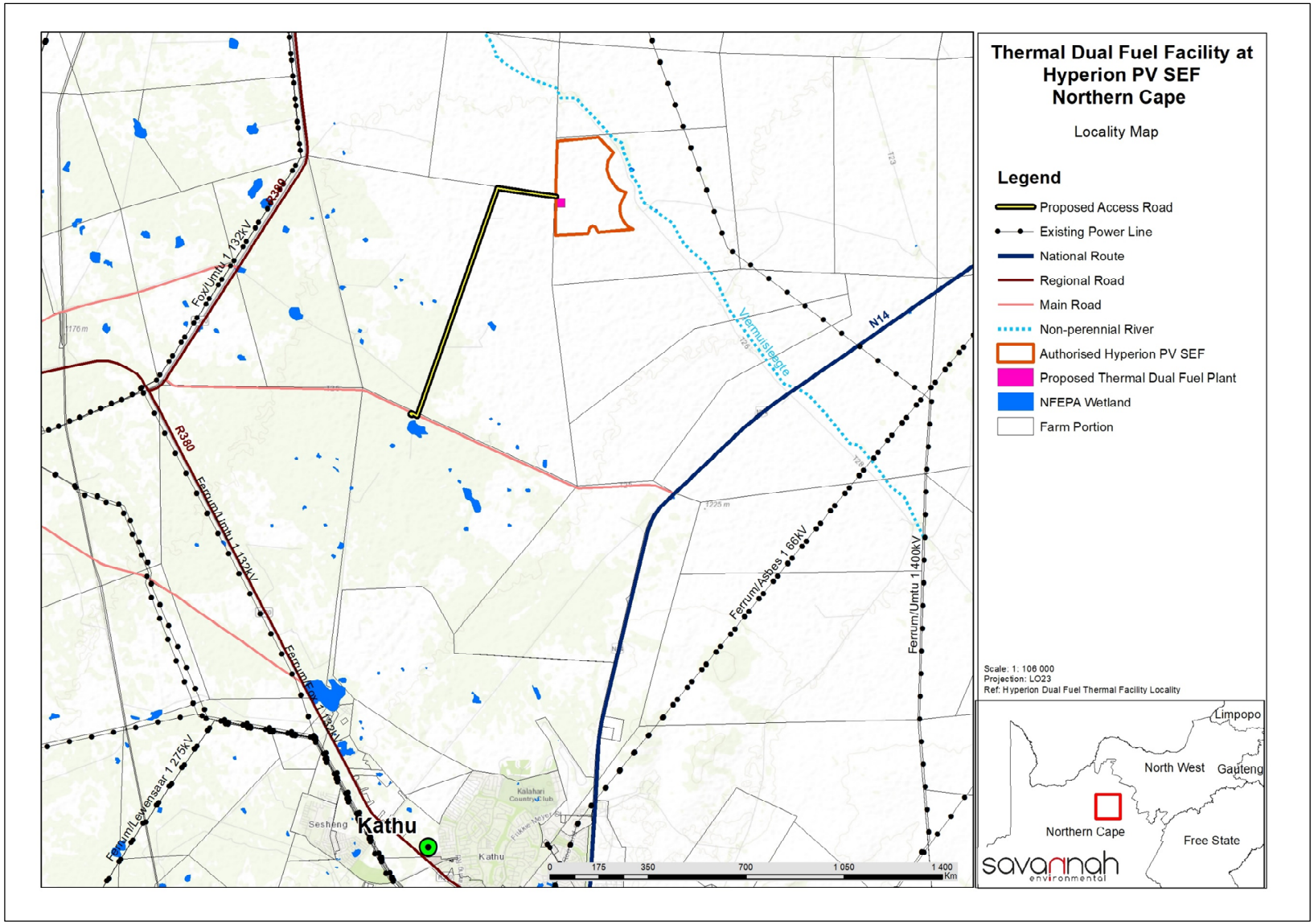

Figure 1.1: Locality map showing the area proposed for the establishment of the Thermal Facility and associated infrastructure in relation to the authorised Hyperion 1 & 2 Solar PV facility (**Appendix B1)**

Table 1.1: Summary of the preferred project site identified for the development of the Thermal Dual Fuel Facility and associated infrastructure

Province	**Northern Cape Province**
District Municipality	John Taolo Gaetsewe District Municipality,
Local Municipality	Gamagara Local Municipality
Ward number(s)	7
Nearest town(s)	Kathu (~15km south of the project site); Deben (~18km west of the project site); Kuruman (~34km north east of the project site) and Hotazel (~41.6km north of the project site)
Farm name(s) and number(s)	75MW Thermal Dual Fuel Facility » Remainder of the Farm Lyndoch 432 Access Road: » Portion 1 of Farm 464
SG 21 Digit Code (s)	75MW Thermal Dual Fuel Facility » C04100000000043200000 Access Road » C04100000000046400001
Current zoning	Agricultural (grazing of cattle)
Current land use	Agriculture

1.3. Requirement for an Environmental Impact Assessment Process

The construction and operation of the proposed thermal facility and associated infrastructure is subject to the requirements of the 2014 EIA Regulations, as amended in April 2017, published in terms of Section 24(5) of the National Environmental Management Act (NEMA) 107 of 1998. This section provides a brief overview of the EIA Regulations and their application to this project.

NEMA is the national legislation that provides for the authorisation of 'listed activities. In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these activities must be considered, investigated, assessed and reported on to the competent authority that has been charged by NEMA with the responsibility of deciding on environmental authorisations. In terms of GN R779 of 1 July 2016, the Minister of the Department of Environment, Forestry and Fisheries is the Competent Authority for all activities relating to the Integrated Resources Plan (IRP) of 2010 – 2030 (and any updates thereto) that require environmental authorisation. The DEFF is therefore the Competent Authority for this project, and the Northern Cape Department of Environmental Affairs and Nature Conservation (NC DEANC) will act as a commenting authority.

The need to comply with the requirements of the EIA Regulations published under the NEMA ensures that proponents are provided the opportunity to consider the potential environmental impacts of their activities early in the project development process, and also allows for an assessment to be made as to whether environmental impacts can be avoided, minimised or mitigated to acceptable levels. In addition, the process allows for a dialogue with interested and affected parties (I&APs) and stakeholders and consideration of issues raised during the project development process. Comprehensive, independent environmental specialist studies are required in accordance with the EIA Regulations to provide the competent authority with sufficient information in order to make an informed decision. Hyperion Solar Development (Pty) Ltd appointed Savannah Environmental as the independent environmental consulting company to conduct an EIA process for the proposed project and Application for Environmental Authorisation.

The EIA process being undertaken for the proposed thermal dual fuel facility comprises two phases – i.e. Scoping and Impact Assessment - and involves the identification and assessment of environmental impacts through specialist studies, as well as public participation. The process followed in these two phases is as follows:

- The **Scoping Phase** includes the identification and description of potential impacts associated with the proposed project through a desktop study and consultation with affected parties and key stakeholders. This phase considers the activities associated with the thermal generation facility within the authorised broader site for the Hyperion 1 & 2 PV SEF facilities in order to identify any additional environmental fatal flaws as result of the addition of the thermal facility as well as project alternatives in order to determine which should be assessed in more detail in the EIA Phase. Following the public review period of the Scoping report, this phase culminates in the submission of a final Scoping Report and Plan of Study for EIA to the competent authority for acceptance and approval to continue with the EIA phase of the process.
- The **EIA Phase** involves a detailed assessment of potentially significant positive and negative impacts (direct, indirect, and cumulative) identified in the Scoping Phase. This phase considers a proposed development footprint and includes detailed specialist investigations (including field surveys), consideration of feasible alternatives and public consultation. Recommendations of practical and achievable mitigation and management measures are included in an Environmental Management Programme (EMPr) considering all phases of the project. Following a review of the EIA report and EMPr by stakeholders, this phase culminates in the submission of a Final EIA Report and EMPr to the competent authority for review and decision-making.

1.4. Details of the Environmental Assessment Practitioner and Expertise to conduct the Scoping and EIA

In accordance with Regulation 12 of the 2014 EIA Regulations (GN R326), Hyperion Solar Development (Pty) Ltd has appointed Savannah Environmental (Pty) Ltd (Savannah Environmental) as the independent environmental consultant to undertake the Scoping and EIA process for the thermal dual fuel facility and its associated infrastructure. Neither Savannah Environmental nor any of its specialists are subsidiaries of/or are affiliated to Hyperion Solar Development (Pty) Ltd. Furthermore, Savannah Environmental does not have any interests in secondary developments that may arise out of the authorisation of the proposed thermal dual fuel facility and associated infrastructure.

Savannah Environmental is a leading provider of integrated environmental and social consulting, advisory and management services with considerable experience in the fields of environmental assessment and management. The company is wholly woman-owned (51% black woman-owned) and is rated as a Level 2 Broad-Based Black Economic Empowerment (B-BBEE) Contributor. The company was established in 2006 with a clear objective to provide services to the infrastructure development sector. Savannah Environmental benefits from the pooled resources, diverse skills and experience in the environmental field held by its team that has been actively involved in undertaking environmental studies for a wide variety of projects throughout South Africa and neighbouring countries. Strong competencies have been developed in project management of environmental processes, as well as strategic environmental assessment and compliance advice, and the assessment of environmental impacts, the identification of environmental management solutions and mitigation/risk minimising measures.

The Savannah Environmental team has considerable experience in environmental impact assessments and environmental management and has been actively involved in undertaking environmental studies for a wide variety of projects throughout South Africa, including those associated with electricity generation and transmission.

The Savannah Environmental team comprises:

» **Arlene Singh.** She holds a Bachelor degree in Environmental Science and an Honours degree in Environmental Management and has seven years of experience in the environmental management field. Her key focus is on undertaking environmental impact assessments, public participation, environmental management plans and programmes**.** She is registered as an Environmental Assessment Practitioner with the Environmental Assessment Practitioners Association of South Africa (EAPASA)(2019/898) and registered as a Candidate Natural Scientist with the South African Council for Natural Scientific Professions (SACNASP).

» **Jo-Anne Thomas.** She holds a Master of Science Degree in Botany (M.S.c Botany) from the University of the Witwatersrand and is registered as a Professional Natural Scientist (400024/2000) with SACNASP and a registered Environmental Assessment Practitioner (EAP) with EAPASA (2019/726). She has over 20 years of experience in the field of environmental assessment and management, and the management of large environmental assessment and management projects. During this time, she has managed and coordinated a multitude of large-scale infrastructure EIAs and is also well versed in the management and leadership of teams of specialist consultants, and dynamic stakeholders. She has been responsible for providing technical input for projects in the environmental management field, specialising in Strategic Environmental Advice, EIA studies, environmental permitting, public participation, EMPs and EMPrs, environmental policy, strategy and guideline formulation, and integrated environmental management (IEM). Her responsibilities for environmental studies include project management, review and integration of specialist studies, identification and assessment of potential negative environmental impacts and benefits, and the identification of mitigation measures, and compilation of reports in accordance with applicable environmental legislation.

» **Nicolene Venter.** She is a Board Member of IAPSA (International Association for Public Participation South Africa). She holds a Higher Secretarial Diploma and has over 21 years of experience in public participation, stakeholder engagement, awareness creation processes and facilitation of various meetings (focus group, public meetings, workshops, etc.). She is responsible for project management of public participation processes for a wide range of environmental projects across South Africa and neighbouring countries.

Curricula Vitae (CVs) detailing Savannah Environmental team's expertise and relevant experience are provided in **Appendix A**.

CHAPTER 2: STRATEGIC CONTEXT FOR ENERGY PLANNING

2.1 Legal Requirements as per the EIA Regulations for the undertaking of a Scoping Report, 2014 (as amended)

This chapter of the Final Scoping Report includes the following information required in terms of Appendix 2: Content of the Scoping Report:

Requirement	Relevant Section
(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 considered in the assessment process; (i) an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are applicable to this activity and have been considered in the preparation of the report. (ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks, and instruments.	The policy and legislative context for the development of the Hyperion Thermal Dual Fuel facility and associated infrastructure has been considered throughout this chapter on a national, provincial and local level.

2.2 Energy Policy and Planning

The need to expand electricity generation capacity in South Africa is based on national policy and informed by on-going strategic planning undertaken by the DMRE. The hierarchy of policy and planning documentation that supports the development of a diversified mix of energy projects, such as gas to power plants, renewable energy projects and the requirement for emergency generation capacity as specified within the IRP are discussed in more detail in the following sections, along with the provincial and local policies and plans that have relevance to the development of the thermal power plant and associated infrastructure. The hierarchy of policy and planning documentation that support the development of energy projects such as electricity generation facilities is illustrated in Figure 2.1.

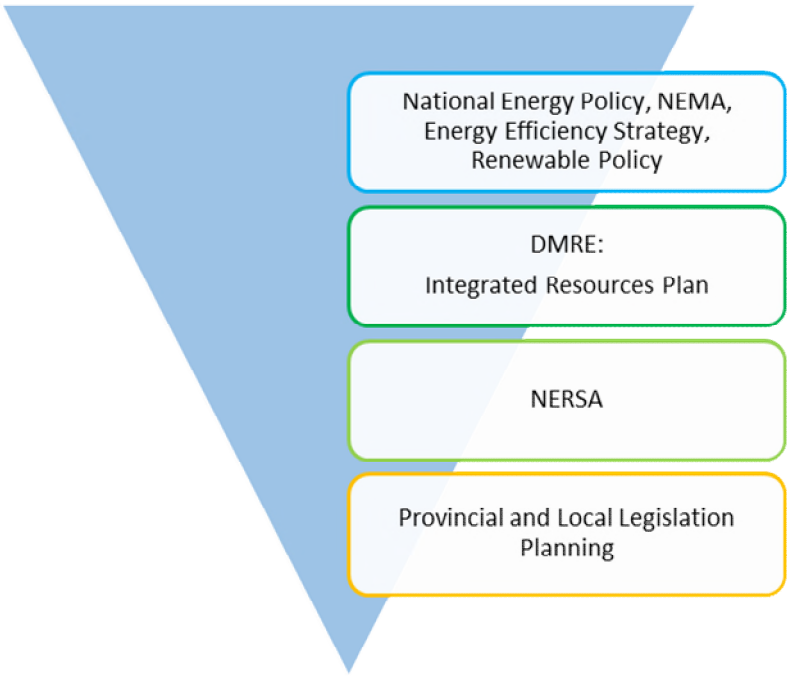

Figure 2.1: Hierarchy of electricity policy and planning documents

The South African energy industry is evolving rapidly, with regular changes to legislation and industry role-players. The regulatory hierarchy for an energy generation project such as that being considered in this Scoping Report consists of three tiers of authority who exercise control through both statutory and non-statutory instruments – that is National, Provincial and Local levels. As energy developments are multi-sectoral (encompassing economic, spatial, biophysical, and cultural dimensions) various statutory bodies are likely to be involved in the approval process of a project such as that considered within this report and the related statutory environmental assessment process.

The relevant national, provincial and local policies and plans that have relevance to the proposed development are discussed in more detail in the following sections.

At **National Level**, the main regulatory agencies are:

- **Department of Mineral Resources and Energy (DMRE):** This Department is responsible for policy relating to all energy forms and for compiling and approving the Integrated Resource Plan (IRP) for electricity and, since merging with the Department of Mineral Resources (DMR), is also responsible for granting approvals for the use of land which is contrary to the objects of the Mineral and Petroleum Resource Development Act (No. 28 of 2002) (MPRDA) in terms of Section 53 of the MPRDA. Therefore, in terms of the Act, approval from the Minister is required to ensure that the proposed activities do not sterilise mineral resource that may occur within the broader study area and development area.
- **National Energy Regulator of South Africa (NERSA):** NERSA is responsible for regulating all aspects of the electricity sector and will ultimately issue licenses for IPP projects to generate electricity and for the construction and operation of fuel storage facilities linked to these IPP projects.
- **Department of Environment, Forestry and Fisheries (DEFF):** This Department is responsible for environmental policy and is the controlling authority in terms of NEMA and the 2014 EIA Regulations (GN R326) as amended. DEFF is the competent authority for this project (as per GNR 779 of 01 July 2016), and is charged with granting the EA for the project under consideration. Furthermore, the Department is also

responsible for issuing permits for the disturbance or destruction of protected tree species listed under Section 15 (1) of the National Forest Act (No. 84 of 1998) (NFA).

» **The South African Heritage Resources Agency (SAHRA):** SAHRA is a statutory organisation established under the National Heritage Resources Act (No. 25 of 1999) (NHRA), as the national administrative body responsible for the protection of South Africa's cultural heritage.
» **South African National Roads Agency Limited (SANRAL):** This Agency is responsible for the regulation and maintenance of all national road routes.
» **Department of Human Settlements, Water and Sanitation (DHSWS):** This Department is responsible for effective and efficient water resources management to ensure sustainable economic and social development. This Department is also responsible for evaluating and issuing licenses pertaining to water use (i.e. Water Use Licenses (WUL) and General Authorisation).
» **The Department of Agriculture, Rural Development and Land Reform (DARDLD):** This Department is the custodian of South Africa's agricultural resources and is responsible for the formulation and implementation of policies governing the agriculture sector and the initiation, facilitation, coordination and implementation of integrated rural development programmes.

At **Provincial Level**, the main regulatory agencies are:

» **Northern Cape Department of Environmental Affairs and Nature Conservation (NC DEANC):** This Department is the commenting authority for the Scoping and EIA process for the project.
» **Northern Cape Department of Transport, Safety and Liaison:** This Department provides effective co-ordination of crime prevention initiatives, provincial police oversight, traffic management and road safety towards a more secure environment.
» **Ngwao-Boswa Ya Kapa Bokone (NBKB):** This Department identifies, conserves and manage heritage resources throughout the Northern Cape Province.

At the **Local Level,** the local and district municipal authorities are the principal regulatory authorities responsible for planning, land use and the environment. In the Northern Cape Province, both the local and district municipalities play a role. The local municipality includes the Gamagara Local Municipality which form part of the John Taolo Gaetsewe District Municipality In terms of the Municipal Systems Act (No. 32 of 2000), it is compulsory for all municipalities to go through an Integrated Development Planning (IDP) process to prepare a five-year strategic development plan for the area under their control.

2.3 National Policy and Planning Context

2.3.1 The National Energy Act (No. 34 of 2008)

The purpose of the National Energy Act (No. 34 of 2008) is to ensure that diverse energy resources are available, in sustainable quantities and at affordable prices, to the South African economy in support of economic growth and poverty alleviation, while taking into account environmental management requirements and interactions amongst economic sectors, as well as matters relating to energy. The National Energy Act also provides for energy planning, increased generation and consumption of renewable energies, contingency energy supply, holding of strategic energy feedstocks and carriers, , appropriate upkeep and access to energy infrastructure. The Act provides measures for the furnishing of certain data and information regarding energy demand, supply and generation, and for establishing an institution to be responsible for promotion of efficient generation and consumption of energy and energy research.

The Act provides the legal framework which supports the development of power generation facilities, such as the Hyperion Hybrid facility and associated infrastructure.

2.3.2 White Paper on the Energy Policy of South Africa, 1998

The White Paper on the Energy Policy, published by the then Department of Minerals and Energy (DME) in December 1998 was developed so as to clarify government policy regarding the supply and consumption of energy for the next decade. It was intended to address all elements of the energy sector as practically as it could. The main objectives of the White Paper are the following:

- Increasing access to affordable energy services.
- Improving energy sector governance.
- Stimulating economic development.
- Managing energy-related environmental impacts.
- Securing supply through diversity.

In order to meet these objectives and the developmental and socio-economic objectives of South Africa, the country needs to optimally use available energy resources. The South African Government is required to address what can be done to meet these electricity needs both in the short and long-term. The White Paper identifies key objectives for energy supply, such as increasing access to affordable energy services, managing energy-related environmental impacts and securing energy supply through diversifying South Africa's electricity mix.

The White Paper on Energy Policy (1998) promotes diversification of generation technologies in the South African energy mix. It also provides the basis for the development of the Integrated Energy Plan (IEP).

2.3.3. The Electricity Regulation Act (No. 04 of 2006) (ERA)

The Electricity Regulation Act (No. 04 of 2006) as amended by the Electricity Regulation Act (No. 28 of 2007), replaced the Electricity Act (No. 41 of 1987), as amended, with the exception of Section 5B, which provides funds for the energy regulator for the purpose of regulating the electricity industry.

The ERA establishes a national regulatory framework for the electricity supply industry and made NERSA custodian and enforcer of the National Electricity Regulatory Framework. The ERA also provides for licences and registration as the manner in which the generation, transmission, distribution, reticulation, trading, and import and export of electricity is regulated.

2.3.4. The National Development Plan (NDP) 2030

The National Development Plan (NDP) 2030 offers a long-term plan for the country. It defines desired destinations where inequality and unemployment are reduced and poverty is eliminated so that all South Africans can attain a decent standard of living. Electricity is one of the core elements of a decent standard of living.

While the achievement of the objectives of the NDP requires progress on a broad front, three priorities stand out, namely:

- Raising employment through faster economic growth
- Improving the quality of education, skills development and innovation
- Building the capability of the state to play a developmental, transformative role

In terms of the Energy Sector's role in empowering South Africa, the NDP 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.
- Social equity through expanded access to energy at affordable tariffs and through targeted, sustainable subsidies for needy households.
- Environmental sustainability through efforts to reduce pollution and mitigate the effects of climate change.

In formulating its vision for the energy sector, the NDP took the IRP 2010 as its point of departure. Therefore, although electricity generation from coal is still seen as part of the energy mix within the NDP, the plan sets out steps that aim to ensure that, by 2030, South Africa's energy system looks very different to the current situation: coal will contribute proportionately less to primary-energy needs, while gas to power and renewable energy resources – especially wind, solar, and imported hydroelectricity – will play a much larger role.

2.3.5. Integrated Energy Plan (IEP), November 2016

The purpose and objectives of the Integrated Energy Plan (IEP) are derived from the National Energy Act (No. 34 of 2008). The IEP takes into consideration the crucial role that energy plays in the entire economy of the country and is informed by the output of analyses founded on a solid fact base. It is a multi-faceted, long-term energy framework which has multiple aims, some of which include:

- To guide the development of energy policies and, where relevant, set the framework for regulations in the energy sector.
- To guide the selection of appropriate technologies to meet energy demand (i.e. the types and sizes of new power plants and refineries to be built and the prices that should be charged for fuels).
- To guide investment in and the development of energy infrastructure in South Africa.
- To propose alternative energy strategies which are informed by testing the potential impacts of various factors such as proposed policies, introduction of new technologies, and effects of exogenous macro-economic factors.

A draft version of the IEP was released for comment on 25 November 2016. 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 development of the IEP is an ongoing continuous process. It is reviewed periodically to take into account changes in the macroeconomic environment, developments in new technologies and changes in national priorities and imperatives, amongst others.

The 8 key objectives of the integrated energy planning process are as follows:

- 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.

2.3.6. Integrated Resource Plan (IRP) for Electricity 2010 - 2030

The Integrated Resource Plan (IRP) for Electricity is a subset of the IEP and constitutes South Africa's National electricity plan. The IRP is an electricity infrastructure development plan based on least-cost electricity supply and demand balance, taking into account security of supply and the environment. The primary objective of the IRP is to determine the long term electricity demand and detail how this demand should be met in terms of generating capacity, type, timing and cost. The IRP also serves as input to other planning functions, including amongst others, economic development and funding, and environmental and social policy formulation.

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.

Following the promulgation of the IRP 2010–2030, implementation followed in line with Ministerial Determinations issued under Section 34 of the Electricity Regulation (Act No. 4) of 2006. The Ministerial Determinations give effect to planned infrastructure by facilitating the procurement of the required electricity capacity.

Since the promulgated IRP 2010–2030, the following capacity developments have taken place:

- A total 6 422 MW under the Renewable Energy Independent Power Producers Programme (REIPPP) has been procured, with 3 876 MW operational and made available to the grid.
- IPPs have commissioned 1 005 MW from two Open Cycle Gas Turbine (OCGT) peaking plants.
- Under the Eskom build programme, the following capacity has been commissioned:
  - 1 332 MW of Ingula pumped storage, 1 588 MW of Medupi, 800 MW of Kusile and
  - 100 MW of Sere Wind Farm.
- 18 000MW of new generation capacity has been committed to.

Besides capacity additions, a number of assumptions have changed since the promulgation of IRP 2010–2030. Key assumptions that changed include the electricity demand projection, Eskom's existing plant performance, as well as new technology costs. In addition, environmental considerations such as South Africa's contribution to Greenhouse gases which contribute to climate change, local air quality and water availability have come to the fore.

These considerations necessitated the review and update of the IRP and ultimately the promulgation of a revised plan in October 2019. In terms of the IRP 2019, South Africa continues to pursue a diversified energy

mix that reduces reliance on a single or a few primary energy sources. In the period prior to 2030, the system requirements are largely for incremental capacity addition (modular) and flexible technology, to complement the existing installed inflexible capacity. South Africa is a signatory to the Paris Agreement on Climate Change and has ratified the agreement. In line with INDCs (submitted to the UNFCCC in November 2016), South Africa's emissions are expected to peak, plateau and from year 2025 decline.

Following consideration of all these factors, the following Plan was promulgated.

	Coal	Coal (Decommis-sioning)	Nuclear	Hydro	Storage	PV	Wind	CSP	Gas & Diesel	Other (Distributed Generation, CoGen, Biomass, Landfill)
Current Base	37,149		1 860	2,100	2 912	1 474	1 980	300	3 830	499
2019	2,155	-2,373					244	300		Allocation to the extent of the short term capacity and energy gap.
2020	1,433	-557				114	300			
2021	1,433	-1403				300	818			
2022	711	-844			513	400 1,000	1,600			
2023	750	-555				1000	1,600			500
2024			1,860				1,600		1000	500
2025						1000	1,600			500
2026		-1,219					1,600			500
2027	750	-847					1,600		2000	500
2028		-475				1000	1,600			500
2029		-1,694			1575	1000	1,600			500
2030		-1,050		2,500		1000	1,600			500
TOTAL INSTALLED CAPACITY by 2030 (MW)	33,364		1,860	4,600	5,000	8,288	17,742	600	6,380	
% Total Installed Capacity (% of MW)	43		2.36	5.84	6.35	10.52	22.53	0.76	8.1	
% Annual Energy Contribution (% of MWh)	58.8		4.5	8.4	1.2*	6.3	17.8	0.6	1.3	

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

- 2030 Coal Installed Capacity is less capacity decommissioned between years 2020 and 2030.
- Koeberg power station rated/installed capacity will revert to 1,926MW (original design capacity) following design life extension work.
- Other/ Distributed generation includes all generation facilities in circumstances in which the facility is operated solely to supply electricity to an end-use customer within the same property with the facility.
- Short term capacity gap is estimated at 2,000MW.

Figure 2.2: IRP 2019 as promulgated in October 2019[1]

The IRP includes provision for a power purchase programme to assist with the acquisition of capacity needed to supplement Eskom's declining plant performance and to reduce the extensive utilisation of diesel peaking generators in the immediate to medium term. This is to be achieved by the procurement and indicated a requirement for of additional generation capacity of between 2000MW and 3000MW from technologies to be determined. The Hyperion Hybrid facility comprising of both thermal generation technology and solar PV technology would contribute towards the alleviating the short term capacity and energy gap.

2.3.7. The Risk Mitigation Power Procurement Programme

The IPP Office initiated the procurement of up to 2000MW of dispatchable generation capacity from a range of technologies in accordance with the IRP 2019 in August 2020. The procurement programme titled the

[1] source: https://www.cliffedekkerhofmeyr.com/en/news/publications/2019/Corporate/energy-alert-22-october-The-Integrated-Resource-Plan-2019-A-promising-future-roadmap-for-generation-capacity-in-South-Africa.html

Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP) is intended to fill the current short-term supply requirements for electricity in the country, alleviate the current electricity supply constraints and reduce extensive utilisation of diesel peaking generators. The programme is intended to procure generation capacity from power generation facilities with short lead times and to produce first power by no later than June 2022. The Hyperion Hybrid facility (consisting of the proposed thermal dual fuel facility and authorised Hyperion 1 and 2 Solar Energy Facility) is intended to be bid into the procurement programme and if selected as a preferred bidder can be brought online and connected to the grid prior to June 2022.

2.3.8. New Growth Path (NGP) Framework, 23 November 2010

The purpose of the New Growth Path (NGP) Framework is to provide effective strategies towards accelerated job-creation through the development of an equitable economy and sustained growth. The target of the NGP is to create 5 million jobs by 2020. With economic growth and employment creation as the key indicators identified in the NGP. Central to the New Growth Path is a massive investment in infrastructure as a critical driver of jobs across the economy. The framework identifies investments in five key areas namely: energy, transport, communication, water and housing. Sustaining high levels of public investment in these areas will create jobs in construction, operation and maintenance of infrastructure. . The framework states that public investment can create 250 000 jobs per annum in energy, transport, water, communications infrastructure and housing. These jobs are said to be in four activities, the construction of new infrastructure; the operation of new facilities; expanded maintenance; and the manufacture of components for the infrastructure programme.

2.3.9. National Climate Change Bill, 2018

On 08 June 2018 the Minister of Environmental Affairs published the National Climate Change Bill ("the Bill") for public comment. The purpose of the Bill is to build an effective climate change response and ensure the long-term, just transition to a climate resilient and lower carbon economy and society. This will be done within the context of sustainable development for South Africa, and will provide for all matters related to climate change.

The National Climate Change Bill addresses issues related institutional and coordination arrangement across the three spheres of government namely national, provincial and local. It further highlights the need the spheres of government and entities, sectors as well business to respond to challenges of climate change. The bill further address the matters relating to, the national adaptation to impacts of climate change, greenhouse gas emissions and removals, and policy alignment and institutional arrangements. The Bill provides a procedural outline that will be developed through the creation of frameworks and plans. The following objectives are set within the Bill:

a) Provide for the coordinated and integrated response to climate change and its impacts by all spheres of government in accordance with the principles of cooperative governance;
b) Provide for the effective management of inevitable climate change impacts through enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to building social, economic, and environmental resilience and an adequate national adaptation response in the context of the global climate change response;
c) Make a fair contribution to the global effort to stabilise greenhouse gas concentrations in the atmosphere at a level that avoids dangerous anthropogenic interference with the climate system within

a timeframe and in a manner that enables economic, employment, social and environmental development to proceed in a sustainable manner.

Although the thermal facility will contribute to greenhouse gas emissions in the country to some extent, the hybridisation of this facility with the authorised solar PV facilities will go some way to addressing emissions associated with power generation facilities in the country.

2.3.10. National Climate Change Response Policy, 2011

South Africa's National Climate Change Response Policy (NCCRP) establishes South Africa's approach to addressing climate change, including adaptation and mitigation responses. The NCCRP formalises Government's vision for a transition to a low carbon economy, through the adoption of the 'Peak, Plateau and Decline' (PPD) GHG emissions trajectory whereby South Africa's emissions should peak between 2020 and 2025, plateau for approximately a decade, and then decline in absolute terms thereafter, and based on this the country has pledged to reduce emissions by 34% and 42% below Business As Usual (BAU) emissions in 2020 and 2025, respectively. This has been considered in the development of the IRP 2019.

2.3.11. National Climate Change Adaptation Strategy (South Africa), 2020

South Africa's National Climate Change Adaptation Strategy (NCCAS) supports the country's ability to meeting its obligations in terms of the Paris Agreement on Climate Change. It gives effect to the National Development Plan's vision of creating a low-carbon, climate resilient economy and a just society. The commitment to the Paris Agreement and its implementation is in line with the principles and provisions of the UNFCCC will ensure the balance between adaptation and mitigation, and adequate financial, technological and skills support for South Africa to enhance their efforts against climate change.

2.3.12. Strategic Integrated Projects (SIPs)

The Presidential Infrastructure Coordinating Committee (PICC) is integrating and phasing investment plans across 36 Strategic Infrastructure Projects (SIPs) which have five core functions: to unlock opportunity, transform the economic landscape, create new jobs, strengthen the delivery of basic services and support the integration of African economies. A balanced approach is being fostered through greening of the economy, boosting energy security, promoting integrated municipal infrastructure investment, facilitating integrated urban development, accelerating skills development, investing in rural development and enabling regional integration. SIP 9 and SIP 20 (a) (in terms of Section 8(1)(a) read with Section 7(1) of the Infrastructure Development Act, as amended, 2014 (Act No. 23 of 2014)) of the energy SIPs support the development of the Hyperion Hybrid power plant and specifically such development under the RMIPPPP:

- SIP 9: Electricity generation to support socio-economic development: The proposed Hyperion Hybrid facility and therefore the thermal dual fuel facility is a potential SIP 9 Project as electricity will be generated and social and economic upliftment, development and growth will take place within the surrounding communities. SIP 9 supports the acceleration of the construction of new electricity generation capacity in accordance with the IRP 2019 to meet the needs of the economy and address historical imbalances.
- SIP 20 (a): Emergency /Risk Mitigation Independent Power Purchase Procurement Programme (2000MW): The proposed Hyperion Hybrid generation facility is intended to be bid into the RMIPPPP in order to

alleviate the frequent load shedding being experienced in South Africa at present and can be brought onto the grid as quickly as possible (by 30 June 2022) if selected as a preferred bidder.

The Hyperion Hybrid generation facility (consisting of the authorised Hyperion 1 and 2 Solar PV facility and the proposed Thermal Dual Fuel facility assessed in this scoping report) will qualify to be registered as a SIP project once it is has been selected as preferred bidder by the DMRE. The project would then contribute to the above-mentioned SIPs.

2.4. Provincial Policy and Planning Context

2.4.1. Northern Cape Provincial Spatial Development Framework (PSDF) 2012)

The Northern Cape Provincial Spatial Development Framework (PSDF) 2012 states that the overarching goal for the Province is to enable sustainability through sustainable development. The Province considers social and economic development as imperative in order to address the most significant challenge facing the Northern Cape, which is poverty.

The PSDF considers the release of greenhouse gas (GHG) emissions created by human activity as the key cause of global warming, which in turn could result in major negative effects and disasters in the short- and medium-term. This effect would increasingly undermine human development gains. Innovative strategies would have to be implemented to reduce the impact of global deterioration.

The PSDF identifies key sectoral strategies and plans which are considered to be the key components of the PSDF. Sectoral Strategy 19 refers to a provincial renewable energy strategy. Within the PSDF a policy has been included which states that renewable energy sources (including the utilisation of solar energy) are to comprise 25% of the Province's energy generation capacity by 2020.

The overall energy objective for the Province also includes promoting the development of renewable energy supply schemes which are considered to be strategically important for increasing the diversity of domestic energy supply and avoiding energy imports, while also minimising the detrimental environmental impacts. The implementation of Hyperion Hybrid power plant is to be promoted within the Province as it considers both social and economic development by addressing poverty in term of the additional opportunities that will become available at the thermal plant and the Sectoral Strategy 19 in support the provincial renewable energy strategy by inclusion of the authorised Hyperion 1 & 2 Solar PV Facility as part of the hybrid facility.

2.4.2. The Northern Cape Climate Change Response Strategy

The key aspects of the Northern Cape Climate Change Response Strategy (NCCCRS) Report are summarised in the MEC's (NCPG: Environment and Nature Conservation) 2011 budget speech: "*The Provincial Climate Change Response Strategy will be underpinned by specific critical sector climate change adaptation and mitigation strategies that include the Water, Agriculture and Human Health sectors as the 3 key Adaptation Sectors, the Industry and Transport alongside the Energy sector as the 3 key Mitigation Sectors with the Disaster Management, Natural Resources and Human Society, livelihoods and Services sectors as 3 remaining key. Sectors to ensure proactive long-term responses to the frequency and intensity of extreme weather events such as flooding and wildfire, with heightened requirements for effective disaster management*".

Key points from the MEC address include the NCPG's commitment to develop and implement policy in accordance with the National Green Paper for the National Climate Change Response Strategy (2010), and an acknowledgement of the NCP's extreme vulnerability to climate-change driven desertification. The development and promotion of a provincial green economy, including green jobs, and environmental learnership is regarded as an important provincial intervention in addressing climate change. The renewable energy sector, including solar and wind energy (but also biofuels and energy from waste), is explicitly indicated as an important element of the Provincial Climate Change Response Strategy.

The facility will be a hybrid facility consisting of a dispatchable, dual fuel (liquid and gas) thermal generation plant in combination with a solar plant. Where possible and where available, solar power will be utilised to meet the demand however where solar power is not available (typically between the hours of 5h00 and 07h00 and again between 18h00 and 21h30), thermal generation will be utilised. The hybrid facility will therefore promote green jobs and where possible make use of renewable energy to meet demand.

