DEVELOPMENT OF A 75MW THERMAL DUAL FUEL FACILITY AS PART OF THE HYPERION HYBRID GENERATION FACILITY, NORTHERN CAPE PROVINCE

Environmental Impact Assessment Report

April 2021

DEFF Reference No.: 14/12/16/3/3/2/2019

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PROJECT DETAILS

DEFF Reference No. : 14/12/16/3/3/2/2019

Title : Environmental Impact Assessment Process: Environmental Impact Assessment Report for Development of a 75MW Thermal Dual Fuel Facility as part of the Hyperion Hybrid Generation Facility, Northern Cape Province

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Applicant : Hyperion Solar Hybrid (Pty) Ltd

Report Status : Final EIA for Authority decision-making

Date : April 2021

When used as a reference this report should be cited as: Savannah Environmental (2021) Environmental Impact Assessment Report 75MW Thermal Dual Fuel Facility as part of the Hyperion Hybrid Generation Facility, Northern Cape Province.

PURPOSE OF THE EIA REPORT

Hyperion Solar Hybrid (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 22km 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 Hybrid (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. Although the project was not successful in the RMIPPPP, the Applicant proposes to bid the project into subsequent procurement programmes.

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, only the potential environmental impacts associated with the construction, operation and decommissioning phases of the 75MW Thermal Dual Fuel Facility and associated infrastructure, are assessed in this EIA Report.

This EIA 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 EIA Phase of the EIA Process.
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- **Chapter 9** provides a description and assessment of the potential cumulative impacts associated with the project.
- **Chapter 10** provides the conclusion and recommendations based on the findings of the EIA report.
- **Chapter 11** provides a list of all references used in the compilation of the EIA Report.

The EIA report was available for review from 12 February 2021 until, 15 March 2021 at the following https://savannahsa.com/public-documents/energy-generation/.

All comments recorded during the 30-day review period have been included, considered and addressed within this Final EIA Report (refer to Comments & Response Report in Appendix C8). This report is submitted for the consideration of the National Department of Environment, Forestry and Fisheries (DEFF). Changes made in this Final EIA Report have been underlined for ease of reference.

EXECUTIVE SUMMARY

Hyperion Solar Hybrid (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 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 22km north of Kathu within the Gamagara Local Municipality which falls within jurisdiction of the John Taolo Gaetsewe District Municipality, Northern Cape Province.

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No environmental fatal flaws were identified in the detailed specialist studies conducted, provided that the recommended mitigation measures are implemented. These measures include, amongst others, the avoidance of highly sensitive features within the project site by the development footprint and the undertaking of monitoring, as specified by the specialists, as well as the operation of the thermal facility as part of a hybrid system together with the PV facilities in order to reduce GHG emissions.

The potential environmental impacts associated with Thermal facility identified and assessed through the EIA process include:

- Impacts on ecology, flora and fauna.
- Impacts on avifauna.
- Impacts on freshwater.
- Impacts on soils and agricultural potential
- Impacts on heritage resources, including archaeology and palaeontology.

- Visual impacts on the area imposed by the components of the facility.
- Positive and negative socio- economic impacts.
- Traffic impacts.
- Impact on air quality and climate change.
- Impacts associated with unexpected events.

Impacts on Ecology: The Terrestrial Biodiversity Assessment (Appendix D) verified the results of previous field and desktop assessments undertaken for the project site (Todd, 2020). The project site has a moderate abundance of Vachellia erioloba with a high abundance of Vachellia haematoxylon, especially within the southern half of the authorised Hyperion PV1&2 footprint, which are species protected under the National Forest Act. If no mitigation measures are implemented, the impact on floral and faunal habitat, diversity and species of concern is likely to be of medium significance. With mitigation measures in place, the impact significance can be reduced to low significance. The assessment concluded that the loss of habitat from the proposed development will not result in significant impacts on floral and faunal communities given that biodiversity outside of the direct footprint is preserved through strict adherence to mitigation measures, although cumulative habitat loss in the greater region area must be considered.

Impacts on Avifauna: The Avifaunal Assessment (Appendix E) verified the results of previous field and desktop assessments undertaken for the project site (Todd, 2019). If no mitigation measures are implemented, the impact on avifaunal habitat, diversity and species of concern is likely to be of medium significance. With mitigation measures in place, the impact significance can be reduced to low significance. In terms of development implications, the loss of habitat from the proposed development will not result in significant impacts on the avifaunal community within the focus and no impacts on a National or Regional scale are anticipated to permeate from the Thermal Plant.

Impacts on Freshwater: The Freshwater Assessment (Appendix F) concluded that there are no watercourses within the proposed development footprint. However, 2 watercourses were identified in the surrounding area, namely the Vlermuisleegte River and a perched depression wetland within the project area. Based on the outcome of the impact assessment, the proposed Hyperion hybrid generation facility is not expected to pose a direct negative impact to the identified Vlermuisleegte River and perched depression wetland. This can be attributed to the distance the proposed Hyperion hybrid generation facility (located at least 420 m from the edge of the river and 522 m from the edge of the perched depression wetland) is located from the watercourses. The proposed upgraded access road is located immediately adjacent to the delineated extent of the Vlermuisleegte River. As such, the construction of the road may pose a direct negative impact to the Vlermuisleegte River. It is highly recommended that the width of the road be extended to the western side of the existing road reserve rather than to the east thereof (if considered technically feasible). This will reduce the impact significance of the proposed access road construction activities on the Vlermuisleegte River. During the operational phase of the access road, if the recommended mitigation measures are implemented, the impacts significance would be low.

Impacts on Land Use, Soil and Agricultural Potential: The Soils and Agricultural Potential Compliance Statement (Appendix G) indicated that the Thermal Plant and northern part of the access road consist of land with Low-Moderate land capability. The assessment concluded that the construction and operation of the Thermal plant and upgraded access road will have impacts that range from medium to low.

Through the consistent implementation of the recommended mitigation measures, most of impacts can all be reduced to low. Since the area around the plant will be fenced off, it is not anticipated that the impact on livestock farming can be mitigated as this area together with the access road alignment, will now be excluded from livestock farming.

The development is considered to be favorable, providing that the mitigation measures are followed to prevent soil erosion and soil pollution and to minimise impacts on the veld quality of the farm portions that will be affected. The project infrastructure should also remain within the proposed footprint boundaries that will be fenced off and the construction corridor around the access road must be as narrow as possible.

Visual Impacts: The Visual Impact Assessment (Appendix J) undertaken determined that the visibility of the proposed engine houses and lower infrastructure is likely to be limited and will be similar to the authorised solar power projects within and adjacent to which the proposed thermal facility is located. The proposed stacks are however likely to be visible over a broader area and could influence the landscape character as experienced by the majority of receptors.

The proposed project will not result in removal of significant areas of vegetation over and above that removed for the authorised solar projects. Vegetation remaining between the project and possible receptors is likely to mean that this removal of vegetation will not be obvious.

At night lighting could make the development obvious in the landscape. This will be seen against the backdrop of other projects in the area. The general area is not a pristine night time landscape as lighting is also likely to be obvious from mining operations as well as the Kathu Airport. However, the area immediately around the project is relatively dark with only homesteads providing isolated low level lighting.

The proposed access road upgrade will result in a degree of vegetation removal. The formalisation of this road will also be obvious from a small number of homesteads.

Identified visual impacts were all assessed as low significance and can be further reduced with implementation for appropriate mitigation measures. From a landscape and visual impact perspective the specialist concluded that the proposed development ought to be authorised.

Impacts on Heritage Resources (archaeological and paleontological): The main issue for this project from a heritage perspective will be the potential to intersect archaeological resources during excavations for both the generator and the road (Appendix H). The impact significance was determined to be high however, with appropriate mitigation, the impacts can be easily managed and reduced to low significance. Also, a scientific benefit could even be derived with successful description and rescue of heritage materials.

In the paleontological assessment the impact significance without mitigation in terms of local fossil heritage resources is assessed as low (negative). Pending the potential exposure of scientifically important fossil remains before or during the construction phase, no further specialist palaeontological studies or mitigation are recommended.

The specialist study recommended that the proposed generator and access road should be authorised from an archaeological perspective with the implementation of the recommended mitigation measures.

Social Impacts: The Social Impact Assessment (Appendix K) indicated 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 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 findings of the assessment also indicates that the potential negative impacts associated with both the construction and operational phase are likely to be Low Negative with mitigation. It was concluded by the specialist that the development of the proposed Hyperion hybrid thermal dual fuel project is supported from a social perspective.

Traffic Impacts: The Traffic Impact Assessment (Appendix M) identified that the main potential traffic impacts will occur during the construction and decommissioning phases where the delivery and decommissioning of the components of the proposed facility will generate significant traffic. The duration of these phases is short term, i.e. the impact of the traffic generated during the construction and decommissioning phases of the proposed facility on the surrounding road network is temporary, and will be low significance with implementation of mitigation measures. The operational phase of the proposed facility, which includes the delivery of LPG to the site, will not add any significant traffic to the road network.

Based on the outcome of the assessment, the impacts associated with the thermal plant and upgraded access road are considered acceptable from a traffic impact perspective with the implementation of the recommended mitigation measures and the specialist concluded that it can therefore be authorised.

Air Quality and Climate Change Impacts: The Air Quality and Climate Change Assessment (Appendix I) assessed baseline air quality at the site for thoracic particulates (with a diameter less than 10 µm – PM10), inhalable particulates (with an aerodynamic diameter less than 2.5 µm – PM2.5), sulfur dioxide (SO2) and nitrogen dioxide (NO2) using data for the period 2018 to 2020. The impact of the facility was simulated to be below the dust control regulations near the thermal power generation facility, but exceedances of the dust control regulations are likely along the access road used for LPG delivery.

Criteria air pollutants associated with the normal operation of the project were determined to be of medium significance, however, could be reduced to low significance with additional mitigation to along the access road. The greenhouse gas emissions associated with the operation of project was determined to be of medium significance.

From an air quality and climate change perspective, it is the opinion of the specialist that the Thermal Plant be authorised and licensed to operate on condition that all recommendations are implemented.

Assessment of Unexpected Events: The main risks identified for the Thermal Plant in the Quantitative Risk Assessment (Appendix L) due to loss of containment of hazardous components include exposure to, thermal radiation from fires and overpressure from explosions. Most of the surrounding land has not been

developed, and thus limited impacts would be experienced from a large release of LPG within these areas. Impacts into the residential areas, recreational areas, hotels, schools, hospitals and other public placeswould not be expected. Impacts assessed for the LPG installations were determined to be of low significance.

No fatal flaws were identified that would prevent the project proceeding to the detailed engineering phase of the project and the specialist concluded that they would support the project provided that a Major Hazard Installation (MHI) risk assessment is completed prior to construction of the Thermal plant.

Assessment of Cumulative Impacts: Based on the specialist cumulative assessment and findings (refer to Appendix D to Appendix M and Chapter 9 of the EIA), the development of Thermal plant and upgraded access road and its contribution to the overall impact of all existing and proposed solar energy facilities and other industrial activities within a 30km radius, it can be concluded that cumulative impacts in the area will be of a low to moderate to high significance, depending on the impact being considered. There are however no impacts or risks identified to be considered as unacceptable with the development of Thermal plant and upgraded access road when considered together with other developments within the surrounding area. In addition, no impacts which will result in whole-scale change are expected.

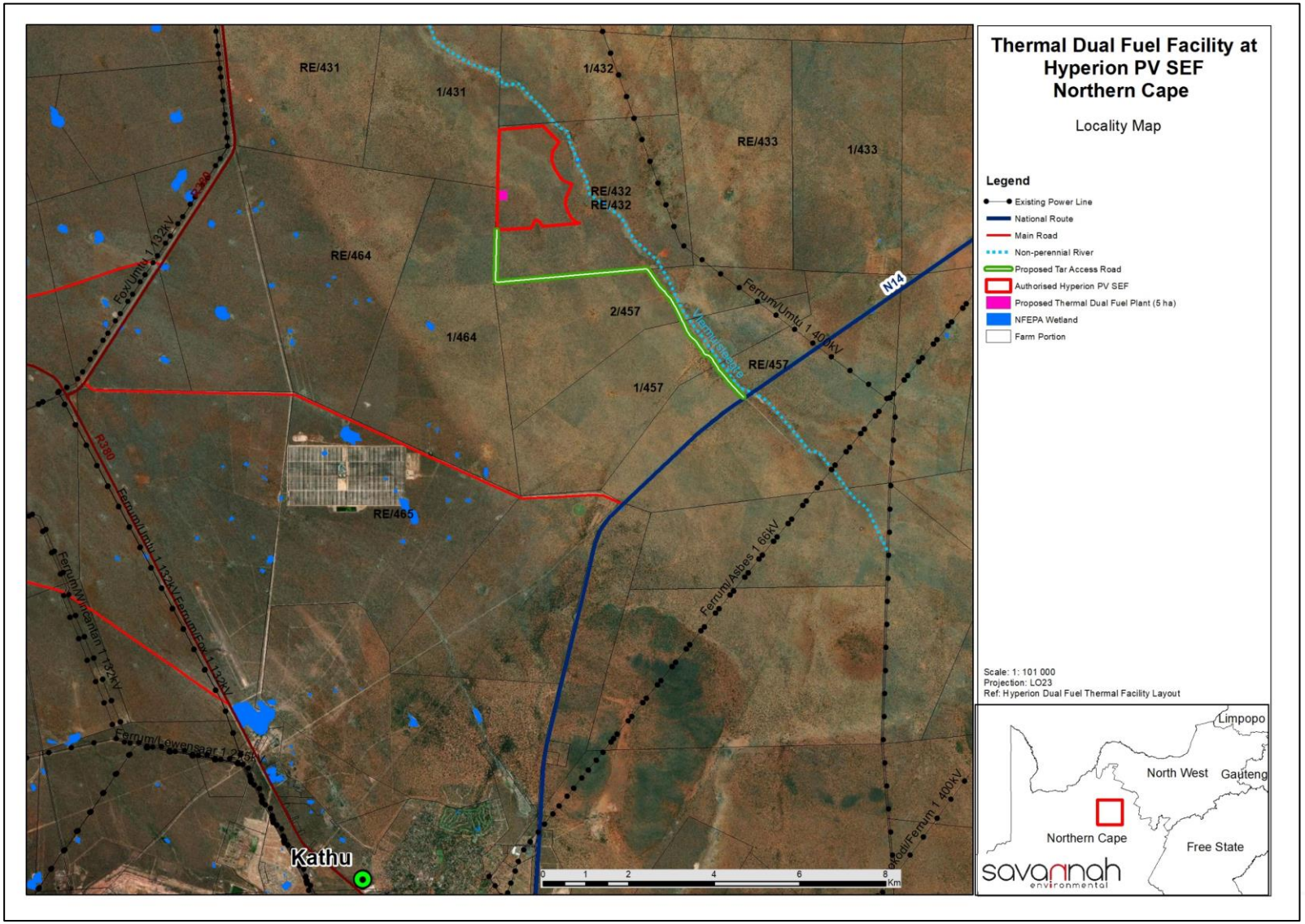

Figure 1: Locality map illustrating the location of the thermal plant and upgraded access road in relation to the authorised Hyperion PV SEF

DEFINITIONS AND TERMINOLOGY

Alternatives: Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the 'do nothing' alternative.

Archaeological material: Remains resulting from human activities which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures.

Commence: The start of any physical activity, including site preparation and any other activity on site furtherance of a listed activity or specified activity, but does not include any activity required for the purposes of an investigation or feasibility study as long as such investigation or feasibility study does not constitute a listed activity or specified activity.

Construction: Construction means the building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity. Construction begins with any activity which requires Environmental Authorisation.

Cumulative impacts: Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities (e.g. discharges of nutrients and heated water to a river that combine to cause algal bloom and subsequent loss of dissolved oxygen that is greater than the additive impacts of each pollutant). Cumulative impacts can occur from the collective impacts of individual minor actions over a period and can include both direct and indirect impacts.

Decommissioning: To take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it cannot be readily re-commissioned. This usually occurs at the end of the life of a facility.

Direct impacts: Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation, or maintenance of an activity and are generally obvious and quantifiable.

Disturbing noise: A noise level that exceeds the ambient sound level measured continuously at the same measuring point by 7 dB or more.

'Do nothing' alternative: The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

Endangered species: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

Emergency: An undesired/ unplanned event that results in a significant environmental impact and requires the notification of the relevant statutory body, such as a local authority.

Endemic: An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place. Whether something is endemic or not depends on the geographical boundaries of the area in question and the area can be defined at different scales.

Environment: the surroundings within which humans exist and that are made up of:

i. The land, water and atmosphere of the earth;
ii. Micro-organisms, plant and animal life;
iii. Any part or combination of (i) and (ii) and the interrelationships among and between them; and
iv. The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental impact: An action or series of actions that have an effect on the environment.

Environmental impact assessment: Environmental Impact Assessment, as defined in the NEMA EIA Regulations and in relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

Environmental management: Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

Environmental management programme: An operational plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its ongoing maintenance after implementation.

Heritage: That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act of 2000).

Indigenous: All biological organisms that occurred naturally within the study area prior to 1800.

Indirect impacts: Indirect or induced changes that may occur because of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place because of the activity.

Interested and affected party: Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups, and the public.

Method statement: A written submission to the ECO and the site manager (or engineer) by the EPC Contractor in collaboration with his/her EO.

Mitigation hierarchy: The mitigation hierarchy is a framework for managing risks and potential impacts related to biodiversity and ecosystem services. The mitigation hierarchy is used when planning and implementing development projects, to provide a logical and effective approach to protecting and conserving biodiversity and maintaining important ecosystem services. It is a tool to aid in the sustainable management of living, natural resources, which provides a mechanism for making explicit decisions that balance conservation needs with development priorities.

No-go areas: Areas of environmental sensitivity that should not be impacted on or utilised during the development of a project as identified in any environmental reports.

Perennial and non-perennial: Perennial systems contain flow or standing water for all or a large proportion of any given year, while non-perennial systems are episodic or ephemeral and thus contains flows for short periods, such as a few hours or days in the case of drainage lines.

Pollution: A change in the environment caused by substances (radio-active or other waves, noise, odours, dust or heat emitted from any activity, including the storage or treatment or waste or substances.

Pre-construction: The period prior to the commencement of construction, this may include activities which do not require Environmental Authorisation (e.g. geotechnical surveys).

Rare species: Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare."

Red data species: Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or in terms of the South African Red Data list. In terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

Riparian: the area of land adjacent to a stream or river that is influenced by stream-induced or related processes. Riparian areas which are saturated or flooded for prolonged periods would be considered wetlands and could be described as riparian wetlands. However, some riparian areas are not wetlands (e.g. an area where alluvium is periodically deposited by a stream during floods but which is well drained).

Significant impact: An impact that by its magnitude, duration, intensity, or probability of occurrence may have a notable effect on one or more aspects of the environment.

Waste: means—

a) any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to this Act; or

b) any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister

Watercourse: as per the National Water Act means -
(a) a river or spring;
(b) a natural channel in which water flows regularly or intermittently;
(c) a wetland, lake or dam into which, or from which, water flows; and
(d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks

Wetlands: land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which under normal circumstances supports or would support vegetation typically adapted to life in saturated soil (Water Act 36 of 1998); land where an excess of water is the dominant factor determining the nature of the soil development and the types of plants and animals living at the soil surface (Cowardin et al., 1979).

ACRONYMS

BGIS	Biodiversity Geographic Information System
CBA	Critical Biodiversity Area
DEFF	Department of Environment, Forestry and Fisheries (National)
DWS	Department of Water and Sanitation
CBA	Critical Biodiversity Area
CR	Critically Endangered
CSIR	Council for Scientific and Industrial Research
DM	District Municipality
DMRE	Department of Mineral Resources Energy
EAP	Environmental Assessment Practitioner
EGIS	Environmental Geographic Information System
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMP	Environmental Management Plan
EMPr	Environmental Management Programme
EN	Endangered
EP	Equator Principles
ESA	Ecological Support Area
GA	General Authorisation
GHG	Greenhouse Gas
IBA	Important Bird Area
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
IEP	Integrated Energy Plan
IFC	International Finance Corporation
IPP	Independent Power Producer
IRP	Integrated Resource Plan
IUCN	International Union for Conservation of Nature
I&AP	Interested and Affected Party
km	Kilometre
kWh	Kilowatt hour
LC	Least Concern
LM	Local Municipality
LNG	Liquid Natural Gas
m	Metre
m^2	Square meters
m^3	Cubic meters
m amsl	Metres Above Mean Sea Level
MW	Megawatts
NDP	National Development Plan
NEMA	National Environmental Management Act (No. 107 of 1998)
NEM:AQA	National Environmental Management: Air Quality Act (No. 39 of 2004)
NEM:BA	National Environmental Management: Biodiversity Act (No. 10 of 2004)

NEM:WA	National Environmental Management: Waste Act (No. 59 of 2008)
NFA	National Forests Act (No. 84 of 1998)
NFEPA	National Freshwater Ecosystem Priority Area
NHRA	National Heritage Resources Act (No. 25 of 1999)
NT	Near Threatened
NWA	National Water Act (No. 36 of 1998)
ONA	Other Natural Area
PA	Protected Area
RMIPPP	Risk Mitigation Independent Power Producer Procurement
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SAIAB	South African Institute for Aquatic Biodiversity
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
TOPS	Threatened or Protected Species
VU	Vulnerable

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APPENDICES LIST

CHAPTER 1 INTRODUCTION

Hyperion Solar Hybrid (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 22km north of Kathu within the Gamagara Local Municipality which falls within jurisdiction of the John Taolo Gaetsewe District Municipality, Northern Cape Province.

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

The EIA 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 EIA Report includes the following information required in terms of Appendix 3: Content of the Environmental Impact Assessment Report:

Requirement	Relevant Section
(a)(i) the details of the EAP who prepared the report and (ii) the expertise of the EAP; 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 **Figure 1.2** 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 DMRE in order to fulfil the Minister's directive.

In response to the requirements of this procurement programme, Hyperion Solar Hybrid (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) or energy from the Battery Energy Storage System (BESS) for the PV facility, 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 Remainder of the Farm 457, Portion 1 of the Farm 457, and Portion 2 of the Farm 457. All 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 which can be readily trucked to the site. The overarching objective for the hybrid facility is to introduce a technology solution that is 100% dispatchable at short notice able to provide electricity supply into the grid as and when is required to avert electricity disruptions and is flexible and that can operate 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:

- Reciprocating Engines, utilising Liquified Petroleum Gas (LPG) 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
- Raw water and treated water storage tank
- Oily water separator and storm water drainage system
- 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. 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 EIA Report.

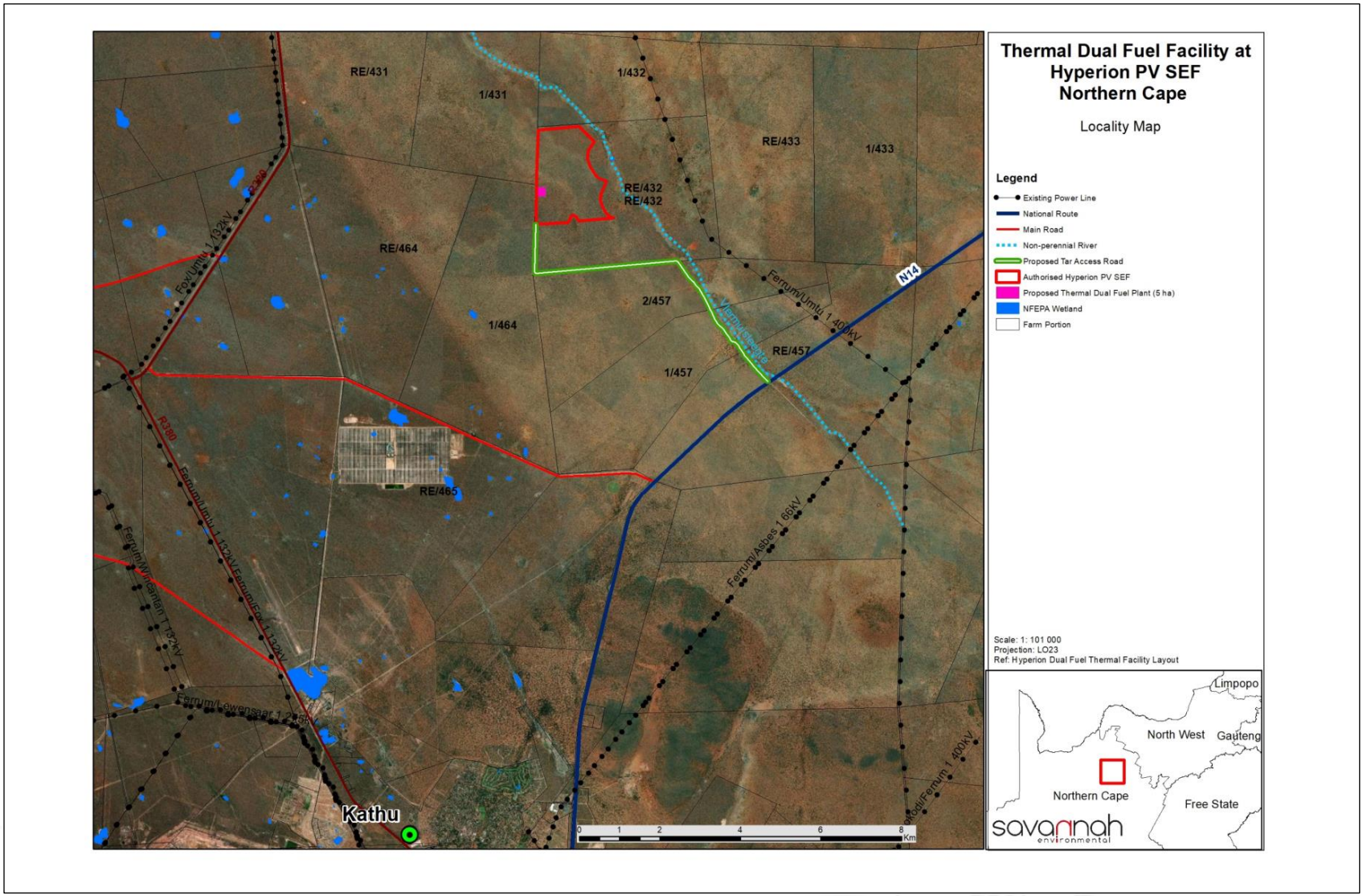


Figure 1.1: Locality of proposed thermal plant and upgraded access road in relation to the Authorised Hyperion PV SEF.

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 (~22km 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**: » Remainder of Farm 457 » Portion 1 of Farm 457 » Portion 2 Farm 457 » Remainder of the Farm Lyndoch 432
SG 21 Digit Code (s)	75MW Thermal Dual Fuel Facility » C04100000000043200000 Access Road » C04100000000045700000 » C04100000000045700001 » C04100000000045700002 » C04100000000043200000
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 Agriculture, Environmental Affairs, Rural Development and Land Reform (NC DAEARD & LR) 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 Hybrid (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 Final Scoping Report was submitted and Plan of Study for the proposed project was submitted to DEFF on **25 November 2020** and acceptance was received on **6 January 2020** thus, marking the start of the EIA Phase.
- 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 EIA

In accordance with Regulation 12 of the 2014 EIA Regulations (GN R326), Hyperion Solar Hybrid (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 Hybrid (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:

» **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.

» **Jana de Jager**. She holds a bachelor's degree in Environmental Science, an Honours degree in Geography & Environmental Science and is currently undertaking her M.S.c in Ecological Water Requirements. She has 3 years of experience in the environmental management field. Her key focus is on undertaking environmental impact assessments, GIS mapping, public participation, environmental management plans and programmes. She is registered as a Candidate Natural Scientist with the South African Council for Natural Scientific Professions (SACNASP).

» **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 the expertise and relevant experience of the Savannah Environmental team are provided in **Appendix A**.

CHAPTER 2 POLICY AND LEGISLATIVE CONTEXT

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

This chapter of the draft EIA Report includes the following information required in terms of Appendix 3: Content of the EIA Report:

Requirement	Relevant Section
(e) a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;	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 energy sector in South Africa has been, and continues to be, at the centre of the economic and social development. The industry directly affects the economy by using labour and capital to produce energy. As the country's economy continues to grow, the Department of Mineral Resources and Energy (DMRE) is mandated to ensure that energy resources are available, and that there is access to energy services in an affordable, reliable, and sustainable manner, while minimizing the associated adverse environmental impacts (Department of Energy, 2019)[1].

The expansion of 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 solar energy and gas to power plants, and requirement for emergency generation capacity as specified within the IRP is illustrated in Figure 2.1. These policies 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 Hyperion Thermal Dual Fuel facility and associated infrastructure.

[1] The South African Energy Sector Report. Department of Energy. 2019

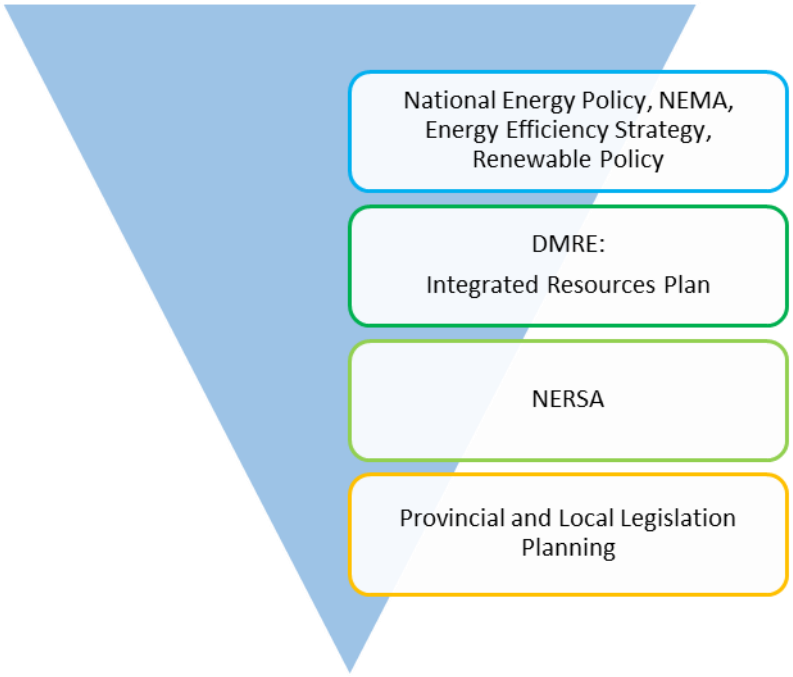


Figure 2.1: Hierarchy of electricity policy and planning documents

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 EIA 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 Agriculture Environmental Affairs, Rural Development and Land Reform (NC DAEARD&LR):** 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[2]

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] 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

i) Independent Power Producer (IPP) Procurement Programmes

Procurement processes for new generation capacity as specified in the approved IRP 2019 are initiated by the DMRE Minister making a so called "Ministerial Determination" in accordance with Section 34 of the Electricity Regulation Act (Act No. 4) of 2006 ("Electricity Act"). Such Ministerial Determination will indicate how much electricity generation capacity is to be procured, from what specified technology and who the procurer (DMRE), buyer (Eskom or other designated party) and seller (Eskom or independent power producer) will be.

The administration of the procurement processes on behalf of the DMRE, as procurer in respect of independent power producer projects, are administered by the Independent Power Producer Office ("IPP Office").

The DMRE Minister has issued two Ministerial Determinations in respect of the IRP 2019, which collectively approve for procurement all the new generation capacity contemplated in the IRP 2019, with the National Energy Regulator of South Africa ("Nersa") having concurred with both of these Ministerial Determinations as required by the Electricity Act, being:

» GNR753 of 07 July 2020: detailing the requirement for 2000MW of new generation capacity to be procured from IPPs via a variety of technologies.

» GNR1015 of 25 September 2020: detailing the requirement for the procurement of new generation capacity from IPPs to contribute towards energy security, including the provision for 3000MW of new generation capacity from gas generation technologies.

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 *Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP)* is intended to fill the current short term supply requirements for electricity, alleviate the current electricity supply constraints and reduce extensive utilisation of diesel peaking generators. In terms of this programme, the 2 000 MW of new generation/supply capacity will be procured from a range of energy technologies and are based on the following criteria:

» It will be technology agnostic with a maximum capacity per project of 450MW.

» It is based on the plant-performance needs of the electricity system operator.

» The plant is to operate in such a manner that it can go from being switched off to operating at 100% of its output and provide various other "ancillary services" in support of the stable operation of the national grid

» Plant to only generate electricity between 05:00 and 21:30 daily, operating on average for a minimum of 12 hours each day during this period.

» It must have an AGC load following ability, flexible capacity factor and must be "scalable" with changing capacity requirements.

» The plant is to operate for 20 years with last date for connection to the grid of the constructed project of 31 December 2022.

» All thermal power plants procured under the RMIPPPP must be capable of conversion to operate on natural gas with little or no further investment.

The Hyperion Hybrid facility has been bid into the procurement programme and if selected as a preferred bidder can be brought online and connected to the grid prior to December 2022. Although the project was not successful in the RMIPPPP, the Applicant may propose to bid the project into subsequent procurement programmes.

2.3.7. 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.

2.3.8. 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 and associated battery energy storage system will go some way to addressing emissions associated with power generation facilities in the country.

2.3.9. 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.

2.3.10. 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.

2.3.11. 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 EIA report) will qualify to be registered as a SIP project once it 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.

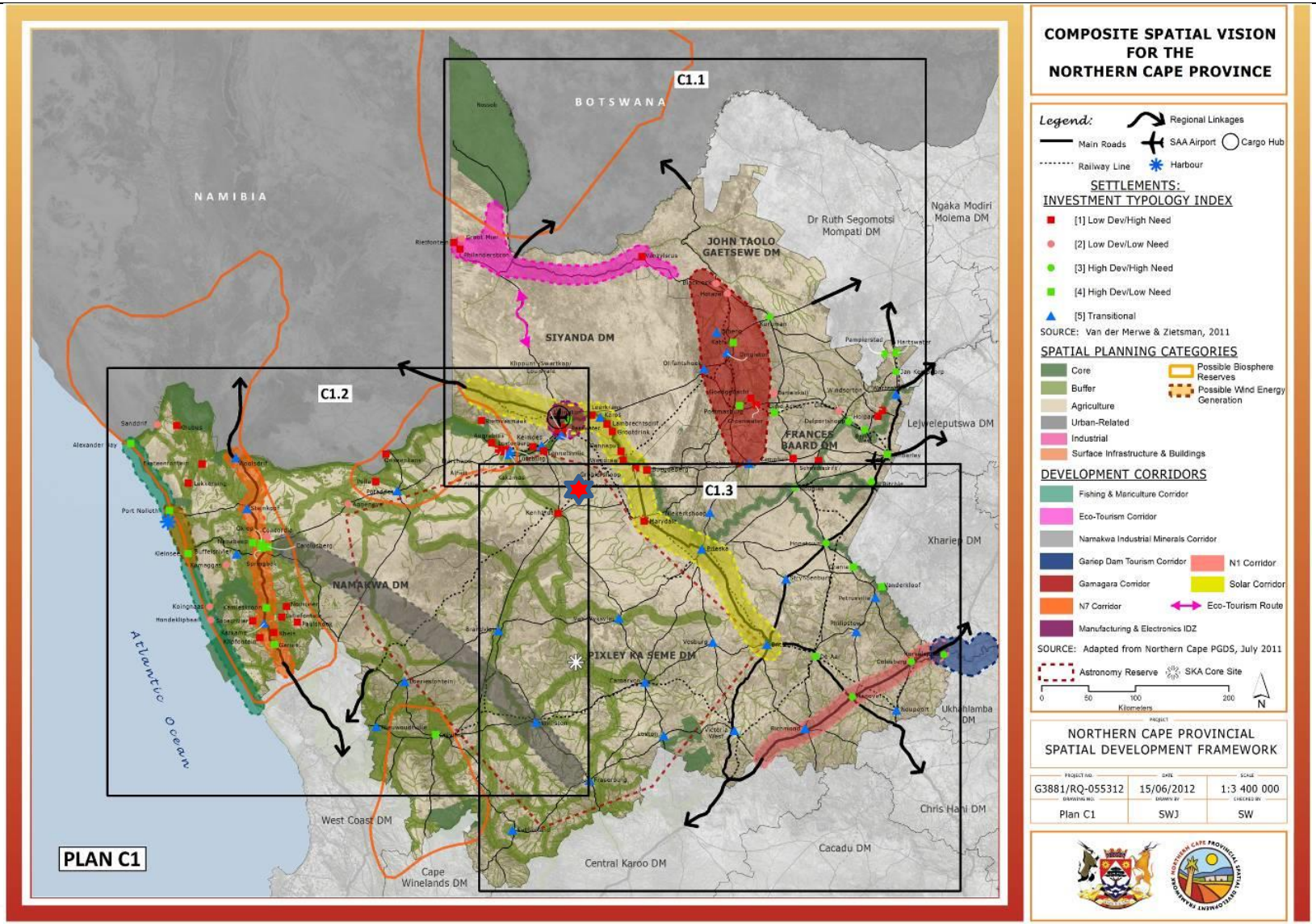


Figure 2.3: Development regions and corridors of the Northern Cape (Source: Northern Cape PSDF 2012). The position of the proposed thermal dual fuel facility and the associated PV facilities is indicated by the red star.

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	» 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.

delivering services is a progressive one. * Ward Committees are functional and meeting their obligations as required. * 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 TECHNOLOGY DESCRIPTION

This chapter provides an overview of thermal power dual fuel technology and varying components associated with 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. A description of the project, as well as the feasible technology alternatives identified for the thermal power dual fuel facility are further detailed in Chapter 4 of this EIA 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.
- Be synchronised to the grid and enables 100% of the power plant's output to be available on the grid shortly after of start-up.
- Be very flexible, allowing for rapid ramp rate and turn down of output.
- 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.
- 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 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.

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 is 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.

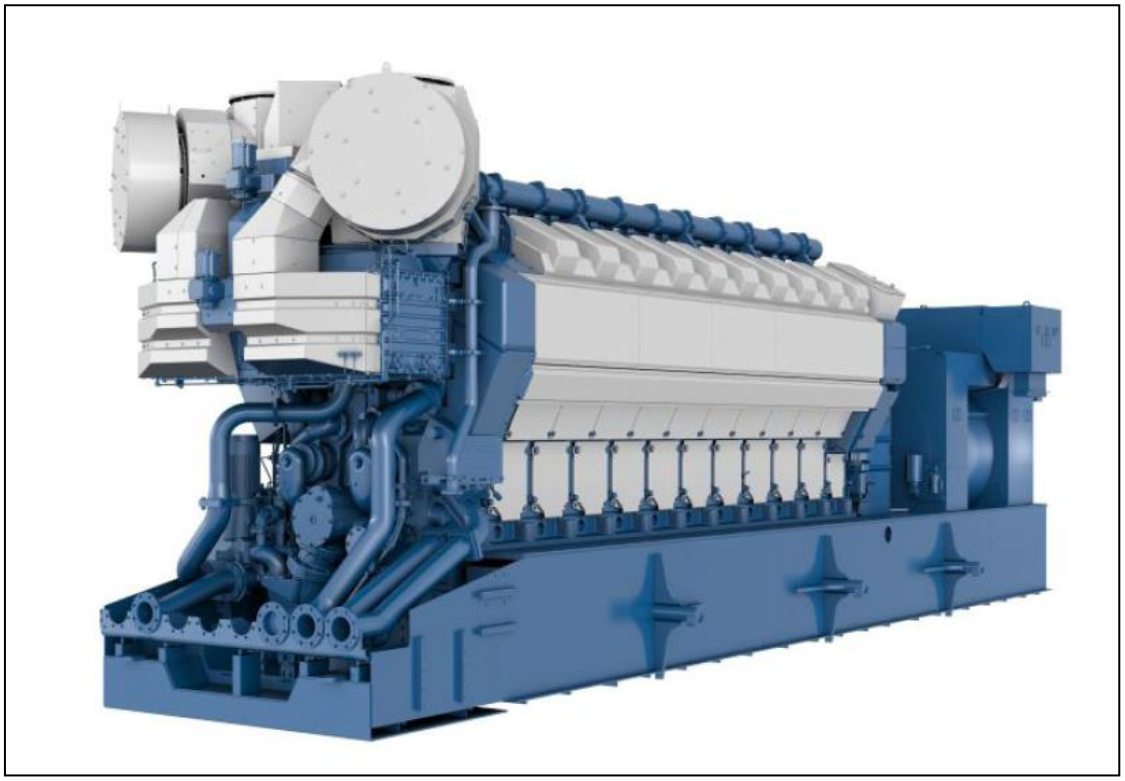


Figure 3.1: Gas Engine configuration

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 several 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.

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

3.2. Hyperion Hybrid Power Plant (encompassing the thermal dual fuel facility and the authorised Hyperion 1 & 2 Solar PV facility)

The thermal dual fuel facility together with the authorised Hyperion 1 & 2 Solar PV Energy Facilities will work as a hybrid generation facility consisting of a dispatchable, dual fuel (liquid or gas) thermal generation plant in combination with the PV facilities (refer to Figure 3.3). There will be a single point of connection to the utility (Eskom) on site, with connection to the national electricity grid at an existing Eskom substation. Although the project was not successful in the RMIPPPP, the hybrid facility aims to meet the RMIPPPP requirement of being 100% dispatchable between the hours of 05h00 and 21h30. Where possible and where available, solar power and stored energy from the BESS will be utilised to meet the demand. Where solar power is not available (typically between the hours of 05h00 and 07h00 and again between 18h00 and 21h30), the thermal dual fuel facility 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.

