NAMAS WIND FARM

Northern Cape Province
Basic Assessment Report
October 2018

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PROJECT DETAILS

Title	:	Environmental Impact Assessment Process: Basic Assessment Report for the Namas Wind Farm and Associated Infrastructure, Northern Cape Province
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When used as a reference this report should be cited as: Savannah Environmental (2018) Basic Assessment Report for the Namas Wind Farm and Associated Infrastructure, Northern Cape Province.

PURPOSE OF THE BASIC ASSESSMENT REPORT AND INVITATION TO COMMENT

Genesis Namas Wind (Pty) Ltd has appointed Savannah Environmental as the independent environmental consultant to undertake the Basic Assessment (BA) for the Namas Wind Farm, Northern Cape. The BA process is being undertaken in accordance with the requirements of the 2014 EIA Regulations promulgated in terms of the National Environmental Management Act (NEMA; Act No. 107 of 1998). Due to the geographical location of the project site within the Springbok REDZ, one of the eight designated REDZ areas, the Namas Wind Farm is now subject to a Basic Assessment (BA) and not a full EIA process, as well as a shortened timeframe of 57 days for the processing of an Application for Environmental Authorisation. The procedure to be followed in applying for environmental authorisation for a large-scale renewable energy project within a REDZ was formally gazetted on 16 February 2018 (in Government Notice (GN) 113 and GN114). The undertaking of a basic assessment process for the project is in-line with the requirements stated in GNR 114 of 16 February 2018.

This Basic Assessment (BA) report represents the findings of the BA process and contains the following chapters:

» **Chapter 1** provides background to the Namas Wind Farm and the basic assessment process.
» **Chapter 2** provides a description of the wind farm.
» **Chapter 3** provides the site selection information and identified project alternatives.
» **Chapter 4** describes wind energy as a power generation option and provides insight to technologies for wind energy.
» **Chapter 5** outlines the strategic regulatory and legal context for energy planning in South Africa and specifically for the wind farm.
» **Chapter 6** describes the need and desirability of the Namas Wind Farm within the preferred project site.
» **Chapter 7** outlines the approach to undertaking the basic assessment process.
» **Chapter 8** describes the existing biophysical and socio-economic environment within and surrounding the preferred project site proposed for the development.
» **Chapter 9** provides an assessment of the potential issues and impacts associated with the wind farm and presents recommendations for the mitigation of significant impacts.
» **Chapter 10** provides an assessment of the potential for cumulative impacts.
» **Chapter 11** presents the conclusions and recommendations based on the findings of the BA report.
» **Chapter 12** provides references used in the compilation of the BA Report.

The BA report is available for review from **25 October 2018 – 23 November 2018** at the following locations:

» Kleinsee Public Library (3rd Avenue, Kleinsee)
» www.savannahSA.com

Please submit your comments by **23 November 2018** to:
Rozanne Els of **Savannah Environmental** PO Box 148, Sunninghill, 2157 Tel: 011-656-3237 Fax: 086-684-0547 Email: publicprocess@savannahsa.com

Comments can be made as written submission via fax, post or email.

EXECUTIVE SUMMARY

Genesis Namas Wind (Pty) Ltd is proposing the development of a 140MW wind farm and associated infrastructure on a site located approximately 20km south-east of Kleinsee. The wind farm is known as the Namas Wind Farm and is located within the Nama Khoi Local Municipality and the Namakwa District Municipality in the Northern Cape Province.

A preferred project site, consisting of 4 affected properties, has been identified by Genesis Namas Wind (Pty) Ltd for the development of a wind farm. The preferred project site has an extent of ~5092ha and is considered sufficient in extent (allowing sufficient space to avoid any major environmental sensitivities which may be identified within the site) and suitable for the development of up to 43 wind turbines from a technical perspective. The project site is located ~20km south-east of Kleinsee (Northern Cape), with the entire extent of the project site located within the Springbok REDZ. The wind farm is to be constructed within the project site, and together with the associated infrastructure, the wind farm will have a development footprint of less than 1% (~35.46ha) of the total project site. The wind farm is proposed within the following farm portions (**Figure 1**):

» Portion 3 of the Farm Zonnekwa 328
» Portion 4 of the Farm Zonnekwa 328
» Remaining Extent of the Farm Rooivlei 327
» Portion 3 of the Farm Rooivlei 327

The development footprint of the wind farm, to be located within the larger project site, will accommodate the wind turbines as well as the associated infrastructure. The grid connection required in order to connect the facility to the national grid at the existing Gromis Substation will primarily be located outside of the project site, and will be assessed as part of a separate Basic Assessment process. The Namas Wind Farm will consist of the following components:

» Up to 43 wind turbines with a maximum hub height of up to 130m. The tip height of the turbines will be up to 205m;
» Concrete turbine foundations and turbine hardstands;
» Temporary laydown areas which will accommodate the storage and assembly area;
» Cabling between the turbines, to be laid underground where practical;
» An on-site substation of 100m x 100m to facilitate the connection between the wind farm and the electricity grid;
» Access roads to the site (with a width of up to 10m) and between project components (with a width of approximately 8m);
» A temporary concrete batching plant; and
» Operation and maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitors centre.

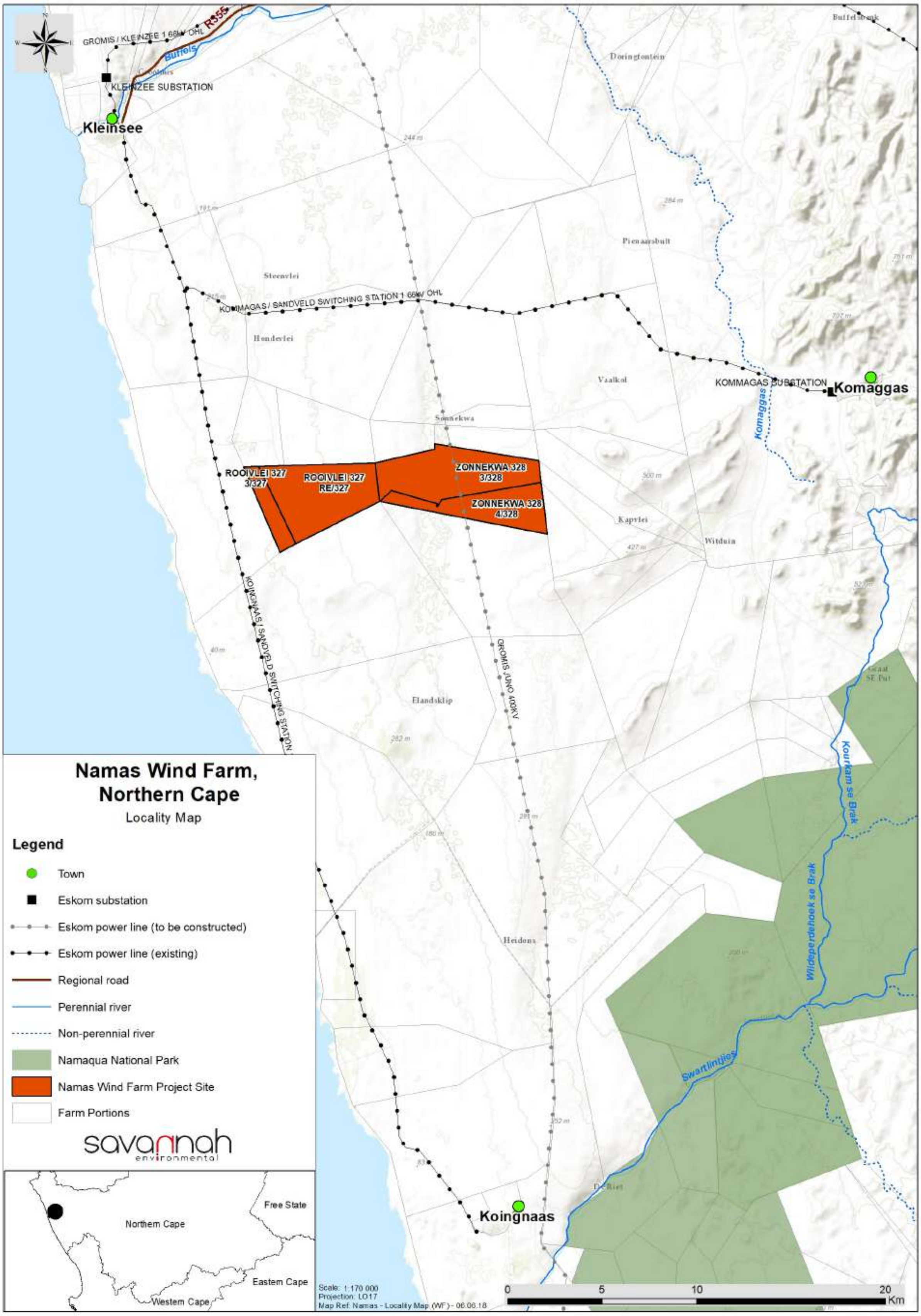

Figure 1: Locality map showing the location of the project site proposed for the development of the Namas Wind Farm

No environmental fatal flaws were identified in the detailed specialist studies conducted, provided that the recommended mitigation measures are implemented, for the Namas Wind Farm. These measures include, amongst others, the avoidance of sensitive features within the development footprint and the undertaking of the construction and operational monitoring, as specified by the specialists. The development footprint was designed by the project developer in order to respond to and avoid the sensitive environmental and social features located within the project site. This approach ensured the application of the mitigation hierarchy (i.e. avoid, minimise and offset) to the Namas Wind Farm project, which ultimately ensures that the development is appropriate from an environmental perspective and is suitable for development within the project site.

The potential environmental impacts associated with the Namas Wind Farm identified and assessed through the BA process include:

Ecological Impacts - Based on the nature and significance of the post-mitigation ecological impacts, the Namas Wind Farm project site is considered as a broadly suitable environment for wind farm development from an ecological perspective. There are no specific long-term impacts likely to be associated with the wind farm that cannot be reduced to an acceptable level through mitigation and avoidance, including a low post-mitigation impact on ESAs and CBAs. Consequently, there are no high residual impacts or fatal flaws associated with the development and it can be supported from a terrestrial ecology perspective. It is therefore the reasoned opinion of the specialist that the Namas Wind Farm should be authorised, subject to the implementation of the recommended mitigation measures.

Avifauna Impacts - From the results of the avifauna assessment, it can be concluded that no impacts of high significance will occur on the avifauna communities within the area and the project site. The avifauna impacts expected to occur include direct impact fatalities, as well as disturbance and loss of foraging habitat. The significance of the impacts on the three collision-prone Red Data species will be low following the implementation of the recommended mitigation measures of the specialists.

Impacts on Bats - Considering the findings of the bat pre-construction monitoring campaign and the impact assessment, it is concluded by the specialist that the development of the Namas Wind Farm is acceptable from a bat impact perspective, subject to the implementation of the recommended mitigation measures. During the construction phase, the impacts include the destruction of foraging habitat through the clearing of vegetation. During the operation phase the impacts to bats include bat mortalities due to direct impact or barotrauma caused by the wind turbines and an increase in bat mortalities due to increased insect numbers as a result of the light attraction caused by the wind farm.

Impacts on Land Use, Soil and Agricultural Potential - Following the assessment of the associated impacts, the specialist concluded that the proposed activities associated with the development of the Namas Wind Farm are acceptable from a soils perspective considering the characteristics and the potential of the soils present within the project site. The impacts associated with land use, soil and agricultural potential include the loss of agricultural land and soil erosion. Both of these impacts can be mitigated to a low significance with the implementation of the recommended mitigation measures.

Impacts on Heritage Resources - The heritage specialist concluded that the palaeontological and archaeological resources are the main concerns for the Namas Wind Farm, although fossils are less likely to be found than archaeological sites. While fossils would be revealed by excavations during construction, and would require reporting when found, archaeological sites will be readily located during a final pre-construction survey and can be rescued through archaeological excavation before construction starts. Impacts on palaeontological resources, archaeological resources and graves may occur during the construction phase should direct destruction or damage arise through the activities associated with excavations for foundations and trenches, or the clearing of land for roads, laydown areas and ancillary infrastructure.

Noise Impacts - The noise specialist concluded that the Namas Wind Farm could have a noise impact on the surrounding environment, however the impacts can be mitigated to a low significance. The increase in the noise levels is not considered to be a fatal flaw and the project is considered to be acceptable from a noise perspective. The construction phase of the wind farm will lead to an increase in the ambient sound level of more than 7dB during the daytime, or daytime rating levels higher than 52dBA. The operation phase of the wind farm will lead to an increase in the ambient sound level with more than 7dB during the daytime, or daytime rating levels higher than 52dBA.

Visual Impacts - The visual specialist concluded that the anticipated visual impacts on sensitive visual receptors in close proximity to the Namas Wind Farm remains high, but that the impact is not considered to be a fatal flaw. The specialist further concluded, that subject to the recommended mitigation measures being implemented, the proposed wind farm development may be supported regardless of the impacts and the significance thereof. The Visual Impact Assessment identified negative impacts on visual receptors during the undertaking of construction activities and during construction and operation of the Namas wind Farm. The visual impact decreases with increasing distance from the wind farm, but remains greatest within the first 5km of the wind farm.

Socio-Economic Impacts - The specialist concluded that the socio-economic benefits outweigh the negative socio-economic effects that the development of the Namas Wind Farm could create, and that there are no objections to the development of the Namas Wind Farm from a socio-economic perspective. The Socio-Economic Impact Assessment identified positive and negative impacts which are expected to occur during the construction, operation and decommissioning phases of the Namas Wind Farm.

Traffic Impacts - The specialist concluded that the development of the Namas Wind Farm is supported from a traffic engineering perspective, subject to the implementation of the stipulated recommendations. The Traffic Impact Assessment identified impacts expected to occur during the construction, operation and decommissioning phases.

Cumulative Impacts - The contribution of the development of the Namas Wind Farm to the overall impact of all wind energy facilities being considered within a 30km radius of the project site, will be of a medium to low significance, with no impacts of high significance anticipated. The development of the Namas Wind Farm will not result in unacceptable, high cumulative impacts and will not result in a whole-scale change of the environment.

Figure 2 provides an environmental sensitivity map of the development footprint assessed as part of the BA process, as well as the environmental sensitivities identified.

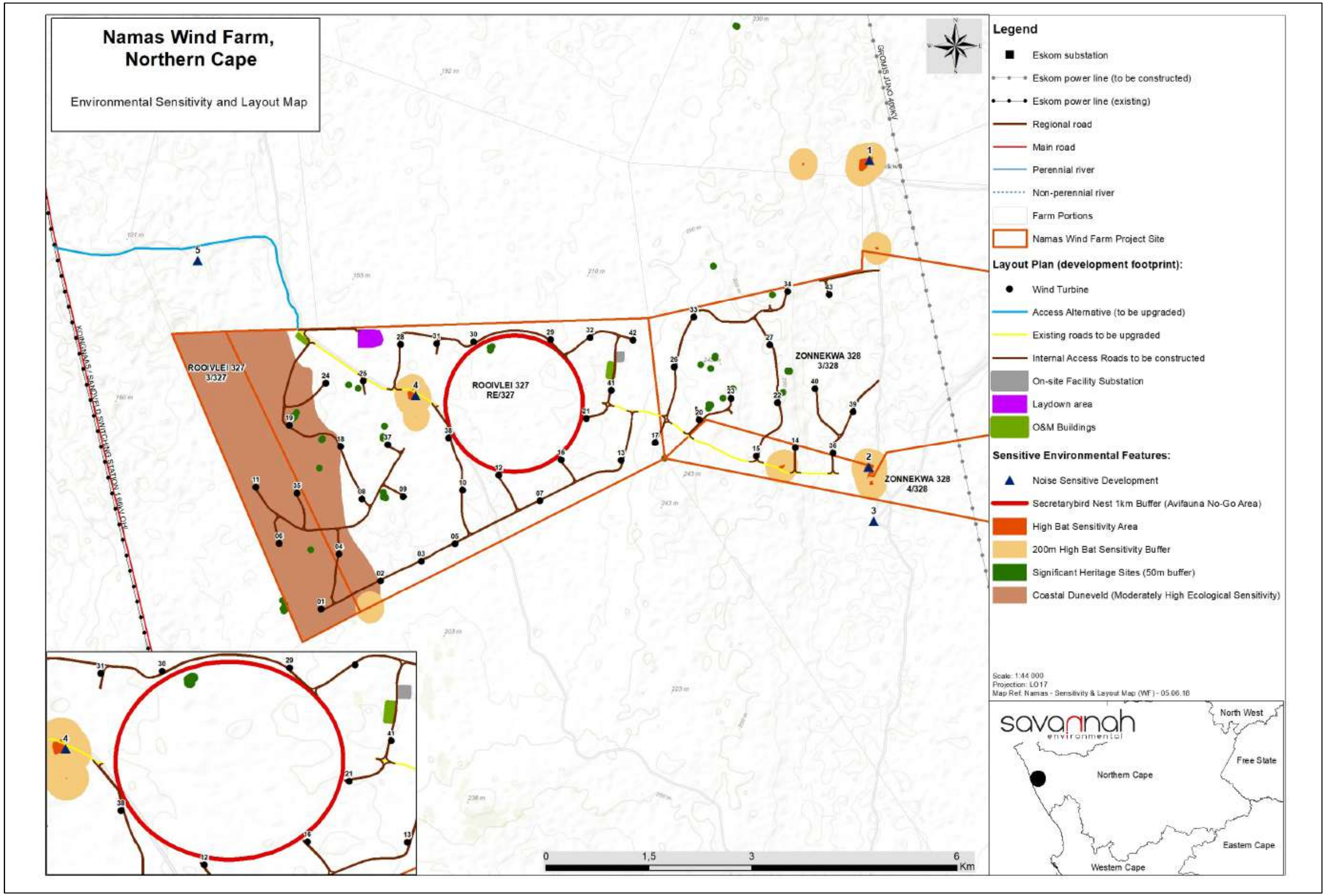

Figure 2: The development footprint (~35.46 ha) of the Namas Wind Farm overlain on the identified environmental sensitive features (refer to **Appendix N** for A3 map)

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.