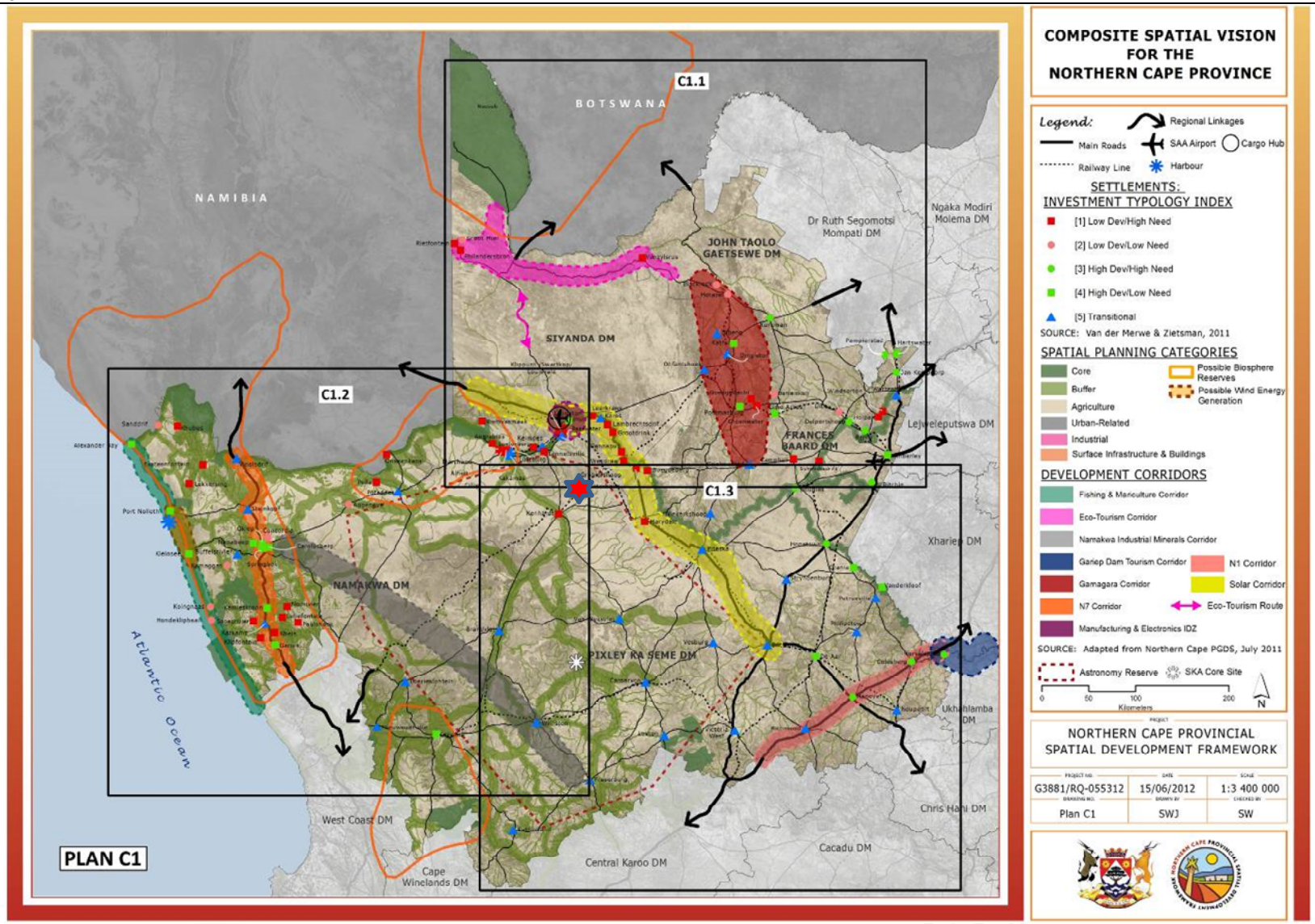

Figure 2.3: Development regions and corridors of the Northern Cape (Source: Northern Cape PSDF 2012). The position of the proposed thermal dual fuel facility and the associated PV facilities is indicated by the red star.

2.5. Local Policy and Planning Context

The strategic policies at the district and local level have similar objectives for the respective areas, namely to accelerate economic growth, create jobs, uplift communities and alleviate poverty. The proposed development is considered to align with the aims of these policies, even if contributions to achieving the goals therein are only minor.

2.5.1. John Taolo Gaetsewe District Municipality Final Integrated Development Plan (IDP) 2017– 2022 (2017)

The vision of the John Taolo Gaetsewe District Municipality (DM) as contained within its Final IDP 2017 – 20 is:

"*Working together for a better life for all in the district*."

The mission statement of John Taolo Gaetsewe DM reflects what the DM will do in an on-going manner to strive towards achieving its vision. The mission of the John Taolo Gaetsewe DM is:

"*Accelerating the implementation of integrated development initiatives and providing support to local municipalities*."

In terms of development priorities, the Final 2017 – 2020 IDP determined that the results of the 2016 Community Survey suggested that the number of people residing within the DM is increasing, as a direct result of mining related activities. Implications for the DM in this regard include:

- The scope and extent of the DM's Spatial Development Framework (SDF).
- Service delivery demands placed on the DM and its local municipalities.
- The grading of the local municipalities, and the resources (i.e. grants and subsidies) made available to them.

The activities of the DM need to reflect its population demographics, both in terms of service delivery, as well as in terms of employment equity. Gender, racial and disability population demographics have been identified as being of particular importance in this regard. As a result, special interest groups, such as the youth, women and persons with disabilities require specific focus in the strategic priorities of the DM.

The implementation of thermal generation facility would contribute towards addressing some of the John Taolo Gaetsewe DM's development priorities through the creation of new employment opportunities which could support a portion of the increasing population, while the increase in revenue from the project could assist in the municipality in addressing service delivery demands.

2.5.2. John Taolo Gaetsewe District Municipality Phase 5 Draft Spatial Development Framework (SDF) (2017)'

The main economic sectors applied within the John Taolo Gaetsewe DM include eco-tourism, agriculture, mining and community services. Even though the development of renewable energy or hybrid energy is not specifically mentioned as part of the framework, the development of an energy generation facility within the area will add to the current economic sectors. That specifically includes community services, as the

development of a solar energy facility will aid in the provision of electricity, as well as employment opportunities and skills development on a local level.

The SDF states that one of the key objectives for the DM is to attract new business. With the development of a SEF within the area, other developers might be encouraged to consider the area as a viable location for further development. This could attract new business to the area and promote financial and socio-economic development within the DM.

2.5.3. *Gamagara Local Municipality Integrated Development Plan (IDP) 2019 – 2022 (2019)*

The vision for the Gamagara Local Municipality (LM) as contained within the IDP 2017 – 2022 is as follows:

"*Build prosperous and sustainable communities*."

The Mission of the Gamagara LM is as follows:

"*To provide universal, sustainable services to the community in order to attain a safe and healthy environment, as well as socio-economic development by exploiting economic benefits and strengthening stakeholder relations*."

The following strength, weaknesses, threats and opportunities (SWOT analysis) have been identified for the Gamagara LM:

Strengths:	**Weaknesses:**
» High potential for economic growth: ∗ The municipality is at the centre of all economic activities around the mining industry in the region. The industrial area growth and development is phenomenal as many small industries and big industry come to the area so as to serve the mining needs in the area. ∗ Small businesses have the potential to grow and serve the improving commercial and mining economic set-up. These businesses either provide mines with equipment or the sub-contract to big contractors in the mine. » High tourism potential: ∗ Gamagara has a vast number of heritage sites that still need to be exploited. These include religious monuments and heritage sites, the oasis of the Kalahari, the caves, etc. » Political maturity and stability: ∗ Co-operation between political parties in delivering services is a progressive one. ∗ Ward Committees are functional and meeting their obligations as required.	» Infrastructure: ∗ Inadequate infrastructure to cater for the rapid development in the municipality. ∗ Ageing infrastructure. » Ineffective internal systems and controls: ∗ Communicating available systems and controls to junior officials is lacking, and leading to some of the crucial tasks not being performed accordingly e.g. delegation of power. ∗ Culture of non-payment is prevalent in the municipality because credit control policy is not fully implemented. ∗ The municipality does not have a culture of retaining skilled personnel due to inconsistent implementation of policies or lack of induction of new employees. ∗ Lack of by-laws to guide and enforce compliance e.g. credit control.

∗ There is strong political leadership and support to the municipal functioning.	
Opportunities:	**Threats:**
» Developmental potential: ∗ Integration of stakeholder contribution to the development of the municipality is possible e.g. sector departments, mining industry, commercial industry, agricultural industry and tourism industry. ∗ There is a potential to acquire more land for development. ∗ Improve infrastructure and create jobs. » Internal systems could be improved: ∗ Can improve on the credit control system to encourage culture of payment for services and increase municipal revenue. ∗ Improve customer care and uphold to the Batho Pele Principle. ∗ Enhance the Local Economic Development (LED) and Tourism markets by disseminating the LED and Tourism strategy to members of the community using various methods of awareness.	» National and international economic trends may destabilise the municipality to achieve its goals. » Retrenchments from the mines may affect the municipal revenue. » Influx of job seekers in the area is causing infrastructure system failure as they overload the system.

The implementation of the proposed project would contribute somewhat towards addressing some of the weaknesses and threats identified for the Gamagara LM. Specifically, with regards to contributing towards Local Economic Development (LED) market, municipal revenue, and job creation.

2.6. Conclusion

The findings of the review of the relevant policies, programmes and documents pertaining to the energy sector indicate that the thermal power dual fuel facility and it associated infrastructure when considering it's functioning as part of a hybrid system is supported at a national, provincial, and local level, and that the development will contribute towards the various targets and policy aims.

CHAPTER 3: DESCRIPTION OF THE TECHNOLOGY FOR THE THERMAL POWER DUAL FUEL FACILITY & FUNCTIONING OF THE HYBRID FACILITY

This chapter provides an overview of the different types of technology that could be considered for the thermal power dual fuel facility, the varying components associated with each technology, differences between the technology and provides a basic description on how the thermal power facility will function together with the authorised Hyperion 1&2 Solar PV facilities. The technology alternatives for the thermal power dual fuel facility are further detailed in Chapter 4 of this Scoping report.

3.1. Emergency and grid balancing power plants

Emergency and grid balancing power plants are designed and developed as power balance systems to manage electricity demand during peak periods to stabilize the grid, through the supply of capacity, energy and ancillary services. The characteristics of emergency and grid balancing power plants are as follows:

- Operates in multiple start/stops per day.
- Can be synchronised to the grid in as little as 5 minutes and enables 100% of the power plant's output to be available on the grid with 15 minutes of start-up.
- Can be very flexible, allowing for rapid ramp rate and turn down of output.
- Is able to provide instantaneous reserves within minutes of being called on to do so.
- Provides regulating reserves to rapidly raise or lower output within seconds when called on to do so.
- The system sizes are small with medium capacity factors of between 10 to 40%, but are capable of operating as base load electricity supply for short periods of time if required.
- Have a low heat rate to improve efficiency to typically ~40%.
- Multiple units are installed together for improved turn down rates and increased operational flexibility.
- The power plant must be on demand and dispatchable either remotely or by an inhouse operator or by the system operator.
- Capable of operating in multiple regimes: Peaking, Mid-Merit and Baseload.
- Good load following capability to balance wind and solar and the ancillary service market.
- Enables fuel flexibility as most systems can operate on diesel or gas (such as LPG).

The proposed thermal power dual fuel facility will be operated in a simple cycle system, with no secondary steam driven turbine component, comprising of **either a gas turbine** or **reciprocating (gas) engine** technology that meets the criteria above for emergency and grid balancing power plants.

The Contracted Capacity of the plant will not be greater than 75MW. However, due to proprietary turbine sizes available in the market, the actual thermal capacity installed is likely to be higher than 75 MW. Where the installed capacity is greater than the contracted capacity, the turbines will never operate at full capacity and the output will always be equal to or less than the 75 MW contracted capacity. The maximum installed Thermal capacity will be less than 120 MW.

3.2. Reciprocating (Gas) Engine Technology

Reciprocating engines are similar to Marine Diesel Engines used to propel large boats. The gas engines in a power plant configuration are used to turn a generator that creates electricity. Through the use of a transformer the electricity generated is shaped and sized for distribution into the electricity grid.

Reciprocating engines for electricity generation offers the following benefits:

- » High electrical efficiency;
- » Low capacity output per engine block so this technology is very effective at responding to changes in the required load and capacity factor;
- » Dual fuel system capable of using diesel or Liquid Petroleum Gas (LPG); and
- » It's a simple reciprocating engine, based on common rail principle very similar to diesel engines.

Simple reciprocating engines are based on the common rail principle. The cylinders are constructed inline and mechanical power is transferred via a drive shaft to the electricity generator. Multiple engine blocks are combined and grouped together to form the entire power plant as shown in figure below.

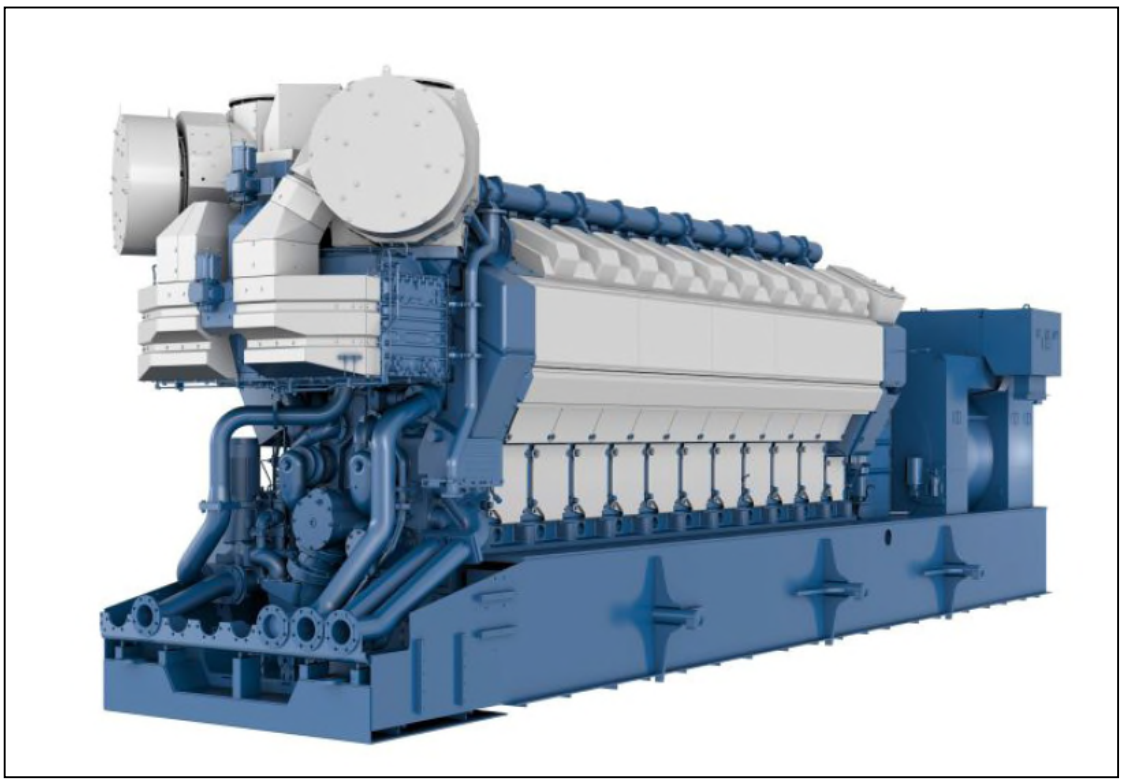

Figure 3.1: Gas Engine configuration

The general process followed by the operation of a gas engine power plant, which increases energy efficiency of a power resource and electrical output, is described below:

1) The gas engine power plant will be equipped with a number of reciprocating internal combustion engines comprising 75W of output capacity, as the prime mover.
2) The engine is a spark-ignited lean-burn gas engine. The engine is connected to a synchronous, brushless, salient pole three-phase electricity generator. The engine and generator form a generating set.
3) The engine is cooled by a closed-circuit cooling water radiator system, divided into a high temperature (HT) circuit and a low temperature (LT) circuit. The cooling water is cooled with roof-mounted (on top of the engine hall), horizontal-type fin fan radiators with electrically driven induced draft fans.
4) The engines are equipped with a two-stage charge air cooling system.
5) The gas engine power plant is designed to use LPG or diesel as its fuel source.

3.3. Gas Turbine Technology

Gas turbines used in electricity generation are typically small compact turbines, similar to the ones used in the aircraft industry, but can vary greatly in size for different applications. The gas turbines are mounted in line with a generator and in larger systems can be coupled to steam turbines to maximise the energy extraction from the hot gas exhaust plume.

The benefit of a gas turbine power plant is that it can be fitted with several auxiliary systems to improve performance, reduce emissions and prolong maintenance. A dry low emission combustion chamber also supports dual fuel sources such as LPG or diesel. The following auxiliary systems can be fitted to the 75MW thermal power dual fuel facility to improve performance and reduce emissions:

- Leading edge guide vanes to improve air intake flow rate;
- Evaporative coolers to lower the ambient temperature of the inlet air, resulting in high combustion efficiency;
- Water suppression systems to reduce the exhaust gas pollutants;
- Heat recovery systems to extract heat energy from the exhaust plume to boil water to form steam. This steam is fuel for a steam turbine that is coupled to a generator

The configuration of a typical aero derivative or industrial gas turbine used for power generation is shown in the figure below:

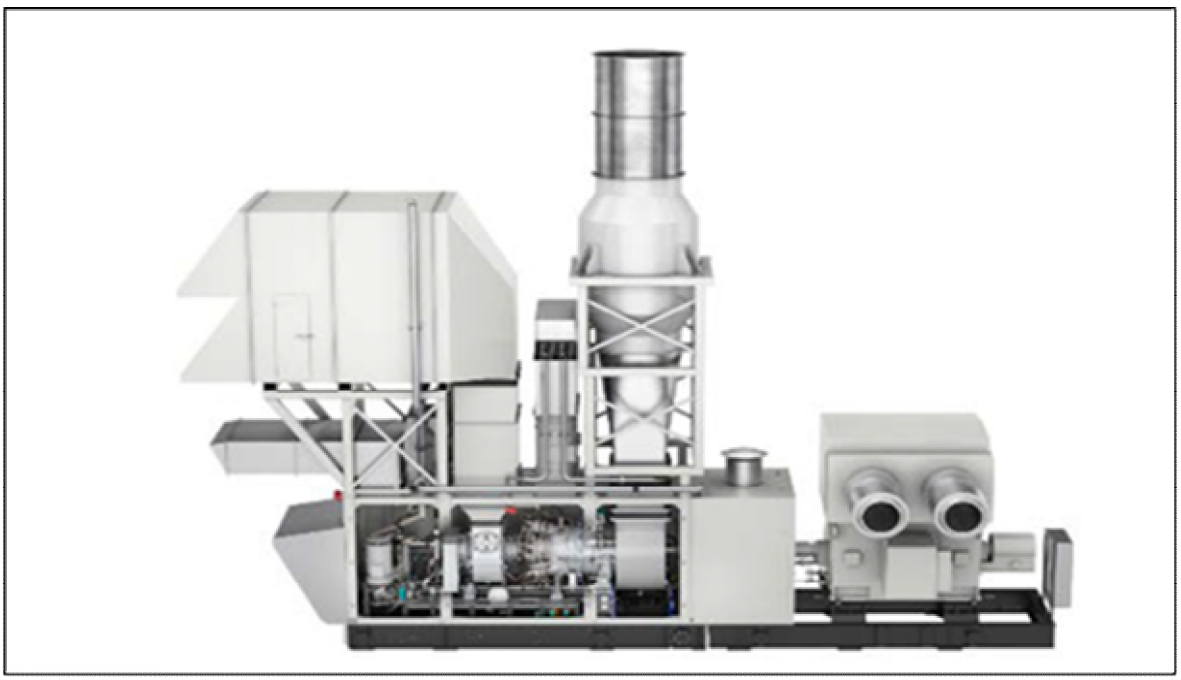

Figure 3.2. Example of the typical setup of a Visual representation of the gas turbine technology option.

The general process followed by the operation of a gas turbine power plant, which increases energy efficiency of a power resource and electrical output, is described below:

1) The gas turbine power plant will have air intake structures and major equipment in the required number of sets to generate 75MW of output.

2) The turbine air inlet system receives, filters, and directs the ambient air flow into the inlet of the compressor section of the gas turbine.
3) The gas turbine compresses the inlet air in the compressor section.
4) The air is then mixed with fuel in the combustion chamber.
5) The hot gases from the combustion expands over the turbine section and rotates the turbine blades.
6) The hot exhaust gas then flows to the exhaust section.
7) The gas turbine is coupled to an electricity generator.

The technologies that is being considered for the thermal facility (i.e. gas engines or reciprocating gas turbines), are the only technologies capable of utilising LPG or diesel in utility scale power generation. Other generation technologies using LPG in a LPG fired steam boiler to drive a steam turbine is not a very efficient way of generating power as the steam cycle requires large amounts of cooling in the air cooled condenser and balance of plant systems.

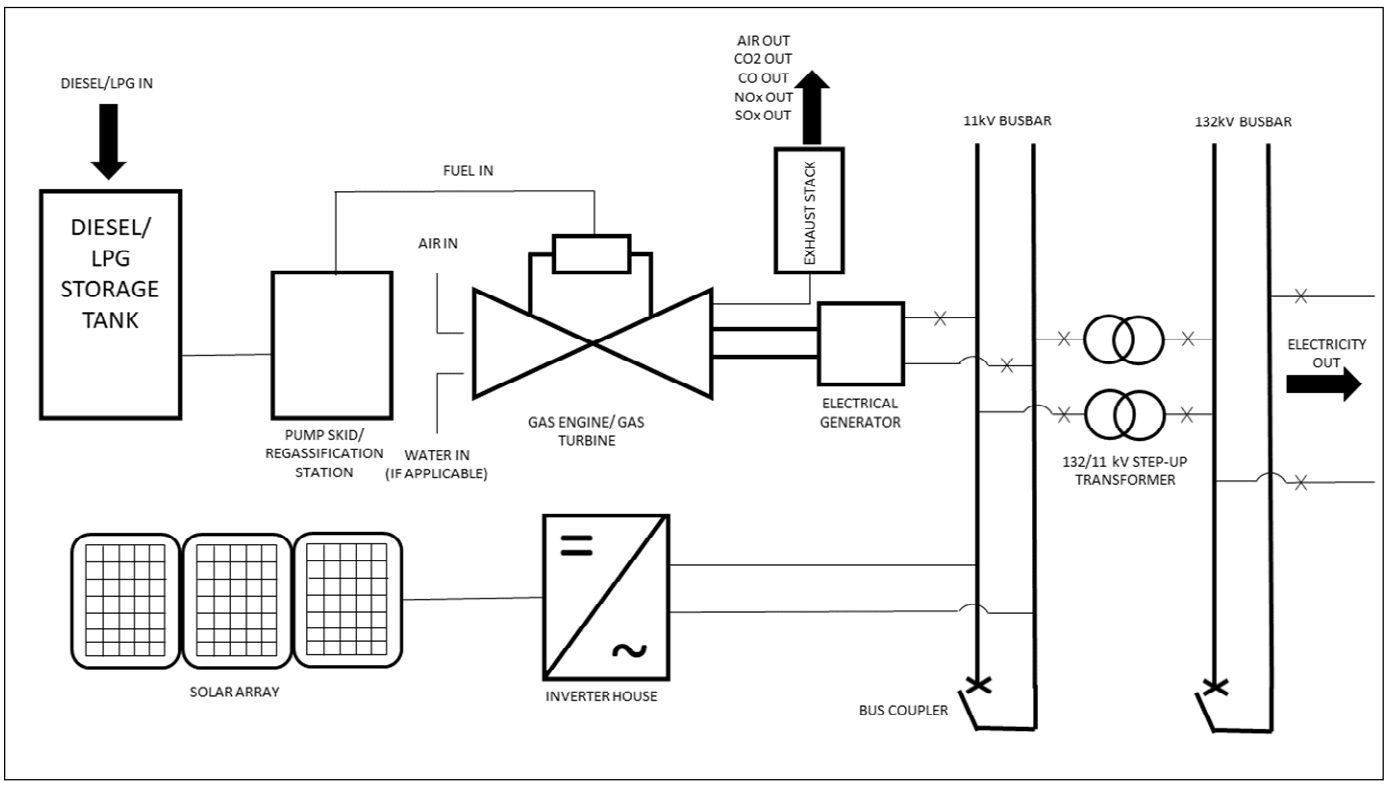

Figure 3.3: Illustration of hybrid thermal power plant and PV solar energy facility

CHAPTER 4: PROJECT DESCRIPTION AND ALTERNATIVES

This chapter of the Final Scoping report provides an overview of the thermal generation plant proposed by Hyperion Solar Development (Pty) Ltd, as well as identified feasible alternatives. The thermal generation components and infrastructure presented in this chapter are indicative at this stage and aimed at enabling the reader to obtain an understanding of the proposed project. These will be further refined in the EIA Phase of the process and confirmed through the final design prior to implementation.

4.1 Legal Requirements as per the EIA Regulations for the undertaking of a Scoping Report, 2014 (as amended)

This chapter of the scoping report includes the following information required in terms of Appendix 2: Content of the Scoping Report:

Requirement	Relevant Section
(g)(i) details of all the alternatives considered;	The details of all alternatives considered for the development of the thermal generation plant are included in Section 4.3.
(g)(ix) the outcome of the site selection matrix	The outcome of the site selection process undertaken for the identification of the preferred project site is included in Section 4.4
(g)(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such	No project site alternatives are considered for the thermal generation plant. Technology alternatives considered for the development of the thermal generation plant are considered within Section 4.7. The motivation behind the exclusion of site alternative have been included in Section 4.4.

4.2 Description of the Proposed Project

The Hyperion hybrid facility involves the construction of a thermal generation plant that will operate in combination with the authorised Hyperion 1 & 2 Solar PV Energy Facilities, and which will provide mid-merit power supply[2] to the electricity grid. Where possible and where available, solar power will be utilised to meet the demand. However, where solar power is not available (typically between the hours of 5h00 and 07h00 and again between 18h00 and 21h30), thermal generation will be utilised. It is estimated that between 50% – 65% of the demand for supply from the hybrid facility will be met utilising solar power with the remaining 35 – 50 % being met utilising thermal generation. The hybrid facility has been designed and developed as a power balance system to manage electricity demand during peak periods to stabilise the grid, as well as provide back up support for base load generation in the event of unscheduled maintenance on Eskom's coal fired power stations. The authorised Hyperion 1 and Hyperion 2 PV facilities each have an output capacity of 100MW. The thermal generation plant on its own will have an installed capacity of up to 75MW, to be operated on LPG or diesel fuel sources. Both LPG and diesel options would be trucked to the site from a reputable South African supplier. The use of diesel or LPG will be investigated further within the EIA phase and the preferred fuel source presented.

[2] A load-following power plant, also known as mid-merit, is a power plant that adjusts its power output as demand for electricity fluctuates throughout the day. Mid-merit power plants fill the gap between the peak load and base load

The main infrastructure associated with the facility includes the following:

- Gas turbines or Reciprocating Gas Engines
- Access road
- Truck entrance and parking facility
- Regasification plant and fuel preparation plant
- Dry cooling system for operating oils/chemicals
- Fuel off-loading facility
- Fuel storage facility
- Water demineralisation plant
- Substation, cabling, O&M building, fencing, warehouses and workshops

In order to operate a thermal generation plant of this nature functioning as part of a hybrid facility, resources are required (input), and processes and outputs occur from the electricity generation process. For combustion, fuel (LPG or diesel) and air will be required. Water is required in the power generation process. Depending on the choice of technology selected (reciprocating gas engines or gas turbines) approximately 38 000 m^3 per annum will be required for emission control. The output of the process is electricity.

Table 4.1 provides details of the proposed thermal power dual fuel facility, including the main infrastructure and services.

Table 4.1: Details of the thermal power dual fuel facility located near within the authorised Hyperion 1 & 2 PV SEF site.

Component	Description/ Dimensions
Location of the site	**75MW Thermal Power Duel Fuel Facility and access road:** Remainder of the Farm Lyndoch 432 **Access Road:** Portion 1 of Farm 464.
Landowner	All of the affected properties of the thermal facility and access road site are privately owned.
Municipal Jurisdiction	John Taolo Gaetsewe District Municipality and the Gamagara Local Municipality
Electricity Generating capacity (Thermal Facility)	75MW
Proposed technology	» Reciprocating Gas Engine technology or; » Gas Turbine technology
Extent of preferred project site (Thermal Facility)	» 340ha
Extent of the development footprint	» **Thermal plant:** Up to 5ha (considering the Thermal generation facility and associated infrastructure) » **Access road:** 8 km in length and approximately 8m wide
Stack dimensions (Site elevation: 1178 m above mean sea)	» Reciprocating Gas Engine or Gas Turbine Exhaust Stack Height: 25m above ground level
Fuel Sources	Either LPG or diesel will be selected as a fuel source: » **LPG**: LPG supply from a reputable South African supplier from either Richards Bay or Saldhana will be delivered to the power plant by LPG road tankers to the thermal generation facility

Component	Description/ Dimensions
	via the R380 and stored in mounded bullet tanks above ground with a capacity of 5500m^3. » **Diesel:** Diesel supply from a reputable South African supplier, preferably from the Northern Cape will be delivered by tankers to the thermal generation facility via the R380 and stored in up to six (6) above ground storage tanks with approximately 4 000m^3 of storage. Due to numerous mining operations in the vicinity of Kathu that make use of diesel in their operations, it is anticipated that an adequate supply of diesel can be sourced and stored within the authorised Hyperion 1 & 2 PV SEF site.
Site access	» Main access to the project site will be via the R380 and via a new access road that will be constructed to the facility and will cross Portion 1 of Farm 464.
Grid connection	» The thermal generation facility and therefore the hybrid facility will be connected to the national grid via a 132kV overhead power line that will connect to the existing Eskom Kalbas substation located 8km to the south-west of the hybrid generation facility site. A separate basic assessment process is being undertaken for the 132kV overhead line, hence it has not been assessed within this scoping report.
Associated infrastructure	» New access road » Internal water, air and gas pipelines » Control and electrical buildings, including a central control room » Firefighting systems » Bulk water storage » Truck entrance and parking facility » Fuel off-loading facility » Fuel storage facility » Regasification plant » O&M building, warehouses and workshops » Storage facilities for fuels, gas and chemicals » Effluent reticulation systems - i.e. 1) sanitary wastewater system; 2) oily water collection system and 3) storm water and rainwater collection system. » Dry Cooling systems for operating oil/chemicals » Balance of plant systems » Generator and Auxiliary transformers
Services required	» Waste disposal - all waste material generated from the development will be collected by a suitable contractor and the waste will be disposed of at a licensed waste disposal site off site. This service will be arranged with the municipality or an independent waste management service provider when required. » Sanitation – during construction, all sewage waste will be collected by a contractor to be disposed of at a licensed waste disposal site. This service will be arranged with the

Component	Description/ Dimensions
	municipality or an independent waste management service provider when required. During operation, the facility will be connected to the municipal sewer system. » Water – Water is to be sourced from either the Municipality or from the existing borehole on site. The construction phase of the thermal generation facility will require approximately of 45 000m^3 for construction per annum. Water volumes for emission control depending on the level of dispatch is approximately 38 000 m^3 . » Electricity: the electricity requirements for this facility are to be obtained from the municipality. This service will be arranged with the municipality when required. Services agreements will be entered into. .No agreements for the above services have been obtained as of yet.
Raw/Process-Water Storage Reservoir	» Water storage facilities for process water up to 500m^3 will be located in tanks at the site. » Water for fire-fighting purposes will be located on site.

4.3. Project Alternatives

In accordance with the requirements of Appendix 2 of the 2014 Environmental Impact Assessment (EIA) Regulations (GNR 326), reasonable and feasible alternatives including site and technology alternatives, as well as the "do-nothing" alternative should be considered. Alternatives are required to be assessed in terms of social, biophysical, economic and technical factors.

As per the definition of alternatives as per the Environmental Impact Assessment (EIA) Regulations (GNR 326); "alternatives", in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to the—
(a) property on which or location where the activity is proposed to be undertaken;
(b) type of activity to be undertaken;
(c) design or layout of the activity;
(d) technology to be used in the activity; or
(e) operational aspects of the activity;
and includes the option of not implementing the activity;

Most guidelines use terms such as "reasonable", "practicable", "feasible" or "viable" to define the range of alternatives that should be considered. Essentially there are two types of alternatives:

» **Incrementally different** (modifications) alternatives to the project.
» **Fundamentally (totally) different** alternatives to the project.

4.3.1. Consideration of Fundamentally Different Alternatives

Fundamentally different alternatives are usually assessed at a strategic level, and project-specific EIAs are therefore limited in scope and ability to address fundamentally different alternatives. Electricity generating alternatives have been addressed as part of the IRP 2010 – 2030. In this regard, the need for a diversification

of the technology mix for power generation, as well as the need for the acquisition of capacity needed to supplement Eskom's declining plant performance and to reduce the extensive utilisation of diesel peaking generators in the immediate to medium term has been considered. The fundamental energy generation alternatives were assessed and considered within the development of the IRP and the need for the development of both gas generated energy and renewable energy and highly flexible generation capacity has been defined. Therefore, fundamental alternatives to the proposed project, including that of alternative energy development options, were not considered within the EIA report.

4.3.2. Consideration of Incrementally Different Alternatives

Incrementally different alternatives relate specifically to the project under investigation. "Alternatives", in relation to a proposed activity, means different ways of meeting the general purposes and requirements of the activity, which may include alternatives to:

- The property on which, or location where the activity is proposed to be undertaken.
- The technology to be used in the activity.
- The design or layout of the activity.

In addition, the option of not implementing the activity (i.e. the "do-nothing" alternative) must also be considered.

These alternatives are discussed below.

4.3.3. Site Alternatives

The project site near Kathu has been identified by Hyperion Solar Development (Pty) Ltd as the preferred area for the development of the thermal generation facility due to:

- it being a location of the already authorised Hyperion 1 & 2 SEF PV projects that will enable the development of the hybrid facility and allow for dispatchable energy once the thermal generation facility has been authorised.
- the site has previously been assessed for the Hyperion 1 & 2 PV SEF facilities and it has been determined that there are no environmental fatal flaws associated with development within this site.
- the close proximity (<8km) of the project site to the existing Eskom Kalbas substation that will allow connection to the national grid.

No alternative sites have been identified.

4.4.4. Design and Layout Alternatives

The thermal generation plant and associated infrastructure will have a development footprint of approximately 5ha, to be located within the greater Hyperion 1 & 2 PV SEF site of approximately 340ha. The design and layout thereof is determined by the footprint of the authorised PV facilities.
No feasible design or layout alternatives were identified for the proposed project.

4.6. Fuel Alternatives

Power generation technology as proposed for this project is able to operate using various fuel sources, depending on availability. The thermal generation plant is proposed to operate using Liquified Petroleum Gas, or diesel initially, both of which can be trucked to the site via a reputable South African supplier.

4.6.1. Liquified Petroleum Gas (LPG)

LPG (Liquefied Petroleum Gas, comprising principally of propane) is the term applied to those hydrocarbons which are vapours at room temperature and can be liquefied by moderate compression. When LPG is liquefied, its volume decreases considerably so that it requires much less storage space. LPG is composed of a mixture of mainly propane and butane (approximate ratio 70:30 by mass, but can be up to 100% propane) but may contain some propylene and butylene as well as traces of ethane, ethylene, pentane and butadiene. It is colourless and odourless, although commercial LPG is usually stenched with a substance called ethyl mercaptan to give it a characteristic odour. (http://www.afrox.co.za/)

4.6.2. Diesel

Diesel fuel is the common term for the petroleum distillate fuel oil sold for use in motor vehicles that use the compression ignition engine. Diesel fuel is refined from crude oil at petroleum refineries. Diesel fuel is a mixture of hydrocarbons - with boiling points in the range of 150 to 380°C - which are obtained from petroleum. Most freight and delivery trucks as well as trains, buses, boats, and farm, construction, and military vehicles have diesel engines. Diesel fuel is also used in diesel engine generators to generate electricity. Industrial facilities, large buildings, institutional facilities, hospitals, and electric utilities have diesel generators for backup and emergency power supply. One of the most important and unique features of diesel-powered generators compared to other technologies is quick response time, able to start and absorb a full electrical load within ten seconds of grid power failure (https://www.eia.gov/energyexplained/diesel-fuel/).

4.4.5 Power Generation Technology Alternatives

The thermal generation facility will be operated as an open cycle system, with no steam driven turbine component. Two technologies are being proposed – i.e. **reciprocating gas engines** and **gas turbines.** The preferred technology for implementation will be informed by the outcomes of the EIA process as well as technical and economic considerations.

Reciprocating gas engines are similar to Marine Diesel Engines used to propel large boats. The fuel is kept under pressure according to the demand of the engine and it is supplied to the cylinder mixed with air necessary for combustion. The gas engines in a power plant configuration are used to turn a generator that creates electricity. By using a transformer, the electricity generated is shaped and sized to distribute into the electricity grid.

The gas engine power plant proposed for the thermal generation plant will be equipped with several reciprocating internal combustion engines as the prime mover depending on the final choice of engine size. Gas Engine cooling jacket water will be cooled and recycled using fin-fan cooler banks.

Gas turbines used in electricity generation range from large-scale industrial grade turbines to small compact turbines, based on models used in the aircraft industry. The gas turbine compresses air and mixes it with fuel which is combusted to produce high temperature combustion gases. The high temperature combustion gases pass through a gas turbine resulting in the rotation of the turbine blades. The rotational movement of the turbine blades at a high speed drives a generator which converts a portion of the energy produced by the rotational blades into electricity. Gas turbines will vent to atmosphere in open cycle configuration for cooling purposes.

The gas turbine power plant proposed for the thermal dual fuel facility will comprise of approximately 10 turbines depending on the final choice of turbine.

It must be considered that the thermal generation facility will be operated as part of "hybrid" power generation facility as it will work together with the authorised Hyperion 1 & 2 PV SEF's projects. On one hand PV technology will be utilised to meet the demand. Where solar power is not available (typically between the hours of 5h00 and 07h00 and again between 18h00 and 21h30), the thermal dual fuel facility will be utilised. This provides a hybrid solution to dispatch power quickly and efficiently to the grid when required.

4.4.6. The 'Do-Nothing' Alternative

The 'do-nothing' alternative is the option of not constructing the proposed thermal generation facility on the project site within the within the authorised Hyperion 1 & 2 PV SEF site. This alternative will be further assessed within the EIA phase of the process as required in terms of the EIA Regulations.

4.5 Life-cycle Phases of the thermal generation facility and associated infrastructure

4.5.1. Construction Phase

Construction of the thermal power facility and associated infrastructure is expected to take up to 14-20 months to construct depending on the choice of technology, the lead time for equipment and any contractual timing requirements. The construction activities involve the following:

- Prior to initiating construction, a number of surveys will be required including, but not limited to site survey and confirmation of the thermal facility footprint and location of exhaust stacks key components.
- Site preparation activities will include clearance of vegetation and excavations for foundations and internal roads. These activities will require the stripping of topsoil, which will need to be stockpiled, backfilled and/or spread on site.
- Thereafter civil works will take place which involves concrete works for structures such as foundation, the production unit (which houses the engines/turbines, generator, engines and so forth), stacks, cooling towers (if applicable), substation and associated infrastructure.
- Civil works for water demineralisation processing plant.
- Mechanical and electrical work will then follow.
- Ancillary infrastructure such as guard house, admin building, workshops and a warehouse will be established.
- Storage facilities for LPG or diesel will be constructed.
- Water storage for both treated water from the bulk water supplier and demineralised water will be established.

» As construction is completed in an area, and as all construction equipment is removed from the site, the site will be rehabilitated where practical and reasonable.

Employment opportunities to local community members will be available during the construction phase of the project. Approximately 350-500 positions will be available over the construction phase and approximately 20 employment opportunities will be for permanent positions which will transition into the operation phase of the development. Employment opportunities will include highly skilled, skilled and semi-skilled positions. Highly skilled positions will be limited. Employees will not reside on the project site and will be accommodated in the Kathu area.