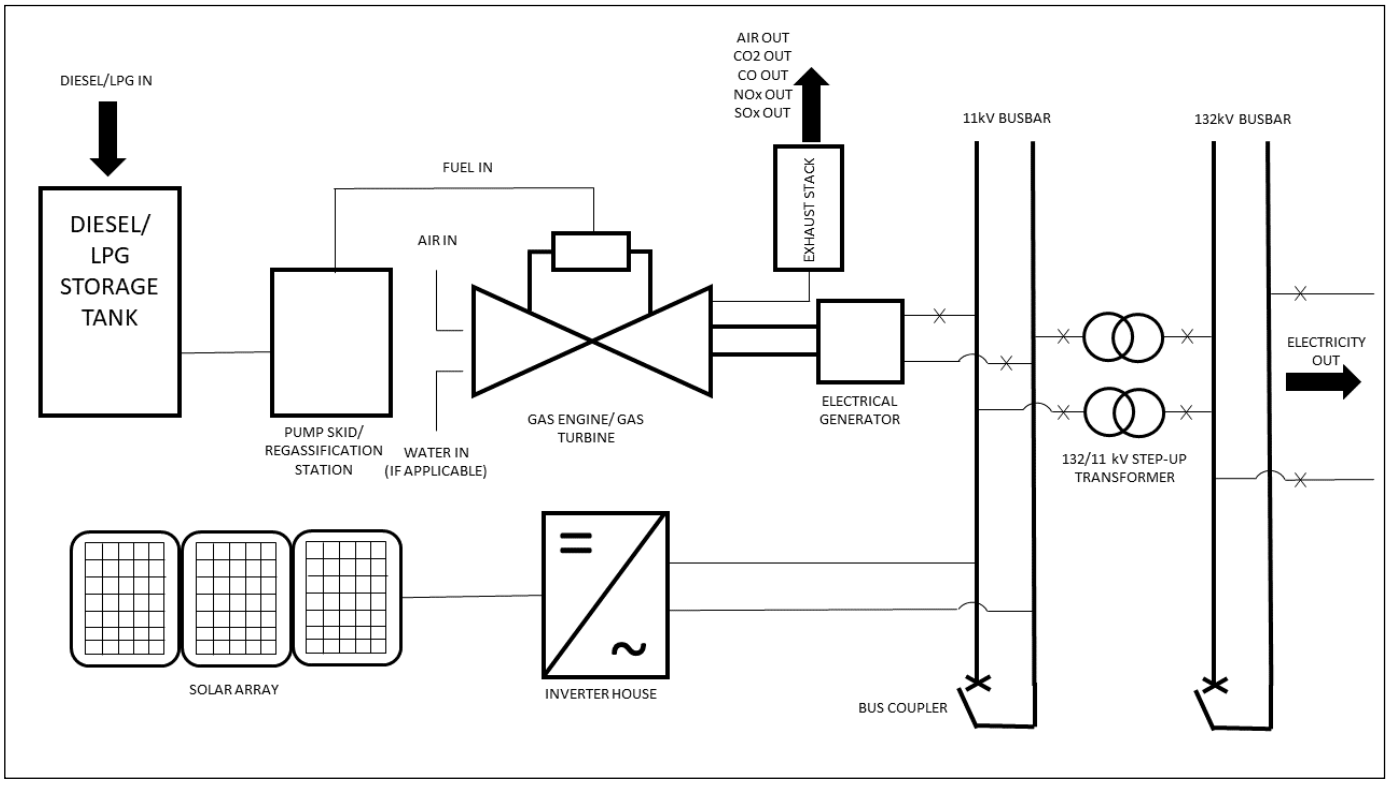


Figure 3.3: Illustration of hybrid thermal power plant and PV solar energy facility

CHAPTER 4. PROJECT DESCRIPTION

This chapter provides an overview of the thermal generation plant proposed by Hyperion Solar Hybrid (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 confirmed through the final design prior to implementation.

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

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

Requirement	Relevant Section
(h)(ix) if no alternative development footprints for the activity were investigated, the motivation for not considering such; and	The identification of the preferred project site is included in Section 4.4
(h)(x) a concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report	No project site alternatives are considered for the Hyperion Thermal plant. Technology alternatives considered for the development of the project 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[3] 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 75MW. The thermal generation plant on its own will have an installed capacity of up to 75MW, to be operated on LPG. LPG will be trucked to the site from a reputable South African supplier.

The main infrastructure associated with the facility includes the following:

[3] 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

- 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
- 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) and air will be required. Water is required in the power generation process. Depending on the choice of technology selected (reciprocating gas engines) approximately 38 000 m^3 per annum will be required for emission control. The output of the process is electricity.

Table 4.1 and **Figure 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 within the authorised Hyperion 1 & 2 PV SEF site.

Component	Description/ Dimensions
Location of the site	**75MW Thermal Power Dual Fuel Facility and access road:** Remainder of the Farm Lyndoch 432 **Access Road:** » Remainder of Farm 457 » Portion 1 of Farm 457 » Portion 2 of Farm 457
Landowner	All of the affected properties of the thermal facility site are privately owned. Part of the access road is a provincial road
Municipal Jurisdiction	John Taolo Gaetsewe District Municipality and the Gamagara Local Municipality
Electricity Generating capacity (Thermal Facility)	75MW
Proposed technology	» Reciprocating Gas Engine technology
Extent of preferred project site	» 340ha
Extent of the development footprint	» **Thermal plant:** Up to 5ha (considering the Thermal generation facility and associated infrastructure) ∗ Two engine halls approximately 40m long, 20m wide and 10m high each housing six gas turbines and associated infrastructure; » **Access road:** 8.5 km in length (maximum 15m wide)
Coordinates (Thermal Plant- centre)	» 27°33'15.12"S 23° 3'53.38"E
Coordinates (Access road)	» **Start:** 27°33'42.42"S 23° 3'48.41"E » **Middle:** 27°34'13.52"S 23° 5'34.23"E

Component	Description/ Dimensions
	» **End:** 27°35'47.07"S 23° 7'19.03"E
Stack dimensions (Site elevation: 1178 m above mean sea)	» Two groups of exhaust stacks each containing 6 stacks approximately 27m high
Fuel Sources	LGP will be selected as a fuel source: » **LPG**: LPG supply from a reputable South African supplier from either Richards Bay or Saldanha will be delivered to the power plant by LPG road tankers to the thermal generation facility via the N14 and stored in mounded bullet tanks above ground with a capacity of 5500m^3.
Site access	» Main access to the project site will be via the T26 road which will be upgraded and surfaced, and will cross Remainder of Farm 457, Portion 1 of the Farm 457, and Portion 2 of the Farm 457.
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 an existing an Eskom substation. A separate basic assessment process is being undertaken for the 132kV overhead line, hence it has not been assessed within this EIA report.
Associated infrastructure to the Thermal Plant	» Access road » Water demineralisation plant » 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 and fuel preparation plant » O&M building, warehouses, workshops, cabling and fencing » 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 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 the existing borehole on site.

Component	Description/ Dimensions
	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	» Raw water and water for fire-fighting purposes will be located on site (300m^2). » A 5-ton self-contained water treatment plant will be installed to treat the water from the borehole. » Treated water will be stored in a 10m^2 tank. » Process water to go into conservancy, and serviced by independent service provider (no sludge or brine to be produced)

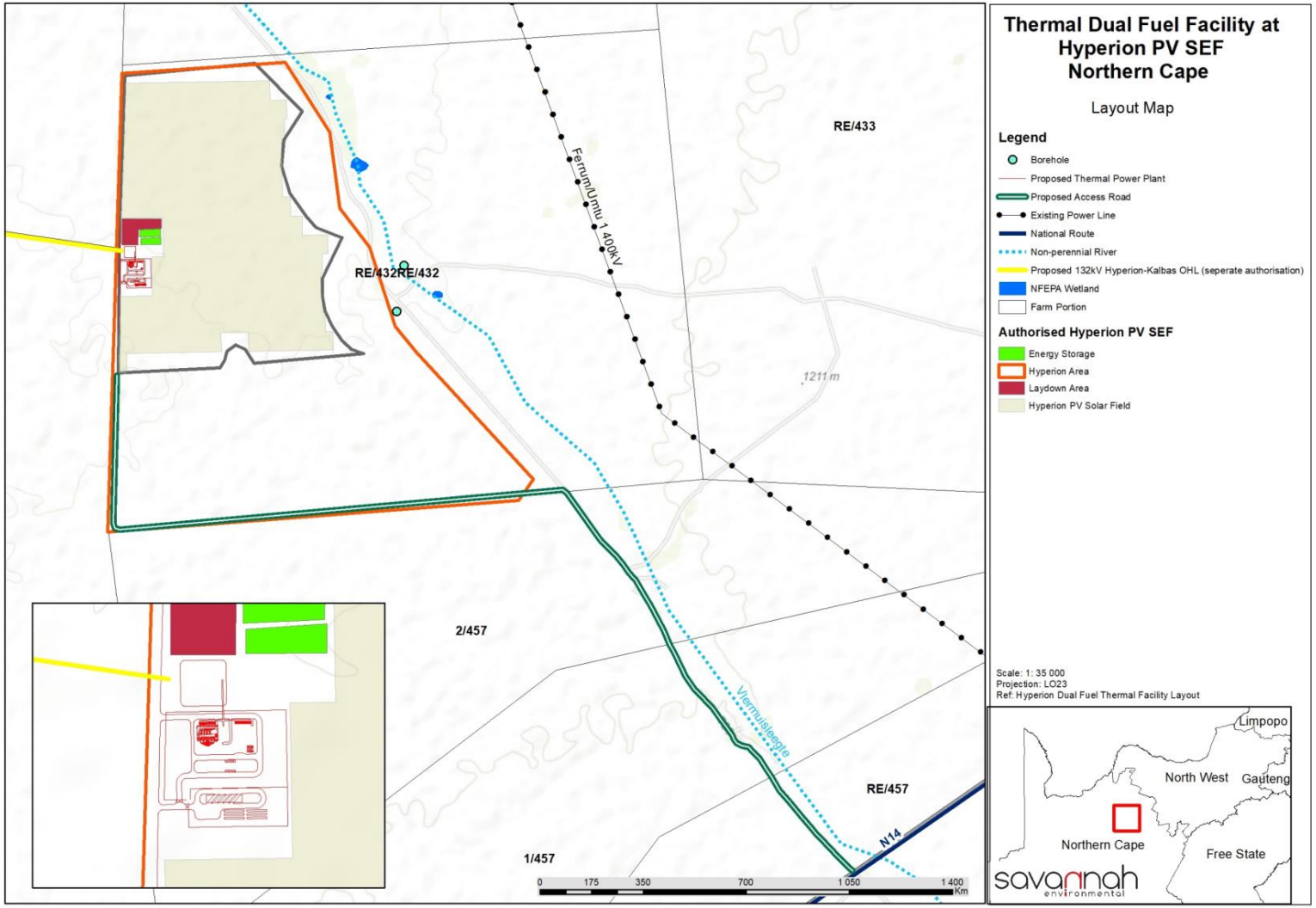


Figure 4.1: Layout map of the thermal plant and associated infrastructure

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 process.

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.

The following project alternatives were previously considered during the scoping phase. A consideration of these alternatives in arriving at the final design parameters of the 75MW Thermal Plant are set out below.

» Design and Layout alternatives
  - A new access road crossing Portion 1 of the Farm 464 was initially considered in the scoping phase. During more detailed design considerations, it was opted to utilise an authorised access road for the Hyperion PV facility adjacent to the Vlermuisleegte River. The surfacing and expansion of this authorised road is included within the assessment in the EIA phase.
» Fuel alternatives
  - The fuel alternative of diesel, as alternatives to LPG, was initially considered in the scoping phase. Diesel was discarded as an alternative fuel source since the DMRE indicated as part of the RMIPPPP RFP clarification notices that diesel ought to be moved away from as fuel source. LPG is also a more efficient fuel source.
» Gas to power technology alternatives
  - Both gas engine and gas turbine technologies were considered during the scoping phase.
  - Gas engine technology was selected as the preferred technology alternative, as compared to gas turbines since gas engines provide the most efficient heat rate and therefore a lower Levelised Cost of Electricity.

Alternatives considered during the EIA phase are discussed below.

4.4. Site Alternatives

The project site near Kathu has been identified by Hyperion Solar Hybrid (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 of the project site to the existing Eskom infrastructure that will allow connection to the national grid

No feasible alternative sites have been identified for the proposed project.

4.5. 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 (LPG), 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/)

4.7. Power Generation Technology Alternatives

The thermal generation facility will be operated as an open cycle system, with no steam driven turbine component. As detailed above, reciprocating gas engines have been determined as the preferred technology for implementation.

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.

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 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.

4.8. 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 is assessed in Chapter 8 as required in terms of the EIA Regulations.

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

4.9.1. Construction Phase

Construction of the thermal power facility and associated infrastructure is expected to take up to 14-20 months depending on 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.

4.10.2. 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.

i) <u>Operating Regime</u>

As the Dispatchable Facility of the Hybrid Power Project solution, the 75W Thermal Plant could be required to operate 16.5 hours a day, 7 days a week (6000 hours per year and 365 starts per year of operation), if the Hyperion PV Facility (Non-Dispatchable) is unable to meet demand.

ii) Scheduling and Dispatch Control System

For the Hybrid Project to operate in accordance with the RFP obligations, the grid code and in a cost-optimised manner, there will be a single overarching control system (the Scheduling and Dispatch Control System or SDCS). Broadly speaking the SDCS will receive Dispatch Instruction from Eskom and issue appropriate instructions to the 75MW Thermal Plant and the Hyperion PV facility based upon each of the facility's availability, facility forecasted yield (in the case of Non-Dispatchable Facilities) and in the most cost-effective manner.

4.10.3. 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. NEED AND DESIRABILITY

Appendix 3 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 EIA Phase are assessed separately in **Chapter 8** of this EIA Report.

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

This chapter of the EIA report includes the following information required in terms of Appendix 3: Content of an EIA 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 National Development Plan (NDP) envisages that, by 2030, South Africa will have an energy sector that provides reliable and efficient energy service at competitive rates; that is socially equitable through expanded access to energy at affordable tariffs; and that is environmentally sustainable through reduced emissions and pollution. South Africa's current energy mix is highly carbon intensive with the majority of the country's electricity from coal resources (Stats SA, 2016), resulting in a large carbon footprint. 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**).

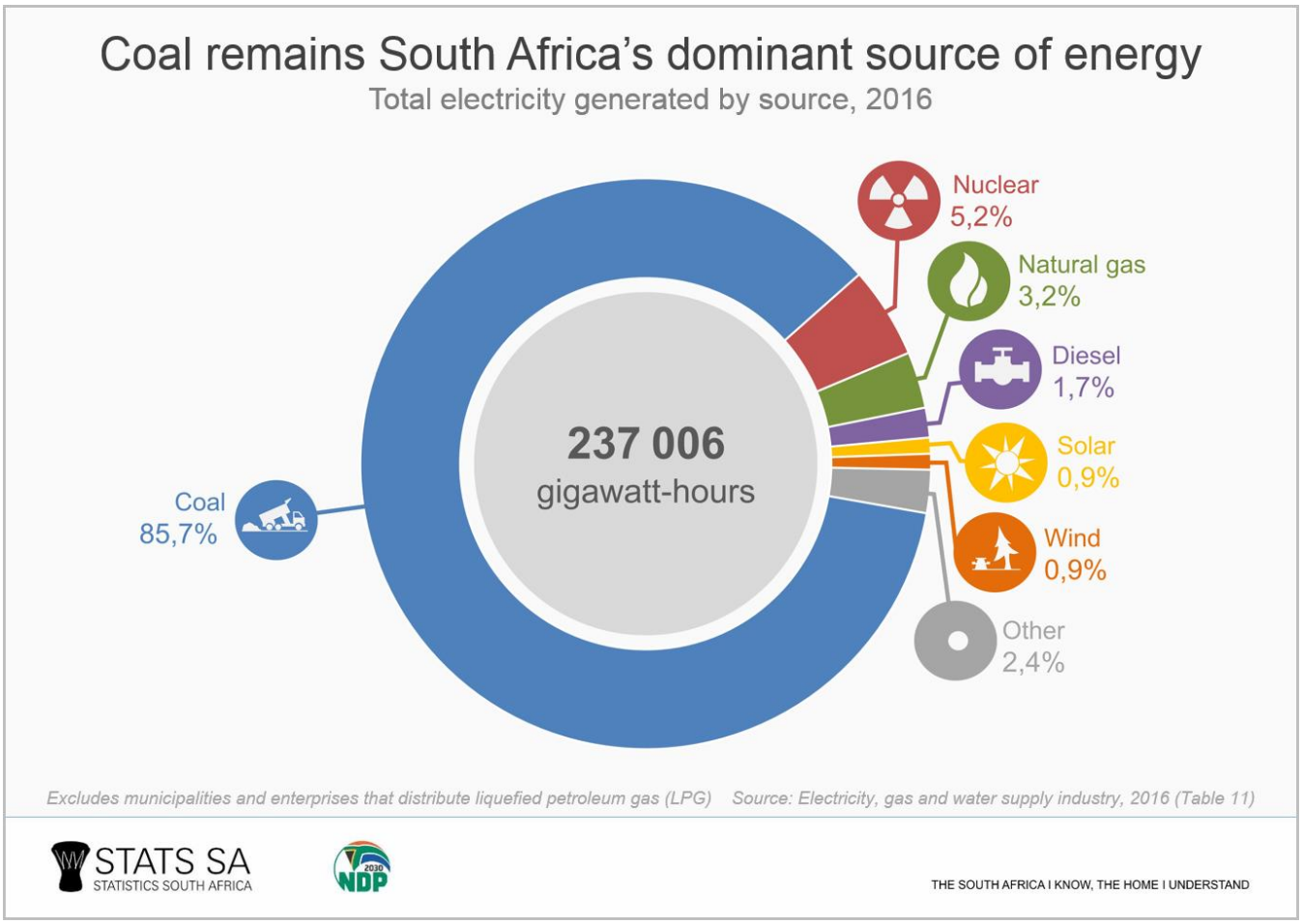


Figure 5.1: Overview of South Africa's electricity generation by source (Source: StatsSA, Electricity, gas and water supply industry report for 2016).

The dominance of a single energy system, which is highly reliant on fossil fuels, inevitably places an excessive burden on the environment. Taking into consideration the need to ensure adequate supply of electricity, minimise environmental impact and meet international obligations in terms of addressing climate change, Government has identified the need to diversify the energy mix within the country.

As detailed in Chapter 2, the following key policies have been developed by Government to consider South Africa's current energy production and projected future demands, and provides the necessary framework within which energy generation projects can be developed:

» Integrated Energy Plan (IEP)
» Integrated Resource Plan (IRP)

The above-mentioned policies have been extensively researched and are updated on an on-going basis to take into consideration changing scenarios, new information, developments in new technologies, and to reflect updated demands and requirements for energy production within the South African context. These plans form the basis of South Africa's energy generation sector planning and dictate national priorities for energy production.

The IEP is intended to provide a roadmap of South Africa's future energy landscape which guides future energy infrastructure investments and policy development. In terms of electricity generation, the IEP states that South Africa should continue to pursue a diversified energy mix which reduces reliance on a single or a few primary energy sources, and includes the following statement regarding the contribution of gas technologies to the diversified energy mix:

"Conventional and unconventional natural gas should play a more prominent role in South Africa's future energy mix both in the electricity sector and in the liquid fuel sector. Natural gas is a cleaner energy source than coal; it can be used as a primary energy source for power generation and for liquid fuel production and directly in enduse applications such as thermal."

The IRP for Electricity 2010 – 2030 (gazetted in 2019) is a subset of the IEP, and constitutes South Africa's current gazetted energy plan. The purpose of the plan is to ensure sustainable electricity development which takes into consideration technical, economic, and social constraints, and identifies investments in the electricity sector which are required to meet the country's forecasted electricity demands at minimum costs.

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. In terms of the technology mix, 3000MW is allocated to gas to power technology up until 2030. The IRP 2019 recognises that Gas Fired technologies present the most significant potential for developing the gas market in South Africa. In addition, gas can provide readily dispatchable, lower carbon supply capacity as more cyclical renewable energy supply is added to the generation mix. The need for new gas to power generation has therefore been identified and assessed by government at a national scale considering the national energy requirements as well as international commitments in terms of addressing climate change issues.

The IRP 2019 further identified that there is short term generation capacity shortfall approximately 2000MW - 3000MW, and concludes as follows 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."

In this regard, the Minister of Mineral Resources and Energy ("Minister") issued a determination for the procurement of 2000MW of new generation capacity should be procured from a range of energy source technologies and the IPP Office initiated the Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP).

The Hyperion Thermal Plant is being developed in response to this programme and has been bid as an innovative hybrid solution comprising of gas to power technology (this project), using LPG as fuel source. Although the project was not successful in the RMIPPPP, the Applicant proposes to bid the project into subsequent procurement programmes.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 on natural gas. The chosen technology solution meets the RMIPPPP objectives as:

» The identified technology solution is 100% dispatchable at short notice, able to provide electricity supply into the grid as and when required at 100% of output within 15 minutes of being required.
» The identified technology is flexible and capable of operating across a wide variety of dispatch profiles, from base load to peaking

In addition to the policy considerations detailed above, Government has prioritised post COVID-19 turnaround plans and has compiled an Economic Reconstruction and Recovery Plan which was presented to Parliament in October 2020. According to this plan, the economic recovery will rely on a massive investment in infrastructure, including in energy, telecommunications, ports and rail. The core elements of the Economic Reconstruction and Recovery Plan are as follows:

1. Priority interventions for economic recovery: the plan sets out eight priority interventions that will ignite South Africa's recovery and reconstruction effort. These are the flagship initiatives that all of society will rally around to build a new economy.
2. Enabling conditions for growth: these are the growth-enhancing reforms and other preconditions for an inclusive, competitive and growing economy.
3. Macroeconomic framework: economic reconstruction and recovery requires careful mobilisation of resources to ensure fiscal sustainability.
4. Institutional arrangements: the plan focuses on execution, and is supported by enhanced institutional arrangements to ensure implementation and accountability.

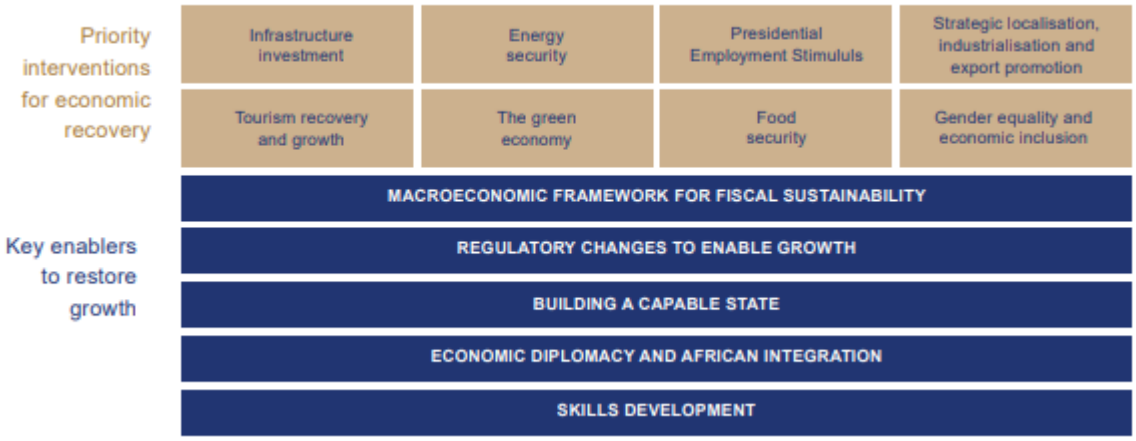


Figure 5.2: Core elements of the Economic Reconstruction and Recovery Plan (source: Building a new economy - Highlights of the Reconstruction and Recovery Plan, Presidency of the Republic of South Africa)

The plan recognises energy security as the most important prerequisite for the recovery agenda. One of the key commitments of the plan is therefore to achieve sufficient, secure and reliable energy supply within two years by improving Eskom's performance and rapidly expanding generation capacity through a diverse energy mix. The Risk Mitigation Power Procurement Programme (RMPPP) is identified as a key mechanism for securing additional power generation capacity.

The Energy Sector Economic Recovery Strategy released by Business for South Africa (2020) has highlighted the need for alignment of the energy sector, with a combined solution for electricity, gas, and liquid fuels. A number of constraints are identified, which if addressed could facilitate the energy sector playing a dual role in driving South Africa's economic recovery, primarily as a catalyst for growth in the economy but also as a driver of direct and indirect jobs.

The need for new power generation from gas has therefore been identified and assessed by Government at a national scale considering the national energy requirements as well as international commitments to address climate change under the Paris Agreement, and provision has been made for the inclusion of new wind power generation capacity in South Africa's energy mix. The Hyperion Thermal Plant is proposed in specific response to the need to diversify the energy mix of the country as per the requirements set out in the IRP 2019. 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). Considering the above, it can be concluded that the implementation of the proposed project has the potential to contribute positively towards the identified need at a national level, while simultaneously contributing to job creation and socio-economic development. As gas technologies can successfully support the roll-out of renewable energy while ensuring a stable supply of electricity, the project would contribute positively towards reducing South Africa's GHG emissions and as the Hyperion Thermal Plant is part of a hybrid project comprising solar generation capabilities, the hybrid project will have reduced GHG emissions as compared to a pure thermal 75MW power plant. In addition, the project would have reduced water requirements, when compared with coal technologies, in alignment with one of the vision 2030 themes of DWS's National Water Resource Strategy 2 (2013) (i.e. transitioning to a low carbon economy through stimulating renewable energy and retrofitting buildings).

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

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 Hybrid(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 N14 and existing T26 road, which will be upgraded and surfaced, to the facility across Remainder of Farm 457, Portion 1 of 457 and Portion 2 of Farm 457.

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.

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). This fuel can be trucked to the site via the N14.

Environmental sensitivity of the site: The EIA 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 10**).

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

CHAPTER 6. APPROACH TO UNDERTAKING THE EIA PROCESS

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. The Application for Authorisation is required to be supported by a Scoping & EIA process.

This EIA 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 EIA process aims at identifying and assessing potential issues associated with the proposed project and defining the extent of studies required within the EIA phase. This was achieved through an assessment of the proposed project involving detailed specialist studies, 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 EIA Phase.

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

This chapter of the EIA report includes the following information required in terms of Appendix 3: Content of the EIA 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 Hyperion Thermal Plant and a description of the activities which form part of the development of the project have been included in section 6.2 and Table 6.1.
(h)(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 Hyperion Thermal Plant has been described and is included in section 6.42.
(h)(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them	A Comments and Responses report including all comments and responses has been included in **Appendix C8**.

6.2 Relevant legislative permitting requirements

6.2.1. National Environmental Management Act (No. 107 of 1998) (NEMA)

NEMA is South Africa's key piece of national environmental legislation that provides for the authorisation of certain controlled activities known as "listed activities". In terms of Section 24(5) of NEMA, the potential impact on the environment associated with listed activities must be considered, investigated, assessed and reported on to the competent authority (the decision-maker) charged by NEMA with granting of the relevant EA. 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 Agricultural, Environmental Affairs, Rural Development and Land Reform (DAEARD&LR) s the commenting authority for the project.

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. Comprehensive, independent environmental studies are required to be undertaken in accordance with the EIA Regulations to provide the competent authority with sufficient information in order for an informed decision to be taken regarding the project and Application for Environmental Authorisation.

The EIA process being conducted for the thermal generation facility is undertaken in accordance with Section 24(5) of the NEMA, which defines the procedure to be followed in applying for Environmental Authorisation, and requires that the potential consequences for, or impacts of, listed or specified activities on the environment be considered, investigated, assessed, and reported on to the competent authority. Listed Activities are activities identified in terms of Section 24 of the NEMA which are likely to have a detrimental effect on the environment, and which may not commence without an EA from the competent authority subject to the completion of an environmental assessment process (either a Basic Assessment (BA) or full Scoping and EIA).

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 6.1: 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)	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 widening and surfacing of the authorised access road will take place within 32 of the Vlermuisleegte River.***
GN 327, 08 December 2014 (as amended on 07 April 2017)	56	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre— (i) where the existing reserve is wider than 13,5 meters; or (ii) where no reserve exists, where the existing road is wider than 8 metres ***The existing authorised access road will be tarred and widened to a width of maximum 15m***
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

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
		The thermal facility will have an installed generating capacity of up to 75MW and use LPG 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.***
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.

6.2.2. National Water Act (No. 36 of 1998) (NWA)

In accordance with the provisions of the National Water Act (No. 36 of 1998) (NWA), all water uses must be licensed with the Competent Authority (i.e. the Regional Department of Human Settlements, Water and Sanitation). Water use is defined broadly, and includes taking and storing water, activities which reduce stream flow, waste discharges and disposals, controlled activities (activities which impact detrimentally on a water resource), altering a watercourse, removing water found underground for certain purposes, and recreation.

Table 6.2 lists the possible Water Uses associated with the proposed project and identified in terms of the NWA identified as being relevant for the project. The table also includes a description of those project activities which relate to the applicable Water Uses.

» **Table 6.1:** List of Water Uses published under Section 21 of NWA, as amended

Activity No.	Description of Water Use
Section 21 (a)	Abstraction of water from a water resource. ***Water for construction and operational phases for the facility will be abstracted from existing farm boreholes.***
Section 21 (c)	Impeding or diverting the flow of water in a watercourse. ***The widening and surfacing of the authorised access road will take place within 32 of the Vlermuisleegte River.***
Section 21 (g)	Disposing of waste in a manner which may detrimentally impact on a water resource. ***Typically, the conservancy tanks at construction camps and then O/M buildings require a license (GA if volumes are below 10 000 m³), however the Thermal Generation facility is below the threshold trigger which requires authorisation***
Section 21 (i)	Altering the bed, banks, course or characteristics of a watercourse. ***The widening and surfacing of the authorised access road will take place within 32 of the Vlermuisleegte River.***

It has been confirmed by DHSWS that a Water Use License (WUL) is applicable for the project.

6.2.3. National Environmental Management: Air Quality Act (No. 39 of 2004) (NEM: AQA)

In accordance with the National Environmental: Air Quality Act (No. 39 of 2004) (NEM: AQA) and the associated Listed Activities (GNR 893 of November 2013), an Air Emissions License (AEL) is required for activities identified as having a potential significant detrimental effect on the environment, including health, social conditions, economic conditions and ecological conditions or cultural heritage. The thermal generation facility is a new facility and does not yet have an AEL. As a gas-fired power station with capacity greater than 50MW, the project will require an AEL to operate. Emissions from the thermal facility will be required to comply with the new plant Minimum Emission Standards (MES). The applicable listed activities categories are detailed in **Table 6.3**.

Table 6.3: Listed activities under NEM: AQA triggered by the thermal generation facility

Activity No(s):	Listed activities as set out in GN 893, 2013 of the NEMAQA.	Describe the portion of the proposed project to which the applicable listed activity relates.
1. Combustion Installations **1.4. Gas combustion installations**	Gas combustion installations (including gas turbines burning natural gas) used primarily for steam raising or electricity generation.	All installations with design capacity equal to or greater than 50 MW heat input per unit, based on the lower calorific value of the fuel used. ***The proposed project consists of open cycle gas engines with a generation capacity of approximately 75MW using LPG as fuel source***
2. Petroleum Industry **2.4. Storage of Petroleum Products**	Petroleum product storage tanks and product transfer facilities, except those used for liquefied petroleum gas.	All loading/ offloading facilities with a throughput greater than 50 000 m^3 per annum

6.2.4. National Heritage Resources Act (No. 25 of 1999) (NHRA)

The National Heritage Resources Act (No. 25 of 1999) (NHRA) provides an integrated system which allows for the management of national heritage resources and to empower civil society to conserve heritage resources for future generations. Section 38 of NHRA provides a list of activities which potentially require the undertaking of a Heritage Impact Assessment.

Section 38: Heritage Resources Management

1). Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as –

- *a. the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;*
- *b. the construction of a bridge or similar structure exceeding 50m in length;*
- *c. any development or other activity which will change the character of a site –*
  - *i). exceeding 5 000m² in extent; or*
  - *ii). involving three or more existing erven or subdivisions thereof; or*
  - *iii). involving three or more erven or divisions thereof which have been consolidated within the past five years; or*
  - *iv). the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;*

Must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

In terms of Section 38(8), approval from the heritage authority is not required if an evaluation of the impact of such development on heritage resources is required in terms of any other legislation (such as NEMA), provided that the consenting authority ensures that the evaluation of impacts fulfils the requirements of the relevant heritage resources authority in terms of Section 38(3) and any comments and recommendations of the relevant resources authority with regard to such development have been taken into account prior to the granting of the consent. However, should heritage resources of significance be affected by the

thermal facility, a permit is required to be obtained prior to disturbing or destroying such resources as per the requirements of Section 48 of the NHRA, and the SAHRA Permit Regulations (GN R668).

6.3. Overview of the Scoping Phase

This Scoping Phase aimed 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 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 the Scoping Phase were 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.

The Scoping Study considered an estimated capacity of 75MW for the thermal plant. The broader project site was considered during the Scoping Study to identify and delineate any environmental fatal flaws, "no-go" or sensitive areas which should be avoided. This was undertaken through specialist studies and process of consultation. The preparation and release of the Scoping Report for a 30-day public review period provided stakeholders and I&APs with an opportunity to verify that the issues they had raised during the Scoping process had been captured and adequately considered and provided a further opportunity for additional key issues to be raised for consideration. The Final Scoping Report and Plan of Study for EIA was submitted to DEFF on 01 December 2020, and acceptance was received on 06 January 2021, thus marking the start of the EIA Phase (refer to **Appendix B**). Additional information requested by the DEFF in the Acceptance of the Scoping Report and the location of the requested information in this EIA Report is detailed in **Table 6.4.**

Table 6.4: DEFF requirements and reference to Section in the EIA Report

DEFF requirement for EIA	Response / Section in this EIA Report
(a) Listed Activities (i) Please ensure that all relevant listed activities are applied for, are specific and that it can be linked to the development activity or infrastructure as described in the project description.	All relevant activities applied for in the application for Environmental Authorisation and included in the EIA Report are relevant to the Thermal Plant and can be linked to the development activity or infrastructure in the project description.
(ii) If the activities applied for in the application form differ from those mentioned in the final SR, an amended application form must be submitted. Please note that the Department's application form template has been amended and can be downloaded from the following link https://www.environment.gov.za/documents/forms.	An additional listed activity has been included for the project due to the identified preferred access road being determined as that authorised for the Hyperion PV facilities. Therefore, an amended application form has been submitted with the EIA report.
(iii) The EIAr must provide an assessment of the impacts and mitigation measures for each of the listed activities applied for.	An assessment of impacts and recommended mitigation measures are included in Chapter 8 of this report.
(b) Public Participation i. Please ensure that comments from all relevant stakeholders are submitted to the Department with the EIAr. This includes but is not limited to the Northern Cape Department of Environment and Nature Conservation, the provincial Department of Agriculture, the Provincial Department of Transport, the local and district Municipality, the Department of Water and Sanitation (DWS), the South African Heritage Resources Agency (SAHRA), the Department of Rural Development and Land Reform (DRDLR), and the Department of Environment, Forestry and Fisheries: Climate Change; Oceans and Coast, Biodiversity and Protected Areas Directorates.	All comments received to date have been included within this Comments and Responses Report. Where comments have not been obtained, proof that attempts were made to obtain comments have been included in **Appendix C4** (Organs of State correspondence) and **Appendix C5** (stakeholder correspondence). A distribution list for the EIA Report has been drafted and will be updated with the waybill numbers and the proof of follow-up for written comments. This document will be included in **Appendix C5** in the final EIA Report. The database detailing registered I&APs is included as **Appendix C1** in the EIA Report.
ii. Please ensure that all issues raised and comments received during the circulation of the draft SR from registered I&APs and organs of state (including this Department's Climate Change; Oceans and Coast, Biodiversity and Protected Areas Directorates), which have jurisdiction in respect of the proposed activity are adequately addressed in the EIAr.	All comments received during the Scoping phase (included in **Appendix C6** and **Appendix C8**) have been addressed throughout this EIA report.
iii. Proof of correspondence with the various stakeholders must be included in the draft EIAr. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments,	All correspondence with stakeholders is included in **Appendix C3** and **Appendix C4** of this EIA report.
iv. The Public Participation Process must be conducted in terms of Regulation 39, 40 41, 42, 43 & 44 of the EIA Regulations 2014, as amended	The Public Participation Process has been conducted in terms of Regulation 39, 40, 41, 42, 43 & 44 of the EIA Regulations 2014, as amended (GNR 326), as well as in accordance with the approved Public Participation Plan. The approved Public Participation Plan is included as **Appendix C9** of the final Scoping Report. I&APs and Organs of State were notified of the

DEFF requirement for EIA	Response / Section in this EIA Report
	Acceptance of Scoping and the commencement of the EIA Phase on 06 January 2021. I&APs and Organs of State were notified of the availability of the EIA Report for review and comment for a 30-day period from **Friday 12 February 2021** until **Monday 15 March 2021** as follows: » an advertisement was placed in the Kathu Gazette on 12 February 20201 (tearsheet to be included in **Appendix C2** of the final EIA Report). » a notification letter was distributed to all registered I&APs on the project database, including the Organs of State Officials. Proof of notifications are included in **Appendices C4** and **C5** and included in the EIA Report. » All registered I&APs and Organs of State Officials will receive reminder notifications regarding the nearing of the end of the review and comment period of the EIA Report (proof to be included in **Appendices C4** and **C5** and included in the final EIA Report
v. The EIAr must provide evidence that all identified and relevant competent authorities have been given an opportunity to comment on the proposed development particularly, the Northern Cape Department of Environment and Nature Conservation, and the District and Local Municipalities	All correspondence to competent authorities and commenting authorities during the EIA process will be included in **Appendix C4** and **C5** and included in the final EIA Report.
vi. A Comments and Response trail report (C&R) must be submitted with the final EIAr. The C&R report must incorporate all comments for this development. The C&R report must be a separate document from the main report and the format must be in the table format as indicated in Appendix 1 of this letter. Please refrain from summarising comments made by I&APs. All comments from I&APs must be copied verbatim and responded to clearly. Please note that a response such as "noted" is not regarded as an adequate response to I&APs' comments.	All comments received during the EIA process, including those of the DEFF, will be included within the Comments and Responses Report (included as **Appendix C8** of the final EIA Report).
c) Layout & Sensitivity Maps (i) The EIAr must provide coordinate points for the proposed development site (note that if the site has numerous bend points, at each bend point coordinates must be provided) as well as the start, middle and end point of all linear activities.	A detailed Layout Map indicating coordinates of proposed infrastructure is included in **Appendix Q**
(ii) Please provide a layout map which indicates the following: a) Positions of the power island, turbine and generator, fuel storage tanks, water storage reservoir and tanks, water and gas supply pipelines;	A detailed Layout Map indicating all proposed infrastructure is included in **Appendix Q**

DEFF requirement for EIA	Response / Section in this EIA Report
b) Permanent laydown area footprint; c) All supporting onsite infrastructure e.g. roads (existing and proposed); d) Substation(s) and/or transformer(s) sites including their entire footprint; e) Connection routes (including pylon positions) to the distribution/transmission network; and f) All existing infrastructure on the site.	
(iii) Please provide an environmental sensitivity map which indicates the following: a) The location of sensitive environmental features on site e.g. CBAs, heritage sites, wetlands, drainage lines etc. that will be affected; b) Buffer areas; and, c) All "no-go" areas.	An Environmental Sensitivity Map indicating all environmentally sensitive features is included in **Appendix Q**
(iv) The above layout map must be overlain with the sensitivity map and a cumulative map which shows neighbouring energy developments and existing grid infrastructure	A combined Layout and Environmental Sensitivity Map indicating all environmentally sensitive features and proposed infrastructure is included in **Appendix Q**
(d) Specialist assessments i. Specialist studies to be conducted must provide a detailed description of their methodology, as well as indicate the locations and descriptions of infrastructure positions, and all other associated infrastructures that they have assessed and are recommending for authorisation,	The methodologies and assessments undertaken by specialist are detailed in the relevant specialist studies (**Appendix D** to **Appendix M**)
ii. The specialist studies must also provide a detailed description of all limitations to their studies. All specialist studies must be conducted in the right season and providing that as a limitation, will not be accepted.	The limitations and assumptions of specialist are detailed in the relevant specialist studies (**Appendix D** to **Appendix M**)
iii. Should the appointed specialists specify contradicting recommendations, the EAP must clearly indicate the most reasonable recommendation and substantiate this with defendable reasons and were necessary, include further expertise advice.	Chapter 10 of this EIA Report contains a summary of recommendations and conclusions made by specialists. No contradicting recommendations have been made.
(e) Cumulative Assessment (i) If there are other similar facilities proposed within a 30km radius of the proposed development site, a cumulative impact assessment must be conducted for all identified and assessed impacts which must be refined to indicate the following:	A Cumulative Map indicating all relevant developments within 30km of the proposed project is included in **Appendix Q**
a) Identified cumulative impacts must be clearly defined, and where possible the size of the identified impact must be quantified and indicated, i.e. hectares of cumulatively transformed land.	Chapter 9 of this EIA report contains an assessment of cumulative impacts associated with the Hyperion Thermal Plant.
b) Detailed process flow and proof must be provided, to indicate how the specialist's recommendations, mitigation measures and	Chapter 9 of this EIA report and the relevant specialist report (**Appendix D** to **Appendix M**) contain an assessment of cumulative impacts associated with the

DEFF requirement for EIA		Response / Section in this EIA Report
	conclusions from the various similar developments in the area were taken into consideration in the assessment of cumulative impacts and when the conclusion and mitigation measures were drafted for this project.	Hyperion Thermal Plant.
c)	The cumulative impacts significance rating must also inform the need and desirability of the proposed development.	A conclusion and recommendation regarding cumulative impact are included in Chapter 10 of this EIA Report. This has informed the need and desirability for the project detailed in Chapter 5.
d)	A cumulative impact environmental statement on whether the proposed development must proceed.	A cumulative impact environmental statement on whether the proposed development must proceed is included in Chapter 10.
(f) General		The Draft Scoping Report including the Plan of Study, and all specialist studies have been submitted to the Climate Change Directorate for comment. Proof of submission is included in **Appendix C5**. No comments were received at the date of submission of the final Scoping report.
(i)	The Air Quality and Climate Change specialist studies' terms of reference (TORs) must be made available to this Department's Climate Change Directorate for comments. Proof of correspondence must be included in the public participation report.	

6.4. Overview of the EIA Phase

As per the EIA Regulations (GNR 326) the objectives of the EIA Phase are to, through a consultative process:

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

» Identify residual risks that need to be managed and monitored.

This EIA Report assesses potential positive and negative, direct, indirect, and cumulative impacts associated with all phases of the project life cycle including pre-construction, construction, operation and decommissioning. In this regard the EIA Report aims to provide the relevant authorities with sufficient information to make an informed decision regarding the proposed project.

The following subsections outline the activities within the EIA process that have been undertaken to date.

6.4.1. Authority Consultation and Application for Authorisation

Consultation with relevant authorities has been undertaken during the Scoping Phase and will continue throughout the EIA process. The following steps are to be undertaken as part of this EIA phase of the process:

» Make the EIA Report, inclusive of the Atmospheric Impact Report (AIR) in support of the AEL Application, available for a 30-day public and authority review period.
» Notification and consultation with stakeholders, I&APs and Organs of State that may have jurisdiction over the project, including provincial and local government departments, and State-Owned Enterprises.
» Incorporating comments received during the 30-day public review period to prepare a Final EIA Report.
» Submission of the Final EIA Report to DEFF for decision making.
» Provide an opportunity for DEFF and DAEARD & LR representatives to visit and inspect the proposed site and project area.