Betz Limit: It is the flow of air over the blades and through the rotor area that makes a wind turbine function. The wind turbine extracts energy by slowing the wind down. The theoretical maximum amount of energy in the wind that can be collected by a wind turbine's rotor is approximately 59%. This value is known as the Betz Limit.

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.

Commercial Operation date: The date after which all testing and commissioning has been completed and is the initiation date to which the seller can start producing electricity for sale (i.e. when the project has been substantially completed).

Commissioning: Commissioning commences once construction is completed. Commissioning covers all activities including testing after all components of the wind turbine are installed.

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.

Cut-in speed: The minimum wind speed at which the wind turbine will generate usable power.

Cut-out speed: The wind speed at which shut down occurs.

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.

Generator: The generator is what converts the turning motion of a wind turbine's blades into electricity.

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

Nacelle: The nacelle contains the generator, control equipment, gearbox and anemometer for monitoring the wind speed and direction.

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.

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).

Rotor: The portion of the wind turbine that collects energy from the wind is called the rotor. The rotor converts the energy in the wind into rotational energy to turn the generator. The rotor has three blades that rotate at a constant speed of about 15 to 28 revolutions per minute (rpm).

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.

Tower: The tower, which supports the rotor, is constructed from tubular steel. It is between 80m and 120m tall. The nacelle and the rotor are attached to the top of the tower. The tower on which a wind turbine is mounted is not just a support structure. It also raises the wind turbine so that its blades safely clear the ground and so it can reach the stronger winds at higher elevations. The tower must be strong enough to support the wind turbine and to sustain vibration, wind loading and the overall weather elements for the lifetime of the wind turbine.

Wind power: A measure of the energy available in the wind.

Wind rose: The term given to the diagrammatic representation of joint wind speed and direction distribution at a particular location. The length of time that the wind comes from a particular sector is shown by the length of the spoke, and the speed is shown by the thickness of the spoke.

Wind speed: The rate at which air flows past a point above the earth's surface.

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CHAPTER 1: INTRODUCTION

Genesis Namas Wind (Pty) Ltd is proposing the development of a 140MW wind farm and associated infrastructure on a site located approximately 20km south-east of Kleinsee. The wind farm is known as the Namas Wind Farm and is located within the Nama Khoi Local Municipality and the Namakwa District Municipality in the Northern Cape Province.

The development of the wind farm is in response to identified objectives of the national and provincial government, and local and district municipalities to develop renewable energy facilities for power generation purposes. The Namas Wind Farm will have the potential to add an additional 140MW[1] of power to the national grid. The project site proposed for the development is located within the Springbok Renewable Energy Development Zone (REDZ), a zone identified by the Department of Environmental Affairs as a geographical area of strategic importance for the development of large scale wind and solar photovoltaic energy development activities, and which has been earmarked for the development of renewable energy facilities within South Africa (as per GNR114 of February 2018). From a regional perspective, this area is also considered favourable for the development of a wind farm due to the availability of wind (i.e. the fuel source), wind characteristics (including speed), availability of suitable land (extent and topography of the site), and the availability of a direct grid connection (i.e. point of connection to the Eskom National grid)[2].

It is the developer's intention to bid the Namas Wind Farm under the Department of Energy's (DoE) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme with the aim of evacuating the generated power into the Eskom national electricity grid and aiding in the diversification and stabilisation of the country's electricity supply, in line with the objectives of the Integrated Resource Plan (IRP).

The nature and extent of the wind farm, as well as the potential environmental impacts associated with the construction, operation and decommissioning phases of a facility of this nature are explored in detail in this Basic Assessment Report. Site specific environmental issues and constraints are considered within independent specialist studies in order to test the environmental suitability of the preferred project site for the wind farm, delineate areas of sensitivity within the project site, and ultimately inform the placement of the wind turbines and associated infrastructure (excluding the associated 132kV power line).

This Basic Assessment (BA) report consists of the following sections:

» **Chapter 1** provides background to the Namas Wind Farm and the basic assessment process.
» **Chapter 2** provides a description of the wind farm.
» **Chapter 3** provides the site selection information and identified project alternatives.

[1] The Namas Wind Farm will have a contracted capacity of up to 140MW.

[2] The Namas Wind Farm will be connected to the existing Gromis Substation located to the north of the project site. The assessment of the 132kV power line will be undertaken as a separate Basic Assessment Process and will be authorised under a separate application for Environmental Authorisation.

- **Chapter 4** describes wind energy as a power generation option and provides insight to technologies for wind energy.
- **Chapter 5** outlines the strategic regulatory and legal context for energy planning in South Africa and specifically for the wind farm.
- **Chapter 6** describes the need and desirability of the Namas Wind Farm within the preferred project site.
- **Chapter 7** outlines the approach to undertaking the basic assessment process.
- **Chapter 8** describes the existing biophysical and socio-economic environment within and surrounding the preferred project site proposed for the development.
- **Chapter 9** provides an assessment of the potential issues and impacts associated with the wind farm and presents recommendations for the mitigation of significant impacts.
- **Chapter 10** provides an assessment of the potential for cumulative impacts.
- **Chapter 11** presents the conclusions and recommendations based on the findings of the BA report.
- **Chapter 12** provides references used in the compilation of the BA Report.

1.1 Requirements for an Environmental Impact Assessment Process

The construction and operation of the Namas Wind Farm is subject to the requirements of the EIA Regulations, 2014 (as amended), published in terms of Section 24(5) of the National Environmental Management Act (NEMA) 107 of 1998. NEMA is the national legislation that provides for the authorisation of certain controlled activities known as "listed activities". In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these 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 environmental authorisation.

The development (i.e. construction and operation) of the proposed Namas Wind Farm is subject to the requirements of the Environmental Impact Assessment (EIA) Regulations of 2014 published in terms of Section 24(5) of NEMA. In terms of the EIA Regulations of 2014 (as amended on 07 April 2017) promulgated under Sections 24 and 24D of the NEMA, various aspects of the project are listed as activities that may have a detrimental impact on the environment. The main listed activity triggered by the proposed facility is Activity 1 of Listing Notice 2 (GN R 325), which relates to the development of facilities or infrastructure for the generation of electricity from a renewable resource where the generating capacity is 20 megawatts or more. The wind farm will have a contracted capacity of up to 140MW.

Due to the geographical location of the project site within the Springbok REDZ, one of the eight designated REDZ areas, the Namas Wind Farm is now subject to a Basic Assessment (BA) and not a full EIA process, as well as a shortened timeframe of 57 days for the processing of an Application for Environmental Authorisation. The procedure to be followed in applying for environmental authorisation for a large-scale renewable energy project within a REDZ was formally gazetted on 16 February 2018 (in Government Notice (GN) 113 and GN114). The undertaking of a basic assessment process for the project is in-line with the requirements stated in GNR 114 of 16 February 2018, which states the following:

"Applications for environmental authorisation for large scale wind or solar photovoltaic energy facilities, when such facilities trigger activity 1 of Environmental Impact Assessment Regulations Listing Notice 2 of 2014 and any other listed and specified activities necessary for the realisation of such facilities, and where the entire proposed facility is to occur in such Renewable Energy Development Zones (REDZ), must follow the basic assessment procedure contemplated in Regulation 19 and 20 of the Environmental Impact

Assessment Regulations, 2014, in order to obtain environmental authorisation, as required in terms of the Act."

The undertaking of the basic assessment process for the Namas Wind Farm is therefore supported by the above Government Notice. This Basic Assessment report (hereafter referred to as the BA Report) is also undertaken in line with Appendix 1 of the EIA Regulations, 2014 (as amended). Genesis Namas Wind (Pty) Ltd appointed Savannah Environmental as the independent environmental consultants to conduct the BA process for the wind farm.

A BA is an effective planning and decision-making tool for the project developer as it allows for the identification and management of potential environmental impacts. It provides the opportunity for the developer to be forewarned of potential environmental issues, and allows for resolution of the issues reported on in the BA report as well as dialogue with interested and affected parties (I&APs).

The BA process comprises one phase and involves the identification and assessment of environmental impacts though specialist studies, as well as public participation. The process followed in the Basic Assessment involves a detailed assessment of potentially significant positive and negative impacts (direct, indirect, and cumulative). This includes detailed specialist investigations and one round of public consultation. Following the public review period of the BA report and Environmental Management Programme (EMPr), a final BA Report and an EMPr is submitted to the Competent Authority, which includes the recommendations for practical and achievable mitigation and management measures for final review and decision-making.

The need to comply with the requirements of the EIA Regulations ensures that the competent authority is provided with the opportunity to consider the potential environmental impacts of a project early in the project development process and to assess if potential environmental impacts can be avoided, minimised or mitigated to acceptable levels. Environmental issues are considered through specialist assessments in order to: test the environmental suitability of the project site for the proposed development, delineate areas of sensitivity within the project site, and ultimately inform the placement of the project components of the Namas Wind Farm and associated infrastructure within the project site. Site specific specialist assessments of the project site, and specifically the proposed development footprint have been undertaken during the BA process. Comprehensive, independent environmental studies are required in accordance with the EIA Regulations to provide the Competent Authority with sufficient information in order to make an informed decision.

In terms of GNR 779 of 01 July 2016, the National Department of Environmental Affairs (DEA) has been determined as the Competent Authority for all projects which relate to the Integrated Resource Plan for Electricity (IRP) 2010 – 2030, and any updates thereto. Through the decision-making process, the DEA will be supported by the Northern Cape Department of Environment and Nature Conservation (DENC) as a commenting authority.

The nature and extent of this wind farm, as well as potential environmental impacts and mitigation associated with the construction, operation and decommissioning phases of a development of this nature are explored in more detail in this Basic Assessment Report.

1.2 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This BA report has been prepared in accordance with the requirements of the EIA Regulations published on 08 December 2014 (as amended in April 2017) promulgated in terms of Chapter 5 of the National Environmental Management Act (Act No 107 of 1998). This chapter of the BA report includes the following information required in terms of Appendix 1: Content of basic assessment reports:

Requirement	Relevant Section
3(a) the details of the (i) EAP who prepared the report and (ii) the expertise of the EAP, including a curriculum vitae.	The details of the EAP who prepared the report and the expertise of the EAP is included in section 1.5. The curriculum vitae of the EAP, project team and independent specialists are included in **Appendix A**.
3(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 co-ordinates of the boundary of the property or properties.	The location of the Namas Wind Farm is included in section 1.3, Table 1.1 and Figure 1.1. The information provided includes the 21-digit Surveyor General code of the affected properties and the farm names. Additional information is also provided regarding the location of the development which includes the relevant province, local and district municipalities, ward and current land zoning.

1.3 Overview of the Namas Wind Farm

Genesis Namas Wind (Pty) Ltd is proposing the establishment of the Namas Wind Farm to add new capacity to the national electricity grid. The project is proposed to be part of the Department of Energy's (DoE) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme and is expected to be bid in the next available bidding window. Should the project be selected by the DoE for implementation, the Namas Wind Farm will be required to apply for a generation license from the National Energy Regulator of South Africa (NERSA), as well as sign a power purchase agreement (PPA) with Eskom (typically for a period of 20 - 25 years) in order to build and operate the wind farm. As part of the PPA, Genesis Namas Wind (Pty) Ltd will be remunerated by Eskom per kWh. Depending on the economic conditions following the lapse of the 20-25 year period, the wind farm can either be decommissioned or the PPA may be renegotiated and extended.

A preferred project site, consisting of 4 affected properties[3], has been identified by Genesis Namas Wind (Pty) Ltd for the development of a wind farm. The preferred project site has an extent of ~5092ha and is considered sufficient in extent (allowing sufficient space to avoid any major environmental sensitivities which may be identified within the site) and suitable for the development of up to 43 wind turbines from a technical perspective. The project site is located ~20km south-east of Kleinsee (Northern Cape), with the entire extent of the project site located within the Springbok REDZ. The wind farm is to be constructed within the project site, and together with the associated infrastructure, the wind farm will have a

[3] The 4 affected properties included as part of the Namas Wind Farm are collectively known as the project site.

development footprint of less than 1% (~35.46ha) of the total project site[4]. The wind farm is proposed within the following farm portions (**Figure 1.1** and **Table 1.1**):

» Portion 3 of the Farm Zonnekwa 328
» Portion 4 of the Farm Zonnekwa 328
» Remaining Extent of the Farm Rooivlei 327
» Portion 3 of the Farm Rooivlei 327

The development footprint of the wind farm, to be located within the larger project site, will accommodate the wind turbines as well as the associated infrastructure. The grid connection required in order to connect the facility to the national grid at the existing Gromis Substation will primarily be located outside of the project site, and will be assessed as part of a separate Basic Assessment process. The Namas Wind Farm will consist of the following components:

» Up to 43 wind turbines with a maximum hub height of up to 130m. The tip height of the turbines will be up to 205m;
» Concrete turbine foundations and turbine hardstands;
» Temporary laydown areas which will accommodate the storage and assembly area;
» Cabling between the turbines, to be laid underground where practical;
» An on-site substation of 100m x 100m to facilitate the connection between the wind farm and the electricity grid;
» Access roads to the site (with a width of up to 10m) and between project components (with a width of approximately 8m);
» A temporary concrete batching plant; and
» Operation and maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitors centre.

The key infrastructure components proposed as part of the facility are described in greater detail in Chapter 2 of this BA Report.

Genesis Namas Wind (Pty) Ltd has confirmed that the project site is particularly suitable for wind energy development from a technical perspective due to the strength of the prevailing wind resources, access to the electricity grid, current land use and land availability (refer to Chapter 2 for further details). Genesis Namas Wind (Pty) Ltd has been measuring the wind resource at the project site since May 2017 and has determined that the wind resource is feasible for the development of a wind farm. Depending on the final turbine selection, the estimated total contracted capacity for the wind farm is up to 140MW.

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4 The development footprint of the Namas Wind Farm will be located within the 5092ha project site and will be a much smaller area within which the wind turbines and associated infrastructure (excluding the 300m power line corridor within which the new 132kV power line is proposed) will be constructed and operated in. The development footprint has been subject to detailed design by the developer through the consideration of sensitive environmental features which need to be avoided by the wind farm.

Table 1.1: A detailed description of the Namas Wind Farm project site

Province	Northern Cape Province
District Municipality	Namakwa District Municipality
Local Municipality	Nama Khoi Local Municipality
Ward number(s)	8
Nearest town(s)	Kleinsee (~20km north-west), Komaggas (~19km east) and Koingnaas (~37km south)
Affected Properties: Farm name(s), number(s) and portion numbers	**Namas Wind Farm:** » Portion 3 of the Farm Zonnekwa 328 » Portion 4 of the Farm Zonnekwa 328 » Remaining Extent of the Farm Rooivlei 327 » Portion 3 of the Farm Rooivlei 327
SG 21 Digit Code (s)	**Namas Wind Farm:** » Portion 3 of the Farm Zonnekwa 328 - C05300000000032800003 » Portion 4 of the Farm Zonnekwa 328 - C05300000000032800004 » Remaining Extent of the Farm Rooivlei 327 - C05300000000032700000 » Portion 3 of the Farm Rooivlei 327 - C05300000000032700003
Current zoning	Agricultural
Site co-ordinates (centre of affected properties)	**Namas Wind Farm:** » Portion 3 of the Farm Zonnekwa 328 - 29°50'21.10"S ; 17°15'35.90"E » Portion 4 of the Farm Zonnekwa 328 - 29°51'20.78"S ; 17°16'29.29"E » Remaining Extent of the Farm Rooivlei 327 - 29°50'54.07"S ; 17°11'12.96"E » Portion 3 of the Farm Rooivlei 327- 29°51'20.41"S ; 17° 9'27.75"E

The overarching objective for the planning process is to maximise electricity production through exposure to the wind resource, while minimising infrastructure, operational and maintenance costs, as well as social and environmental impacts. As local level environmental and planning issues were not assessed in sufficient detail through the regional level site identification process undertaken by the developer, these issues must now be considered within site-specific studies and assessments through the BA process in order to delineate areas of sensitivity within the broader project site and ultimately inform the placement of the wind turbines and associated infrastructure within areas considered suitable for development.