4.5.2. Operation Phase

Prior to the operation of the thermal facility, testing and trials will need to be undertaken. The proposed facility will create approximately 20 permanent employment positions (dependent on final generation technology chosen) that will be retained for the 20 year life of the project. The permanent employment positions will include highly skilled, skilled and semi-skilled positions.

It is anticipated that there will be full time security, maintenance and control room staff required at the site.

4.5.3. Decommissioning Phase

The lifespan of the proposed thermal generation facility will be at least 20 years from date of commissioning. Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life or if it is no longer required. An upgrade of the thermal generation facility technology could be possible after the initial 20 year operational life should an extension of operational life be required as the gas engines and turbines are common to have longer operational lives than 20 years.

It is most likely that decommissioning activities of the infrastructure of the facility discussed in this EIA process would comprise the disassembly and disposal of the infrastructure. Decommissioning activities will involve disassembly of the production units and ancillary infrastructure, demolishing of buildings, fuel storage tanks and removal of waste from the site and rehabilitation to the desired end-use. A new permitting process will be undertaken to assess the decommissioning phase as per the legislation requirements at the time.

Future use of the site after decommissioning of the thermal generation facility could possibly form part of another energy generating project of an alternative industry that would be able to utilise some of the existing infrastructure associated with the thermal generation facility. This would however be dependent on the development plans of the area at the time.

CHAPTER 5: PROJECT NEED AND DESIRABILITY

Appendix 2 of the EIA Regulations, 2014 (as amended) requires the inclusion of 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. The need and desirability of a development needs to consider whether it is the right time and right place for locating the type of land-use/activity being proposed. Need and desirability is therefore equated to the wise use of land, and should be able to answer the question of what the most sustainable use of land is.

This Chapter provides an overview of the anticipated suitability of the thermal generation facility (and by implication the hybrid facility) being developed at the preferred location from a national, regional, and site-specific perspective. It also provides an overview of the need and desirability of the project specifically. Potential impacts associated with the project which have been identified to date during the Scoping Phase are described separately in **Chapter 8** of this Scoping Report.

5.1 Legal Requirements as per the EIA Regulations for the undertaking of a Scoping Report, 2014 (as amended)

This chapter of the scoping report includes the following information required in terms of Appendix 2: Content of the Scoping Report:

Requirement	Relevant Section
(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;	The need and desirability for the development of the proposed thermal facility and hybrid facility is included in Section 5.2.

5.2 Need and Desirability for the Proposed Thermal Generation Facility from a National Perspective

The thermal generation facility is proposed in response to a national government initiative, namely the requirement for the diversification of power generation technology within the IRP 2019 (as detailed within Chapter 2), and specifically the recently announced Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP). As a result, the need and desirability of the project from a national perspective can largely be assimilated from the project's alignment with national government policies, plans and programmes which have relevance to energy planning and production (as discussed in detail in **Chapter 2**).

The promulgated IRP 2010–2030 identifies the preferred generation technologies required to meet expected demand growth up to 2030. It incorporates government objectives such as affordable electricity, reduced greenhouse gas (GHG) emissions, reduced water consumption, diversified electricity generation sources, localisation and regional development.
The IRP includes provision for a power purchase programme to assist with the acquisition of capacity needed to supplement Eskom's declining plant performance and to reduce the extensive utilisation of diesel peaking generators in the immediate to medium term. This is to be achieved by the procurement and indicated a requirement for of additional generation capacity of between 2000MW and 3000MW from technologies to be determined.

The following is stated in section 5.3.1 entitled "Immediate Term Security Supply":

"In the short-term supply and demand side interventions will have to be deployed to minimise the risk of load shedding and/or extensive usage of diesel peaking plants. The short-term gap in this regard is estimated to be about 2 000MW. A medium-term power purchase programme (MTPPP) similar to that adopted following the IRP 2010 must be considered with the goal of avoiding extensive diesel usage and load shedding."

Following the publication of the IRP 2019 the Minister of Mineral Resources and Energy ("Minister") issued two section 34 determinations in terms of the Electricity Regulation Act, 2006 (Act No. 4 of 2006) ("the ERA") and the Electricity Regulation on New Generation Capacity (published in GNR. 399 in Government Gazette No. 34262 dated 4 May 2011 ("Regulations") as follows:

1) 2000MW of new generation capacity should be procured from a range of energy source technologies in accordance with the short-term risk mitigation capacity allocated under the heading "Others", for the years 2019 to 2022 in Table 5 of the IRP 2019 by way of independent power producers ("IPP's") targeting connection to the grid by no later than June 2022 ("Risk Mitigation Independent Power Producers Procurement Programme"), which procurement process was initiated by the IPP Office in August 2020 targeting the procurement of 2000MW of dispatchable new generation capacity from a range of technologies; and
2) 6000MW of new generation capacity should be procured to be generated from other technologies, which represents the capacity allocated under heading "Other", for the years 2023 to 2030 in Table 5 of the IRP 2019 by way of IPPs, which procurement process has yet to be initiated by the IPP Office.

Following the above, a procurement process was initiated by the Independent Power Producer Office (IPP Office) in August 2020 for the procurement of up to 2000MW of dispatchable generation capacity from a range of technologies

The hybrid facility is being developed as an innovative solution to comprise of thermal generation (using LPG or diesel as a fuel source) and renewable energy via solar energy in direct response to the 2000MW RMIPPPP. The aim of the hybrid facility is to meet the RMIPPPP requirement of being 100% dispatchable between the hours of 05h00 and 21h30. This project therefore aims to meet both the short term requirements of providing affordable dispatchable generation capacity, but also meet the long term goal of operating by the use of "other" technology.

The implementation of the proposed project therefore has the potential to contribute positively towards the identified need at a national level, while simultaneously contributing to job creation and socio-economic development.

5.3. Need and Desirability for the Proposed Thermal Generation Facility from a Regional Perspective

According to the IEP (2016), if South Africa is to make the transition to a low carbon economy, it will become increasingly important to reduce dependence on fossil fuels and diversify energy resources to include other energy forms. The role that the hybrid facility can play in the transition to a low carbon future should also be considered. Diversifying the energy mix is necessary in order to improve security of supply, while at the same time minimising environmental impact and facilitating regional development.

The dominance of a single energy system, which is highly reliant on fossil fuels only, inevitably places an excessive burden on the environment. This eventually weakens it through environmental fatigue, failure (permanent damage) or even catastrophe if the situation continues for too long. This inevitably poses a health and environmental risk.

South Africa's electricity generation mix has historically been dominated by coal. This can be attributed to the fact that South Africa has abundant coal deposits, which are relatively shallow with thick seams, and are therefore easy and comparatively cost effective to mine. In 2016, South Africa had a total generation capacity of 237 006GWh. Approximately 85.7% (equivalent to 203 054GWh) of this figure was generated by coal (predominantly located in Mpumalanga and Limpopo), and only 3,2% (equivalent to 7 584GWh) was generated by natural gas (refer to **Figure 5.1**).

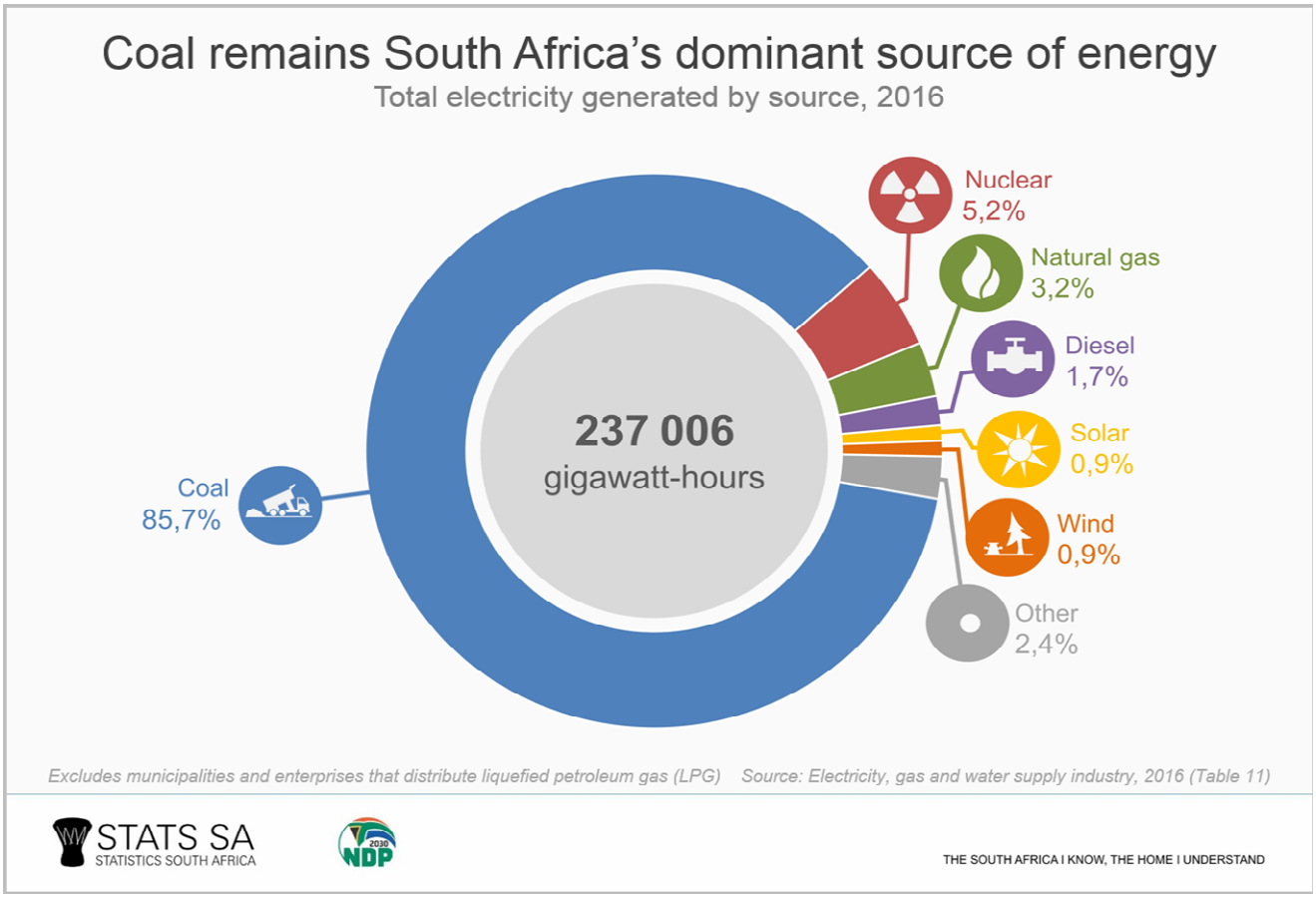

Figure 5.1: Overview of South Africa's electricity generation by source (Source: StatsSA 2016 Electricity, gas and water supply industry).

Whereas the majority of South Africa's electricity generation infrastructure is currently located within Mpumalanga Province due to the location of coal resources within this province, the Northern Cape Province has been identified as an area where the development of solar facilities is a feasible and suitable option for electricity generation. The applicant has identified combination of solar PV with thermal generation facilities to operate as a hybrid facility to be a feasible option to meet the requirements for dispatchable energy.

The Kathu area has been identified as a suitable area for the development of solar energy projects due to the viability of the solar resource for the area. The GHI for the area derived from the World Bank Group's Global Solar Atlas is approximately 2 227.5kWh/m^2/annum, almost equivalent to the highest GHI values in the country. The output of the authorised Hyperion 1 & 2 PV SEF facilities will be enhanced by the proposed thermal generation facility, allowing for the hybrid facility to be operated as a md-merit facility in accordance with the requirements of the DMRE.

The hybrid facility is aligned with the Northern Cape's Spatial Development Framework (PSDF) to address the triple challenge of poverty, inequality and unemployment through creation of 350-500 job opportunities during the construction phase and 20 job opportunities during its operational lifespan. The project will contribute to human resource development, and strategic infrastructure for social and economic growth which will contribute towards reducing poverty and inequality in the Northern Cape. The development of the thermal generation facility and the operation of the Hyperion 1 & 2 PV SEF facilities will also drive economic growth, infrastructural transformation and development and is seen as a favourable area for investment and development in terms of the John Taolo Gaetsewe District Municipality Phase 5 Draft Spatial Development Framework. The project will also contribute towards economic value, economic support and economic growth in Kathu in support of the Gamagara Local Municipality Integrated Development Plan (IDP) 2019 – 2022.

Where possible and where available, solar power will be utilised to meet the demand. However, where solar power is not available (typically between the hours of 5h00 and 07h00 and again between 18h00 and 21h30), thermal generation will be utilised. It is estimated that between 50% – 65% of the demand for supply from the hybrid facility will be met utilising solar power with the remaining 35 – 50 % being met utilising thermal generation. The use of the hybrid facility for power generation will offer reduced emissions when compared to the use of coal for electricity generation in line with the Northern Cape Climate Change Response Strategy.

5.4. Receptiveness of the proposed project site to development of the thermal power facility

Hyperion Solar Development (Pty) Ltd identified the authorised Hyperion 1 & 2 PV SEF site near Kathu for the development of the proposed thermal generation facility, and ultimate operation of a hybrid generation facility. These properties are readily available for development of the facilities and can support the infrastructure required for the proposed thermal facility. The following aspects regarding the receptiveness of the site for the proposed development was considered:

Extent of the site: The thermal power facility and its associated infrastructure requires an area of land approximately 5ha in extent. The project site, which includes the authorised Hyperion 1 & 2 PV SEF, is approximately 340ha. This is sufficient to accommodate the proposed thermal facility while still allowing for the avoidance of environmental sensitivities.

Site access: Access to the site is obtained via the R380 and a new access road which will be constructed to the facility across Portion 1 of Farm 464.

Current land use considerations: The properties comprising the project site are privately owned and already authorised for the development of the Hyperion 1 & 2 PV SEF site. The proposed project site is in

close proximity to an existing cluster or node for solar PV development and therefore compliments existing and future land use.

Grid Connection: The existing Eskom Kalbas substation is located approximately 8km away from the project site, allowing for ease of access to the grid and distribution to the national grid.

Landowner support: The selection of a project site where the landowner is supportive of the development of the project is essential for ensuring the success of the project. The landowner does not view the development as a conflict with their current or future land use practices.

Fuel resources: The site is ideally located for access to the fuel sources proposed for the facility (i.e. LPG or diesel). This fuel can be trucked to the site via the R380.

Environmental sensitivity of the site: The Scoping process conducted for the project to date has identified no fatal flaws which could restrict the development of the proposed project. In addition, no environmental fatal flaws were previously identified to be associated with the authorised Hyperion 1 & 2 PV facilities . The proposed thermal generation facility will be located within the footprint of the authorised Hyperion 1 & 2 PV SEF facilities thereby maximizing the development footprint of the site (refer to **Chapter 9**).

Based on the above considerations, it was concluded that the proposed site is a desirable location for the proposed thermal generation facility.

CHAPTER 6: DESCRIPTION OF THE RECEIVING ENVIRONMENT

This section of the Scoping Report provides a description of the environment that may be affected by the thermal generation facility and associated infrastructure. This information is provided in order to assist the reader in understanding the receiving environment within which the proposed development is situated. Features of the biophysical, social and economic environment that could be directly or indirectly affected by, or could affect the proposed development have been described. This information has been sourced from existing information available for the area (refer to Chapter 11 for list of references) and aims to provide the context within which this EIA process is being conducted.

6.1. Legal Requirements as per the EIA Regulations for the undertaking of a Scoping Report, 2014 (as amended)

This chapter of the scoping report includes the following information required in terms of Appendix 2: Content of the Scoping Report:

Requirement	Relevant Section
(g)(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	The environmental attributes associated with the development of the thermal generation facility is included as a whole within this chapter. The environmental attributes that are assessed within this chapter includes the following:
	» The regional location of the project site is described in Section 6.2.
	» The climatic conditions of the Kathu area is described in Section 6.3.
	» Biophysical characteristics of the project site and the surrounding areas are described in Section 6.4 and 6.5. This includes the topography, hydrology, geology, soils, agricultural potential, geo-hydrology and ecology of the project site.
	» Visual considerations are described in Section 6.6
	» The air quality of the area is considered in Section 6.7
	» Ambient noise levels of the area are described in Section 6.9.
	» Heritage resources, including the palaeontology and archaeology of the project site are described in Section 6.10 and 6.11.
	» Social and economic characteristics of the Kathu area are described in Section 6.12

6.2. Regional Setting: Location of the Project Site

The Northern Cape Province is located in the north-western extent of South Africa and constitutes South Africa's largest province, occupying an area 372 889km² in extent, equivalent to nearly a third (30.5%) of the country's total land mass. It is also South Africa's most sparsely populated province with a population of 1 145 861 people, and a population density of 3.1/km². The capital city is Kimberley, and other important towns include Upington, Springbok, Kuruman, De Aar, and Sutherland. It is bordered by the Western Cape, and Eastern Cape Provinces to the south, and south-east; Free State, and North West Provinces to the east; Botswana and Namibia, to the north; and the Atlantic Ocean to the west. The Northern Cape is the only South African province which borders Namibia, and therefore plays an important role in terms of providing

linkages between Namibia and the rest of South Africa. The Orange River, which is South Africa's largest river, is a significant feature and is also the main source of water in the Province, while also constituting the international border between the Northern Cape and Namibia.

The Northern Cape makes the smallest contribution to South Africa's economy (contributing only 2% to South Africa's Gross Domestic Product per region (GDP-R) in 2007). The Northern Cape is rich in minerals including alluvial diamonds, iron ore, and copper. The province is also rich in asbestos, manganese, fluorspar, semi-precious stones and marble. The mining sector is the largest contributor to the provincial GDP. The Northern Cape's mining industry is of national and international importance, as it produces approximately 37% of South Africa's diamond output, 44% of its zinc, 70% of its silver, 84% of its iron-ore, 93% of its lead and 99% of its manganese. According to the fourth reviewed IDP of the Gamagara LM, the town of Kathu is considered to be the administrative and economic hub of the municipality which is located within the centre of the Gamagara Mining Corridor.

The province has fertile agricultural land in the Orange River Valley, especially at Upington, Kakamas and Keimoes, where grapes and fruit are cultivated intensively. The agricultural sector employs approximately 19.5% of the total formally employed individuals (LED Strategy). The sector is experiencing significant growth in value-added activities, including game-farming, while food production and processing for the local and export market is also growing significantly (PGDS, July 2011). Approximately 96% of the land is used for stock farming, including cattle and sheep or goats, as well as game farming, while approximately 2% of the province is used for crop farming, mainly under irrigation in the Orange River Valley and Vaalharts Irrigation Scheme (LED Strategy).

The Northern Cape offers unique tourism opportunities including wildlife conservation destinations, natural features, historic sites, festivals, cultural sites, stars gazing, adventure tourism, agricultural tourism, ecotourism, game farms, and hunting areas, etc. The Province is home to the Richtersveld Botanical and Landscape World Heritage Site, which comprises a United Nations Educational, Scientific and Cultural Organisation (UNESCO) World Heritage Site under the World Heritage Convention. The Northern Cape is also home to two Transfrontier National Parks, namely the Kgalagadi Transfrontier Park, and the Richtersveld /Ai-Ais Transfrontier Park, as well as five national parks, and six provincial reserves. The Northern Cape also plays a significant role in South Africa's science and technology sector, as it is home to the Square Kilometre Array (SKA), the Southern African Large Telescope (SALT), and the Karoo Array Telescope (MeerKAT).

The Northern Cape comprises five (5) Districts, namely Frances Baard, John Taolo Gaetsewe, Namakwa, Pixley Ka Seme, and ZF Mgcawu (refer to **Figure 6.1**).

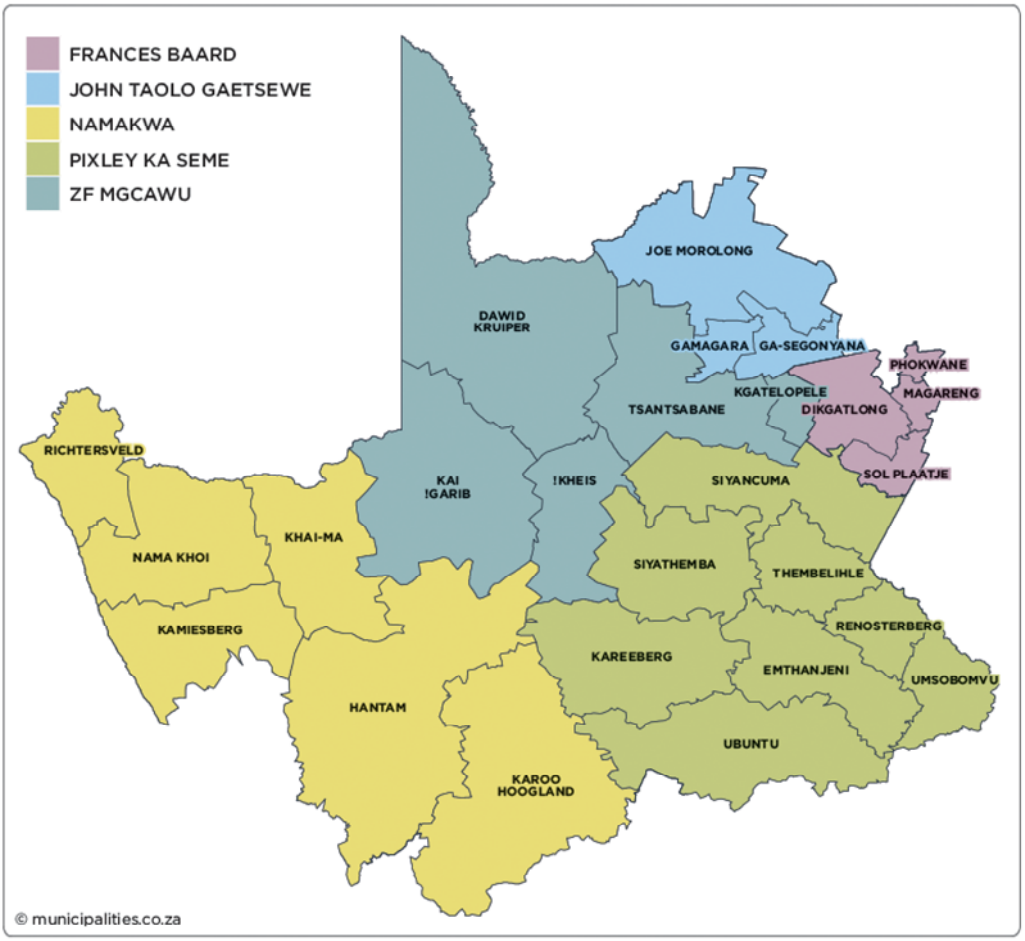

Figure 6.1: Districts of the Northern Cape Province (Source: Municipalities of South Africa).

The John Taolo Gaetsewe DM (previously known as the Kgalagadi DM) is situated in the north-eastern extent of Northern Cape Province, and is bordered by ZF Mgcawu DM to the south-west, and south; Frances Baard DM to the south-east; Dr Ruth Segomotsi Mompati DM of North West Province to the east; and Botswana to the north. It is the second smallest DM in the Province in terms of land mass (27 283km², equivalent to 7.32% of the total Provincial land mass), and third largest in terms of population (224 799, equivalent to 19.62% of the total Provincial population), with the second highest population density of 8.2/km².

The John Taolo Gaetsewe DM comprises 186 towns and settlements, approximately 80% of which includes villages. Predominant towns within the DM include: Bankhara-Bodulong, Dibeng, Hotazel, Kathu, Kuruman, Mothibistad, Olifantshoek, Santoy, and Van Zylsrus. It is characterised by a mixture of land uses, of which agriculture and mining are dominant. The main economic sectors within the DM include agriculture, mining, and retail. The DM holds potential as a viable tourist destination and has numerous growth opportunities in the industrial sector. The DM comprises 3 Local Municipalities, namely: Gamagara, Ga-Segonyana, and Joe Morolong Local Municipalities. In 2006 the boundaries of the John Taolo Gaetsewe DM were demarcated to include the once north-western part of Gamagara and Olifantshoek, along with its surrounds, into the Gamagara LM (refer to **Figure 6.2)**

Figure 6.2: Local Municipalities of the John Taolo Gaetsewe District (Source: Municipalities of South Africa).

The Gamagara LM is situated approximately 200km north east of Upington and 280km north west of Kimberley in the southern to south-western extent of the John Taolo Gaetsewe DM. It is bordered by the Gamagara LM to the north, the Ga-Segonyana LM to the east, and the Tsantsabane LM of the ZF Mgcawu DM of the Northern Cape Province to the south and west. The Gamagara LM has the smallest population (41 617) compared to the other LM in the John Taolo Gaetsewe, and is the second most densely populated LM of the John Taolo Gaetsewe DM with a population density of 16/km².

The Gamagara LM comprises five towns, namely: Kathu, Shesheng, Dibeng, Dingleton, and Olifantshoek. Kathu is the largest town and is also the administrative centre of the Gamagara LM. Olifantshoek is the second largest town, and is located near the Gamagara River to the north west of Kathu, and Dingleton is the smallest of the five towns, and is located in the centre of the mining activities directly south of Kathu.

6.3. Climatic Conditions

The Kathu area is typically characterised as having a local steppe climate (BSh) with little rainfall. The area receives a mean annual average rainfall of approximately 395mm. Precipitation is highest in March with an average of 74mm; and lowest in July with an average of 3mm. Minimal rain occurs between May to September. The average annual temperature in Kathu is 18.9°C. January is the hottest month of the year with an average temperature of 25.3°C, while July is the coldest month of the year with an average temperature of 10.8°C (refer to **Figure 6.3**). Frost is frequent to very frequent during winter, with up to 37 mean frost days per year. Droughts and floods are a regular occurrence at both provincial and local scales, and play a significant role in almost every aspect of the social, economic, and ecological environment within the Province.

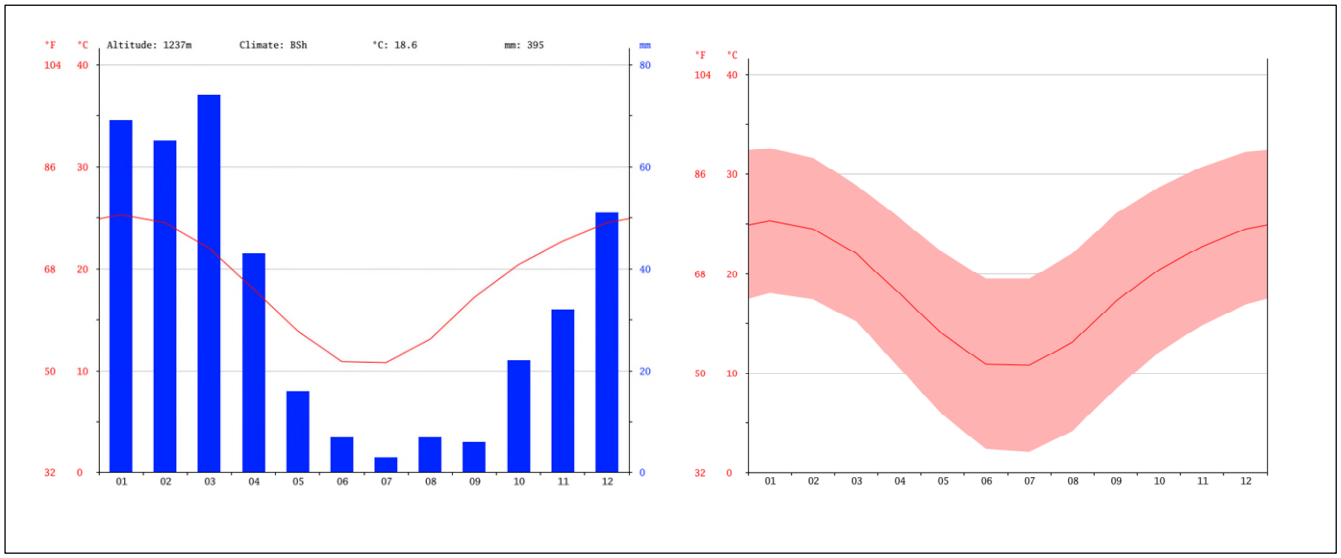

Figure 6.3: Climate and Temperature graphs for Kathu, Northern Cape Province (Source: en.climate-data.org).

6.4. Biophysical Characteristics of the Study Area

6.4.1 Topography

The landscape within the project site can be described as flat to very slightly undulating and consists of two terrain units where terrain unit 4 represent the vast flat areas that dominates the landscape and terrain unit 5 represent areas of slight depression where endorheic pans can develop. The entire development area as well as the north-eastern section of the access road consists of Land Type Ah9. The remaining section of the access road consists of Land Type Ag110.

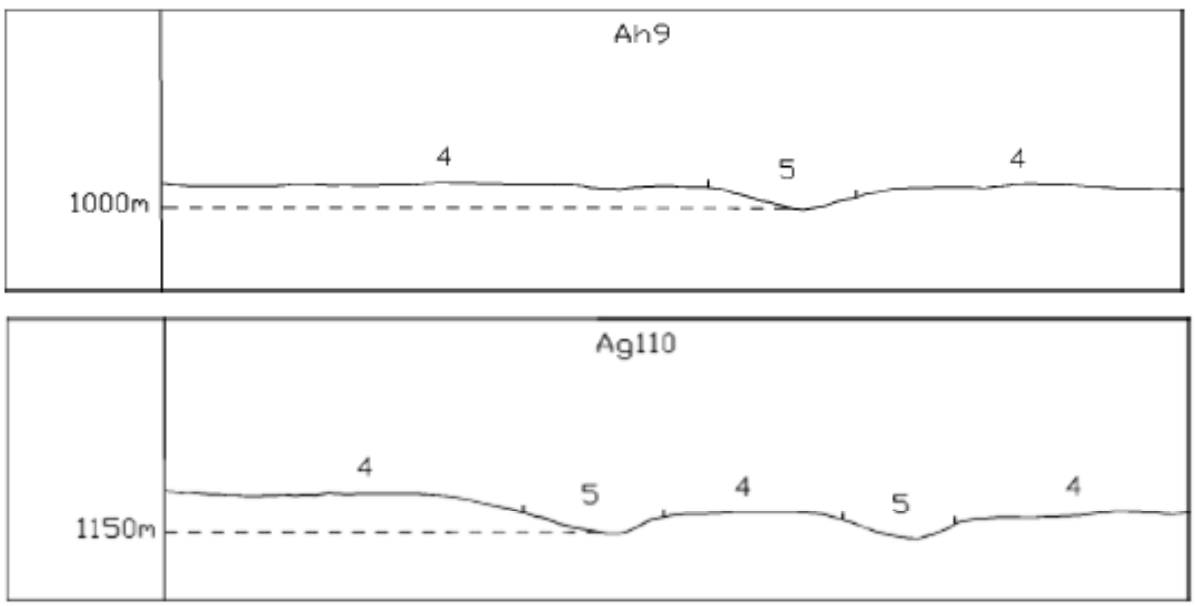

Figure 6.4: Terrain units within Ah9 and Ag110 land types

6.4.2 Geology

The Kathu area is largely underlain by Late Cenozoic continental sediments of the Kalahari Group (Partridge et al. 2006). Much of the broader study area comprises of thick calcretes of the Mokolanen Formation which could be up to 5 million years old and which are overlain by gravels of the Obobogorop Formation and red Kalahari aeolian sands of the Gordonia Formation. Substantial calcretised deposits including possible unconsolidated alluvium, palaeo-vlei or pan deposits and alluvial gravels are associated with the Vlermuisleegte River.

Small sections of inliers of the Precambrian (Proterozoic) basaltic to andesitic lavas of the Ongeluk Formation (Postmasburg Group) are exposed in the north-central and southern portions of the project site. These volcanic rocks form the basement to the Cenozoic Kalahari Group sediments in the region.

6.4.3. Soil, Land types and Agricultural Potential

A land type is defined as an area with a uniform terrain type, macroclimate and broad soil pattern. The area under investigation falls within the following land types (refer to **Figure 6.5**):

- *Ah9* - The texture of soil in this land type is dominated by sand with the clay fraction estimated as less than 10%. Deep Hutton and Clovelly soil forms (deeper than 120cm) constitutes the largest portion of this land type with very limited possibility for finding shallow, rocky soils of the Mispah and Glenrosa forms over the entire land type area (an estimated 3.5%).
- *Ag110* - The texture of soil in this land type is dominated by sand and sandy loam with the clay fraction estimated as less than 15%. This land type mainly consists of shallow soil profiles of the Hutton and Mispah soil forms with an estimated 18.5% of areas in this land type consisting of deeper soil profiles of the Hutton form.

The project site has a low to low-moderate land capability and is poorly suited for arable agriculture. Although the soil forms present within the project site are suitable for arable agriculture in other areas of the country, the project site has a dry, semi-arid climate with erratic rainfall patterns which are not appropriate for dryland crop production. The grazing capacity of the largest section of the development area is 11 ha/LSU. A narrow strip along the western boundary of the development area has a grazing capacity of 13 ha/LSU. Since the proposed infrastructure within the development area will be fenced off, it will no longer be available for livestock grazing. Similarly, the access road will be stripped of vegetation in preparation of the road surface and will no longer be suitable for livestock grazing. Considered in isolation, the development area is not a viable unit for livestock farming.

6.4.3 Hydrology and Geohydrology

The project site is situated within the Lower Vaal Water Management Area (WMA) 10, Quaternary Catchment D41K (Molopo Catchment) and the Southern Kalahari Ecoregion. The project site is furthermore located in an area defined as an upstream management catchment (FEPACODE 4). Upstream management catchments are required to prevent the downstream degradation of FEPAs and Fish Support Areas (FSAs).

The episodic Vlermuisleegte River bisects the centre of the broader project site (refer to **Figure 6.6**). This river drains in a south-eastern to north-western direction and is considered to be largely natural according to the Present Ecological State (PES) 1999. The river is classified as moderately modified (Class C) according to the National Freshwater Ecosystem Priority Area (NFEPA) database. Agricultural fields occur within the floodplain associated with the Vlermuisleegte River. This is most likely due to the episodic nature of the river, and the fact that the river consists of enriched, deep soils deposited through alluvial processes. Due to these agricultural activities, the natural indigenous riparian vegetation has been removed. However, analysis of digital satellite imagery indicates that some natural riparian vegetation remains within the area east of the river.

No watercourses are located within the focus area for this study. However, several watercourses are within the investigation area, namely the episodic Vlermuisleegte River, a natural depression, an artificial unchanneled valley bottom wetland, an artificial flat as well as a natural flat wetland. In addition to these wetlands a pan was also identified in the southern portion of the investigation area, around the 300m access road corridor. Two additional cryptic wetlands and a pan were identified within the investigation area. These will be verified and refined accordingly during the EIA Phase.