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

6.4.2. 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 be covered and implemented as part of the public participation plan considering the current limitations. In addition, alternative means of undertaking consultation have 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 facilitates the undertaking of the public participation process 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 relevant 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 approved public participation plan considers 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 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 EIA Phase to ensure effective participation includes the following:

» Notice of commencement of the EIA phase circulated to registered I&APs
» Placement of advertisements in a local newspaper.
» Radio live reads.
» Updating of the I&AP database throughout the 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 EIA report, inclusive of the Atmospheric Impact Report (AIR) in support of the AEL Application, for a 30-day review periods.

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

i. Adverts and Notifications

The EIA process, commencing in February 2021, and the availability of the EIA Report for comment was announced as follows:

» A letter advising registered parties of the Acceptance of Scoping received from DEFF and the commencement of the EIA process distributed on 27 January 2021.
» Notification letter distributed to all registered parties advising them of the availability of the EIA Report, inclusive of the AIR in support of the AEL Application, for review and comment on 10 February 2021
» An advertisement announcing the availability of and inviting comment on the EIA Report in the Kathu Gazette newspaper on 12 February 2021. The tear sheets of the newspaper advert will be contained in **Appendix C2** of the Final EIA Report.
» Radio adverts (live reads) on a local community radio station will be undertaken announcing the project and the availability of the scoping report and where I&AP's can register their details should they require any further information.
» I&APs have been encouraged to view the EIA Report and submit written comment. The EIA Report has been circulated to Organs of State via electronic transfer (Dropbox, WeTransfer, etc), or CD and/or hardcopy as per individual request. The evidence of distribution of the EIA Report has been included in this EIA Report (refer to **Appendix C**).

ii. 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 are being provided to I&APs in the EIA phase of the process to note their issues and comments. I&APs are being consulted through the following means:

» Opportunity for review of the EIA report, inclusive of the AIR in support of the AEL Application, for a 30-day period from – XXX. Comments received during this review period will be captured in within a Comments and Responses Report, which will be included within the Final EIA Report.
» **Focus group meetings**: Virtual focus group meetings will be held with key government departments, stakeholders and landowners during the scoping phase of the process. The purpose of these focus group meetings is to provide an overview of the findings of the EIA studies in order 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 will be held via virtual platform. The minutes of these meetings will be included in the final Scoping Report for review and acceptance by the DEFF. A preliminary list of meetings planned is included in Table 6.3.

- **One-on-one consultation meetings** for example with directly affected or surrounding landowners. As per the approved public participation plan, these meetings will be held via virtual platform.
- **Telephonic** consultation sessions.
- Written, faxed or e-mail correspondence.

All comments received during the 30-day review period will be included in **Appendix C6** and minutes of all meetings held during the review period will be included in **Appendix C7** within the Final EIA report.

Table 6.3: Summary of Public Participation Process

Activity	Date
Notice of Commencement of the EIA phase circulated to registered I&APs	27 January 2021
The availability of the EIA report was advertised in: The Kathu Gazette	12 February 2021
Distribution of notification letters for the availability of the EIA report to organs of state departments, ward councillors, landowners within the study area, neighbouring landowners and stakeholder groups.	9 February 2021
Distribution of EIA Report	12 February 2021
Review period for the EIA Report for public comment.	12 February 2021 – 15 March 20211
List of Focus Group Meetings held: » John Taolo Gaetsewe District Municipality » Gamagara Local Municipality » Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform (DAEARD & LR) » Adjacent Landowners	Focus Group Meetings were held on the following dates as per the meeting minutes provided in Appendix C7: » 3 March 2021 » 4 March 2021 » 5 March 2021

iii. Identification and Recording of Issues and Concerns

A Comments and Responses Report has been compiled to include all comments received. Comments received during the EIA phase 30-day review period, have been included in the Comments and Responses Report within the Final EIA Report. The Comments and Responses Report including all comments received to date is included as **Appendix C8**.

Comments and issues raised during the 30-day review period by stakeholders are summarised below:

- **Department of Environment, Forestry, and Fisheries (DEFF):** The DEFF provided inputs into listed activities, public participation, layout and sensitivity mapping, cumulative assessment, and the EMPr for the project.
- **Department of Environment, Forestry, and Fisheries (DEFF) – Biodiversity:** The DEFF: Biodiversity provided recommendation in terms undertaking an ecological walkthrough, erosion and alien invasive species plan, permit applications, and public participation.
- **South African Heritage Resources Agency (SAHRA):** Provided inputs into conditions for specialist appointments, unmarked graves, and archaeological and palaeontological chance finds. SAHRA also stated that it has no objection to the proposed development.
- **Transnet:** Stated that no objection to the project given that Transnet or its infrastructure is not affected by the proposed project.

- **Northern Cape Department of Agriculture, Environmental Affairs, Rural Development, and Land Reform (NC DAEARD&LR)- Air Quality**: Requested information regarding project details and listed activities in terms of NEMAQA .
- **South African Radio Astronomy Observatory (SARAO):** SARAO indicated that the project will not cause a determinantal impact to the SKA radio telescope, and therefore have no objection to the project.

6.5. Review of the EIA Report

The EIA Report was made available for review from 12 February 2021 – 15 March 2021. In accordance with the accepted Public Participation Plan, the report was available for download from the Savannah Environmental website, www.savannahSA.com and was also be sent via other electronic means such as WeTransfer, Dropbox or CD at the request of stakeholders. Hard copy reports were made available where sanitary conditions can be assured.

6.6. Identification and Assessment 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 R)** for the proposed development is applicable as it triggers Regulation 19 of the 2014 EIA Regulations (as amended). **Table 6.4** 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 6.4: 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 G)
Landscape/Visual Impact Assessment	Not specified within screening tool	A Visual Impact Assessment has been undertaken for the proposed project.(Appendix M)
Archaeological and Cultural Heritage Impact Assessment	Medium Sensitivity	A Heritage Impact Assessment including an Archaeological assessment has been undertaken for the proposed project (Appendix H)
Palaeontology Impact Assessment	Medium Sensitivity	A Heritage Impact Assessment including a Palaeontological assessment has been undertaken for the proposed project (Appendix H)
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 freshwater assessment has been undertaken for the proposed project (Appendix F)

Specialist Assessment	Sensitivity Rating as per the Screening Tool (relating to the need for the study)	Project Team Response
Avifauna 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 E)
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.
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 and Avifauna Assessment has been undertaken for the proposed project that includes the assessment of fauna (Appendix D and Appendix F)

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 were 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.

Based on the outcomes of the Scoping Phase evaluation of the project, the following issues were identified as requiring detailed assessment.

Table 6.5: Specialist consultants appointed to asse the potential impacts associated with the thermal generation facility and associated infrastructure

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

Climate Change)		
Social Impact Assessment	Tony Barbour of Tony Barbour Environmental Consulting	Appendix J
Quantitative Risk Assessment	Mike Oberholzer	Appendix K
Traffic Impact Assessment	JG Afrika	Appendix L
Visual Impact Assessment	Jon Marshall of Environmental Planning & Design Consult	Appendix M

Specialist studies considered direct, indirect, and cumulative environmental impacts associated with the development of the Thermal Plant. Issues were assessed in terms of the following criteria:

- The **nature**, a description of what causes the effect, what will be affected, and how it will be affected;
- The **extent**, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international. A score of between 1 and 5 is assigned as appropriate (with a score of 1 being low and a score of 5 being high);
- The **duration**, wherein it is 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;
  - 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);
  - 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The **probability of occurrence**, which describes the likelihood of the impact actually occurring. Probability is 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);
  - Assigned a score of 5 is definite (impact will occur regardless of any prevention measures).
- The **significance**, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high;
- The **status**, which is 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).

The purpose of the cumulative assessment is to test if such impacts are relevant to the proposed project in the proposed location (i.e. whether the addition of the proposed project in the area will increase the impact). In this regard, specialist studies considered whether the construction of the proposed development will result in:

- Unacceptable risk
- Unacceptable loss
- Complete or whole-scale changes to the environment or sense of place
- Unacceptable increase in impact

A conclusion regarding whether the proposed development will result in any unacceptable loss or impact considering all the projects proposed in the area is included in the specialist reports.

As the Applicant has the responsibility to avoid or minimise impacts and plan for their management (in terms of the EIA Regulations, 2014 (as amended)), the mitigation of significant impacts is discussed. Assessment of impacts with mitigation is made to demonstrate the effectiveness of the proposed mitigation measures. An Environmental Management Programme (EMPr) is included as **Appendix N**.

6.7. Finalisation of the EIA Report

The final stage in the EIA process has entailed the capturing of responses from stakeholders and I&APs on the EIA report in order to finalise and submit this EIA report for consideration. It is this final EIA report upon which the decision-making environmental authorities will issue a decision.

6.8 Assumptions and Limitations of the EIA Process

In conducting the EIA studies, the following general assumptions have been made:

- All information provided by the developer and I&APs to the environmental team was correct and valid at the time it was provided.
- It is assumed that the project site identified represents a technically suitable site for the establishment of the Thermal Plant and associated infrastructure (i.e., based on the surrounding land use, access to the site, access to infrastructure etc.)

- Conclusions of specialist studies undertaken, and this overall Impact Assessment assume that any potential impacts on the environment associated with the proposed development will be avoided, mitigated, or offset.
- This EIA Report and its investigations are project-specific, and consequently the environmental team did not evaluate any other power generation alternatives.

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

6.9 Legislation and Guidelines that have informed the preparation of this EIA Report

The following legislation and guidelines have informed the scope and content of this EIA 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)
- Department of Environmental Affairs (2017), Public Participation guidelines in terms of NEMA EIA Regulations;
- Procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for environmental authorisation; and
- International guidelines – the Equator Principles and the International Finance Corporation and World Bank Guidelines.

A listing of relevant legislation applicable to the 320MW is provided in **Table 6.6**.

Table 6.6: Review of the relevant environmental policies, legislation, guidelines and standards applicable to the Thermal Generation Facility

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Legislation			
Constitution of the Republic of South Africa (No. 108 of 1996)	In terms of Section 24, the State has an obligation to give effect to the environmental right. The environmental right states that: "*Everyone has the right –* » *To an environment that is not harmful to their health or well-being, and* » *To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:* * *Prevent pollution and ecological degradation,* * *Promote conservation, and* * *Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development*."	Applicable to all authorities	There are no permitting requirements associated with this Act. The application of the Environmental Right implies a long term responsibility to ensure sustainable development and environmental protection for future generations. The Environmental right clause provides that justifiable economic and social development should be promoted, through the use of natural resources and ecologically sustainable development.
National Environmental Management Act (No 107 of 1998) (NEMA)	The 2014 EIA Regulations have been promulgated in terms of Chapter 5 of NEMA. Listed activities which may not commence without EA are identified within the Listing Notices (GNR 327, GNR 325 and GNR 324) which form part of these Regulations (GNR 326). In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these listed activities must be assessed and reported on to the competent authority charged by NEMA with granting of the relevant environmental authorisation. A Scoping and EIA Process is required to be undertaken for the proposed project.	DEA – Competent Authority Northern Cape DAEARD & LR	The listed activities requiring authorisation triggered by the proposed project have been identified and are being assessed as part of the EIA process for the Thermal Plant. The EIA process will culminate in the submission of this final EIA Report to the Competent Authority in support of the Application for Environmental Authorisation.
National Environmental Management Act (No	In terms of the "Duty of Care and Remediation of Environmental Damage" provision in Section 28(1) of NEMA	DEFF	While no permitting or licensing requirements arise directly by virtue of the Thermal Plant in

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
107 of 1998) (NEMA)	every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment. In terms of NEMA, it is the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts.	Northern Cape DAEARD & LR	terms of this section, this general duty of care finds application through the consideration of potential cumulative, direct and indirect impacts.
Environment Conservation Act (No. 73 of 1989) (ECA)	The Noise Control Regulations in terms of Section 25 of the ECA contain regulations applicable for the control of noise in the Provinces of Limpopo, North West, Mpumalanga, Northern Cape, Eastern Cape, and KwaZulu-Natal Provinces. The Noise Control Regulations cover the powers of a local authority, general prohibitions, prohibitions of disturbing noise, prohibitions of noise nuisance, use of measuring instruments, exemptions, attachments, and penalties. In terms of the Noise Control Regulations, no person shall make, produce or cause a disturbing noise, or allow it to be made, produced or caused by any person, machine, device or apparatus or any combination thereof (Regulation 04).	DEFF Northern Cape DAEARD & LR Gamagara Local Municipality	Noise is expected to be associated with the construction and operational phase of the project. Considering the remote location of the Thermal Plant, noise is unlikely to present a significant intrusion to the local community.
National Water Act (No. 36 of 1998) (NWA)	A water use listed under Section 21 of the NWA must be licensed with the Regional DWS, unless it is listed in Schedule 1 of the NWA (i.e. is an existing lawful use), is permissible under a GA, or if a responsible authority waives the need for a licence.	Regional Department of Water and Sanitation	A water use authorisation process has been initiated for the proposed groundwater abstraction (Section 21(a)) and alternation and impeding and/or diverting of a watercourse within the regulated area (Section 21(c) and

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	Water use is defined broadly, and includes consumptive and non-consumptive water uses, taking and storing water, activities which reduce stream flow, waste discharges and disposals, controlled activities (activities which impact detrimentally on a water resource), altering a watercourse, removing water found underground for certain purposes, and recreation. Consumptive water uses may include taking water from a water resource (Section 21(a)), and storing water (Section 21(b)). Non-consumptive water uses may include impeding or diverting of flow in a water course (Section 21(c)), and altering of bed, banks or characteristics of a watercourse (Section 21(i)).		Section (I)). Confirmation of this process is attached in Appendix B.
Minerals and Petroleum Resources Development Act (No. 28 of 2002) (MPRDA)	In accordance with the provisions of the MPRDA a mining permit is required in accordance with Section 27(6) of the Act where a mineral in question is to be mined, including the mining of materials from a borrow pit. Any person who wishes to apply for a mining permit in accordance with Section 27(6) must simultaneously apply for an Environmental Authorisation in terms of NEMA.	Department of Mineral Resources	No borrow pits are expected to be required for the construction of the project, and as a result a mining permit or EA is not required to be obtained in this regard.
	Section 53 of the MPRDA states that any person who intends to use the surface of any land in any way which may be contrary to any object of the Act, or which is likely to impede any such object must apply to the Minister for approval in the prescribed manner.		In terms of Section 53 of the MPRDA, approval is required from the Minister of Mineral Resources to ensure that the proposed project does not sterilise a mineral resource that might occur on the site.
National Environmental Management: Air Quality Act (No. 39 of 2004) (NEM:AQA)	The List of Activities Which Result in Atmospheric Emissions Which Have or May Have A Significant Detrimental Effect on The Environment, Including Health, Social Conditions, Economic Conditions, Ecological Conditions or Cultural	DEFF Northern Cape DAEARD & LR / John	The project is a new facility and does not yet have an AEL. As a gas-fired power station with capacity greater than 50 MW, the project will require an AEL to operate. Emissions from the

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	Heritage (GN 893) published under Section 21(1)b of the NEM: AQA prescribe the emissions standards for a number of listed activities deemed detrimental to the environment. In accordance with the Regulations (GN 893) any person who conducts any activity in such a way as to give rise to emissions in quantities and concentrations that may exceed the minimum emissions standards set out must, apply for an Air Emissions License (AEL).	Taolo Gaetsewe District Municipality	power station will be required to comply with the new plant Minimum Emission Standards (MES). The applicable listed activities categories will include: Subcategory 1.4 (Gas Combustion Installations) and 2.4 (Storage and Handling of Petroleum Products). Listed activities defined in Section 21 of the NEM:AQA (as amended) require Environmental Authorisation – therefore triggering the Environmental Impact Assessment process - prior to the issuance of an AEL granting license to operate a facility that may impact ambient air quality.
National Heritage Resources Act (No. 25 of 1999) (NHRA)	Section 07 of the NHRA stipulates assessment criteria and categories of heritage resources according to their significance. Section 35 of the NHRA provides for the protection of all archaeological and palaeontological sites, and meteorites. Section 36 of the NHRA provides for the conservation and care of cemeteries and graves by SAHRA where this is not the responsibility of any other authority. Section 38 of the NHRA lists activities which require developers or any person who intends to undertake a listed activity to notify the responsible heritage resources authority and furnish it with details regarding the location, nature, and extent of the proposed development. Section 44 of the NHRA requires the compilation of a Conservation Management Plan as well as a permit from SAHRA for the presentation of archaeological sites as part	South African Heritage Resources Agency	A Heritage Impact Assessment has been undertaken as part of the EIA process (refer to **Appendix H** of this EIA Report). From an archaeological perspective there are no areas that require avoidance or buffering. Relevant procedures, as detailed in the EMPr, are required to be implemented should any chance finds be encountered during construction. The project is in an area of moderate palaeontological sensitivity. The Fossil Finds Procedure as included in the EMPr must be implemented.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	of tourism attraction.		
National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA)	Section 53 of NEM:BA provides for the MEC / Minister to identify any process or activity in such a listed ecosystem as a threatening process. Three government notices have been published in terms of Section 56(1) of NEM:BA as follows: » Commencement of TOPS Regulations, 2007 (GNR 150). » Lists of critically endangered, vulnerable and protected species (GNR 151). » TOPS Regulations (GNR 152). It provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), and 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 (NEM:BA: National list of ecosystems that are threatened and in need of protection, (Government Gazette 37596, GNR 324), 29 April 2014).	DEFF Northern Cape DAEARD	Under NEM:BA, a permit would be required for any activity which is of a nature that may negatively impact on the survival of a listed protected species. No protected species were found within the project site that require rescue and relocation permits under NEMBA (refer to Terrestrial Biodiversity Report in Appendix D)
National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA)	Chapter 5 of NEM:BA pertains to alien and invasive species, and states that a person may not carry out a restricted activity involving a specimen of an alien species without a permit issued in terms of Chapter 7 of NEM:BA, and that a permit may only be issued after a prescribed assessment of risks and potential impacts on biodiversity is carried out.	DEFF Northern Cape DAEARD	No Alien plant species listed in terms of Chapter 5 of NEM: BA were identified within the project as per the findings of the Ecological Impact Assessment (**Appendix D** of the EIA report). Any species identified must be managed in terms of the requirements of the Act.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	Applicable, and exempted alien and invasive species are contained within the Alien and Invasive Species List (GNR 864). Restricted activities and the respective requirements applicable to persons in control of different categories of listed invasive species are contained within the Alien and Invasive Species Regulations (GNR 598) published under NEM:BA, together with the requirements of the Risk Assessment to be undertaken.		
Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA)	Section 05 of CARA provides for the prohibition of the spreading of weeds. Regulation 15 of GNR 1048 published under CARA provides for the classification of categories of weeds and invader plants, and restrictions in terms of where these species may occur. Regulation 15E of GNR 1048 published under CARA provides requirement and methods to implement control measures for different categories of alien and invasive plant species.	The Department of Agriculture, Land Reform and Rural Development (DALRRD)	CARA will find application throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies need to be developed and implemented. In addition, a weed control and management plan must be implemented. The permission of DALRRD will be required if the project requires the draining of vleis, marshes or water sponges on land outside urban areas. However, this is not anticipated to be relevant for the project. In terms of Regulation 15E (GNR 1048) where Category 1, 2 or 3 plants occur a land user is required to control such plants by means of one or more of the following methods: » Uprooting, felling, cutting or burning. » Treatment with a weed killer that is registered for use in connection with such plants in accordance with the directions for the use of such a weed killer.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
			» Biological control carried out in accordance with the stipulations of the Agricultural Pests Act (No. 36 of 1983), the ECA and any other applicable legislation. » Any other method of treatment recognised by the executive officer that has as its object the control of plants concerned, subject to the provisions of sub-regulation (4). » A combination of one or more of the methods prescribed, save that biological control reserves and areas where biological control agents are effective shall not be disturbed by other control methods to the extent that the agents are destroyed or become ineffective.
National Forests Act (No. 84 of 1998) (NFA)	According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. Notice of the List of Protected Tree Species under the National Forests Act (No. 84 of 1998) was published in GNR 734. The prohibitions provide that "no person may cut, damage, disturb, destroy or remove any 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 licence granted by the Minister".	DAFF	A licence is required for the removal of protected trees listed under the National Forests Act of 1998 (No 84 of 1998). The following NFA-listed tree species were identified within the project site *Vachellia erioloba*, *Vachellia haematoxylon,* and *Boscia albitrunca*. A walk-through of the PV facility and thermal generation facility site has already been undertaken during December 2020 and a permit application submitted.
National Veld and Forest Fire Act (No. 101 of 1998) (NVFFA)	Chapter 4 of the NVFFA places a duty on owners to prepare and maintain firebreaks, the procedure in this regard, and the role of adjoining owners and the fire protection association. Provision is also made for the making of firebreaks on the international boundary of the Republic of South Africa. The applicant must ensure that firebreaks are wide and long enough to have a	DAFF	While no permitting or licensing requirements arise from this legislation, this Act will be applicable during the construction and operation of the Thermal Facility, in terms of the preparation and maintenance of firebreaks, and the need to provide appropriate equipment and personnel for firefighting purposes.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	reasonable chance of preventing a veldfire from spreading to or from neighbouring land, it does not cause soil erosion, and it is reasonably free of inflammable material capable of carrying a veldfire across it. Chapter 5 of the Act places a duty on all owners to acquire equipment and have available personnel to fight fires. Every owner on whose land a veldfire may start or burn or from whose land it may spread must have such equipment, protective clothing and trained personnel for extinguishing fires, and ensure that in his or her absence responsible persons are present on or near his or her land who, in the event of fire, will extinguish the fire or assist in doing so, and take all reasonable steps to alert the owners of adjoining land and the relevant fire protection association, if any.		
Hazardous Substances Act (No. 15 of 1973) (HAS)	This Act regulates the control of substances that may cause injury, or ill health, or death due to their toxic, corrosive, irritant, strongly sensitising or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger, to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products. » Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc., nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared as Group I or Group II substance	Department of Health (DoH)	It is necessary to identify and list all Group I, II, III, and IV hazardous substances that may be on site and in what operational context they are used, stored or handled. If applicable, a license would be required to be obtained from the Department of Health (DoH). Hazardous substances (i.e. LPG) are anticipated to be stored on within the project site.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	» Group IV: any electronic product, and » Group V: any radioactive material. The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.		
National Environmental Management: Waste Act (No. 59 of 2008) (NEM:WA)	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. The Minister may amend the list by – » Adding other waste management activities to the list. » Removing waste management activities from the list. » Making other changes to the particulars on the list. In terms of the Regulations published in terms of NEM:WA (GNR 912), a BA or EIA is required to be undertaken for identified listed activities. Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that: » The containers in which any waste is stored, are intact and not corroded or in » Any other way rendered unlit for the safe storage of waste. » Adequate measures are taken to prevent accidental spillage or leaking. » The waste cannot be blown away. » Nuisances such as odour, visual impacts and breeding of vectors do not arise, and » Pollution of the environment and harm to health are	DEFF – hazardous waste Northern Cape DAEARD – general waste	No waste listed activities are triggered by the project and therefore no Waste Management License is required to be obtained. General and hazardous waste handling, storage and disposal will be required during construction and operation. The National Norms and Standards for the Storage of Waste (GNR 926) published under Section 7(1)(c) of NEM:WA will need to be considered in this regard, if more than 100m^3 of general waste or 80m^3 for hazardous waste is to be generated by the project and stored on site at any one time. .

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	prevented.		
National Road Traffic Act (No. 93 of 1996) (NRTA)	The technical recommendations for highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts. The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.	South African National Roads Agency (SANRAL) – national roads Northern Cape Department of Transport (DoT)	An abnormal vehicle permit may be required to transport various components of the transmission infrastructure to site for construction. These may include road clearances for vehicles carrying abnormally dimensioned loads (transport vehicles exceeding the dimensional limitations (length) of 22m).
Provincial Policies / Legislation			
Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009)	This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current	Northern Cape DAEARD	In the Terrestrial Biodiversity Report (**Appendix D**) seven (7) Protected Species under the NCNCA were identified within the project site. Permits from the Northern Cape DAEARD are required for removal of these species.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	project: » Boundary fences may not be altered in such a way as to prevent wild animals from freely moving onto or off of a property » Aquatic habitats may not be destroyed or damaged » The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species The Act provides lists of protected species for the Province		

6.9.1. International Guidelines

i) <u>The Equator Principles III (June, 2013)</u>

The Equator Principles (EPs) III constitute a financial industry benchmark used for determining, assessing, and managing projects environmental and social risks. The EPs are primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making. The EPs are applicable to large infrastructure projects and apply globally to all industry sectors.

The EPs comprise the following principles:

Principle 1: Review and Categorisation
Principle 2: Environmental and Social Assessment.
Principle 3: Applicable Environmental and Social Standards.
Principle 4: Environmental and Social Management System and Equator Principles Action Plan
Principle 5: Stakeholder Engagement
Principle 6: Grievance Mechanism
Principle 7: Independent Review
Principle 8: Covenants
Principle 9: Independent Monitoring and Reporting
Principle 10: Reporting and Transparency.

When a project is proposed for financing, the Equator Principle Financial Institution (EPFI) will categorise it based on the magnitude of its potential environmental and social risks and impacts.

Projects can be categorized as follows:

Category A: Projects with potential significant adverse environmental and social risks and/or impacts that are diverse, irreversible or unprecedented.
Category B: Projects with potential limited adverse environmental and social risks and/or impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures.
Category C: Projects with minimal or no adverse environmental and social risks and/or impacts.

Based on the abovementioned criteria, the Thermal Generation Facility can be anticipated to be categorised as a Category B project.

Category A and Category B projects require that an assessment process be conducted to address the relevant environmental and social impacts and risks associated with the project. Such an assessment may include the following where applicable:

» An assessment of the baseline environmental and social conditions.
» Consideration of feasible environmentally and socially preferable alternatives.
» Requirements under host country laws and regulations, applicable international treaties and agreements.
» Protection and conservation of biodiversity (including endangered species and sensitive ecosystems in modified, natural and Critical Habitats) and identification of legally protected areas.

- Sustainable management and use of renewable natural resources (including sustainable resource management through appropriate independent certification systems).
- Use and management of dangerous substances.
- Major hazards assessment and management.
- Efficient production, delivery and use of energy.
- Pollution prevention and waste minimisation, pollution controls (liquid effluents and air emissions), and solid and chemical waste management.
- Viability of Project operations in view of reasonably foreseeable changing weather patterns/climatic conditions, together with adaptation opportunities.
- Cumulative impacts of existing Projects, the proposed Project, and anticipated future Projects.
- Respect of human rights by acting with due diligence to prevent, mitigate and manage adverse human rights impacts.
- Labour issues (including the four core labour standards), and occupational health and safety.
- Consultation and participation of affected parties in the design, review and implementation of the Project.
- Socio-economic impacts.
- Impacts on Affected Communities, and disadvantaged or vulnerable groups.
- Gender and disproportionate gender impacts.
- Land acquisition and involuntary resettlement.
- Impacts on indigenous peoples, and their unique cultural systems and values.
- Protection of cultural property and heritage.
- Protection of community health, safety and security (including risks, impacts and management of Project's use of security personnel).
- Fire prevention and life safety.

Such an assessment should propose measures to minimise, mitigate, and offset adverse impacts in a manner relevant and appropriate to the nature and scale of the proposed Project. In terms of the EPs South Africa is a non-designated country, and as such the assessment process for projects located in South Africa evaluates compliance with the applicable IFC Performance Standards on Environmental and Social Sustainability and the World Bank Group (WBG) EHS Guidelines (refer to the sections below).

The Thermal Generation Facility is currently being assessed in accordance with the requirements of the 2014 EIA Regulations, as amended (GNR 326), published in terms of Section 24(5) of the National Environmental Management Act (No. 107 of 1998) (NEMA), which is South Africa's national legislation providing for the authorisation of certain controlled activities. Through this assessment, all potential social and environmental risks are identified and assessed, and appropriate mitigation measures proposed.

ii) International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability (January 2012)

The International Finance Corporation (IFC), a division of the World Bank Group that lends to private investors, uses a Sustainability Framework (IFC, 2012), to promote sound environmental and social practices, encourage transparency and accountability, and contribute to positive development impacts.

The IFC Performance Standards (PS) on Environmental and Social Sustainability were developed by the IFC. The Performance Standards are directed towards clients, providing guidance on how to identify risks

and impacts, and are designed to help avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable way, including stakeholder engagement and disclosure obligations of the client in relation to project-level activities. Together, the eight Performance Standards establish standards that the client is to meet throughout the life of an investment by IFC. The overall objectives of the IFC PS are:

- To fight poverty.
- To do no harm to people or the environment.
- To fight climate change by promoting low carbon development.
- To respect human rights;
- To Promote gender equity;
- To provide information prior to project development, free of charge and free of external manipulation;
- To collaborate with the project developer to achieve the PS;
- To provide advisory services; and
- To notify countries of any Trans boundary impacts as a result of a Project.

The PS comprise of the following:

Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts.
Performance Standard 2: Labour and Working Conditions.
Performance Standard 3: Resource Efficiency and Pollution Prevention.
Performance Standard 4: Community Health, Safety and Security.
Performance Standard 5: Land Acquisition and Involuntary Resettlement.
Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources.
Performance Standard 7: Indigenous Peoples.
Performance Standard 8: Cultural Heritage.

Performance Standard 1 establishes the importance of:

i). Integrated assessment to identify the social and environmental impacts, risks, and opportunities of projects.
ii). Effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them.
iii). The management of social and environmental performance throughout the life of a project through an effective Environmental and Social Management System (ESMS).

PS 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. PS 1 is the overarching standard to which all the other standards relate. PS 2 through 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, PS 2 through 8 describe potential social and environmental impacts that require particular attention in emerging markets. Where social or

environmental impacts are anticipated, the developer is required to manage them through its Environmental and Social Management System (ESMS) consistent with PS 1.

iii) **The IFC Environmental Health and Safety (EHS) Guidelines**

The IFC EHS Guidelines are technical reference documents with general and industry specific examples of Good International Industry Practice (GIIP). The following IFC EHS Guidelines have relevance to the proposed project:

- IFC EHS General Guidelines
- IFC EHS Guidelines for Electric Power Transmission and Distribution
- IFC EHS Guidelines for Thermal Power Plants

The General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines, which in this instance is the EHS Guideline for Thermal Power Plants. The application of the General EHS Guidelines should be tailored to the hazards and risks associated with a project and should take into consideration site-specific variables which may be applicable, such as host country context, assimilative capacity of the environment, and other project factors. In instances where host country regulations differ from the standards presented in the EHS Guidelines, whichever is the more stringent of the two in this regard should be applied.

The General EHS Guidelines include consideration of the following:

- Environmental:
  - Air Emissions and Ambient Air Quality
  - Energy Conservation
  - Wastewater and Ambient Water Quality
  - Water Conservation
  - Hazardous Materials Management
  - Waste Management
  - Noise
  - Contaminated Land
- Occupational Health and Safety:
  - General Facility Design and Operation
  - Communication and Training
  - Physical Hazards
  - Chemical Hazards
  - Biological Hazards
  - Radiological Hazards
  - Personal Protective Equipment (PPE)
  - Special Hazard Environments
  - Monitoring
- Community Health and Safety:
  - Water Quality and Availability
  - Structural Safety of Project Infrastructure
  - Life and Fire Safety (L&FS)
  - Traffic Safety

- Transport of Hazardous Materials
- Disease Prevention
- Emergency Preparedness and Response

» Construction and Decommissioning:
- Environment
- Occupational Health & Safety
- Community Health & Safety

The EHS Guidelines for Thermal Power Plants 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.

Industry specific EHS issues associated with thermal power plants considered in the Guideline are as follows:

» Environment
- Air emissions
- Energy efficiency and Greenhouse Gas (GHG) emissions
- Water consumption and aquatic habitat alteration
- Effluents
- Solid wastes
- Hazardous materials and oil
- Noise

» Occupational Health and Safety
- Non-ionizing radiation
- Heat
- Noise
- Confined spaces
- Electrical hazards
- Fire and explosion hazards
- Chemical hazards; and
- Particulate matte

» Community Health and Safety
- Water Consumption
- Traffic Safety

CHAPTER 7. DESCRIPTION OF THE RECEIVING ENVIRONMENT

This section of the EIA 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.

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

This chapter of the scoping report includes the following information required in terms of Appendix 3: Content of the EIA Report:

Requirement	Relevant Section
(h)(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 7.2. » The climatic conditions of the Kathu area is described in Section 7.3. » Biophysical characteristics of the project site and the surrounding areas are described in Section 7.4 and 7.5. This includes the topography, hydrology, geology, soils, agricultural potential, geo-hydrology and ecology of the project site. » Visual considerations are described in Section 7.6 » The air quality of the area is considered in Section 7.7 » Ambient noise levels of the area are described in Section 7.9. » Heritage resources, including the palaeontology and archaeology of the project site are described in Section 7.10 and 7.11. » Social and economic characteristics of the Kathu area are described in Section 7.12

7.2. 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 7.1**).

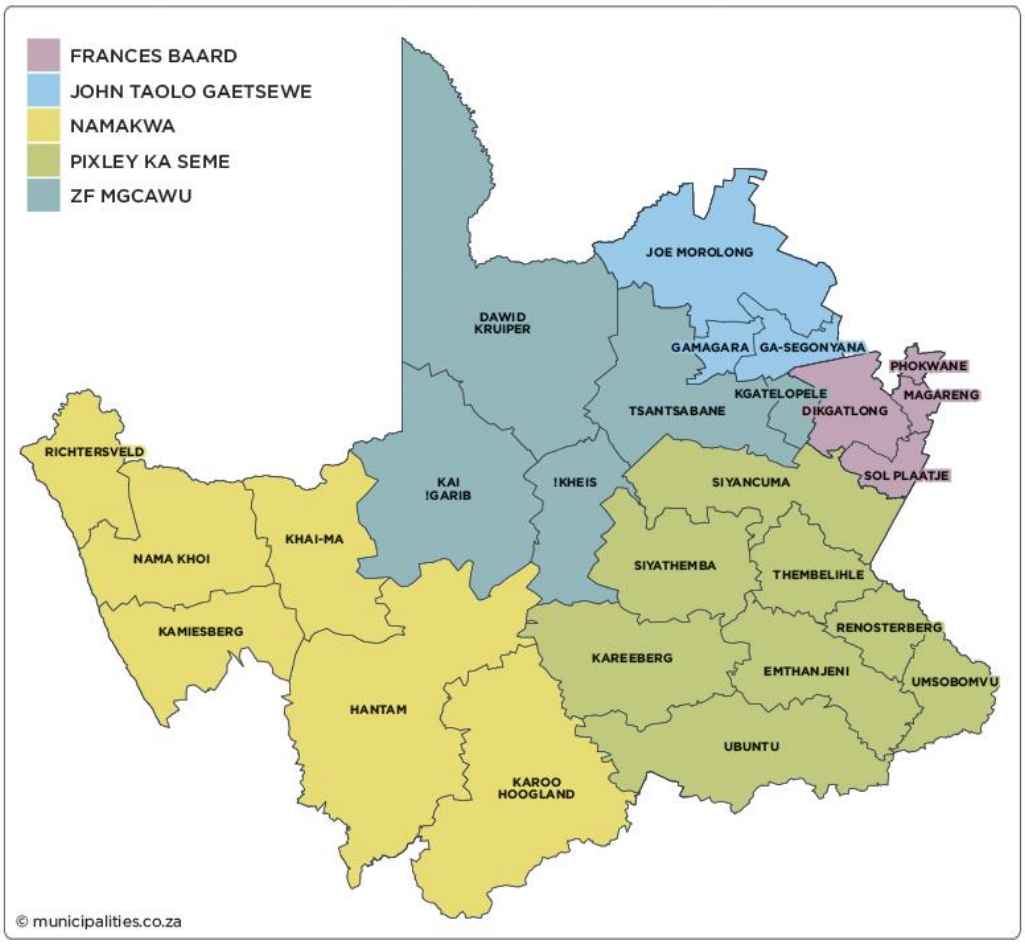


Figure 7.1: Districts of the Northern Cape Province (Source: Municipalities of South Africa).

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 7.2**).

Figure 7.2: 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.

7.3. 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 7.3**). 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.

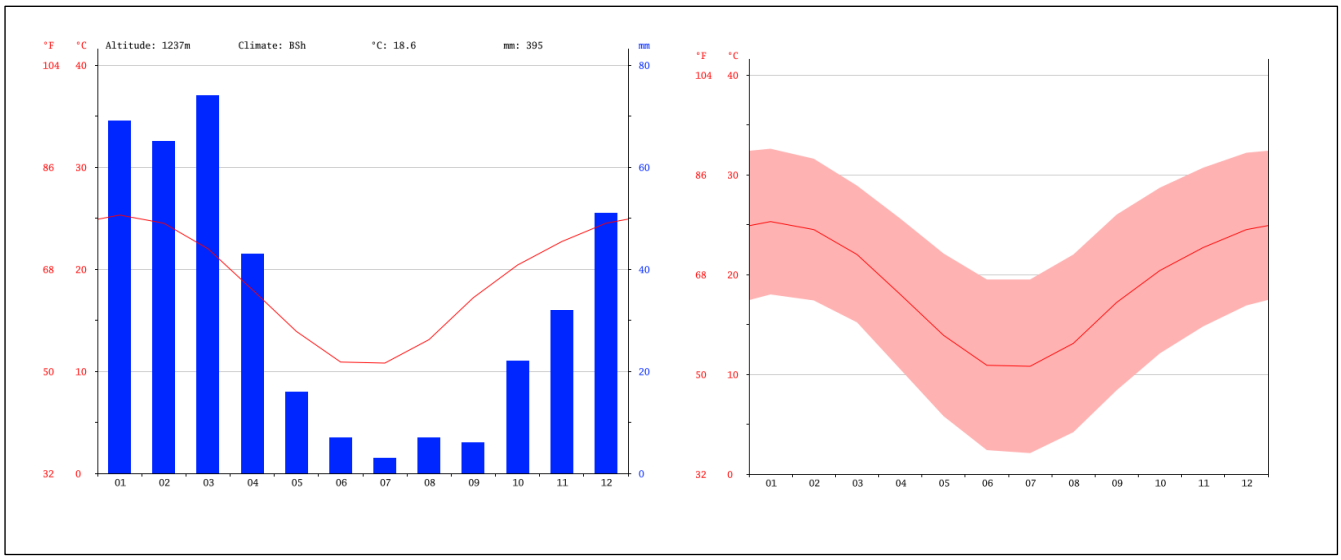


Figure 7.3: Climate and Temperature graphs for Kathu, Northern Cape Province (Source: en.climate-data.org).

7.4. Biophysical Characteristics of the Study Area

7.4.1 Topography

The landscape within the project site can be described as flat to very slightly undulating. The entire development area consists of Land Type Ah9. This land type consists of only two terrain units where Terrain Unit 4 is the vast flat areas that dominates the landscape and Terrain Unit 5 is the areas of slight depression where endorheic pans can develop

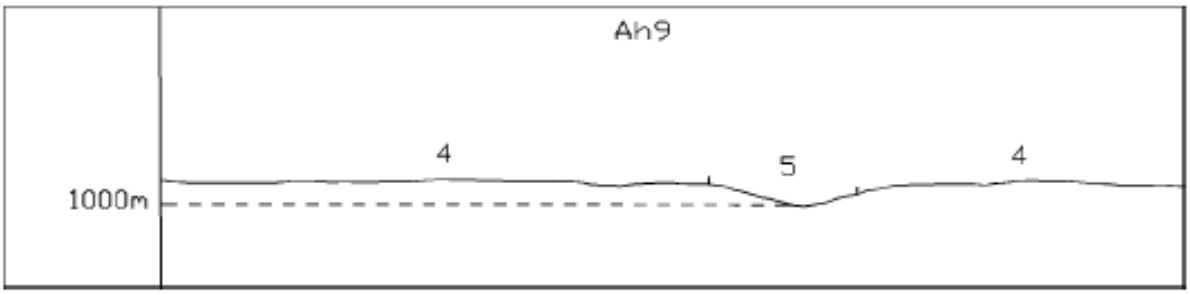


Figure 7.4: Terrain units within Ah9 land type

7.4.2 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.

7.4.3. 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 7.5**):

» *Ah*9 - 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%).

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.

7.4.3 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 7.6**). 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, and a perched depression wetland was also identified within the Vlermuisleegte River.

Figure 7.5: Land type classification of the proposed development area and access road

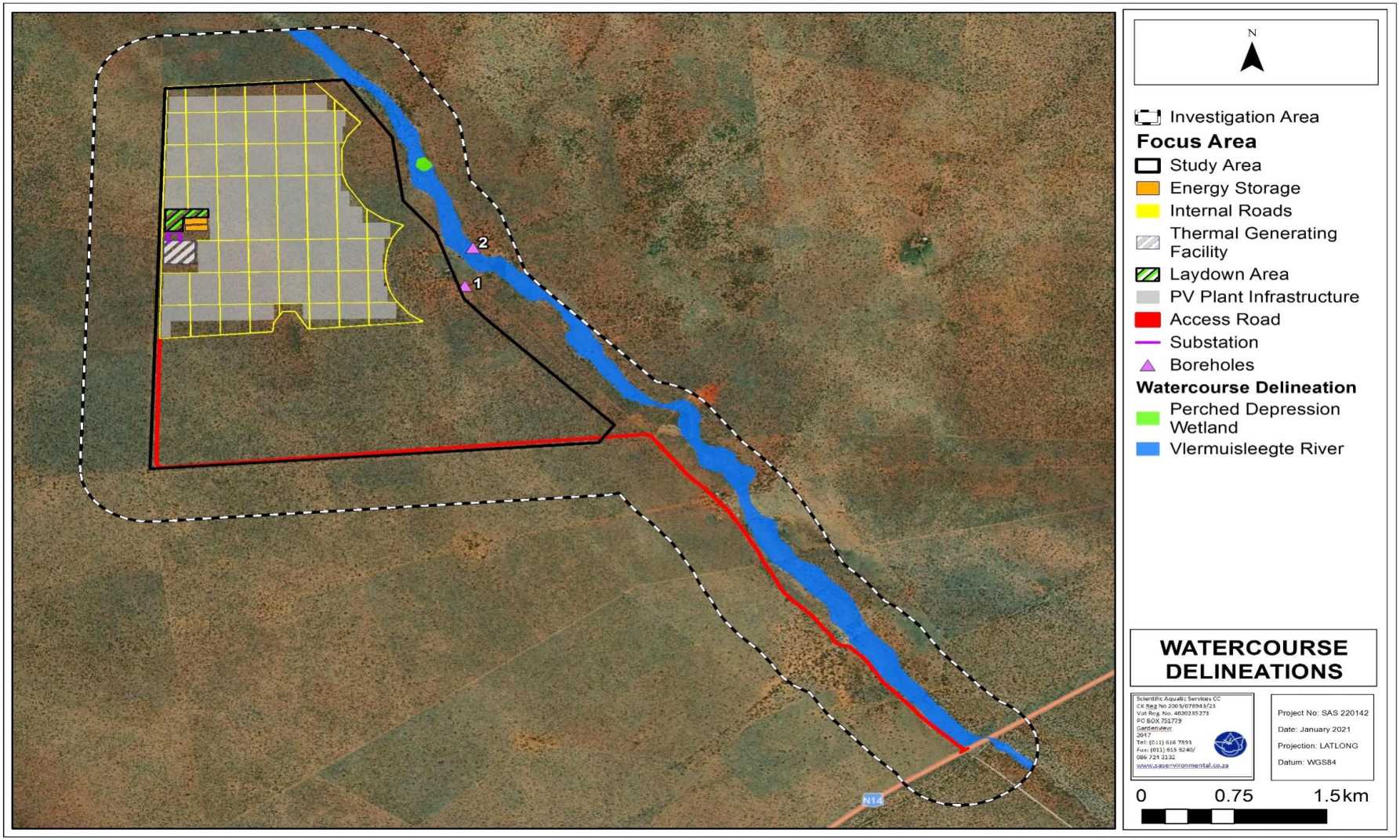


Figure 7.6: Locality and extent of the desktop delineated watercourses associated with the project site and access road.