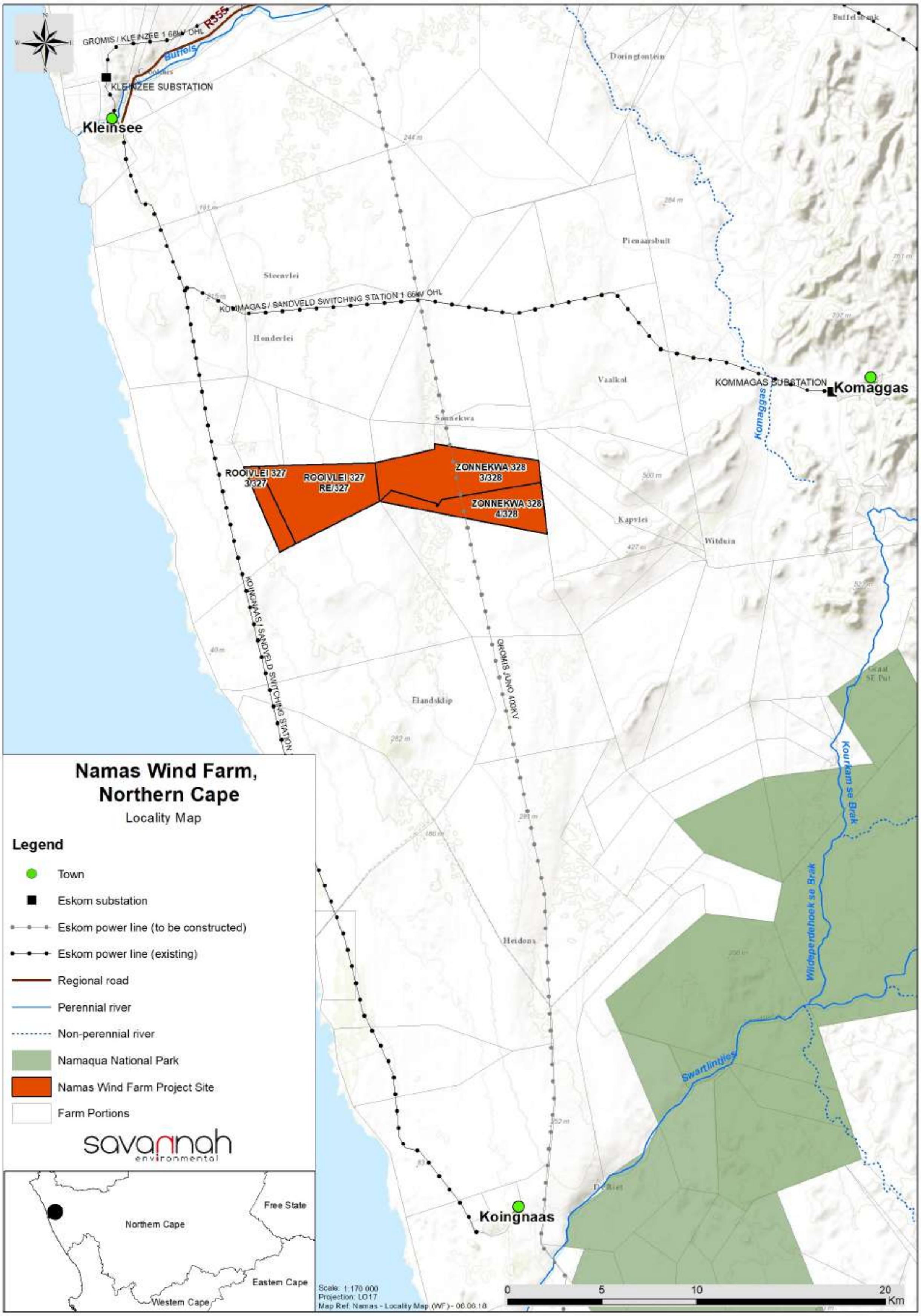

Figure 1.1: Locality map showing the location of the preferred project site proposed for the development of the Namas Wind Farm

1.4 Objectives of the Basic Assessment Process

Appendix 1 of the EIA Regulations, 2014 (as amended), contains the objectives to be achieved through the undertaking of a BA process. The following objectives have been considered, undertaken and achieved through a consultative process within this BA report for the Namas Wind Farm:

» The identification and consideration of the policies and legislative context associated with the location of the wind farm and the manner in which the proposed development complies with and responds to the relevant policies and legislative context.
» The identification and consideration of feasible alternatives associated with the Namas Wind Farm that relate to the specific proposed activity, the location of where the development is proposed and the technology considered to be installed and operated.
» The consideration of the need and the desirability of the Namas Wind Farm considering the alternatives identified, including the desirability for the development within the preferred project site.
» The identification and consideration of the nature, consequence, extent, duration and probability of the impacts associated with the Namas Wind Farm, as well as the degree to which the impacts can be reversed, result in irreplaceable loss of resources and be avoided, managed or mitigated.
» Motivation for the preferred project site, proposed activity and technology.
» Consideration and identification of the site sensitivities to also provide input in terms of measures to avoid, manage and mitigate the impacts and the residual risks that need to be managed and monitored.

The release of the BA report for a 30-day review period will provide stakeholders with an opportunity to review and provide input in terms of potential issues and concerns that may be associated with the establishment of the wind farm. The final BA report for submission to the DEA will consider and incorporate all issues, concerns and responses raised during the review period of the BA report. The DEA will also consider these issues, concerns and responses in their decision-making of the application for Environmental Authorisation.

1.5 Details of the Environmental Assessment Practitioner and Expertise to conduct the BA process

In accordance with Regulation 12 of the 2014 EIA Regulations (GNR 326), Genesis Namas Wind (Pty) Ltd has appointed Savannah Environmental (Pty) Ltd (Savannah Environmental) as the independent Environmental Assessment consultant to undertake the Basic Assessment and prepare the BA Report for the Namas Wind Farm. Neither Savannah Environmental nor any of its specialists are subsidiaries of, or are affiliated to Genesis Namas Wind. Furthermore, Savannah Environmental does not have any interests in secondary developments that may arise out of the authorisation of the proposed project.

Savannah Environmental is a specialist environmental consulting company providing a holistic environmental management service, including environmental assessment and planning to ensure compliance and evaluate the risk of development, and the development and implementation of environmental management tools. Savannah Environmental benefits from the pooled resources, diverse skills and experience in the environmental field held by its team.

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

» *Lisa Opperman*, the principle author of this report. She holds a Bachelor degree with Honours in Environmental Management and has 3 years of experience in the environmental field. Her key focus is on environmental impact assessments, public participation, environmental management plans and programmes, as well as mapping using ArcGIS for a variety of environmental projects. She is currently involved in several EIAs for renewable energy projects across the country.
» *Nicolene Venter* – 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.
» *Karen Jodas*, is a registered Professional Natural Scientist and holds a Master of Science degree. She has 20 years of experience consulting in the environmental field and is the EAP for the project. Her key focus is on strategic environmental assessment and advice; management and co-ordination of environmental projects, which includes integration of environmental studies and environmental processes into larger engineering-based projects and ensuring compliance to legislation and guidelines; compliance reporting; the identification of environmental management solutions and mitigation/risk minimising measures; and strategy and guideline development. She is currently responsible for the project management of EIAs for several renewable energy projects across the country.

In order to adequately identify and assess potential environmental impacts associated with the proposed Namas Wind Farm, the following specialist consultants have provided input into this Basic Assessment report:

Specialist	Area of Expertise
Simon Todd of Simon Todd Consulting	Ecology
Rob Simmons and Marlei Martins of Birds and Bats Unlimited Environmental Consultants	Avifauna
Werner Marais of Animalia	Bats
Garry Paterson of the Agricultural Research Council (ARC)	Soils and Agricultural Potential
Jayson Orton of ASHA Consulting (with input from John Pether)	Heritage (including archaeology and palaeontology)
Morné de Jager of Enviro Acoustic Research (EAR)	Noise
Lourens du Plessis of LOGIS	Visual
Elena Broughton of Urban-Econ	Socio-economic
Iris Wink of JG Africa	Traffic

Appendix A includes the curricula vitae for the environmental assessment practitioners from Savannah Environmental and the specialist consultants.

CHAPTER 2: PROJECT DESCRIPTION

This chapter provides an overview of the Namas Wind Farm project and details the project scope, which includes the planning/design, construction, operation and decommissioning activities required for the development.

2.1. Legal Requirements as per the EIA Regulations, 2014 (as amended)

This chapter of the BA report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 1: Content of basic assessment reports:

Requirement	Relevant Section
3(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 proposed Namas Wind Farm is detailed in Chapter 1, **Table 1.1**, as well as section 2.2.1 below.
3(c)(i)(ii) a plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or on land where the property has not been defined, the coordinates within which the activity is to be undertaken	A layout map illustrating the development footprint of the Namas Wind Farm, including associated infrastructure (excluding the grid connection power line) is included as **Figure 2.1**.
3(d)(ii) a description of the scope of the proposed activity, including a description of the activities to be undertaken including associated structures and infrastructure	A description of the activities to be undertaken with the development of the Namas Wind Farm is included in **Table 2.1** and **Table 2.2**.

2.2 Nature and extent of the Namas Wind Farm

Genesis Namas Wind (Pty) Ltd is proposing the development of a wind farm and associated infrastructure on a site located south-east of Kleinsee to add capacity to the national electricity grid. The Namas Wind Farm will be developed in a single phase, and will comprise up to 43 wind turbines with a contracted capacity of up to 140MW. The optimum turbine for use at the site is yet to be determined, and it is considered that each turbine could have a generating capacity of up to 4.5MW[5], with a hub height of up to 130m and a tip height of up to 205m. The final turbine capacity and model will be dependent on what is deemed suitable for the site in relation to, among other things, further studies of the wind regime, terrain, and outcome of the final engineering, procurement and construction (EPC) tendering process.

[5] The 4.5MW capacity of the individual turbines is a predicted maximum capacity per turbine.

2.2.1. *Project Site and Development Footprint*

The preferred project site for the Namas Wind Farm is located within the Nama Khoi Local Municipality and the Namakwa District Municipality and comprises the following 4 affected properties[6]:

- » Portion 3 of the Farm Zonnekwa 328
- » Portion 4 of the Farm Zonnekwa 328
- » Remaining Extent of the Farm Rooivlei 327
- » Portion 3 of the Farm Rooivlei 327

The project site identified for the Namas Wind Farm is located approximately 20km south-east of Kleinsee. The entire extent of the project site is located within the Springbok Renewable Energy Development Zone (REDZ). The wind farm is to be constructed within a project site of 5092ha in extent, and the turbines, together with the associated infrastructure (including roads), will have a permanent development footprint of less than 1% (~35.46ha) of the total project site[7].

Access to the project site is ample with the presence of existing roads. The current formal site access is located off of a provincial gravel minor road that connects from the surfaced MR751 road located to the west of the project site. The project site can also be accessed via a gravel road connecting to the DR2964 north of the site, however this route is an informal access point. Refer to **Figure 2.1**.

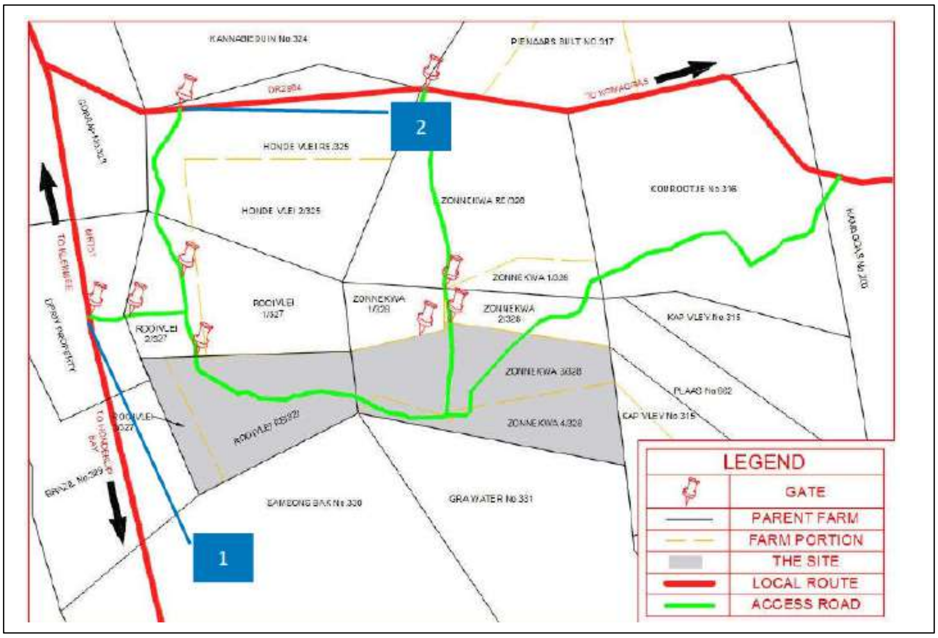

Figure 2.1: Site access points (numbered 1 and 2 in the figure) being considered for the Namas Wind Farm

6 The 4 affected properties included as part of the Namas Wind Farm are collectively known as the project site.
7 The development footprint of the Namas Wind Farm will be located within the 5092ha project site and will be a much smaller area within which the wind turbines and associated infrastructure will be constructed and operated. The development footprint has been subject to detailed design by the developer through the consideration of sensitive environmental features which need to be avoided by the wind farm.

2.2.2. *Components of the Namas Wind Farm*

The project site is proposed to accommodate both the wind turbines as well as the associated infrastructure which is required for such a facility, and will include:

» Up to 43 wind turbines with a maximum hub height of up to 130m. The tip height of the turbines will be up to 205m;
» Concrete turbine foundations and turbine hardstands;
» Temporary laydown areas which will accommodate the storage and assembly area;
» Cabling between the turbines, to be laid underground where practical;
» An on-site substation of 100m x 100m to facilitate the connection between the wind farm and the electricity grid;
» Access roads to the site (with a width of up to 10m) and between project components (with a width of approximately 8m);
» A temporary concrete batching plant; and
» Operation and maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitors centre.

A summary of the details and dimensions of the planned infrastructure associated with the project is provided in **Table 2.1.**

Table 2.1: Confirmed details or dimensions of the proposed development footprint of the Namas Wind Farm[8]

Infrastructure	Footprint and dimensions
Development footprint (permanent infrastructure) area	~35.46ha (including all associated infrastructure but excluding the grid connection power line)
Number of turbines	Maximum of 43 turbines
Turbine hub height	Up to 130m
Turbine tip height	Up to 205m
Contracted capacity of the facility	Up to 140MW (individual turbines up to 4.5MW in capacity each)
Tower type	Steel or concrete towers can be utilised at the site. Alternatively, the towers can be of a hybrid nature, comprising concrete towers with top steel sections.
Area occupied by the on-site facility substation	~ 100m x100m
Capacity of on-site facility substation	22kV/132kV or 33kV/132kV
Area occupied by laydown areas	One temporary laydown area with an extent of ~6ha will be required
Access and internal roads	Existing roads on the affected properties will be used where feasible and practical. The width of the access roads to the site will be up to

[8] The confirmed details and dimensions of the Namas Wind Farm development footprint was assessed as part of the independent specialist studies.

	10m. The width of the access roads between the project components will be approximately 8m. The total extent of the internal access roads will be ~24ha. The length of the internal roads will be between 25 and 30km.
Turbine hardstand	~60m x 30m per turbine
Turbine foundation	~20m x 20m per turbine
Grid connection	The Namas Wind Farm will connect to the national electricity grid via a 132kV power line. The connection point will be the existing Gromis Substation located to the north of the project site. The 132kV power line will be assessed as part of a separate Basic Assessment process.
Underground cabling	Underground cabling will be installed to connect the turbines to the on-site facility substation.
Operation and maintenance buildings	~1ha in extent
Temporary infrastructure total area	Temporary infrastructure (including hardstand areas and a concrete batching plant) will be required during the construction phase. All temporary infrastructure will be rehabilitated following the completion of the construction phase, where it is not required for the operation phase.

Figure 2.2 illustrates the proposed development footprint of the Namas Wind Farm assessed as part of this BA report.

Table 2.2 overleaf provides the details regarding the requirements and the activities to be undertaken during the Namas Wind Farm project development phases (i.e. construction phase, operation phase and decommissioning phase). **Table 2.3** provides photographs of the construction phase of a wind farm similar in nature to the Namas Wind Farm.