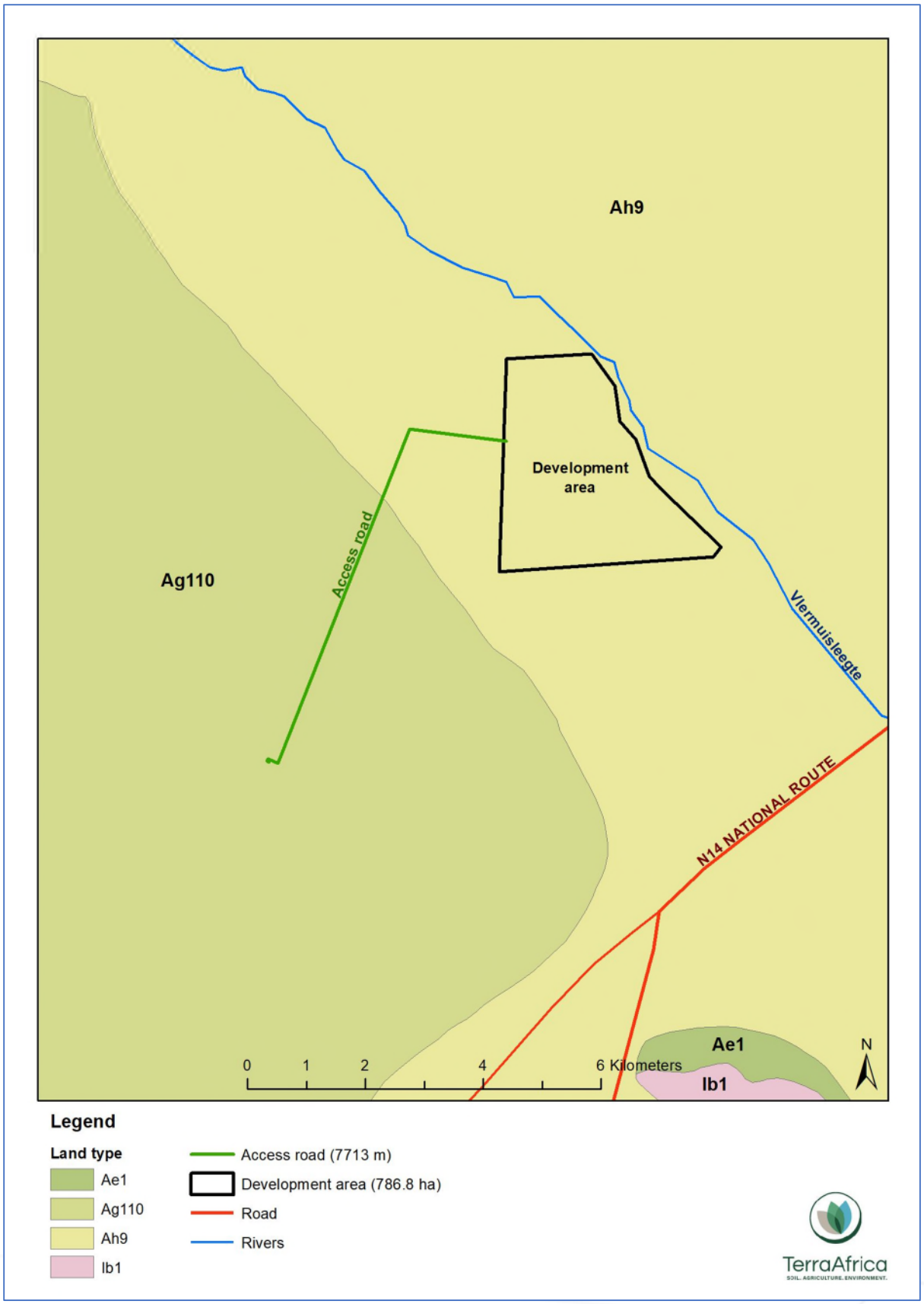

Figure 6.5: Land type classification of the proposed development area and access road

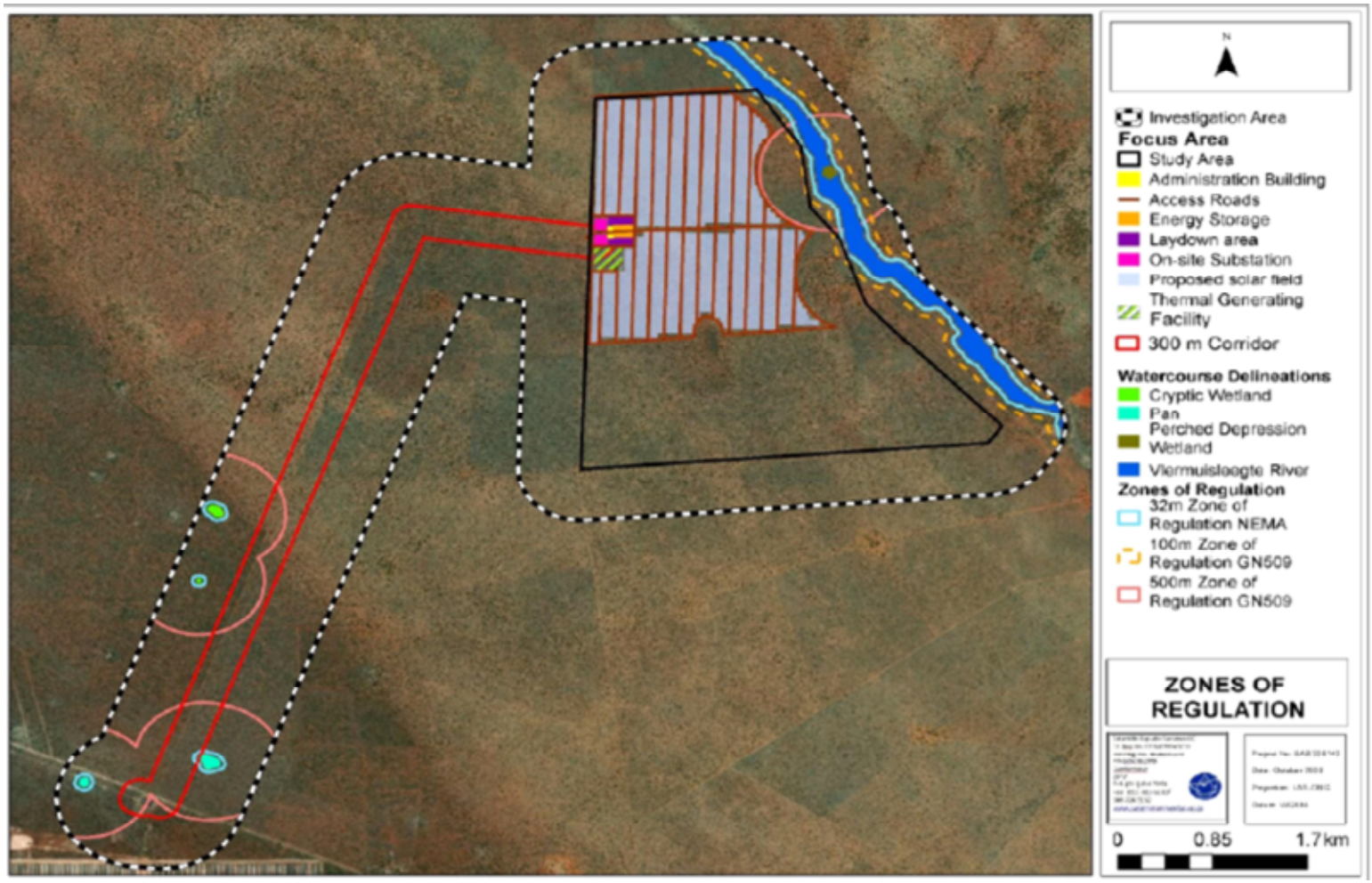

Figure 6.6: Locality and extent of the desktop delineated watercourses associated with the project site and access road.

6.4.3 Ecological Profile

The vegetation within and surrounding the project site comprises Kathu Bushveld. This vegetation type extends from Kathu and Dibeng in the south through to Hotazel and to the Botswana border between Van Zylsrus and McCarthysrus. The project site also consists of a well-developed tree layer and a variable-density grass layer. Three broad vegetation communities can be identified:

» The Vlermuisleegte River – non-perennial river which has largely been in-filled with sand. It is characterised by a high density of large *A. erioloba* trees.
» The area east of the Vlermuisleegte River - the vegetation within this area is generally more open and largely dominated by *A. erioloba* with some localised areas dominated by *A. mellifera* or *Terminalia sericea*.

Table 6.1: Key species associated with the project site

Plant Community	Key Species
Woody Layer	
Trees	***Small Tree**: Senegalia erubescens (d), Boscia albitrunca (d), Terminalia sericea* ***Tall Tree**: Vachellia erioloba*
Shrubs	***Tall Shrub**: Diospyros lycioides subsp. lycioides (d), Dichrostachys cinerea, Grewia flava, Gymnosporia buxifolia, Rhigozum brevispinosum.* ***Low Shrubs**: Aptosimum decumbens, Grewia retinervis, Nolletia arenosa, Sida cordifolia, Tragia dioica* ***Succulent Shrub**: Kalanchoe rotundifolia, Talinum caffrum*
Forb layer	
Herbs	*Acrotome inflata, Erlangea misera, Gisekia africana, Heliotropium ciliatum, Hermbstaedtia fleckii, H. odorata, Limeum fenestratum, L. viscosum, Lotononis platycarpa, Senna italica subsp. arachoides, Tribulus terrestris*
Gramminoid layer	
Graminoids	*Aristida meridionalis (d), Brachiaria nigropedata (d), Centropodia glauca (d), Eragrostis lehmanniana (d), Schmidtia pappophoroides (d), Stipagrostis ciliata (d), Aristida congesta, Eragrostis biflora, E. chloromelas, E. heteromera, E. pallens, Melinis repens, Schmidtia kalahariensis, Stipagrostis uniplumis, Tragus berteronianus.*

**(d) is for dominant*

The vegetation types of South Africa are categorised according to their conservation status, which is assessed according to the degree of transformation and rates of conservation. The status of a habitat or vegetation type is based on how much of its original area remains intact, relative to various thresholds.

According to the Northern Cape Province Spatial Development Framework (NCPSDF), the study area is located within the Griqualand West Centre (GWC) of plant endemism (Figure 6). This semi-arid region is broadly described as Savanna, forming part of the Eastern Kalahari Bushveld Bioregion. Studies investigating the endemism of the centre report at least 23 plant species that have restricted distributions (Frisby et al. 2019).

6.4.4 Listed and protected plant species of the project site

Several plant species that are protected under Schedule 2 (Protected Species) of the Northern Cape Nature Conservation Act (Act No. 9 of 2009) were identified as having the potential to be located within the study area. As these species are provincially important, should they be present within the study area, they will require rescuing and relocation to a similar habitat near the study area before any construction commences. A full list of species can be viewed in Table F1 of the Biodiversity specialist study (refer to Appendix D).

6.5. Fauna

6.5.1. Terrestrial Mammals

The potential diversity of mammals within the project site is moderate. Although more than 50 species of terrestrial mammals are known from the broader study area, the extent and habitat diversity of the project site is too low to support a very wide range of mammals. Species observed within the project site include Aardvark, Cape Porcupine, Springhare, South African Ground Squirrel, Scrub Hare, Vervet Monkey, Small-spotted Genet, Yellow Mongoose, Slender Mongoose, Black-Backed Jackal, Steenbok, Duiker and Kudu. Small mammals trapped in the area include Desert Pygmy Mouse, Multimammate Mouse, Bushveld Gerbil, Hairy footed Gerbil, Pouched Mouse and Grey Climbing Mouse. (Todd,2018) Listed terrestrial mammal species that potentially occur in the area are included in **Appendix G1 of the Biodiversity Scoping report.**

6.5.2. Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs)

According to the Northern Cape Critical Biodiversity Areas (2016) database, the study area does not fall within any Critical Biodiversity Areas (CBAs). However, most of the study area falls within an area categorised as Other Natural Areas, although small sections (in both the northeast and the southwest) of the study area fall within Ecological Support Areas (ESAs). ESAs are required to be maintained in an ecologically functional state to support Critical Biodiversity Areas and/or Protected Areas. ESAs maintain the ecological processes on which Critical Biodiversity Areas and Protected Areas depend.

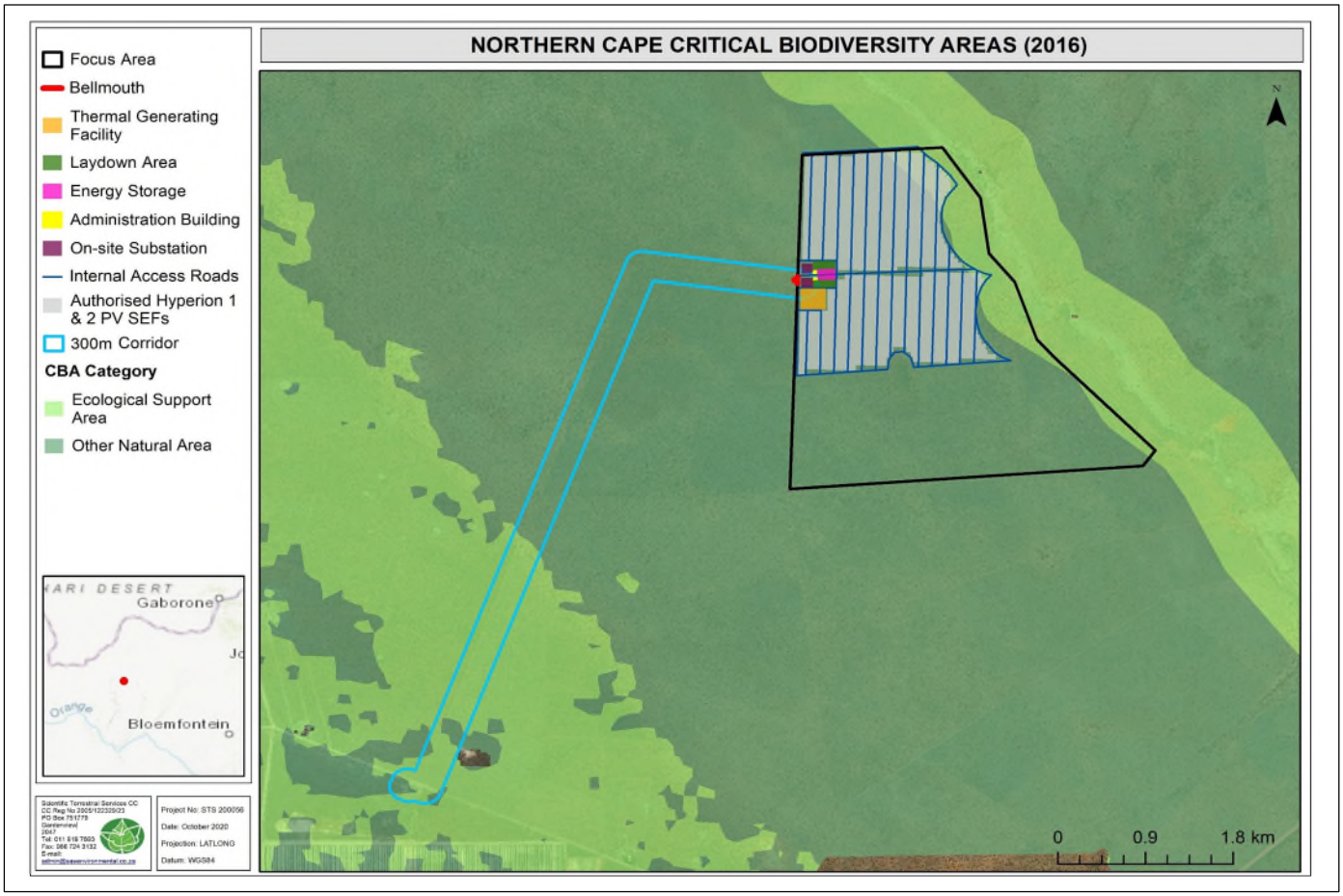

Figure 6.8: Northern Cape Critical Biodiversity areas associated with the study area and associated infrastructure

6.5.3. Avifauna

The bird assemblage recorded within the project site is typical of the Kalahari bioregion. Based on information derived from the South African Bird Atlas Project (SABAP1) approximately 219 bird species are expected to occur within the project site and the surrounding area of which 75 species were recorded within the project site.

The majority of the species consist of small passerines species, compared to non-passerines. Five near-endemic species reported for the broader study area include Fiscal Flycatcher, Karoo Thrush Fairy Flycatcher, Black-headed Canary and Black Harrier of which only the former two widespread species are relatively common in the broader study area.

The most abundant species at the project site was the Scaly-feathered Finch. Other common species which occurred at significantly lower abundances include Black-chested Prinia, Kalahari Scrub-robin and Chestnut-vented. These four species had the highest encounter rates of all detected species within the project site. The remaining species had significantly lower encounter rates, with the most common of these being Violet-eared Waxbill, Ant-eating Chat, Fork-tailed Drongo, Yellow Canary, and Burchell's Sandgrouse (mostly seen flying overhead) (Herman & Todd, 2018).

a) *Conservation Areas, Protected Areas and Important Bird Areas (IBA)*

The project site is situated approximately 156km south east of the Spitskop Dam which is considered to be an IBA. The Kathu Forest Nature Reserve and Protected Woodlands Area are located approximately 6km south of the proposed thermal facility.

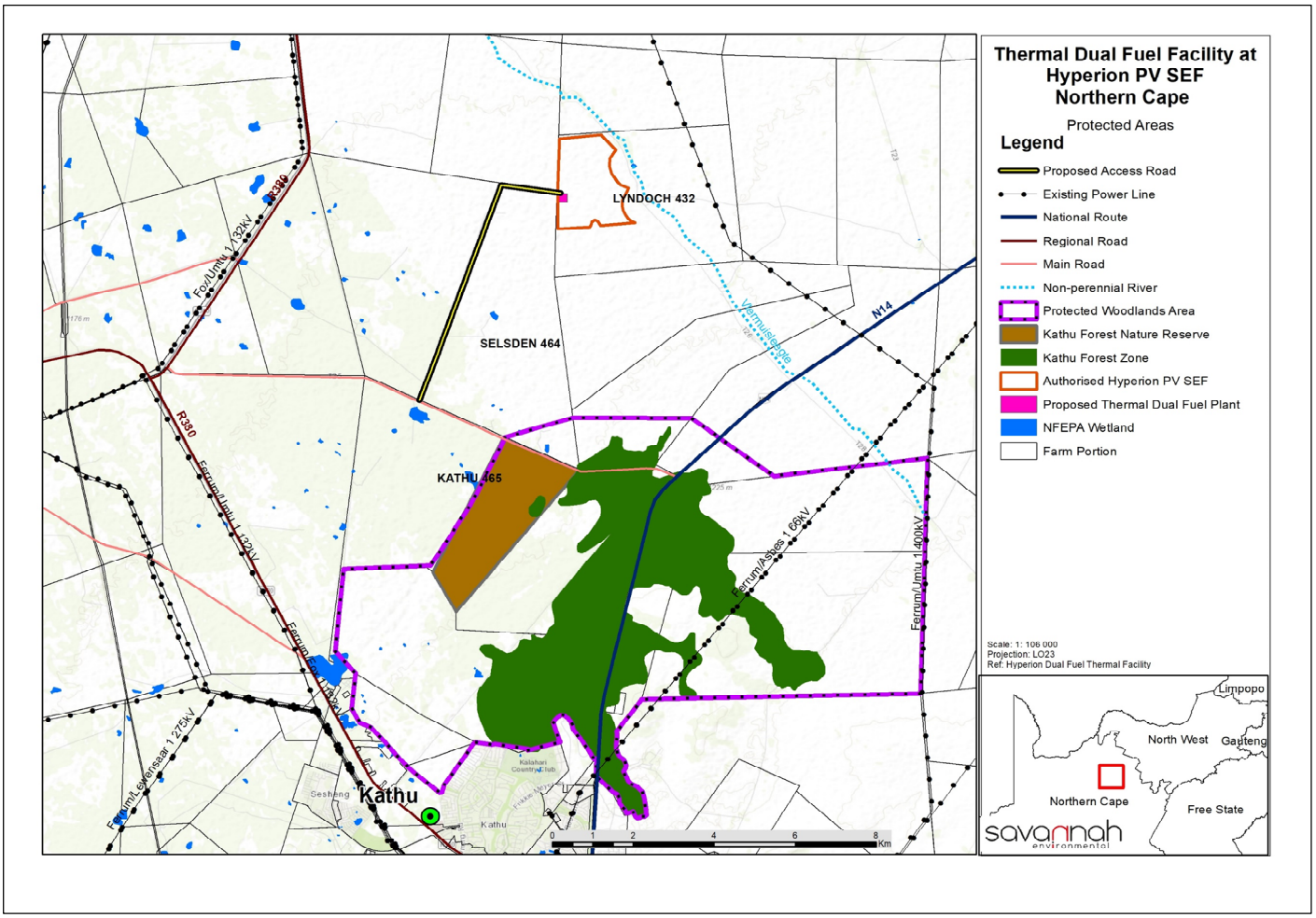

Figure 6.9: Protected areas surrounding the project area

6.6 Visual Considerations

6.6.1. *Landscape Character*

Landscape character is defined as "a distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another". Landscape Character is a composite of a number of influencing factors including:

» Landform and drainage;
» Nature and density of development; and
» Vegetation patterns.

a) *Landform and drainage*

The Vlermuisleegte River is considered to be the main regional drainage feature located in the vicinity of the project site which is a non-perennial river that traverses the centre of the project site. The valley floor falls from southeast to northwest at a gentle gradient of approximately 1:200.

The visual implications of landform include:
» The N14 located approximately 6km to the south of the site at an elevation approximately 30m higher than the proposed project area. It is highly likely that the project will be visible from this road.
» The shallow gradient is likely to indicate that the project will be viewed largely in elevation with little or no extended overview.

b) *Nature and Density of Development*

The population density of the area immediately surrounding the proposed development varies. Kathu is the largest town of five towns within the Gamagara Local Municipality. Rural homesteads were found to have an average occupancy of 4 people. This indicates that there is a rural homestead for approximately every 0.75km^2. Kathu is primarily a rural service centre. It is likely that a proportion of its economy is derived from local mining operations as well as its position on the N14 as it acts as a transit stop for travellers. The town of Kathu also has a regional airport, located approximately 11.7km to the west of the proposed project site.

Given the Province's dry conditions and dependence on irrigation, many Northern Cape farmers are branching out into value-added activities such as game farming. This is apparent in rural areas surrounding the proposed development site as low intensity grazing appears to be mixed with game farming, hunting operations and bush lodges.

Apart from agriculture, mining is the largest industrial activity in the area, especially within the area surrounding Kathu. The Mamatwan Manganese Mine operated by Anglo American is located west of Kathu and south of the proposed project site. In addition to Mamatwan Mine, there are numerous areas of degraded land. It is possible that these areas have resulted from informal mining operations. All major mining activities are a significant distance from the project site and are unlikely to have a significant influence on the character of the landscape surrounding the project.

Visual implications of landcover include the potential that homesteads on adjacent farms these were not identified to have tourism importance.

c) *Vegetation Patterns*

The proposed project is located in a relatively natural area according to Mucina and Rutherford (2006). Vegetation types within the broader study area include:
» Kuruman Thornveld;
» Kathu Bushveld; and
» Kuruman Mountain Bushveld.

All vegetation types are usually open tree and shrub cover with a sparse grass layer. Visual implications include;

- Where the viewer is amongst natural vegetation, it is possible that there will be a degree of screening provided by the natural vegetation.
- Where the viewer is set back from natural vegetation or where ground elevation provides a slightly elevated overview of the landscape, the extent of screening provided by natural vegetation is likely to be limited.

6.6.2. Visual Receptors

Visual Receptors are defined as "individuals and/or defined groups of people who have the potential to be affected by the proposal".

It is possible that an area might be sensitive due to an existing use of the area. The nature of an outlook is generally more critical to areas that are associated with recreation, tourism and in areas where outlook is critical to land values.

Possible visual receptors within the landscape, which due to use, could be sensitive to landscape change include:

- *Point Receptors*: include homesteads that are scattered throughout the area. It is likely that the focus for this area is agricultural production. Unless farms have diversified into the tourism market it is unlikely that this group of receptors will be overly sensitive to the likely landscape change as long as it does not impact on agricultural productivity.
- *Linear Receptors*: include the N14, the R380 and or local routes through the area. The N14 is a primary tourism route. Local routes surrounding the proposed development are likely to be mainly used by local people and relate to agricultural activities. The R380 provides access to mining areas around Hotazel, which is approximately 42km to the north of the proposed project site. This road also links to northern Namibia and probably carries a proportion of tourism traffic. There are existing local roads, which include a minor road that runs to the south and south west of the site and which provides a link between the N14 and the R380 (known as the T25 road).
- *Kathu (Sishen) Airport*: located approximately 11.7km to the southwest of the proposed array. The airport is a regional airport with daily flights to and from O R Tambo.

6.7 Air Quality

Meteorological mechanisms direct the dispersion, transformation and eventual removal of pollutants from the atmosphere. The extent to which pollution will accumulate or disperse in the atmosphere is dependent on the degree of thermal and mechanical turbulence within the earth's boundary layer. This dispersion comprises vertical and horizontal components of motion. The stability of the atmosphere and the depth of the surface-mixing layer define the vertical component. The horizontal dispersion of pollution in the boundary layer is primarily a function of the wind field. The wind speed determines both the distance of downward transport and the rate of dilution of pollutants. The generation of mechanical turbulence is similarly a function of wind speed, in combination with surface roughness. The wind direction, and variability in wind direction, determines the general path pollutants will follow, and the extent of crosswind spreading. The pollution concentration levels therefore fluctuate in response to changes in atmospheric stability, to concurrent variations in the mixing depth, and to shifts in the wind field.

i) Sources of air pollution in the region

The identification of existing sources of emissions in the region and the characterisation of existing ambient pollutant concentrations is fundamental to understand the current air quality of the area. Source types present in the area and the pollutants associated with such source types are noted with the aim of identifying pollutants, which may be of importance in terms of cumulative impact potentials. The source types include:

- Wind-blown dust from exposed or unvegetated areas.
- Fugitive particulate matter entrainment by vehicles travelling on paved and unpaved roads.
- Iron-ore and manganese mining in the vicinity.
- Construction of solar power facilities.

Existing monitoring networks in the area show that baseline ambient particulate concentrations are elevated in Kathu and Sishen.

There are 17 individual homesteads within 10 km of the proposed facility, while nearby residential areas include Kathu (south), Deben (west), and Sishen (south west).

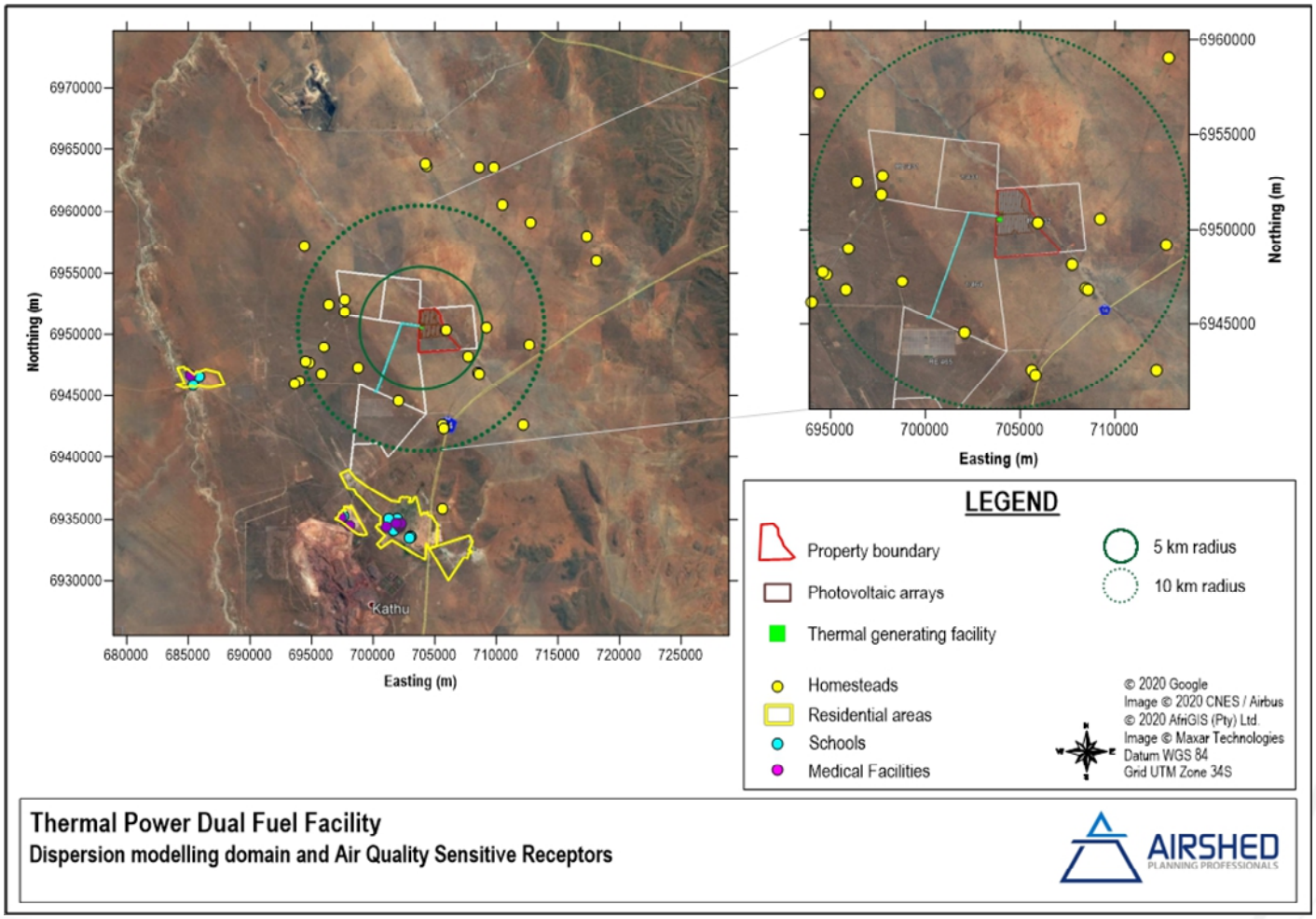

Figure 6.10: Locality map showing proposed project site and nearby AQSRs.

Mining sources

Mining operations within the Kathu area almost exclusively include iron-ore and manganese mining activities. Mining operations represent potentially significant sources of fugitive dust emissions, where the particulate emissions are the main pollutant of concern. Fugitive dust sources associated with sand mining activities include materials handling activities, vehicle-entrainment by haul trucks and wind-blown dust from tailings impoundments and stockpiles.

Transport related emissions

Vehicles, and the airport are included in this category. The main source of concern in the area is vehicle tailpipe emissions. The main national and provincial highways and roads include the N14 to the east of the site.

Miscellaneous sources

Various miscellaneous fugitive dust sources, including agricultural activities, wind erosion of open areas, vehicle-entrainment of dust along paved and unpaved roads are found in the area.

ii) Measured Baseline Ambient Air Quality

Existing monitoring networks in the area show that baseline ambient particulate concentrations are elevated in Kathu and Sishen. The period, day, and night-time wind roses **(Figure 6.11)** depict the predominance of the northerly, north-easterly, and north-westerly winds, however wind direction can be variable. Wind speeds are frequently above 4 m/s and rarely calm (when the wind speeds are lower than 1 m/s). Impacts as a result of the project are expected to be experienced to the south-west.

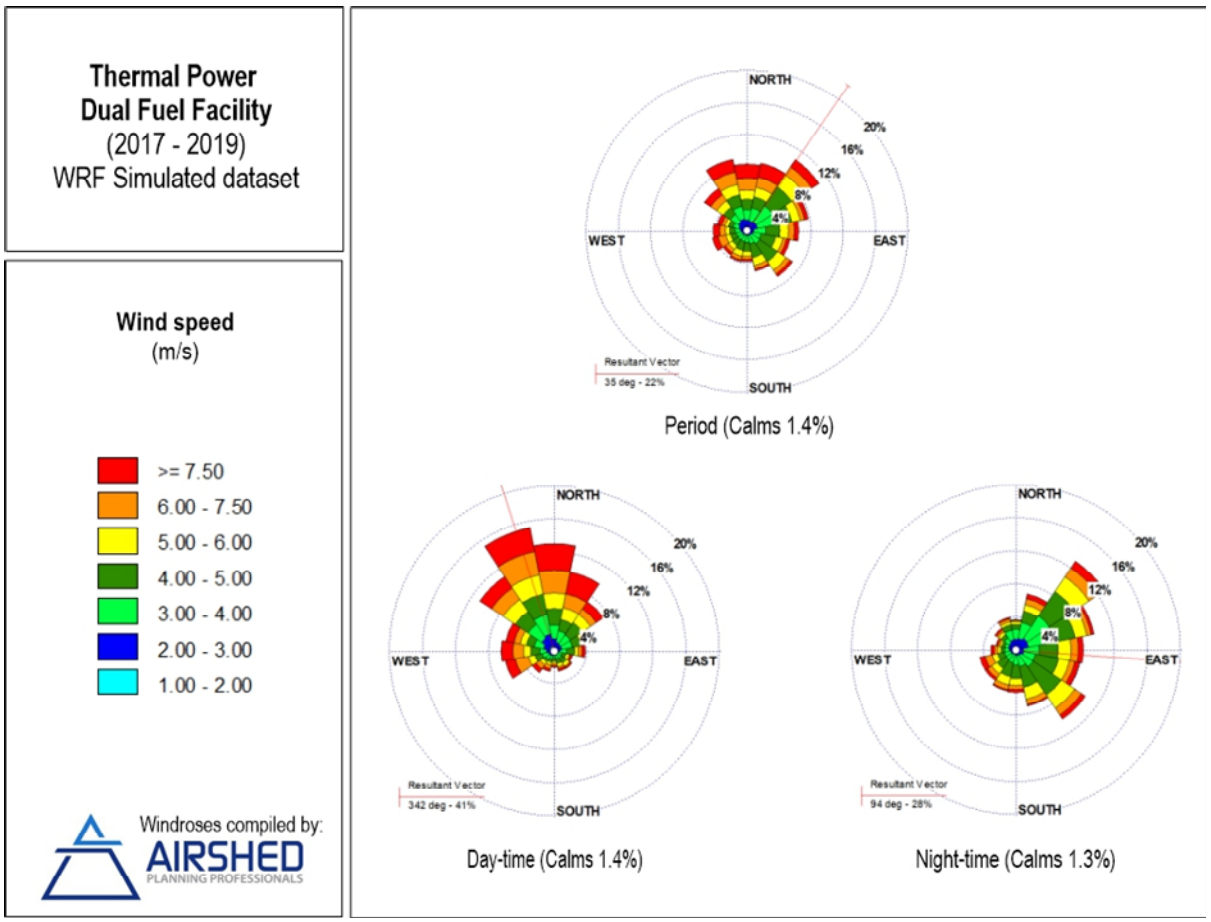

Figure 6.11: Period, day- and night-time wind rose for the proposed project location for the period 2017 - 2019

6.9. Noise

Potential noise-sensitive developments/receptors were identified using tools such as Google Earth® as well as the potential sensitive areas (using the Screening Tool, available at https://screening.environment.gov.za/screeningtool/#/pages/welcome). The closest potential noise-sensitive development (receptors) is highlighted in **Figure 6.12**. The closest potential noise-sensitive receptor is located around 1.95 km from the proposed thermal generation facility.

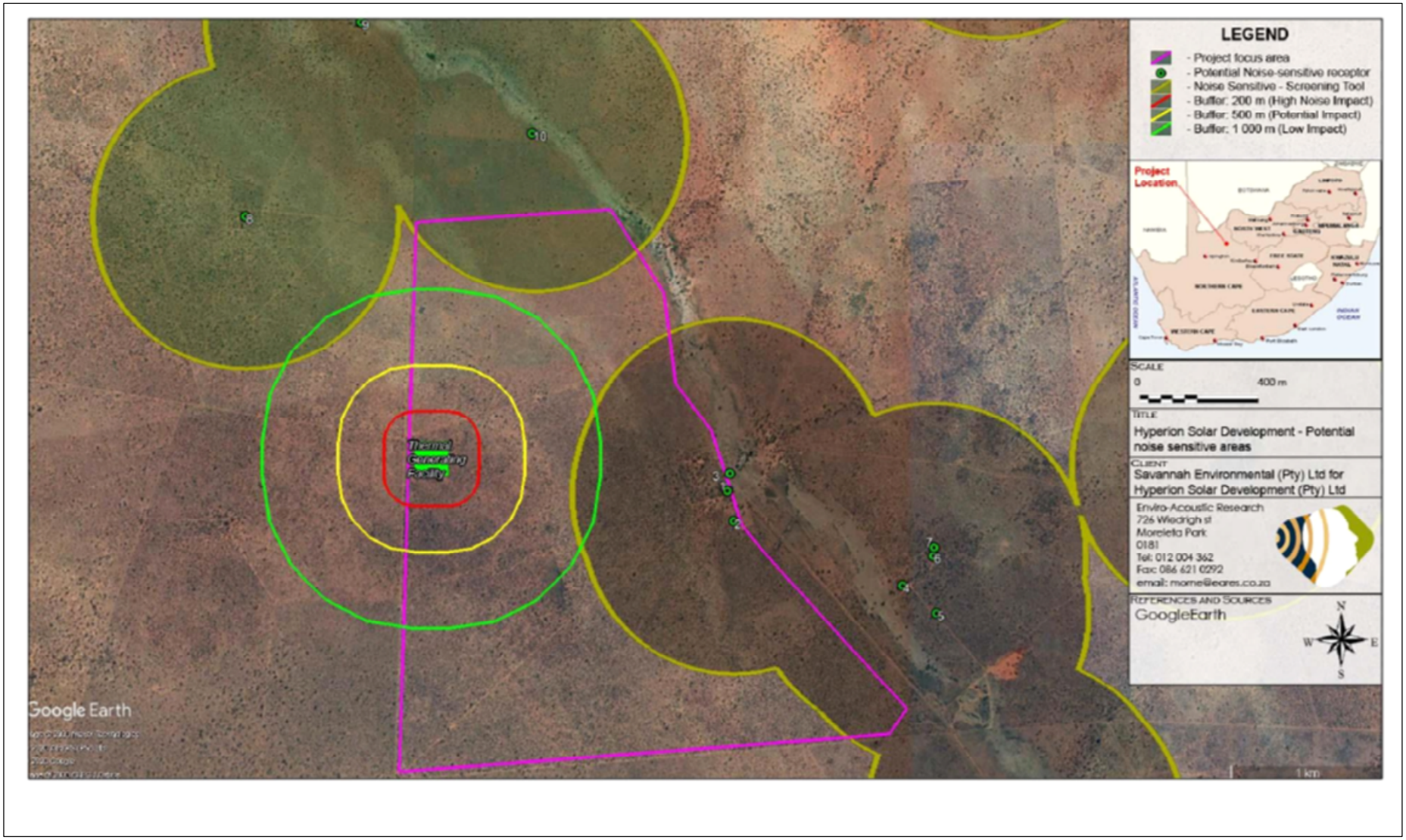

Figure 6.12: Potential Noise Sensitive Areas and identified receptors

There are currently no other noise sources of significance in the area. Based on numerous measurements collected in similar areas, it is expected that ambient sound levels will be typical of a rural noise district with faunal sounds dominating both night and day. Most landowners in the area will consider this to be naturally quiet.

Considering the developmental character, it was selected to assign an acceptable noise rating level of a rural noise district (as per SANS 10103:2008). Typical night-time sound levels will be less than 35 dBA with daytime sound levels being less than 45 dBA (during no, or low wind conditions).

6.10. Heritage features of the region

6.10.1. Heritage and archaeology

The modern town of Kathu dates back to the 1970s when iron ore mining commenced in the area. The former Crown Colony of British Bechuanaland was annexed by the Cape Colony on 16th November 1895. A year later, in December 196 and January 1897, uprisings collectively known as the Langeberg Rebellion broke out in the area. Over the following months the Tlhaping and Tlharo took root in the Langeberg Mountains, west of modern-day Kathu, and were only suppressed by the Government in August 1897. The discontent among the Tlhaping and Tlharo people had arisen years earlier when, in 1884, approximately 75% of their land was taken away from them. Two years later the Land Commission met to settle land claims after the demise of the Boer Republics of Stellaland and Goshen, but little was done to help the Tlhaping and Tlharo people. Although ten (10) Native Reserves were proclaimed, 1400 square miles of crown land was made available for white settlement which created further friction and unhappiness. In addition to the loss of land, the Tswana chiefs were also losing their authority. Eventually, on 27 November 1896, seventeen head of cattle strayed out of the Taungs Reserve and were shot which appears to have been the critical moment when the rebellion began.

Several Kathu sites, together known as the Kathu Complex, have been formally graded as a Grade 1 heritage resource indicating that the collection of sites has been accorded national significance. An endemic camel-thorn tree forest situated north of the town of Kathu was registered as a National Heritage site in 1995. This forest has also been declared a protected woodland in terms of Section 12(1) (c) of the NFA (No. 84 of 1998). The area surrounding Kathu is most well-known for the extensive deposits of Early Stone Age (ESA) material that have been described in literature. The archaeological resources within and beyond the proposed declaration area are under continued threat from development in the vicinity. Archaeology within the surrounding area tends to be physically associated with gravel deposits. South of Kathu, the surface sands are underlain directly by calcrete rather than gravel. The lack of known archaeological sites near the project site does not indicate a lack of archaeological deposits north of Kathu. This paucity is more of a reflection of this area being largely unexamined by archaeologists.