7.4.3 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 7.1: 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. 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).

7.4.4 Listed and protected plant species of the project site

Several tree and plant species that are protected under the National Forest Act (Act 84 of 1998) and Schedule 2 (Protected Species) of the Northern Cape Nature Conservation Act (Act No. 9 of 2009) have

the potential to occur 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).

7.5. Fauna

7.5.1. 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).

7.5.2. 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. There are no other formal protected areas or any IBAs and Biodiversity Areas in close proximity to the project site.

Other protected areas in close proximity to the project site include the Kathu Forest Nature Reserve and Protected Woodlands Area, which situated approximately 2km east of the project site (**Figure 7.8**).

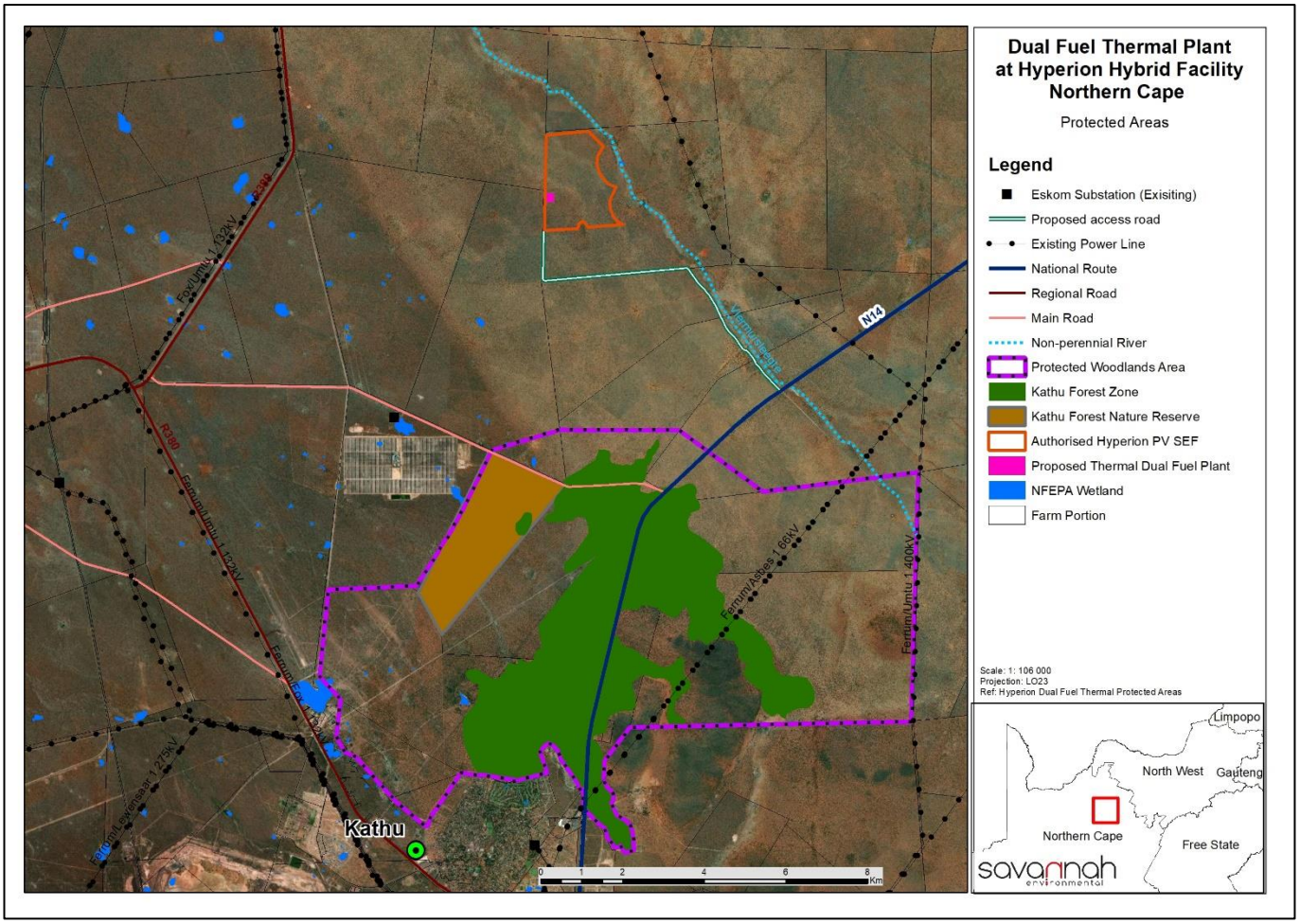


Figure 7.8: Map of protected areas in close proximity to the project site

7.5.3. 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) (refer to **Figure 7.9**). 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.

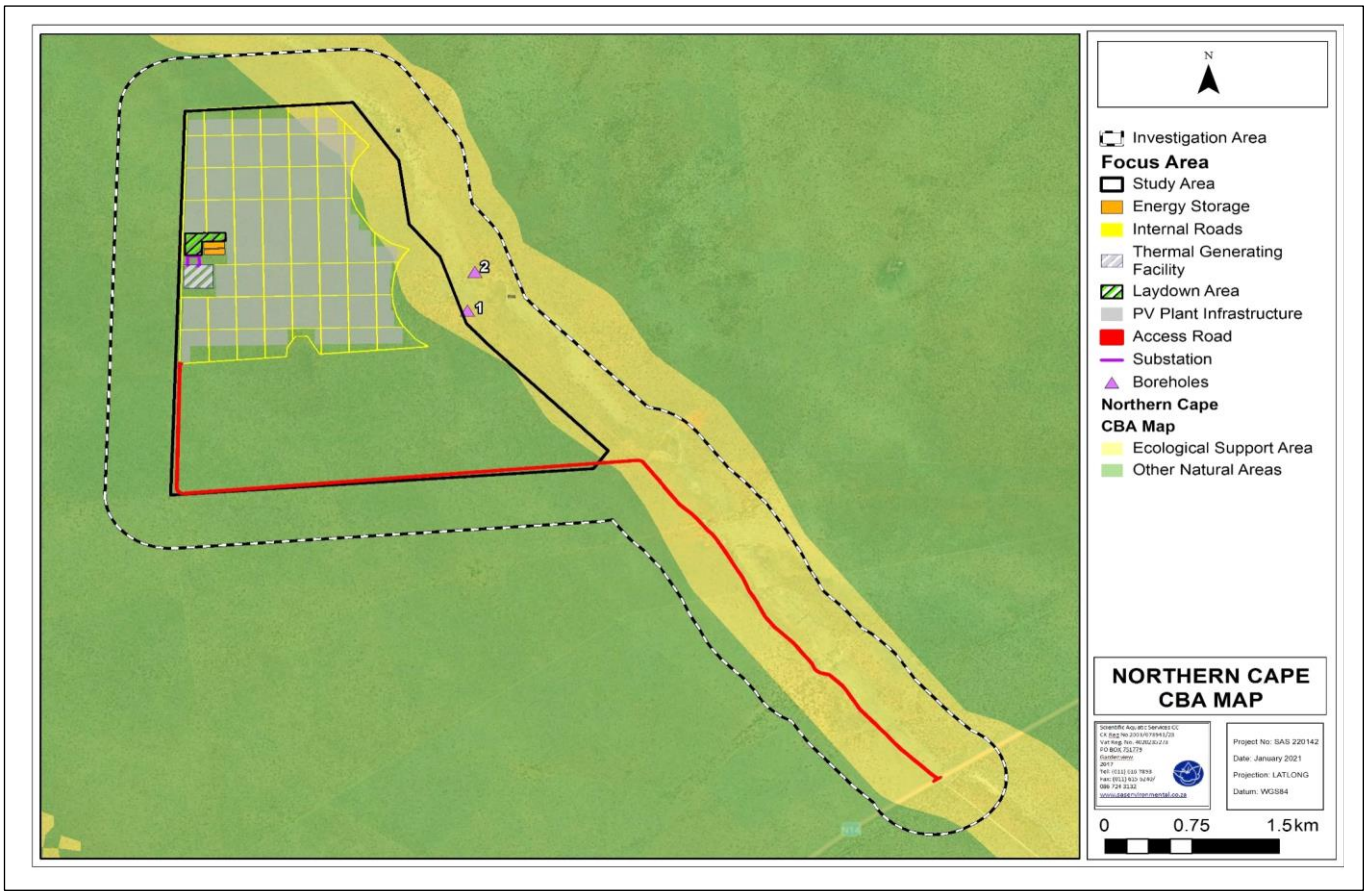


Figure 7.9: Northern Cape Critical Biodiversity areas associated with the study area and associated infrastructure

7.6 Visual Considerations

7.6.1. 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.

7.6.2. 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.

7.7 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).

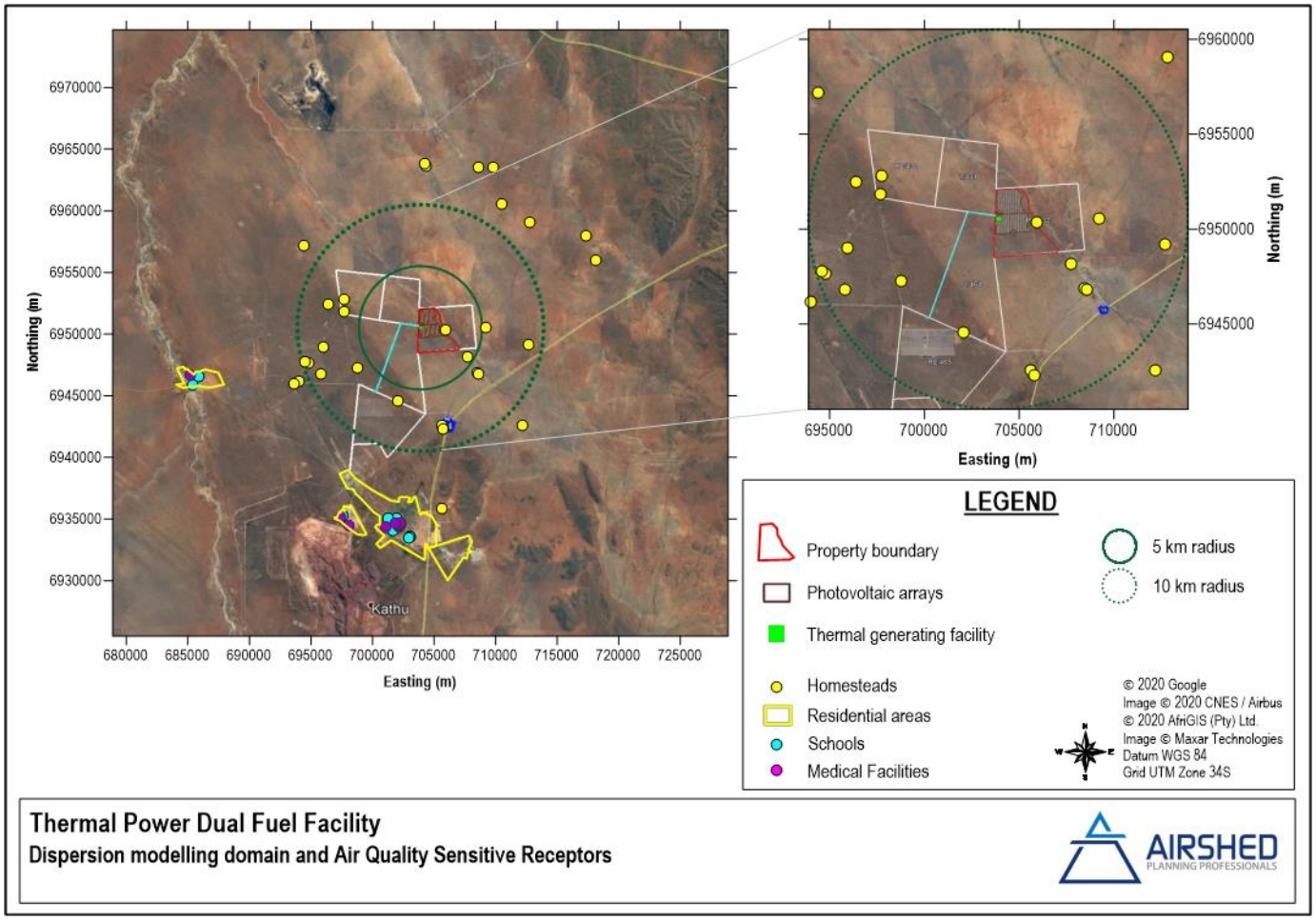


Figure 7.10: Locality map showing proposed project site and nearby sensitive receptors.

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 7.11)** 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.

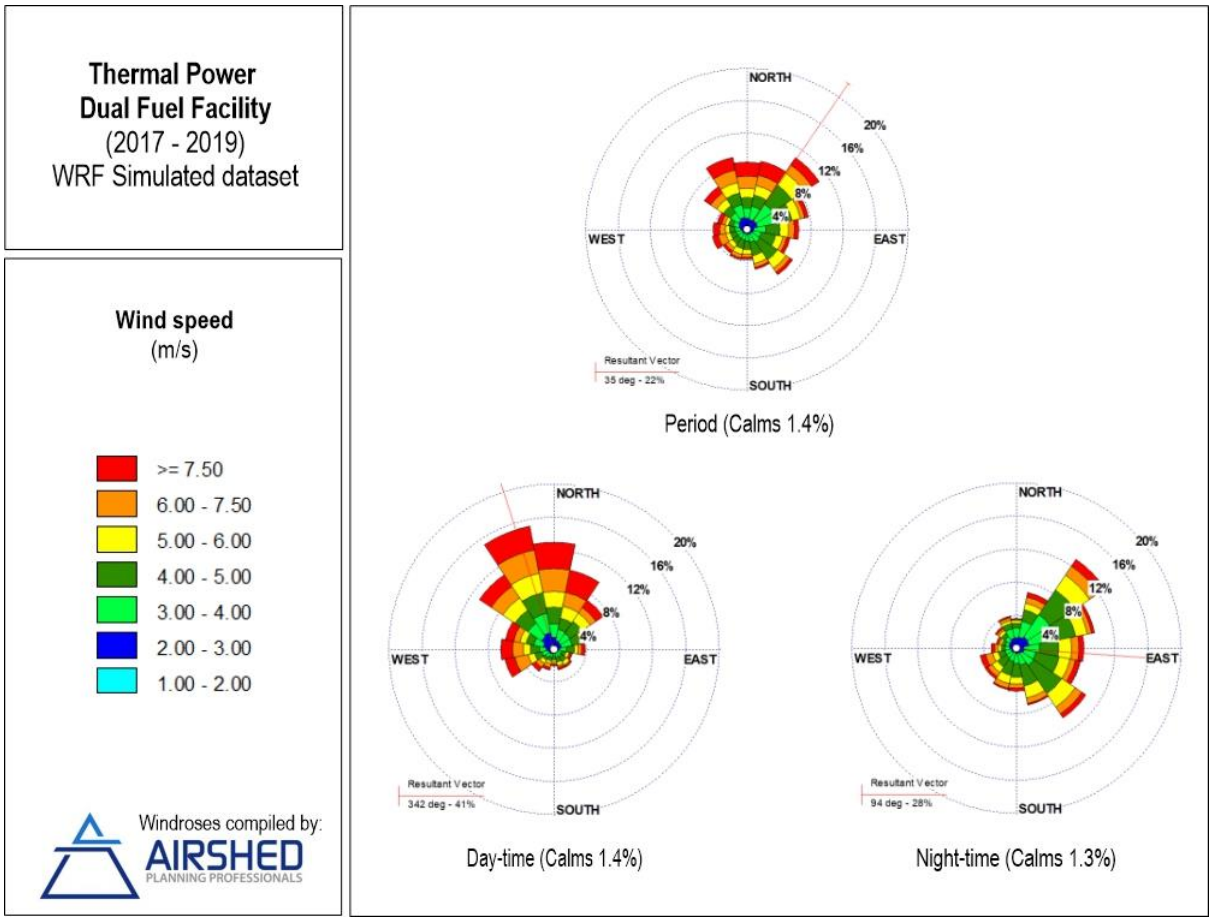


Figure 7.11: Period, day- and night-time wind rose for the proposed project location for the period 2017 - 2019

7.9. 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) are highlighted in **Figure 7.12**. The closest potential noise-sensitive receptor is located around 1.95 km from the proposed thermal generation facility.

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).

From the assessment undertaken during the Scoping Phase it was determined that a a low potential for a noise impact exists in the area and that no acoustical studies would be required for the proposed Thermal Plant.

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 1896 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.

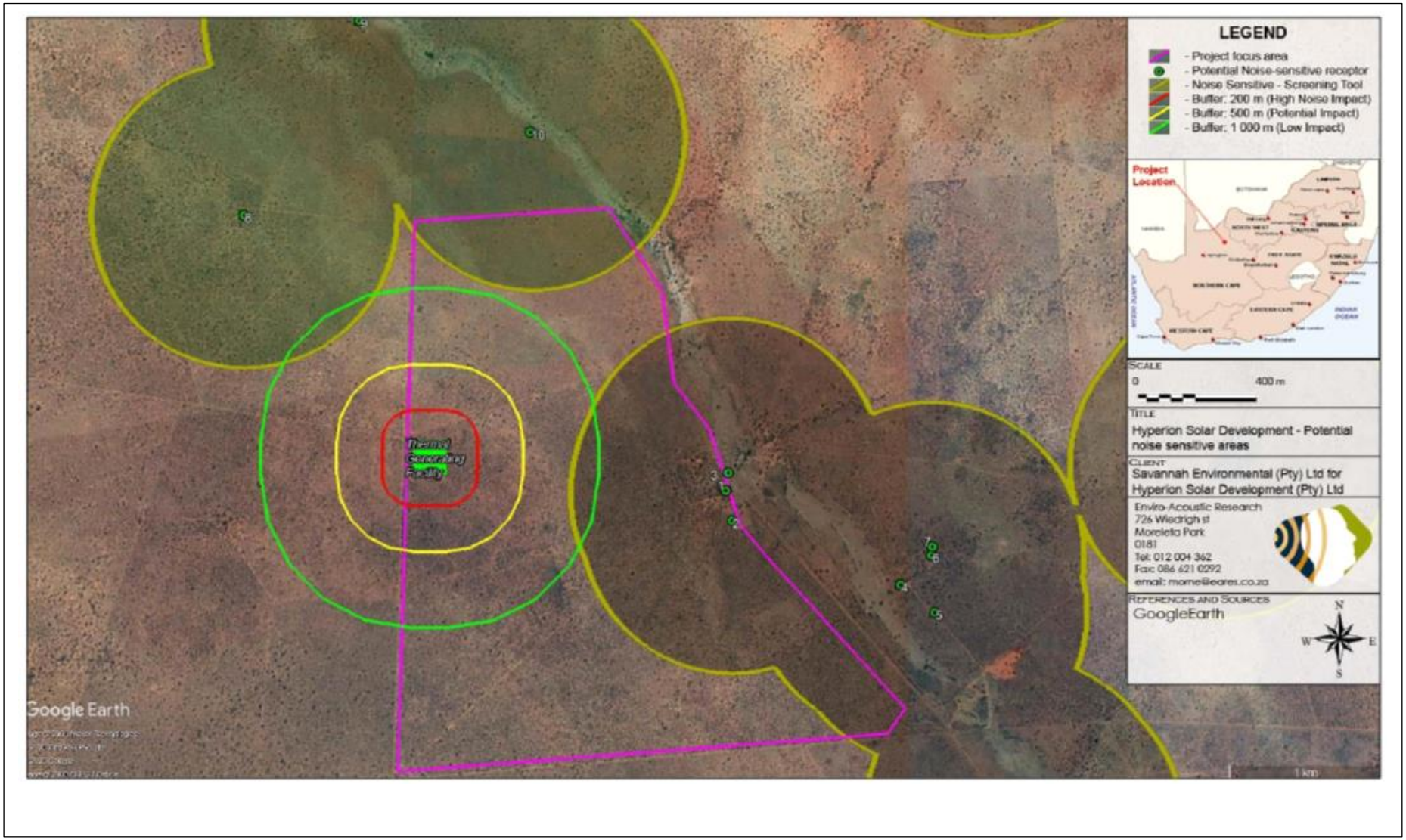


Figure 7.12: Potential Noise Sensitive Areas and identified receptors

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 thermal generator site and whole extent of the access road are of moderate palaeontological sensitivity (**Figure 7.13**).

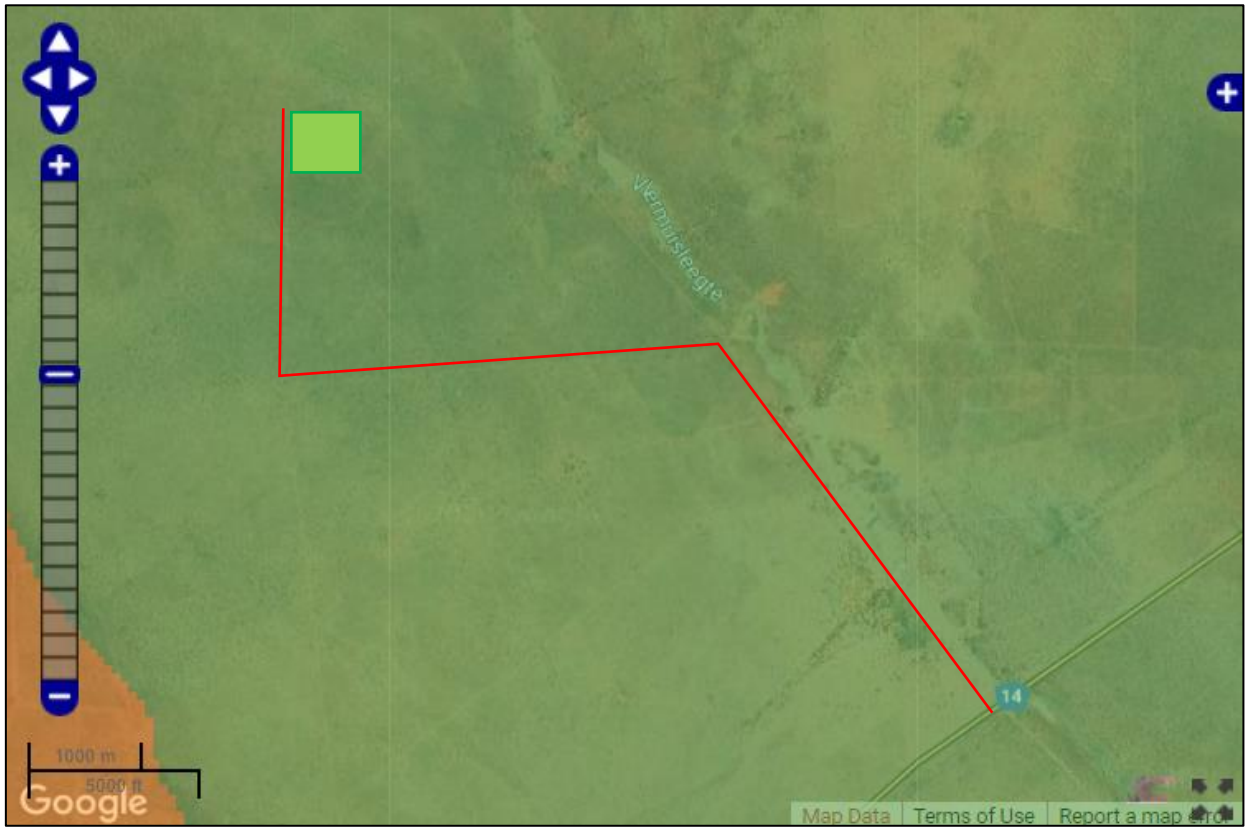


Figure 7.13. Palaeosensitivity map showing the study area to be of moderate (green shading) sensitivity.

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 8. ASSESSMENT OF IMPACTS

This chapter serves to assess the significance of the positive and negative environmental impacts (direct and indirect) expected to be associated with the development of Thermal Dual Fuel Facility and its associated infrastructure. This assessment has considered the construction of a thermal plant with a contracted capacity of up to 75MW within a development footprint of approximately 5ha in extent. The project will comprise the following key infrastructure and components:

- Reciprocating Gas Engines
- Access road (surfaced)
- 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
- Cabling, O&M building, fencing, warehouses and workshops

The project site was considered through the EIA process by the independent specialists and the EAP. On-site sensitivities were identified through the review of existing information, desktop evaluations and field surveys. A development footprint for the Thermal plant and associated infrastructure within the project site was proposed by the developer through consideration of the sensitive environmental features and areas identified through the EIA process.

A layout for Thermal plant was designed within the already authorised development footprint of the Hyperion PV1&2 facilities and avoids no-go, very high and high sensitivity areas identified (refer to **Figure 8.1**). The site will be accessed via a proposed surfacing and widening of the access road is for an existing authorised road for the PV facility. The layout/development footprint of the proposed project is considered as *least intrusive* on the environment at the proposed location, and most suitable for the EIA investigation.

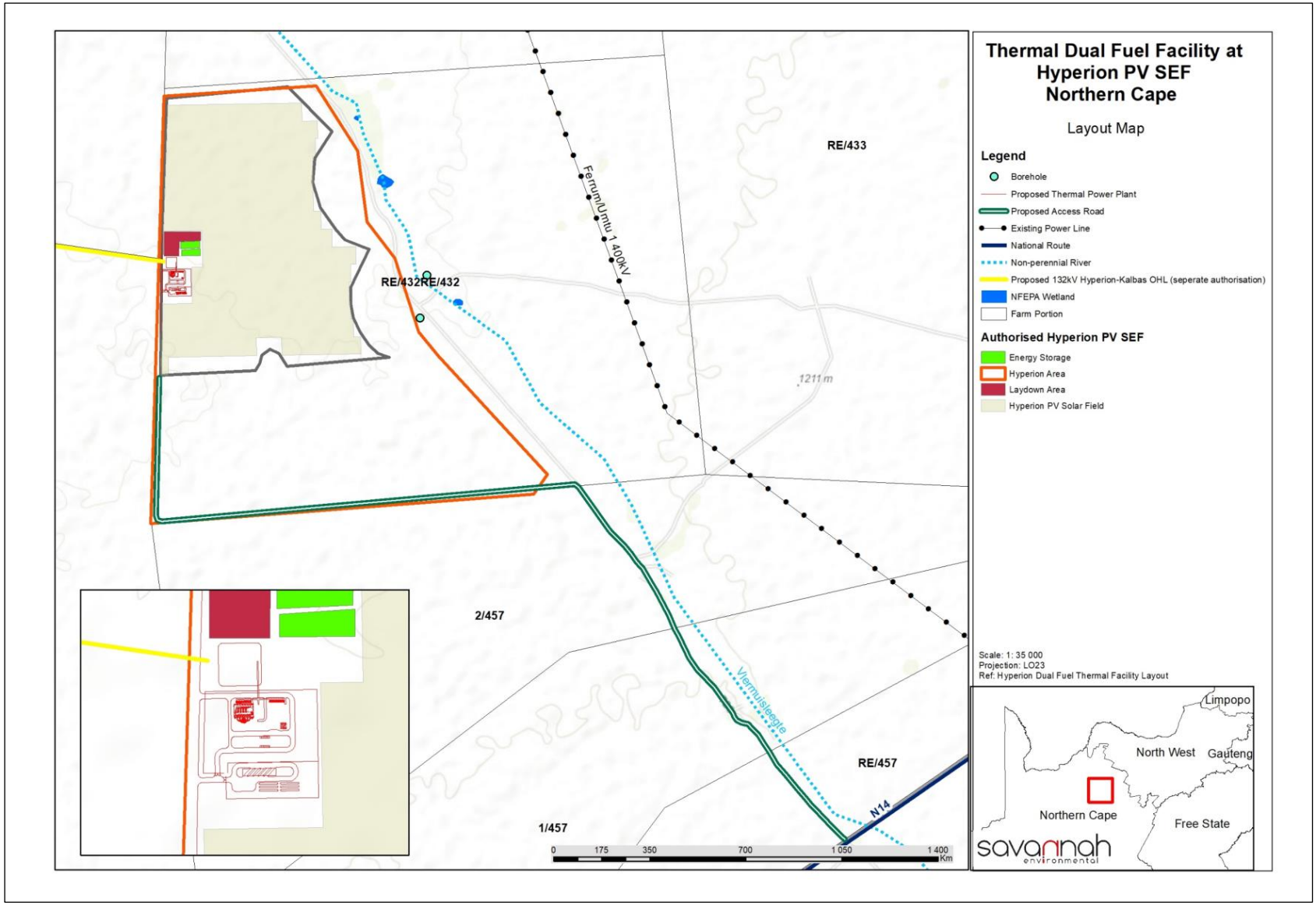


Figure 8.1: Map illustrating the project layout considered for the Thermal Plant as part of the Hyperion Hybrid Facility

The development of Thermal plant will comprise the following phases:

- *Pre-Construction and Construction* – will include pre-construction surveys; site preparation; establishment of access roads, laydown areas, and facility infrastructure; construction of foundations involving excavations; the transportation of components/construction equipment to site, manoeuvring and operating vehicles for unloading and installation of equipment; laying cabling; and commissioning of new equipment and site rehabilitation. The construction phase for the Thermal plant is estimated at 12 - 18 months.
- *Operation* – will include the operation of the thermal facility and the generation of electricity as part of a hybrid system with the Hyperion PV1&2 facility. The electricity generated will be fed into the national grid via the on-site substation (authorised as part of the PV facilities) and an overhead power line (assessed through a separate process). The operation phase of Thermal plant is expected to be approximately 20 years (with maintenance).
- *Decommissioning* – depending on the economic viability of the thermal plant, the length of the operation phase may be extended beyond a 20-year period. At the end of the project's life, decommissioning will include site preparation, disassembling of the components of the facility, clearance of the relevant infrastructure at the site and appropriate disposal thereof, and rehabilitation. Note that impacts associated with decommissioning are expected to be similar to those associated with construction activities. Therefore, these impacts are not considered separately within this chapter.

Environmental issues associated with construction and decommissioning activities may include, among others, threats to biodiversity and ecological processes, including habitat alteration and impacts to fauna, impacts to sites of heritage value, soil contamination and erosion, and nuisance from the movement of vehicles transporting equipment and materials.

Environmental impacts associated with the operation phase includes air emissions and contributions to climate change. Other impacts associated with the operation phase include visual impacts, night time lighting impacts, soil contamination and erosion and potential invasion by alien and invasive plant species.

8.1. Quantification of Areas of Disturbance on the Site

Site-specific impacts associated with the construction and operation of the Thermal plant relate to the direct loss of vegetation and species of special concern, disturbance of animals and loss of habitat, and impacts on soils. In order to assess the impacts associated with Thermal plant, it is necessary to understand the extent of the affected area.

The project footprint of the Thermal plant is approximately 5ha in extent and is located within the already authorised development area of the Hyperion PV1&2 facility. An authorised and existing access road will be surfaced and widened to provide access to the Thermal plant site during construction and operation.

8.2. Potential Impacts on Ecology (Ecology, Flora and Fauna)

The majority of the ecological impacts associated with the development would occur during the construction phase as a result of the disturbance associated with site clearance, excavations, the operation of heavy machinery at the site and the presence of construction personnel. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix D** for more details).

8.2.1 Results of the Ecological Impact Assessment

A verification statement of high-level walk through by Simon Todd (2020) was provided as part of the assessment for the project under consideration. The site has a moderate abundance of *Vachellia erioloba* with a high abundance of *Vachellia haematoxylon*, especially within the southern half of the current footprint of the Hyperion PV Facilities. The overall floral diversity was intermediate to moderately high, depending on habitat conditions, with the northern section less diverse due to historic impacts (likely fire-related). As such, the loss of a relatively high number of floral species, including protected trees, cannot be avoided.

No nationally threatened floral species of concern (SCC) were observed during the site assessment. Suitable habitat is however available *for Harpagophytum procumbens*. No nationally or provincially threatened or protected faunal species were observed on the Thermal plant site. Although having gone undetected during the field survey, there remains a probability that some of these species may occur within the focus area.

The focus area was associated with a high abundance of tree species protected under the NFA, including the Camel Thorn, *Vachellia erioloba* and the Gray Camel Thorn, *Vachellia haematoxylon*. The Shephard Tree, *Boscia albitrunca* was observed within the surrounding areas. **Table 8.1** provides a summary of the number of listed and protected species which were encountered during the walk-through of the authorised Hyperion PV facilities. As the thermal facility is located within the authorised footprint for these PV facilities, no additional trees will be impacted by this plant.

Table 8.1. Summary of the number of listed and protected species which were encountered during the walk-through (Todd,2020).

Species	Estimate	Minimum	Maximum
Vachelia erioloba	8725	7720	9729
Vachelia haematoxylon	22872	20863	24881

8.2.2 Description of Ecological Impacts

The potential impact to floral and faunal species associated with the activities pertaining to the proposed Thermal Facility of 5 ha and the proposed access road are detailed below**.**

» *Pre-Construction Phase*
- Failure to relocate floral or faunal SCC to suitable habitats may result in loss of faunal or floral SCC within the development footprint areas in the focus area.

» *Construction Phase*
- Loss of faunal and floral habitat, diversity, and the loss of floral SCC due to site clearing and vegetation removal
- Proliferation of alien invasive species resulting in a loss of favourable faunal and floral habitat outside of the direct development footprint, including a decrease in species diversity and a potential loss of faunal and floral SCC.
- Local loss of floral species, faunal abundance and diversity
- Loss or alteration of floral and faunal habitat and species diversity.

» *Operational Phase and Maintenance Phase*

- Failure to monitor the success of relocated floral SCC may result in potential loss of SCC individuals.
- A lack of maintenance activities and poor implementation of alien invasive management plan may result ongoing or permanent loss of faunal and floral habitat, diversity, and potential SCC
- Loss of faunal and floral habitat, medicinal flora, and SCC, as well as overall species diversity within the local area due to increased huma activity in the area (e.g. increased fire risk, illegal harvesting etc.

8.2.3 Impact tables summarising the significance of impacts on ecology during construction and operation (with and without mitigation)

i) Floral Impact Assessment Results

The tables below indicate the potential risks to the floral ecology associated with all phases of the proposed development. The impact tables consider the potential impacts from the proposed Thermal facility and Access Road separately.

Impact on the floral habitat, diversity, and SCC resulting from the proposed Access Road

Nature: *Impact of floral habitat and diversity, and floral SCC*

Local loss of floral diversity associated with the focus area and potentially the clearance of protected and/or threatened flora. The current design allows for minimal habitat loss as a large section of the proposed access road includes an upgrade of an existing road. Habitat fragmentation is also reduced due to the road being aligned with the property fence.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Long-term (4)
Magnitude	Moderate (4)	Low (2)
Probability	Highly Probable (5)	Highly Probable (5)
Significance	**Medium (44)**	**Low (28)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	Yes (to an extent)	

Mitigation:

» The construction and upgrade of the proposed Access Road must limit vegetation clearing to the approved footprint area and must prevent footprint creep that will result in the loss of additional floral species. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimal. Any temporary roads should be rehabilitated as soon as they are no longer in use to prevent effects of habitat fragmentation.

» The section of the Access Road that will require new construction must, as far as possible, be aligned to existing fences so to avoid fragmentation if the vegetation.

» Removal of alien invasive species should preferably commence during the pre-construction phase and continue throughout the construction, operational, maintenance phases. AIPs were recorded along the existing T26 gravel road and during the road upgrade. These species must be cleared and disposed of at a registered waste facility. Their propagules (any part of the plant that can result in the reproduction of the specimen) must not be allowed to spread to natural vegetation along the section of the Access Road that requires new construction. AIP control is increasingly important along road construction as linear developments form corridors along which AIPs can more readily spread.

» Vehicles must remain along existing and/or approved roads during all phases of the project and must not be

allowed to drive recklessly, impacting on adjacent natural vegetation.
» Prior to construction activities, the proposed Access Road section that requires new construction must undergo a walkdown to identify and mark all potentially occurring floral SCC – i.e., NFA protected flora, nationally protected flora and threatened flora. These individuals, if present, must be marked for relocation (where feasible) or permit application for their clearance.

Residual Impacts:

Even with extensive mitigation, residual impacts on the receiving floral ecological environment are deemed likely. The following points highlight the key residual impacts that have been identified:

» Permanent loss of and altered floral species diversity due to long-term nature of the project and the potential for alien vegetation and bush encroaching to become extensive along linear developments over time (increased human movement);
» The ongoing risk of loss of SCC/protected floral species with increased human presence; and
» Disturbed areas are not adequately rehabilitated, resulting in ongoing loss of floral habitat, species diversity and SCC/protected floral species.

Impact on the floral habitat, diversity, and SCC resulting from the proposed Thermal Generating Facility

Nature: *Impact on floral habitat and diversity, and floral SCC*

Vegetation clearance will result in the local loss of floral habitat and diversity. Floral SCC will be minimally affected by the Thermal Generating Facility when assessed apart from the entire Solar Farm footprint Thermal Generating Facility. No nationally threatened ecosystems will be lost, and no endemic species were recorded within the footprint.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Long-term (4)
Magnitude	Moderate (6)	Minor (2)
Probability	Highly Probable (4)	Probable (3)
Significance	**Medium (52)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Moderate	Moderate
Can impacts be mitigated?	This impact cannot be well mitigated because the loss of vegetation and individuals of protected tree species is unavoidable and is a certain outcome of the development.	

Mitigation:

» Minimise loss of indigenous vegetation where possible through planning and where necessary by incorporating the sensitivity of the biodiversity report as well as other specialist studies.
» Ensure that no development occurs outside of the planned development footprint.
» Temporary laydown areas should be located within previously transformed areas or areas that have been identified as being of low sensitivity. These areas should be rehabilitated after use.
» Prior to the commencement of construction activities, an AIP Management/Control Plan should be compiled for implementation. An AIP Management/Control Plan should be implemented by a qualified professional. No uncertified chemicals may be used for chemical control of AIPs. Trained personnel to be used for the application of chemical control or for the use of dangerous tools / machinery if mechanical clearing is to be pursued.
» All floral and faunal SCC and protected tree species that will be affected by the construction activities, must be marked and where possible, relocated to suitable habitat surrounding the disturbance footprint. Permits might be required from provincial (DENC) and national authorities such as DEFF.
» Removal of vegetation must be restricted to what is absolutely necessary and should remain within the approved development footprint. It is recommended that vegetation only be cleared where infrastructure will be placed.
» Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be avoided or, if required, must be limited to what is

absolutely necessary, and the footprint thereof kept to a minimal.
» Care should be taken during the construction and operation of the proposed development to limit edge effects to surrounding natural habitat. This can be achieved by:
  - Demarcating all footprint areas during construction activities;
  - No construction rubble or cleared alien invasive species are to be disposed of outside of demarcated areas, and should be taken to a registered waste disposal facility;
  - All soils compacted because of construction activities should be ripped and profiled and reseeded; and
  - Manage the spread of AIP species, which may affect remaining natural habitat within surrounding areas.
» Upon completion of construction activities, it must be ensured that no soils be left bare, and that indigenous
» species be used to revegetate the disturbed area.
» No collection of floral or faunal SCC or medicinal floral species must be allowed by construction and maintenance personnel.
» Disturbed areas are to be rehabilitated to a similar state as that of pre-disturbance conditions – where veld condition can be improved, it is recommended.

Residual Impacts:
Even with extensive mitigation, residual impacts on the receiving floral ecological environment are deemed likely. The following points highlight the key latent impacts that have been identified:
» Destruction of ecologically intact habitat outside of the authorised development;
» Permanent loss of and altered floral species diversity outside of the focus area, including loss of favourable habitat for SCC;
» Loss of NFA protected tree species and of NCNCA protected floral species resulting from increased vegetation clearing and/or harvesting in the region; and
» Potential AIP proliferation and ongoing bush encroachment into adjacent natural vegetation communities.

ii) Faunal Impact Assessment

The below table indicates the perceived risks to the faunal ecology associated with all phases of the proposed access road and the Thermal Generating Facility development and operation.

Impact on the faunal habitat, diversity, and SCC resulting from the proposed Access Road.

Nature: *Impact of floral habitat and diversity, and fauna SCC*

Local loss of habitat will lead to a decline in faunal diversity associated with the footprint area. The current design of the road will result in minimal habitat loss as a large section of the proposed Access Road includes an upgrade of an existing road. Habitat fragmentation is also reduced due to the road being aligned with the property fence which already pose a barrier to movement for some faunal species. Faunal species diversity may further be impacted upon due to faunal collisions with vehicles along the route.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Moderate (4)	Low (2)
Probability	Highly Probable (5)	Probable (3)
Significance	**Medium (40)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	Yes (to an extent)	

Mitigation:
» Keep the proposed access road footprint to an absolute minimum and use existing road networks as far as possible.
» Clearly demarcate the areas to be cleared and do not deviate from this footprint.

- Monitor and control alien plant growth along the entire route in line with mitigation set out in the floral impact section.
- Vehicles should not be allowed to exceed 40km/h along the road in order to minimise the risk of faunal collisions.
- Suitable storm water planning must be done to ensure that water runoff from the road does not lead to erosion of the verges and additional habitat loss.
- Any faunal species found along the route that do not naturally relocate themselves during vegetation clearing and operational activities must be carefully relocated to similar habitat outside of the disturbance footprint.
- In the unlikely event that species encountered do not self-relocate and are listed as protected/ endangered, a permit must be obtained where/ if applicable from the relevant authority and the relocation should be undertaken by a suitably qualified specialist.
- All soils compacted because of maintenance activities should be ripped and reprofiled to natural levels and revegetated with indigenous vegetation. Establishment of reintroduced vegetation within such disturbed areas must be monitored as part of maintenance activities to ensure no cumulative loss of floral habitat.
- No dumping of waste should take place during maintenance activities, especially not within any sensitive habitat or open space natural areas.
- Vehicles should be restricted from travelling in sensitive environments. Where possible, monitoring and maintenance should occur on foot.