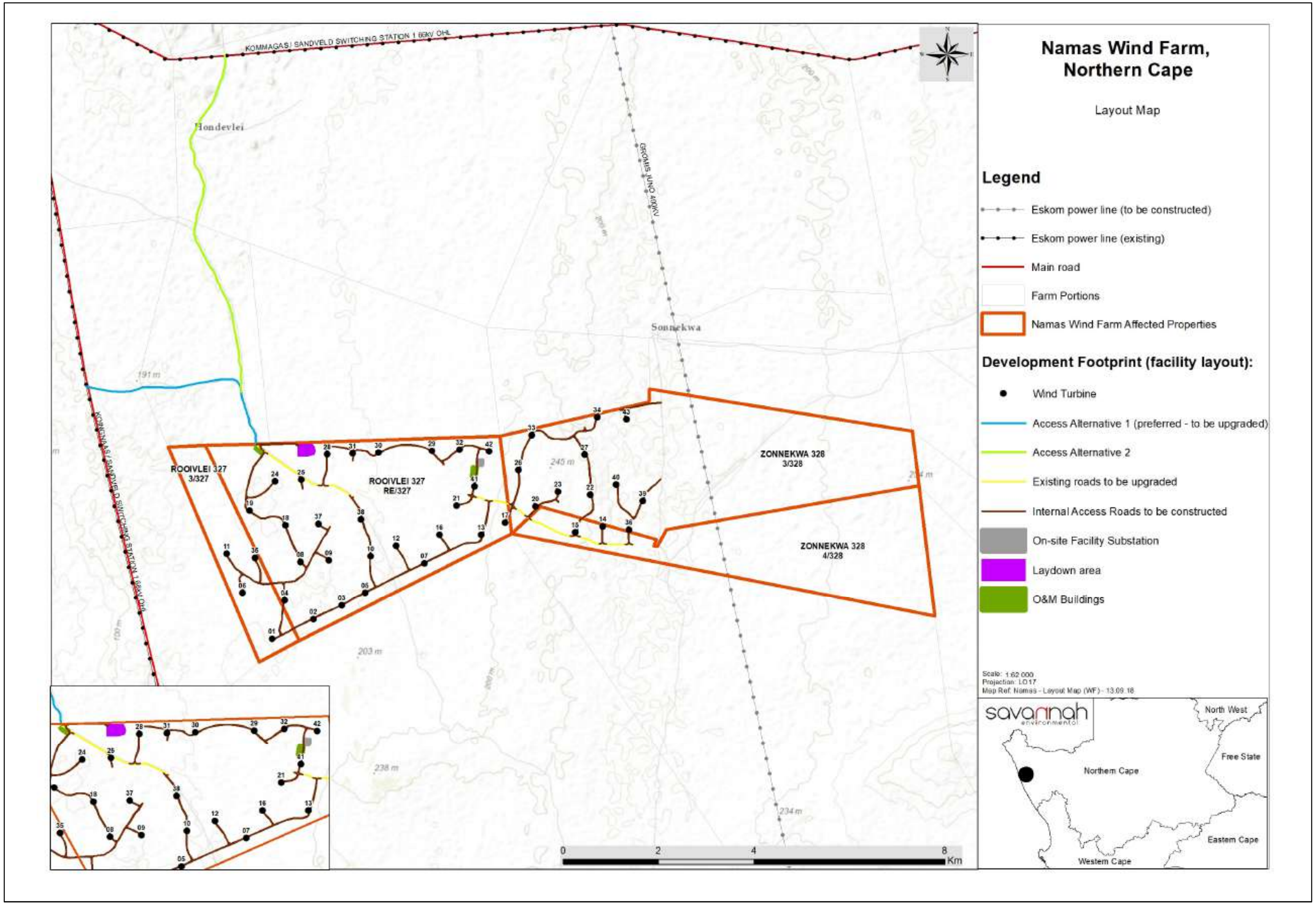

Figure 2.2: Development footprint (~35.46ha) being considered for the Namas Wind Farm

2.2.3 *Project Development Phases associated with the Namas Wind Farm*

Table 2.2: Details of the Namas Wind Farm project development phases (i.e. construction, operation and decommissioning)

Construction Phase	
Requirements	» Project requires Environmental Authorisation from DEA, preferred bidder allocation granted by Department of Energy, a generation license issued by NERSA, and a Power Purchase Agreement secured with Eskom. » Duration dependent on number of turbines; expected to be up to 24 months for the Namas Wind Farm. Construction is envisaged to begin in either 2020 or 2021, depending on the timing of the DoE's next REIPPP Programme bid window. » Create direct construction employment opportunities. Up to 400 jobs created and maintained for approximately two years. » No on-site labour camps. Employees to be accommodated in the nearby towns such as Kleinsee, and transported to and from site on a daily basis. » Overnight on-site worker presence would be limited to security staff. » Waste removal and sanitation will be undertaken by a sub-contractor or the municipality, where possible. Waste containers, including containers for hazardous waste, will be located at each crane pad, site camp and laydown area when construction activities are active. » Electricity required for construction activities will be generated by a generator or will be sourced from available 11kV or 22kV Eskom distribution networks in the area. » Water will be required for the construction phase, which will be approximately 100 000m^3 in total. Water will be supplied either by the Nama Khoi Local Municipality, an existing borehole on site or a new borehole, or water will be extracted from any bulk water supply pipelines near the site.
Activities to be undertaken	
Conduct surveys prior to construction	» Including, but not limited to: a geotechnical survey, site survey and confirmation of the turbine micro-siting footprint, survey of the on-site substation site and survey of power line servitude to determine and confirm tower locations and all other associated infrastructure.
Establishment of access roads to the Site	» Access/haul roads and internal access roads within the site will be established at the commencement of construction. » Existing access roads will be utilised where possible to minimise impact, and upgraded where required. » Access roads to the site will have a width of up to 10m. » Access roads to be established between the turbines for construction and/or maintenance activities within the development footprint. » Internal service road alignment will be approximately 8m wide.
Undertake site preparation	» Including the clearance of vegetation at the footprint of each turbine, establishment of the laydown areas, the establishment of internal access roads and excavations for foundations. » Stripping of topsoil to be stockpiled, backfilled, removed from site and/or spread on site. » To be undertaken in a systematic manner to reduce the risk of exposed ground being subjected erosion. » Include search and rescue of floral species of concern (where required) and the identification and excavation of any sites of cultural/heritage

	value (where required).
Establishment of laydown areas and batching plant on site	» A laydown area for the storage of wind turbine components, including the cranes required for tower/turbine assembly and civil engineering construction equipment. » The laydown area will also accommodate building materials and equipment associated with the construction of buildings. » A crane hardstand at each turbine position where the main lifting crane will be erected and/or disassembled. Each hardstand to be ~60m x 30m in extent. This will also include the pre-assembly area and storage area at each turbine. » No borrow pits will be required. Infilling or depositing materials will be sourced from licenced borrow pits within the surrounding areas. » A temporary concrete batching plant of 50m x 50m in extent to facilitate the concrete requirements for turbine foundations.
Construct foundation	» Concrete foundations of approximately 400m^2 in extent to be constructed at each turbine location. » Excavations to be undertaken mechanically. » Concrete foundation will be constructed to support a mounting ring. » Depending on geological conditions, the use of alternative foundations may be considered (e.g. reinforced piles).
Transport of components and equipment to and within the site	» Turbine units to be transported includes the tower segments, hub, nacelle, and three rotor blades. » Components to be transported to the site in sections on flatbed trucks by the turbine supplier. Imported components to be transported from the Port of Saldanha to the project site via the R27, R399, N7, MR739 and the MR751. » Transportation will take place via appropriate National and Provincial roads, and the dedicated access/haul road to the site. » Components considered as abnormal loads in terms of Road Traffic Act (Act No 29 of 1989) due to dimensional limitations (abnormal length of the blades) and load limitations (i.e. the nacelle) will require a permit for the transportation of the abnormal loads on public roads. » Specialised construction and lifting equipment to be transported to site to erect the wind turbines. » Civil engineering construction equipment to be brought to the site for the civil works (e.g. excavators, trucks, graders, compaction equipment, cement trucks, site offices etc.). » Components for the establishment of the substation (including transformers) and the associated infrastructure to be transported to site.
Construction of the turbine	» A lifting crane will be utilised to lift the tower sections, nacelle and rotor into place. » Approximately 1 week is required to erect a single turbine depending on climatic conditions. » Lifting cranes are required to move between the turbine sites.
Construction of the substation	» One on-site substation to be constructed within the development footprint. » Substation will be constructed with a high-voltage yard footprint of up to 100m x 100m.
Connection of wind turbines to the substation	» Each wind turbine to be connected to the on-site substation via underground electrical cables. » Excavation of trenches are required for the installation of the cables. Trenches will be approximately 1.5m deep. » Underground cables are planned to follow the internal access roads, as far as possible.
Establishment of ancillary infrastructure	» A workshop, contractor's equipment camp, temporary storage areas and a construction compound will be required. » Service buildings for site offices, storage and safe refuelling areas are also required.

	» Establishment will require the clearing of vegetation, levelling and the excavation of foundations prior to construction.
Connect substation to the power grid	» On-site substation to connect the wind farm to the existing Gromis Substation located to the north of the site. » Connection via an overhead 132kV power line (located within a 32m servitude) in order to evacuate the generated electricity (to be undertaken as a separate Basic Assessment process).
Undertake site rehabilitation	» Commence with rehabilitation efforts once construction is completed in an area, and all construction equipment is removed. » On commissioning, access points to the site that will not be required for the operation phase will be closed and prepared for rehabilitation.
Operation Phase	
Requirements	» Duration will be 20-25 years. » Requirements for security and maintenance of the facility. » Employment opportunities relating mainly to operation activities and maintenance. Up to 30 full-time employment opportunities will be available. » Current land-use activities, i.e. farming activities, being undertaken within the project site can continue during the operation of the wind farm.
Activities to be undertaken	
Operation and Maintenance	» Full time security, maintenance and control room staff. » All turbines will be operational except under circumstances of mechanical breakdown, inclement weather conditions, or maintenance activities. » Wind turbines to be subject to periodic maintenance and inspection. » Disposal of waste products (e.g. oil) in accordance with relevant waste management legislation. » Areas which were disturbed during the construction phase to be utilised should a laydown area be required during operation.
Decommissioning Phase	
Requirements	» Decommissioning of the Namas Wind Farm infrastructure at the end of its economic life. » Potential for repowering of the facility, depending on the condition of the facility at the time. » Expected lifespan of approximately 20 - 25 years (with maintenance) before decommissioning is required. » Decommissioning activities to comply with the legislation relevant at the time.
Activities to be undertaken	
Site preparation	» Confirming the integrity of site access to accommodate the required equipment and lifting cranes. » Preparation of the site (e.g. laydown areas and construction platform). » Mobilisation of construction equipment.
Disassemble and remove turbines	» Large crane required for the disassembling of the turbine and tower sections. » Components to be reused, recycled, or disposed of in accordance with regulatory requirements. » All parts of the turbine would be considered reusable or recyclable except for the blades.

	» Concrete will be removed to a depth as defined by an agricultural specialist and the area rehabilitated. » Cables will be excavated and removed, as may be required.
Components to be disposed of or recycled.	» Foundation » Tower » Electrical facilities in tower base » Rotor » Generator » Machine house » Reinforcing steel will go through cleansing and milling to re-melt the components

It is expected that the areas of the project site affected by the wind farm infrastructure (development footprint) will revert back to its original land-use (i.e. primarily sheep farming and grazing) once the Namas Wind Farm has reached the end of its economic life and all infrastructure has been decommissioned.

Table 2.3: Photographs of the construction phase of a wind farm similar to the Namas Wind Farm

CHAPTER 3: ALTERNATIVES

This chapter details the preferred site location, activity and technology alternatives as well as the 'do nothing' option for the Namas Wind Farm.

3.1. Legal Requirements as per the EIA Regulations, 2014 (as amended)

This chapter of the BA report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 1: Content of basic assessment reports:

Requirement	Relevant Section
3(g) a motivation for the preferred site, activity and technology alternative	The identification and motivation for the preferred project site, the development footprint within the project site, the proposed activity and the proposed technology is included in sections 3.3.1, 3.3.2 and 3.3.3.
3(h)(i) details of the alternative considered	The details of all alternatives considered as part of the Namas Wind Farm is included in sections 3.3.1 – 3.3.5. A summary of the alternative is also included in section 3.2.
3(h)(ix) the outcome of the site selection matrix	The site selection process followed by the developer in order to identify the preferred project site is described in section 3.3.1.
3(h)(x) if no alternatives, including alternative locations for the activity were investigation, the motivation for not considering such	Where no alternatives have been considered, motivation has been included. This is included in section 3.3.

3.2 Summary of all Alternatives considered as part of the Namas Wind Farm

The sections below describe the alternatives being considered as part of the Namas Wind Farm. **Table 3.2** provides an overview of the alternatives being considered as part of the project:

Table 3.2: Summary of the alternatives considered as part of the Namas Wind Farm project.

Nature of Alternatives Considered	Description of the Alternative relating to the Namas Wind Farm
Site-specific and Layout Alternatives	One preferred project site has been identified for the development of the Namas Wind Farm due to site specific characteristics such as the wind resource, land availability, topographical considerations and environmental features. The project site is 5092ha in extent which is considered to be sufficient for the development of a wind farm with a contracted capacity of up to 140MW.
Activity Alternatives	Only the development of a renewable energy facility is considered by Genesis Namas Wind (Pty) Ltd. Due to the location of the project site and the suitability of the wind resource, only the development of a wind farm is considered feasible considering the natural resources available to the area and the current land-use activities undertaken within the project site (i.e. grazing activities and sheep farming).
Technology Alternatives	Only the development of a wind farm is considered due to the characteristics of the site, including the natural resources available.
Access Road Alternatives	Two access road alternatives were considered. However, only Access alternative 1 was identified as feasible by the traffic and transportation specialist. As such only Access

Nature of Alternatives Considered	Description of the Alternative relating to the Namas Wind Farm
	alternative 1 will be considered further in the BA report.
'Do-nothing' Alternative	The option to not construct the Namas Wind Farm. No impacts (positive or negative) are expected to occur on the social and environmental sensitive features or aspects located within or within the surrounding areas of the project site. The opportunities associated with the development of the wind farm for the Kleinsee area will not be made available.

3.3 Project Alternatives under Consideration for the Namas Wind Farm

The following alternatives have been considered as part of the BA report for the Namas Wind Farm.

3.3.1 Site-specific and Layout Alternatives

The preferred project site for the development of the Namas Wind Farm was identified through an investigation of prospective sites and properties in the Kleinsee area undertaken by the developer in 2015. The investigation involved the consideration of specific characteristics within the Northern Cape Province and specifically within the Kleinsee area. The characteristics considered were identified by the developer as the main aspects that play a role in the opportunities and limitations for the development of a wind farm. The characteristics considered, and the results thereof, are discussed in the sections below. The developer considered that should these characteristics not be favourable for the development of a wind farm, then some limitations and challenges may be expected.

» *Wind Resource* – The developer firstly considered the available wind resource for the Northern Cape and the Kleinsee area through the consideration of various datasets and variables. Through the consideration of the datasets, involving wind presence and wind speed, as well as meteorological information and geographical factors it was confirmed that the Kleinsee area, and in particular the Namas Wind Farm project site, is suitable for the development of a wind farm. Refer to **Figure 3.1**.

  Following the consideration and the confirmation of the wind presence and wind speed on a desktop level (through the consideration of existing data) the developer installed a wind mast on the Namas Wind Farm project site in April 2017. The on-site measurements taken at the project site confirmed the wind resource and ultimately the suitability of the resource for the development of a wind farm.

» *Land Availability* – In order to develop the Namas Wind Farm with a contracted capacity of up to 140MW sufficient space is required. The preferred project site was identified within the Northern Cape Province and in the Kleinsee area following the confirmation of the wind resource. The properties included in the project site are some of the few available privately-owned parcels available in the area. The combination of the affected properties has an extent of ~5092ha, which was considered by the developer as sufficient for the development of the ~35.46ha development footprint.