The following features of heritage significance have been identified within close proximity to the project site:

» Kathu Pan;
» Kathu Townlands;
» Nature and density of development; and
» Vegetation patterns

These sites indicate that archaeological materials are fairly widespread around Kathu and the area is best regarded as an archaeological landscape rather than a collection of individual sites.

a) Kathu Pan:

The Kathu Pan was discovered in 1974 and is the most studied and best-known heritage site in the area. The site is a natural sinkhole located within a large pan that, under natural conditions, would have filled with water during the summer (owing to the rising water table during the summer rainy season) and become a valuable water supply for prehistoric populations (Van Zinderen Bakker 1995). A sequence of Early Stone Age (ESA) deposits including some Fauresmith material and evidence for the onset of the Middle Stone Age (MSA) some 500 000 years ago (Wilkins 2013) have been identified at the site. Wilkins *et al.* (2012) have studied fracture patterns on points from the site and determined that they were used in a hafted manner as spear tips. The site has also yielded very early evidence for blade production (Wilkins & Chazan 2012). Faunal remains, including remains of species such as hippopotamus have been preserved at the site, which is unusual for Kathu.

b) Kathu Townlands:

The Kathu Townlands is situated across the surface of a low rise within the boundary of the town of Kathu. It was first reported in 1980 and had initial excavations carried out by Beaumont in 1982 and 1990 (Beaumont 1990). Due to the proposed development on the site, mitigation work was carried out to enable a better understanding of the deposits identified on the site (Walker *et al.* 2013). The archaeological material occurred within a dense accumulation of banded iron formation (BIF) rubble with a sandy matrix directly over bedrock. The artefacts from both the Beaumont and Walker excavations lack evidence of water transport, but damage to the artefacts does indicate mechanical damage through redeposition subsequent to the ESA occupation (Walker *et al.* 2014).

c) Bestwood:

Archaeological sites were first reported at Bestwood by Dreyer (2008) after which further research was undertaken by Chazan *et al.* (2012). Bestwood 1 and Bestwood 2 provide an indication of a larger landscape of artefacts that have been exposed by sand quarrying activity within in a sandy valley. A third site, Bestwood 3, is located on the hilltop along the east side of this valley. Initial investigation at Bestwood 1 revealed a lithic industry characterised by well-made hand-axes, well-retouched scrapers, occasional blades and a great diversity of core types (Chazan *et al.* 2012:331).

Excavations at Bestwood 1 demonstrated that material is present *in situ* in a single horizon beneath the covering sands Walker *et al.* (2013). This horizon is similar to the surface exposures at Bestwood 3 and Uitkoms 1 in terms of artefacts. Considering these observations (as well as other currently unpublished work done at Bestwood), it seems that the archaeological deposit extends beyond the limits of the quarries, across the landscape and connects the two hilltop exposures as a continuous horizon.

d) Uitkoms:

Various archaeological artefacts have been identified within the farm Uitkoms situated north east of Kathu. Beaumont has named these occurrences as Uitkoms 1, 2, 3 and 4. Uitkoms 1 appears to be similar to Kathu

Townlands 1 in terms of artefact density and debitage frequency, but occurs on a hilltop. Uitkoms 4 is largely buried beneath surface sands in a manner similar to Bestwood 1 and 2, where bifaces are very similar to those from the quarries, but with a formal tool incidence about a thousand times higher (Beaumont 2008b:3). In 2006, two road cuttings along the N14 towards Kuruman contain ESA artefacts in a thin rubble of jaspilite and below red sand. One of these, Uitkoms 3, suggests that the Uitkoms 1 extends over the north western side of the Kathu hill. Uitkoms 2 could represent the extreme western limit of a site that may range over two upslope hills on Hartnolls (Beaumont, 2007).

6.11. Palaeontology (Fossils)

The project site is underlain by Late Cenozoic continental sediments of the Kalahari Group, thick calcretes of the Mokolanen Formation and gravels of the Obobogorop Formation and red Kalahari aeolian sands of the Gordonia Formation. Small inliers of Precambrian (Proterozoic) basaltic to andesitic lavas of the Ongeluk Formation crop out in the north-central and southern portions of the project site. These volcanic rocks form the basement to the Cenozoic Kalahari Group sediments in the region.

Proterozoic (Precambrian) volcanic bedrocks of the Ongeluk Formation are entirely unfossiliferous. The overlying Kalahari Group deposits in the surrounding Kathu area are considered to be of generally low palaeontological sensitivity (Almond 2014, 2015a, 2015b, Pether 2011), although localised areas of high sensitivity may occur. The main palaeontological heritage concern associated with the project site would be Quaternary mammalian remains (bones, teeth and horncores), trace fossils and plant fossils associated with solution hollows as well as ancient pan or *vlei* deposits along drainage lines, such as have been recorded from the well-known Kathu Pan site situated approximately 5.5.km north west of town of Kathu (Beaumont 1990, Beaumont 2004, Beaumont *et al.* 1984) (See also Almond 2013a, 2013b).

The geology of the Kathu region is indicated on 1:250 000 geological map 2722 Kuruman for which a sheet explanation has not yet been published (refer to **Figure 6.13)**. The thermal generator site and the vast majority of the access road are of moderate palaeontological sensitivity with only the very southern end of the access road being of high sensitivity.

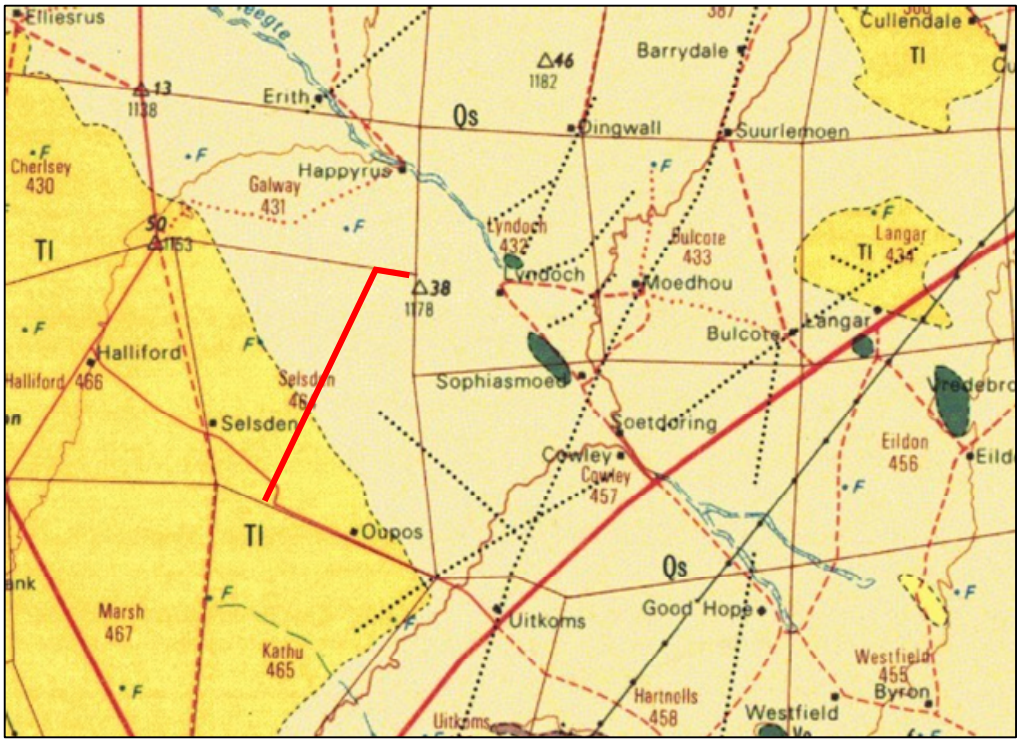

Figure 6.13. Extract from the 1:250 000 geological map 2722 showing the location of the proposed generator (green polygon) and access road (red line). Tl (yellow) indicates calcretes (surface limestone) of the Kalahari Group, while Qs (pale orange) denotes aeolian sands of the Gordonia Formation, Kalahari Group

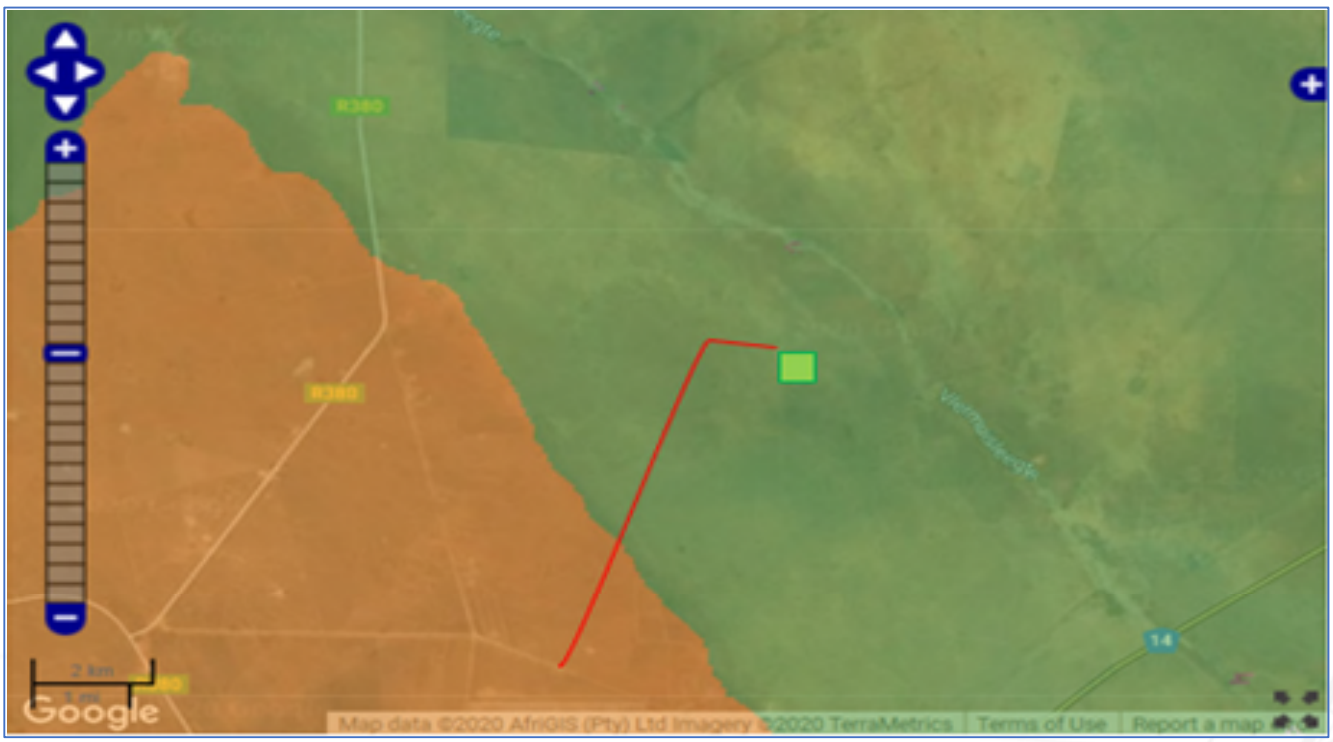

Figure 6.14. Palaeosensitivity map showing the study area to be of moderate (green shading) to high (orange shading) sensitivity.

6.12. Social Characteristics of the Broader Study Area and the Project Site

The following is a baseline summary of the socio-economic profile of the Gamagara Local Municipality within which the thermal generation facility is proposed:

- The Gamagara LM covers an area of land approximately 2 619km² in extent, and comprises five towns, namely: Kathu, Shesheng, Dibeng, Dingleton, and Olifantshoek. The town of Kathu is the largest within the LM and the administrative centre of the LM.
- The population of the Gamagara LM in 2011 was 41 617. There is no data from the 2016 Community Household Survey for the GLM. Of this total, 29.9% were under the age of 18, 67.5% were between 18 and 64, and the remaining 2.6% were 65 and older. The population of Ward 7 in 2011 was 1 529. Of this total, 20.3% were under the age of 18, 74.1% were between 18 and 64, and the remaining 5.6% were 65 and older. The Gamagara LM and Ward 17 therefore have a high percentage of the population that fall within the economically active group of 18-65 compared to the JTGDM and Northern Cape (55.1% and 58.5% respectively). 2001 and 2011 the Gamagara LM experienced a positive population growth rate of 5.8% per year, almost doubling in size from 23 202 people in 2001 to 41 617 people in 2011.
- Black Africans comprise the predominant population group within the Gamagara LM, John Taolo Gaetsewe DM, and Northern Cape Province.
- The Gamagara LM, John Taolo Gaetsewe DM, and Northern Cape Provincial population age structures are youth dominated. A considerable proportion of the respective populations therefore comprise individuals of the economically active population between the ages of 15 – 64.
- The Gamagara LM has a dependency ratio of 48%, which is considerably lower than the John Taolo Gaetsewe DM (63.3%), Northern Cape Province (55.7%), and South Africa (52.7%) as a whole.
- In terms of education levels, the percentage of the population over 20 years of age in the GLM and Ward 7 with no schooling was 9.9% and 10.4% (2011) respectively, compared to 11.1% for the Northern Cape Province in 2011. The percentage of the population over the age of 20 with matric was 29.5% and 34.6% respectively, compared to 25.2% for the Northern Cape.
- The figures for Ward 7 in 2011 were 7% unemployed 77.1% employed, 14.3% not economically active and 1.6% discouraged work seekers. The unemployment rates for the GLM and Ward 7 are lower than the Provincial rate of 14.5% and the District rate of 13.5%. This reflects the key role played by the mining sector in the Gamagara LM.
- Household income levels in the LM are higher than the DM, province and South Africa as a whole, with a lower proportion of low income earners, and higher proportion of high income earners. The area can therefore be expected to have a lower poverty level with associated social consequences such as not being able to pay for basic needs and services, and poor living conditions than that of the DM and Northern Cape Province.
- The primary economic activities within the Gamagara LM include mining, game farming, and business services.
- The majority of households within the Gamagara LM comprise formal brick dwellings.
- The majority of households within the Gamagara LM are well serviced with regards to electricity, water, sanitation, and refuse removal.

CHAPTER 7: APPROACH TO UNDERTAKING THE SCOPING PHASE

In terms of the EIA Regulations of December 2014 (published in terms of the National Environmental Management Act (NEMA; No. 107 1998), as amended, the construction and operation of the proposed facility is a listed activity requiring environmental authorisation. This Scoping process for the proposed thermal generation facility is being undertaken in accordance with the Section 24 (5) of the National Environmental Management Act (No 107 of 1998). In accordance with these Regulations, this Scoping process aims at identifying and describing potential issues associated with the proposed project and defining the extent of studies required within the EIA phase. This was achieved through an evaluation of the proposed project involving desk-top specialist inputs, as well as a consultation process with the Interested and Affected Parties (I&APs), including the decision making authority, directly impacted landowners/occupiers, adjacent landowners/occupiers, relevant organs of state departments, ward councillors and other key stakeholders. This chapter serves to outline the process which was followed during the Scoping Phase of the EIA process.

7.1. Legal Requirements as per the EIA Regulations for the undertaking of a Scoping Report, 2014 (as amended)

This chapter of the scoping report includes the following information required in terms of Appendix 2: Content of the Scoping Report:

Requirement	Relevant Section
(d) a description of the scope of the proposed activity, including (i) all listed and specified activities triggered and (ii) a description of the activities to be undertaken, including associated structures and infrastructure	All relevant listed activities triggered by the development of the thermal power facility and a description of the activities which form part of the development of the thermal generation facility have been included in section 7.2 and Table 7.2.
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 considered in the assessment process;	The specific environmental legislation and policies applicable to the development are considered in Table 7.1.
(g)(ii) details of the public participation process undertaken in terms of Regulation 41 of the Regulations, including copies of the supporting documents and inputs	The details of the public participation process undertaken as part of the EIA process for the thermal generation facility has been described and is included in section 7.3.2.
(g)(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them	A summary of the issues raised by I&APs has been included in section 7.3.2. A Comments and Responses report including all comments and responses has been included in **Appendix C8**.

7.2. Legislation and Guidelines that have informed the preparation of this Scoping Report

The following legislation and guidelines have informed the scope and content of this Scoping Report:

- National Environmental Management Act (Act No. 107 of 1998)
- EIA Regulations of December 2014, published under Chapter 5 of NEMA (as amended in GNR R326 in Government Gazette No 40772 of April 2017)
- International guidelines – the Equator Principles and the International Finance Corporation and World Bank Guidelines.

Several other Acts, standards or guidelines have also informed the project process and the scope of issues evaluated in the scoping report, and are to be addressed in the EIA. A listing of relevant legislation is provided in **Table 7.1**. A more detailed review of legislative requirements applicable to the thermal generation facility will be included in the EIA phase.

Table 7.1: Initial review of the relevant environmental policies, legislation, guidelines and standards applicable to the thermal generation facility EIA

Legislation	Applicable Sections
	National Legislation
Constitution of the Republic of South Africa (Act No 108 of 1996)	» Bill of Rights (S2) » Environmental Rights (S24) – i.e. the right to an environment which is not harmful to health and well-being » Rights to freedom of movement and residence (S22) » Property rights (S25) » Access to information (S32) » Right to just administrative action (S33) » Recognition of international agreements (S231)
National Environmental Management Act (Act No 107 of 1998)	» National environmental principles (S2), providing strategic environmental management goals and objectives of the government applicable throughout the Republic to the actions of all organs of state that may significantly affect the environment » NEMA EIA Regulations (GN 324 – 327 of December 2014, as amended in April 2017) » The requirement for potential impact on the environment of listed activities must be considered, investigated, assessed and reported on to the competent authority (S24 – Environmental Authorisations) » Duty of Care (S28) requiring that reasonable measures are taken to prevent pollution or degradation from occurring, continuing or recurring, or, where this is not possible, to minimise & rectify pollution or degradation of the environment » Procedures to be followed in the event of an emergency incident which may impact on the environment (S30) » Appeals against decisions made by authorities (S43)
Environment Conservation Act (Act No 73 of 1989)	» National Noise Control Regulations (GN R154 dated 10 January 1992)
National Noise Control Regulations (of 10 January 1992)	» In terms of Section 25 of the ECA, the national noise-control regulations (GN R154 in Government Gazette No. 13717 dated 10 January 1992) were promulgated. The NCRs were revised under Government Notice Number R. 55 of 14 January 1994 to make it obligatory for all authorities to apply the regulations. » Subsequently, in terms of Schedule 5 of the Constitution of South Africa of 1996, legislative responsibility for administering the noise control regulations was devolved to provincial and local authorities. Provincial Noise Control Regulations exist in the Free State, Western Cape and Gauteng provinces.
National Heritage Resources Act (Act No 25 of 1999)	» Stipulates assessment criteria and categories of heritage resources according to their significance (S7) » Provides for the protection of all archaeological and palaeontological sites, and meteorites (S35)

Legislation	Applicable Sections
	» Provides for the conservation and care of cemeteries and graves by SAHRA where this is not the responsibility of any other authority (S36) » Lists activities which require developers any person who intends to undertake to notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development (S38) » Requires the compilation of a Conservation Management Plan as well as a permit from SAHRA for the presentation of archaeological sites as part of tourism attraction (S44)
National Environmental Management: Biodiversity Act (Act No 10 of 2004)	» Provides for the MEC/Minister to identify any process or activity in such a listed ecosystem as a threatening process (S53) » A list of threatened and protected species has been published in terms of S 56(1) - Government Gazette 29657. » Three government notices have been published, i.e. GN R 150 (Commencement of Threatened and Protected Species Regulations, 2007), GN R 151 (Lists of critically endangered, vulnerable and protected species) and GN R 152 (Threatened or Protected Species Regulations). » Provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, (G 34809, GN 1002), 9 December 2011). » This Act also regulates alien and invader species (GN 37886 of August 2014).
National Environmental Management: Air Quality Act (Act No 39 of 2004)	» S18, S19 and S20 of the Act allow certain areas to be declared and managed as "priority areas". » Declaration of controlled emitters (Part 3 of Act) and controlled fuels (Part 4 of Act) with relevant emission standards. » The Act provides that an air quality officer may require any person to submit an atmospheric impact report if there is reasonable suspicion that the person has failed to comply with the Act. » Dust control regulations promulgated in November 2013 may require the implementation of a dust management plan. » Government Gazette 37054 of 22 November 2013 provides a list of activities which require an Air Emissions License and provides the emission thresholds that need to be complied with.
Conservation of Agricultural Resources Act (Act No 43 of 1983)	» Prohibition of the spreading of weeds (S5). » Classification of categories of weeds & invader plants (Regulation 15 of GN R1048) & restrictions in terms of where these species may occur.

Legislation	Applicable Sections
	» Requirement & methods to implement control measures for alien and invasive plant species (Regulation 15E of GN R1048).
National Water Act (Act No 36 of 1998)	» Under S21 of the Act, water uses must be licensed unless such water use falls into one of the categories listed in S22 of the Act or falls under the general authorisation. » In terms of S19, the project proponent must ensure that reasonable measures are taken throughout the life cycle of the project to prevent and remedy the effects of pollution to water resources from occurring, continuing, or recurring. » National Government is the public trustee of the Nation's water resources (S3) » Entitlement to use water (S4) – entitles a person to use water in or from a water resource for purposes such as reasonable domestic use, domestic gardening, animal watering, fire-fighting and recreational use, as set out in Schedule 1 » Duty of Care to prevent and remedy the effects of pollution to water resources (S19) » Procedures to be followed in the event of an emergency incident which may impact on a water resource (S20) » Definition of water use (S21) » Requirements for registration of water use (S26 and S34) » Definition of offences in terms of the Act (S151) » GNR 509 of 2016 provides the requirements for General Authorisation relating to impeding or diverting the flow of water in a watercourse (section 21(c)) or altering the bed, banks, course or characteristics of a watercourse (section 21(i)) » GNR 267 of 2017 provides Regulations regarding the Procedural Requirements for Water Use Licence Applications and Appeals' including Section 21(b) for the storage of water in dams or reservoirs, section 21(f) for the discharge of water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit, Section 21(g) for the disposal of waste in a manner which may detrimentally impact of a water resource and Section 21 (h) for the disposal in any manner of water which contains waste from or which has been heated in any industrial or power generation process.
National Environmental Management: Waste Act (Act No 59 of 2008)	» The Minister may by notice in the Gazette publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. » In terms of the regulations published in terms of this Act (GN 921 of November 2013), a Basic Assessment or Environmental Impact Assessment is required to be undertaken for identified listed activities in support of an application for Waste Management Licenses. » The storage of waste must be undertaken in terms of the relevant norms and standards.
National Forests Act (Act No 84 of 1998)	» According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that 'no person may cut, damage, disturb, destroy or remove any

Legislation	Applicable Sections
	protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a license granted by the Minister'. » GN 908 of 21 November 2014 provides a list of protected tree species.
The Hazardous Substances Act No. 15 of 1973	» This Act was promulgated to provide for the control of substances which may cause injury or ill-health to, or death of, humans by reason of their toxic, corrosive, irritant, strongly sensitising or flammable nature. » The Hazardous Substances Act also provides for matters concerning the division of such substances or products into groups in relation to the degree of danger, the prohibition and control of the importation, manufacture, sale, use, operation, application and disposal of such substances and products.
Major Hazardous Installation Regulations	» The regulations make the employer responsible for the health and safety of his employees as well as the public in or in the vicinity of the workspace where the installation has taken place.
Provincial Legislation	
Northern Cape Nature Conservation Act, Act No. 9 of 2009	» The Act provides lists of protected species for the Province
Guideline Documents / Standards / Plans	
South African National Standard (SANS) 10328, Methods for environmental noise impact assessments in terms of NEMA No. 107 of 1998	» Prediction of impact that noise emanating from a proposed development would have on occupants of surrounding land by determining the rating level. » Noise limits are based on the acceptable rating levels of ambient noise contained in SANS 10103.
South African Bureau of Standards (SABS)	» Four South African Bureau of Standards (SABS) scientific standards are considered relevant to noise from a Power Station. They are: * SANS 10103:2008. 'The measurement and rating of environmental noise with respect to annoyance and to speech communication'. * SANS 10210:2004. 'Calculating and predicting road traffic noise'. * SANS 10328:2008. 'Methods for environmental noise impact assessments'. * SANS 10357:2004. 'The calculation of sound propagation by the Concave method'. » The relevant standards use the equivalent continuous rating level as a basis for determining what is acceptable. The levels may take single event noise into account, but single event noise by itself does not determine whether noise levels are acceptable for land use purposes. The recommendations that the standards make are likely to inform decisions by authorities, but non-compliance with the standards will not necessarily render an activity unlawful per se.
SANS 69 - South African National Standard - Framework for setting & implementing national ambient air quality standards, SANS	» The South African Bureau of Standards (SABS), through a technical committee, developed ambient air quality limits based on international best practice for particulate matter less than 10 µm in aerodynamic

Legislation	Applicable Sections
1929 - South African National Standard - Ambient Air Quality - Limits for common pollutants.	diameter (PM10), dust fallout, sulphur dioxide, nitrogen dioxide, ozone, carbon monoxide, lead and benzene. » These ambient limits were derived from international best practice and what was regarded to be achievable in the South African context, taking both the natural environment and socio-economic status into account. The SANS limits informed the newly promulgated SA Standards
IFC Air Emissions and Ambient Air Quality. Environmental, Health and Safety Guidelines. Washington DC, International Finance Corporation	» The World Bank group through the IFC has emission guidelines for power plants. These guidelines are applicable to new facilities. Please note that the emission values are normalised to 6% excess oxygen, while the South African standards are normalised to 10% excess oxygen.
IFC EHS Guideline for Thermal generation facilities	» The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards. » The guideline includes information relevant to combustion, gasification or pyrolysis processes fuelled by gaseous, liquid and solid fossil fuels and biomass and designed to deliver electrical or mechanical power, steam, heat, or any combination of these, regardless of the fuel type (except for solid waste which is covered under a separate Guideline for Waste Management Facilities), with a total rated heat input capacity equal to or above 50 Megawatt thermal input (MWth). It applies to boilers, reciprocating engines, and combustion turbines in new and existing facilities. » As described in the introduction to the General EHS Guidelines, the general approach to the management of EHS issues in industrial development activities, including power plants, should consider potential impacts as early as possible in the project cycle, including the incorporation of EHS considerations into the site selection and plant design processes in order to maximize the range of options available to prevent and control potential negative impacts.
International Finance Corporation (IFC) Performance Standards and Environmental and Social Sustainability (January 2012)	» The International Finance Corporation's (IFC) Performance Standards (PSs) on Environmental and Social Sustainability were developed by the IFC and were last updated on 1 January 2012. » Performance Standard 1 requires that a process of environmental and social assessment be conducted, and an ESMS appropriate to the nature and scale of the project, and commensurate with the level of its environmental and social risks and impacts, be established and maintained. The above-mentioned standard is the overarching standard to which all the other standards relate. Performance Standard 2

Legislation	Applicable Sections
	through to 8 establish specific requirements to avoid, reduce, mitigate or compensate for impacts on people and the environment, and to improve conditions where appropriate. While all relevant social and environmental risks and potential impacts should be considered as part of the assessment, the standards 2 and 8 describe potential social and environmental impacts that require particular attention specifically within emerging markets. Where social or environmental impacts are anticipated, the developer is required to manage them through its ESMS consistent with Performance Standard 1. » Given the nature of the thermal power dual fuel facility, its associated infrastructure and taking into consideration the functioning of the hybrid facility, it is anticipated (at this stage of the process) that Performance Standards 1, 2, 3, 4, 6, and 8 may be applicable to the project.
The Equator Principles (June 2003)	» The Equator Principles (EPs) are a voluntary set of standards for determining, assessing and managing social and environmental risk in project financing. Equator Principles Financial Institutions (EPFIs) commit to not providing loans to projects where the borrower will not or is unable to comply with their respective social and environmental policies and procedures that implement the EPs. » The Equator Principles were developed by private sector banks. The banks choose to model the Equator Principles on the environmental standards of the World Bank and the social policies of the International Finance Corporation (IFC).

7.3. Relevant Listed Activities

In terms of the EIA Regulations, 2014, of GN R324, GN R325 and GN R327, the following 'listed activities' are triggered by the proposed facility:

Table 7.2: Listed activities triggered by the thermal generation facility and associated infrastructure

Indicate the number and date of the relevant notice:	Activity No (s) (in terms of the relevant notice) :	Describe each listed activity as per project description
GN 327, 08 December 2014 (as amended on 07 April 2017)	11	The development of facilities or infrastructure for the transmission and distribution of electricity— (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts ***The project includes the construction and operation of a substation with a capacity less than 275kV.***
GN 327, 08 December 2014 (as amended on 07 April 2017)	12	The development of – (ii) Infrastructure or structures with a physical footprint of 100 square metres or more Where such development occurs- (a) within a watercourse (c) within 32 metres of a watercourse ***The 300m corridor for the proposed access road falls within 32 meters of watercourses and pans near the project site.***
GN 327, 08 December 2014 (as amended on 07 April 2017)	24(ii)	The development of a road— (ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres ***An access road will be developed to the thermal facility which will be 8 km in length, paved or tarred at a width of approximately 8m-12m***
GN 325, 08 December 2014 (as amended on 07 April 2017)	2	The development and related operation of facilities or infrastructure for the generation of electricity from a non-renewable resource where the electricity output is 20 megawatts or more ***The thermal facility will have an installed generating capacity of up to 75MW and use LPG or Diesel as a fuel source.***
GN 325, 08 December 2014 (as amended on 07 April 2017)	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 500m^3 ***The storage of dangerous goods (e.g.; oils, diesel, and LPG storage tanks) will be required. The combined capacity of the containers will be more than 500m^3.***

Indicate the number and date of the relevant notice:	Activity No (s) (in terms of the relevant notice) :	Describe each listed activity as per project description
GN 325, 08 December 2014 (as amended on 07 April 2017)	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 the national or provincial legislation governing the generation or release of emissions, pollution or effluent. ***The development of the 75MW facility will require an air emissions license as per the NEM:AQA.***

On the basis of the above listed activities, a Scoping and EIA process is required to be undertaken for the development. This process is to be undertaken in two phases as follows:

- The Scoping Phase includes the identification and description of potential impacts associated with the proposed project through a desktop study and consultation with affected parties and key stakeholders. This phase considers the activities within the broader site, as well as project alternatives in order to determine which should be assessed in more detail in the EIA Phase. Following the public review period of the Scoping report, this phase culminates in the submission of a final Scoping Report and Plan of Study for EIA to the competent authority for acceptance and approval to continue with the EIA phase of the process.
- The EIA Phase involves a detailed assessment of potentially significant positive and negative impacts (direct, indirect, and cumulative) identified in the Scoping Phase. This phase considers a proposed development footprint and includes detailed specialist investigations (including field surveys), consideration of feasible alternatives and public consultation. Recommendations of practical and achievable mitigation and management measures are included in an Environmental Management Programme (EMPr) considering all phases of the project. Following a review of the EIA report and EMPr by stakeholders, this phase culminates in the submission of a Final EIA Report and EMPr to the competent authority for review and decision-making.

7.3. Objectives of the Scoping Phase

This Scoping Phase aims to:

- Identify, describe and evaluate potential environmental (biophysical and social) impacts and benefits of all phases of the proposed facility (including design, construction, operation and decommissioning) within the site through a desk-top review of existing baseline data and desk-top specialist studies.
- Identify potentially sensitive environmental features and areas within the broader site in order to inform the preliminary design process of the facility.
- Define the scope of studies to be undertaken within the EIA process.
- Provide the authorities with sufficient information in order to make a decision regarding the scope of issues to be addressed in the EIA process, as well as regarding the scope and extent of specialist studies that will be required to be undertaken as part of the EIA Phase of the process.

Within this context, the objectives of this Scoping Phase are to, through a consultative process:

- Identify the policies and legislation relevant to the project.
- Motivate the need and desirability of the proposed project, including the need and desirability of the activity in the context of the preferred location.
- Identify and confirm the preferred project and technology alternative.
- Identify and confirm the preferred site.
- Identify the key issues to be addressed in the EIA 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 project will impose on the preferred site through the life of the project, including the nature, significance, consequence, extent, duration and probability of the impacts to inform the location of the development footprint within the preferred site.
- 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.

7.4. Overview of the Scoping Phase

Key tasks undertaken within the scoping phase included:

- Consultation with relevant decision-making and regulating authorities (at National, Provincial and Local levels).
- Submission of the completed application for authorisation to the competent authority (i.e. the National DEFF) in terms of Regulations 5 and 16 of the EIA Regulations 2016, as amended in April 2017 (GNR326).
- Undertaking a public participation process throughout the Scoping phase in accordance with Chapter 6 of GNR326 in order to identify issues and concerns associated with the proposed project.
- Undertaking of independent specialist studies in accordance with Appendix 6 of GNR326.
- Preparation of a Scoping Report and Plan of Study for EIA in accordance with the requirements of Appendix 2 of GN R326.
- Preparation of a Comments and Responses Report detailing key issues raised by I&APs as part of the Scoping phase.

The tasks are discussed in detail below.

7.4.1. Authority Consultation and Application for Authorisation

In terms of Government Notice 779 of 01 July 2016, the National Department of Environment, Forestry and Fisheries (DEFF) is the competent authority for all energy related projects. As the project is located within the Northern Cape Province, the Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform (DAEARD & LR) is the commenting authority for the project. Consultation with these authorities will be undertaken throughout this Scoping phase. To date, this consultation has included the following:

- Submission and approval of the public participation plan;
- Submission of the application for authorisation to DEFF;
- Submission of this Scoping Report for review by I&APs, the Organs of State and the competent and commenting authorities.

A record of all authority correspondence undertaken prior to and within the Scoping Phase is included in **Appendix C4** and **Appendix C5**.

7.4.2. Public Participation Process

Public participation is an essential and regulatory requirement for an environmental authorisation process and is guided by Regulations under NEMA, specifically the EIA Regulations. The sharing of information forms the basis of the public participation process and offers the opportunity to Interested and Affected Parties (I&APs) to become actively involved in the EIA Process from the outset. The public participation process is designed to provide sufficient and accessible information to I&APs in an objective manner to assist them to achieve the following:

During the Scoping Phase

- identify issues of concern and suggestions for enhanced benefits;
- verify that their issues have been recorded;
- assist in identifying reasonable alternatives; and
- contribute relevant local information and knowledge to the environmental assessment.

During the EIA Phase

- contribute relevant local information and knowledge to the environmental assessment;
- verify that their issues have been considered in the environmental investigations; and
- comment on the findings of the environmental assessments.

During the decision-making phase:

- to advise I&APs of the outcome of the competent authority's decision, and how and by when the decision can be appealed.

The public participation process therefore aims to ensure that:

- Information that contains all the relevant facts in respect of the application is made available to I&APs for review.
- Public participation is facilitated in such a manner that I&APs are provided with a reasonable opportunity to comment on the thermal generation facility project.
- Adequate review periods are provided for I&APs to comment on the findings of the Scoping and EIA Reports.

The restrictions enforced in terms of Government Gazette 43096 which placed the country in a national state of disaster limiting the movement of people to curb the spread of the COVID-19 virus has placed some limitations on the commencement and continuation of the public consultation as part of the EIA process. Considering these limitations, a public participation plan **(Appendix C9)** and consultation process has been designed by Savannah Environmental and approved by DEFF to cater for the undertaking of the public participation process which includes I&APs, the competent authority, directly impacted landowners/ occupiers, adjacent landowners/occupiers, relevant Organs of State departments, Municipalities, ward councillors and other key stakeholders.

The traditional means and opportunities available for the undertaking of public participation will still be covered and implemented as part of the public participation plan considering the current limitations.

Alternative means of undertaking consultation has been designed and will be implemented by Savannah Environmental to ensure that I&APs are afforded sufficient opportunity to raise comments on the project through an interactive web-based platform readily available and accessible to any person illustrating interest in the project and enables the public participation process to be undertaken in line with Regulations 41 to 44 of the EIA Regulations, 2014, as amended.

This online stakeholder engagement platform allows the EAP to visually present details regarding the project and our consultation documentation, including project maps and plans, presentations and posters regarding the project, and reports available for review. The use of online tools enables stakeholders and I&APs to explore the project- specific content in their own time, and allow them to participate in a meaningful way in the consultation process. The online platform allows for instant feedback and comments to be submitted by I&APs, in so doing saving time for the stakeholder and also giving the assurance that their comments have been submitted for inclusion in the project reporting. The online stakeholder engagement platform considered the limitations applied by the Disaster Management Act Regulations prohibiting the gathering of people, as well as limitations which certain I&APs may have in terms of access to computers and internet as well as access to public spaces not open for operation or which have restricted access.

The schematic illustration below provides an overview of the tools that are available to I&APs and

i. Stakeholder identification and register of I&APs	• Register as an I&AP on the online platfrom via completion of a form and provison of contact information, by responding to an advert, or sending a 'please call me' which will be responded to • State interest in the project • Receive all project related information via email
ii. Advertisments and notifications	• Advertisements, site notices, and/or radio adverts and notifications provide information and details on where to access project information • Notifications regarding the Scoping and EIA process, and availability of project reports for public review to be sent via email, post or SMS notifications
iii. Public Involvement and consultation	• Distribution of a BID providing details on the project and how I&APs can become involved in the process • Submission of comments or queries via the online platform to the PP team • Virtual presentations (English) available via the online platform • Availability of project information via the online platform • An opportunity for I&APs and stakeholders to request virtual meetings with the project team
iv. Comment on the Scoping and EIA Reports	• Availability of the project reports via the online platform for 30-day comment period • Submission of comments via the online platform, email or post to the PP team • Comments recorded and responded to, as part of the process
v. Identification and recording of comments	• Comments and Responses Report, including all comments received, and included within the final Report for decision-making

stakeholders to access project information and interact with the public participation team to obtain project information and resolve any queries that may arise, and to meet the requirements for public participation.

Key tasks undertaken in the Scoping Phase to ensure effective participation includes the following:

» Distribution of project related information in the form of notification letters and a background information document at the outset of the EIA process.
» Identification of stakeholders and I&APs, including:
  - all organs of state which have jurisdiction in respect of the activity to which the application for environmental authorisation relates;
  - owners, person in control of and occupiers of the site where the activity is to be undertaken or to any alternative site where the activity is to be undertaken;
  - owners, person in control of, and occupiers of land adjacent to the site where the activity is to be undertaken or to any alternative site where the activity is to be undertaken;

- the municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area;
- the municipality which has jurisdiction in the area; and
- any other I&AP as required by the competent authority.

» Placement of site notices at the project site.
» Placement of advertisements in a local or regional newspaper.
» Radio live reads.
» Compilation of an I&AP database which is updated throughout the Scoping and EIA process.
» On-going consultation with all registered I&APs regarding the progress in the EIA process through stakeholder consultation via notification letters, telephone calls, sms's, whatsapp, 'please call me' and consultation meetings or virtual focus group meetings.
» Release of the Scoping and EIA reports for 30-day review periods.