Residual Impacts:

Even with extensive mitigation, residual impacts on the receiving faunal ecological environment are deemed likely. The following points highlight the key residual impacts that have been identified:

- Permanent loss of and altered faunal species diversity in the areas immediately adjacent to the road, alien plant growth leading to further habitat loss and increased risk of poaching
- The potential for ongoing risk of loss of SCC/protected faunall species with increased human presence; and
- Disturbed areas are not adequately rehabilitated, resulting in ongoing loss of floral habitat, species diversity and SCC/protected floral species.

Impact on the faunal habitat, diversity, and SCC resulting from the proposed Thermal Generating Facility

Nature: *Impact on faunal habitat and diversity, and faunal SCC*

Vegetation clearance will result in the local loss of habitat which will lead to a decrease in species abundance and potentially species diversity in the area. However, there is sufficient suitable habitat, often in better condition, in the surrounding areas to support these faunal species that will be displaced from the proposed footprint. Faunal SCC may be impacted upon slightly should they occur in, or temporarily utilise the footprint area, however faunal SCC that may occur in the footprint should naturally relocate to suitable surrounding habitat at the onset of vegetation clearance activities.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Long-term (4)
Magnitude	Moderate (6)	Low(4)
Probability	Highly Probable (4)	Probable (3)
Significance	**Medium (52)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Moderate	Moderate
Can impacts be mitigated?	This impact cannot be fully mitigated as the loss of vegetation within the footprint is a definite and as such will lead to the displacement of faunal species from the footprint area	

Mitigation:

- Keep the proposed thermal generating facility footprint to an absolute minimum and use existing road networks as far as possible.

» Clearly demarcate the areas to be cleared and do not deviate from this footprint. » No vegetation outside of the demarcated areas is to be cleared and no faunal species in the adjacent natural are to be disturbed. » No hunting or snaring of faunal species is allowed by personal or any people on site. » Monitor and control alien plant growth along the entire route in line with mitigation set out in the floral impact section. » Suitable storm water planning must be done to ensure that water runoff does not lead to erosion and additional habitat loss. » Any faunal species found within the footprint that do not naturally relocate themselves during vegetation clearing activities must be carefully relocated to similar habitat outside of the disturbance footprint. » In the unlikely event that species encountered do not self-relocate and are listed as protected/ endangered, a permit must be obtained where/ if applicable from the relevant authority and the relocation should be undertaken by a suitably qualified specialist. » All soils compacted because of activities should be ripped and reprofiled to natural levels and revegetated with indigenous vegetation. Establishment of reintroduced vegetation within such disturbed areas must be monitored as part of maintenance activities to ensure no cumulative loss of floral habitat. » No dumping of waste should take place during maintenance activities, especially not within any sensitive habitat or open space natural areas. » Vehicles should be restricted from travelling in sensitive environments. Where possible, monitoring and maintenance should occur on foot.
Residual Impacts: Even with extensive mitigation, residual impacts on the receiving floral ecological environment are deemed likely. The following points highlight the key latent impacts that have been identified: » Permanent loss of and altered fauna; species diversity outside and within the development; » Potential for ongoing loss of SCC/protected faunal species due to increased human presence » Disturbed areas not adequately rehabilitated resulting in ongoing loss of faunal habitat and diversity

8.2.4 Implications for Project Implementation

The direct impacts associated with the construction and operation of the Thermal plant and upgrade of the existing access road on floral and faunal ecology will have a medium impact significance if no mitigation measures are implemented. If mitigation measures are implemented, the impact significance for the focus area is still anticipated to be Low. In terms of development implications, the loss of habitat from the proposed development will not result in significant impacts on floral and faunal communities given that biodiversity outside of the direct footprint is preserved through strict adherence to mitigation measures.

8.3. Potential Impacts on Avifauna

Potential impacts on avifauna and the relative significance of the impacts associated with the construction and operation of the Thermal plant and access road are summarised below (refer to **Appendix E** for more details).

8.3.1 Results of the Avifauna Impact Assessment

A verification statement of high-level walk through by Simon Todd (2020) was provided as part of the assessment for the project under consideration. During the previous assessment for the Hyperion PV facilities, a low diversity of avifauna were noted within the project area.

Only a single species of conservation concern (SCC) was confirmed during the verification site investigation namely, *Ardeotis kori* (Kori Bustard, Near-threatened). The presence of several other SCC within the area is deemed possible, although the focus area will likely only be utilised for foraging as opposed to breeding in most cases.

Many of these species will likely self-relocate at the start of construction activities and as such it is unlikely that rescue and relocation permits (NEMBA or NCNCA) will be required, however, should avifaunal nests be observed within any of the larger trees they should be monitored.

8.3.2 Description of Avifaunal Impacts

The potential impact to avifaunal species associated with the activities pertaining to the proposed Thermal Facility of 5 ha and the proposed access road are detailed below**.**

» *Pre-Construction Phase*
- Failure to relocate avifaunal SCC to suitable habitats may result in loss of avifaunal SCC within the development footprint areas in the focus area.

» *Construction Phase*
- Loss of habitat, diversity, and the loss of avifaunal SCC due to site clearing and vegetation removal
- Proliferation of alien invasive species resulting in a loss of favourable avifaunal habitat outside of the direct development footprint, including a decrease in species diversity and a potential loss of SCC.
- Further disturbance of avifaunal species due to increased huma activity (e.g. increased potential for hunting/poaching)

» *Operational Phase and Maintenance Phase*
- Permanent loss of avifaunal habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural avifaunal habitat. Further reduction of available habitat in the long-term, compounding the limiting factors to avifaunal assemblages
- Increased risk of collisions with the project infrastructure and/or electrocution while perching on the pylons or powerlines (potential fire risk)
- Potential overexploitation through the removal and/or collection of important or sensitive avifaunal SCC on the property.

8.3.3 Impact tables summarising the significance of impacts on avifauna during construction and operation (with and without mitigation)

The below table indicates the potential risks to avifauna associated with all phases of the proposed access road and the Thermal Generating Facility development and operation.

Impact on the avifauna habitat, diversity, and SCC resulting from the proposed Access Road.

Nature: *Impact of floral habitat and diversity, and fauna SCC* Local clearing of vegetation will result in the minor loss of avian habitat adjacent the existing gravel road within the focus area. The current design allows for minimal habitat loss as a large section of the proposed Access Road includes an upgrade of an existing road. An increased probability of avian collisions with vehicles is also anticipated during operation.		
	Without mitigation	**With mitigation**

Extent	Local (2)	Local (1)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Moderate (4)	Low (2)
Probability	Highly Probable (5)	Probable (3)
Significance	**Medium (40)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	Yes (to an extent)	

Mitigation:

» The construction and upgrade of the proposed Access Road must limit vegetation clearing to the approved footprint area whilst avoiding footprint creep that will result in the loss of additional avian habitat. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimal. Any temporary roads should be rehabilitated as soon as they are no longer in use to limit the effects of habitat fragmentation.

» The section of the Access Road that will require new construction must, as far as possible, be aligned to existing fences so to avoid fragmentation of the vegetation.

» Removal of alien invasive species should preferably commence during the pre-construction phase and continue throughout the construction and operational phases in order to limit damaging changes to the local avian habitat. AIPs were recorded along the existing T26 gravel road and during the road upgrade, these species must be cleared and disposed of at a registered waste facility. AIP control is increasingly important along road construction as linear developments form corridors along which AIPs can more readily spread.

» Vehicles must remain along existing and/or approved roads during all phases of the project and must not be allowed to drive recklessly (a speed limit of 40km/h is recommended).

Residual Impacts:

Even with extensive mitigation, residual impacts on the receiving faunal ecological environment are deemed likely. The following points highlight the key residual impacts that have been identified:

» Permanent loss of and altered avifauna habitat due to long-term nature of the project and the potential for alien vegetation and bush encroaching to become extensive along linear developments over time (increased human movement) which may reduce the suitability of avian habitat within the focus area.

» The potential for ongoing risk of loss of SCC/protected avifaunal species with increased human presence; and

» Disturbed areas are not adequately rehabilitated, resulting in ongoing loss of floral habitat, species diversity and SCC/protected floral species.

Impact on the avifaunal habitat, diversity, and SCC resulting from the proposed Thermal Generating Facility

Nature: *Impact on avifaunal habitat and diversity, and faunal SCC*

Vegetation clearance will result in the local loss of avian habitat and diversity in the direct footprint. Habitat loss in the footprint area will result in the displacement of birds into adjacent habitat where resource competition will increase, however, these impacts are not anticipated to be large as the area encompasses 5 ha.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Long-term (4)
Magnitude	Moderate (6)	Low(4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (39)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Moderate	Moderate
Can impacts be mitigated?	This impact can be mitigated as the size of the Thermal Plant	

	covers 5 ha and is not located in an area that is particularly sensitive to avifauna. The proposed new Thermal Plant will replace the current natural veld, which will increase potential risks and impacts on local avifauna while providing little opportunity for habitation

Mitigation:

- Should any avifaunal species protected under the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) or the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) or large raptor nest be encountered within the footprint area, construction should be halted and authorisation to relocate or remove the trees containing said nests must be obtained from the relevant departments.
- Minimise loss of indigenous vegetation where possible by not clearing outside of the designated footprint area.
- Temporary laydown areas should be located within previously transformed areas or areas that have been identified as being of low sensitivity. These areas should be rehabilitated after use.
- In order to reduce bird presence within the infrastructure footprint (fenced off area), constant disturbance or harassment to any birds attempting to utilize the area (for breeding or foraging) should be initiated.
- Any structures which may act as perching sites for birds should be installed with anti-perching spikes.
- Infrastructure associated with the Thermal Plant may be used as shelter by avifauna, which increases their potential activity around the site. Methods to reduce available shelter include: 1) Exclusion measures such as spikes, netting, panelling on ledges and holes around buildings to assist in prevention of birds taking residence, 2) Nest removal, and 3) Cutting of grass within the fenced off infrastructure area should be considered depending on the major bird assemblages, as some species prefer short grass while other species prefer long grass.
- Any avifaunal SCC nests that will be affected by the construction activities, must be marked and where possible, the current breeding attempt should be allowed to complete its cycle before any activities are undertaken within close proximity of the nest (depending on the species). After the breeding attempt has failed or the chick has fledged the nest should be destroyed or moved. Permits for such activities must be obtained from the relevant authorities where required.
- Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be avoided or, if required, must be limited to what is absolutely necessary, and the footprint thereof kept to a minimal. A strict speed limit should be maintained (40 km/h is recommended) to limit potential bird strikes.
- Care should be taken during the construction and operation of the proposed development to limit edge effects to surrounding natural habitat. This can be achieved by:
    - Demarcating all footprint areas during construction activities;
    - No construction rubble or cleared alien invasive species are to be disposed of outside of demarcated areas, and should be taken to a registered waste disposal facility;
    - All soils compacted because of construction activities should be ripped and profiled and reseeded; and
    - Manage the spread of AIP species, which may affect remaining natural habitat within surrounding areas.
- Upon completion of construction activities, it must be ensured that no soils are left bare, and that indigenous species be used to revegetate the disturbed area.
- No collection, trapping or killing of avifaunal SCC must be allowed by construction and maintenance personnel.
- Disturbed areas are to be rehabilitated to a similar state as that of pre-disturbance conditions – where veld condition can be improved, it is recommended.

Residual Impacts:

Even with extensive mitigation, residual impacts on the receiving avifaunal environment are deemed likely. The following points highlight the key latent impacts that have been identified:

- Permanent loss of and altered avifaunal species diversity outside and within the development.
- Potential for ongoing loss of SCC/protected faunal species due to increased human presence.
- Disturbed areas not adequately rehabilitated resulting in ongoing loss of avifaunal habitat and diversity.

8.3.4 Implications for Project Implementation

With the implementation of mitigation measures by the developer, contractors, and operational staff, the significance of avifauna impacts associated with Thermal Plant and proposed upgraded access road likely to be of medium significance. With mitigation measures in place, the impact significance can be reduced to low. In terms of development implications, the loss of habitat from the proposed development will not result in significant impacts on the avifaunal community within the focus and no impacts on a National or Regional scale are anticipated to permeate from the Thermal Plant.

8.4. Assessment of Impacts on Watercourses

The impacts on watercourses (including rivers, pans and wetlands) associated with the development was assessed to ascertain the significance of potential impacts on the key drivers and receptors (hydrology, water quality, geomorphology, habitat, and biota) of these watercourses. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix F** for more details).

8.4.1 Results of the Watercourses Impact Assessment

Based on the layout of the proposed Hyperion hybrid generation facility, no watercourses are located within the footprint area of the Hyperion hybrid generation facility, including the footprint of the proposed thermal power dual fuel facility (**Figure 8.2**). The eastern portion of the investigation area associated with the focus area is bisected by the Vlermuisleegte River which flows in a south-eastern to north-western direction. A perched depression wetland was also identified within the eastern portion of the investigation area located within the delineated extent of the Vlermuisleegte River. The proposed access road is located directly west of the Vlermuisleegte River.

The Present Ecological State (PES) of the Vlermuisleegte River is classified as Moderately to Largely Modified (class C/D), and the perched depression is classified as Largely Natural with few modifications (class B).

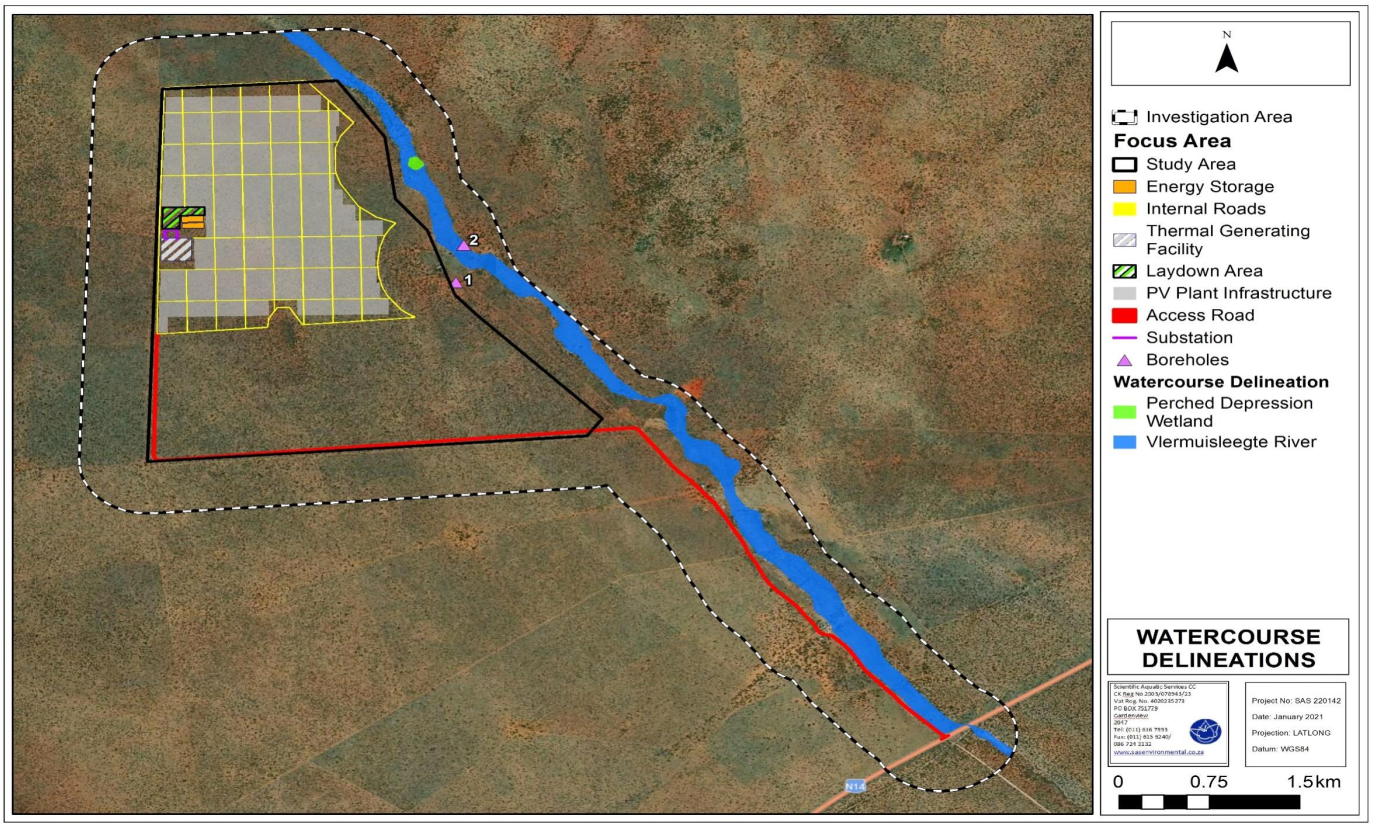


Figure 8.2: watercourses associated with the Hyperion development area

8.4.2 Description of the Impacts to Watercourses

The following impacts to watercourses are expected to occur with the development of Hyperion Thermal Plant and proposed upgraded access road:

Construction:

» Disturbance to the natural buffer zone surrounding the Vlermuisleegte River, including the vegetation and soil components. This can impact on the habitat provisioning and biodiversity of the river.
» Disturbance of the vegetation and soil associated with the Vlermuisleegte River and potentially increase the volume of sediment entering the river system.
» Potential risk of flooding of the construction footprint due to the proposed access road locality relative to the modelled 1:100 year floodline (Highlands Hydrology, 2020).
» Disturbance to the vegetation and habitat of the Vlermuisleegte River and its surrounding buffer area could lead to the proliferation of alien invasive vegetation species.
» Potential trampling by construction personnel within the Vlermuisleegte River beyond the construction footprint, impacting on the geomorphology of the river.
» Altered topography/geomorphology of the river, leading to altered runoff patterns and formation of preferential flow paths

Operation:

» Potential disturbance to the natural buffer zone surrounding the Vlermuisleegte River during maintenance activities, including disturbance to the vegetation and soil components. This can impact on the habitat provisioning and biodiversity of the river.

- Increased hardened surfaces in the vicinity of the river may potentially alter the pattern of runoff entering the river.
- Increased hardened surfaces in the vicinity of the pans may potentially alter the pattern of runoff entering the pans.
- Runoff from the road entering the river could be contaminated and could impact on the surface water quality of the river (if surface water is present).
- Runoff from the road can potentially create preferential flow paths in the river, thus causing erosion of the embankment of the river

8.4.3 Impact tables summarising the significance of impacts on watercourses related to the Thermal facility and associated access road during construction and operation (with and without mitigation)

Construction Phase Impacts

Nature: *Impacts on watercourse associated with Hyperion Thermal Plant.*
This will entail the following:.
Disturbance to the Vlermuisleegte river and its surrounding buffer area could lead to the proliferation of alien invasive vegetation species.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Short term (1)	Short term (1)
Magnitude	Minor (2)	Moderate (6)
Probability	Improbable (2)	Highly Probable (4)
Significance	**Low (10)**	**Medium (36)**
Status (positive or negative)	Neutral	Neutral
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:
Contractor laydown areas, and material storage facilities to remain outside of the Vlermuisleegte river and its 32m NEMA Zone of Regulation (ZoR).
All development footprint areas to remain as small as possible and vegetation clearing to be limited to what is essential.
Retain as much indigenous freshwater vegetation as possible.
Water imported to the construction site may not be allowed to drain into the Vlermuisleegte River or perched depression wetland, and should be managed with appropriate stormwater management systems.
Any concrete or mixing of materials as part of the construction activities should be done within a designated batching area only.
After construction of the road, the area surrounding the road must be revegetated with suitable indigenous vegetation to prevent the establishment of alien vegetation species and to prevent erosion from occurring.

Residual:
There is a residual risk that a decrease in habitat provision by the Vlermuisleegte River may occur due to vegetation not being able to re-establish within and directly surrounding the construction footprint area.

Nature: *Impacts associated with construction of proposed upgraded access road*
The upgrading (through widening and tarring) of the existing T26 gravel road to a tarred road of up to 15 m in width. This will entail the following activities and their resulting impacts on the Vlermuisleegte River

- Disturbance to the natural buffer zone surrounding the Vlermuisleegte River, including the vegetation and soil components. This can impact on the habitat provisioning and biodiversity of the river.

» Altered topography/geomorphology of the river, leading to altered runoff patterns and formation of preferential flow paths.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Short term (1)	Short term (1)
Magnitude	High (8)	Moderate (6)
Probability	Definite (5)	Highly probable (4)
Significance	**Medium (55)**	**Medium (32)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

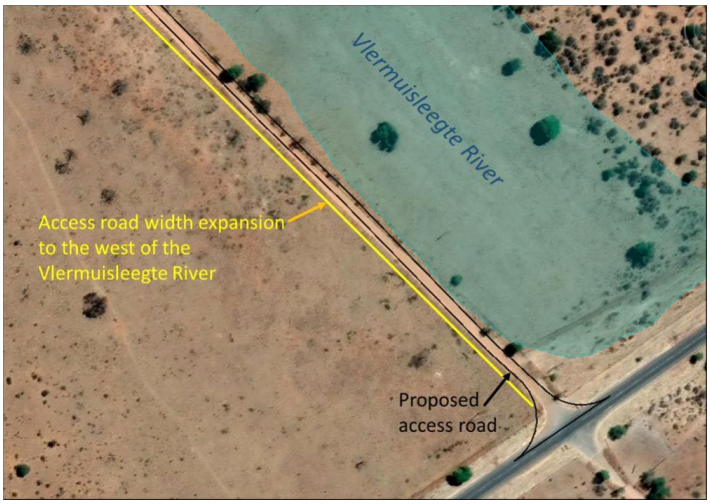
Mitigation:

All vehicle re-fuelling is to take place outside of the Vlermuisleegte river and its 32m NEMA ZoR.

All development footprint areas to remain as small as possible and vegetation clearing to be limited to what is essential.

Retain as much indigenous freshwater vegetation as possible.

It is highly recommended that the width of the road be extended to the western side of the existing road reserve rather than to the east thereof (if technically feasible). This may potentially prevent the encroachment of the road into the delineated extent of the Vlermuisleegte River.



» Construction of the road must be undertaken during low flow or no flow conditions. Although the crossing of the river is not proposed, undertaking construction during low flow periods minimises the potential for the activities to impact on the downstream reach of the river.

» Material to be used (asphalt, bitumen, sand) as part of the widening of the road must be stockpiled outside the 32 m NEMA ZoR of the river to prevent sedimentation of the river. These stockpiles may not exceed a height of 2 m and should be protected from wind using tarpaulins.

» All alien and invasive vegetation should be removed. Any vegetation removed should be taken to a registered landfill site to prevent the proliferation of alien and invasive species.

» It is highly recommended that an alien vegetation management plan be compiled during the planning phase and implemented concurrently with the commencement of construction.

Residual:

There is a residual risk that a decrease in habitat provision of the Vlermuisleegte River may occur due to vegetation not being able to re-establish within and surrounding the construction footprint area.

Operation Phase Impacts

Nature: *Impacts associated with the operation of proposed Hyperion Thermal plant.*

Operation of the proposed Thermal plant is located outside of the 100m/500m GN509 ZoR of the Vlermuisleegte and perched depression wetland. As these activities are located outside of the applicable GN509 ZoR of the watercourses in accordance with the National Water Act, 1998 (Act 36 of 1998), the proposed operational activities thereof do not pose any legislative or freshwater conservation constraints. Nevertheless, the potential of edge effects to occur on the closest watercourse (i.e. the Vlermuisleegte River) were considered as a precautionary approach:

Disturbance to the natural buffer zone surrounding the Vlermuisleegte River during maintenance activities including the vegetation and soil components. This can impact on the habitat provisioning and biodiversity of the area surrounding the river.

Increased hardened surfaces in the vicinity of the river may potentially alter the pattern of runoff entering the river.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (2)	Very Improbable (1)
Significance	**Low (18)**	**Low (9)**
Status (positive or negative)	Neutral	Neutral
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

Regular inspection of the area surrounding the surface infrastructure should occur to monitor the establishment of vegetation and prevent the establishment of alien and invasive vegetation species, and their potential spread into the river.

Stormwater runoff from the internal roads should be monitored, not to cause erosion and to be diffusely spread across the landscape.

No unauthorised or indiscriminate movement of vehicles in the Vlermuisleegte River or pan may be permitted during the visual inspection.

If repair activities to the infrastructure components are required, the mitigation measures as per that of the construction phase must be implemented.

Residual:

There is a residual risk that a decrease in habitat provision of the Vlermuisleegte River or depression wetland may occur due to vegetation not being able to re-establish within the area surrounding the development area.

Nature: *Impacts associated with the operation of proposed upgraded access road*

This will entail the following:

Runoff from the road entering the river could be contaminated and could impact on the surface water quality of the river (if surface water is present).

Runoff from the road can potentially create preferential flow paths in the river, thus causing erosion of the embankment of the river.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Minor(2)
Probability	Probable (3)	Probable (3)
Significance	**Medium (30)**	**Low (24)**
Status (positive or negative)	Negative	Negative

Reversibility	High	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: Ensure that routine inspections and monitoring of the road are implemented. Monitoring should occur biannually (or as specified by the relevant engineer), and specifically after significant rainfall events. Regular inspection for alien and invasive vegetation along the road should occur, to limit their spread into the river. Stormwater runoff from the road into the river may not form preferential surface flow paths into the river. If this does occur, the areas should be rehabilitated (erosion gullies infilled) and revegetated to aid in dispersing the flow of water from the road into the river. No unauthorised or indiscriminate movement of vehicles in the Vlermuisleegte River may be permitted during the visual inspection. If repair activities to the road are required, the mitigation measures as per that of the construction phase must be implemented.		
Residual: Constant usage of the road could potentially decrease the biodiversity (mainly faunal species) within and directly surrounding the portion of the river associated with the access road.		

8.4.4 Implications for Project Implementation

Due to the distance of the proposed Hyperion hybrid generation facility from the Vlermuisleegte River and perched depression wetland, with the implementation of the recommended mitigation measures, a low to very low impact on the watercourses is expected to occur. As this infrastructure is located outside of the applicable 32 m NEMA of the Vlermuisleegte River and perched depression wetland, the proposed construction and operational activities associated with these activities do not pose any legislative or freshwater conservation constraints.

The proposed access road was determined to pose a Medium impact significance to the Vlermuisleegte River during the construction phase, with the application of the recommended mitigation measures. Although this access road will entail the upgrading of an existing road (increasing its width and surfacing), which have already caused an impact to the Vlermuisleegte River, increasing the footprint of this access road may result in encroachment into the delineated extent of the Vlermuisleegte River which will result in further disturbance to the vegetation and geomorphological components of the river during the construction phase. It is, however, not expected that the potential impacts will have a significant impact on the downstream reach of the river considering the non-perennial nature of the river (impacts are expected to be limited in extent) and its present ecological condition. Nevertheless, it is highly recommended that the width of the road be extended to the western side of the existing road reserve rather than to the east thereof (if technically feasible). During the operational phase of the access road, if the recommended mitigation measures are implemented, the impacts significance would be Low.

8.5. Assessment of Impacts on Land Use, Soil and Agricultural Potential

The impact of Thermal plant and proposed upgraded access road on the soils, land use, land capability and agricultural potential has been assessed as low to medium (after mitigation), depending on the impact being considered. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix G** for more details).

8.5.1 Results of the Land Use, Soil and Agricultural Potential Study

The land capability of the areas located within the project site can be classified as low-very low and low-moderate. Considering the soil forms present within the development area as well as the good grazing quality of the veld, the development area can be classified as having a low-moderate land capability (Class 7).

Overall, the project site has low sensitivity to the proposed development. The deep red and yellow-brown apedal soil profiles have no physical limitations to crop production but land capability of the area is severely impeded by the dry, semi-arid climate. Although the site is suitable for livestock production, the grazing capacity is also limited by the low rainfall of the area.

From a soil quality conservation perspective, the area is considered to have Medium Sensitivity to the proposed development. The sandy texture of the soil indicates that soil will be sensitive to soil erosion in the absence of vegetation cover and the low buffering capacity and high water infiltration rate of these soils increase the risk of soil contamination spread, should it occur.

8.5.2 Description of Land Use, Soil and Agricultural Potential Impacts

The following impacts on soils have been identified and assessed for the construction phase:

- Soil erosion is possible due to vegetation clearance. This will result in exposed soil surfaces that will be prone to erosion. Both wind and water erosion are a risk and even though the project area is in the arid climate, the intensity of single rainstorm may result in soil particles being transported away.
- Soil chemical pollution due to the storage of hazardous chemicals, temporary sanitary facilities and potential oil and fuel spillages from vehicles. This impact will be localised within the site boundary.
- In areas of permanent changes such as roads and the erection of infrastructure and topsoil stockpiles, the current land capability and land use will be lost permanently. This impact will however be localised within the site boundary.

All infrastructure and activities required for the operational phase will be established during the construction phase. Once construction has ceased, a number of impacts remain during the operational phase. During the operation phase the impacts related to loss of land use and land capability will stay the same. Areas under permanent infrastructure and other covered surfaces are no longer susceptible to erosion, but hard surfaces will increase run-off during rain storms onto bare soil surfaces.

Soil chemical pollution during the operation phase will be minimal. Possible sources are oil that needs to be replaced and oil and fuel spillage from maintenance vehicles. This impact will be localised within the project site boundary.

The areas where vegetation was cleared will remain at risk of soil erosion, especially during a rainfall event when runoff from the cleared surfaces will increase the risk of soil erosion in the areas directly surrounding the Hyperion thermal plant and access road.

8.5.3 Impact tables summarising the significance of impacts on Land Use, Soil and Agricultural Potential during construction and operation (with and without mitigation)

Construction Phase

Nature: *Increased risk of soil erosion due to construction of the Thermal Plant and access road*

All areas where vegetation is removed from the soil surface in preparation for the infrastructure construction, will result in exposed soil surfaces that will be prone to erosion. Both wind and water erosion are a risk and even though the project area is in the arid climate, the intensity of single rainstorm may result in soil particles being transported away.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (30)**	**Low (8)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	

Mitigation:

Land clearance must only be undertaken immediately prior to construction activities.

Unnecessary land clearance must be avoided.

Level any remaining soil removed from excavation pits that remained on the surface instead of allowing small stockpiles of soil to remain on the surface.

Where possible, conduct the construction activities outside of the rainy season.

Residual:

The residual impact from the construction and operation of Hyperion Thermal plant and access road on the susceptibility to erosion will be negligible.

Nature: *Soil compaction*

The clearing and levelling of land for both the thermal plant infrastructure as well as the access road, will result in soil compaction. In the area where the access road will be constructed, topsoil will be removed and the remaining soil material will be deliberately compacted to ensure a stable road surface.

	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	Medium (30)	Low (16)
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	N/A

Mitigation:

- Vehicles and equipment must travel within demarcated areas and not outside of the construction footprint.
- Unnecessary land clearance must be avoided.
- Where possible, conduct the construction activities outside of the rainy season.
- Vehicles and equipment must park in designated parking areas.

Residual Impacts:

The residual impact from the construction and operation of the proposed Hyperion Thermal Dual Fuel Facility on soil compaction is considered low.

Nature: Soil pollution

The following construction activities can result in the chemical pollution of the soil:

1. Petroleum hydrocarbon (present in oil and diesel) spills by machinery and vehicles during earthworks and the removal of vegetation as part of site preparation.
2. Spills from vehicles transporting workers, equipment, and construction material to and from the construction site.
3. The accidental spills from temporary chemical toilets used by construction workers.
4. The generation of domestic waste by construction workers.
5. Spills from fuel storage tanks during construction.
6. Pollution from concrete mixing.
7. Pollution from road-building materials.
8. Any construction material remaining within the construction area once construction is completed.
9. Containment breaches related to the battery units and any inadvertent chemical exposure therefrom.

	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Low (4)	Improbable (2)
Significance	Medium (36)	Low (14)
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	N/A

Mitigation:

» Maintenance must be undertaken regularly on all vehicles and construction/maintenance machinery to prevent hydrocarbon spills.
» Any waste generated during construction, must be stored into designated containers and removed from the site by the construction teams.
» Any left-over construction materials must be removed from site.

Residual Impacts:
The residual impact from the construction and operation of the proposed project will be low to negligible.

Operational Phase

Nature: Soil erosion
The areas where vegetation was cleared, will remain at risk of soil erosion, especially during a rainfall event when runoff from the cleared surfaces will increase the risk of soil erosion in the areas directly surrounding the Hyperion thermal plant and access road.

	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	Medium (30)	Low (16)
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	N/A

Mitigation:

» The area around the Hyperion thermal plant as well as the access road must regularly be monitored to detect early signs of soil erosion on-set.

» If soil erosion is detected, the area must be stabilised by the use of geo-textiles and facilitated re-vegetation.
Residual Impacts: The residual impact from the operation of the proposed Hyperion Thermal Dual Fuel Facility on the susceptibility to erosion is considered low.

Nature: Soil pollution

During the operational phase, potential spills and leaks from maintenance vehicles and equipment as well as waste generation on site, can result in soil pollution. In addition, any failure of the fuel storage containers or equipment can be a source of soil pollution.

	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Low (4)	Improbable (2)
Significance	Medium (36)	Low (14)
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	N/A

Mitigation:

» Maintenance must be undertaken regularly on all vehicles and maintenance machinery to prevent hydrocarbon spills;
» No domestic and other waste must be left at the site and must be transported with the maintenance vehicles to an authorised waste dumping area.

Residual Impacts:
The residual impact from the operation of the proposed project will be low to negligible.

8.5.4 Implications for Project Implementation

It is anticipated that the construction and operation of the Hyperion Thermal Dual Fuel Facility will have impacts on soils that range from medium to low. Through the consistent implementation of the recommendation mitigation measures, most of impacts can all be reduced to low.

The thermal plant infrastructure components will be placed in close proximity to each other, and all reasonable measures have been taken to avoid or minimize fragmentation and disturbance of agricultural activities, provided that the mitigation measures provided in this report are implemented.

It is the opinion of the specialist that this application be considered favourably, provided that the mitigation measures are followed to prevent soil erosion and soil pollution and to minimise impacts on the veld quality of the farm portions that will be affected. The project infrastructure should also remain within the proposed footprint boundaries that will be fenced off and the construction corridor around the access road must be as narrow as possible.

8.6. Assessment of Visual Impacts

Impacts on visual receptors will occur during the undertaking of construction activities and the operation of Thermal plant and associated infrastructure. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix J**).

8.6.1 Results of the Visual Impact Assessment

Based on the location of the engine halls and the stacks, key receptors are likely to include travellers on the N14, the R380, Kathu Airport, other minor local roads as well as inhabitants of local homesteads.

It is likely that the elements associated with the adjacent four Solar PV projects (i.e. Hyperion PV 1, 2, 3 and 4) will be visible over similar sections of the road as the engine halls and lower sections of the proposed project. However the introduction of 27m high stacks is likely to extend the visual influence of power generating projects in the area. Visual implications of the proposed project for identified receptors are likely to include:

» Views from roads:
The project is likely to be visible from the N14. The proposed project is located approximately 7.3km from the road.

The Zone of Theoretical Visibility (ZTV) analysis indicates that the engine halls could potentially be visible intermittently over approximately 10km of the road. The intermittent nature of views indicated on the analysis is due solely to landform. This is likely to be increased by existing vegetation close to the road which will also help to screen views of the structures.

The ZTV analysis indicates that the engine halls could potentially be visible over approximately 21km of the road. The analysis also indicates that due to landform there will be minor breaks in views. These breaks are also likely to be is likely to be increased by existing vegetation close to the road which will also help to screen views of the structures. Due to their height however, the views of the stacks are likely to be more continuous than the engine halls.

The authorised solar PV projects are likely to break the view of lower elements from the road. The project may also be visible to the R380 which at its closest is approximately 6.3km to the west of the proposed project. As with views from the N14, it will be viewed over flat topography and through natural vegetation.

The ZTV analysis indicates that intermittent views of the engine halls from this road may be possible over approximately 7km of the road and at a distance in excess of 8km. Given the topography, screening provided by vegetation and the distance, that whilst clear views may be possible over sections of the road it is likely that the extent of the road over which these views are possible will be significantly reduced.

The ZTV analysis indicates that intermittent views of the stacks from this road may be possible over approximately 26km of the road and at a distances between 6.3km and 18km. The assessment indicates that unbroken views of the stacks may be possible over much of this length of road. However, due to the nature of existing vegetation and its proximity to the road, there are likely to be sections over which views of the stacks are screened. Vegetation will also partially break views over much of the road length.

At the distances involved, low structures and infrastructure within the plant are unlikely to be visually obvious, although may possibly be seen through existing vegetation. The access road is only likely to be obvious from these roads in the vicinity of its junction with local roads.

» Views from homesteads:

There are twelve groups of buildings within the Approximate Limit of Visibility of the engine halls and twenty within the Approximate Limit of Visibility of which the stacks of which six fall within the ZTV of the engine halls and eighteen fall within the ZTV of the stacks.

The closest homestead is approximately 1.9km to the east of the development. From discussion with the Environmental Assessment Practitioner, this homestead is inhabited by the landowner who is in agreement with the project proceeding.

There is a homestead located approximately 3km to the north of the proposed plant. From Google Earth, the main house is orientated east to west with relatively dense trees on its southern side. It is therefore unlikely that it is therefore likely that the proposed project will be largely screened from the house. Views of the project may be possible from the surrounding area; however, it is also likely that existing vegetation will at least partly screen the development.

There is also a group of buildings approximately 4.5km to the southeast of the proposed plant. It includes a single homestead with other farm buildings. These buildings are also surrounded by trees which are likely to provide a degree of screening. Any visual impact is likely to be part mitigated by distance as well as screening that is provided by existing natural vegetation.

The remaining groups of buildings are in excess of 6km from the proposed plant. It is possible that glimpses of the development may be possible from these, however, distance and intervening natural vegetation are likely to largely screen views of engine houses and lower structures. It is possible that the stacks will be visible from some of these however.

The access road has the potential to impact visually on three homesteads that are immediately adjacent to the alignment. It is possible that owners of the homesteads could favour this as it is likely to result in an upgraded access road that they might use. It will also mean that there will be an increased volume of traffic visible to the homesteads. This however is likely to be largely during the construction phase.

» Kathu Airport:

Kathu Airport is located approximately 11.5km from the proposed plant. Largely due to distance and vegetation, it is highly unlikely that the proposed engine houses and lower elements will be visible from the airport.

The analysis also indicates that the stacks are likely to be visible from the airport. Given the extent of open landscape within and around the airport, it is unlikely that they will be screened to any significant extent.

There is one solar power facility that is significantly closer that is also visible from the airport. The stacks are likely to be visible in the vicinity and behind this project.

It is likely that the proposed plant will be visible from planes on approach and exit from the airport.

» Lighting Impacts:
High mast security and operational lighting is proposed that could make the project visible to receptors at night.

This will be seen in the context of other projects as well as lighting associated with mining and settlement.

Currently the lighting in the immediate vicinity of the project is largely associated with homesteads and is relatively low level.

The existing security and operational lighting associated with the solar project that is visible from Kathu Airport (Kalahari Solar Power Project) is visible at night. It should be noted that from observations made on site, only lighting associated with the turbine house of this development is visible. It is likely that the high mast lighting associated with the proposed plant could also be visible in the same area as this existing lighting.

8.6.2 Visual Assessment

Visual impacts will occur during the construction and operation phases of Thermal Plant and proposed upgraded access road. The following impacts are assessed in detail in section 8.6.3:

» The proposed development could impact on the general rural landscape character of the area;
» The proposed development could impact on views from roads including the N14, the R308 and local roads;
» The proposed development could impact on views from local homesteads; and
» Lighting potentially creating light pollution and making the project obvious within a relatively dark night time landscape.

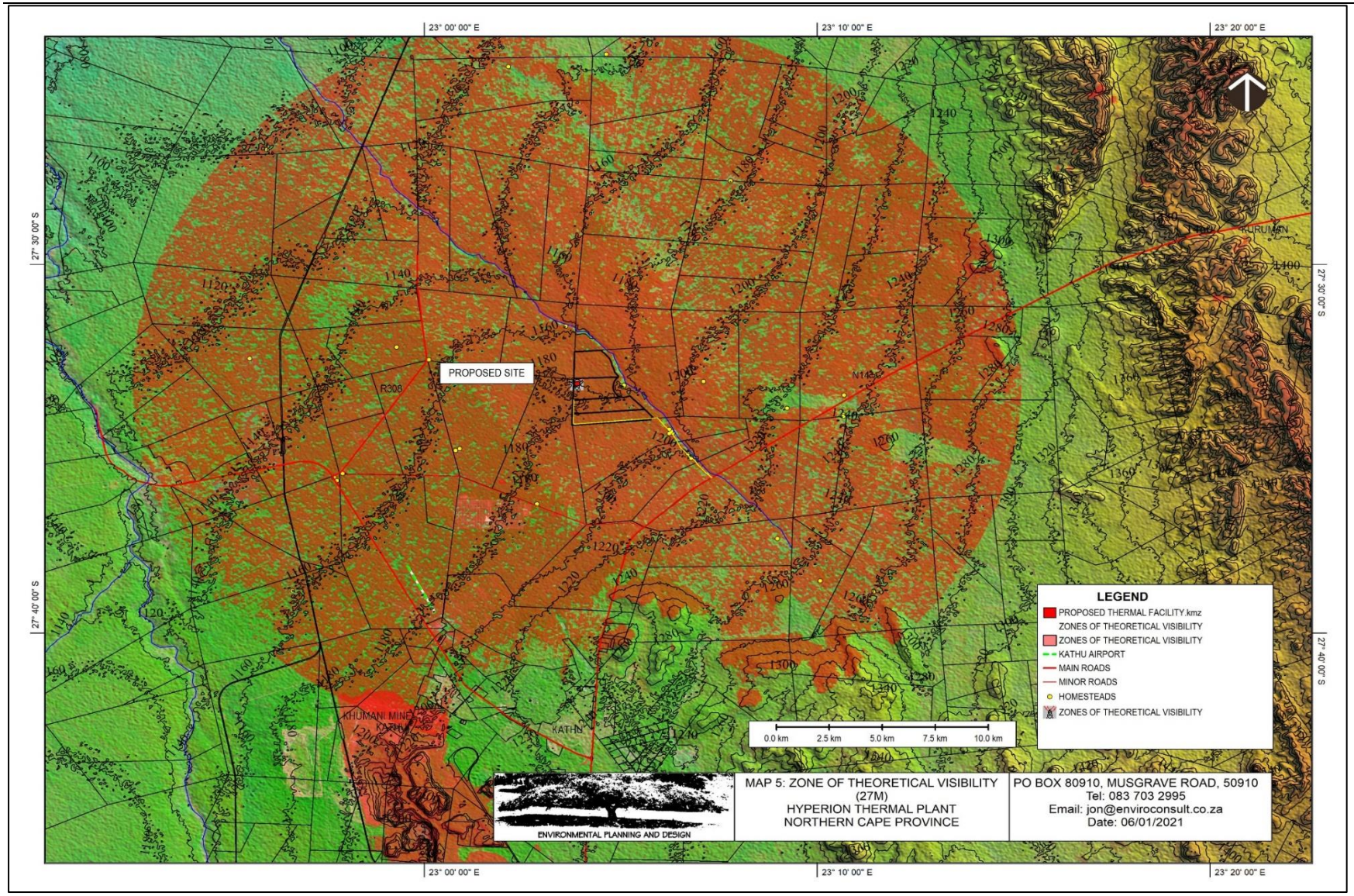


Figure 8.6: A map illustrating the zone of theoretical visibility (ZTV) and the typical views towards Thermal plant and associated infrastructure.