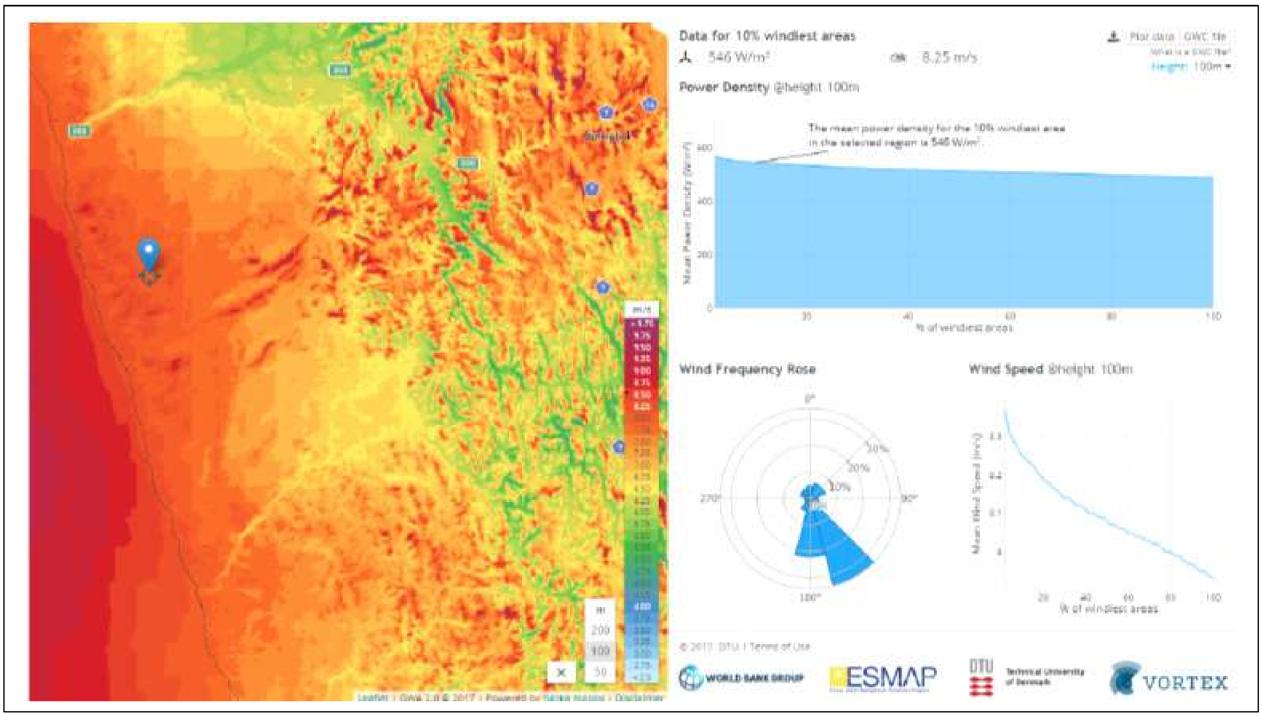

Figure 3.1: Average wind speed expected at the Namas Wind Farm project site (https://globalwindatlas.info/)

» *Access to the National Grid* – Following the confirmation of sufficient available land for the development of the wind farm, the developer considered the possible grid connection points in order to evacuate the generated electricity into the national grid. This was considered as a vital aspect by the developer for the project. The developer consulted with the Eskom network planners to understand the future demand centres and the strategic plans to upgrade and strengthen the local networks in the area. Through this consultation it was confirmed that Eskom are in the process of moving forward with the construction of the authorised Gromis-Juno 400kV power line, which will traverse the eastern portion of the project site. It was also identified that Eskom plans to upgrade the existing Gromis Substation located ~26km north of the project site, which will be the connection point for the Gromis-Juno 400kV power line. Considering these developments in line with the local grid infrastructure, the developer identified the existing Gromis Substation as the preferred grid connection point for the Namas Wind Farm. The developer identified a 300m power line corridor parallel to the Eskom Gromis-Juno 400kV power line, within which the facility 132kV grid connection line for the wind farm will be constructed. The developer considered this as a benefit in order to reduce the on-ground disturbance by power lines within the area as well as the associated visual intrusion.

» *Geographical and Topographical Considerations and Existing Infrastructure* – The greater area surrounding the project site has intense diamond mining and low intensity agricultural activities as the dominant land uses. The developer considered the potential opportunity for the Namas Wind Farm to bring some relief to the area, to an extent, after being degraded by the mining activities, specifically the socio-economic effects that are associated with the closure of the mining operations. The entire project site is also located within the Springbok Renewable Energy Development Zone (REDZ). The development of the Namas Wind Farm within the REDZ is considered to be a strategic placement as supporting transmission and distribution infrastructure (required for the development of renewable energy developments) is being developed and upgraded within these areas in order to enable renewable energy development.

» The availability of existing infrastructure was also considered by the client as this will enable the wind farm development to make use of infrastructure already available and reduce the disturbance associated with the construction of the associated infrastructure. The existing road network within the surrounding areas and within the project site makes access manageable. The developer also considered the fact that the area has little infrastructure related to residential uses, which may be affected by the development of a wind farm.

» From a topographical perspective there are very few physical constraints present which would have an effect on the wind speed and direction as well as the construction of the wind farm.

» *Environmental Screening and consideration of sensitive environmental features* – Following the confirmation of the Namas Wind Farm preferred project site as being technically feasible for the development of a wind farm, the developer set out to screen the site, and assess the main constraints and opportunities and whether or not there were any potential fatal flaws or significant no-go areas that might compromise or limit the development of the Namas Wind Farm. The screening exercise included the consideration of ecological features and sensitive habitats and features associated with bats and birds located within the project site. The screening of the bird and bats sensitivities formed part of the long-term monitoring campaigns undertaken for the site. The screening exercise and the sensitivities identified in the three respective fields of study (i.e. birds, bats and ecology) was then considered by the developer and a development footprint (i.e. facility layout) was designed which avoided these features. The development footprint was then provided to all other specialists for assessment as part of the BA report.

The site selection process applied by the developer for the identification of the preferred project site and the consideration of sensitive environmental features as part of the design of the development footprint, demonstrates due consideration of the suitability of the project site for the Namas Wind Farm in line with a typical mitigation hierarchy:

1. First Mitigation: avoidance of adverse impacts as far as possible by use of preventative measures (in this instance a sensitivity analysis assisted in the avoidance of identified ecological, avifaunal and bat sensitive areas)
2. Second Mitigation: minimisation or reduction of adverse impacts to 'as low as practicable' through implementation of mitigation and management measures
3. Third Mitigation: remedy or compensation for adverse residual impacts, which are unavoidable and cannot be reduced further.

As part of the site selection process and environmental screening, as described above, the first tier of avoidance has already been applied prior to the BA process and the development footprint. As part of the BA process this development footprint has been assessed and the impact of the wind farm ground-truthed by independent specialists. The significance of the impacts associated with the proposed development footprint and the appropriateness of the layout has been assessed and is included in Chapter 9 and **Appendices D - L**

Where any further conflicts in terms of the development footprint and environmental and social sensitivities or features occur, a mitigation strategy will be developed and applied to meet the objectives of the mitigation hierarchy (i.e. avoid, minimise, mitigate). This application of the mitigation strategy will result in the identification of the optimised proposed development footprint.

The Namas Wind Farm project site was identified by the developer as being the most technically feasible and viable project site within the broader area for further investigation in support of an application for authorisation due to a number of characteristics associated with the site. The specific on-site environmental feasibility and sensitivity of the project site for the proposed development is to be determined through the BA process currently being undertaken for the site, as well as the appropriate mitigation measures to minimise the expected impacts to acceptable levels (i.e. tier 2 of the mitigation hierarchy).

Therefore, considering the results of the site selection process, the preferred project site proposed for the development of the Namas Wind Farm is considered suitable for development at a broader scale. Genesis Namas Wind (Pty) Ltd therefore confirms the 5092ha area (project site), ~20km south-east of Kleinsee as the preferred project site for the development of the Namas Wind Farm. No alternative sites were, therefore, assessed as part of this BA process.

3.3.2 Activity Alternatives

Genesis Namas Wind (Pty) Ltd is a renewable energy project developer and as such will only consider renewable energy activities. Considering the available natural energy resources within the area and the current significant restrictions placed on other natural resources such as water, it is considered that wind energy is the preferred option for the development of a wind farm within the preferred project site. There are only a few sites in South Africa with a wind resource as good as the proposed site, and therefore the project site is considered best suited for the development of a wind farm. Considering the location of the project site and the fact that there are no constructed wind farms within the surrounding area, the potential for cumulative impacts associated with the development of wind farms is considered to be low. This is considered to be a positive aspect with regards to implementing this technology in the identified location (i.e. project site). In addition, grid connection infrastructure to connect the wind farm to the national grid is present within the vicinity of the project site.

Considering the suitability of the project site for the development of a wind farm, the current land-use activities being undertaken within the project site which relate to grazing and sheep farming, the size of the development footprint for the wind farm (i.e. ~35.46ha) and the minimal loss to grazing carrying capacity as a result of the development, the activity (i.e. the development of a wind farm) is considered to be appropriate. Therefore, no further activity alternatives are considered further.

3.3.3 Technology Alternatives

As Genesis Namas Wind (Pty) Ltd is an IPP, only renewable energy technologies are being considered for the generation of up to 140MW (contracted capacity) of electricity. Considering the local resources available (i.e. wind and solar irradiation) for such technologies, the footprint requirements for such developments and the current land use in the project site (i.e. agriculture), the project site is considered most suitable for the establishment of a wind farm. This has been confirmed through the on-site wind measurement campaign undertaken by the developer and other technical characteristics available within and within the surrounding areas of the project site.

Once environmental constraining factors have been determined through the BA process, and more detailed site-specific wind data is available from the wind monitoring on site, Genesis Namas Wind (Pty) Ltd will be considering various wind turbine options. The preferred option will be informed by efficiency as well as environmental impact and constraints (such as noise associated with the turbine and sensitive biophysical features). The wind turbines being proposed for the Namas Wind Farm will be up to 4.5 MW[9] in capacity. The turbines are proposed to have a hub height of up to 130 m, with an overall tip height of up to 205m.

There is a limited range of alternative technologies (turbines) available for commercial-scale wind energy facilities. In addition, the technology is constantly evolving. **Table 3.1** summarises the types of variables associated with existing wind turbine technologies. There are no significant differences from an environmental perspective between technologies.

Table 3.1: Variables associated with existing wind turbine technologies.

Variables	Description
Type	The horizontal axis wind turbine completely dominates the commercial scale wind turbine market.
Size	Typical land-based utility scale wind turbines are currently in the 600 kW to 6MW range internationally.
Foundation	The foundation is usually poured reinforced concrete. Its size and shape is dictated by the size of the wind turbine and local geotechnical considerations. The foundation for the Namas Wind Farm will be 20m x 20m.
Tower	Towers are typically constructed from steel and/or concrete. The towers used for the Namas Wind Farm will be up to 130m in height.
Rotor	3- Bladed rotor is standard.
Rotor Speed Control	Fixed or variable speed rotors.
Gears	Geared and gearless.
Generator	Standard high speed generator (geared) or custom low-speed ring generator (gearless).
Other variables	Yaw gears, brakes, control systems, lubrication systems and all other turbine components are similar on modern wind turbines.

In addition, the most optimal and final layout will be determined by considering the mitigation hierarchy in order to maximise the capacity of the site while minimising environmental impacts. The main focus of the mitigation hierarchy will relate to the avoidance of all identified no-go areas or sensitive features within the project site, and consider feasible and appropriate mitigation measures in order to minimise the impact of the development on any remaining sensitive features.

Genesis Namas Wind (Pty) Ltd therefore confirms wind energy technology as the preferred technology alternative for the development of the Namas Wind Farm. No further technology alternatives will be considered.

[9] The 4.5MW capacity of the individual turbines is a predicted maximum per turbine and the final decision regarding the final turbine capacity will be based on the final facility layout and technical and environmental considerations.

3.3.4 Access Road Alternatives

Access to the project site is possible via two alternative routes. The current formal access to the site is located off of a provincial gravel minor road that connects from the surfaced MR751 road located to the west of the project site (Access alternative 1). The project site can also be accessed via a gravel road connecting to the DR2964 located to the north of the site (Access alternative 2). These are illustrated on **Figure 3.2.**

These two alternatives were considered by a traffic and transportation specialist (refer to the report in **Appendix L**). Access alternative 1 was confirmed as the feasible alternative for the Namas Wind Farm project due to the following:

» Access alternative 1 is an existing formal access to the site which will need to be upgraded for the project.
» Access alternative 2 will be a new access point off the DR2964 which will need to be constructed.
» Access alternative 1 provides shorter access to the site, whereas Access alterative 2 is longer.
» The new access point required for Access alternative 2 on the DR2964 is located on rolling terrain with limited sight distances.

Therefore considering the above, Access alternative 2 is not considered as a reasonable or feasible alternative for the wind farm project, and is therefore not considered further as part of this BA report or process. It is recommended by the traffic and transportation specialist that Access alternative 1 be maintained as the primary site access road.

3.3.5. The 'do-nothing' Alternative

The 'do-nothing' alternative is the option of Genesis Namas Wind (Pty) Ltd not constructing the Namas Wind Farm on the proposed site. This would result in no environment or social impacts (positive or negative) as a result of the development of a wind farm within the preferred project site. This alternative is assessed in detail within Chapter 9 of this BA Report.

The main reasons why the do-nothing alternative is not considered as a preferred alternative in relation to this wind farm project are discussed below, namely:
» The current land-use regime of the site;
» The need for relief in the area after the closure of mining operations;
» The need for additional energy generation capacity in South Africa; and
» The need to diversify the energy mix in South Africa.

There are no high potential soils in the project site, and all soils present are of a moderate potential. Every land type is dominated by structureless soils which are sandy. There is little potential to increase the agricultural potential in the form of irrigation development as the irrigable soils are very limited and the soils present will lead to rapid water infiltration and the soils drying out. Water availability is limited (scarce and of variable quality) and the low rainfall experienced in the area means that there is little potential for rain-fed arable agriculture. The soils present are considered to be suitable for extensive grazing at best, however the grazing capacity of the area is very low with around 24-40ha/large stock unit. Therefore, the 'do-nothing' alternative would leave the land-use restricted to the current livestock grazing, losing out on the opportunity to generate renewable energy from wind as additive thereto (i.e. current livestock grazing would continue). Therefore, from a land-use perspective, the 'do-nothing' alternative is not preferred.

Due to the closure of the mining operations in the Kleinsee area, socio-economic challenges occurred that affected the socio-economic conditions of the area. The closure resulted in the loss of employment as well as out-migration of people living in the area. Therefore, the 'do-nothing' alternative would remove the potential opportunity to relieve pressure on some of the socio-economic challenges in the area, such as the lack of employment opportunities. Therefore, the 'do-nothing' alternative is not preferred.

The electricity demand in South Africa is placing increasing pressure on the country's ageing power generation capacity, and future restrictions are considered to be damaging to the economy. There is, therefore, a need for additional electricity generation options to be developed throughout the country, as supported through the IRP. The IRP includes 17.8GW of renewables, 9.6GW of nuclear, 6.25GW of coal, and approximately 8.9GW of other generation sources such as hydro, and gas. The 'do-nothing' alternative, in terms of implementing renewable energy projects, results in a scenario where a fossil fuel or nuclear facility must rather be developed because the need for power does not go away. Environmental considerations aside, these have long lead times (considerably longer than the time required to implement renewable energy projects) and hence the South African economy and its citizens will suffer. Furthermore, the development of a renewable energy project, as promoted by the South African Government, would also not be realised, and the reliance on fossil fuel energy sources would not be reduced, as has been committed to.

The purpose of the Namas Wind Farm is to add new capacity for the generation of renewable energy to the national electricity mix and to aid in achieving the goal of 17.8GW of renewable energy, as targeted by the Department of Energy (DoE). The Namas Wind Farm is fully aligned with policy at all three levels of government (refer to Chapter 5 of this BA report).

The 'do-nothing' alternative is not a preferred alternative, because if the wind farm is not developed the following positive impacts will not be realised:

» Job creation from the construction and operation phases.
» Economic benefit to participating landowners due to the revenue that will be gained from leasing the land to the developer.
» Potential relief for a stressed area.
» Meeting of future demand for additional generation in a most economic and rapid manner.
» Provision of clean, renewable energy in an area where it is optimally available.