The following sections detail the tasks which were undertaken as part of the public participation process within the Scoping Phase to date.

i. Stakeholder identification

The first step in the public participation process is to initiate the identification of potential I&APs. I&APs have been identified through a process of networking and referral, obtaining information from Savannah Environmental's existing stakeholder database, liaison with potentially affected parties in the study area and a registration process involving the completion of a registration and comment sheet. Key stakeholders and affected and surrounding landowners have been identified and registered on the project database. Other stakeholders are required to formally register as stakeholders or interested and affected parties (I&APs) for the EIA process. An initial list of stakeholders identified and registered is listed in **Table 7.2**.

Table 7.2: List of Stakeholders identified during the Scoping Phase

Organs of State
National Government Departments
Department of Mineral Resources and Energy (DMRE)
Department of Environment, Forestry and Fisheries (DEFF)
Department of Agriculture, Rural Development and Land Reform (DARDLR)
Department of Human Settlement, Water and Sanitation (DHSWS)
Government Bodies and State-Owned Companies
Eskom Holdings SOC Limited
National Energy Regulator of South Africa (NERSA)
South African Civil Aviation Authority (CAA)
South African National Roads Agency Limited (SANRAL)
South African Heritage Resources Agency (SAHRA)
Telkom SA Ltd
Provincial Government Departments
Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform (DAEARD & LR)
Northern Cape Department of Roads and Public Works
Ngwao Boswa Kapa Bokone (NBKB)
Local Government Departments

John Taolo Gaetsewe District Municipality
Gamagara Local Municipality
Non-Governmental Organisations
BirdLife South Africa
Endangered Wildlife Trust (EWT)
Landowners
Affected landowners and tenants
Neighbouring landowners and tenants

ii. Database of Interested and Affected Parties

As per Regulation 42 of the EIA Regulations, 2014 (as amended in April 2017), all relevant stakeholder and I&AP information has been recorded within a register of I&APs (refer to **Appendix C1** for a listing of the recorded parties). The register of I&APs contains the details of[10]:

- all persons who requested to be registered on the database in writing;
- all organs of state which hold jurisdiction in respect of the activity to which the application relates; and
- all persons who submitted written comments or attended meetings during the public participation process.

While I&APs have been encouraged to register their interest in the EIA process from the onset, the identification and registration of I&APs will be on-going for the duration of the EIA process. The register of I&APs will be updated throughout the EIA process, and will act as a record of the parties involved in the public participation process.

iii. Adverts and Notifications

The EIA process, commencing in October 2020, was announced with an invitation to the organs of state, potentially affected and neighbouring landowners and general public to register as I&APs and to actively participate in the EIA process. This was achieved via the following:

- Placement of site notices announcing the EIA process on 01 October 2020 at visible points along the boundary of the project site, in accordance with the requirements of the EIA Regulations. Photographs and the GPS coordinates of the site notices are contained in **Appendix C2**.
- Placement of advertisements announcing the EIA process for the project and inviting members of the public to register themselves as I&APs on the project database and announcing the availability of the Scoping Report in the Kathu Gazette newspaper on 17 October 2020. The tear sheet of the newspaper advert is available in Appendix C2 of the Final Scoping Report.
- Radio adverts (live reads) on a local community radio station, Radio Riverside, have been undertaken on 29 October, 6 November, and 16 November 2020 announcing the project and the availability of the scoping report and where I&APs can register their details should they require any further information (Appendix C2).
- Compilation of a background information document (BID) for the project in order to provide information regarding the thermal generation facility and associated infrastructure and the EIA

[10] Note that addresses and contact details are not contained within the register presented to the public in line with the requirements of the Protection of Personal Information (POPI) Act (Act 4 of 2013).

process (refer to **Appendix C3**). The BID was distributed to identified stakeholders and I&APs together with a notification letter on 13 October 2020. The BID is also available electronically on the Savannah Environmental website (https://www.savannahsa.com/public-documents/energy-generation/hyperion-thermal-power-storage/).

- Distribution of EIA process notification letters notifying registered I&APs of the thermal generation facility and of the availability of the Scoping Report for review, and stakeholder reply forms to organs of state, potentially affected and neighbouring landowners as well as stakeholders/I&APs via email on 13 October 2020. The evidence of this process notification is contained in **Appendices C4** and **C5**. I&APs were encouraged to view the Scoping Report and submit written comment. The Scoping Report was circulated to Organs of State via CD or electronic transfer (Dropbox, WeTransfer, etc), as per individual request.

iv. Public Involvement and Consultation

In order to accommodate the varying needs of stakeholders and I&APs within the study area, as well as capture their views, issues and concerns regarding the project, various opportunities will be provided in the scoping phase and will continue to be provided to I&APs to note their issues during the remainder of the EIA process. I&APs have been consulted through the following means:

- **Focus group meetings**: Virtual focus group meetings have been held with key government departments, stakeholders and landowners during the scoping phase of the process. The purpose of these focus group meetings was to introduce the project and EIA process, to facilitate comments on the EIA process and Scoping Report, as well as to record any issues or concerns raised by stakeholders regarding the project. As per the approved public participation plan, these meetings were held via virtual platform. The minutes of these meetings have been included in this final Scoping Report for review and acceptance by the DEFF (**Appendix C7**). The list of focus group meetings undertaken is included in Table 7.3.
- **One-on-one consultation meetings** for example with directly affected or surrounding landowners. As per the approved public participation plan, these meetings have been held via virtual platform.
- **Telephonic** consultation sessions.
- Written, faxed or e-mail correspondence.

All comments received during the 30-day review period have been included in **Appendix C6** and minutes of all meetings held during the review period have been included in **Appendix C7** within this Final Scoping report.

Table 7.3: Summary of Public Participation Process

Activity	Date
The EIA process and availability of the scoping report was advertised in: » The Kathu Gazette.	17 October 2020
Placement of site notices, on-site and in public places.	01 October 2020
Distribution of process notification letters and background information documents to organs of state departments, ward councillors, landowners within the study area, neighbouring landowners and stakeholder groups.	13 October 2020

Activity	Date
Distribution of notification letters for the availability of the scoping report to organs of state departments, ward councillors, landowners within the study area, neighbouring landowners and stakeholder groups.	13 October 2020
Distribution of Scoping Report	16 October 2020
Review period for the Scoping Report for public comment.	17 October 2020 – 17 November 2020
List of Focus Group Meetings that were held include: » John Taolo Gaetsewe District Municipality » Gamagara Local Municipality » Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform (DAEARD & LR) » Adjacent Landowners	20 November 2020

v. Identification and Recording of Issues and Concerns

A Comments and Responses Report has been compiled and includes all comments received during the 30-day review period. The Comments and Responses Report is included as **Appendix C8**.

A summary of the issue raised during the 30-day review period are summaries below:

Department of Environment, Forestry & Fisheries (DEFF): Specific comments provided by DEFF included that the Air Quality and Climate Change specialist studies' terms of reference must be made available to the DEFF's Climate Change Directorate for comments.
South African Heritage Resources Agency (SAHRA): The SAHRA indicated that the EIA phase report Heritage Impact Assessment must include a field-based survey and must include a Palaeontological Desktop Study.

7.5. Review of the Scoping Report

The Scoping Report was made available for review from **17 October 2020 – 17 November 2020** and can be download from the Savannah Environmental website, www.savannahSA.com.

7.6. Identification and Evaluation of Issues

In terms of GN R960 (promulgated on 5 July 2019) and Regulation 16(1)(b)(v) of the 2014 EIA Regulations (as amended), the submission of a Screening Report generated from the national web based environmental screening tool is compulsory for the submission of applications in terms of Regulation 19 and 21 of the 2014 EIA Regulations.

The requirement for the submission of a Screening Report (**Appendix M** for the proposed development is applicable as it triggers Regulation 19 of the 2014 EIA Regulations (as amended). **Table 7.4** provides a summary of the specialist assessment requirements identified for the project site in terms of the screening tool and responses to each assessment requirement based on the nature and extent of the project.

Table 7.4: Sensitivity ratings from the DEFF's web-based online Screening Tool associated with the development of thermal generation facility and associated infrastructure

Specialist Assessment	Sensitivity Rating as per the Screening Tool (relating to the need for the study)	Project Team Response
Agricultural Impact Assessment	Medium Sensitivity	An Agricultural Potential and Soils Impact Assessment has been undertaken for the proposed project. (**Appendix F**)
Landscape/Visual Impact Assessment	Not specified within screening tool	A Visual Impact Assessment has been undertaken for the proposed project.(**Appendix J**)
Archaeological and Cultural Heritage Impact Assessment	Medium Sensitivity	A Heritage Impact Assessment including an Archaeological assessment has been undertaken for the proposed project. (**Appendix G**)
Palaeontology Impact Assessment	Medium Sensitivity	A Heritage Impact Assessment including a Palaeontological assessment has been undertaken for the proposed project.(**Appendix G**)
Terrestrial Biodiversity Impact Assessment	Very High Sensitivity	A Terrestrial Biodiversity Impact Assessment has been undertaken for the proposed project. (Appendix D)
Aquatic Biodiversity Impact Assessment	Very High Sensitivity	A fresh water assessment has been undertaken for the proposed project. (**Appendix E**)
Avian Impact Assessment	Not specified within screening tool	A Terrestrial Biodiversity Assessment has been undertaken for the proposed project that includes the assessment of avifauna. (**Appendix D**)
Civil Aviation Assessment	Medium Sensitivity	As the project is located in close proximity to the Sishen Airport the CAA will be included in the scoping and EIA process to determine any potential impacts.
RFI Assessment	Not specified within screening tool	A risk assessment is currently underway for the EIA phase of the project.
Geotechnical Assessment	Not specified within screening tool	A geotechnical assessment will be undertaken for the proposed project.
Plant Species Assessment	Low Sensitivity	A Terrestrial Biodiversity Assessment has been undertaken for the proposed project that includes the assessment of flora.(**Appendix D**)
Animal Species Assessment	Not specified within screening tool	A Terrestrial Biodiversity Assessment has been undertaken for the proposed project that includes the assessment of fauna.(**Appendix D**)

Based on the results of the screening, and from experience on similar projects and in the study area, the EIA project team has identified the following issues as requiring investigation.

Table 7.5: Specialist consultants appointed to evaluate the potential impacts associated with the thermal generation facility and associated infrastructure

Issue	Specialist	Refer Appendix
Terrestrial Ecology (including flora, fauna and avifauna)	Scientific Terrestrial Services cc	**Appendix D**
Freshwater Ecology Assessment	Scientific Aquatic Services	**Appendix E**
Soils and Agricultural Potential	Mariné Pienaar of TerraAfrica Consult cc	**Appendix F**
Heritage (including Archaeology & Palaeontology)	Dr Jayson Orton of ASHA Consulting (Pty) Ltd	**Appendix G**
Air Quality	Terri Bird of AirShed Planning Professionals	**Appendix H**
Noise	Morne de Jager of Enviro Acoustic Research cc	**Appendix I**

Issue	Specialist	Refer Appendix
Visual	Jon Marshall of Environmental Planning & Design Consult	**Appendix J**
Social	Tony Barbour of Tony Barbour Environmental Consulting	**Appendix K**

In order to evaluate issues and assign an order of priority, the following methodology was used to identify the characteristics of each potential issue/impact for each of the proposed project components:

- Identify the **nature** of the potential impact, which includes a description of what causes the effect, what will be affected and how it will be affected
- Identify the **extent** of the potential impact, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development) or regional
- Identify **sensitive receptors** that may be impacted on by the proposed facility and the **types of impacts** that are most likely to occur.
- Evaluate the **significance** of potential impacts in terms of the requirements of the EIA Regulations.
- Identify the potential impacts that will be **considered further** in the EIA Phase.

7.7. Finalisation of the Scoping Report

The final stage in the Scoping Phase will entail the capturing of responses from stakeholders and I&APs on the Scoping report in order to finalise and submit the Scoping report for consideration. It is this final Scoping report upon which the decision-making environmental authorities provide comment, recommendations, and acceptance to undertake the EIA Phase of the process.

7.8 Assumptions and Limitations of the EIA Process

In conducting this Scoping report, the following general assumptions have been made:

- It is assumed that the project site identified represents a technically suitable site for the establishment of the thermal generation facility and associated infrastructure (i.e. based on the surrounding land use, access to the site, access to infrastructure etc.)
- This Scoping report has been prepared based on information available at the time of undertaking the study. More detailed information will be available for consideration in the EIA phase of the process.

Refer also to the specialist studies contained in **Appendices D – K**.

CHAPTER 8: SCOPING OF POTENTIAL ISSUES ASSOCIATED WITH THE THERMAL GENERATION FACILITY AND ASSOCIATED INFRASTRUCTURE

The potential impacts of the proposed thermal generation facility (i.e. construction, operation and decommissioning phases) are identified, described and evaluated in this chapter in accordance with the requirements of the EIA Regulations. In accordance with the objectives of the scoping study (as defined in Chapter 7 of this report), this has been informed by a review of existing baseline information and desktop investigations. This has been undertaken with the aim of determining the feasibility of undertaking the development within the project site, and identifying issues which will be assessed further and confirmed in the EIA phase.

Potential environmental issues associated with construction and decommissioning activities of the development are similar and include, among others:

» Impacts on ecology, freshwater resources, fauna and flora within and around the site.
» Impacts on soil and agricultural potential of the development footprint.
» Impacts on heritage resources, including archaeological and palaeontological resources, within the development footprint.
» Impacts on the social aspects of the affected communities within and around the project site, including visual, traffic and noise impacts.

Potential environmental issues specific to the operation of the thermal generation facility and its associated infrastructure could include, among others:

» Impacts on water resources.
» Impacts on ambient noise levels in the area.
» Impacts on ambient air quality of the area.
» Impacts on climate change.
» Impacts on the social and visual aspects of the affected communities within and around the project site.
» Social impacts, including those associated with traffic and visual aesthetics

The sections which follow provide a summary of the findings of the scoping study undertaken for the construction and operation phases of the proposed project. Impacts associated with the decommissioning phase are expected to be similar to those associated with construction and are therefore not repeated. Impacts of the thermal generation facility are described and evaluated, and recommendations are made regarding further studies required within the EIA phase of the process.

8.1 Legal Requirements as per the EIA Regulations for the undertaking of a Scoping Report, 2014 (as amended)

This chapter of the scoping report includes the following information required in terms of Appendix 2: Content of the Scoping Report:

Requirement	Relevant Section
(g)(v) the impacts and risks which have informed the identification of each alternative, including the nature, significance, consequence, extent, duration and probability of such identified 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.	The potential impacts associated with the construction and operation of the thermal generation facility have been identified and assessed within Section 8.3.
(g)(vi) the methodology used in identifying and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives	The methodology used in identifying the potential impacts and risks is included in Section 8.2.
(g)(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	The positive and negative impacts associated with the development of the project have been included in Section 8.3.
(g)(viii) the possible mitigation measures that could be applied and level of residual risk	Recommendations regarding the development of the thermal generation facility have been included in Section 8.3.

8.2. Methodology for the Impact and Risk Assessment during the Scoping Phase

The following methodology was used to describe and evaluate the main issues and potential risks and impacts associated with the thermal generation facility during the scoping phase:

» The identification of potential sensitive environments and receptors that may be impacted on by the development and the types of impacts (i.e. direct, indirect and cumulative) that are most likely to occur. This was achieved through a review of existing baseline information and desktop investigations to define sensitivities in relation to the project description and layouts provided at this stage in the process.
» Description of the nature, significance, consequence, extent, duration and probability of potential impacts, as well as the degree to which these impacts are reversible, may cause irreplaceable loss of resources and can be avoided, managed or mitigated during the construction and operation phases.
» The identification of potential risks to the development and the environment, and identification of 'No-Go' areas within the broader area and project site, where applicable.
» The compilation of a summary of the potential impacts that will be considered further in the EIA Phase through specialist assessments.

8.3. Impacts during the Construction Phase

8.3.1 Potential Impacts on Ecology

The following potential impacts on ecology may occur on site and the surrounding area during the construction phase of the thermal generation facility and associated infrastructure (refer to **Appendix D**):

- Habitat fragmentation
- Loss of floral and faunal communities
- Alteration, degradation, loss, or destruction of faunal and floral habitat
- Loss of protected and/or SCC plant species
- Loss of protected and/or SCC faunal species
- Loss of a poorly protected ecosystem
- Loss of ESA areas
- Loss of areas within a centre of plant endemism
- Loss of a developmental corridor
- Soil and water contamination

Impact
According to the National web based environmental screening tool (2020), the terrestrial biodiversity theme for the study area is considered to have a very high sensitivity. The triggered sensitivity features include an Ecological Support Areas (ESA). The Plant Species Theme was identified to be of low sensitivity whereas the Animal Species Theme was identified as having a medium sensitivity, which is triggered by the presence of *Sagittarius serpentarius* which is considered vulnerable. The habitat present at the proposed development site is degraded through historical land uses and alien plant infestations.

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Habitat fragmentation	Vegetation clearing and construction activities will lead to habitat destruction, disturbance and fragmentation within the footprint area and will likely lead to the loss of floral and faunal communities, consequently impacting on the terrestrial biodiversity within the study area.	Local	None identified at this stage
Loss of floral and faunal communities	Potential indiscriminate fires by construction personnel may lead to uncontrolled / run-away fires, impacting on floral and faunal communities of the study area and surrounds.	Local	

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Alteration, degradation, loss, or destruction of faunal and floral habitat	» Vehicles may impact the habitat during construction, operation, and rehabilitation, resulting in a loss of habitat. Vehicular movement and construction activities could additionally cause increased erosion, leading to poor growth and establishing conditions for floral species and, consequently, providing sub-optimal living conditions for faunal species. » Dumping of construction waste materials in the surrounding habitat will result in floral and faunal habitat changes, which is likely to push faunal species out of their current home ranges, resulting in an increased competition for space and resources within the study area and in the surrounding area. » Earthworks may lead to increased runoff and erosion resulting in a further loss of faunal and floral habitat. » Risk of discharge of contaminated water from construction related operations may pollute the receiving environment leading to altered floral and faunal habitat.	National	
Loss of protected and/or SCC plant species	Several floral species that are protected under Schedule 2 (Protected Species) of the Northern Cape Nature Conservation Act (Act No. 9 of 2009) have the potential to be found within the study area. A field investigation will be necessary to determine the presence of suitable habitat for the above-mentioned species. Increased personnel on site may result in an increased risk of harvesting/overutilisation of species of conservation concern (SCC) species, threatening the current floral populations.	Local	
Loss of protected and/or SCC faunal species	Several faunal SCC as identified by the Threatened or Protected Species list (2007) have the potential to be located within the study area. Increased personnel on site may result in an increased risk of harvesting/overutilisation of species of conservation concern (SCC) species. Moreover, increased personnel within the study area inherently brings an increased risk of poaching activities, threatening the current faunal populations.	Local	

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Loss of a poorly protected ecosystem	According to the National Biodiversity Assessment (2011), the entire study area falls within the Kathu Bushveld which is of least concern and is a poorly protected ecosystem.	Regional	
Loss of ESA areas	The Northern Cape Critical Biodiversity Areas (2016) database has indicated that most of the study area falls within areas categorised as other natural areas. However, the southern portion of the 300 m corridor along which the access road will be aligned, as well as the north-eastern parts of the Hyperion 1 & 2 PV SEF sites and the focus area fall within an ecological support area (ESA). ESAs are important as they maintain the ecological processes on which Critical Biodiversity Areas and Protected Areas depend.	Regional	
Loss of areas within a centre of plant endemism	According to the Northern Cape Province Spatial Development Framework (NCPSDF), the study area is located within the Griqualand West Centre (GWC) of plant endemism. This semi-arid region is broadly described as Savanna, forming part of the Eastern Kalahari Bushveld Bioregion. Studies investigating the endemism of the centre report at least 23 plant species that have restricted distributions.	Regional	
Loss of habitats within developmental corridor	The NCPSDF indicates that the study area also falls within the Gamagara corridor. The Gamagara Corridor comprises the mining belt of the John Taolo Gaetsewe and Siyanda districts and runs from Lime Acres and Danielskuil to Hotazel in the north. The corridor focuses on the mining of iron and manganese.	Local	
Soil and water contamination	Untreated wastewater and other effluents from the construction activities may contaminate water resources in the project site. Inappropriate disposal of hazardous and non-hazardous waste may potentially cause groundwater pollution and deteriorate habitat quality on adjacent areas	Local/Regional	

Description of expected significance of impact

Impacts on ecological resources are likely to occur at the extent of the study area and the broader area. A field investigation will be necessary to determine the presence of suitable habitat for the faunal and floral species that are potentially located within the study area

Gaps in knowledge & recommendations for further study

As the study area has only been assessed using desktop analysis, the exact ecological state of the area could not be described. Thus, a gap in the knowledge of the condition of the habitat exists, and it is anticipated that these gaps will be sufficiently addressed during a site investigation as part of the EIA Phase of this project. Several Red Listed/Protected flora and fauna species potentially occur within the study area. Thus, detailed fauna and flora field investigations must be conducted during the EIA phase to identify any Red Listed/Protected fauna and flora species within the study area.

8.3.2 Potential Impacts on Freshwater Features

The following potential impacts on the freshwater features may occur on and in the surrounding areas during the construction phase of thermal plant and associated infrastrcuture (**Appendix E**):

- Disturbance of watercourse habitat
- The decrease of watercourse habitat integrity
- Alteration of runoff patterns
- Altered hydrology of the watercourses
- Altered stream and baseflow patterns
- Contamination of surface water bodies

Impact

Impacts associated with the construction activities (within the focus area) include potential encroachment and direct disturbance of the watercourses, alterations to stormwater run-off within the development area, altering the hydrology of the systems and increased sedimentation.

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Direct disturbance of watercourse habitat	» The potential loss of biodiversity as a result of construction related activities within the watercourses, including construction or upgrading of roads and placement of cables within watercourses. » Decrease in the provision of watercourse ecoservices due to the potential degradation of the watercourses.	Local	*All delineated watercourses should be considered no-go areas for new developments.* *The applicable GN509 regulated area of a watercourse should also be avoided where feasible. This is only recommended to*
The decrease of watercourse habitat integrity	Encroachment of internal road infrastructure and construction activities may result in the contamination of the watercourses (if surface water is present). This impact may be direct or indirect.	Local	

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Alteration of runoff patterns	The potential for increased erosion as a result of earthworks in the vicinity of watercourses.	Local	*prevent triggering the application of a water use application. If infrastructure were to be proposed within this area, it would not be considered a fatal flaw*
Altered hydrology of the watercourses	The potential loss of catchment yield due to stormwater management during the construction activities.	Local	
Altered stream and baseflow patterns	Potential that the construction of stream crossings may impact on the hydrology and sedimentation of systems.	Local	
Potential impact on surface water bodies due to on-site accidental fuel spills and leaks/leachate and infiltration of dirty water.	Contamination of the surface waterbodies surrounding the project site through the transportation of the contaminants via surface water runoff	Local	

Description of expected significance of impact

Since no watercourses are located within the focus area, no direct impacts from the construction of the thermal generation facility and related infrastructure are expected to occur on the watercourses outside of the focus area. Nevertheless, the potential occurrence of impacts associated with edge effects on the watercourses must be considered. If these edge effects are managed accordingly, the impact significance on the watercourses is expected to be low to very low.

The significance of impact will be defined during the EIA Phase.

Gaps in knowledge & recommendations for further study

As the watercourses have only been assessed by using desktop analysis, their characteristics, Present Ecological State (PES) and goods and services could not accurately be described. Thus, a gap in the knowledge of the condition of these watercourses exists, and it is anticipated that these gaps will be sufficiently addressed during a site investigation as part of the EIA Phase of this project. It is not expected that the delineation of the watercourses will change significantly.

8.3.3 Impacts on soil and agricultural potential

The following potential impacts on soil and agricultural potential may occur on the site during the construction phase of the thermal generation facility and associated infrastructure (**Appendix F**):

- Soil compaction
- Soil erosion
- Loss of soil fertility through disturbance of in situ horizon organisation
- Soil chemical pollution

Impact
The anticipated impacts of the proposed project on soil are soil compaction, erosion, soil pollution and the loss of soil fertility from the topsoil horizons to be stripped and stockpiled during the construction phase. The most significant impact will most likely be caused by the traversing of vehicles over the terrain during the construction phase. This will result in soil compaction. Soil compaction affects the infiltration of rain into the soil and will increase the risk of erosion as a result of this. Deep level soil compaction (as caused by heavy vehicle traffic) is difficult to alleviate.

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Soil compaction	» Soil compaction reduces the water infiltration rate of soil that increase the risk of run-off.	Local	None identified at this stage
Soil erosion	» Bare soil surfaces are prone to loss of soil particles as a result of wind and water movement.	Local	None identified at this stage
Loss of soil fertility through disturbance of in situ horizon organisation	» Earthworks as part of construction of the hybrid facility will result in disturbance of in situ soil profiles.	Local	None identified at this stage
Soil chemical pollution	» Oil and fuel spillages as well as waste generation during the project cycle will result in soil chemical pollution.	Local	None identified at this stage
Description of expected significance of impact The impact of the thermal generation facility and associated infrastructure on the soil and agricultural potential within the project site will be local in extent and is expected to be low.			
Gaps in knowledge & recommendations for further study » The interpretation of the soil data available from the previous soil assessment of the Hyperion PV project areas will be analysed to determine whether the soil physical properties of the site are particularly sensitive to soil compaction in the EIA phase. » The interpretation of the soil data available from the previous soil assessment of the Hyperion PV project areas will be analysed to determine the erodibility risk of the soil in the development area in the EIA phase. » The results of the previous soil survey that was conducted will be used to determine the sensitivity of the in situ profiles to this impact. » The only knowledge gap is the full project description that includes detail of activities and materials that may result in soil pollution during the different project phases.			

8.3.4 Impacts on heritage (archaeological) and palaeontological resources

The following potential impacts to heritage resources may occur on site and the surrounding area during the construction phase of the thermal generation facility and associated infrastructure (**Appendix G**):

» Potential impacts to fossils (palaeontological impacts)

» Potential impacts to Archaeological stone artefacts (archaeological impacts)
» Potential impacts to graves

Impact
The heritage issues that have been identified as potential concerns for the proposed thermal facility and access road development are impacts on palaeontology, archaeology and graves.

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Fossils may be damaged or destroyed during any excavation work for foundations or road building.	The excavation and construction work may result in the direct loss of fossils that could otherwise have provided scientific information related to past environments.	Most likely to be local, but an important discovery could extend to provincial or national significance	None identified at this stage
Archaeological stone artefacts may be damaged or destroyed during any excavation work for foundations or road building.	The excavation and construction work may result in the direct loss of stone artefacts that could otherwise have provided scientific information related to past occupants of the area. It should be remembered that the Kathu Complex to the south is a Grade I heritage site which means it has been accorded national significance.	Most likely to be local because of the distance from the declared Kathu Complex area.	None identified at this stage
Graves may be damaged or destroyed during any excavation work for foundations or road building	The excavation and construction work may result in the direct loss of graves.	Local	None identified at this stage

Description of expected significance of impact

Palaeontology: The far southern end of the road alignment is rated as being of medium sensitivity, while the remainder of the study area is of low sensitivity. In practice, it is likely that all areas will be of low sensitivity since, aside from Kathu Pan, there are no known fossil localities in the area. Buried pan deposits or dolines, which are highly unlikely to occur, are the main identified potential sensitivity. Nevertheless, a small chance exists that fossils could be revealed in the Kalahari Group sediments.

Archaeology: Most areas are likely to be of low to medium sensitivity, since dense artefacts as seen closer to Kathu have not been recorded in this area. However, the calcrete area in the far southern part of the road alignment is likely to be of lower sensitivity. It is unknown how deep the sand cover is, but the small outcropping area of artefact-bearing gravel in the generator site suggests that it may be quite shallow in places. In areas where the sand cover is thick, the sensitivity is expected to be lower, especially for road construction which would not require deep excavations. Due to the generally low-medium cultural significance of the archaeological materials, the intensity of impacts is not expected to be very high and the resulting significance would likely be low with mitigation.

Graves: All areas are expected to be of low sensitivity because of the rarity of burials in the landscape. The calcrete area in the southern part of the road alignment is highly unlikely to host burials.

Gaps in knowledge & recommendations for further study
» The subsurface palaeontological record can never be fully understood and the EIA Phase report will need to make recommendations for monitoring and/or mitigation to be carried out in advance of or during construction work. » The subsurface archaeological record can never be fully understood. » The EIA Phase report will need to make recommendations for mitigation to be carried out in advance of construction work. This will likely entail monitoring of excavations and excavating column samples from a few strategic locations. It should be noted that the potential does exist for a larger excavation to be required if highly significant archaeological resources are discovered. » The EIA Phase work can also be conducted from the desktop, since reasonably good information is available and a surface examination of the site is highly unlikely to provide any new insights. » No operational phase impacts were identified.

8.3.5 Impacts on ambient air quality

The following potential impacts on air quality may occur on site and the surrounding area during the construction of the thermal generation facility and associated infrastructure include (**Appendix H**):

» Elevated ambient concentrations of particulate and gaseous atmospheric pollutants as a result of construction activities.

Impact Elevated ambient concentrations of particulate and gaseous atmospheric pollutants as a result of construction activities.			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Particulate and Gaseous pollutant emissions	Elevated ambient concentrations of particulate and gaseous atmospheric pollutants as a result of construction activities.	Local	None identified at this stage
Description of expected significance of impact The construction of the proposed thermal generation facility and associated infrastructure may result in elevated (and potentially non-compliance with NAAQS) daily PM10 concentrations due to background PM10 and the proximity to other particulate emission sources. The impacts are likely to be local and of short duration.			
Gaps in knowledge & recommendations for further study » The duration and scale of construction activities is expected to last between 14 and 20 months over the 5 ha area for the proposed facility. Construction impacts will be assessed during the EIA phase. Relevant information required includes: expected fuel use; vehicle types, activity patterns and on-site road usage; and, full extent of bulk earthworks.			

8.3.6 Impacts on ambient noise levels

The acoustical implications considering a questionnaire as proposed by SANS 10328:2008 was carried out for the proposed thermal generation facility answering negatively to all the question proposed. It was determined unlikely that the planned development will present a noise disturbance. As recommended by SANS 10328:2008, a scoping investigation and an environmental noise impact investigation may not be required.

Considering the location where the potential thermal generation facility is proposed, the thermal generation facility would be further than 1 000 m from the closest identified NSD, with the closest NSD 1.95 km away. While the thermal generation facility may be audible during quiet periods, noise levels are unlikely to significantly change the ambient sound levels at this distance. It was therefore the opinion of the specialist that there exists a **low potential** for a noise impact and that no further Scoping or other acoustical studies would be required for the proposed thermal generation facility. No specific mitigation measures regarding noise or additional noise measurements are recommended. No additional conditions regarding noise are recommended for inclusion in the EMPr. The full Noise Compliance Statement for the proposed thermal generation facility can be viewed in **Appendix I**.

8.3.7 Visual Impacts

The following potential impacts on visual aspects may occur on site and the surrounding area during the construction of the thermal generation facility and associated infrastructure include (**Appendix J**):

» The proposed development could negatively impact on views from roads.
» The proposed development could negatively impact on views from local homesteads.

Impact Visual impact of the construction activities on observers in close proximity to the proposed infrastructure and activities. Potential sensitive visual receptors may include: » Travellers on the N14, the R308 and a local road that runs to the south and south west between the N14 and the R308. » A homestead approximately 2.7km to the north of the proposed development.			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Industrialisation of the landscape	» The proposed development is likely to have low negative impact due to distance from public viewpoints and the extent of screening provided by intervening vegetation. » The proposed development is likely to have low negative impact due to general limited visibility.	This is likely to affect the immediately surrounding area	None identified at this stage

Description of expected significance of impact
There is likely to be minimal additional industrial influence on surrounding landscape character as experienced by the majority of receptors. This impact is therefore likely to have a low significance. There is likely to be limited change of surrounding landscape character as experienced from the majority of homesteads.
Gaps in knowledge & recommendations for further study
» A development layout and details of structure height is needed to assess the impacts as well as the identification of possible mitigation measures in any detail. This will be assessed in the EIA phase of the project.

8.3.8 Impacts on the social environment

The development of the thermal generation facility and associated infrastructure will have both positive and negative impacts on the social environment during the construction phase. The section below provides more details of the associated potential impacts (**Appendix K**).

The following positive potential impacts on social aspects may occur on site and the surrounding area during the construction of the thermal generation facility and associated infrastructure include:

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

The potential negative impacts which could arise as a result of the construction activities include the following:

» Impacts associated with the presence of construction workers on local communities,
» Impacts related to the potential influx of job-seekers,
» Increased risks to livestock and farming infrastructure associated with the construction related activities and presence of construction workers on the site,
» Increased risk of grass fires associated with construction related activities,
» Nuisance impacts, such as noise, traffic, dust and safety, associated with construction related activities and vehicles,
» Impact on productive farmland.

Impact: Employment and business creation opportunities during the construction phase			
Issue	**Nature**	**Extent of Impact**	**No-Go Areas**
The construction phase of hybrid thermal power facility will extend over a period of approximately 14	Positive – Creation of employment and business opportunities during the construction phase	The impact will occur at a local and regional level	N/A

months and create in the region of 350 employment opportunities.			

Description of expected significance of impact

Given relatively high local unemployment levels and limited job opportunities in the area, this will represent a significant, if localised, social benefit. The capital expenditure associated with the construction phase will be approximately R1.5 billion (2020 Rand value). This will create opportunities for local companies and the regional and local economy. Due the key role played by the mining sector in the area, there are a likely to be a number of local contractors and engineering companies based in Kathu that will be suitably qualified to provide services and skills. Positive impacts are anticipated to be of Medium significance with enhancement measures.

Gaps in knowledge & recommendations for further study

» Some of the provincial documents do not contain data from the 2011 Census and/or 2016 Household Community Survey. However, where required the relevant 2011 and 2016 data has been provided.

» A site visit will be undertaken during the Assessment Phase of the SIA. The site visit will include interviews with interested and affected parties. However, as indicted above, the author is confident that the majority of social issues have been identified. In addition, the findings of the specialist studies undertaken as part of the Hyperion PV projects, including the SIA, identified no fatal flaws. All impacts, including social impacts, associated with the project can also be mitigated to acceptable levels.

Impact:

Impact of construction workers on local communities

Issue	Nature	Extent of Impact	No-Go Areas
The presence of construction workers poses a potential risk to family structures and social networks. While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on local communities.	Potential impacts on family structures and social networks associated with the presence of construction workers	The impact will occur at a local and regional level	N/A

Description of expected significance of impact

While the risks associated with construction workers at a community level will be low, at an individual and family level they may be significant, especially in the case of contracting a sexually transmitted disease or an unplanned pregnancy. Given the nature of construction projects it is not possible to totally avoid these potential impacts at an individual or family level.

Gaps in knowledge & recommendations for further study

» Some of the provincial documents do not contain data from the 2011 Census and or 2016 Household Community Survey. However, where required the relevant 2011 and 2016 data has been provided.

» A site visit will be undertaken during the Assessment Phase of the SIA. The site visit will include interviews with interested and affected parties. However, as indicted above, the specialist is confident that the majority of social issues have been identified. In addition, the findings of the specialist studies undertaken as part of the Hyperion PV projects, including the SIA, identified no fatal flaws. All impacts, including social impacts, associated with the project can also be mitigated to acceptable levels.

Impact: Influx of job seekers.			
Issue	**Nature**	**Extent of Impact**	**No-Go Areas**
Large construction projects tend to attract people to the area in the hope that they will secure a job, even if it is a temporary job. These job seekers can in turn become "economically stranded" in the area or decide to stay on irrespective of finding a job or not.	Potential impacts on family structures, social networks and community services associated with the influx of job seekers.	The impact will occur at a local level.	N/A
Description of expected significance of impact The findings of the SIA indicate that economically motivated in-migration and subsequent labour stranding linked to the mining sector has and continues to take place in the Kathu area. The proposed development is unlikely to result in an increase in in-migration to the area and the town of Kathu. The risks associated with the influx of job seekers are therefore likely to be low.			
Gaps in knowledge & recommendations for further study » Some of the provincial documents do not contain data from the 2011 Census and or 2016 Household Community Survey. However, where required the relevant 2011 and 2016 data has been provided. » A site visit will be undertaken during the Assessment Phase of the SIA. The site visit will include interviews with interested and affected parties. However, as indicted above, the specialist is confident that the majority of social issues have been identified. In addition, the findings of the specialist studies undertaken as part of the Hyperion PV projects, including the SIA, identified no fatal flaws. All impacts, including social impacts, associated with the project can also be mitigated to acceptable levels.			

Impact: Risk to safety, livestock and damage to farm infrastructure			
Issue	**Nature**	**Extent of Impact**	**No-Go Areas**

The presence on and movement of construction workers on and off the site poses a potential safety threat to local famers and farm workers in the vicinity of the site. In addition, farm infrastructure, such as fences and gates, may be damaged and stock losses may also result from gates being left open and/or fences being damaged or stock theft linked either directly or indirectly to the presence of farm workers on the site.	Potential risk to safety of scholars, farmers and farm workers, livestock and damage to farm infrastructure associated with the presence of construction workers on site	The impact will occur at a local level.	N/A
Description of expected significance of impact The potential risks (safety, livestock and farm infrastructure) can be effectively mitigated to low significance by careful planning and managing the movement of construction on and off the site workers during the construction phase.			
Gaps in knowledge & recommendations for further study » Some of the provincial documents do not contain data from the 2011 Census and or 2016 Household Community Survey. However, where required the relevant 2011 and 2016 data has been provided. » A site visit will be undertaken during the Assessment Phase of the SIA. The site visit will include interviews with interested and affected parties. However, as indicted above, the specialist is confident that the majority of social issues have been identified. In addition, the findings of the specialist studies undertaken as part of the Hyperion PV projects, including the SIA, identified no fatal flaws. All impacts, including social impacts, associated with the project can also be mitigated to acceptable levels.			