8.6.3 Impact table summarising the significance of visual impacts during construction and operation (with and without mitigation)

Nature: Impact on General Landscape Character
Loss of natural vegetation and industrialisation of the landscape caused by the proposed project. The issue relates to the further degradation / industrialisation of the general rural landscape character.

The development area is located within an area that is perceived as being a semi-natural rural landscape. However, the review indicates that glimpses of the lower sections of the project and broader views of the higher stacks will be obvious, the perception of a semi-natural landscape is likely to remain.

The proposed development is not likely to significantly change this perception.

	Without mitigation	With mitigation
Extent	Region (3)	Site and immediate surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Small (0)
Probability	Probable (3)	Improbable (2)
Significance	**Low (27)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	The proposed development can be dismantled and removed at the end of the operational phase. There will therefore be no irreplaceable loss. However, given the likely long term nature of the project, it is possible that a proportion of stakeholders will view the loss of view as irreplaceable.	No irreplaceable loss
Can impacts be mitigated?	Yes.	

Mitigation:
Planning:
- Plan development levels to minimise earthworks to ensure that levels are not elevated.
- Plan to maintain the height of structures as low as possible.
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.
- Retain and augment natural vegetation on all sides of the proposed project.

Operation:
- Reinstate any areas of vegetation that have been disturbed during construction.
- Remove all temporary works.
- Monitor rehabilitated areas post-construction and implement remedial actions.
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.
- Maintain and augment natural vegetation around the proposed project.

Decommissioning:
- Remove infrastructure not required for the post-decommissioning use of the site;
- Rehabilitate and monitor areas post-decommissioning and implement remedial actions.

Residual Impacts:
The residual risk relates to the failure to remove infrastructure and loss of natural vegetation cover being obvious on decommissioning of the proposed project. It is therefore critical that infrastructure is removed and effective rehabilitation is undertaken

Nature: Impact on views from roads including the N14, the R308 and local roads

The issue relates to the industrialisation of the rural landscape due to views of the project from roads. Possible receptors 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. The affected sections of all roads are in excess of 6km from the proposed plant. Due to the flat topography, the distance involved and the natural vegetation which is likely to provide a degree of screening particularly to the engine houses and lower infrastructure. The proposed stacks however are likely to be visible over long sections of the roads.

It is therefore likely that the stacks will be the elements that will largely affect views from these roads.

	Without mitigation	With mitigation
Extent	Region (2)	Region (3)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	The proposed development can be dismantled and removed at the end of the operational phase. There will therefore be no irreplaceable loss. However, given the likely long term nature of the project, it is possible that a proportion of stakeholders will view the loss of view as irreplaceable.	No irreplaceable loss
Can impacts be mitigated?	Yes.	

Mitigation:

» It is the proposed stacks that are likely to have the largest influence on change of view from roads. It is not possible to mitigate views of these elements.

Residual Impacts:

The residual risk relates to loss of natural vegetation cover being obvious on decommissioning of the proposed project. It is therefore critical that effective rehabilitation is undertaken. It is therefore critical that infrastructure is removed and effective rehabilitation is undertaken.

Nature: Impact on views from local homesteads

The issue relates to the industrialisation of the rural landscape due to views of the project from homesteads.

There is potential for a total of 20 homesteads to be affected. There is one homestead located approximately 1.9km from the proposed development. However this is inhabited by the affected landowner and his family. It has been confirmed that he is in agreement with the proposed development.

There is a homestead approximately 3km to the north of the proposed plant. It is unlikely that the development will be highly obvious from the house due to existing trees around the building and its orientation. Views of the plant may be possible from the surrounding area. However, it is likely that existing vegetation will at least part screen the development.

There is also a group of buildings approximately 4.5km to the southeast of the proposed plant. The buildings are also surrounded by trees which are likely to provide a degree of screening. Any visual impact is also likely to be part mitigated by distance as well as screening that is likely to be provided by existing natural vegetation.

The remaining affected buildings are in excess of 6km from the proposed plant. It is possible that glimpses of the development may be possible from these; however, distance and intervening natural vegetation is likely to largely screen views of the engine houses and lower sections of infrastructure. It is likely however that views of the higher stacks will be obvious from a number of homesteads.

The majority of affected homesteads are therefore likely to be at a distance in excess of 6km. The sight of stacks above existing vegetation will only affect a limited section of views and it will not change the perception that homesteads are largely surrounded by natural landscape.

If vegetation loss results from implementation, it is possible that new views could be opened up for the closest homesteads.

	Without mitigation	With mitigation
Extent	Region (3)	Region (3)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor to low (1)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (30)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	The proposed development can be dismantled and removed at the end of the operational phase. There will therefore be no irreplaceable loss. However, given the likely long term nature of the project, it is possible that a proportion of stakeholders will view the loss of view as irreplaceable.	No irreplaceable loss
Can impacts be mitigated?	Yes.	

Mitigation:

Planning:

- Plan development levels to minimise earthworks to ensure that levels are not elevated.
- Plan to maintain the height of structures as low as possible.
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.
- Retain and augment natural vegetation on all sides of the proposed project.

Operation:

- Reinstate any areas of vegetation that have been disturbed during construction.
- Remove all temporary works.
- Monitor rehabilitated areas post-construction and implement remedial actions.
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.
- Maintain and augment natural vegetation around the proposed project.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site.
- Rehabilitate and monitor areas post-decommissioning and implement remedial actions.

Residual Impacts:

The residual risk relates to loss of natural vegetation cover being obvious on decommissioning of the proposed project. It is therefore critical that effective rehabilitation is undertaken.

Nature: Impact on views from Kathu Airport

The issue relates to the industrialisation of the rural landscape due to views of the project.

Kathu Airport is located approximately 11.5km from the proposed plant. Largely due to distance and vegetation, it is highly unlikely that the proposed engine houses and lower elements will be visible from the airport.

The analysis also indicates that the stacks are likely to be visible from the airport. Given the extent of open landscape within and around the airport, It is unlikely that they will be screened to any significant extent.

There is one solar power facility that is significantly closer that is also visible from the airport. The stacks are likely to be visible in the vicinity and behind this project. The proposed project is unlikely therefore to increase the extent of the view that will be affected by industrial development.

It is also likely that the proposed plant will be visible from planes on approach and exit from the airport

	Without mitigation	With mitigation
Extent	Region (2)	Region (3)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No irreplaceable loss	No irreplaceable loss
Can impacts be mitigated?	Yes.	

Mitigation:

It is the proposed stacks that are likely to have the largest influence on change of landscape character. It is not possible to mitigate views of these elements.

Residual Impacts:

The residual risk relates to failure to remove infrastructure

Nature: Light pollution and making the project obvious within a relatively dark night time landscape

High mast security and operational lighting is proposed that could make the project visible to receptors. It is likely that this will be seen in the vicinity of lighting associated with an existing solar power project (Kalahari Solar Power).
There is potential therefore for the project to increase the influence of lighting into an area that would otherwise be relatively dark at night.

	Without mitigation	With mitigation
Extent	Site and immediate surroundings (2)	Site (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Small to Minor (1)
Probability	Definite (5)	Improbable (2)
Significance	**Medium (50)**	**Low (12)**
Status (positive or negative)	The appearance of a large lit area may be accepted by most people because it is so close to the N14, major mining operations as well as Kathu, all of which are well lit. It is likely however that some people will see the expansion of lighting as	If the lights are generally not visible then the occasional light is unlikely to be seen as negative. Neutral

	a negative impact.	
Reversibility	High	High
Irreplaceable loss of resources?	It would be possible to change the lighting / camera system so the impact cannot be seen as an irreplaceable loss.	No irreplaceable loss
Can impacts be mitigated?	Yes.	
Mitigation: » Use low key lighting around buildings and operational areas that is triggered only when people are present. » Plan to utilise infra-red security systems or motion sensor triggered security lighting; » Ensure that lighting is focused on the development with no light spillage outside the site; and » Keep lighting low, no tall mast lighting should be used.		
Residual Impacts: No residual risk has been identified.		

8.6.4 Implications for Project Implementation

It is possible that the engine halls and lower sections of the development could be slightly 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 large degree of screening. There is therefore only likely to be a low level of impact associated with these elements on the identified roads.

Taller elements including the stacks are likely to be more obvious and will be viewed largely as isolated elements standing above natural vegetation from numerous sections of the identified roads. Whilst these elements are likely to be relatively obvious from a wide area, existing vegetation will play a role in softening and in on some sections of road, completely screening views.

It is unlikely that the development will be highly obvious from the house due to existing trees around the building and its orientation. Views of the plant may be possible from the surrounding area. However, it is likely that existing vegetation will at least part screen the development.

Overall, identified visual impacts are all assessed as low. Appropriate mitigation measures can also reduce anticipated impacts further. There is no reason from a landscape and visual impact perspective why the proposed development should not proceed.

8.7. Assessment of Impacts on Heritage Resources

Impacts on heritage resources may occur due to loss of archaeological and palaeontological resources during construction activities of the Thermal plant and undegraded access road. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix H**).

8.7.1 Results of the Heritage Impact Assessment (including archaeology and palaeontology)

A trigonometrical survey beacon lies within the generator site. It is built on a base of unknown age but the beacon is marked on the 1972 topographic map of the area. The beacon and its base have no heritage value. However, two houses greater than 60 years of age do occur alongside the section of the existing access road that is to be upgraded. Both are mid-20th century structures of low heritage significance and

neither will be affected by the project other than that their rural context will be slightly reduced through tarring of the access road.

Palaeontology:

According to the SAHRIS palaeosensitivity map, the proposed thermal power plant and access route overlie outcrop areas of only low to moderate sensitivity for palaeontological heritage resources. No fossils are recorded from the volcanic Ongeluk Formation, although the middle and upper parts of the lava succession was probably extruded subaqueously. The main palaeontological heritage concern in the present study region 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 c. 5.5. km NW of Kathu town (Beaumont 1990, Beaumont 2004, Beaumont et al. 1984) (See also Almond 2013a, 2013b). However, no major drainage lines will be traversed by the proposed access road.

Archaeology:

During a 2018 survey for the PV facilities the generator site was visited. This revealed a small exposure of gravel with occasional artefacts that was present at the base of the trigonometric beacon that occurs there (**Figure 8.2**). The north-western part of the road was not specifically covered but it is envisaged that very little or, more likely, no archaeology would have been seen on the sandy surface as was the case throughout the majority of the Hyperion PV Cluster area (Orton 2019a, b, c, d). The northwest to southeast trending section of the access road that currently exists but will require upgrading and widening revealed archaeological materials in several areas that were examined. In some cases, the material was clearly in a secondary context in gravel that had been imported and spread over the sand to create the road surface. In other cases, however, it was evident that the natural gravel was higher and had been intersected by the road building. It is quite possible that gravel from these areas was in fact moved to the sandy areas when the road was built. Importantly, however, all spots examined revealed artefacts in association with the gravel which offers further evidence for their presence all along the margins of the Vlermuisleegte.

Graves:

Several graves were identified within the project site. This included as informal farm workers' graveyard and five 'stone-packed' graves present of which only one had a 'headstone' which was made from a piece of corrugated iron. A sheet of flat metal dated 1973 was found in the grass and had once been part of one of the graves. This was the only date associated with the five graves. A single formal grave was identified adjacent to the Vlermuisleegte River. Its headstone indicated the date of death as being 8 October 1928. To the east of the Vlermuisleegte River, a collection of stone was located in a sandy area on the upper part of the bank. No other stone were present in the vicinity and the collection is clearly anthropogenic. No graves protected under the NHRA are known from the project site.

Cultural landscape and scenic routes

Overall, the cultural landscape is strongly dominated by modern landscape uses (energy developments, mining) which are of no heritage concern. Because of this, none of the roads in the area can be considered significant scenic routes. The N14 does increase in scenic value towards the northeast as it approaches the Kuruman Hills, although it is noted that renewable energy facilities have also been proposed in that area.

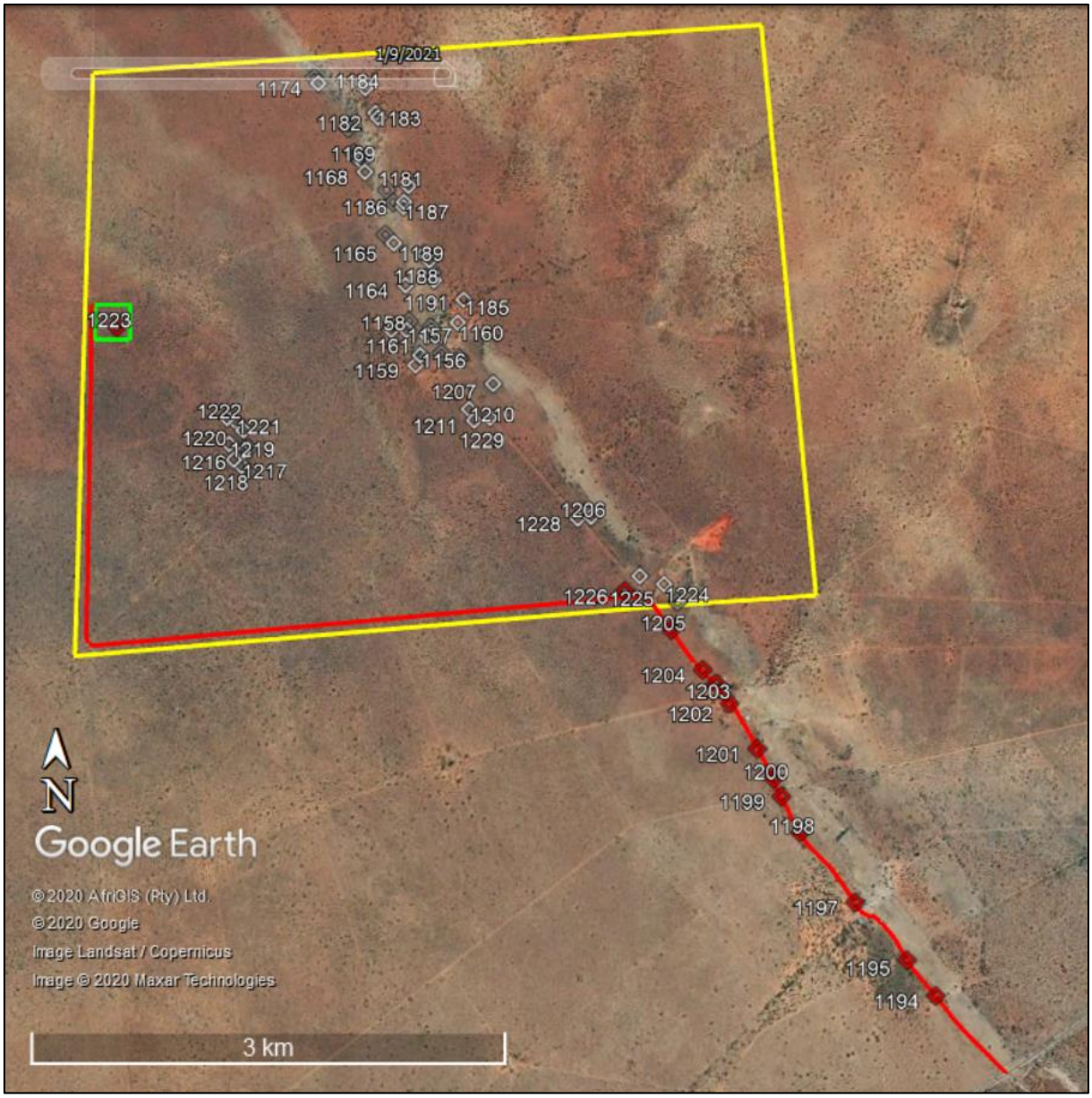


Figure 8.2: Heritage resources within the vicinity of the proposed thermal plant and upgraded access road

8.7.2 Description of the Heritage Impacts

The cultural landscape has been shown to be of little to no significance and therefore does not require further assessment. The historical buildings are of little heritage concern and the potential contextual impacts to them are negligible. These aspects are thus not assessed further and require no mitigation or management measures. The only heritage issues that have been identified as potential concerns for the proposed generator and access road development are palaeontology, archaeology and graves.

Potential impacts to archaeological resources would occur during the construction phase only and would be in the form of direct impacts.

8.7.3 Impact tables summarising the significance of impacts on heritage related to the Thermal plant and upgraded access road during construction and operation (with and without mitigation)

Nature: Impacts on archaeological resources due to the construction of Thermal plant and upgraded access road Direct destruction of archaeological materials during construction activities.		
	Without mitigation	With mitigation
Extent	Regional (3)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Moderate (6)	Minor (2)
Probability	Definite (5)	Improbable (2)
Significance	70 (High)	16 (Low)
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: Test excavations and sampling of artefacts and also protection and reporting of chance finds for further actions as needed. Geotechnical investigations can inform on where gravel is likely to be intersected during development and mitigation work should focus on such areas.		
Residual Impacts: It is not possible to locate every single stone artefact and there is a possibility that artefacts may be lost during the development process. Of concern would be the loss of denser patches of archaeology but this cannot yet be determined because the vast majority of material lies deeply buried. Successful sampling of the archaeology on site would greatly reduce the residual impacts.		

Nature: :Impact to paleontological resources Direct destruction, damage or disturbance of fossils during excavation of pylon foundations and surface clearance for access road		
	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Minor (2)
Probability	Improbable (2)	Very improbable (1)
Significance	Low (20)	Low (8)
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Unlikely	Unlikely
Can impacts be mitigated?	Yes	
Mitigation: EO, site foreman or other responsible person to monitor excavations for pylon foundations and clearance for access road for fossils and also explain to workers the need to protect and report any fossils uncovered during development. If fossils are found they must be protected *in situ*, the Chance Fossil Finds Procedure must be implemented and the finds must be reported to a qualified palaeontologist or SAHRA for evaluation. If the Chance Fossil Finds Procedure is implemented properly then this evaluation can often occur remotely.		
Residual Impacts: Unavoidable but likely to be low. It is impossible to locate every fossil and, if present, some, especially smaller ones, will always be missed and lost during excavation.		

Nature: Impacts on graves Direct destruction of graves during construction activities.		
	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Moderate (6)	Minor (2)
Probability	Very improbable (1)	Very improbable (1)
Significance	Low (12)	Low (8)
Status (positive or negative)	Negative	Negative
Reversibility	Low	Irreversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes.	
Mitigation: *In situ* protection and reporting of any graves discovered during construction work so that they can be recorded and removed to safety.		
Residual Impacts: There may still be graves that are never identified and preserved or rescued. However, for preserved or rescued graves there would be almost zero residual impact.		

8.7.4 Implications for Project Implementation

The main issue for this project will be the potential to intersect archaeological resources during excavations for both the generator and the road. However, with appropriate mitigation, the impacts can be easily managed. No further specialist palaeontological studies or mitigation are recommended. From an archaeological perspective, the following recommendations should be included in the authorisation conditions or EMPr as appropriate:

- An archaeologist should be appointed to conduct test excavations and sampling of the archaeology in areas where in situ gravel may be intersected by foundations, trenches and the access road. If geotechnical work is done in time, the results of such work could inform the archaeological fieldwork. This work should aim primarily to understand the distribution of archaeology on the landscape through sampling many small areas, although if any dense archaeology is encountered it may be necessary to expand excavations; and
- If any fossils, archaeological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist or palaeontologist. Such heritage is the property of the State and may require excavation and curation in an approved institution.

As negative impacts can be readily managed and a positive impact to archaeology is likely with mitigation, it is the opinion of the heritage specialist that the development should be authorised in full using the layouts indicated in this report.

8.8. Assessment of Social Impacts

Impacts on the social environment are expected during both the construction and operation phases. Potential social impacts and the relative significance of the impacts associated with the development of Thermal plant and upgraded access road are summarised below (refer to **Appendix K**).

8.8.1 Results of the Social Impact Assessment

The findings of the assessment 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 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 findings of the assessment also indicate that the potential negative impacts associated with both the construction and operational phase are likely to be Low Negative with mitigation.

8.8.2 Description of Social Impacts

The following positive and negative impacts have been identified and assessed for Thermal plant and upgraded access road:

Positive social impacts associated with the construction phase:
» Direct and indirect employment opportunities and skills development

Negative social impacts associated with the construction phase:
» 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, dust and safety, associated with construction related activities and vehicles;
» Impact on productive farmland.

Positive social impacts associated with the operation phase:
» The establishment of infrastructure to improve energy security and support the renewable sector.
» Direct and indirect employment opportunities and skills development
» Socio-economic stimulation

Negative social impacts associated with the operation:
» Noise impacts associated with the operation of the plant;
» Visual impacts and associated impact on sense of place.

8.8.3 Impact tables summarising the significance of social impacts during construction and operation (with and without mitigation measures)

Construction Phase Impacts

Nature: *Direct and indirect employment opportunities and skills development* The project will lead to the creation of both direct and indirect job which will have a positive economic benefit within

the region. In this regard there are approximately 350 direct jobs associated with the construction phase of the project. Approximately 75% of the jobs will benefit low-skilled workers, 25% semi-skilled and 5% high skilled. Members from the local communities in the area, specifically Kathu and Debeng, would be in a position to qualify for most of the low skilled and semi-skilled employment opportunities. Most of these employment opportunities will accrue to Historically Disadvantaged (HD) members of the community. Based on information provided by the proponent the total wage bill will be in the region of R 31 million (2020 Rand values). A percentage of the wage bill will be spent in the local economy which will also create opportunities for local businesses in Kathu surroundings.

	Without enhancement	**With enhancement**
Extent	Local – Regional (2)	Local – Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (40)**	**Medium (44)**
Status (positive or negative)	Positive	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	N/A	N/A
Can impacts be mitigated?	Yes	

Enhancement:

» Wherever feasible, local residents should be recruited to fill semi- and unskilled jobs.
» Women should be given equal employment opportunities and encouraged to apply for positions.
» A skills transfer plan should be put in place at an early stage and workers should be given the opportunity to develop skills which they can use to secure jobs elsewhere post-construction.
» A procurement policy promoting the use of local business should, where possible, be put in place and applied throughout the construction phase.
» As far as possible local contractors that are compliant with Broad-Based Black Economic Empowerment (B-BBEE) criteria should be used.

Residual Impacts:

» Improved pool of skills and experience in the local area.

Nature: *Potential impacts on family structures and social networks associated with the presence of construction workers*

Workers will be accommodated in Kathu where a high number of contractors associated with the mining operations are also accommodated. The potential impact on the local community will therefore be negligible.

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

	Without Mitigation	With Mitigation
Extent	Local (2)	Local (1)
Duration	Short term for community as a whole (2)	Short term for community as a whole (2)
Magnitude	Moderate for the community as a whole (6)	Low for community as a whole (4)
Probability	Probable (3)	Probable (3)
Significance	Medium (30)	Low (21)
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS.	

	Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	

Mitigation:

- Where possible, the proponent should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically for semi and low-skilled job categories.
- The proponent should consider the option of establishing a Monitoring Forum (MF) in order to monitor the construction phase and the implementation of the recommended mitigation measures. The MF should be established before the construction phase commences, and should include key stakeholders, including representatives from GLM, farmers and the contractor(s). The MF should also be briefed on the potential risks to the local community associated with construction workers.
- The proponent and the contractor(s) should, in consultation with representatives from the MF, develop a code of conduct for the construction phase. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be dismissed. All dismissals must comply with the South African labour legislation.
- The proponent and the contractor should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase.
- The construction area should be fenced off before construction commences and no workers should be permitted to leave the fenced off area.
- The contractor should provide transport for workers to and from the site on a daily basis. This will enable the contactor to effectively manage and monitor the movement of construction workers on and off the site.
- The contractor must ensure that all construction workers from outside the area are transported back to their place of residence within 2 days of their contract coming to an end.
- It is recommended that no construction workers, except for security personnel, should be permitted to stay over-night on the site. However, as indicated above, due to the location of the site, on-site accommodation for workers may need to be provided.

Residual impacts:

Impacts on family and community relations that may, in some cases, persist for a long period of time. Also in cases where unplanned / unwanted pregnancies occur or members of the community are infected by an STD, specifically HIV and or AIDS, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community

Nature: *Potential impact due to the influx of job seekers*

The main areas of concern associated with the influx of job seekers include:

- Impacts on existing social networks and community structures;
- Competition for housing, specifically low-cost housing;
- Competition for scarce jobs;
- Increase in incidences of crime.

	Without Mitigation	With Mitigation
Extent	Local (2)	Local (1)
Duration	Permanent (5) (For job seekers that stay on the town)	Permanent (5) (For job seekers that stay on the town)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	Low (27)	Low (24)

Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	

Mitigation:

» The proponent, in consultation with the local municipality, should investigate the option of establishing a monitoring forum to monitor and identify potential problems that may arise due to the influx of job seekers to the area. The MF should also include the other proponents of solar energy projects in the area.
» The proponent should implement a "locals first" policy, specifically with regard to unskilled and low skilled opportunities.
» The proponent should implement a policy that no employment will be available at the gate.

Residual impacts:

Impacts on family and community relations that may, in some cases, persist for a long period of time. Also in cases where unplanned / unwanted pregnancies occur or members of the community are infected by an STD, specifically HIV and or AIDS, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community.

Nature: 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

	Without Mitigation	With Mitigation
Extent	Local (3)	Local (2)
Duration	Short term (2)	Short term (2)
Magnitude	Medium (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Medium (33)	Low (24)
Status	Negative	Negative
Reversibility	Yes, compensation paid for stock losses and damage to farm infrastructure etc.	Yes, compensation paid for stock losses and damage to farm infrastructure etc.
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	Yes

Mitigation:

» The proponent should enter into an agreement with local farmers in the area whereby damages to farm property etc. during the construction phase will be compensated for. The agreement should be signed before the construction phase commences.
» Traffic movement and construction related activities should be contained within clearly designated areas.
» Strict traffic speed limits must be enforced.
» All farm gates must be closed after passing through.
» Contractors appointed by the proponent should provide daily transport for construction workers to and from the site. This would reduce the potential risk of trespassing on the remainder of the farm and adjacent properties.
» The proponent should consider the option of establishing a MF (see above) that includes local farmers and develop a Code of Conduct for construction workers. This committee should be established prior to commencement of the construction phase. The Code of Conduct should be signed by the proponent and the contractors before the contractors move onto site.
» The proponent should hold contractors liable for compensating farmers in full for any stock losses and/or damage to farm infrastructure that can be linked to construction related activities and or workers. This should be

contained in the Code of Conduct to be signed between the proponent, the contractors and neighbouring landowners. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities (see below).

- The Environmental Management Plan (EMP) must outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested.
- Contractors appointed by the proponent must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.
- Contractors appointed by the proponent must ensure that construction workers found guilty of stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation;
- No construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.

Residual impacts:
None, provided losses are compensated for.

Nature: *Nuisance impacts (noise and dust) associated with the Thermal plant and upgraded access road*
Construction related activities, including the movement of heavy construction vehicles of and on the site, has the potential to create dust, noise and safety impacts and damage roads. However, 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.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Short Term (2)	Short Term (2)
Magnitude	Medium (6)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Medium (30)**	**Low (15)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

- The movement of construction vehicles on the site should be confined to agreed upon access road/s.
- The movement of heavy vehicles associated with the construction phase should be timed to avoid times days of the week, such as weekends, when the volume of traffic travelling along the access roads may be higher.
- Dust suppression measures should be implemented, such as wetting on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.
- All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits.

Residual Impacts:

- If damage to local farm roads is not repaired then this will affect the farming activities in the area and result in higher maintenance costs for vehicles of local farmers and other road users. The costs will be borne by road users who were no responsible for the damage. .

Nature: 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.

	Without Mitigation	With Mitigation

Extent	Local (1)	Local (1)
Duration	Long term-permanent if disturbed areas are not effectively rehabilitated (5)	Short term if damaged areas are rehabilitated (2)
Magnitude	Medium (6)	Minor (2)
Probability	Probable (3)	Highly Probable (4)
Significance	Medium (36)	Low (20)
Status	Negative	Negative
Reversibility	Yes, disturbed areas can be rehabilitated	Yes, disturbed areas can be rehabilitated
Irreplaceable loss of resources?	Yes, loss of farmland. However, disturbed areas can be rehabilitated	Yes, loss of farmland. However, disturbed areas can be rehabilitated
Can impact be mitigated?	Yes, however, loss of farmland cannot be avoided	Yes, however, loss of farmland cannot be avoided
Mitigation: » An Environmental Control Officer (ECO) should be appointed to monitor compliance during the construction phase. » Existing internal roads should be used where possible. In the event that new roads are required, these roads should be rehabilitated on the completion of the construction phase. » The footprint associated with the construction related activities (access roads, construction camps, workshop etc.) should be minimised. » All areas disturbed by construction related activities, such as access roads on the site, construction camps etc., should be rehabilitated at the end of the construction phase. » The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. The specifications for the rehabilitation programme should be included in the EMP. » The implementation of the Rehabilitation Programme should be monitored by the ECO.		
Residual impacts: Overall loss of farmland could affect the livelihoods of the affected farmers, their families, and the workers on the farms and their families. However, disturbed areas can be rehabilitated.		

Operation Phase Impacts

Nature: Development of infrastructure to improve energy security and support renewable sector		
	Without Mitigation	With Mitigation
Extent	Local, Regional and National (4)	Local, Regional and National (5)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	High (8)
Probability	Highly Probable (4)	Definite (5)
Significance	High (64)	High (85)
Status	Positive	Positive
Reversibility	Yes	
Irreplaceable loss of resources?	Yes, impact of climate change on ecosystems	Reduced CO_2 emissions and impact on climate change
Can impact be mitigated?	Yes	
Enhancement: » Implement a skills development and training programme aimed at maximizing the number of employment opportunities for local community members. » Maximise opportunities for local content, procurement and community shareholding.		
Residual impacts: contribution to establishing an economically viable commercial generation sector in the Northern Cape and South Africa.		

Nature: Creation of employment and business opportunities associated with the operational phase		
	Without Mitigation	With Enhancement
Extent	Local and Regional (1)	Local and Regional (2)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	Low (28)	Medium (40)
Status	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	

Enhancement:

- Wherever feasible, local residents should be recruited to fill semi- and unskilled jobs.
- Women should be given equal employment opportunities and encouraged to apply for positions.
- A skills transfer plan should be put in place at an early stage and workers should be given the opportunity to develop skills.
- A procurement policy promoting the use of local business should, where possible, be put in place and applied throughout the operational phase.
- As far as possible local contractors that are compliant with Broad-Based Black Economic Empowerment (B-BBEE) criteria should be used.

Residual impacts:

Creation of permanent employment and skills and development opportunities for members from the local community and creation of additional business and economic opportunities in the area

Nature: Benefits associated with support for local community's form socio-economic development contributions		
	Without Mitigation	With Enhancement[4]
Extent	Local and Regional (2)	Local and Regional (3)
Duration	Long term (4)	Long term (4)
Intensity	Low (4)	Moderate (6)
Likelihood	Probable (3)	Definite (5)
Significance	Medium (30)	High (65)
Status	Positive	Positive
Reversibility	Yes	Yes
Can impact be enhanced?	Yes	

Enhancement:

- The proponents should liaise with the local municipality and representatives from the GDF to identify projects that can be supported by SED contributions.
- Clear criteria for identifying and funding community projects and initiatives in the area should be identified. The criteria should be aimed at maximising the benefits for the community as a whole and not individuals within the community.
- Strict financial management controls, including annual audits, should be instituted to manage the SED contributions.

[4] Enhancement assumes effective management of the community trust

Residual impacts: Promotion of social and economic development and improvement in the overall well-being of the community

Nature: Visual impact associated with the proposed facility and associated infrastructure and the potential impact on the areas rural sense of place.		
	Without Mitigation	With Mitigation
Extent	Local (2)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	Low (24)	Low (21)
Status	Negative	Negative
Reversibility	Yes, Hybrid energy plant components and other infrastructure can be removed.	
Irreplaceable loss of resources?	No	Yes
Can impact be mitigated?	Yes	
Mitigation: See Visual Impact Assessment		
Residual impacts: Potential impact on current rural sense of place		

Nature: Potential noise impacts associated with the operation of the hybrid thermal facility on nearby farmhouses		
	Without Mitigation	With Enhancement / Mitigation
Extent	Local (2)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Low (2)
Probability	Probable (3)	Probable (3)
Significance	Medium (36)	Low (21)
Status	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	
Enhancement: N/A as no further noise mitigations were recommended in the Scoping Phase		
Residual impacts: Given that the site is located in the Upington REDZ the cumulative impacts are not rated significant.		

8.6.4 Implications for Project Implementation

The significance of the positive impacts associated with the socio-economic aspects that will be affected by thermal plant and access road ranges from medium to high with the implementation of the enhancement measures recommended. From the outcomes of the studies undertaken, it is concluded that the thermal facility can be developed and social impacts can be managed to acceptable levels.

The significance of the negative impacts associated with the social aspects that will be thermal plant and access road ranges from low to medium with the implementation of the recommended mitigation measures.

8.9. Assessment of Impacts on Traffic

Potential traffic impacts and the relative significance of the impacts associated with the development of thermal plant and access road are summarised below (refer to **Appendix M**).

8.9.1 Results of the Traffic Impact Assessment

During the construction phase traffic will include vehicles for deliveries, removal of materials and construction staff. It is expected that the delivery of the components to the site during the construction phase will not result in a significant increase in traffic. The impact of the staff traffic is deemed to be acceptable as the trips do not exceed 50 vehicles per hour.

The expected trips generated during operational will be staff trips and fuel (LPG) deliveries. The operational trips generated will be low and will have a negligible impact on the external road network as trips will not exceed 50 vehicles per hour

Several options can be considered for the transportation of infrastructure to the development area. These include:

» *National Route to Site for Imported Components:*
There are two viable options for the port of entry for imported components - the Port of Saldanha in the Western Cape and the Port of Ngqura in Port Elizabeth. The preferred route from the preferred point of entry and an alternative route is shown in green in **Figure 8.7**. The preferred route is approximately 948km in length and will start at the Port of Ngqura, heading north on the N10 passing Middelburg, Hanover, De Aar, Britstown, Prieska, Griekwastad, Postmasburg en route to the N14 at Kathu. From the N14 at Kathu, the vehicles will travel on gravel roads leading to the proposed site.

An alternative route, shown in light blue in the **Figure 8.7**, is 967km in length and follows the same route as the preferred route up to Middelburg, where it connects to the N9 towards Kimberley, passing the towns of Colesberg, Phillippolis, Fauresmith and Koffiefontein. From Kimberley. Vehicles will follow the R31 past Barkly West, turning onto the R31 at Danielskuil. The vehicles will turn left onto the N14 at Kuruman and access the gravel roads leading to the proposed site. It is critical to ensure that the abnormal load vehicle will be able to move safely and without obstruction along the preferred route.

» *Route for Components manufactured locally:*
It is anticipated that elements manufactured within South Africa will be transported to the site from the Cape Town, Johannesburg and Pinetown/Durban areas. It is also assumed that the transformer, which will be transported with an abnormal load vehicle, will be transported from the Johannesburg area and therefore it needs to be verified that the route from the manufacturer to the site does not have any load limitations for abnormal vehicles.

» *Route from Cape Town:*
Components, manufactured in Cape Town will be transported to site via road as shown in **Figure 8.8**. Haulage vehicles will travel via the R27, R399 and N7 to site, passing Veldrift, Piketberg, Vanrhynsdorp, Calvinia, Kenhardt and Keimoes en route to the site. Haulage vehicles will mainly travel on national and provincial roads and the total distance to the proposed site is approximately 1 020km.

» *Route from Johannesburg:*
The travel distance is around 570km and no road limitations are expected on this route for normal loads vehicles as it will mainly follow national and provincial roads. The route is shown in **Figure 8.9**.

» *Route from Pinetown/Durban:*
Haulage vehicles will mainly travel on national and provincial roads and the total distance to the proposed site is a 1000km and no road limitations are expected on this route for normal load vehicles.

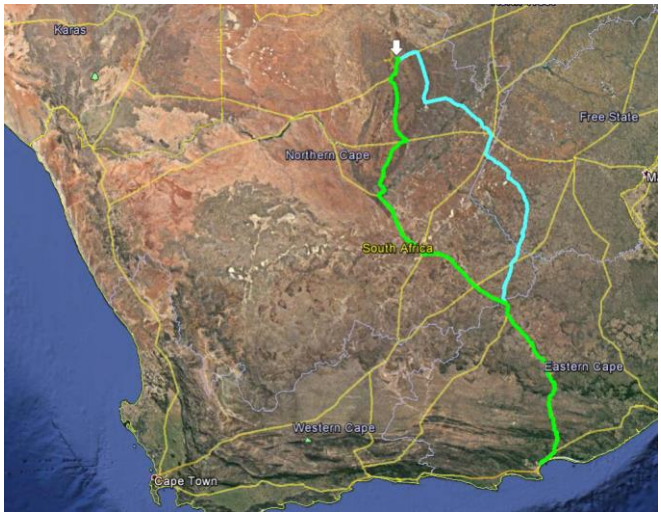


Figure 8.7: Preferred and alternative route from Port of Ngqura.

Figure 8.8: Route from Cape Town.

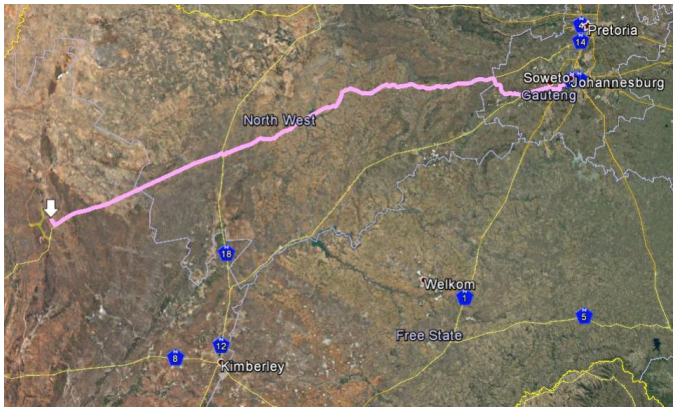


Figure 8.9: Route from Johannesburg.

Figure 8.10: Route from Pinetown/Durban

8.9.2 Description of Traffic Impacts

The following impacts have been identified and assessed for thermal plant and access road.

Impacts associated with the construction phase:
» Congestion due to construction related traffic.
» The construction traffic would also lead to noise and dust pollution.
» This phase also includes the construction of roads, excavations, trenching for electrical cables and other ancillary construction works that will temporarily generate the most traffic.

Impacts associated with the operation phase:

» During operation, it is expected that a 20 permanent staff will be based at the facility and security will periodically visit the facility. The traffic generated during this phase will be minimal and will not have an impact on the surrounding road network.
» The transportation of fuel to the facility will generate approximately 20 trips per day.
» The significance of the transport impact without mitigation measures during the construction phase can be considered as medium. However, considering that this is temporary and short term in nature, the impact can be mitigated to an acceptable level.

8.9.3 Impact tables summarising the significance of impacts on traffic during the construction and operation phases (with and without mitigation)

Construction Phase

Nature: Congestion as a result of the transport of equipment, material and staff to site		
	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Short (2)	Short (3)
Magnitude	Moderate (6)	Low (4)
Probability	Definite (5)	Probable (3)
Significance	Medium (45)	Low (24)
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Stagger component delivery to site. » Reduce the construction period. » The use of mobile batch plants and quarries in close proximity to the site. » Staff and general trips should occur outside of peak traffic periods. » Regular maintenance of gravel roads by the Contractor during the construction phase and by Client/Facility Manager during operation phase.		
Residual Impacts: The proposed mitigation measures for the construction traffic will result in a reduction of the impact on the surrounding road network, but the impact on the local traffic will remain moderate. Traffic will return to normal levels after construction is completed		

Nature: Traffic on roads will generate dust. Air quality will be affected by dust pollution		
	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Short (2)	Short (3)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	Medium (36)	Low (24)
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Dust Suppression of gravel roads during the construction phase, as required.		

» Regular maintenance of gravel roads by the Contractor during the construction phase and by Client/Facility Manager during operation phase.
Residual Impacts: None are anticipated.

Nature: Traffic on roads will generate noise. Noise pollution due to increased traffic.		
	Without mitigation	With mitigation
Extent	Local ()	Local (1)
Duration	Short (2)	Short (3)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	Medium (36)	Low (24)
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Stagger component delivery to site. » Reduce the construction period as far as possible. » The use of mobile batch plants and quarries in close proximity to the site. » Staff and general trips should occur outside of peak traffic periods.		
Residual Impacts: None are anticipated.		

Operational Phase

Nature: Traffic congestion due to an increase in traffic caused by the LPG deliveries, staff trips and trips for maintenance requirements		
	Without mitigation	With mitigation
Extent	Local (2)	Local (1)
Duration	Long term(4)	Long term(4)
Magnitude	Low(3)	Small (0)
Probability	Probable (3)	Vert improbable (1)
Significance	Low (27)	Low (4)
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » LPG deliveries, staff trips and trips for maintenance requirements could be staggered or scheduled to occur outside of peak traffic periods. » Consider scheduling shift changes to occur outside peak hours to concentrate staff trips in off peak periods » A larger LPG delivery vehicle could be considered to reduce the number of daily trips		
Residual Impacts: The proposed mitigation measures for the operations traffic will result in a reduction of the impact on the surrounding road network, but the impact on the local traffic will remain moderate. The mitigation measures will significantly reduce the trips and associated impact on the surrounding road network		

Nature: Traffic on roads will generate noise. Noise pollution due to increased traffic.		
	Without mitigation	With mitigation
Extent	Local (2)	Local (1)
Duration	Long term(4)	Long term(4)
Magnitude	Low(3)	Small (0)
Probability	Probable (3)	Vert improbable (1)
Significance	Low (24)	Low (5)
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » LPG deliveries, staff trips and trips for maintenance requirements could be staggered or scheduled to occur outside of peak traffic periods. » A larger LPG delivery vehicle could be considered to reduce the number of daily trips		
Residual Impacts: None are anticipated.		