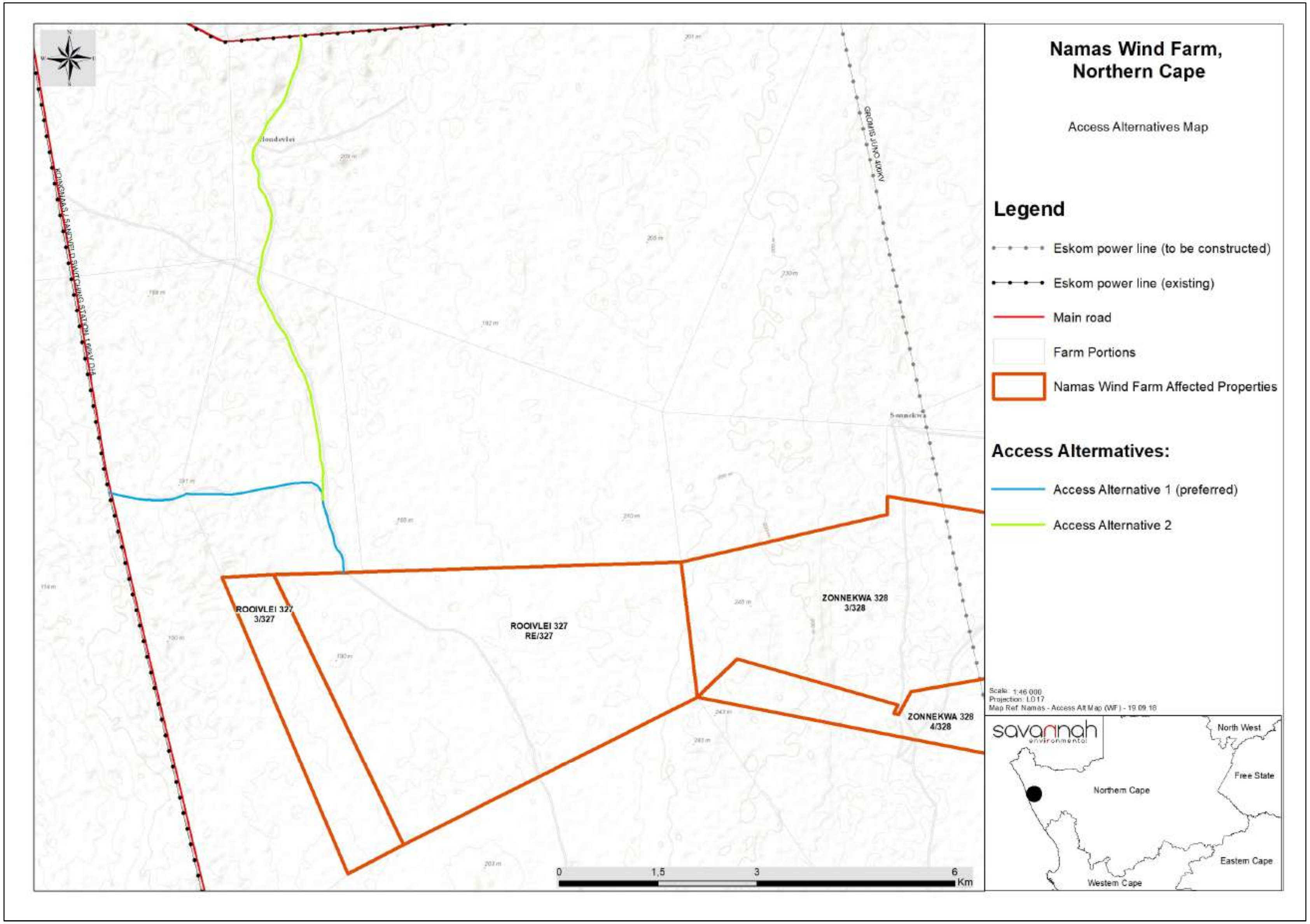

Figure 3.2: Alternative access routes considered as part of the Namas Wind Farm development footprint

CHAPTER 4: WIND AS A POWER GENERATION TECHNOLOGY

Compared with other renewable energy sources such as solar and bio-energy, wind energy generates the highest energy yield while affecting the smallest physical land space. Wind technologies convert the energy of moving air masses at the earth's surface to mechanical power that can be used directly for mechanical needs (e.g. milling or water pumping) or converted to electric power in a generator (i.e. a wind turbine).

The use of wind for electricity generation is essentially a non-consumptive use of a natural resource, and produces an insignificant quantity of greenhouse gases in its life cycle. A wind farm also qualifies as a Clean Development Mechanism (CDM) project (i.e. a financial mechanism developed to encourage the development of low carbon generating technologies) as it meets all international requirements in this regard. Environmental pollution and the emission of CO_2 from the combustion of fossil fuels through the implementation of conventional power plants constitute a threat to the environment. The use of fossil fuels is reportedly responsible for ~70% of greenhouse gas emissions worldwide. The approach to addressing climate change needs to include a shift in the way that energy is generated and consumed. Worldwide, many solutions and approaches are being developed to reduce emissions. However, it is important to acknowledge that the most cost-effective solution in the short-term is not necessarily the least expensive long-term solution. This holds true not only for direct project costs, but also indirect project costs such as impacts on the environment. Renewable energy is considered a 'clean source of energy' with the potential to contribute greatly to a more ecologically, socially and economically sustainable future. The challenge however is to ensure that wind energy projects are able to meet all economic, social and environmental sustainability criteria through the appropriate placement of these facilities.

This chapter explores the use of wind energy as a means of power generation.

4.1. The Importance of Wind Resource as Power Generation

The importance of using the wind resource for energy generation has the attractive attribute in that the fuel is free. The economics of a wind energy project crucially depend on the wind resource at the project site. Detailed and reliable information about the speed, strength, direction, and frequency of the wind resource is vital when considering the installation of a wind farm, as the wind resource is a critical factor to the success of the installation.

- **Wind power** is the conversion of wind energy into a useful form, such as electricity, using wind turbines.
- **Wind speed** is the rate at which air flows past a point above the earth's surface. Average annual wind speed is a critical siting criterion, since this determines the cost of generating electricity. The doubling of the wind speed increases the wind power by a factor of 8, so even small changes in wind speed can produce large changes in the economic performance of a wind farm. Wind turbines can start generating electricity at wind speeds of between ~3 m/s to 4 m/s (this is also known as the cut-in wind speed), with wind speeds greater than 6 m/s currently required for a wind energy facility to be economically viable. Wind speed can be highly variable and is also affected by a number of factors, including surface roughness of the terrain. The effect of height variation/relief in the terrain is seen as a speeding-up/slowing-down effect of the wind due to the topography of the landscape. Elevation in the topography influences the flow of air, and results in turbulence within the air stream, which has to be considered in the placement of turbines.

- **Wind direction** at a site is important to understand as it influences the turbulence over the site, and therefore the potential energy output. However, wind turbines can extract energy from any wind direction as the nacelle automatically turns to face the blades into the predominant wind direction at any point in time.

A wind resource measurement campaign and analysis programme must be conducted for the site proposed for development, as only measured data will provide a robust prediction of the wind farm's expected energy production over its lifetime. This is being undertaken for the project site through the on-site monitoring of the wind resource via one wind mast installed in April 2017.

The placement of the individual turbines within a wind farm must consider the following technical factors:

- Predominant wind direction, wind strength and frequency;
- Topographical features or relief affecting the flow of the wind (e.g. causing shading effects and turbulence of air flow); and
- Effects of adjacent turbines on wind flow and speed – specific spacing is required between turbines in order to reduce the effects of wake turbulence.

Wind turbines typically need to be spaced approximately 3 to 5 times the rotor diameter apart in order to minimise the induced wake effect that the turbines might have on each other (refer to **Figure 4.1**). Once a viable footprint for the establishment of the wind farm has been determined (through the consideration of both technical and environmental criteria) the spacing requirements will be considered through the process of micro-siting the turbines on the site.

4.1.1. How do wind turbines function

Wind turbines are mounted on a tower at height to capture the most energy. The kinetic energy of wind is used to turn a wind turbine to generate electricity. At an increased height above ground, they can take advantage of the faster and less turbulent wind. Turbines catch the wind's energy with their propeller-like blades. Usually, two or three blades are mounted on a shaft to form a *rotor*. Generally a wind turbine consists of three rotor blades and a nacelle mounted at the top of a tapered steel or concrete tower. The mechanical power generated by the rotation of the blades is transmitted to the generator within the nacelle.

Turbines are able to operate at varying speeds. The amount of energy a turbine can harness depends on both the wind velocity and the length of the rotor blades. It is anticipated that the turbines utilised for the Namas Wind Farm will have a hub height of up to 130m, and a tip height of up to 205m. The capacity of the wind farm will depend on the wind turbine selected by Genesis Namas Wind (Pty) Ltd (turbine capacity and model that will be deemed most suitable for the site). A maximum of 43 turbines are proposed for the project site.

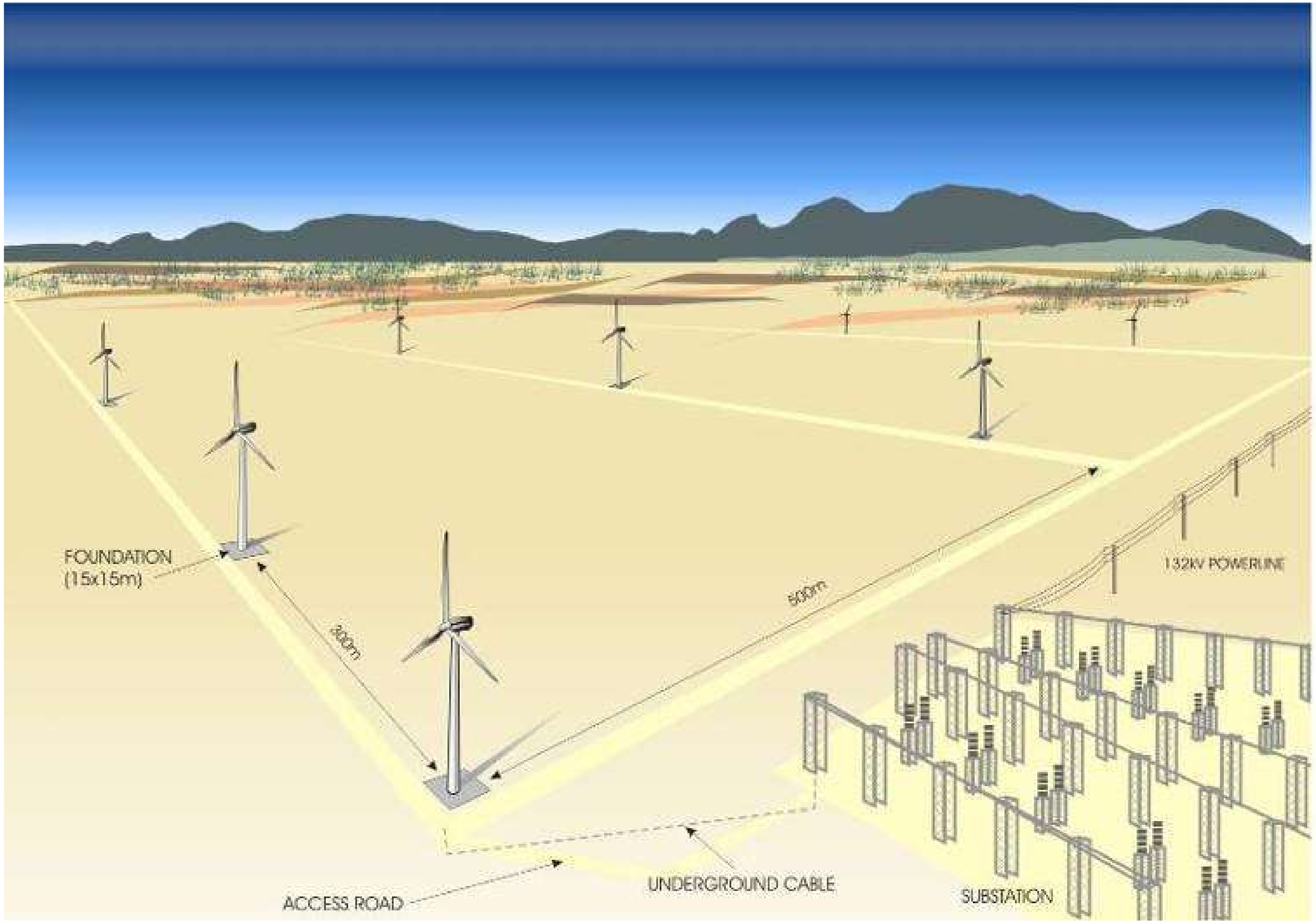

Figure 4.1: Artist's impression of a portion of a typical wind energy facility, illustrating the various components and associated infrastructure. Note that distances and measurements shown are indicative and for illustrative purposes only.

4.1.2. Main Components of a Wind Turbine

The turbine consists of the following major components (as shown in **Figure 4.2**):

- » The foundation unit
- » The tower
- » The rotor
- » The nacelle

<u>The foundation</u>

The foundation is used to secure each wind turbine to the ground. These structures are commonly made of reinforced concrete and are designed to withstand the vertical loads (weight) and lateral loads (wind).

<u>The tower</u>

The tower is a hollow structure (steel or concrete or a combination of the two materials, known as hybrid) allowing access to the nacelle (up to 130m in height). The height of the tower is a key factor in determining the amount of electricity a turbine can generate as the wind speed varies with height. Towers are typically delivered to site in sections and then erected and joined together on site. Most towers are made of steel however some are made of reinforced post-stressed concrete.

The tower on which a wind turbine is mounted is not just a support structure. It also raises the wind turbine so that its blades safely clear the ground and so it can reach the stronger winds at higher elevations. The tower must be strong enough to support the wind turbine and to sustain vibration, wind loading and the overall weather elements for the lifetime of the wind turbine.

Example of a tower on which the rotor is mounted

The Rotor

The portion of the wind turbine that collects energy from the wind is called the rotor. The rotor comprises of three rotor blades. The rotor blades use the latest advances in aeronautical engineering materials science to maximise efficiency. The greater the number of turns of the rotor the more electricity is produced. The rotor converts the energy in the wind into rotational energy to turn the generator. The rotor has three blades that rotate at about 15 to 28 revolutions per minute (rpm). The speed of rotation of the blades is controlled by turning the blades to face into the wind ('yaw control'), and changing the angle of the blades ('pitch control') to make the most use of the available wind.

The rotor blades function in a similar way to the wing of an aircraft, utilising the principles of lift**.** When air flows past the blade, a wind speed and pressure differential is created between the upper and lower blade surfaces. The pressure at the lower surface is greater and therefore acts to "lift" the blade. When blades are attached to a central axis, like a wind turbine rotor, the lift is translated into rotational motion. Lift-powered wind turbines are well suited for electricity generation.

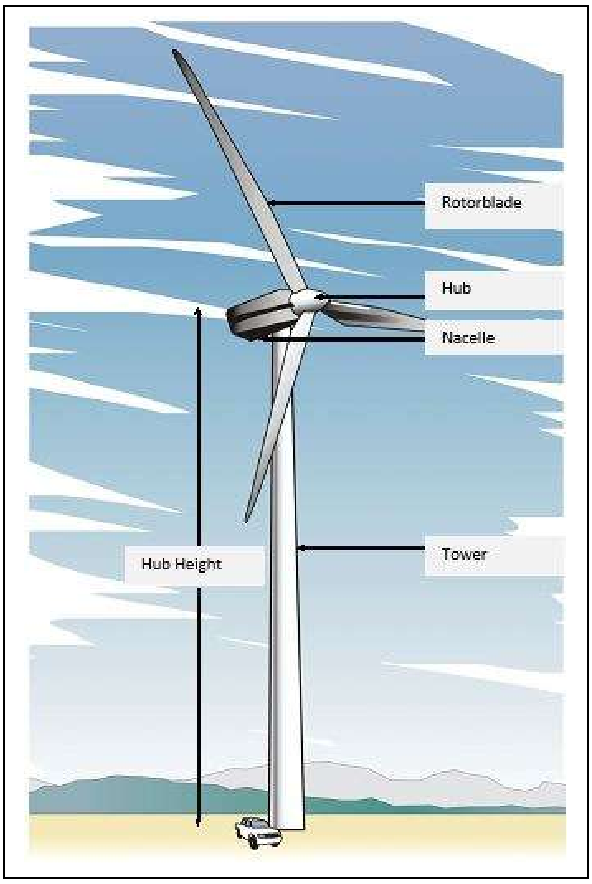

Figure 4.2: Illustration of the main components of a wind turbine

The nacelle

The nacelle at the top of the tower accommodates the gears, the generator, anemometer for monitoring the wind speed and direction, cooling and electronic control devices, and yaw mechanism. Geared nacelles generally have a longer form/ structure than gearless turbines. The generator is what converts the turning motion of a wind turbine's blades into electricity. Inside this component, coils of wire are rotated in a magnetic field to produce electricity. The generator's rating, or size, is partly dependent on the length of the wind turbine's blades because more energy is captured by longer blades.

Other infrastructure associated with the facility includes internal access roads, a power line (assessed as part of a separate Basic Assessment process) and an on-site collector substation and operation and maintenance buildings. The construction phase of the wind farm is dependent on the number of turbines erected and is estimated at a maximum of approximately 24 months (including all infrastructure). The lifespan of the facility (i.e. operation phase) is approximated at 20 to 25 years.

4.1.3. Operating Characteristics of a Wind Turbine

A turbine is designed to operate continuously, unattended and with low maintenance for more than 20 years or >120 000 hours of operation. Once operating, a wind farm can be monitored and controlled remotely, with a mobile team for maintenance, when required.

The cut-in speed is the minimum wind speed at which the wind turbine will generate usable power and is usually between ~3 m/s and 4 m/s. This wind speed is typically between 10 and 15 km/hr (i.e. ~3 m/s and 4 m/s).

At very high wind speeds, typically over 90 km/hr (25 m/s), the wind turbine will cease power generation and shut down. The wind speed at which shut down occurs is called the cut-out speed. Having a cut-out speed is a safety feature which protects the wind turbine from damage. Normal wind turbine operation usually resumes when the wind drops back to a safe level.