Impact: Assessment of impact of increased risk of grass fires			
Issue	**Nature**	**Extent of Impact**	**No-Go Areas**
The presence of construction workers and construction-related activities on the site poses an increased risk of grass fires that could, in turn pose, a threat to livestock, crops, wildlife and farm infrastructure.	Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of grass fires.	The impact will occur at a local level	N/A
Description of expected significance of impact			

The potential risk of grass fires are higher during the dry, windy winter months from May to October. In terms of potential mitigation measures that would reduce the significance of the impact to low, the option of constructing a firebreak around the perimeter of the site prior to the commencement of the construction phase should be investigated. In addition, fire-fighting equipment must be provided on site
Gaps in knowledge & recommendations for further study » Some of the provincial documents do not contain data from the 2011 Census and or 2016 Household Community Survey. However, where required the relevant 2011 and 2016 data has been provided. » A site visit will be undertaken during the Assessment Phase of the SIA. The site visit will include interviews with interested and affected parties. However, as indicted above, the specialist is confident that the majority of social issues have been identified. In addition, the findings of the specialist studies undertaken as part of the Hyperion PV projects, including the SIA, identified no fatal flaws. All impacts, including social impacts, associated with the project can also be mitigated to acceptable levels.

Impact: Nuisance impacts associated with construction related activities			
Issue	**Nature**	**Extent of Impact**	**No-Go Areas**
Construction related activities, including the movement of heavy construction vehicles to and on the site, has the potential to create dust, noise and safety impacts and damage roads.	Potential noise, dust and safety impacts associated with construction related activities	The impact will occur at a local level.	N/A
Description of expected significance of impact The surrounding area is sparsely populated and there are a limited number of farmhouses located within a 2-3 km of the site. The number of sensitive social receptors that would potentially be impacted is therefore limited. In addition, the impacts can be effectively mitigated to low significance.			
Gaps in knowledge & recommendations for further study » Some of the provincial documents do not contain data from the 2011 Census and or 2016 Household Community Survey. However, where required the relevant 2011 and 2016 data has been provided. » A site visit will be undertaken during the Assessment Phase of the SIA. The site visit will include interviews with interested and affected parties. However, as indicted above, the specialist is confident that the majority of social issues have been identified. In addition, the findings of the specialist studies undertaken as part of the Hyperion PV projects, including the SIA, identified no fatal flaws. All impacts, including social impacts, associated with the project can also be mitigated to acceptable levels.		

Impact: Impacts associated with loss of farmland			
Issue	**Nature**	**Extent of Impact**	**No-Go Areas**

The activities associated with the construction phase and establishment of the proposed project and associated infrastructure will result in the disturbance and loss of land available for grazing	The activities associated with the construction phase, such as establishment of access roads and the construction camp, movement of heavy vehicles and preparation of foundations for the project etc. will damage farmlands and result in a loss of farmlands for grazing.	The impact will occur at a local level	N/A
Description of expected significance of impact The impact on farmland associated with the construction phase can be mitigated to low significance by minimising the footprint of the construction related activities and ensuring that disturbed areas are fully rehabilitated on completion of the construction phase. Existing internal roads should be used where possible. This requires careful site planning and management of operations. In the event that new roads are required, these roads should be rehabilitated on the completion of the construction phase. In addition, the landowner will be compensated for the loss of land.			
Gaps in knowledge & recommendations for further study » Some of the provincial documents do not contain data from the 2011 Census and or 2016 Household Community Survey. However, where required the relevant 2011 and 2016 data has been provided. » A site visit will be undertaken during the Assessment Phase of the SIA. The site visit will include interviews with interested and affected parties. However, as indicted above, the specialist is confident that the majority of social issues have been identified. In addition, the findings of the specialist studies undertaken as part of the Hyperion PV projects, including the SIA, identified no fatal flaws. All impacts, including social impacts, associated with the project can also be mitigated to acceptable levels.			

8.4. Impacts during the Operation Phase

8.4.1 Potential Impacts on Ecology

The following potential impacts on ecology may occur on site and the surrounding area during the operation of the thermal generation facility and associated infrastructure include (**Appendix D**):

» Alteration, degradation, loss, or destruction of faunal and floral habitat
» Lack of maintenance activities

Impact According to the National web based environmental screening tool (2020), the terrestrial biodiversity theme for the study area is considered to have a very high sensitivity. The triggered sensitivity features include an Ecological Support Areas (ESA). The Plant Species Theme was identified to be of low sensitivity whereas the Animal Species Theme was identified as having a medium sensitivity, which is triggered by the presence of Sagittarius serpentarius which is considered vulnerable.

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Alteration, degradation, loss, or destruction of faunal and floral habitat	» Vehicles may impact the habitat during, operation, and rehabilitation, resulting in a loss of habitat. Vehicular movement activities could additionally cause increased erosion, leading to poor growth and establishing conditions for floral species and, consequently, providing sub-optimal living conditions for faunal species » Dumping of operational waste materials in the surrounding habitat will result in floral and faunal habitat changes, which is likely to push faunal species out of their current home ranges, resulting in an increased competition for space and resources within the study area and in the surrounding area;	Local	None identified at this stage
Lack of maintenance activities	Failure to implement an alien floral control plan will result in a high risk of increased loss of biodiversity within the study area; and the ineffective removal of alien invader species, and rehabilitation of exposed areas could lead to re-establishment of invasive species, impacting on floral community rehabilitation efforts	Local	
Description of expected significance of impact Impacts on ecological resources are likely to occur at the extent of the study area and the broader area. A field investigation will be necessary to determine the presence of suitable habitat for the faunal and floral species that are potentially located within the study area.			
Gaps in knowledge & recommendations for further study As the study area has only been assessed using desktop analysis, the exact ecological state of the area could not be described. Thus, a gap in the knowledge of the condition of the habitat exists, and it is anticipated that these gaps will be sufficiently addressed during a site investigation as part of the EIA Phase of this project. Several Red Listed/Protected flora and fauna species potentially occur within the study area. Thus, detailed fauna and flora field investigations must be conducted during the EIA phase to identify any Red Listed/Protected fauna and flora species within the study area.			

8.4.2 Potential Impacts on Freshwater Features

The following potential impacts on wetland and aquatic may occur on site and the surrounding area during the operation of the thermal generation facility and associated infrastructure include (**Appendix E**):

» Mismanagement and ineffective rehabilitation of watercourses
» Pollution of surface and groundwater due to chemical, oil and fuel spills

Impact
Sediment laden stormwater runoff entering the Vlermuisleegte River is a potential impact that might occur during the operational phase of the hybrid facility. During the operational phase of the proposed project, the potential for spills and leakages will occur. Contaminants will include mainly from oil/ grease and petrol/ diesel and LPG. These pollutants may result from leakages from operating equipment, vehicles, oil changes during the servicing of equipment and vehicles or, or from spills as a result of incorrect handling of substances or equipment

Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Mismanagement and ineffective rehabilitation of watercourses	The potential for siltation and changes in the hydrological functioning of these areas.	Local	All delineated watercourses should be considered no-go areas for new developments.
Pollution of surface and groundwater due to chemical, oil and fuel spills	The potential for changes to water quality and shift in aquatic species composition	Regional	
Description of expected significance of impact Contaminants such as hydrocarbons, solids and pathogens will be generated from several potential sources (examples include petrol/diesel, oil/grease, LPG and other hazardous substances). These contaminants have the capacity to negatively affect aquatic ecosystems including sensitive or intolerant species of flora and fauna. Since no watercourses are located within the focus area, no direct impacts from the operation of the hybrid facility and related infrastructure are expected to occur on the watercourses outside of the focus area. The impact significance on the watercourses is expected to be low to very low. The significance of impact will be defined during the EIA Phase.			
Gaps in knowledge & recommendations for further study The watercourses have only been assessed by using desktop analysis, their characteristics, Present Ecological State (PES) and goods and services could not accurately be described. Thus, a gap in the knowledge of the condition of these watercourses exists, and it is anticipated that these gaps will be sufficiently addressed during a site investigation as part of the EIA Phase of this project. It is not expected that the delineation of the watercourses will change significantly.			

8.4.3. Impacts on soil and agricultural potential

The following potential impacts on soil and agricultural potential may occur on site and the surrounding area during the operation of the thermal generation facility and associated infrastructure include (**Appendix F**):

» Potential impacts on land use

Impact
Potential impacts on land use

Issue	Nature of Impact	Extent of Impact	No-Go Areas
The proposed project will change the current land use from agriculture to energy generation	Change in land use	Local	None identified at this stage
Description of expected significance of impact As the potential for agricultural activities on the proposed site is limited, the proposed project may have a moderate to major positive impact on the current land use and in the worst case, have a neutral impact.			
Gaps in knowledge & recommendations for further study » The economic viability of livestock farming within the development area will be calculated during the detailed study phase.			

8.4.4. Impacts on ambient air quality

The following potential impacts on air quality may occur on site and the surrounding area during the operation of the thermal generation facility and associated infrastructure include (**Appendix H**):

» During the operational phase, the proposed thermal generation facility is likely to contribute sulphur dioxide, nitrogen dioxide, carbon monoxide to the existing baseline concentrations.
» The combustion of LPG or diesel at the thermal generation facility will produce greenhouse gas emissions which will contribute to the global phenomenon of anthropogenic climate change.

Impact Elevated ambient concentrations of gaseous atmospheric pollutants as a result of operational activities (LPG or diesel combustion in turbine units or reciprocal engines).			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Gaseous pollutant emissions	During the operation phase, the proposed thermal generation facility is likely to contribute sulphur dioxide, nitrogen dioxide, carbon monoxide to the existing baseline concentrations. Operational activities are not likely to result in a significant change from current levels.	Local	None identified at this stage
Contribution to Climate Change	The combustion of natural gas, LPG or diesel at the thermal generation facility will produce greenhouse gas emissions which will contribute to the global phenomenon of anthropogenic climate change.	International;	None identified at this stage
Description of expected significance of impact			

During the operation phase, the proposed thermal generation facility is likely to contribute elevated concentrations of gaseous pollutants such as, sulphur dioxide, nitrogen dioxide, carbon monoxide from the combustion facility and from delivery-vehicle exhaust gases. The impacts as a result of the combustion of diesel or LPG are of medium significance with the implementation of mitigation measures. Impacts are likely to be locality with affects to surrounding farm portions.
Gaps in knowledge & recommendations for further study » As far as the specialist is aware, existing monitoring in the area do not include gaseous pollutants (sulphur dioxide, nitrogen dioxide, and carbon monoxide) and will be confirmed during the EIA phase. Atmospheric dispersion modelling will be used during the EIA phase to assess the extent of the impact of the proposed facility. Cumulative impacts may not be able to be quantified for the gaseous pollutants due to the knowledge gap. However, due to the types of existing sources, the baseline concentrations of these pollutants are not expected to be elevated. » Climate Change impact statement will be undertaken during the EIA phase to determine the impact of the thermal generation facility and the hybrid facility developments on the climate.

8.4.5. Visual Impacts

The following potential impacts on visual aspects may occur on site and the surrounding area during the operation of the thermal generation facility and associated infrastructure include infrastructure (**Appendix J**):

» Night time lighting impacts.
» The proposed development could negatively impact on the landscape character of the affected area.
» The proposed development could negatively impact on views from roads.
» The proposed development could negatively impact on views from local homesteads.

Impact
Visual impact of the thermal facility on observers in close proximity to the proposed infrastructure and activities. Potential sensitive visual receptors may include:

» Lighting impacts.
» Observers travelling along the R34 arterial road.
» Residents of homesteads and farm dwellings (if present in close proximity to the facility).

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Lighting impacts	The proposed development could be made obvious due to high levels of lighting. However, with mitigation levels of lighting will be low during normal circumstances. The impact could be high negative but with mitigation is likely to be negligible.	This is likely to affect the immediately surrounding area	None identified at this stage

Industrialisation of the landscape (landscape character, views from roads and homesteads)	The proposed development is likely to have a low negative impact due to distance from public viewpoints and the extent of screening provided by intervening vegetation.	This is likely to affect the immediately surrounding area	None identified at this stage
Description of expected significance of impact » Due to the nature of the surrounding landscape which is likely to include lighting from mining operations and other power generation projects, the significance of this impact is likely to be low. » There is likely to be minimal additional industrial influence on surrounding landscape character as experienced by the majority of receptors. This impact is therefore likely to have a low significance. » There is likely to be limited change of surrounding landscape character as experienced from the majority of homesteads. » Due to the fact that the majority of power generation projects, including the proposed project, are located some distance from major routes and other public viewpoints Development of this site is likely to result in minimal cumulative impact			
Gaps in knowledge & recommendations for further study » A development layout and details of structure height is needed to assess the impacts as well as the identification of possible mitigation measures in any detail. » Confirmation of proposed lighting is needed to assess the impact. » This analysis will be refined in the EIA phase when the layout of the project is known			

8.4.6 Impacts on the social environment

The following potential impacts on the social environment may occur on site and the surrounding area during the operation of the thermal generation facility and associated infrastructure include (**Appendix K**).

The potential positive impacts which may arise as a result of the operation activities include the following:

» The establishment of infrastructure to improve energy security and support renewable sector.
» Creation of employment opportunities.
» Benefits associated with the socio-economic contributions to community development.

The potential negative impacts which may arise as a result of the operation activities include the following:

» Visual impacts and associated impact on sense of place.

Impact:
Improve energy security and support renewable sector

Issue	Nature	Extent of Impact	No-Go Areas
The primary goal of the proposed project is to improve energy security in South Africa by generating additional energy.	Positive- Development of infrastructure to improve energy security and support renewable sector	The impact will occur at a local, regional and National level.	None identified at this stage

Description of expected significance of impact

The project also reduces the carbon footprint by merging thermal with solar hybrid solutions, hence the location adjacent to the authorised PV projects. The project should therefore be viewed within the context of the South Africa's current reliance on coal powered energy to meet the majority of its energy needs, and secondly, within the context of the success of the RMIPPPP is of a high (positive) significance at local, regional and national level.

Gaps in knowledge & recommendations for further study

» Information on the exact direct and indirect employment impact on business output / production will be determined during the EIA phase of the impact assessment.

Impact:
Creation of employment opportunities

Issue	Nature	Extent of Impact	No-Go Areas
Job creation and employment opportunities	Positive – Creation of employment and business opportunities associated with the operational phase	The impact will occur at a local and regional level	None identified at this stage

Description of expected significance of impact

The proposed development will create 20 full time employment opportunities during the operational phase, of which 70% will be unskilled, 25% semi-skilled 25%, and 5% skilled. The annual operating budget will be in the region of R24 million (2020 Rand values), including wages. The impact is positive and will have an extent at both a local and regional level.

Gaps in knowledge & recommendations for further study

» A site visit will be undertaken during the Assessment Phase of the SIA. The site visit will include interviews with interested and affected parties. However, as indicted above, the specialist is confident that the majority of social issues have been identified. In addition, the findings of the specialist studies undertaken as part of the Hyperion PV projects, including the SIA, identified no fatal flaws. All impacts, including social impacts, associated with the project can also be mitigated to acceptable levels.

Impact:
Benefits associated with socio-economic development contributions

Issue	Nature	Extent of Impact	No-Go Areas

Socio-economic development (SED) contributions are an important focus of the RMIPPPP (Risk Mitigation Independent Power Producer Programme) and REIPPPP and are aimed at ensuring that local communities benefit directly from the investments attracted into the area.	Positive – Benefits associated with support for local communities form SED contributions.	The impact will occur at a local, regional.	None identified at this stage

Description of expected significance of impact

The proposed hybrid thermal facility is required to contribute a percentage of projected revenues to SED. These contributions are linked to Community Trusts and accrue over the project operation life and, in so doing, create an opportunity to generate a steady revenue stream over an extended period. This revenue can be used to fund development initiatives in the area and support the local community. The long-term duration of the revenue stream also allows local municipalities and communities to undertake long term planning for the area. The revenue from the proposed hybrid thermal plant can be used to support a number of social and economic initiatives in the area, including:

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

The impact is positive, with a local and regional extent.

Gaps in knowledge & recommendations for further study

» A site visit will be undertaken during the Assessment Phase of the SIA. The site visit will include interviews with interested and affected parties. However, as indicted above, the specialist is confident that the majority of social issues have been identified. In addition, the findings of the specialist studies undertaken as part of the Hyperion PV projects, including the SIA, identified no fatal flaws. All impacts, including social impacts, associated with the project can also be mitigated to acceptable levels.

Impact:
Visual impact and impact on sense of place

Issue	Nature	Extent of Impact	No-Go Areas
The components associated with the proposed hybrid thermal project	Visual impact associated with the proposed facility and associated infrastructure and the potential impact on the areas rural sense of place.	The impact will occur at a local level	None identified at this stage

and associated grid infrastructure, specifically the gas turbines or reciprocating gas engines, regassification system, dry cooling system and fuel storage facility will impact on the areas current rural sense of place			

Description of expected significance of impact

The areas sense of place has been impacted by the existing and proposed PV solar energy facilities and associated infrastructure, including transmission lines. The potential impact on the areas sense of place is therefore likely to be limited. This will be confirmed during the assessment phase.

Gaps in knowledge & recommendations for further study

- A site visit will be undertaken during the Assessment Phase of the SIA. The site visit will include interviews with interested and affected parties. Significance of visual impacts will be informed by the specialist VIA to be undertaken for the project.
- As indicted above, the specialist is confident that the majority of social issues have been identified. In addition, the findings of the specialist studies undertaken as part of the Hyperion PV projects, including the SIA, identified no fatal flaws. All impacts, including social impacts, associated with the project can also be mitigated to acceptable levels.

Impact:

Impacts on daily and living movement patterns associated with fuel delivery

Issue	Nature	Extent of Impact	No-Go Areas
Traffic Congestion	Traffic congestion due to an increase in traffic caused by the LPG or diesel deliveries, staff trips and trips for maintenance requirements	The impact will occur at a local level	N/A

Description of expected significance of impact

Traffic congestion and noise impacts caused by an increase in LPG or diesel deliveries, staff trips and trips for maintenance is likely to be negative, local in extent, long-term, and of low significance with the implementation of mitigation measures and duration of operation of the thermal generation facility.

Gaps in knowledge & recommendations for further study

- A detailed traffic impact assessment will be undertaken for the EIA phase of the project to assess the impacts a result of construction and operational activities.

8.5. Cumulative Impacts

Approach to Cumulative Effects Assessment

Cumulative impacts, in relation to an activity, refer to the impact of an activity that in-itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area. For cumulative effects analysis to help the decision-maker and inform interested parties, it must be limited to effects that can be evaluated meaningfully. Boundaries must be set so analysts are not attempting to measure effects on everything. Therefore, the cumulative impacts associated with the thermal generation facility and associated infrastructure have been viewed from two perspectives within this report:

- Cumulative impacts associated with the location and nature of the project, i.e. a thermal generation facility and associated infrastructure located within near Kathu on the Remainder of the Farm Lyndoch 432 and Portion 1 of Farm 464 for the proposed new access road.
- Cumulative impacts associated with other relevant approved or existing and proposed similar developments within the surrounding area of the proposed thermal generation facility and associated infrastructure. (Refer to Table 8.1 below for Other solar energy projects / developments approved within a 30km radius of Hyperion Solar Development 1 & 2).
- Cumulative impact associated with the hybrid facility (i.e. the impacts of the thermal generation facility and the PV facility).

Table 8.1. Other energy generation projects within the 30km radius of the authorised Hyperion PV SEF projects and proposed thermal facility

Project Name	DEA Reference Number(s)	Location	Approximate distance from Hyperion Solar Development 1	Project Status
Kalahari Solar Power Project (CSP) (1 x 100MW project)	12/12/20/1994	Remaining Extent of the Farm Kathu 465	~9.3km south west	Preferred Bidder (already constructed)
Kalahari Solar Power Project (CSP) (1 x 75MW project)	12/12/20/1994	Remaining Extent of the Farm Kathu 465	~9.3km south west	Approved
Kalahari Solar Power Project (CSP) (1 x 75MW project)	12/12/20/1994	Remaining Extent of the Farm Kathu 465	~9.3km south west	Approved
Bestwood Solar Farm (PV)	12/12/20/1906	Remaining Extent of the Farm Bestwood 459	~14km south	Approved
Boitshoko Solar Power Plant (PV) (1 x 115MW project)	14/12/16/3/3/2/935	Remaining Extent of Portion 1 of the Farm Lime Bank 471	~15.4km south west	Approved
Sishen Solar Farm (PV) (1 x 75MW project)	12/12/20/1860	Portion 6 of the Farm Wincanton 472	~15.8km west	Preferred Bidder (already constructed)

Kathu SEF (PV) (1 x 75MW project)	12/12/20/1858/1	Portion 4 of the Farm Wincanton 472	~15.8km west	Preferred Bidder (already constructed)
Kathu SEF (PV) (1 x 25MW project)	12/12/20/1858/2	Portion 4 of the Farm Wincanton 472	~15.8km west	Approved
Shirley Solar Park (PV) (1 x 75MW project)	14/12/16/3/3/2/616	Portion 1 of the Farm Shirley 367	~17.9km north west	Approved
Adams Solar Power Generation Plant (PV) (1 x 19MW project)	12/12/20/2566	Remaining Extent of the Farm Adams 328	~22km north	Approved
Adams PV SEF (PV) (1 x 75MW project)	12/12/20/2567	Remaining Extent of the Farm Adams 328	~22km north	Preferred Bidder (already constructed)
AEP Kathu Solar PV Energy Facility (PV) (1 x 75MW project)	14/12/16/3/3/2/911	Remaining Extent of the Farm Legoko 460	~22.4km south	Approved
AEP Legoko PV Solar Facility (PV) (1 x 75MW)	14/12/16/3/3/2/819	Portion 2 of the Farm Legoko 460	~22.4km south	Approved
Roma Energy Mount Roper Solar Plant (PV) (1 x 10MW project)	14/12/16/3/3/1/474	Portion 4 of the Farm Whitebank 379	~25km north east	Approved
Whitebank Solar Plant (PV) (1 x 10MW project)	14/12/16/3/3/1/475	Portion 4 of the Farm Whitebank 379	~25km north east	Approved
Mogobe PV SEF (1 x 75MW project)	14/12/16/3/3/2/820	Portion 1 of the Farm Legoko 460	~25km south	Approved
Roma Energy Mount Ropers Solar Plant (PV) (1 x 5MW project)	14/12/16/3/3/1/1753	Remaining Extent of the Farm Mount Roper 321	~25.7km north east	Approved
Perth – Kuruman Solar Farm (PV) (1 x 75MW project)	14/12/16/3/3/2/761	Remaining Extent of the Farm Pert 276	~30km north	Approved
Perth – Hotazel Solar Farm (PV) (1 x 75MW project)	14/12/16/3/3/2/762	Remaining Extent of the Farm Pert 276	~30km north	Approved
Kagiso Solar Power Plant (PV) (1 x 115MW project)	14/12/16/3/3/2/934	Remaining Extent of the Farm Pert 276	~30km north	Approved

Tshepo Solar Power Plant (PV) (1 x 115MW project)	14/12/16/3/3/2/936	Remaining Extent of Farm 275	~30km north	Approved

Refer to **Figure 8.1** for an illustration of other existing energy developments located within the surrounding areas of the project site.

Cumulative impacts, in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities (NEMA, 2017). The complicating factor is that the projects that need to be considered are from past, present and reasonably foreseeable future development. Cumulative effects can be characterised according to the pathway they follow. One pathway could be the persistent additions from one process. Another pathway could be the compounding effect from one or more processes. Cumulative effects can therefore occur when impacts are:

» additive (incremental);
» interactive;
» sequential; or
» synergistic.

Canter and Sadler (1997) describe a three-step process for addressing cumulative effects in an EIA:

» delineating potential sources of cumulative change (i.e. GIS to map the relevant industrial development in close proximity to one another).
» identifying the pathways of possible change (direct impacts)
» indirect, non-linear or synergistic processes; and
» Classification of resultant cumulative changes.

The project site and in particular the Kathu region is a hot spot for several other energy generation projects. As such, it can be expected that various other energy generation developments will take place in addition to the existing and authorised facilities.

Cumulative impacts associated with the proposed project could relate to:

» Ecological Impacts;
» Aquatic Impacts;
» Visual and social impacts;
» Air quality and Climate Change impacts;
» Noise impacts;
» Traffic impacts; and
» Social impacts.

From a cumulative perspective it is anticipated at this stage that the development of the thermal generation facility and its associated infrastructure will not result in unacceptable risk or loss to the environment. This is supported by the following:

- The already authorised Hyperion 1 & 2 PV SEF facilities are located on the proposed project site. The footprint of the thermal facility is limited in relation to these PV facilities.
- The avoidance of direct impacts on watercourses, wetlands and pans identified in the surrounding areas.
- The limited potential of the site for agricultural purposes due to the soil type.
- The location of the site in relation to residential areas and sensitive social receptors and other energy generation facilities.
- The low abundance of other sources of gaseous emissions in the area.

The cumulative impacts associated with the development of the thermal generation facility and associated infrastructure will be assessed in detail as part of the EIA Phase specialist reports and the EIA report.

Summary of the nature, significance, consequence, extent, duration and probability of cumulative impacts

- The positive cumulative impacts include creation of employment, skills development and training opportunities, and downstream business opportunities. Benefits to the local, regional and national economy through employment and procurement of services could be substantial.
- The potential negative cumulative impacts are considered to be probable, although the extent, duration, and magnitude of these impacts can be minimised to levels where this impact can be regarded as low significance through implementation of appropriate mitigation measures.
- The duration of the project is expected to be long-term and subsequently the impact is also expected to be long-term.
- The impact associated with the proposed development is expected to be local, affecting mainly the immediate environment and the surrounding areas. Positive impacts including job creation and economic development are considered to be regional in extent.
- Critical and much needed energy enhancement of South Africa's energy security, through the establishment of additional electricity generation capacity to alleviate load shedding and provide much need efficient and flexible generation capacity necessary to support the variability and expansion of South Africa's renewable generation capacity.

Gaps in knowledge & recommendations for further study:

- Each specialist study to be undertaken within the EIA Phase of the process will consider and assess the cumulative impacts of proposed, approved and authorised industrial developments within the area.

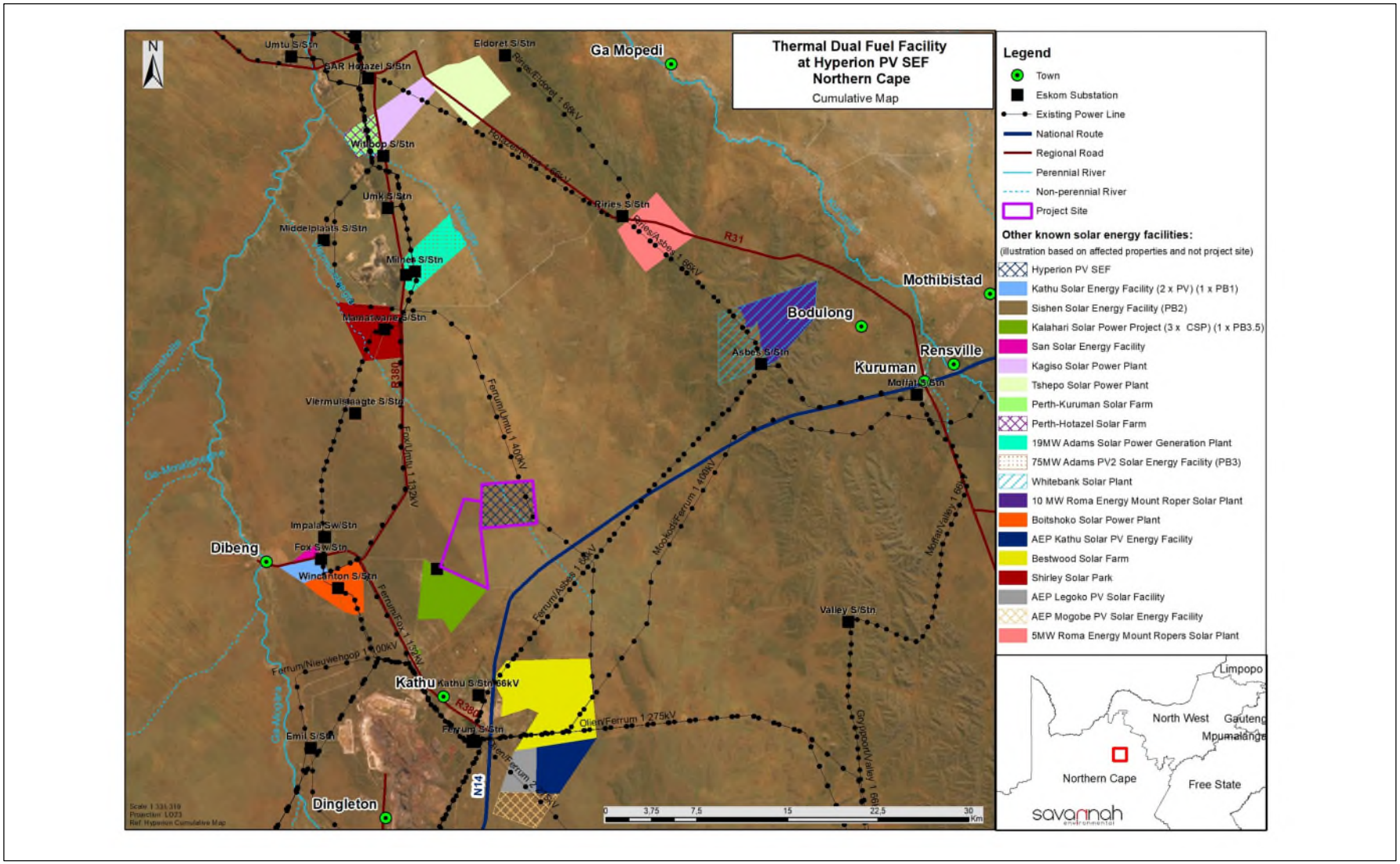

Figure 8.1: Cumulative map illustrating other energy generation developments located within the vicinity of the thermal generation facility and associated infrastructure project sites (**Appendix B2**

CHAPTER 9: CONCLUSION

Hyperion Solar Development (Pty) Ltd is proposing the development of a hybrid generation facility consisting of a dispatchable, dual fuel (liquid or gas) thermal generation plant that will work in combination with the authorised Hyperion 1 & 2 Solar PV Energy Facilities. The hybrid thermal power facility, access road and associated infrastructure are located approximately 15km north of Kathu within in the Gamagara Local Municipality which falls within jurisdiction of the John Taolo Gaetsewe District Municipality, Northern Cape Province. The power generated by the Hyperion hybrid generation facility will feed into the national electricity grid via an overhead 132kV power line to the existing Eskom Kalbas substation located to the south-west of the hybrid generation facility site[4]. The facility will be operated with either liquified petroleum gas comprising up to 100% propane (LPG), or diesel as a fuel source.

This Scoping Study has been undertaken in accordance with the 2014 EIA Regulations, as amended in April 2017, published in Government Notice 40772, in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998). This Scoping Report is aimed at detailing the nature and extent of the thermal generation facility and associated infrastructure, identifying potential issues associated with the development and defining the extent of studies required within the EIA phase. This was achieved through an evaluation of the thermal generation facility and associated infrastructure, involving the project proponent, specialist consultants, and a consultation process with key stakeholders (including relevant government authorities) and interested and affected parties (I&APs). The public consultation process is being undertaken in accordance with the approved public participation plan, and every effort is being made to include representatives of all stakeholder groupings in the communities surrounding the project site and the Province.

During this Scoping phase potential issues associated with the proposed project were identified and investigated through the review of existing information and desk-top evaluations of impacts and specialist inputs.

This chapter concludes the Scoping Report and provides an evaluation of the identified potential environmental risks and impacts associated with the construction and operation phases of the thermal generation facility and associated infrastructure. Recommendations regarding investigations required to be undertaken within the EIA Phase of the process are provided within the Plan of Study for EIA, contained within Chapter 10 of this Scoping Report.

9.1. Legal Requirements as per the EIA Regulations for the undertaking of a Scoping Report, 2014 (as amended)

This chapter of the final scoping report includes the following information required in terms of Appendix 2: Content of the Scoping Report:

Requirement	Relevant Section
(h)(xi) A concluding statement indicating the preferred alternatives, including the preferred location of the activity.	A concluding statement regarding the Scoping Phase of the thermal generation facility is included within this chapter as a whole.

[4] This power line is the subject of a separate application process.

9.2 Conclusion drawn from the Evaluation of the Proposed Project

Potential impacts associated with the development of the thermal generation facility and associated infrastructure are expected to occur during both the construction and operation phases. The conclusion of the findings of the Scoping Study is that the potential impacts identified to be associated with the construction and operation of the thermal generation facility and associated infrastructure are anticipated to be at a site or localised level, with few impacts extending from a local to national extent which includes both positive and negative impacts. The primary impact arising at a national level will be the positive impact of critical additional energy generation. The issue of Climate change arises from an international perspective.

The following provides a summary of the findings of the specialist studies undertaken:

» ***Ecology:*** Potential impacts on ecology are expected to occur mainly during the construction phase. The study area falls within an ecosystem of least concern, namely the Kathu Bushveld. The study area is not located within a protected area, however, is situated within a 10 km radius of the Kathu Forest Nature Reserve. According to the Northern Cape Critical Biodiversity Areas (2016) database, the study area does not fall within any Critical Biodiversity Areas (CBAs). However, most of the study area falls within an area categorised as Other Natural Areas, although small sections (in both the northeast and the southwest) of the study area fall within Ecological Support Areas (ESAs). As per the Northern Cape Province Spatial Development Framework (NCPSDF), the study area is located within the Griqualand West Centre (GWC) of plant endemism. According to the National web based environmental screening tool (2020), the terrestrial biodiversity theme for the study area is considered to have a very high sensitivity. The triggered sensitivity features include an Ecological Support Areas (ESA). The Plant Species Theme was identified to be of low sensitivity whereas the Animal Species Theme was identified as having a medium sensitivity, which is triggered by the presence of *Sagittarius serpentarius* (Secretary Bird) which is considered vulnerable. Due to the potential occurrence of floral and faunal species of conservation concern (SCC) as listed for the province, permits will be required to move or destroy these species if they are identified on site. It was determined that a full biodiversity assessment will need to be undertaken to determine the sensitivity of the site and the potential impacts to the study areas should the proposed development receive Environmental Authorisation. It is the opinion of the ecologists that this study provides the relevant information required in order to implement Integrated Environmental Management (IEM) and to ensure that the best long-term use of the ecological resources in the study area will be made in support of the principle of sustainable development.

» ***Freshwater Features:*** No watercourses are located within the focus area. However, several watercourses are within the investigation area, namely the episodic Vlermuisleegte River, a natural depression, an artificial unchanneled valley bottom wetland an artificial flat as well as a natural flat wetland. In addition to these wetlands, a pan was identified in the southern portion of the investigation area, around the 300 m corridor for the access road. Based on digital signatures, two additional cryptic wetlands and a pan was identified within the investigation area. These will be verified and refined accordingly during the EIA Phase. Since no watercourses are located within the focus area, no direct impacts from the construction of the thermal generation facility and related infrastructure are expected to occur on the watercourses outside of the focus area. Nevertheless, the potential occurrence of impacts associated with edge effects on the watercourses must be considered. If these edge effects are managed accordingly, the

impact significance on the watercourses is expected to be low to very low. During the EIA Phase of this project, a site assessment will be undertaken during which the watercourses will be assessed in detail and the delineation thereof verified on-site, in order to accurately determine the potential occurrence and significance of potential impacts on the watercourses resulting from the proposed development.

» ***Soils and Agricultural Potential:*** the proposed development of the Hyperion power dual fuel facility and supporting infrastructure will affect land with low to medium soil and agricultural sensitivity. No no-go areas have been identified for the proposed project from the perspective of soil and agricultural resource conservation. It is anticipated that the proposed project will have very limited impact on the soil properties and land capability while the land use will change from livestock farming to generation of energy. Potential for soil contamination has been identified due to storage of oils, grease, diesel/LPG and the potential for spillage of hazardous substances during construction and operational phases of the project. The detailed assessment and subsequent reporting will provide in-depth detail on all these aspects.

» ***Heritage Resources:*** Fossil localities are unknown in the area aside from Kathu Pan. There is a small chance of finding fossils in the Kalahari Group sediments due to construction of the thermal generation facility. Previous studies in the immediate area (including at the generator site) have shown that in sandy and calcrete-covered areas archaeological materials are virtually absent from the surface. Graves are an ever-present but very unlikely type of heritage resource that could be present. The main issue for this project will be the potential to intersect archaeological resources during excavations for the thermal facility and, to a lesser degree, the road. However, with appropriate mitigation, the impacts can be easily managed and a scientific benefit could even be derived with successful description and rescue of heritage materials. It is especially important to the archaeology of the region, and Grade I Kathu Complex, to understand both the vertical and horizontal distribution of buried archaeological resources and development projects allow opportunities to gain such insights. It is recommended that the proposed development proceed to the EIA Phase because no fatal flaws have been identified and all impacts can be readily managed and/or mitigated. Indeed, some benefit is likely to accrue with application of the correct archaeological mitigation measures. A sensitivity of low-medium has been determined for the majority of the site.

» ***Air Quality and climate change:*** The construction of the thermal generation facility has the potential to impact on the ambient air quality of the area through elevated ambient concentrations of particulate and gaseous atmospheric pollutants. During the operation phase, the thermal generation facility is likely to contribute sulfur dioxide, nitrogen dioxide and carbon monoxide to the existing baseline concentrations (including greenhouse gasses). The impact is expected to be of a medium significance. A detailed Air Quality Impact Assessment is recommended to assess the potential impacts on air quality as a result of the project. Climate change impacts associated with the development of the thermal generation facility and the hybrid facility relate to the combustion of fuel (diesel or LPG) at the thermal generation plant which will produce greenhouse gas emissions that will contribute to the global phenomenon of anthropogenic climate change. Climate change is projected to effect many environmental changes across the globe. It is expected that the thermal generation facility will contribute to South Africa's national emissions inventory. The significance of this impact must be quantified in the impact assessment phase of the project.

» ***Noise:*** Based on the questionnaire as proposed by SANS 10328:2008 and the resulting negative answer, it is unlikely that the planned development will present a noise disturbance during construction and operation. As recommended by SANS 10328:2008, a scoping investigation and an environmental noise impact investigation may not be required. Considering the location of the proposed thermal generation facility, it would be further than 1 000 m from the closest identified NSD, with the closest NSD 1.95 km away. While the thermal facility may be audible during quiet periods, noise levels are unlikely to significantly change the ambient sound levels at this distance. It was determined that there was a low potential for a noise impact and that no further Scoping or other acoustical studies would be required for the proposed thermal generation facility. No specific mitigation measures regarding noise or additional noise measurements were recommended and no additional conditions regarding noise are recommended for inclusion in the EMPr.