8.9.4 Implications for Project Implementation

The potential transport related impacts for the construction and operation phases for the proposed 75MW
Thermal Power Dual Fuel Facility were assessed.

» The construction phase traffic, although significant, will be temporary and impacts are considered to have a medium significance without mitigation measures and low with mitigation measures.
» The traffic generated during the operational phase will be minimal and will not have a significant impact on the surrounding road network

The development is supported from a transport perspective provided that the recommendations and mitigations are adhered to. The impacts associated with the Thermal Power Dual Fuel Facility are acceptable with the implementation of the recommended mitigation measures and can therefore be authorised.

8.10. Assessment of Impacts associated with Unexpected Events

Potential risk impacts and the relative significance of the impacts associated with the development of the Thermal Plant are summarised below (refer to **Appendix L**).

8.10.1. Results of Risk Assessment

The main aim of the investigation was to quantify the risks to employees, neighbours and the public with regard to the proposed Thermal Plant. This risk assessment was conducted in accordance with the MHI regulations and can be used as notification for the facility.

The main activity of the power plant would be the generation of mid-merit power supply to the South African electricity grid. The fuel used to generate power would be LPG, that will be delivered to site by

truck. The main hazards that would occur with a loss of containment of hazardous components at the proposed Thermal facility include exposure to:

» Thermal radiation from fires;
» Overpressure from explosions.

The following installations were considered for analysis in the Qualitative Risk Assessment (QRA):

» LPG installation, including road tanker offloading bay, LPG storage bullets, LPG vaporisers and pipeline to the respective gensets.

The combined site risks (i.e. the summation of all risks posed by the site onto works or the public) were calculated. These are represented as Maximum Individual Risks or Societal Risks. The investigation concluded that under the current design conditions, the proposed Thermal facility would be considered as a Major Hazard Installation and would require notification in accordance with the MHI regulations. An MHI Risk Assessment should be completed prior to construction of the terminal once final designs are available.

8.10.2 Description of Risks

The following negative risk impacts have been identified and assessed for the Thermal plant:

» Catastrophic rupture of LPG storage vessel leading to a fireball event, flammable vapour dispersion and ignition leading to flash fire thermal radiation effects and/or vapour cloud explosion overpressure effects.
» Catastrophic rupture of diesel storage vessel leading to a pool fire with impacts not extending beyond the site boundary.

8.10.3. Impact tables summarising the significance of the risk impacts goods (with and without mitigation measures)

Nature: *Impact associated with LPG Installations* Worst case loss of containment scenario – catastrophic rupture of LPG storage vessel leading to a fireball event, flammable vapour dispersion and ignition leading to flash fire thermal radiation effects and/or vapour cloud explosion overpressure effects.		
	Without Mitigation	With Mitigation
Extent	Low (2)	Low (1)
Duration	Very short (1)	Very short (1)
Magnitude	High (8)	High (6)
Probability	Very improbable (1)	Very improbable (1)
Significance	Low (11)	Low (11)
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible (worst case: death)	Irreversible (worst case: death)
Irreplaceable loss of resources?	Yes (human)	Yes (human)
Can impacts be mitigated?	Yes	Yes
Mitigation: Mitigation would include emergency response arrangements and systems, such as alarms to allow for personnel to muster in case of emergency, as well as fire-fighting systems and cooperation with emergency responders.		

Preventive measures would include maintenance procedures to prevent the occurrence of a catastrophic loss of containment from corrosion, fire and gas detection and firewater systems to prevent escalation as well as strict control of ignition sources and other measures, which may be required according to standards such as those prescribed by the South African National Standards system.
Residual Risks: Even with mitigation, there may be residual risk of occurrence due to failures in protection systems and break-down in procedures and documented systems.

8.10.4. Implications for Project Implementation

As a result of the risk assessment study conducted for the proposed Thermal plant, a number of events were found to have risks beyond the site boundary. These risks could be mitigated to acceptable levels.

No fatal flaws were identified that would prevent the project proceeding to the detailed engineering phase of the project and would support the project under the following conditions most of which will be detailed in the MHI study:

- Compliance with all statutory requirements, i.e., pressure vessel designs.
- Compliance with applicable SANS codes, i.e., SANS 10087, SANS 10089, SANS 10108, etc.
- Incorporation of applicable guidelines or equivalent international recognised codes of good design and practice into the designs.
- Completion of a recognised process hazard analysis (such as a HAZOP study, FMEA, etc.) on the proposed facility prior to construction to ensure design and operational hazards have been identified and adequate mitigation put in place.
- Full compliance with IEC 61508 and IEC 61511 (Safety Instrument Systems) standards or equivalent to ensure that adequate protective instrumentation is included in the design and would remain valid for the full life cycle of the tank farm:
  - Including demonstration from the designer that sufficient and reliable instrumentation would be specified and installed at the facility.
- Preparation and issue of a safety document detailing safety and design features reducing the impacts from fires, explosions and flammable atmospheres to the MHI assessment body at the time of the MHI assessment:
  - Including compliance to statutory laws, applicable codes and standards and world's best practice;
  - Including the listing of statutory and non-statutory inspections, giving frequency of inspections;
  - Including the auditing of the built facility against the safety document; and
  - Noting that codes such as IEC 61511 can be used to achieve these requirements;
- Demonstration by 320 MW RMPP owner or their contractor that the final designs would reduce the risks posed by the installation to the South African requirements as prescribed in SANS 1461 (2018).
- Signature of all terminal designs by a professional engineer registered in South Africa in accordance with the Professional Engineers Act, who takes responsibility for suitable designs.
- Completion of an emergency preparedness and response document for on-site and off-site scenarios prior to initiating the MHI risk assessment (with input from local authorities).
- Any increases to the product list or product inventories must be with the approval of the authorities under NEMA, where required Permission not being granted for increases to the product list or product inventories without redoing part of or the full EIA.
- Final acceptance of the facility risks with an MHI risk assessment that must be completed in accordance with the MHI regulations:

- Basing such a risk assessment on the final design and including engineering mitigation.

8.11. Assessment of Air Quality and Climate Change Impacts

Impacts on air quality associated with the development are expected to occur during the construction and operational phases. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix I** for more details).

8.11.1. Air Quality Sensitive Receptors

The sensitive receptors identified (**Figure 8.4** and **Table 8.2**)) included the nearby residential areas, hospitals and schools. There are 3 individual homesteads within 5 km of the proposed facility and 17 homesteads within 10 km of the proposed facility. Nearby residential areas include Kathu (south 15 km), Sesheng (south west 16 km), and Deben (west 20 km).

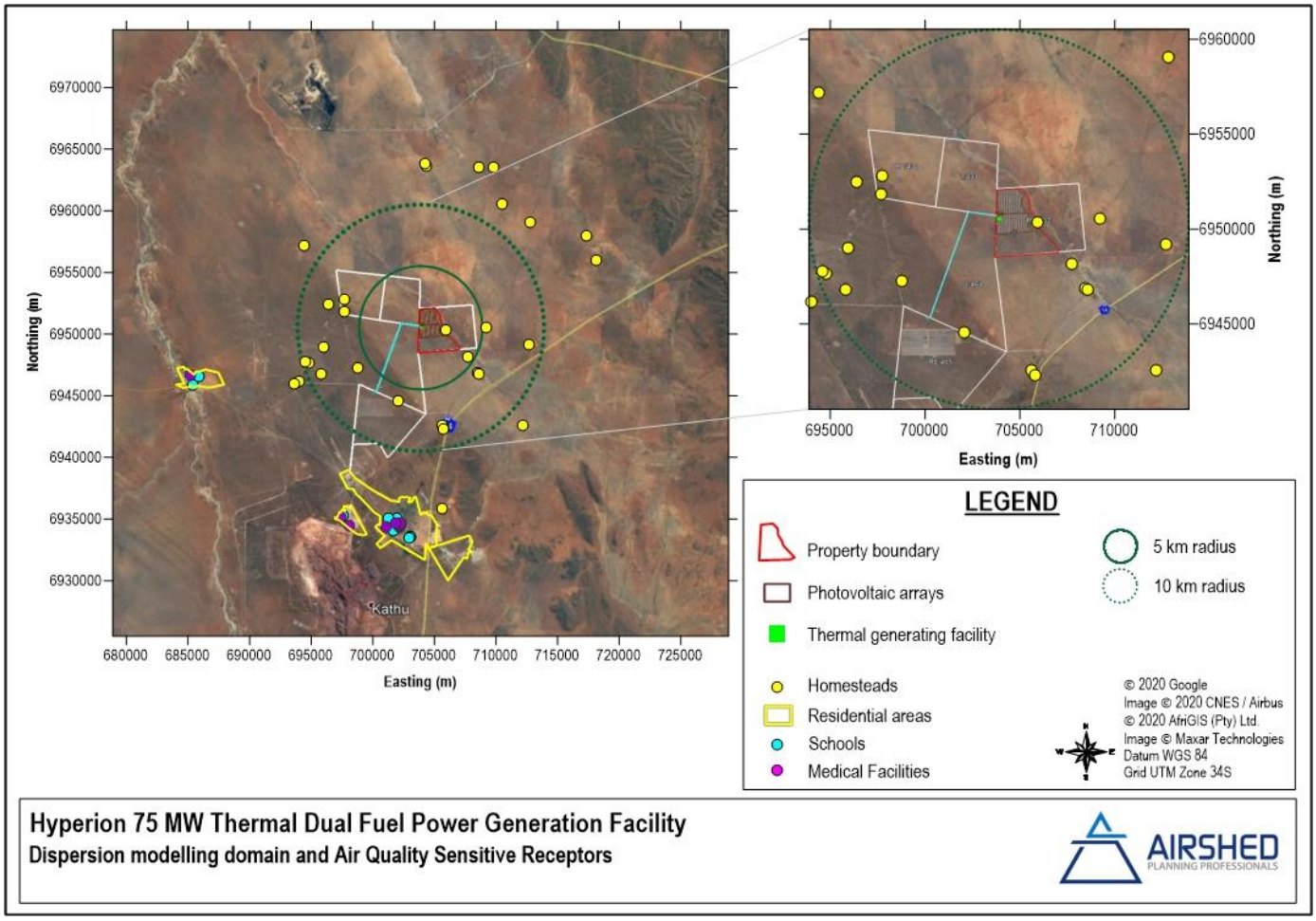


Figure 8.4: Location of the project in relation to the air quality sensitive receptors (AQSRs)

Table 8.2: Distance to the air quality sensitive receptors

Receptor name / details	Distance from proposed site (km)	Direction from proposed site
SR1	2.0	E
SR4	4.5	ESE
SR2	5.3	E
SR5	5.8	SE

Receptor name / details	Distance from proposed site (km)	Direction from proposed site
SR12	6.0	SE
SR7	6.1	WSW
SR6	6.2	SSW
SR8	6.3	WNW
SR10	6.6	WNW
SR9	7.8	WNW
SR11	8.1	W
SR14	8.1	SSE
SR15	8.4	SSE
SR3	8.9	E
SR20	8.9	WSW
SR21	9.5	WSW
SR22	9.7	WSW
SR18	10.8	WSW
SR19	11.2	WSW
SR13	11.4	SE
SR17	11.6	NW
SR23	12.1	NNE
SR24	12.3	NE
SR29	13.1	N
SR30	13.3	N
SR28	13.9	NNE
SR27	14.3	NNE
SR16	14.7	S
SR26	15.2	ENE
SR25	15.4	ENE
Kathu High School	15.5	S
Tanelle Se Creche	15.7	S
UGM Clinic	15.9	S
Family Health Centre Kathu	16.0	S
Kathu Family Care Clinic	16.0	S
Kathu Medi-Clinic	16.0	S
Lenmed Kathu Private Hospital	16.2	S
Life Occupational Health - Assmang Ltd Khumani Mines Clinic	16.2	S
Kathu Clinic	16.4	S
Mpelega Pre-Primary School	16.5	SSW
Kathu Primary School	16.6	S
Sishen Intermediate Mine School	16.6	SSW
Sishen Occupational Health Clinic	16.7	SSW
Curro Kathu Independent School	16.9	S
Curro Castle Kathu	16.9	S
Sishen Primary School	17.1	S
Unjani Clinic Kathu	17.1	SSW

Receptor name / details	Distance from proposed site (km)	Direction from proposed site
Deben Primêre Skool	18.4	WSW
Hoerskool Gamagara	19.1	WSW
Jan Witbooi Clinic	19.1	WSW
Dingleton Clinic	26.9	SSW
Sishen Primary School	27.8	SSW

8.11.2. Description of Air Quality and Climate Change Impacts

The impact of the project on ambient air quality was simulated using the United States Environmental Protection Agency (US EPA) AERMOD modelling suite. Simulated meteorological data for the project area was acquired for the period 2017 to 2019. The wind field showed generally north to north-easterly dominance. The assessment of the impact of the project assumed that emissions from the power station would primarily be vented to the atmosphere via the exhaust stacks where the emissions would meet the minimum emission standards (MES) for Subcategory 1.5 – Reciprocating Engine facilities using gas. Simulated pollutant concentrations were compared against the NAAQS and various environmental screening levels for ecosystem impacts. Simulated nuisance dust-fall rates were compared against the National Dust Control Regulations (NDCR) for non-residential and residential areas.

The main findings of the simulated incremental assessment were:

1. During the construction phase, compliance with NAAQS for PM_{10} and NDCR for daily dustfall rates is likely.
   a. A significance was determined for the impact associated with the construction phase of the project.
2. Compliance with hourly, daily, and annual NAAQS under normal operations is likely across the domain and at the receptors for NO_2, particulate matter, (PM_{10} and $PM_{2.5}$), and carbon monoxide (CO).
3. The MES scenario showed simulated SO_2 concentrations above the hourly and daily NAAQ limit values up to 250 m and 180 m off-site, respectively but not at any receptors. Annual concentrations were simulated to be lower than the NAAQS across the domain.
4. It is unlikely that gas combustion will result in SO_2 emissions at the emission standard and therefore the facility's impact on SO_2 was also assessed using mass balance calculations for LPG boilers using actual sulfur content of the fuel (0.014%)
   a. Compliance the NAAQS was simulated for hourly, daily, and annual average SO_2.
5. The impact of the facility was simulated to be below the NDCR.
   a. However, mitigation measures for control vehicle entrainment dust emissions are recommended along the delivery route, especially near the homesteads.
6. The United Nations Economic Commission for Europe (UNECE) Convention on Long Range Trans-boundary Air Pollution Limits) critical levels were used to assess the potential for impact of annual SO_2 and NO_2 concentrations on vegetation via various measures of productivity and reproductive success.
   a. Impacts to vegetative productivity are unlikely due to the thermal power generation facility across in the domain or at any receptors.
7. Annual greenhouse gas (GHG) emissions for the operational phases of the plant were estimated to represent 0.026% of the published South African National 2015 GHG Inventory, contributing to the Energy sector.

8.11.3. Impact tables summarising the significance of impacts on Air Quality during construction and operation (with and without mitigation)

Nature: *Impacts on air quality during construction and decommissioning*

Construction (and decommissioning) activities are likely to result in emissions of particulate and gaseous pollutants due to civil and building work and from vehicle traffic. The nature of emissions from construction activities is highly variable in terms of temporal and spatial distribution and is also transient. Increased ambient concentrations of fine particulates and gaseous pollutants may result in negative human health impacts. Increased nuisance dustfall is likely as a result of wind-blown dust emissions from the working areas. Increased nuisance dustfall rates will likely result in negative impact on dustfall at nearby residences and on potentially on plants.

Unmitigated particulate emissions were found to result in ambient PM10 and dustfall rates below the assessment criteria on and off-site. However, residences areas may occasionally be affected by elevated concentrations and nuisance dustfall during the road construction. Areas to the west of the project site are more likely to be affected, especially in the short-term, due to the predominant winds. The impact of gaseous pollutants is likely to minor.

	Without mitigation	**With mitigation**
Extent	Local (3)	Site (1)
Duration	Short duration (2)	Short duration (2)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Low (15)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Highly likely	Likely
Can impacts be mitigated?	Yes, with minimum control efficiency of 50%.	

Mitigation:

Commencement of road construction prior to thermal power generation facility construction.
Wet, or other appropriate, dust suppression at key handling points or cleared areas.
Berms, screens, or wet suppression along roads construction areas, especially near homesteads.
Haul trucks to be restricted to specified haul roads and using the most direct route.
Reduce unnecessary traffic.
Strict on-site speed control (i.e. 40km/hr for haul trucks on access roads; 20 km/hr for all large vehicles near residences or on-site).
Reduction of extent of open areas to minimised the time between clearing and infrastructure construction, and/or use of wind breaks and water suppression to reduce emissions from open areas.
Restriction of disturbance to periods of low wind speeds (less than 10 m/s).
Stabilisation of disturbed soil (for example, chemical, rock cladding, or vegetation).
Re-vegetation of cleared areas as soon as practically feasible.

Residual:

Expected to be low if mitigation measures are properly implemented.

Nature: *Impacts on air quality during operation (SO_2, NO_2, PM, CO, and VOC impacts)*

The normal operation of the proposed open cycle power station will result in emission of gaseous and particulate pollutants including: SO_2, NO_2, PM, CO, and VOCs. Increased ambient concentrations of these pollutants may result in negative human health impacts, and nuisance dustfall.

Unmitigated emissions of these pollutants were found to comply with the assessment criteria and off-site impacts are unlikely, provided that fuel sulfur content is low (<0.1%) and recommended mitigation measures are applied to

control vehicle entrainment emissions along the access road. Residential receptors, schools, and medical facilities are unlikely to be affected. Areas to the west of the project site are more likely to be affected in the long-term, due to the predominant winds.		
	Without mitigation	**With mitigation**
Extent	Site (2)	Site (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Medium (30)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Unlikely	
Can impacts be mitigated?	To some extent.	
Mitigation: Regular inspection and maintenance of turbines, boilers, and associated equipment in accordance with manufacturer recommendations. Optimise start-up times to minimise elevated emissions from turbines and boilers. Access roads are to be paved and particulate content minimised through sweeping or watering (or other appropriate suppressants). Vehicle idling periods should be minimised when stationary for extended periods of time. Strict on-site speed control (i.e. 15km/hr for large vehicles). Euro V or better emission limits from LPG delivery vehicle engines.		
Residual: Expected to be low if mitigation measures are properly implemented.		

Nature: *Climate Change Impacts associated with the project*		
The normal operation of the gas-to-power plant will result in emission of greenhouse gases: CO_2, and to a lesser extent methane and nitrous oxide. Annual GHG emissions equate to 0.03% of South Africa's total greenhouse emissions (based on the 2015 emissions inventory) with a total of 131 047 tonnes CO_2-e per year for Scope 1 emissions for the operational phase. The impact of the operation on global climate is considered to have a long-term impact on greenhouse gas concentrations.		
	Without mitigation	With mitigation
Extent	National (5)	National (5)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Medium (33)**	**Medium (33)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes, in the long-term	Yes, in the long-term
Can impacts be mitigated?	To some extent.	
Proposed mitigation measures: » Reduced fuel usage in delivery vehicles using Euro V or better emission standards. » Reduced fuel usage through minimal idle time of stationary LPG delivery and fuel-efficient vehicles. » Local sources of LPG or alternative fuels would reduce the Scope 3 emission » Investigation of offset projects.		
Residual impacts: The risk of impact of climate change on the operation, due to historical global emissions, is high even if mitigation		

measures are effectively applied.

8.11.4. Implications for Project Implementation

It is likely that the Construction (and decommissioning) Phase(s) may have a medium impact on the ambient air quality if emissions are unmitigated, and a low impact if mitigation measures are effectively implemented. The operational phase of the project will have a low impact (based on design mitigation measures) on ambient SO_2, PM, CO, and VOC concentrations. The impact of the operation on global climate is considered to have a long-term impact on greenhouse gas concentrations of medium significance.

From an air quality perspective, it is the opinion of the specialist that the Thermal plant be authorised and licensed to operate, on condition that:

- Emissions be monitored as per standard practice for the appropriate listed activity, controlled emitters, and non-classified boilers;
- Emissions are maintained at or lower than the Minimum Emission Standards appropriate for the listed activity and controlled emitters;
- Conformance with the other environmental management programme requirements for air quality (as detailed in Appendix F of the Air Quality specialist report) are met.

8.12. Assessment of the 'Do Nothing' Alternative

The 'do-nothing' alternative (i.e. no-go alternative) is the option of not constructing Thermal plant and upgraded access road. Should this alternative be selected, there would be no environmental impacts on the site due to the construction and operation activities of the thermal plant and upgraded access road.

Costs and Benefits associated with the Thermal plant and upgraded access road

The implementation of the thermal plant and upgraded access road at the proposed site is expected to result in a number of social and environmental costs and benefits**.**

Environmental costs identified for the project include:

- Direct loss of biodiversity, flora, fauna, and avifauna due to the clearing of land for the construction and utilisation of land for the project (which is limited to the development footprint within the authorised Hyperion PV1&2 Facility). This impact is minimised through the placement of the thermal facility within the already authorised footprint of the Hyperion PV1&2 development areas.
- Impact to the Vlermuisleegte river as a result of upgrading and surfacing of the existing access road. No direct impact is expected due to the positioning of the access road. Indirect impacts expected can be minimised through the implementation of the recommended mitigation measures.
- Visual impacts associated with the project. The location of the facility within an area characterised by vast space and vegetation and other energy development mitigates the visual impact of the facility to a large extent.

- Impacts on ambient air quality. The results of the impact assessment indicate that the operational phase of the project will have a low impact (based on design mitigation measures) on ambient SO_2, PM, CO, and VOC concentrations.
- Impacts in terms of GHG emissions. The potential for reduced emissions as a result of the project being developed as part of a hybrid facility involving renewable energy with the Hyperion PV1&2 Facility reduces the potential impacts associated with these emissions.

The positive implications of establishing the project on the demarcated site include:

- The project will result in important socio-economic benefits at the local and regional scale through job creation, procurement of materials and provision of services and other associated downstream economic development. These will persist during the pre-construction, construction and operational phases of development.
- Development of the facility will require the implementation of appropriate management actions which could have positive impacts on the surrounding areas specifically in terms of alien vegetation and erosion management.
- The project contributes towards the development of additional power generation sources as outlined in the IRP 2019. The project has been bid into the RMIPPPP and is intended to contribute towards the 2000MW of energy required to supplement Eskom's supply in the short- and medium-term. Although the project was not successful in the RMIPPPP, the Applicant proposes to bid the project into subsequent procurement programmes.

Apart from impacts associated with GHG emissions, the costs associated with the project are anticipated to occur at a site specific level, the significance of which can be largely reduced through the application of appropriate mitigation measures, and through the appropriate placement of infrastructure within areas of lower sensitivity identified on site. Impacts associated with GHG emissions can be managed through appropriate planning and design of the facility to meet the South African targets, as well as through the operation of the facility as part of a hybrid with the authorised Hyperion PV1 & PV 2 facilities. Due to the fact that the benefits of the project are expected to occur at a larger scale (i.e. national, regional and local level), the expected benefits of the project are expected to partially offset the localised environmental costs of the project.

Impacts of the Do Nothing Alternative

The following impacts are anticipated with the implementation of the "Do Nothing" option:

- Failure to provide additional power generation capacity in accordance with the Department of Mineral Resource and Energy (DMRE) National Integrated Resource Plan (IRP), which has identified the need for dispatchable emergency power generation in the short- to medium-term.
- Failure to provide an additional 75MW of mid-merit electricity to the national electricity grid through the RMIPPPP or similar procurement processes (should the project be selected as Preferred Bidder), which in turn has the opportunity to stimulate economic growth and development
- Failure to realise the potential local economic development and social upliftment benefits associated with the implementation of project.

Conclusion

Although a number of impacts of potential high significance have been identified, no environmental fatal flaws were identified to be associated with the Thermal plant and upgraded access road through the specialist studies undertaken. Where impacts cannot be avoided, appropriate mitigation has been identified to minimise impacts to acceptable levels. A number of negative impacts have been identified to be associated with the implementation of the do nothing alternative.

The 'do nothing' alternative is therefore not preferred and not proposed to be implemented for the development of Thermal plant and proposed access road.

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CHAPTER 9. ASSESSMENT OF POTENTIAL CUMULATIVE IMPACTS

As identified and assessed in Chapter 8, the thermal plant and upgraded access road may have effects (positive and negative) on natural resources, the social environment and on the people living in the project area. The preceding impact assessment chapter has reported on the assessment of the impacts associated with the project largely in isolation (from other similar developments).

The IRP includes provision for 3000MW gas to power as part of the energy mix up to 2030. In addition to this, the DMRE, under the RMIPPPP in accordance with the IRP 2019, released an RFP to meet a stated electricity supply shortfall of 2000MW of generation capacity. Although the RMIPPPP is technology agnostic, it has been noted that criteria of the RMIPPPP favours gas or diesel-based generators as such technology can be designed to be fully dispatchable.[5]

As a result, there has been a substantial increase in interest in gas to power facility developments in South Africa, with several gas to power facilities being bid into the RMIPPPP and possible future gas to power procurement programmes. It is, therefore, important to follow a precautionary approach in accordance with NEMA to ensure that the potential for cumulative impacts[6] is considered and avoided where possible.

This chapter assesses the potential for the impacts associated with the project to become more significant when considered in combination with other large-scale industrial developments in the area.

9.1 Approach taken to Assess Cumulative Impacts

The cumulative impacts that have the potential to be compounded through the development of the thermal plant and its associated infrastructure in proximity to other similar developments include impacts such as those listed below. The role of the cumulative assessment is to test if such impacts are relevant to the thermal plant and upgraded access road within the project site being considered for the development:

- Unacceptable impacts to air quality and contributions to pollutant levels.
- Unacceptable risks and contributions to climate change.
- Unacceptable loss of threatened or protected vegetation types, habitat or species through clearing, resulting in an impact on the conservation status of such flora, fauna or ecological functioning.
- Unacceptable risk to water resources through disturbance associated with construction activities and increased runoff and erosion during the operation phase.
- Unacceptable loss of heritage resources.

[5] Source: https://www.engineeringnews.co.za/article/ipp-office-extends-bid-deadline-for-r40bn-risk-mitigation-programme-2020-11-02

[6] Cumulative impacts in relation to an activity are defined in the Environmental Impact Assessment Regulations (Government Notice R326) as 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 existing and reasonably foreseeable impacts eventuating from similar or diverse activities.

- Complete or whole-scale change in sense of place and character of an area and unacceptable visual intrusion.
- Unacceptable impact to socio-economic factors and components.
- Unacceptable risk and degradation due to traffic related impacts.

It is important to explore the potential for cumulative impacts as this will lead to a better understanding of these impacts and the potential for mitigation that may be required. The scale at which the cumulative impacts are assessed is important. For example, the significance of the cumulative impact on the regional or national economy will be influenced by gas to power facility developments throughout South Africa, while the significance of the cumulative impact on visual amenity may only be influenced by industrial facility developments that are in closer proximity to each other. For practical purposes, a sub-regional scale of 30km has been selected for this cumulative impact evaluation. The potential for cumulative impacts is summarised in the sections which follow and has been considered within respective specialist studies in varying degrees (refer to **Appendices D – M**).

Figure 9.1 indicates the location of the Thermal plant in relation to all known and viable large-scale industrial energy developments and open cast mining operations located within a radius of 30km from the project site. These developments were identified using information available in the public domain at the time of this assessment. Although these developments do not fall within the same sector as the thermal plant, it contributes to the regional industrial character and the mining operations influence regional ambient air quality.

From an RMIPPPP development perspective, only those projects selected as Preferred Bidder following the adjudication of bids will be implemented. Considering the number of bids received by the IPP Office in this regard (28 in total), it is considered unlikely that all projects bid under this programme would be successful in their bids and be developed. In addition, not all proposed gas to power developments will be granted the relevant permits by the competent authorities (DEFF, Department of Mineral Resources and Energy, National Energy Regulator of South Africa, and Eskom) due to the following reasons:

- there are existing limitations on the electricity evacuation capacity in Richards Bay or physical challenges in the connection of certain of the RMIPPPP projects to the grid;
- there are certain regulatory approvals in respect of the importation of LNG into South Africa in support of certain of the RMIPPPP bids that may not be granted;
- not all applications may receive a positive environmental authorisation;
- not all proposed facilities will eventually be granted a generation license by the National Energy Regulator of South Africa and sign a Power Purchase Agreement with Eskom; and
- not all developers will be successful in securing financial support to advance their projects further.

The IPP Office has disclosed the list of bidders who have submitted projects in the RMIPPPP bidding process, confirming the submission of the Hyperion Hybrid Facility under the RMIPPPP is proposed for development in Kathu. This cumulative assessment is assuming that the project proponent for the Hyperion Hybrid project will be successful in their bid.

This assessment is based on information which is currently available. The following potential impacts are considered:

- Cumulative impacts on Air Quality and Climate Change
- Cumulative Impacts on Terrestrial Biodiversity and Ecology
- Cumulative Impacts on Avifauna
- Cumulative Impacts on Aquatic Resources
- Cumulative Impacts on Heritage Resources
- Cumulative Visual Impacts
- Cumulative Socio-economic Impacts
- Cumulative of Soils and Agricultural Potential
- Cumulative Impacts on Traffic
- Cumulative quantitative risks

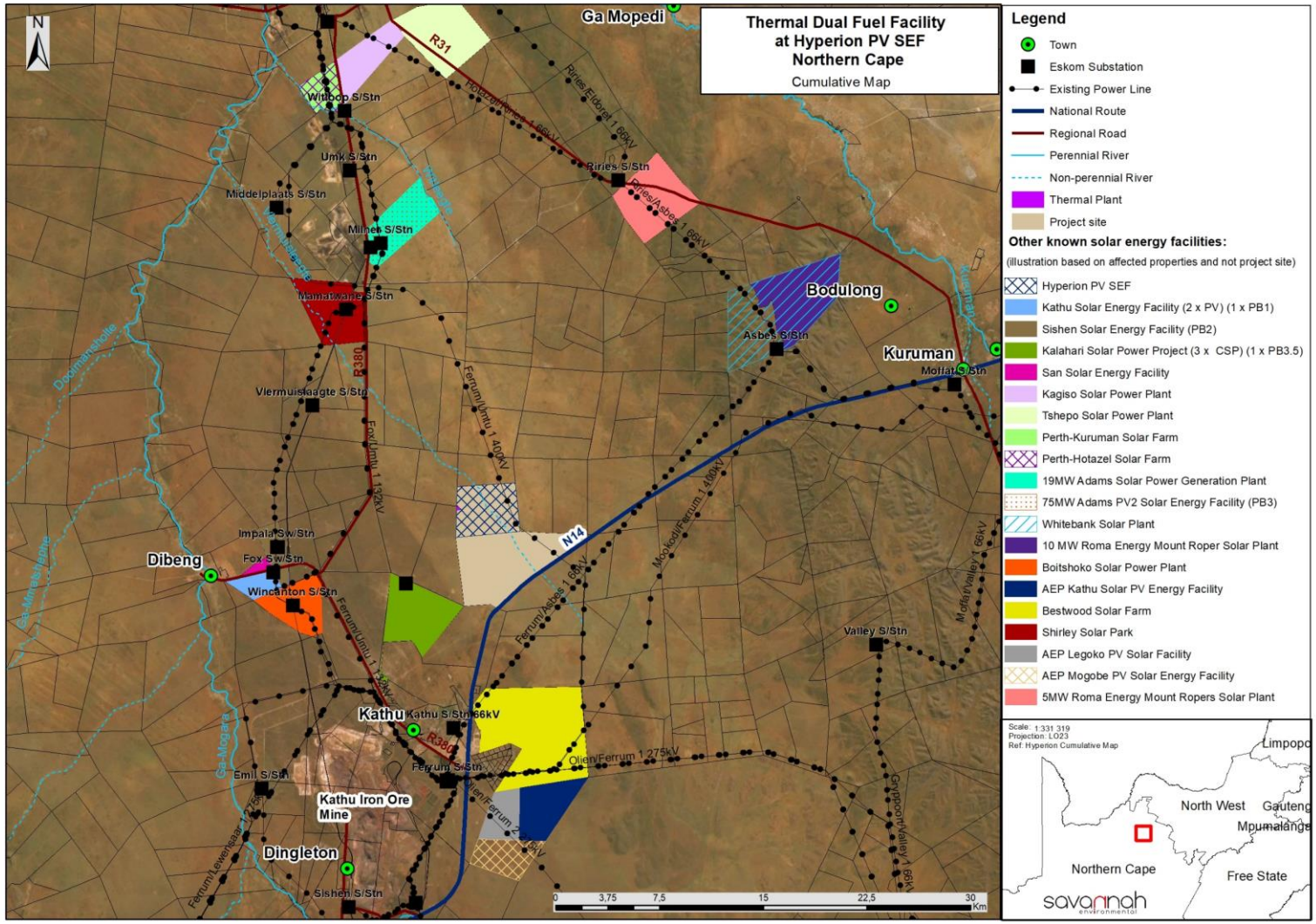

Figure 9.1: Cumulative map of similar large-scale industrial/ energy developments within a 30km radius

9.2 Cumulative Impact on Terrestrial Biodiversity

Cumulative ecological impacts have been identified for the Thermal Plant and upgraded access road (refer to **Appendix D**). From an ecological perspective, the cumulative impacts associated with the proposed development area are expected to be of medium significance, with the contribution of the thermal facility being low.

Nature: *Cumulative impacts associated with the faunal habitat, diversity and SCC arising from the proposed development activities.*

Reduction / loss of faunal habitat on a local and potentially regional scale. Loss of habitat and increased anthropogenic activities will lead to a decrease in faunal abundance and potentially diversity in the local area, with a low-level risk to regional population numbers, provided impacts are mitigated. Persecution and collection of faunal SCC is a potential threat that may lead to a loss of SCC diversity in the local areas which may have a knock on impact
regional population numbers and population security.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (2)	Local (2)
Duration	Medium (3)	Permanent (5)
Magnitude	Moderate (6)	Low to Moderate (5)
Probability	Probable (3)	Probable (3)
Significance	**Low (18)**	**Medium (38)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Moderate	Low
Can impacts be mitigated?	The development will contribute to cumulative impacts on habitat loss and transformation in the area. Although all species within the proposed footprint will be displaced, some, notably small mammals and invertebrates, may to a degree be able to recolonise the footprint during the operational phase of the facility. The remaining displaced species will likely readily be accommodated in the surrounding natural areas and as such the impact from this displacement is not perceived to be detrimental to the current faunal communities in the area. The cumulative impacts of the proposed project can be mitigated to a degree provided that the mitigation measures are implemented, such as revegetation, minimising vegetation clearance and suitable AIP control measures	

Mitigation:

- Rehabilitation of any disturbed sites must be undertaken and monitored to ensure that habitat and food resources are reinstated as far as possible.
- No dumping of waste should take place during maintenance activities, especially not within any sensitive habitat or areas designated as "open space.
- Vehicles should be restricted from travelling in sensitive environments. Use must be made of existing roads only. Where possible, monitoring and maintenance should occur on foot.

9.3 Cumulative Impact on Avifauna

Cumulative impacts on avifauna have been identified for the Thermal Plant and upgraded access road (refer to **Appendix E**). From an avifauna perspective, the cumulative impacts associated with the

proposed development area is of medium significance, with the contribution of the thermal facility being low.

Nature: *Cumulative avifaunal habitat, diversity and species of concern loss*

A reduction in common and SCC richness and abundance within the local environment. No impacts on a National Scale are anticipated as no important breeding, foraging or movement corridors are known within the focus are and its surrounds.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Improbable (2)	Probable (3)
Significance	**Low (18)**	**Medium (36)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Moderate	Moderate
Can impacts be mitigated?	The development will contribute to cumulative impacts on habitat loss and transformation in the area. Although large numbers of avifaunal SCC are likely to occur within the focus area this is not considered an important foraging, breeding, roosting or movement corridor for any of these species.	

Mitigation:

- Any avifaunal SCC nests that will be affected by activities, must be marked and where possible, the current breeding attempt should be allowed to complete its cycle before any activities are undertaken within close proximity of the nest (depending on the species). After the breeding attempt has failed or the chick has fledged the nest should be destroyed or moved. Permits for such activities must be obtained from the relevant authorities where required;
- Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be avoided or, if required, must be limited to what is absolutely necessary, and the footprint thereof kept to a minimal. A strict speed limit should be maintained (40 km/h is recommended) to limit potential bird strikes;
- Care should be taken during the construction and operation of the proposed development to limit edge effects to surrounding natural habitat. This can be achieved by:
  - Demarcating all footprint areas during construction activities;
  - No construction rubble or cleared alien invasive species are to be disposed of outside of demarcated areas, and should be taken to a registered waste disposal facility;
  - All soils compacted because of construction activities should be ripped and profiled and reseeded; and
  - Manage the spread of AIP species, which may affect remaining natural habitat within surrounding areas;
- Upon completion of construction activities, it must be ensured that no soils be left bare, and that indigenous species be used to revegetate the disturbed area;
- No collection, trapping or killing of avifaunal SCC must be allowed by construction and maintenance personnel;
- Disturbed areas are to be rehabilitated to a similar state as that of pre-disturbance conditions – where veld condition can be improved, it is recommended

9.4 Cumulative Impact on Freshwater

Cumulative impacts on freshwater have been identified for the Thermal Plant and upgraded access road (refer to **Appendix F**). The proposed Hyperion hybrid generation facility and access road would contribute in a similar way to the cumulative impacts on the natural environment in the vicinity of the proposed project as the existing solar energy facilities within a 30 km radius of the focus area and other anthropogenic activities. Since no building surface infrastructure is located within any of the identified watercourses, the significance of the cumulative impacts of the proposed building infrastructure are therefore regarded to be low. However, since the proposed access road is located directly adjacent to a watercourse, direct negative impacts are expected, however this is not considered to be extensive given the non-perennial nature of the river and its present ecological state From a freshwater perspective, the cumulative impacts associated with the proposed development area is of medium significance.

Nature: *Cumulative impacts on watercourses*
Other activities within the vicinity of the proposed thermal plant and upgraded access road include an existing solar energy facility (approximately 9.3km south west of the project site), natural and untransformed areas, road crossings and bridges, as well as urban areas.

Aspects pertaining to the cumulative impacts include:
- Site clearing, compaction and disturbance of soils in the vicinity of watercourses;
- Changes to biodiversity maintenance, streamflow regulation capabilities, sediment balance etc. of the watercourses; and
- Erosion, canalisation, increased runoff and sedimentation of the watercourses.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Low (2)	Low (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (2)	Very Improbable (1)
Significance	**Low (18)**	**Low (9)**
Status (positive or negative)	Neutral	Neutral
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:
- Contractor laydown areas, and material storage facilities to remain outside of the Vlermuisleegte river and pans and their 32m NEMA ZoR.
- All vehicle re-fuelling is to take place outside of the Vlermuisleegte river and pans and their 32m NEMA ZoR;
- All development footprint areas to remain as small as possible and vegetation clearing to be limited to what is essential.
- Retain as much indigenous freshwater vegetation as possible.
- All vegetation removed should be transported from the construction site (may not be stockpiled) and disposed of at a registered waste disposal facility.
- Material to be used (gravel) as part of the widening of roads must be stockpiled outside the 32m NEMA ZoR of the river to prevent sedimentation of the river. These stockpiles may not exceed a height of 2m and should be protected from wind using tarpaulins.
- Roads should be permeable to allow for drainage from the road surface. In this regard, suitable stormwater

management should be implemented to allow for water to drain from the road without causing erosion.
» Any concrete or mixing of materials as part of the construction activities should be done within a designated batching area only and must not be mixed within the 32m NEMA ZoR of the Vlermuisleegte River and pans in the area.
» After construction of roads, the area surrounding the roads must be revegetated with suitable indigenous vegetation to prevent the establishment of alien vegetation species and to prevent erosion from occurring.
» It is highly recommended that an alien vegetation management plan be compiled during the planning phase and implemented concurrently with the commencement of construction.
» All alien and invasive vegetation should be removed. Any vegetation removed should be taken to a registered landfill site to prevent the proliferation of alien and invasive species.

9.5 Cumulative impacts on Air Quality and Climate Change

Cumulative impacts on air quality have been identified for the Thermal Plant and upgraded access road (refer to **Appendix I**). The cumulative impact of the proposed facility and the existing baseline would result in elevated ambient air pollutant concentrations of medium significance.

Nature: *Cumulative Air Quality Impacts in the area*

The normal operation of the proposed thermal plant will result in emission of gaseous and particulate pollutants including: SO_2, NO_X, PM. Increased ambient concentrations of these pollutants may result in negative human health impacts, and nuisance dustfall. Cumulative impacts, to short- and long-term ambient concentrations, were assessed to be minor since there are few major sources of air pollution in the region. Cumulative ambient short-term PM_{10} and $PM_{2.5}$ concentrations may exceed the NAAQS within the domain but are likely to be localised near the source(s).

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Near site (2)	Local (3)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (30)**	**Medium (33)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Unlikely	No
Can impacts be mitigated?	Yes	To some extent

Potential mitigation measures:
» Liaise with other major sources to minimise fugitive emissions especially particulates.
» Use community and industry fora to discuss air pollution issues and progress towards minimising impacts.

Residual impacts:
Expected to be low if mitigation measures can be effectively implemented.

9.6 Cumulative impacts on Traffic

Cumulative impacts traffic have been identified for the Thermal Plant and upgraded access road (refer to **Appendix M**). The construction and decommissioning phases are the only significant traffic generators. The duration of these phases is short term (i.e. the impact of the generated traffic on the surrounding road network is temporary and facility, when operational, do not add any significant traffic to the road network).

In terms of the cumulative impact of the project and other projects in the area, even if all similar projects within the area are constructed at the same time, the respective roads authority will consider all applications for abnormal loads and work with all project companies to ensure that loads on the public roads are staggered and staged to ensure that the impact will be acceptable.

Nature: Traffic generated by the proposed development and the associated noise and dust pollution.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	High (5)
Duration	Short (3)	Medium-term (3)
Magnitude	Moderate (4)	Moderate (6)
Probability	Definite (3)	Improbable (2)
Significance	**Medium (45)**	**Low (28)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Stagger component delivery to site. » Dust suppression. » Reduce the construction period. » The use of mobile batch plants and quarries in close proximity to the site. » Staff and general trips should occur outside of peak traffic periods.		