It is the flow of air over the blades and through the rotor area that makes a wind turbine function. The wind turbine extracts energy by slowing the wind down. The theoretical maximum amount of energy in the wind that can be collected by a wind turbine's rotor is approximately 59%. This value is known as the Betz Limit. Therefore, if a blade were 100% efficient then it would extract 59% of the energy as this is the maximum (due to Betz law). In practice, the typical collection efficiency of a rotor is 35% to 45%. A complete wind energy system incurs losses through friction and modern systems end up converting between 20-25% of the energy in the air into electricity which equates to 34 - 42% of the maximum (due to Betz Law).

However, because the energy in the air is free, describing how efficiently the energy is converted is only useful for system improvement and monitoring purposes. A more useful measurement is the Capacity Factor, which is also represented as a percentage. The Capacity Factor percentage is calculated from the actual MWh output of electricity from the entire wind farm over 1 year divided by the nameplate maximum theoretical output for the same period. It therefore also takes wind resource, wind variability and system availability (downtime, maintenance and breakdowns) into account. Genesis Namas Wind (Pty) Ltd has initial predictions for Capacity Factors of between 35-40% which compares favourably with other best resource sites in South Africa. This figure will be predicted more accurately when more on-site wind data has been recorded and the most suitable turbine has been chosen.

Wind turbines can be used as stand-alone applications, or they can be connected to a utility power grid. For utility-scale sources of wind energy, a large number of wind turbines are usually erected close together (suitably spaced so as to minimise wake losses and wake induced turbulence) and then connected to an on-site substation where all power is transformed to the correct voltage and then exported via a linkage to the utility power grid. This is termed a wind farm.

CHAPTER 5: REGULATORY AND PLANNING CONTEXT

This chapter provides insight into the policy and legislative context within which the Namas Wind Farm is located, and documents the manner in which the development of the wind farm complies with and responds to these policies and legislation.

5.1. Legal Requirements as per the EIA Regulations, 2014 (as amended)

This chapter of the BA report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 1: Content of basic assessment reports:

Requirement	Relevant Section
3(e)(i) a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are applicable to this activity and have been considered in the preparation of the report	Chapter 5 as a whole provides an overview of the policy and legislative context which is considered to be associated and relevant to the development of the Namas Wind Farm. The regulatory and planning context has been considered at international, national, provincial and local level.
3(e)(ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools, frameworks and instruments.	Tables 5.1, 5.2, 5.3 and 5.4 illustrate the compliance of the proposed Namas Wind Farm with the legislation, policies, plans, guidelines, tools, frameworks and instruments.

5.2. Strategic Electricity Planning in South Africa

The development of electricity generation capacity in South Africa is based on national policy and is informed by on-going strategic planning undertaken by the Department of Energy (DoE). The regulatory hierarchy of policy and planning documentation that support the development of an energy generation project of this nature consists of three tiers of authority who exercise control through both statutory and non-statutory instruments – that is National, Provincial and Local levels. These policies are discussed in more detail in the following sections, along with the provincial and local policies or plans that have relevance to the development of the proposed Namas Wind Farm.

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

» *Department of Energy (DoE):* DoE is responsible for policy relating to all energy forms, and is responsible for compiling and approving the IRP for Electricity.
» *National Energy Regulator of South Africa (NERSA):* NERSA is responsible for regulating all aspects of the electricity sector, and will ultimately issue licenses in the form of Power Purchase Agreements (PPAs) for IPP projects to generate electricity.
» *Department of Environmental Affairs (DEA):* DEA is responsible for environmental policy and is the controlling authority in terms of NEMA and the 2014 EIA Regulations (GNR 326). As per GNR 779 of 01 July 2016, DEA is the Competent Authority, and is charged with making a decision regarding the granting of the relevant EA for this project.

- *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):* SANRAL is responsible for the regulation and maintenance of all national roads and routes.
- *Department of Water and Sanitation (DWS):* DWS is responsible for effective and efficient water resources management to ensure sustainable economic and social development. DWS is also responsible for evaluating and issuing licenses pertaining to water use (i.e. Water Use Licenses (WULs) and / or registration of General Authorisations (GAs)).
- *Department of Agriculture, Forestry and Fisheries (DAFF):* DAFF is the custodian of South Africa's agricultural, forestry, and fishery resources and is primarily responsible for the formulation and implementation of policies governing the Agriculture, Forestry and Fisheries Sector. DAFF is also responsible for the issuing of permits for the disturbance or destruction of protected tree species.
- *Department of Mineral Resources (DMR):* Approval from DMR will be required to use land surface contrary to the objects of the Mineral and Petroleum Resources Development Act (No. 28 of 2002) (MPRDA) in terms of Section 53 of the Act. In terms of the MPRDA approval from the Minister of Mineral Resources is required to ensure that proposed activities do not sterilise a mineral resource that may occur on site.
- *Department of Rural Development and Land Reform (DRDLR):* DRDLR is dedicated to the social and economic development of rural South Africa, and is responsible for providing a framework for rural development.

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

- *Northern Cape Department of Environment, and Nature Conservation (DENC):* DENC is the Commenting Authority for the project, and is also responsible for issuing any biodiversity and conservation-related permits. DENC's involvement relates specifically to sustainable resource management, conservation of protected species and land care.
- *Northern Cape Department of Roads and Public Works (NCDRPW):* NCDRPW is responsible for roads and the granting of exemption permits for the conveyance of abnormal loads on public roads.
- *Ngwao Boswa Kapa Bokone (NBKB):* NBKB, the Northern Cape Provincial Heritage Resources Authority is responsible for the identification, conservation and management of heritage resources, as well as commenting on heritage related issues within the Province.

At the **Local Level** the local and municipal authorities are the principal regulatory authorities responsible for planning, land use and the environment. In the Northern Cape, both the local and district municipalities play a role.

- The local municipality is the Nama Khoi Local Municipality.
- The district municipality is the Namakwa District Municipality.

In terms of the Municipal Systems Act (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 governance.

5.3. Policy and Planning Considerations on International, National, Provincial and Local Levels

5.3.1. Policy and Planning on an International Level

South Africa has committed to various international policies which relate to environmental concerns, specifically that of climate change and global warming. **Table 5.1** below provides a summary of the international policies and plans that South Africa has made commitments towards, and how the development of the Namas Wind Farm aligns with the thinking or commitments of these agreements.

Table 5.1: International policies and plans relevant to the Namas Wind Farm

Policy or Plan	**Is the development of the Namas Wind Farm aligned with this policy or plan?**
The Kyoto Protocol, 1997	Yes. The protocol calls for the reduction of South Africa's greenhouse gas emissions through actively cutting down on using fossil fuels, or by utilising more renewable resources. The development of the Namas Wind Farm will add capacity to the renewable energy sector of the country and strengthen the commitment and action plan to achieve the requirements as set out in the protocol.
United Nations Framework Convention on Climate Change and COP21 – Paris Agreement	Yes. South Africa supports the adoption of the Paris Agreement which has the main objective of addressing the climate change issue and marks the first international political response to climate change. South Africa has set out a goal of 17GW of renewable energy by 2030 within the IRP of 2011[10]. Through the development of renewable energy projects (including the Namas Wind Farm) additional renewable energy will be made available to the country, which in turn will demonstrate the contribution that South Africa is making to the global response to climate change specifically relating to the development of the renewable energy sector.
The Equator Principles III, June 2013	Yes. The Equator Principles (EPs) III constitute a financial industry benchmark used for determining, assessing, and managing a project's 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. 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 Environmental Health and Safety (EHS) Guidelines. The Namas Wind Farm 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.
International Finance Corporation (IFC) Performance Standards on Environmental and Social	Yes. The overall objectives of the IFC performance standards are to fight poverty, do no harm to people or the environment, fight climate change by promoting low carbon development, respect human rights, promote gender equality, provide information prior to project development, collaborate with the project developer in order to achieve the

[10] The draft IRP 2030 released for public comment in August 2018 includes a target of 37GW of wind energy as part of the energy mix by 2050.

Policy or Plan	Is the development of the Namas Wind Farm aligned with this policy or plan?
Sustainability, January 2012	performance standard, provide advisory services and notify countries of trans boundary impacts. When considering the development of the Namas Wind Farm the following performance standards are anticipated to be applicable at this stage of the BA process: » *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 6:* Biodiversity Conservation and Sustainable Management of Living Natural Resources » *Performance Standard 8:* Cultural Heritage

5.3.2. Policy and Planning on a National Level

National policies and plans adopted by South Africa, which are considered to be relevant to the development of the Namas Wind Farm have been summarised in **Table 5.2**.

Table 5.2: National policies, plans and legislation relevant to the Namas Wind Farm

Policy, Plan or Legislation	Is the development of the Namas Wind Farm aligned with this policy, plan or legislation?
The National Energy Act (2008)	Yes. One of the objectives of the Act is to promote the diversity of the supply of energy and its sources. In this regard, the preamble makes direct reference to renewable resources and states that provision must be made for increased generation and consumption of renewable energies. The Namas Wind Farm project promotes diversity of supply of energy and the source of supply, in line with the Act's objectives.
White Paper on the Energy Policy of South Africa, 1998	Yes. The South African Energy Policy of 1998 identifies five key objectives, namely increasing access to affordable energy services, improving energy sector governance, stimulating economic development, managing energy related environmental impacts and securing supply through diversity. In order to meet these objectives South Africa needs to optimally use available energy resources. The development of the Namas Wind Farm will contribute, albeit only to a limited extent, to the achievement of the five objectives of the Energy Policy of the country.
White Paper on the Renewable Energy Policy of the Republic of South Africa (2003)	Yes. This White Paper fosters the uptake of renewable energy in the economy and has a number of objectives that need to be met, including that equitable resources are invested in renewable technologies. South Africa is also endowed with renewable energy resources that can be sustainable alternatives to fossil fuels. The development of additional renewable energy projects (including the Namas Wind Farm) will promote the use of the abundant South African renewable energy resources and contribute to long-term energy security and diversification of the energy mix.
The Electricity Regulation Act, 2006 (Act No. 4 of 2006), as amended	Yes. The Act establishes a national regulatory framework for the electricity supply industry of the country and introduces the National Energy Regulator as the custodian and enforcer of the National Electricity Regulatory Framework. The Act also provides for licences and registration as the manner in which generation, transmission, distribution, trading and the import and export of electricity are regulated. The developer of the Namas Wind Farm project will have to ensure compliance with this Act as a license for the generation of electricity will be required.
Renewable Energy Policy in South Africa	Yes. Support for the Renewable Energy Policy is guided by a rationale that South Africa has a very attractive range of renewable energy resources, particularly solar and wind,

Policy, Plan or Legislation	Is the development of the Namas Wind Farm aligned with this policy, plan or legislation?
	and that renewable applications are, in fact, the least cost energy service in many cases from a fuel resource perspective (i.e. the cost of fuel in generating electricity from such technology); more so when social and environmental costs are taken into account. However, the National Energy Policy acknowledges that the development and implementation of renewable energy applications has been largely neglected in South Africa. Challenges regarding the implementation of renewable energy have been identified. Through the development of renewable energy projects (including the Namas Wind Farm project), additional renewable energy will be made available which will assist with the further growth and development of the renewable energy sector.
National Development Plan (NDP)	Yes. The NDP aims at eliminating poverty and reducing inequality by 2030 and identifies 9 key challenges and associated remedial plans. Managing the transition towards a low carbon national economy is identified as one of the 9 key national challenges. Expansion and acceleration of commercial renewable energy is identified as a key intervention strategy. The plan also sets out steps that aim to ensure that, in 20 years, South Africa's energy system looks very different to the current situation: coal will contribute proportionately less to the primary-energy needs, while gas and renewable energy resources – especially wind, solar and imported hydroelectricity – will play a much larger role. Through the development of renewable energy projects (including the Namas Wind Farm project) additional renewable energy will be available which will assist in expanding the renewable energy sector of the country and add to the diversification of the energy mix, which is moving away from coal and towards the use of gas and renewable energy.
Integrated Energy Plan (IEP)	Yes. 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. Eight key objectives were identified which relate mainly to the security, cost, access, diversity, efficiency, impact in terms of emissions, conservation and social benefits in terms of energy planning. The IEP recognises the potential of renewable energy for power generation. With the additional renewable energy to be generated by the Namas Wind Farm, a contribution to this objective will be made. Also, with the development of the Namas Wind Farm, the eight key objectives in terms of energy planning will be met, even if only to a limited extent.
Integrated Resource Plan (IRP) 2010 - 2030	Yes. The Integrated Resource Plan (IRP) for Electricity 2010 – 2030 constitutes a subset of the IEP and is South Africa's national electricity plan. The document outlines the proposed generation new-build fleet for South Africa. The adopted scenario was derived based on a cost-optimal solution for new-build options (considering the direct costs of new build power plants), which was then "balanced" in accordance with qualitative measures such as local job creation. The IRP essentially drives the assortment of energy to be implemented for South Africa which is known as the energy mix of the country, considering various generation technologies. The plan includes 17.8GW of renewables, 9.6GW of nuclear; 6.25GW of coal, and approximately 8.9GW of other generation sources such as hydro, and gas. On this basis, Ministerial determinations have called for a procurement of 8 100MW of wind energy by the end of 2030 (Department of Energy, 2018[11]). The development of the Namas Wind Farm has the potential to contribute up to 140MW of wind energy which will support the Government's target for electricity generated by wind energy facilities.

[11] An updated IRP was released in August 2018 for review and comment. A new IRP is expected to be promulgated shortly.

Policy, Plan or Legislation	Is the development of the Namas Wind Farm aligned with this policy, plan or legislation?
Strategic Integrated Projects (SIP)	Yes. In 2010, a National Development Plan was drafted to address socio-economic issues affecting development in South Africa. These issues were identified and placed under 18 different Strategic Integrated Projects (SIPs) to address the spatial imbalances of the past by addressing the needs of the poorer provinces and enabling socio-economic development. The development of renewable energy projects (including the Namas Wind Farm) will support the Strategic Integrated Projects within three SIPs, which relate to the development of the wind farm and the development of the associated infrastructure. This includes SIP 8 – green energy in support of the South African economy; SIP 9 – electricity generation to support socio-economic development; and SIP 10 – electricity transmission and distribution for all. In support of SIP 8, the Department of Environmental Affairs undertook a Strategic Environmental Assessment (SEA) to facilitate the implementation of sustainable green energy initiatives. This SEA identified areas where large-scale wind and solar PV energy facilities can be developed in terms of SIP 8 and in a manner that limits significant negative impacts on the natural environment, while yielding the highest possible socio-economic benefits to the country (DEA, 2015). These areas are referred to as Renewable Energy Development Zones (REDZs). 8 REDZ areas have been designated and were gazetted within GNR114 of February 2018. The Namas Wind Farm falls within REDZ 8 (Springbok) and is therefore considered to be in line with national planning in this regard. SIP 9 supports the acceleration of the construction of new electricity generation capacity, in accordance with the IRP 2010, to meet the needs of the economy and address historical imbalance. The proposed Namas Wind Farm will generate electricity, which will result in social and economic upliftment and development within the surrounding communities. In support of SIP 10, the Department of Environmental Affairs undertook a Strategic Environmental Assessment (SEA) which aims to provide guidance for the efficient and sustainable expansion of strategic electricity grid infrastructure in South Africa. This SEA identified the optimal location for strategic corridors where transmission infrastructure expansion is needed to enable the balancing of future demand and supply requirements, while minimising negative impacts to the environment. These areas are referred to as Power Corridors, and were gazetted within GNR113 of February 2018. The Namas Wind Farm falls within the Northern Transmission Corridor and is therefore considered to be in line with national planning in this regard.
New Growth Path (NGP) Framework, 2010	Yes. 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. To achieve this, government will seek to, amongst other things, identify key areas for large-scale employment creation, as a result of changes in conditions in South Africa and globally, and to develop a policy package to facilitate employment creation in these areas. The Namas Wind Farm will assist with the creation of both temporary and permanent employment opportunities during the construction and operation phases, which will contribute, albeit to a limited extent, to the economy and sustainable growth.
National Climate Change Response Strategy	Yes. This strategy aims to address issues identified as priorities for dealing with climate change in the country. The focus of the strategy is adapting to climate change; developing a sustainable energy programme; adopting an integrated response by the relevant government departments; compiling inventories of greenhouse gases; accessing and managing financial resources; and research, education, and training. The

Policy, Plan or Legislation	Is the development of the Namas Wind Farm aligned with this policy, plan or legislation?
	development of renewable energy projects (including the Namas Wind Farm) will ensure additional uptake of renewable energy into the national grid which will reduce the need for the use of coal as an energy resource and thereby assist in addressing climate change and global warming.
Climate Change Bill, 2018	Yes. The Bill provides a framework for climate change regulation in South Africa aimed at governing South Africa's sustainable transition to a climate resilient, low carbon economy and society. The Bill provides a procedural outline that will be developed through the creation of frameworks and plans. The bill aims to provide for the coordinated and integrated response to climate change and its impacts, provide effective management of inevitable climate change impacts and to make a fair contribution to the global effort to stabilise greenhouse gas concentrations. The Namas Wind Farm comprises a renewable energy generation facility and would therefore not result in the generation or release of emissions during its operation.