Visual: Impacts from a visual perspective are expected to occur during the construction and operation phases of the thermal generation facility on homesteads in close proximity and roads in the vicinity including the N14 and the R308. Potential impacts associated with roads and homesteads relate to visual intrusion and the general industrialisation of a semi-natural rural landscape. Glimpses of the proposed development could be visible from sections of the affected roads. However, these views are likely to be mitigated by distance, the fact that the project will be seen in a flat landscape meaning that there will be no overview and existing vegetation is likely to provide a high degree of screening. There is therefore only likely to be a low level of impact experienced by users of the identified roads. The closest homestead is approximately 2.7km from the proposed development. The orientation of the building, existing mature vegetation around the homestead, the flat landscape and intervening vegetation are all likely to help mitigate impacts. The initial assessment therefore indicates that levels of visual impacts are likely to be low.

» ***Socio-economic aspects:*** The findings of the Social Baseline Scoping Report indicate that the proposed Hyperion hybrid thermal dual fuel project will result in several social and socio-economic benefits, including creation of employment and business opportunities during both the construction and operational phase. The project will also contribute to local economic development though socio-economic development (SED) contributions. In addition, the development will improve energy security and reduce the carbon footprint associated with energy generation by merging thermal with solar hybrid solutions. The potential positive impacts are likely to be moderate to high. The potential negative impacts associated with both the construction and operational phases are likely to include safety risks, loss of farm land, increase risk of grass fires, impacts resulting from heavy vehicles and visual impacts. and will be low negative with mitigation. The potential negative impacts can therefore be effectively mitigated if the recommended mitigation measures are implemented. This will be confirmed during the Assessment phase.

» ***Cumulative Impacts:*** The project site is located within the footprint of the authorised Hyperion 1 & 2 PV SEFs and located in the vicinity of several other energy generation projects. Due to the development plans for the site and its unsuitable soil conditions it is considered unlikely that it would be used for agricultural purposes. Other similar facilities within the area include the operational Kalahari Solar Power CSP Project located south west of the project site. As a result, there is the potential for cumulative impacts to occur. The significance of these impacts must be assessed within the impact assessment phase of the EIA process.

No environmental fatal flaws or impacts of very high significance were identified to be associated with the development of the thermal generation facility and associated infrastructure on the identified project site at this stage in the process. This conclusion must however be confirmed through a detailed investigation of the development footprint within the EIA Phase of the process.

9.3 Scoping Phase Sensitivity Analysis

Through the Scoping Phase a number of sensitive features within the project site have been identified which could be affected by the development of the thermal generation facility (refer to **Figure 9.1**). These include wetland features within the larger project site. The identified wetlands, pans and associated buffer areas are however avoided by the proposed development. The indirect impacts on the wetland features and the direct and indirect impacts on biodiversity on the site must be assessed in detail during the EIA phase.

9.5 Recommendations

The findings of this final Scoping Report were based primarily on desktop assessments and site visits. Based on this assessment, no environmental fatal flaws have been identified to be associated with the project at this stage. Therefore, there is no reason why the project cannot be evaluated further in a detailed EIA study.

During the EIA phase more detailed environmental studies will be conducted in line with the Plan of Study contained in Chapter 10 of this report. These studies will consider the detailed layouts produced by Phinda and make recommendations for the implementation of avoidance strategies (if required), mitigation and management measures to ensure that the final assessed layout retains an acceptable environmental impact.

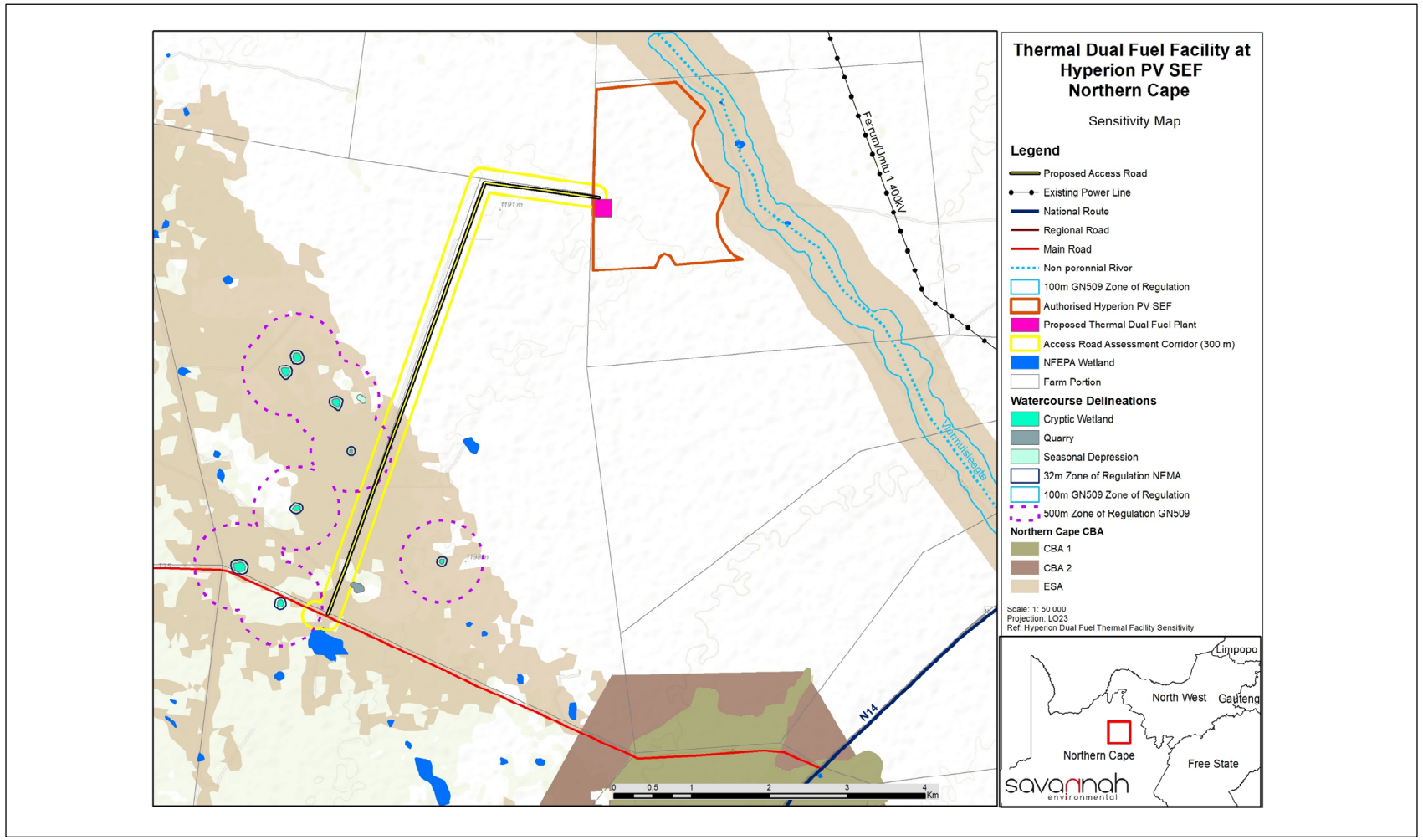

Figure 9.1: Updated sensitivity map illustrating the sensitive environmental features located within the thermal generation facility and associated infrastructure project sites (**Appendix B3)**

CHAPTER 10: PLAN OF STUDY FOR ENVIRONMENTAL IMPACT ASSESSMENT

This Scoping Report includes a description of the nature and extent of the thermal generation facility and associated infrastructure located within the authorised Hyperion 1 & 2 PV SEF facility footprint on the Farm Lyndoch 432 near Kathu. Details of the Scoping Study undertaken and the issues identified, described and evaluated are also included. The Scoping Study concluded that no fatal flaws are expected to be associated with the project and that the studies should proceed to the EIA Phase. This chapter provides the Plan of Study for the Environmental Impact Assessment (EIA) based on the outcomes of the Scoping Study and associated specialist investigations.

The EIA Phase of the study will include detailed specialist studies for those impacts recorded to be of potential significance, as well as on-going public consultation. The key findings of the Scoping Phase (which includes inputs from authorities, stakeholders, the public, the proponent and the EIA specialist team), together with the requirements of the NEMA EIA Regulations and applicable guidelines, are used to inform the Plan of Study for the EIA.

10.1. Legal Requirements as per the EIA Regulations for the undertaking of a Scoping Report, 2014 (as amended)

This chapter of the Scoping Report includes the following information required in terms of Appendix 2: Content of the Scoping Report:

Requirement	Relevant Section
(h) a plan of study for the undertaking of the environmental impact assessment process to be undertaken	A plan of study for the undertaking of the EIA phase for the thermal generation facility and associated infrastructure is included within Sections 10.2 to 10.8 of this chapter.

10.2 Aims of the EIA Phase

The EIA Study to be undertaken for the thermal generation facility and associated infrastructure will aim to achieve the following:

- Provide a description of all components of the project, including identified feasible alternative.
- Provide an overall description of the economic, social and biophysical environment affected by the development of the proposed project.
- Provide a description of the 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;
- Assess potentially significant impacts (direct, indirect and cumulative, where required) Identify and recommend appropriate measures to avoid, manage and mitigate potentially significant environmental impacts.
- Undertake a fully inclusive public involvement process to ensure that I&APs are afforded the opportunity to participate, and that their issues and concerns are recorded. This process will include consultation with I&APs, the public review of the EIA report for a 30-day period and the undertaking of focus group meetings and public meetings.

The EIA will address potential environmental impacts and benefits (direct, indirect and cumulative impacts) associated with each life-cycle stage of the development including design, construction, operation and decommissioning; and will aim to provide the environmental authorities with sufficient information to make an informed decision regarding the proposed thermal generation facility and associated infrastructure. A detailed facility layout will be assessed through detailed specialist studies. As required in terms of the EIA Regulations the assessment will include the consideration of the 'do nothing' alternative.

10.3 Authority Consultation

Consultation with the regulating authorities has been undertaken in the Scoping Phase and will continue throughout the EIA process. On-going consultation will include the following:

- Submission of a Final Scoping Report following a 30-day review period which will include all comments and issues raised during the review period as well as appropriate responses to the comments.
- Submission of an EIA Report and EMPr for review and comment. The report will be made available for a 30-day review period.
- Submission of a Final EIA Report and EMPr following a 30-day review period which will include all comments and issues raised during the review period as well as appropriate responses to the comments received.
- Consultation and an authority site visit (if required) in order to discuss the findings and conclusions of the EIA Report.

10.4 Consideration of Alternatives

The following project alternatives for the thermal facility will be investigated in the EIA Phase:

- **The 'do nothing' alternative:** Hyperion Solar Development (Pty) Ltd does not establish the thermal generation facility and associated infrastructure thereby forming the Hyperion hybrid facility on the proposed project sites, i.e. Remainder of the Farm Lyndoch 432 and Portion 1 of Farm 464 (for the proposed access road).
- **Site-specific layout/design alternatives:** In terms of the position of the thermal generation facility and associated infrastructure within the project site, and layout and/or design of the facility development footprint, particularly the layout of the turbines /engines and corridors/servitudes for associated infrastructure such as the access roads.
- **Technology alternatives:** Two technology alternatives are being considered for the thermal generation facility, namely reciprocating gas engine technology and gas turbine technology.
- **Fuel alternatives:** The thermal generation facility is proposed to operate using Liquified Petroleum Gas or diesel that is readily available to be trucked to the site.
- **Water supply alternatives:** Water is to be sourced from either the municipal supply and be trucked into the site, or from the existing borehole on site.

10.5 Assessment of Potential Impacts and Recommendations regarding Mitigation Measures

A summary of the issues which require further investigation within the EIA phase, as well as the proposed activities to be undertaken in order to assess and ground-truth the significance of these potential impacts is provided within **Table 10.1**. The specialists responsible for these studies are also reflected within this table. These specialist studies will consider the development footprint proposed for the thermal generation facility and all associated infrastructure, as well as feasible and reasonable alternatives identified for the development. The specialist studies to be undertaken in the EIA Phase will contain detailed descriptions of the methodologies used within each report, and details of infrastructure associated with the thermal facility that has been assessed. In addition, all specialist studies to be undertaken in the EIA Phase will contain detailed descriptions of the limitations and gaps

Based on the findings of the Scoping assessment, the following issues were identified as not requiring further investigation within the EIA, and no further or detailed assessment is required:

» ***Impacts on* noise** –Based on the questionnaire as proposed by SANS 10328:2008 and the resulting negative answer, it is unlikely that the planned development will present a noise disturbance. As recommended by SANS 10328:2008, a scoping investigation and an environmental noise impact investigation may not be required. Considering the location of the proposed thermal generation facility, it would be further than 1 000 m from the closest identified NSD, with the closest NSD 1.95 km away. While the thermal generation facility may be audible during quiet periods, noise levels are unlikely to significantly change the ambient sound levels at this distance. It was determined that there was a low potential for a noise impact and that no further Scoping or other acoustical studies would be required for the proposed thermal generation facility. No specific mitigation measures regarding noise or additional noise measurements were recommended and no additional conditions regarding noise are recommended for inclusion in the EMPr. Therefore, the findings of the Noise Assessment (**Appendix I**) are considered to be sufficient and no further impact assessment is required for the EIA Phase.

Table 10.1: Issues requiring further investigation during the EIA Phase and activities to be undertaken in order to assess the significance of potential impacts relevant to the thermal generation facility and associated infrastructure

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
Ecological Impact Assessment (terrestrial ecology including fauna and flora)	**Sensitivity Analysis and EIA assessment** The assessment of potential ecology impacts will be undertaken in compliance with the relevant specialist protocols. As a means to determine the significance of the impacts on fauna and flora on the project site, the following activities will be undertaken: » To identify and consider all sensitive landscapes including rocky ridges, wetlands and/or any other special features; » The terrestrial ecological assessment will focus on: * Conducting a Species of Conservational Concern (SCC) assessment, including potential for species to occur within the focus area; * Providing floral and faunal inventories of species that were encountered on site * Describing the spatial significance of the proposed development with regards to surrounding natural areas * Describing floral habitats, communities and ecological state of the proposed development layout as is determined on site; * Identifying dominant floral and faunal species for each habitat type; * Focus will be given to identifying areas of severe alien and invader encroachment and listing Category 1, 2 and 3 species in terms of GN No. 864 Alien and Invasive Species List, 2016: National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA); * Specific focus will also be given to establishing the presence of RDL and protected fauna and flora as listed within the IUCN List, relevant protected species listed under Schedule 2 (Protected Species) of the Northern Cape Nature Conservation Act (Act No. 9 of 2009), the National Forest Act, and the TOPS list of NEMBA » The reports produced will include a detailed impact assessment of all identified significant risks, including cumulative impacts on ecological assemblages in the region; and Recommendations on the management and mitigation measures (including opportunities and constraints) with regards to the construction and operation of the proposed activities, will be provided to manage and mitigate impacts on the terrestrial ecology of the area.	Chris Hooton of Scientific Terrestrial Services

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	From the above, an assessment of impacts will be undertaken and recommendations regarding mitigation measures will be made for inclusion in the EMPr. A reasoned opinion regarding the acceptability of the project, and whether the proposed project should be authorised, will be provided. **Assessment of Impacts for the EIA** The methodology described above will assist in the assessment of the overall effect of the proposed activity on the environment. It includes an assessment of the significant direct, indirect, and cumulative impacts. The significance of environmental impacts is to be assessed by means of the criteria of extent (scale), duration, magnitude (severity), probability (certainty) and direction (negative, neutral or positive). The nature of the impact will be defined and described, and refer to the causes of the effect, what will be affected and how it will be affected. For each anticipated impact, recommendations will be made for desirable mitigation measures. **Environmental Management Programme** For each overarching anticipated impact, management recommendations for the design, construction, and operational phase will be drafted for inclusion in the project EMPr.	
Freshwater Impact Assessment	**Sensitivity Analysis and EIA assessment** The impact assessment for the consideration of wetlands and aquatic features will be undertaken in compliance with the relevant specialist protocols, and will include the following: » Ground-truthing of delineation of the outermost edge of the watercourses associated with the focus area and investigation area in accordance with "DWAF120052: A practical field procedure for identification of wetlands and riparian areas". Aspects such as soil morphological characteristics, vegetation types and wetness were used to delineate the watercourses; » The watercourse classification assessment will be undertaken according to the Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland systems (Ollis et al., 2013) » The EIS of the watercourses will be determined according to the method described by Rountree & Kotze (2013) » The PES of the watercourses will be determined according to the resource-directed measures guideline of Macfarlane et al. (2008)	Stephen van Staden of Scientific Aquatic Services

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	» The watercourses will be mapped according to the ecological sensitivity of the watercourses in relation to the focus area. In addition to the watercourse boundaries, the appropriate provincial recommended buffers and legislated regulated areas will be depicted where applicable » Allocation of a suitable REC (Recommended Ecological Category) to the watercourses based on the results obtained from the PES and EIS assessments; » Evaluation of environmental issues and potential impacts (direct, indirect and cumulative impacts and residual risks) identified, including: * The nature of the impact; * The extent of the impact; * Anticipated duration of the impact; * Magnitude; * Probability of occurrence * The significance of the impact; * The status of the impact (positive, negative or neutral); * The degree to which the impact can be reversed/cause irreplaceable loss of resources and/or can be mitigated; and * Assessment of cumulative Impacts » Development of recommendations for mitigating potential impacts on the receiving environment. **Assessment of Impacts for the EIA** The methodology described above will assist in the assessment of the overall effect of the proposed activity on the environment. It includes an assessment of the significant direct, indirect, and cumulative impacts. The significance of environmental impacts is to be assessed by means of the criteria of extent (scale), duration, magnitude (severity), probability (certainty) and direction (negative, neutral or positive). The nature of the impact will be defined and described, and refer to the causes of the effect, what will be affected and how it will be affected. For each anticipated impact, recommendations will be made for desirable mitigation measures. **Environmental Management Programme** For each overarching anticipated impact, management recommendations for the design, construction, and operational phase will be drafted for inclusion in the project EMPr.	

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
Air Quality Impact Assessment	**Sensitivity Analysis and EIA assessment** The impact assessment for air quality will include the following: » Information review and collation which will include a review and identification of legal requirements pertaining to air quality and establishment of the background information on dust fall, PM10, and PM2.5 » Identification of air quality sensitive receptors. » An analysis of site-specific atmospheric dispersion considering local meteorology, land-use and topography; and. » Analysis and assessment of existing (baseline) ambient air quality data (if available). Any available on-site/near-site ambient monitoring data would be sourced from monitoring networks in the vicinity. » Meteorological modelling, including input data analysis and preparation which will consist of acquisition and processing of meteorological data such as Surface wind field; Temperature and Rainfall. This data will be acquired from a simulated (Weather Research and Forecasting model) dataset for the proposed site. » Establishment of the facility's emissions inventory. » A review of the entire process and assignment of emission factors at each stage of the process will be done. Assignment of USEPA and /or Australian emission factors will help in the completion of the inventory. » Information needed to estimate the furnace emissions will include stack parameters (Height, diameter, stack gas exit temperature, gas exit velocity or flow). » The emissions will be based on the minimum emissions standards (MES) for the potential subcategories » Dispersion modelling will be done according to the regulations. » Human inhalation health risk screening, compliance and impact assessment » The compliance assessment for the project should conform to NAAQS; NDCR. Where South African Standards are not available, IFC, WHO and other international guidelines will be used. » Impact report and management plan for EIA that conforms to Appendix 6 of the 2014 EIA regulations will be drafted. **Assessment of Impacts for the EIA** The methodology described above assist in the assessment of the overall effect of the proposed activity on the environment. It includes an assessment of the significant direct, indirect, and cumulative impacts.	Terri Bird of AirShed Planning Professionals

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	The significance of environmental impacts is to be assessed by means of the criteria of extent (scale), duration, magnitude (severity), probability (certainty) and direction (negative, neutral or positive). The nature of the impact will be defined and described, and refer to the causes of the effect, what will be affected and how it will be affected. For each anticipated impact, recommendations will be made for desirable mitigation measures. **Environmental Management Programme** For each overarching anticipated impact, management recommendations for the design, construction, and operational phase will be drafted for inclusion in the project EMPr.	
Climate Change Impact Assessment	**Sensitivity Analysis and EIA assessment** The undertaking of the climate change impact assessment will include the following: * Review of information. * Study of receiving environment, legislative requirements & predicted change in climate. * Equator Principles IV: Climate Change Risk Assessment Requirements including TCFD Transitional and Physical Risk identification. * Emissions inventory (GHG) (construction, operation, decommissioning) [Scope 1 - 3], estimated carbon tax implication. * Impact statement report in AIR. **Assessment of Impacts for the EIA** The methodology described above assists in the assessment of the overall effect of the proposed activity on the environment. It includes an assessment of the significant direct, indirect, and cumulative impacts. The significance of environmental impacts is to be assessed by means of the criteria of extent (scale), duration, magnitude (severity), probability (certainty) and direction (negative, neutral or positive). The nature of the impact will be defined and described, and refer to the causes of the effect, what will be affected and how it will be affected. For each anticipated impact, recommendations will be made for desirable mitigation measures. **Environmental Management Programme**	Terri Bird of AirShed Planning Professionals

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	For each overarching anticipated impact, management recommendations for the design, construction, and operational phase will be drafted for inclusion in the project EMPr.	
Soil and Agricultural Potential	**Sensitivity Analysis and EIA assessment** The soils and agricultural potential assessment will be undertaken in compliance with the relevant specialist protocols. The undertaking of the soil and agricultural impact assessment will include the following: * The existing Soil, Land Use, Land Capability and Agricultural Potential Assessments will be reviewed. * The data points of the spatial data that was generated by the field surveys of these projects, will be re-interpreted for the soil and land capability mapping of the final Soil and Agricultural EIA-level report to be submitted for the proposed Hyperion thermal power dual fuel facility, and access road. * The report will be prepared in alignment with all the relevant NEMA regulations as well as General Notice 320 of 2020 that specifically address Agricultural Compliance reporting for the renewable energy sector. **Assessment of Impacts for the EIA** The methodology described above assists in the assessment of the overall effect of the proposed activity on the environment. It includes an assessment of the significant direct, indirect, and cumulative impacts. The significance of environmental impacts is to be assessed by means of the criteria of extent (scale), duration, magnitude (severity), probability (certainty) and direction (negative, neutral or positive). The nature of the impact will be defined and described, and refer to the causes of the effect, what will be affected and how it will be affected. For each anticipated impact, recommendations will be made for desirable mitigation measures. **Environmental Management Programme** For each overarching anticipated impact, management recommendations for the design, construction, and operational phase will be drafted for inclusion in the project EMPr.	Mariné Pienaar of TerraAfrica
Visual Impact Assessment	**Sensitivity Analysis and EIA assessment** The visual impact that the thermal generation facility and associated infrastructure will have on surrounding areas will be assessed. The visual impact assessment will include the following: * Identification of issues raised in scoping phase, and site visit	Jon Marshall of Environmental Planning and Design

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	* Likely issues have already been identified in this scoping analysis. The assessor has already visited the proposed site for the assessment process for the authorised Hyperion solar PV projects. It is intended to use the information gathered during this site visit for this assessment. * Description of the receiving environment and the proposed project * The receiving environment has been described and categorised as part of the assessment processes for the authorised Hyperion solar PV projects. It is intended to use the information gathered during this site visit to prepare a detailed description of the receiving environment * Establishment of view catchment area, view corridors, viewpoints and receptors * Initial zones of theoretical visibility and visual receptors have been established from the GIS analysis included in this document. These will be verified when the detailed layout is available. * Indication of potential visual impacts using established criteria * Areas of likely visual impacts have been identified and described. This assessment will be developed further once a development layout is available. Impacts will be assessed using a numerical assessment system that has been adopted by Savannah Environmental for the overall assessment. This methodology is tried and tested, and its use will ensure that the Visual Impact Assessment can be easily incorporated into the Environmental Impact Assessment * Inclusion of potential lighting impacts at night * The impact of lighting at night will be included in the assessment using the above criteria. * Description of alternatives, mitigation measures and monitoring programmes. * Mitigation and monitoring measures will be developed during the preparation of the LVIA report during the EIA phase **Assessment of Impacts for the EIA** The methodology described above assists in the assessment of the overall effect of the proposed activity on the environment. It includes an assessment of the significant direct, indirect, and cumulative impacts. The significance of environmental impacts is to be assessed by means of the criteria of extent (scale), duration, magnitude (severity), probability (certainty) and direction (negative, neutral or positive). The nature of the impact will be defined and described, and refer to the causes of the effect, what will be affected and how it will be affected. For each anticipated impact, recommendations will be made for desirable mitigation measures.	

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	Environmental Management Programme For each overarching anticipated impact, management recommendations for the design, construction, and operational phase will be drafted for inclusion in the project EMPr.	
Heritage Impact Assessment	**Sensitivity Analysis and EIA assessment** The undertaking of the heritage impact assessment will include the following: * The EIA Phase work will be conducted via a desktop assessment, since reasonably good information is available for the site and surrounding area, and a surface examination of the site is highly unlikely to provide any new insights * The EIA Phase report will make recommendations for monitoring and/or mitigation to be carried out in advance of or during construction work. * The EIA Phase report will make recommendations for mitigation to be carried out in advance of construction work. This will likely entail monitoring of excavations and excavating column samples from a few strategic locations. It should be noted that the potential does exist for a larger excavation to be required if highly significant archaeological resources are discovered. * The EIA Phase report will make recommendations for mitigation or avoidance of graves visible on the surface and indicate how to proceed in the event that a grave is discovered during excavation. **Assessment of Impacts for the EIA** The methodology described above assists in the assessment of the overall effect of the proposed activity on the environment. It includes an assessment of the significant direct, indirect, and cumulative impacts. The significance of environmental impacts is to be assessed by means of the criteria of extent (scale), duration, magnitude (severity), probability (certainty) and direction (negative, neutral or positive). The nature of the impact will be defined and described, and refer to the causes of the effect, what will be affected and how it will be affected. For each anticipated impact, recommendations will be made for desirable mitigation measures. **Environmental Management Programme** For each overarching anticipated impact, management recommendations for the design, construction, and operational phase will be drafted for inclusion in the project EMPr.	Dr Jayson Orton of ASHA Consulting

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
Social Impact Assessment	**Sensitivity Analysis and EIA assessment** It is recommended that a full EIA level Social Impact Assessment be conducted as part of the EIA phase. The following activities will be undertaken as part of this process: » Review comments pertaining to social impacts received from members of the key stakeholders, and any organ of state during the public review of the Scoping Report. Where applicable, comments received from DEFF on the Final Scoping Report, which may pertain to social impact assessment, will also be reviewed. » Collect primary data. Interview key stakeholders to obtain primary information related to the project site, socio-economic environment, and to gain their inputs on the proposed project and its perceived impact (positive and /or negative). » Update the baseline information with information received during the data collection, as well as any additional information received from the client, or updates to the project description. » Assess impacts identified for the project in terms of their nature, extent, duration, magnitude, probability, status, and significance; including energy demand, as well as the degree to which the impact can be reversed, may cause irreplaceable loss of resources, and can be mitigated. » Identify mitigation measures with which to reduce negative impacts and enhance positive impacts for inclusion in the Environmental Management Programme (EMPr). » Provide a reasoned opinion regarding the acceptability of the project, and whether the proposed project should be authorised. **Assessment of Impacts for the EIA** The methodology described above assists in the evaluation of the overall effect of a proposed activity on the environment. It includes an assessment of the significant direct, indirect, and cumulative impacts. The significance of environmental impacts is to be assessed by means of the criteria of extent (scale), duration, magnitude (severity), probability (certainty) and direction (negative, neutral or positive). The nature of the impact will be defined and described, and refer to the causes of the effect, what will be affected and how it will be affected. For each anticipated impact, recommendations will be made for desirable mitigation measures. **Environmental Management Programme**	Tony Barbour of Tony Barbour Environmental Consultants

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	For each overarching anticipated impact, management recommendations for the design, construction, and operational phase will be drafted for inclusion in the project EMPr.	
Traffic Impact Assessment	**Sensitivity Analysis and EIA assessment** The undertaking of the traffic impact assessment will include the following: » An assessment of the facility layout; » A site visit to the area; » A site access and access road assessment; » Trip generation for both the construction and operation phases; » One 12 hour / peak hour traffic counts; » Trip distribution and trip assignment; and » Intersection or access analysis. From the above, an assessment of impacts will be undertaken and recommendations regarding mitigation measures will be made for inclusion in the EMPr. A reasoned opinion regarding the acceptability of the project, and whether the proposed project should be authorised will be provided. **Assessment of Impacts for the EIA** The methodology described above assists in the assessment of the overall effect of the proposed activity on the environment. It includes an assessment of the significant direct, indirect, and cumulative impacts. The significance of environmental impacts is to be assessed by means of the criteria of extent (scale), duration, magnitude (severity), probability (certainty) and direction (negative, neutral or positive). The nature of the impact will be defined and described, and refer to the causes of the effect, what will be affected and how it will be affected. For each anticipated impact, recommendations will be made for desirable mitigation measures. **Environmental Management Programme** For each overarching anticipated impact, management recommendations for the design, construction, and operational phase will be drafted for inclusion in the project EMPr.	Adrian Johnson of JG Afrika
Risk Assessment	**EIA Assessment** The undertaking of the risk assessment will include the following: » The identification of potential NEMA Section 30 incidents'	Mike Oberholzer of RISCOM

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	» The determination of whether the proposed project is likely to be considered an MHI » If found to be an MHI, the determination of whether the proposed project would meet the requirements of the MHI regulations and whether the risks could be engineered or managed to an acceptable level » The determination of whether there any factors that will prevent the project from proceeding to the next phase of construction or alternatively whether the project could continue under certain conditions or with mitigation » The determination of whether there are any special requirements that the local authorities should be aware of when evaluating the proposal From the above, an assessment of impacts will be undertaken and recommendations regarding mitigation measures will be made for inclusion in the EMPr. A reasoned opinion regarding the acceptability of the project, and whether the proposed project should be authorised will be provided. **Assessment of Impacts for the EIA** Generally, at the EIA phase there is insufficient detailed information to complete an MHI risk assessment in full accordance with the MHI regulations. For example, emergency plans have not been developed and final designs have not been completed. Under the circumstances a risk assessment would be conducted generally in accordance with the prescribed topics of the MHI regulations. The proposed risk assessment will assess the consequence of major events with the extent of the impact. Risks will be calculated based on the detail available and some assumptions. Excessive risks (as per international criteria) will be highlighted with some mitigation suggestions to reduce risks to international criteria. By definition, an EIA proposes mitigation that must be addressed in the final designs. Thus, the final designs are expected to be different from the designs presented during the EIA. Similarly, the risk assessment done at the EIA phase cannot be submitted as a MHI risk assessment as the designs and layouts are subject to change after the EIA. **Environmental Management Programme** For each overarching anticipated impact, management recommendations for the design, construction, and operational phase will be drafted for inclusion in the project EMPr.	

10.6 Methodology for the Assessment of Potential Impacts

Direct, indirect and cumulative impacts of the above issues identified through this Scoping Study will be assessed in terms of the following criteria:

- The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional:
  - local extending only as far as the development site area – assigned a score of 1;
  - limited to the site and its immediate surroundings (up to 10 km) – assigned a score of 2;
  - will have an impact on the region – assigned a score of 3;
  - will have an impact on a national scale – assigned a score of 4; or
  - will have an impact across international borders – assigned a score of 5.
- The **duration**, wherein it will be indicated whether:
  - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
  - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
  - medium-term (5–15 years) – assigned a score of 3;
  - long term (> 15 years) - assigned a score of 4; or
  - permanent - assigned a score of 5.
- The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
  - 0 is small and will have no effect on the environment;
  - 2 is minor and will not result in an impact on processes;
  - 4 is low and will cause a slight impact on processes;
  - 6 is moderate and will result in processes continuing but in a modified way;
  - 8 is high (processes are altered to the extent that they temporarily cease); and
  - 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The **probability** *of occurrence*, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale, and a score assigned:
  - Assigned a score of 1–5, where 1 is very improbable (probably will not happen);
  - Assigned a score of 2 is improbable (some possibility, but low likelihood);
  - Assigned a score of 3 is probable (distinct possibility);
  - Assigned a score of 4 is highly probable (most likely); and
  - Assigned a score of 5 is definite (impact will occur regardless of any prevention measures).
- the **significance**, which shall be determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high.
- the **status**, which will be described as either positive, negative or neutral.
- the degree to which the impact can be reversed.
- the degree to which the impact may cause irreplaceable loss of resources.
- the *degree* to which the impact can be *mitigated*.

The **significance** is determined by combining the criteria in the following formula:

S= (E+D+M) P; where

S = Significance weighting

E = Extent
D = Duration
M = Magnitude
P = Probability

The **significance weightings** for each potential impact are as follows:

» < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
» 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
» > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

As the developer has the responsibility to avoid and/or minimise impacts as well as plan for their management (in terms of the EIA Regulations), the mitigation of significant impacts will be discussed. Assessment of mitigated impacts will demonstrate the effectiveness of the proposed mitigation measures.

10.6.1. Approach to the Assessment of Cumulative Impacts

The role of the cumulative assessment is to test if such impacts are relevant to the proposed project in the proposed location when considered together with other similar developments. This will include consideration of the potential for:

» Unacceptable loss of habitat or landscape connectivity as a result of impacts on ecology and vegetation.
» Unacceptable risk to fauna through loss of habitats and disturbance.
» Unacceptable risk to aquatic resources.
» Unacceptable loss of soils and agricultural resources.
» Unacceptable loss of heritage resources (including palaeontological and archaeological resources).
» Complete or whole-scale change in the sense of place and character of an area and unacceptable visual intrusion.
» Unacceptable impact to social factors and components.

10.7 EIA Report

The results of the specialist studies and other available information will be integrated and synthesised by the Savannah Environmental project team into the EIA Report for the project. The EIA Report will be compiled in terms of the requirements of the EIA Regulations and will include:

» The details and expertise of the **EAP** who prepared the report.
» The **location** of the activity and a locality map illustrating the location of the proposed activity.
» A **description** of the scope of the proposed activity including all listed activities triggered and a description of associated structures and infrastructure.
» The **policy and legislative** context within which the development is located and an explanation of how the development complies and responds to the legislation and policy context.

- The **need and desirability** of the proposed development of the activity in the context of the preferred location.
- A motivation for the **preferred development footprint** within the approved site.
- A description of the **process** followed to reach the proposed development footprint within the approved site, including:
  - details of the development footprint considered;
  - details of the public participation process undertaken in terms of Regulation 41 of the 2014 EIA Regulations, including copies of supporting documents;
  - a summary of issues raised by interested and affected parties and the manner in which the issues were incorporated;
  - 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, including the degree to which these impacts can be reversed, may cause irreplaceable loss of resources and can be avoided, managed or mitigated;
  - the methodology used for determining and ranking the nature, significance, consequence, extent, duration and probability of potential environmental impacts and risks;
  - positive and negative impacts that the activity and alternatives will have on the environment and the community;
  - possible mitigation measures to be applied and the level of residual risk;
  - a motivation for not considering alternative development locations (if applicable);
  - a concluding statement indicating the preferred alternative development location; and
  - a full description of the process followed to identify, assess and rank impacts of the activity and associated infrastructure on the preferred location including all environmental issues and risks that have been identified and an assessment of the significance of each issue and risk and the extent to which the issue/risk can be avoided or mitigated.
- An **assessment** of the identified potentially significant impacts and risks.
- A summary of the **findings and recommendations** of any specialist report and an indication as to how these findings and recommendations have been included.
- An **environmental impact assessment** containing a summary of key findings, an environmental sensitivity map and a summary of the positive and negative impacts and risks of the proposed activity.
- **Recommendations** from specialist, the recording of proposed impact management **objectives** and the impact management **outcomes** for inclusion in the **EMPr** as well as inclusion as conditions of authorisation.
- The final **alternatives** which respond to the impact management measures, avoidance and mitigation measures identified.
- Any aspects which were **conditional** to the findings of the assessment.
- Description of the assumptions, uncertainties and gaps in knowledge relating to the assessment and mitigation measures proposed.
- An **opinion** as to whether the proposed activity should or should not be authorised and the conditions thereof.
- An undertaking under **affirmation** by the EAP in relation to the correctness of the information, the inclusion of comments and inputs from stakeholders and Interested and affected parties, the inclusion of inputs and recommendations from the specialists 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.
- Any specific information that may be required by the competent authority.

The EIA Report will be released to the public and relevant Organs of State for a 30-day review period. The comments received from I&APs will be captured within a Comments and Response Report, which will be included within the Final EIA Report, for submission to the competent authority for decision-making.

10.7 Public Participation Process

A public participation process will be undertaken by Savannah Environmental during the EIA phase in accordance with the approved Public Participation Plan. Consultation with affected and adjacent landowners/occupiers, key stakeholders and I&APs will be on-going throughout the EIA Phase. Through this consultation process, stakeholders and I&APs will be encouraged to verify that their issues were recorded in the Scoping Phase and to identify additional issues of concern or highlight positive aspects of the thermal generation facility and associated infrastructure, and to comment on the findings of the EIA Phase. In order to accommodate the varying needs of stakeholders and I&APs within the broader area surrounding the project site, as well as capture their inputs, various opportunities will be provided for stakeholders and I&APs to be involved in the EIA Phase of the process, through the following means:

- Virtual focus group or public meetings will be held (pre-arranged and I&APs invited to attend) using the most suitable virtual platform.
- One-on-one consultation meetings will be held via an appropriate forum (for example with directly affected and surrounding landowners).
- Telephonic consultation sessions (consultation with various parties from the EIA project team, including the public participation consultant, lead EIA consultant as well as specialist consultants).
- Written, faxed, or e-mail correspondence received via the Savannah Environmental online stakeholder engagement platform or in writing.

The EIA Report will be made available for a 30-day review period prior to finalisation and submission to the DEFF for decision-making.

10.8 Key Milestones of the Programme for the EIA

The envisaged key milestones of the programme for the EIA Phase are outlined in the following table (and include indicative dates):

Key Milestone Activities	Anticipated timeframe
Make Scoping Report available to the public, stakeholders and authorities for review and comment	17 October 2020 – 17 November 2020
Finalisation of Scoping Report, and submission of the Final Scoping Report to DEFF	November 2020
Authority acceptance of the Final Scoping Report and Plan of Study to undertake the EIA	December 2020
Undertake specialist studies	October to December 2020
Make EIA Report and EMPr available to the public, stakeholders and authorities for review and comment	December 2020/January 2021 (taking into consideration days of reckoning)
Finalisation of EIA Report, and submission of the Final EIA Report to DEFF	March 2021
Authority review period and decision-making (107 calendar days)	May 2021

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