9.7 Cumulative impacts on Heritage Resources

Cumulative impacts on heritage resources have been identified for the Thermal Plant and upgraded access road (refer to **Appendix H**). Archaeological resources are the only heritage considered to be an issue from the perspective of cumulative impacts. The present project will result in some impacts to archaeological resources and some developments in Kathu have been implemented without archaeological mitigation. the opportunity to explore the archaeology can be seen as a positive cumulative impact of medium significance for regional archaeology.

Nature: Direct impacts to heritage resources. The focus is on archaeological resources which have the greatest potential for significant impacts, and which can be physically disturbed or destroyed during construction activities.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Low (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Low (4)
Probability	Improbable (2)	Probable (3)
Significance	**16 (Low)**	**Medium (33)**
Status (positive/negative)	Negative	Positive
Reversibility	Low	Low
Loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation:		

Test excavations and sampling of artefacts and also protection and reporting of chance finds for further actions as needed. Geotechnical investigations can inform on where gravel is likely to be intersected during development and mitigation work should focus on such areas.

9.8. Cumulative Social impacts

Cumulative social impacts on the local economy and service provision have been identified for the Thermal Plant and upgraded access road (refer to **Appendix K**).

Nature: *Cumulative impacts on local services* The establishment of a number of renewable energy facilities and associated projects, such as the proposed hybrid thermal project, in the GLM has the potential to place pressure on local services, specifically medical, education and accommodation.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local and regional (1)	Local and regional (2)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Moderate (6)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Low (28)**	**Medium (36)**
Status (positive/negative)	Negative	Negative
Reversibility	High, hybrid energy plant components and other infrastructure can be removed	
Loss of resources?	No	No
Can impacts be mitigated?	Yes	
Confidence in findings: High.		
Mitigation: The proponent should liaise with the Gamagara Local Municipality and Gamagara Development Forum to address potential impacts on local services.		

Nature: *Cumulative impacts on local economy* The establishment of renewable energy facilities and associated projects, such as the hybrid thermal energy project, in the GLM will create employment, skills development and training opportunities, creation of downstream business opportunities.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local and regional (1)	Local and regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Moderate (6)
Probability	Highly Probable (4)	Definite (5)
Significance	**Low (28)**	**High (65)**
Status (positive/negative)	Positive	Positive
Reversibility	High, hybrid energy plant components and other infrastructure can be removed	
Loss of resources?	No	No
Can impacts be enhanced?	Yes	

Confidence in findings: High.
Mitigation: The proposed establishment of suitably sited renewable energy facilities and associated projects, such as the proposed hybrid thermal energy plant, within the GLM and NCP should be supported.

9.9 Cumulative Visual impacts

Cumulative visual impacts to landscape change, views from roads, local homesteads and the Kathu Airport, and as a result of lighting have been identified for the Thermal Plant and upgraded access road (refer to **Appendix J**).

Nature: *Cumulative impacts on Landscape Change*

The proposed project could extend the general influence of development and specifically power generation projects into a relatively natural rural area.

Whilst there are twenty one power generation projects within 30km of the proposed project, seven are located within the limit of visibility of the proposed project.

Other projects could also combine to create this impression but the subject project will not add to this impression.

Due to the relatively low height of the majority of authorised solar projects within the area, projects are likely to be generally viewed in isolation surrounded by relatively natural areas and will create the impression of industrialisation as a stakeholder moves through the area, they are unlikely to create the impression that solar development is the main landcover, in other words, they will appear as industrial elements within a general naturalistic landscape.

The proposed thermal projects will however introduce taller elements in the form of 27m high stacks which are likely to be viewed over a broader area and may be seen at the same time as other power generation projects.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Region **(3)**	Region **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Minor **(2)**	Moderate **(6)**
Probability	Probable **(3)**	Probable **(3)**
Significance	**Low (27)**	**Medium (39)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	**Yes** however this will not affect the overall level of impact.	Unknown

Mitigation:
It is the proposed stacks that are likely to have the largest influence on change of landscape character. It is not possible to mitigate views of these elements.

From close views, the loss of vegetation could have an influence on visibility of lower sections of the proposed plant. Minimising loss and disturbance are the key mitigation measures.

Planning:

- » Plan development levels to minimise earthworks to ensure that levels are not elevated;
- » Plan to maintain the height of structures as low as possible;
- » Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;
- » Retain and augment natural vegetation on all sides of the proposed project.

Operations:

- » Reinstate any areas of vegetation that have been disturbed during construction;
- » Remove all temporary works;
- » Monitor rehabilitated areas post-construction and implement remedial actions;
- » Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.
- » Maintain and augment natural vegetation around the proposed project.

Decommissioning:

- » Remove infrastructure not required for the post-decommissioning use of the site;
- » Rehabilitate and monitor areas post-decommissioning and implement remedial actions.

Nature: *Cumulative impact on views from roads*

The affected sections of all roads are in excess of 6km from the proposed plant. Due to the flat topography, the distance involved and the natural vegetation which is likely to provide a degree of screening particularly to the engine houses and lower infrastructure. The proposed stacks however are likely to be visible over long sections of the roads.

It is therefore likely that the stacks will be the elements that will largely affect views from these roads. These elements are likely to be viewed over a broader area and may be seen at the same time as other power generation projects.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Region, (3)	Regional, (3)
Duration	Long term, (4)	Long term, (4)
Magnitude	Minor, (2)	Low, (4)
Probability	Probable (3)	Probable (3)
Significance	**Low, (27)**	**Medium, (33)**
Status (positive or negative)	**Negative**	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No irreplaceable loss.	No irreplaceable loss.
Can impacts be mitigated?	Yes	Unknown

Mitigation:

Planning:

- » Plan development levels to minimise earthworks to ensure that levels are not elevated;
- » Plan to maintain the height of structures as low as possible;
- » Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;
- » Retain and augment natural vegetation on all sides of the proposed project.

Operations:

- » Reinstate any areas of vegetation that have been disturbed during construction;
- » Remove all temporary works;
- » Monitor rehabilitated areas post-construction and implement remedial actions;
- » Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area;
- » Maintain and augment natural vegetation around the proposed project.

Decommissioning:

- » Remove infrastructure not required for the post-decommissioning use of the site;
- » Rehabilitate and monitor areas post-decommissioning and implement remedial actions.

Residual Impacts:

Residual impacts relate to the loss of indigenous vegetation as well as the failure to remove development and infrastructure on decommissioning,

Nature: *Cumulative impact on local homesteads*

The proposed project may not be visible from existing homesteads but will be visible from areas surrounding homesteads.

It is likely that other closer projects will be more visible to homesteads and will in fact help screen the proposed development.

Whilst a detailed assessment of the impact of other projects (other than Hyperion 1, 3 & 4) has not been undertaken due to limited information available on these projects, from review of online mapping, it seems possible that other projects will impact negatively on homesteads in the region.

The cumulative impact is therefore also likely to be improbable with a low significance.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Region, (3)	Regional, (3)
Duration	Long term, (4)	Long term, (4)
Magnitude	Minor, (2)	Low, (4)
Probability	Probable (3)	Probable (3)
Significance	**Low**, **(27)**	**Medium, (33)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No irreplaceable loss.	No irreplaceable loss.
Can impacts be mitigated?	Yes	Unknown

Mitigation:

Planning:

- » Plan development levels to minimise earthworks to ensure that levels are not elevated;
- » Plan to maintain the height of structures as low as possible;
- » Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;
- » Retain and augment natural vegetation on all sides of the proposed project.

Operations:

- » Reinstate any areas of vegetation that have been disturbed during construction;
- » Remove all temporary works;
- » Monitor rehabilitated areas post-construction and implement remedial actions;
- » Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the

development area;
- » Maintain and augment natural vegetation around the proposed project.

Decommissioning:
- » Remove infrastructure not required for the post-decommissioning use of the site;
- » Rehabilitate and monitor areas post-decommissioning and implement remedial actions.

Nature: *Cumulative visual impacts on the Kathu Airport*

The analysis indicates that the stacks are likely to be visible from the airport. Given the extent of open landscape within and around the airport, It is unlikely that they will be screened to any significant extent.
There is one solar power facility that is significantly closer that is also visible from the airport. The stacks are likely to be visible in the vicinity and behind this project. The proposed project is unlikely therefore to increase the extent of the view that will be affected by industrial development. It will however result in additional industrial elements being visible.
It is also likely that the proposed plant and other power generation projects will be visible from planes on approach and exit from the airport.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Region, **(3)**	Regional **(3)**
Duration	Long term, **(4)**	Long term **(4)**
Magnitude	Minor, **(2)**	Low **(4)**
Probability	Probable **(3)**	Probable **(3)**
Significance	**Low, (27)**	**Low (36)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No irreplaceable loss.	No irreplaceable loss.
Can impacts be mitigated?	No	

Mitigation:
From the ground, it is the proposed stacks that are likely to have the largest influence on change of landscape character. It is not possible to mitigate views of these elements.
It will also not be possible to screen views from the air.

Nature: *Cumulative impact of night time lighting*

Currently lighting in the area is comprised of low level lighting around homesteads and an another solar project (Kalahari Solar) as well as lighting on the N14 to the south.

There is a risk that the proposed project will intensify lighting impacts in the area. If additional solar development does occur on other sites, it is highly possible that these developments could also extend lighting impacts. If appropriate mitigation measures are applied as recommended for the subject project then cumulative impacts are anticipated to be low.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site (1)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Small to minor (1)	Small to minor (1)
Probability	Improbable (2)	Improbable (3)
Significance	**Low (12)**	**Low (24)**

Status (positive or negative)	If the lights are generally not visible then the occasional light is unlikely to be seen as negative. **Neutral**	**Neutral**
Reversibility	High	High
Irreplaceable loss of resources?	No irreplaceable loss	No irreplaceable loss
Can impacts be mitigated?	Yes	
Mitigation: » Use low key lighting around buildings and operational areas that is triggered only when people are present; » Plan to utilise infra-red security systems or motion sensor triggered security lighting; » Ensure that lighting is focused on the development with no light spill outside the site; andKeep lighting low, if high mast lighting is required particularly for maintenance, ensure that it is only activated as it is needed.		

9.10 Cumulative on Soils and Agricultural Resources

Cumulative impacts to soils and agricultural potential have been identified for the Thermal Plant and upgraded access road (refer to **Appendix G**).

Nature: *Assessment of cumulative impact of areas susceptible to soil erosion* Increase in areas susceptible to soil erosion		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Regional (2)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	**Medium (30)**	**Medium (33)**
Status (positive/negative)	Negative	Negative
Reversibility	Low	Low
Loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	No
Confidence in findings: High.		
Mitigation: Each of the projects should adhere to the highest standards for soil erosion prevention and management as defined in Chapter 8.		

Nature: *Assessment of cumulative impact of increased risk of soil pollution* Increase in areas susceptible to soil pollution		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Regional (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Medium (30)**
Status (positive/negative)	Negative	Negative

Reversibility	Low	Low
Loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	No
Mitigation: Each of the projects should adhere to the highest standards for soil pollution prevention and management as defined in the Chapter 8.		

9.11 Cumulative Impact of Unexpected Events

Cumulative impacts of unexpected events have been identified for the Thermal Plant (refer to **Appendix L**).

Nature: *Potential impact on surrounding human populations, including possibility of serious injury or death as a result of major industrial accidents from hazardous materials used on-site.*

The cumulative project risks and the LPG storage risk are identical

	Overall impact of the proposed project in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Low (2)	Low (1)
Duration	Very short (1)	Very short (1)
Magnitude	High (8)	High (6)
Probability	Very improbable (1)	Very improbable (1)
Significance	**Low (11)**	**Low (11)**
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible (worst case: death)	Irreversible (worst case: death)
Irreplaceable loss of resources?	Yes (human)	Yes (human)
Can impacts be mitigated?	Yes	Yes

Confidence in findings:
Medium to High (more process detail required to increase confidence).

Mitigation:

Mitigation would include emergency response arrangements and systems, such as alarms to allow for personnel to muster in case of emergency, as well as fire-fighting systems and cooperation with emergency responders. Preventive measures could include maintenance procedures to prevent the occurrence of a catastrophic loss of containment from corrosion, fire and gas detection and firewater systems to prevent escalation, as well as strict control of ignition sources and other measures, which may be required according to standards such as those prescribed by the South African National Standards system.

Residual Risks:
Even with mitigation, there is still possibility of human death as a result of major incidents on-site due to the nature of operations.

9.12 Conclusions regarding Cumulative Impacts

Cumulative impacts are expected to occur with the development of Thermal plant and upgraded access road throughout all phases of the project life cycle and within all areas of study considered as part of this EIA Report. The main aim for the assessment of cumulative impacts is to test and determine whether the development will be acceptable within the landscape proposed for the development, and whether the loss, from an environmental and social perspective, will be acceptable without whole-scale change.

The assessment of the cumulative impacts was undertaken through the consideration of impacts in isolation and compared to the cumulative impacts of Thermal plant and access road and industrial developments (renewable energy facilities, mining etc.) within a 30km radius from the proposed project site.

The significance of the cumulative impacts associated with the development of Thermal Plant and access road ranges from low to high, depending on the impacts being considered. A summary of the cumulative impacts is included in **Table 9.2** below.

Table 9.2: Summary of the cumulative impact significance for the Thermal Plant and access road within the project site

Specialist assessment	Overall significance of impact of the proposed project considered in isolation	Cumulative significance of impact of the project and other projects in the area
Ecology	Low	Medium
Avifauna	Low	Medium
Freshwater	Medium	Medium
Air Quality	Medium	Medium
Traffic	Medium	Low[7]
Heritage (archaeology and palaeontology)	Low	Medium
Socio-Economic	Medium (Positive) Low (Negative)	High (Positive) Medium (Negative)
Visual	Low	Medium
Soil, Land use and Agricultural Potential	Low / Medium (depending on impact)	Medium
Risk Assessment	Low	Low

The following can be concluded regarding the cumulative impacts of Thermal Plant and upgraded access road:

» **Ecological processes:** Cumulative impacts associated with the Thermal plant and upgraded access road include the loss of habitat and faunal species diversity and abundance in the region due to vegetation clearance and/or disturbance. The development of the proposed thermal facility and access road will result in the localised loss of habitat within the proposed footprints; however, this habitat loss will lead to the displacement of faunal species. Although this displacement is not expected to be significant it will be occurring within a region that has, and still is, experiencing larger scale species displacement due to surrounding developments. The cumulative impacts are of medium significance and can be mitigated and are not considered to pose an unacceptable risk or impact to the development.

[7] Specialist assumed a precautionary approach in terms of authorisation from road authority ensuring application for abnormal loads are staggered and staged.

- **Avifauna:** Cumulative impacts associated with Thermal plant and upgraded access road from an avifauna perspective includes habitat, diversity and species of concern loss. The significance of the cumulative impact associated with the development of Thermal plant and access road is expected to be of medium significance. The cumulative impacts can be mitigated to some extent and are not considered to pose an unacceptable risk or impact to the development of Thermal plant and access road.
- **Freshwater:** The cumulative impact of this project is of low impact significance on the freshwater environment should the recommended mitigation measures as provided in this report be adhered to. Impacts arising from the proposed project can be attributed to the construction of the proposed access road adjacent to the Vlermuisleegte River which is expected to have a direct negative impact on a section of the Vlermuisleegte River. The impacts are, however, expected to be localised and not of significant extent considering the overall size of the river and its catchment. It is also highly recommended that the construction of the road be undertaking in the dry period to avoid potential impacts to impact on the downstream reach of the river. As such, the cumulative impact of the proposed Hyperion hybrid generation facility and access road and other similar projects in the area are considered of Low cumulative impact significance to the freshwater environment.
- **Air Quality and Climate Change:** Cumulative impact of the proposed thermal power generation facility and the other sources in the area are likely to be compliant with the NAAQS. A Low significance rating was determined for the mitigated impact of the project in isolation and Medium in the context of other air pollution sources in the vicinity. The normal operation of the thermal plant will result in emission of greenhouse gases (CO_2, and to a lesser extent methane and nitrous oxide). Annual GHG emissions equate to 0.03% of South Africa's total greenhouse emissions. The impact of the operation on global climate is considered to have a long-term impact on greenhouse gas concentrations. This is however not an unacceptable risk if the recommended mitigation measures are implemented. Assuming that the thermal power generation facility replaces generative capacity from other fossil fuel sources, the facility could lower South Africa's GHG emissions from the Energy sector since LPG facility will have a lower emission per unit electricity when compared to coal fired power stations.
- **Land Use, Soils and Agricultural Potential:** Cumulative impacts on land-use, soil and agricultural potential have been identified and assessed which relates to a decrease in land capability for livestock farming, soil erosion and the increased risk of soil pollution. The significance of the cumulative impact will be medium with the development of Thermal plant and upgraded access road and other industrial facilities within the surrounding area. The contribution of the Thermal plant and upgraded access road to cumulative impacts is considered to be low. There will be no unacceptable loss of land capability for livestock farming due to the development of Thermal plant and upgraded access road and other facilities.
- **Heritage (including archaeology and palaeontology):** Thermal plant and upgraded access road will likely result in minimal cumulative impacts to heritage resources. The most significant impact will be associated with impacts to archaeological resources. The significance of the cumulative impact will be of medium significance. There will be no unacceptable loss of heritage resources associated with the development of Thermal plant and upgraded access road and facilities within the surrounding areas.
- **Visual:** The cumulative impact on general landscape character, impacts on views from roads and from local homesteads due to renewable energy projects and other developments in the area is

considered to be of medium to low significance. There will be no unacceptable impact on the visual quality of the landscape associated with the development of Thermal plant and upgraded access road and other developments within the surrounding area.

- **Socio-economic:** Social cumulative impacts have been identified and assessed for the Thermal Plant and access road. Positive cumulative impacts include creation of employment, skills development and training opportunities, and downstream business opportunities which is is high significance in consideration with other similar developments in the area. Negative cumulative impacts impact on local services due to the establishment of developments in the area however, initiatives undertaken by Provincial and Local Government to address the additional demand for services and accommodation etc., created by the establishment of developments should mitigate these impacts. There will be no unacceptable social impact as a result of the Thermal plant and upgraded access road.
- **Traffic:** The cumulative assessment followed a precautionary approach in considering even if all similar projects within the area are constructed at the same time, the respective roads authority will consider all applications for abnormal loads and work with all project companies to ensure that loads on the public roads are staggered and staged to ensure that the impact will be acceptable resulting in a low cumulative significance. There will be no unacceptable traffic impact as a result of the Thermal plant and upgraded access road.
- **Unexpected events:** From a risk perspective the cumulative project risks are related to the LPG storage risk. The cumulative risk associated with LPG storage with the project in isolation and together with other projects are of low significance. No unacceptable risks have been identified for the thermal plant.

Based on the specialist cumulative assessment and findings, the development of Thermal plant and upgraded access road and its contribution to the overall impact of all existing and proposed solar energy facilities and other industrial activities within a 30km radius, it can be concluded that cumulative impacts will be of a low to moderate to high significance, depending on the impact being considered. There are however no impacts or risks identified to be considered as unacceptable with the development of Thermal plant and upgraded access road when considered together with other developments within the surrounding area. In addition, no impacts which will result in whole-scale change are expected.

CHAPTER 10. CONCLUSIONS AND RECOMMENDATIONS

Hyperion Solar Hybrid (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 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 22km 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 Hybrid (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. The project was bid into the RMIPPPP in December 2020. Although the project was not successful in the RMIPPPP, the Applicant may propose to bid the project into subsequent procurement programmes.

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, only the potential environmental impacts associated with the construction, operation and decommissioning phases of the 75MW Thermal Dual Fuel Facility and associated infrastructure are assessed in this EIA Report.

10.1 Legal Requirements as per the EIA Regulations, 2014 (as amended). For the undertaking of an EIA Report

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

Requirement	Relevant Section
3(k) where applicable, a summary of the findings and impact management measures identified in any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final report	A summary of the findings of the specialist studies undertaken for thermal plant and associated infrastructure has been included in section 10.2.
3(l) an environmental impact statement which contains (i) a summary of the key findings of the environmental impact assessment, (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers and (iii) a summary of the positive	An environmental impact statement containing the key findings of the environmental impacts of the thermal plant and associated infrastructure has been included as section 10.4. Sensitive environmental features located within the study area and development area, overlain with the proposed development footprint have been

Requirement	Relevant Section
and negative impacts and risks of the proposed activity and identified alternatives.	identified and are shown in Figure 10.1. A summary of the positive and negative impacts associated with thermal plant infrastructure has been included in section 10.2.
h (xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity.	A concluding statement indicating the preferred alternatives and the preferred location of the activity is included in section 10.5.
3(n) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation.	All conditions required to be included in the Environmental Authorisation of the thermal facility have been included in section 10.5.
3(p) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation.	A reasoned opinion as to whether the thermal plant and associated infrastructure should be authorised has been included in section 10.5.

10.2 Evaluation of Thermal Plant and upgraded access road

The preceding chapters of this report together with the specialist studies contained within **Appendices D-M** provide a detailed assessment of the potential impacts that may result from the development of proposed Thermal and upgraded access road associated with the Hyperion Hybrid Facility. This chapter concludes the environmental assessment of the thermal plant and associated infrastructure by providing a summary of the results and conclusions of the assessment of the development area. In so doing, it draws on the information gathered as part of the EIA process, the knowledge gained by the environmental specialists and the EAP and presents a combined and informed opinion of the environmental impacts associated with the project.

No environmental fatal flaws were identified in the detailed specialist studies conducted, provided that the recommended mitigation measures are implemented. These measures include, amongst others, the avoidance of highly sensitive features within the project site by the development footprint and the undertaking of monitoring, as specified by the specialists, as well as the operation of the thermal facility as part of a hybrid system together with the PV facilities in order to reduce GHG emissions.

The potential environmental impacts associated with Thermal facility identified and assessed through the EIA process include:

- Impacts on ecology, flora and fauna.
- Impacts on avifauna.
- Impacts on freshwater.
- Impacts on soils and agricultural potential
- Impacts on heritage resources, including archaeology and palaeontology.
- Visual impacts on the area imposed by the components of the facility.
- Positive and negative socio- economic impacts.
- Traffic impacts.
- Impact on air quality and climate change.
- Impacts associated with unexpected events.

10.1.1 Impacts on Ecology

The Terrestrial Biodiversity Assessment (**Appendix D**) verified the results of previous field and desktop assessments undertaken for the project site (Todd, 2020). The project site has a moderate abundance of *Vachellia erioloba* with a high abundance of *Vachellia haematoxylon,* especially within the southern half of the authorised Hyperion PV1&2 footprint, which are species protected under the National Forest Act. If no mitigation measures are implemented, the impact on floral and faunal habitat, diversity and species of concern is likely to be of medium significance. With mitigation measures in place, the impact significance can be reduced to low significance. The assessment concluded that the loss of habitat from the proposed development will not result in significant impacts on floral and faunal communities given that biodiversity outside of the direct footprint is preserved through strict adherence to mitigation measures, although cumulative habitat loss in the greater region area must be considered.

10.1.2 Impacts on Avifauna

The Avifaunal Assessment (**Appendix E**) verified the results of previous field and desktop assessments undertaken for the project site (Todd, 2019). If no mitigation measures are implemented, the impact on avifaunal habitat, diversity and species of concern is likely to be of medium significance. With mitigation measures in place, the impact significance can be reduced to low significance. In terms of development implications, the loss of habitat from the proposed development will not result in significant impacts on the avifaunal community within the focus and no impacts on a National or Regional scale are anticipated to permeate from the Thermal Plant.

10.1.3 Impacts on Freshwater

The Freshwater Assessment (**Appendix F**) concluded that there are no watercourses within the proposed development footprint. However, 2 watercourses were identified in the surrounding area, namely the Vlermuisleegte River and a perched depression wetland within the project area. Based on the outcome of the impact assessment, the proposed Hyperion hybrid generation facility is not expected to pose a direct negative impact to the identified Vlermuisleegte River and perched depression wetland. This can be attributed to the distance the proposed Hyperion hybrid generation facility (located at least 420 m from the edge of the river and 522 m from the edge of the perched depression wetland) is located from the watercourses. The proposed upgraded access road is located immediately adjacent to the delineated extent of the Vlermuisleegte River. As such, the construction of the road may pose a direct negative impact to the Vlermuisleegte River. It is highly recommended that the width of the road be extended to the western side of the existing road reserve rather than to the east thereof (if considered technically feasible). This will reduce the impact significance of the proposed access road construction activities on the Vlermuisleegte River. During the operational phase of the access road, if the recommended mitigation measures are implemented, the impacts significance would be low.

10.1.4 Impacts on Land Use, Soil and Agricultural Potential

The Soils and Agricultural Potential Compliance Statement (**Appendix G**) indicated that the Thermal Plant and northern part of the access road consist of land with Low-Moderate land capability. The assessment concluded that the construction and operation of the Thermal plant and upgraded access road will have impacts that range from medium to low. Through the consistent implementation of the recommended mitigation measures, most of impacts can all be reduced to low. Since the area around the plant will be

fenced off, it is not anticipated that the impact on livestock farming can be mitigated as this area together with the access road alignment, will now be excluded from livestock farming.

The development is considered to be favorable, providing that the mitigation measures are followed to prevent soil erosion and soil pollution and to minimise impacts on the veld quality of the farm portions that will be affected. The project infrastructure should also remain within the proposed footprint boundaries that will be fenced off and the construction corridor around the access road must be as narrow as possible.

10.1.5 Visual Impacts

The Visual Impact Assessment (**Appendix J**) undertaken determined that the visibility of the proposed engine houses and lower infrastructure is likely to be limited and will be similar to the authorised solar power projects within and adjacent to which the proposed thermal facility is located. The proposed stacks are however likely to be visible over a broader area and could influence the landscape character as experienced by the majority of receptors.

The proposed project will not result in removal of significant areas of vegetation over and above that removed for the authorised solar projects. Vegetation remaining between the project and possible receptors is likely to mean that this removal of vegetation will not be obvious.

At night lighting could make the development obvious in the landscape. This will be seen against the backdrop of other projects in the area. The general area is not a pristine night time landscape as lighting is also likely to be obvious from mining operations as well as the Kathu Airport. However, the area immediately around the project is relatively dark with only homesteads providing isolated low level lighting.

The proposed access road upgrade will result in a degree of vegetation removal. The formalisation of this road will also be obvious from a small number of homesteads.

Identified visual impacts were all assessed as low significance and can be further reduced with implementation for appropriate mitigation measures. From a landscape and visual impact perspective the specialist concluded that the proposed development ought to be authorised.

10.1.6 Impacts on Heritage Resources (archaeological and paleontological)

The main issue for this project from a heritage perspective will be the potential to intersect archaeological resources during excavations for both the generator and the road (**Appendix H**). The impact significance was determined to be high however, with appropriate mitigation, the impacts can be easily managed and reduced to low significance. Also, a scientific benefit could even be derived with successful description and rescue of heritage materials.

In the paleontological assessment the impact significance without mitigation in terms of local fossil heritage resources is assessed as low (negative). Pending the potential exposure of scientifically important fossil remains before or during the construction phase, no further specialist palaeontological studies or mitigation are recommended.

The specialist study recommended that the proposed generator and access road should be authorised from an archaeological perspective with the implementation of the recommended mitigation measures.

10.1.7 Social Impacts

The Social Impact Assessment (**Appendix K**) indicated 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 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 findings of the assessment also indicates that the potential negative impacts associated with both the construction and operational phase are likely to be Low Negative with mitigation. It was concluded by the specialist that the development of the proposed Hyperion hybrid thermal dual fuel project is supported from a social perspective.

10.1.8 Traffic Impacts

The Traffic Impact Assessment (**Appendix M**) identified that the main potential traffic impacts will occur during the construction and decommissioning phases where the delivery and decommissioning of the components of the proposed facility will generate significant traffic. The duration of these phases is short term, i.e. the impact of the traffic generated during the construction and decommissioning phases of the proposed facility on the surrounding road network is temporary, and will be low significance with implementation of mitigation measures. The operational phase of the proposed facility, which includes the delivery of LPG to the site, will not add any significant traffic to the road network.

Based on the outcome of the assessment, the impacts associated with the thermal plant and upgraded access road are considered acceptable from a traffic impact perspective with the implementation of the recommended mitigation measures and the specialist concluded that it can therefore be authorised.

10.1.9 Air Quality and Climate Change Impacts

The Air Quality and Climate Change Assessment (**Appendix I**) assessed baseline air quality at the site for thoracic particulates (with a diameter less than 10 µm – PM10), inhalable particulates (with an aerodynamic diameter less than 2.5 µm – $PM_{2.5}$), sulfur dioxide (SO2) and nitrogen dioxide (NO_2) using data for the period 2018 to 2020. The impact of the facility was simulated to be below the dust control regulations near the thermal power generation facility, but exceedances of the dust control regulations are likely along the access road used for LPG delivery.

Criteria air pollutants associated with the normal operation of the project were determined to be of medium significance, however, could be reduced to low significance with additional mitigation to along the access road. The greenhouse gas emissions associated with the operation of project was determined to be of medium significance.

From an air quality and climate change perspective, it is the opinion of the specialist that the Thermal Plant be authorised and licensed to operate on condition that all recommendations are implemented.

10.1.10 Assessment of Unexpected Events

The main risks identified for the Thermal Plant in the Quantitative Risk Assessment (**Appendix L**) due to loss of containment of hazardous components include exposure to, thermal radiation from fires and overpressure from explosions. Most of the surrounding land has not been developed, and thus limited impacts would be experienced from a large release of LPG within these areas. Impacts into the residential areas, recreational areas, hotels, schools, hospitals and other public placeswould not be expected. Impacts assessed for the LPG installations were determined to be of low significance.

No fatal flaws were identified that would prevent the project proceeding to the detailed engineering phase of the project and the specialist concluded that they would support the project provided that a Major Hazard Installation (MHI) risk assessment is completed prior to construction of the Thermal plant.

10.1.11 Assessment of Cumulative Impacts

Based on the specialist cumulative assessment and findings (refer to **Appendix D** to **Appendix M** and Chapter 9 of the EIA), the development of Thermal plant and upgraded access road and its contribution to the overall impact of all existing and proposed solar energy facilities and other industrial activities within a 30km radius, it can be concluded that cumulative impacts in the area will be of a low to moderate to high significance, depending on the impact being considered. There are however no impacts or risks identified to be considered as unacceptable with the development of Thermal plant and upgraded access road when considered together with other developments within the surrounding area. In addition, no impacts which will result in whole-scale change are expected.

10.2. Environmental Sensitivity Mapping

As part of the specialist investigations undertaken within the project site, specific environmental features and areas were identified which will be impacted by the placement of the thermal plant and upgraded access road. The current condition of the features identified (i.e. intact or disturbed) informed the sensitivity of the environmental features and the capacity for disturbance and change associated with the proposed development. The environmental sensitivity features and areas identified within the thermal plant development area are illustrated in **Figure 10.1**. The sensitive features identified specifically relate to ecology and freshwater resources, and are detailed below:

i. The proposed upgraded access road is located within an ESA along the Vlermuisleegte River. Protected tree species *V. erioloba* trees *V. erioloba* occur within the development site.
ii. The Vlermuisleegte River is considered to be largely natural according to the Present Ecological State (PES), and is classified as moderately modified (Class C). A 32m Zone of Regulation buffer has been placed around the river.

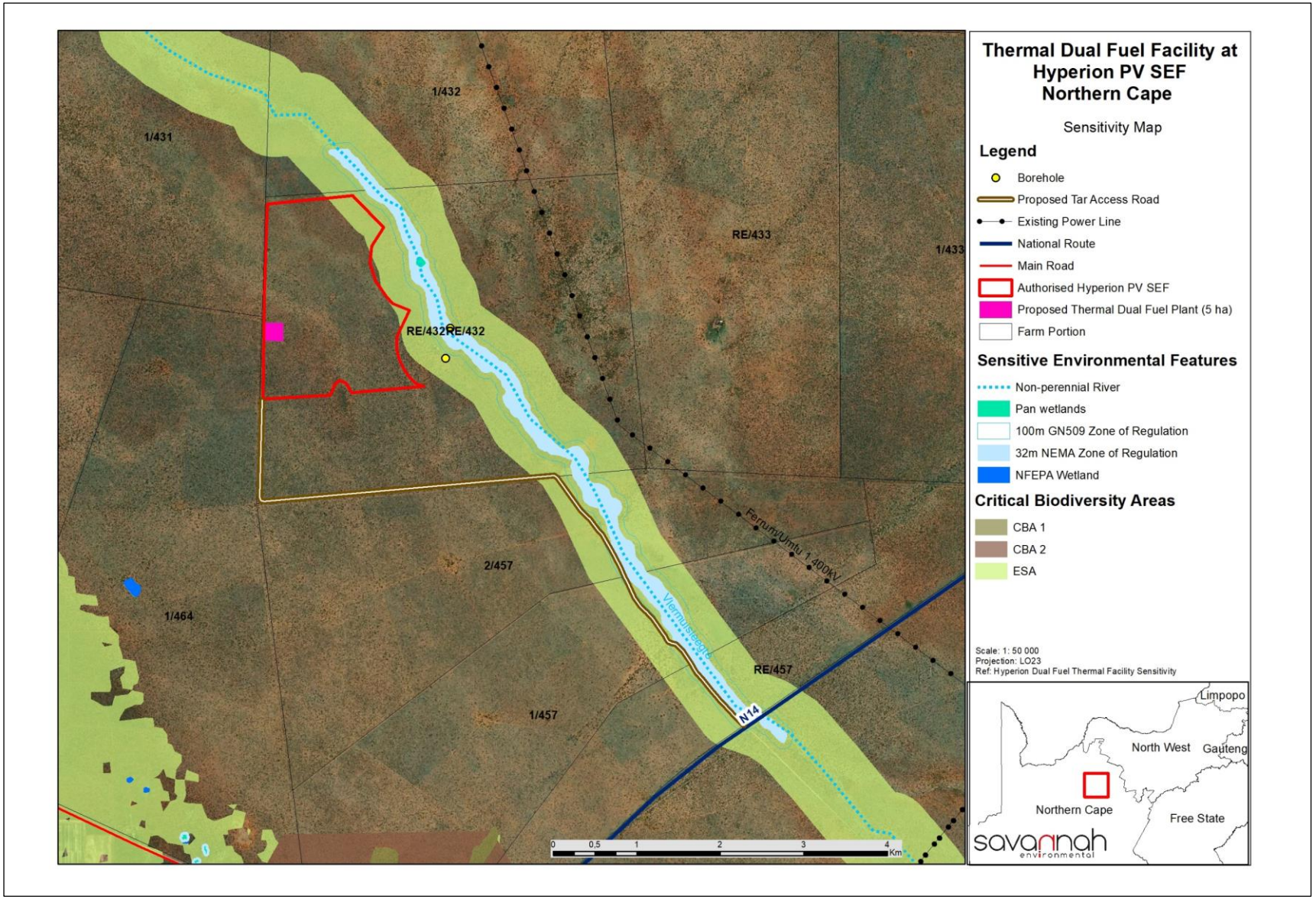

Figure 10.1: Environmental sensitivity map of the project site overlain by the layout assessed for Thermal Plant and upgraded access road

10.4. Overall Conclusion (Impact Statement)

The construction and operation of a thermal plant with a contracted capacity of up 75MW and upgrade of the existing access road on a project site located near Kathu in the Gamagara Local Municipality, and the greater John Taolo Gaetsewe District Municipality has been proposed by Hyperion Solar Hybrid (Pty) Ltd. A technically viable project site and development footprint was proposed by the developer and assessed as part of the EIA process. The environmental assessment of the development footprint within the project site was undertaken by independent specialists and their findings have informed the results of this EIA Report.

The specialist findings have indicated that there are no identified environmental fatal flaws associated with the implementation of Thermal Plant and upgrade of the proposed access road within the authorised Hyperion PV1&2 project site. The developer has proposed a technically viable and suitable layout for the project and associated infrastructure which has been assessed as part of the independent specialist studies. Through this assessment the preferred development footprint from an environmental perspective has been identified and assigned as part of the layout map for the project. No very high and high environmental sensitivity areas were identified within the thermal plant and access road development footprints and therefore the placement of the infrastructure minimises impacts as far as possible. The layout is therefore considered as the most appropriate from an environmental perspective and is considered to be acceptable within all fields of specialist study undertaken for the project. All impacts associated with the preferred layout can be mitigated to acceptable levels or enhanced through the implementation of the recommended mitigation or enhancement measures. The layout map (including the details of the project) is included as **Figure 10.4** and is considered to be the preferred layout for the Thermal Plant as part of the Hyperion Hybrid Facility.

Through the assessment of the development of the Thermal Plant within the project site it can be concluded that the development of the facility is environmentally acceptable (subject to the implementation of the recommended mitigation measures).

10.5. Overall Recommendation

Considering the findings of the independent specialist studies, the impacts identified, the development footprint proposed by the developer which avoids all identified highly sensitive environmental features within the project site, as well as the potential to further minimise the impacts to acceptable levels through mitigation, it is the reasoned opinion of the EAP that the development of the Thermal Plant as part of the Hyperion Hybrid Facility, and upgrading of the access road is acceptable within the landscape and can reasonably be authorised (**Figure 10.4**). The recommended validity period for the environmental authorisation is 10 years.

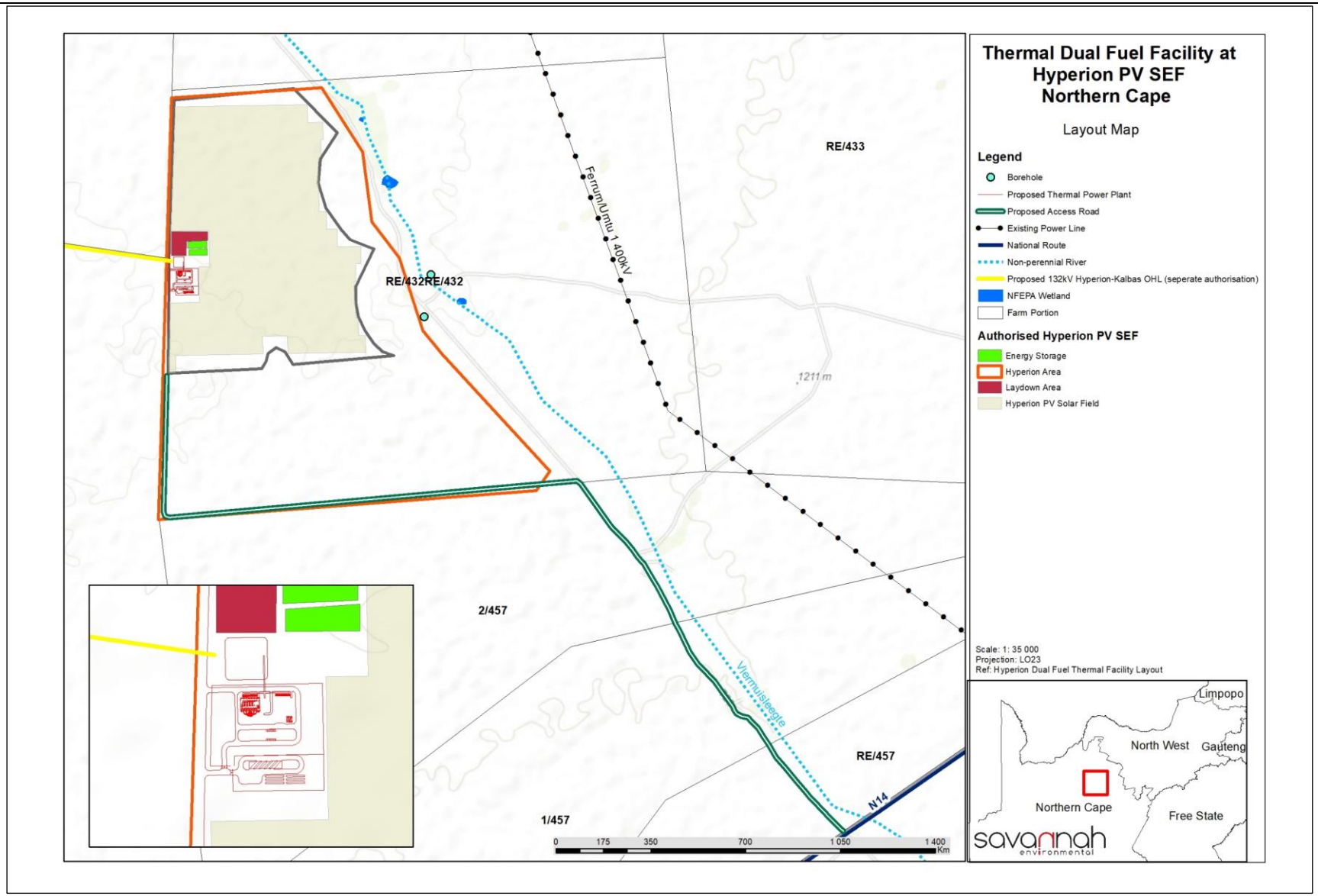

Figure 10.4: Layout map of the preferred development footprint for thermal plant and upgraded access road, as was assessed as part of the EIA process (A3 map included in **Appendix N**)

The authorisation would include the following key infrastructure and components:

- 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
- Cabling, O&M building, fencing, warehouses and workshops

The following key conditions would be required to be included within an authorisation issued for the Thermal Facility:

- All mitigation measures detailed within this EIA Report, as well as the specialist reports contained within **Appendices D to M**, are to be implemented.
- The EMPr as contained within **Appendix N** of this EIA Report should form part of the contract with the Contractors appointed to construct and maintain the Thermal facility in order to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of project is considered key in achieving the appropriate environmental management standards as detailed for this project.
- A pre-construction walk-through of the final development footprint for species of conservation concern that would be affected and that can be translocated as well as comply with the Northern Cape Nature Conservation Act and DAEARD&LR/DEFF permit conditions, must be undertaken prior to the commencement of the construction phase.
- Before construction commences individuals of listed species within the development footprint that would be affected, must be counted and marked and translocated, where deemed necessary by the ecologist conducting the pre-construction walk-through survey. Permits from the relevant provincial authorities, i.e. the Northern Cape DAEARD&LR, must be obtained before the individuals are disturbed.
- The project footprint must be kept as small as possible.
- Width of the road adjacent to the Vlermuisleegte River be extended to the western side of the existing road reserve rather than to the east thereof (if technically feasible)
- An alien vegetation management plan should be compiled during the planning phase and implemented concurrently with the commencement of construction. Regular inspection for alien and invasive vegetation along the road should occur, to limit their spread into the river.
- Once geotechnical work has been done on the site an archaeologist should be appointed to conduct test excavations and sampling of the archaeology in areas where in situ gravel will be intersected by foundations, cable trenches and/or access road. This work should aim primarily to understand the distribution of archaeology on the landscape, although if any dense archaeology is encountered it may be necessary to expand excavations.

A chance find procedure must be developed and implemented in the event that archaeological or palaeontological resources are found. In the case where the proposed development activities bring these materials to the surface, work must cease and SAHRA must be contacted immediately.

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