5.3.3. Policy and Planning at a Provincial Level

Policies and plans have been adopted by the Northern Cape Province for the management of the area and are considered to be relevant to the development of the Namas Wind Farm. **Table 5.3** provides a summary of the relevant provincial plans and policies.

Table 5.3: Provincial policies and plans relevant to the Namas Wind Farm

Policy or Plan	Is the development of the Namas Wind Farm aligned with this policy or plan?
Northern Cape Provincial Spatial Development Framework (PSDF), 2012	Yes. The PSDF seeks to advance the establishment of renewable energy supply schemes within the Province and identifies that the Northern Cape holds a potential comparative advantage due to the regular occurrence of strong winds which could be a source of renewable energy, specifically for sustainable electricity production. The PSDF also aims for renewable energy sources to constitute 25% of the Province's energy production capacity by 2020. The REIPPPP focus on Northern Cape Provincial Report Volume 1 (June 2017) indicates that the Northern Cape Province has contributed 16 991GWh actual energy to the national grid which amounts to approximately 42% of the renewable energy contribution to the grid. Of this 42%, 13% (i.e. 958 GWh) was generated by wind energy facilities and 73% (i.e. 5 218 GWh) was generated by solar energy facilities. With the developed and proposed independent power producer capacity (including the Namas Wind Farm), the Province will produce more than 100% of its own electrical power needs from renewable energy resources (although this energy will be fed into the national grid).

5.3.4. Policy and Planning on a District and Local Level

Strategic policies at the district and local level have similar objectives for the respective areas, namely the delivery of basic services, including the provision of electricity. The proposed development is considered to align with the aims of these policies.

Table 5.4 below provides a summary of the district and local level policies and plans considered to be relevant to the development of the Namas Wind Farm.

Table 5.4: District and local policies and plans relevant to the Namas Wind Farm

Policy or Plan	Is the development of the Namas Wind Farm aligned with this policy or plan?
Namakwa District	Yes. Renewable energy developments are considered to be development priorities within

Policy or Plan	Is the development of the Namas Wind Farm aligned with this policy or plan?
Municipality Rural Development Plan (RDP), 2017	the RDP. The need to evaluate localisation possibilities for all renewable energy technologies is emphasised in the plan. The development of renewable energy projects (including the Namas Wind Farm) will contribute to the achievement of the need for the development of renewable energy developments within the Province.
Namakwa District Municipality Integrated Development Plan (IDP), 2017 - 2022	Yes. The plan identifies the need for support to the local municipalities to deliver basic services such as water, sanitation, housing, electricity and waste management. The IDP also seeks to establish good governance by enforcing the climate change response plan. The development of the Namas Wind Farm may contribute to the delivery of basic services, however only to a limited extent. The proposed wind farm will contribute to the application of the climate change response plan through zero production of greenhouse gas emissions during the operation of the facility.
Nama Khoi Municipality Draft Integrated Development Plan (IDP), 2018/2019	Yes. The IDP seeks to provide sustainable delivery of services such as water and sanitation, electricity, and solid waste management amongst others. The plan also identifies possible high wind energy generation zones to the south of Vioolsdrift, and around Springbok and Koingnaas, and proposes an analysis of the areas for the development of wind farms. The development of the Namas Wind Farm may contribute to the delivery of basic services, however only to a limited extent. The Namas Wind Farm is located near Kleinsee which is located west of Springbok and which is considered to be the area in the Local Municipality suitable for the development of a wind farm.

CHAPTER 6: NEED AND DESIRABILITY

This chapter provides a description of the need and desirability of the Namas Wind Farm at the project site considered reasonable and feasible by the project Applicant.

6.1. Legal Requirements as per the EIA Regulations, 2014 (as amended)

This chapter of the BA report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 1: Content of basic assessment reports:

Requirement	Relevant Section
3(f) a motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred location.	The need and desirability of the Namas Wind Farm is included and discussed as a whole within this chapter. The need and desirability for the development of the Namas Wind Farm has been considered from an international, national, regional and site-specific perspective.

6.2 Need from an International Perspective

The need and desirability of the Namas Wind Farm, from an international perspective, can be described through the project's alignment with internationally recognised and adopted agreements, protocols, and conventions. South Africa is signatory to a number of international treaties and initiatives, including the United Nation's Development Programme's (UNDP's) Sustainable Development Goals (SDGs). The SDGs address social and economic development issues such as poverty, hunger, health, education, climate change, gender equality, water, sanitation, energy, urbanization, environment and social justice. The SDGs comprise 17 global goals set by the United Nations. The 17 SDGs are characterised by 169 targets, and 304 indicators.

Goal 7 of the SGDs relates to "Affordable and Clean Energy", with the aim of the goal being to ensure access to affordable, reliable, sustainable and modern energy for all. The following targets and indicators have been set for Goal 7:

Targets		Indicators	
7.1	By 2030, ensure universal access to affordable, reliable and modern energy services.	7.1.1 7.1.2	Proportion of population with access to electricity. Proportion of population with primary reliance on clean fuels and technology.
7.2	By 2030, increase substantially the share of renewable energy in the global energy mix.	7.2.1	Renewable energy share in the total final energy consumption.
7.3	By 2030, double the global rate of improvement in energy efficiency.	7.3.1	Energy intensity measured in terms of primary energy and GDP.
7.A	By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy	7.A.1	Mobilised amount of United States dollars per year starting in 2020 accountable towards the $100 billion commitment.

Targets		Indicators	
	infrastructure and clean energy technology.		
7.B	By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support.	7.B.1	Investments in energy efficiency as a percentage of GDP and the amount of foreign direct investment in financial transfer for infrastructure and technology to sustainable development services.

The development of the Namas Wind Farm would contribute positively towards achieving Goal 7 of the SGDs through the following means:

- By generating up to 140MW (contracted capacity) of affordable and clean energy.
  - A study published by the CSIR on 14 October 2016 ("Cost of new power generators in South Africa Comparative analysis based on recent IPP announcements", Dr Tobias Bischof-Niemz and Ruan Fourie), which took into consideration the results of the cost prices bid successfully under the DoE's REIPPP and Coal Baseload IPP Procurement (CBIPPP) Programmes, found that wind and solar PV were 40% cheaper than new baseload coal (i.e. R0.62/kWh for wind and PV vs R1.03 for coal).
  - Wind power technology is one of the cleanest electricity generation technologies, as it is not a consumptive technology and does not result in the release of emissions during its operation.
- By contributing towards South Africa's total generation capacity, specifically through the utilisation of renewable energy resources.

The Kyoto Protocol (1997) is also relevant to the need of the development of the Namas Wind Farm from an international perspective. The protocol calls for the reduction of South Africa's greenhouse gas emissions through actively cutting down on using fossil fuels, or by utilising more renewable resources. The development of the Namas Wind Farm will add capacity to the renewable energy sector of the country and strengthen the commitment and action plan to achieve the requirements, as set out in the protocol, through the generation of energy without the emission of greenhouse gasses.

6.3 Need from a National Perspective

The Namas Wind Farm is proposed in specific response to a national government initiative, namely the DoE's REIPPP Programme. This programme was initiated in order to give effect to the requirements of the IRP with regards to renewable energy targets. 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 5). The following key policies have been developed by Government to take into account 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 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. South Africa has a good wind resource for the development and generation of wind energy.

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 wind energy's contribution to the diversified energy mix:

- Wind energy should continue to play a role in the generation of electricity. Allocations to ensure the development of wind energy projects aligned with the IRP should continue to be pursued.

The IRP for Electricity 2010 – 2030 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 IRP 2010 - 2030 includes 9.6GW of nuclear, 6.25GW of coal, 17.8GW of renewables, and approximately 8.9GW of other generation sources such as hydro, and gas in addition to all existing and committed power plants.

On 22 August 2018 the Draft IRP 2018 was released for comment. The latest update of the IRP includes estimates that 9GW of wind, 7.82GW of PV, 10.94GW of gas (CCGT / CCGE / OCGT), and 0.025GW of landfill gas would be required by the end of 2030[12].

In line with government policy to reduce Greenhouse Gas (GHG) emissions, the IRP update uses the moderate decline constraint for GHG emissions. Although, this is subject to change following recent correspondence received from DEA indicating that carbon budget methodology must be used instead of emissions decline constraints; the consideration of GHG emissions in the determination of the energy generation mix indicates government's commitment to international obligations under the Paris Agreement.

In response to the IRP, the DoE initiated a number of IPP Procurement Programmes to secure electricity generated by a range of resources from the private sector (i.e. from IPPs). Under these Programmes, IPPs are invited to submit proposals for the finance, construction, operation, and maintenance of electricity generation facilities for the purpose of entering into an Implementation Agreement with the DoE and a Power Purchase Agreement (PPA) with Eskom as the buyer. IPPP Programmes include the REIPPP, the Co-generation IPPP Programme, the Liquefied Natural Gas (LNG) to Power IPPP Programme, and the CBIPPPP (refer **Table 6.1**).

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[12] These figures reflect capacities for the Least Cost Plan (IRP1) by year 2030 without Annual Build Limits on RE (IRP3).

Table 6.1: Overview of IPPP Programmes and their current allocation (MW)

IPP Procurement Programme	Technology	MW	Total
Renewables	Onshore Wind	6 360 MW	14 725MW
	Concentrated solar thermal	1 200 MW	
	Solar Photovoltaic	4 725 MW	
	Biomass	210 MW	
	Biogas	110 MW	
	Landfill Gas	25 MW	
	Small hydro	195 MW	
	Small Projects	400 MW	
	Solar Parks	1 500MW	
Coal Baseload	Coal	2 500MW	2 500MW
Cogeneration	Cogeneration	800MW	800MW
Gas	Gas	3 000MW	3 000MW

(Sources: https://www.ipp-renewables.co.za/, https://www.ipp-coal.co.za/, https://www.ipp-gas.co.za/ and https://www.ipp-cogen.co.za/)

Renewable resources are valuable in contributing towards electricity generation and diversifying South Africa's electricity mix. Under the REIPPP Programme, the DoE intends to secure 14 725MW of electricity from renewable energy generation facilities utilising either Onshore Wind, Concentrated Solar Thermal, Solar PV, Biomass, Biogas, Landfill Gas, or Hydro across a number of bidding windows, while simultaneously contributing towards socio-economic development. Preferred bidders identified under any IPPP Programme, including the REIPPP Programme, are required to satisfy a number of economic development requirements, including amongst others, job creation, local content, skills development, enterprise and supplier development, and socio-economic development. In addition to electricity generation and supply, IPPP Programmes therefore also contribute positively towards socio-economic development of a region, over and above job creation.

In 2010, the National Development Plan identified socio-economic issues affecting development in South Africa. These issues were identified and placed under 18 different Strategic Integrated Projects (SIPs) to address the spatial imbalances of the past by addressing the needs of the poorer provinces and enabling socio-economic development. The development of renewable energy projects (including the Namas Wind Farm) will support the SIPs which relate to the development of the wind farm and the development of the associated infrastructure. This includes SIP 8 – green energy in support of the South African economy; SIP 9 – electricity generation to support socio-economic development; and SIP 10 – electricity transmission and distribution for all.

SIP 8 relates to the facilitation and implementation of sustainable green energy initiatives. This was undertaken by DEA as part of a Strategic Environmental Assessment (SEA) to identify areas within which large-scale wind and solar PV energy facilities can be developments. These areas are known as Renewable Energy Development Zones (REDZs). The Namas Wind Farm falls within REDZ 8 (Springbok) and is therefore considered to be in line with national planning. Refer to **Figure 6.1**.

SIP 9 aims to meet the needs of the economy and to address historical imbalance through the accelerations of the construction of new electricity generation capacity. The Namas Wind Farm will generate electricity which will result in positive impacts in terms of socio-economic aspects such as social and economic upliftment and development within the surrounding communities.

SIP 10 relates to efficient and sustainable expansion of strategic electricity grid infrastructure in South Africa. An SEA was undertaken by DEA which identified the optimal location for strategic corridors where transmission infrastructure expansion is needed to enable the balancing of future demand and supply requirements, while minimising negative impacts to the environment. These areas are referred to as Power Corridors. The Namas Wind Farm falls within the Northern Transmission Corridor. Refer to **Figure 6.1.**

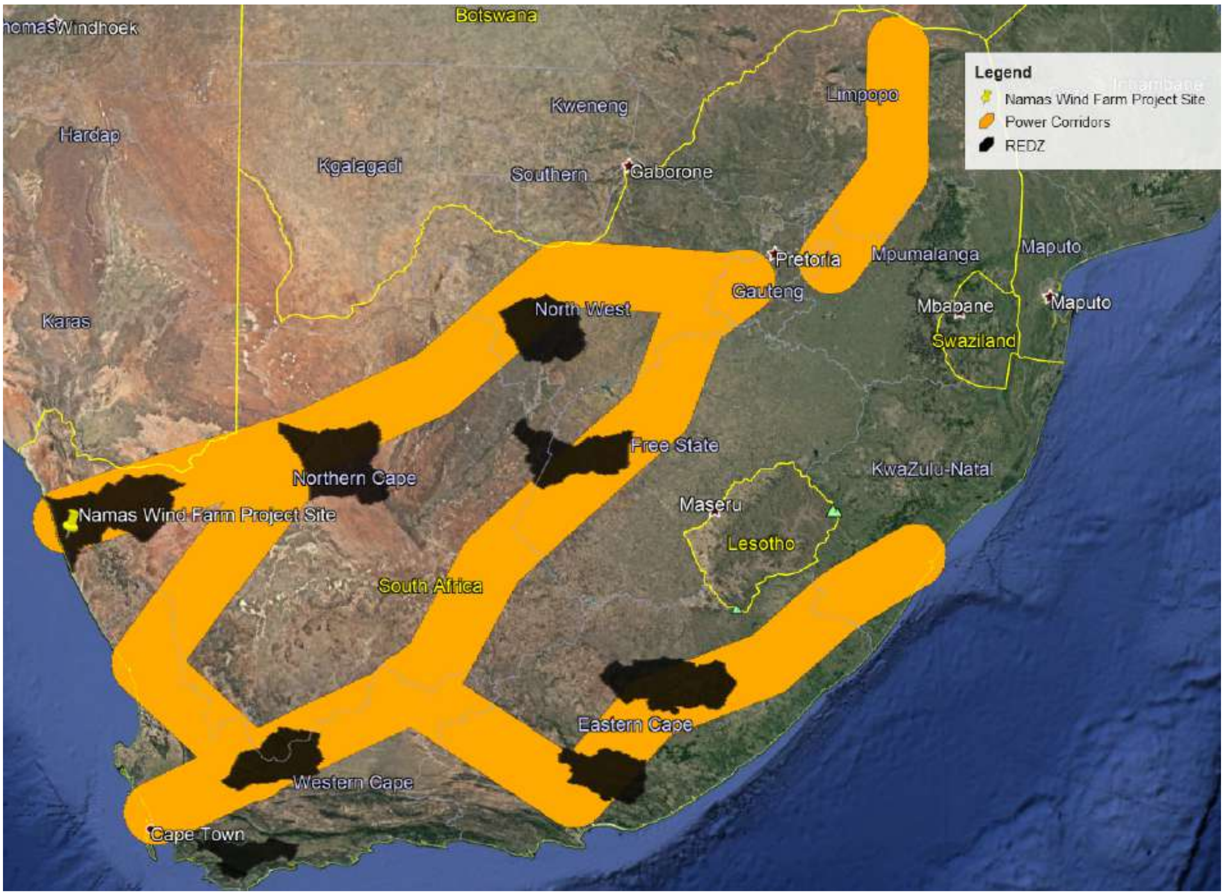

Figure 6.1: The Renewable Energy Development Zones (REDZ) and Power Corridors associated with SIP 8 and SIP 10

The need for new power generation from wind energy 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 implementation of the Namas Wind Farm, therefore, has the potential to contribute positively towards the identified need, while simultaneously contributing to job creation and socio-economic development, which is identified as a need for the country within the National Development Plan. The wind farm will make use of renewable energy technology, and would contribute positively towards reducing South Africa's GHG emissions and ensure compliance with all applicable legislation and permitting requirements. In addition, by making use of wind power technology, the project would have reduced water requirements, when compared with some other generation 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).

6.4 Need from a Regional and District Perspective

South Africa's electricity generation mix has historically been dominated by coal. This can be attributed to the fact that South Africa has abundant coal deposits, which are relatively shallow with thick seams, and are therefore easy and comparatively cost effective to mine. In 2016, South Africa had a total generation capacity of 237 006GWh; approximately 85.7% (equivalent to 203 054GWh) of this figure was generated by coal, and only 0.9% (equivalent to 2 151GWh) was generated by wind (refer to **Figure 6.2**).

Whereas the majority of South Africa's electricity generation infrastructure is currently located within Mpumalanga Province due to the location of coal resources within this province, the Northern Cape Province has been identified as an area where the development of wind farms is a feasible and suitable option for electricity generation.

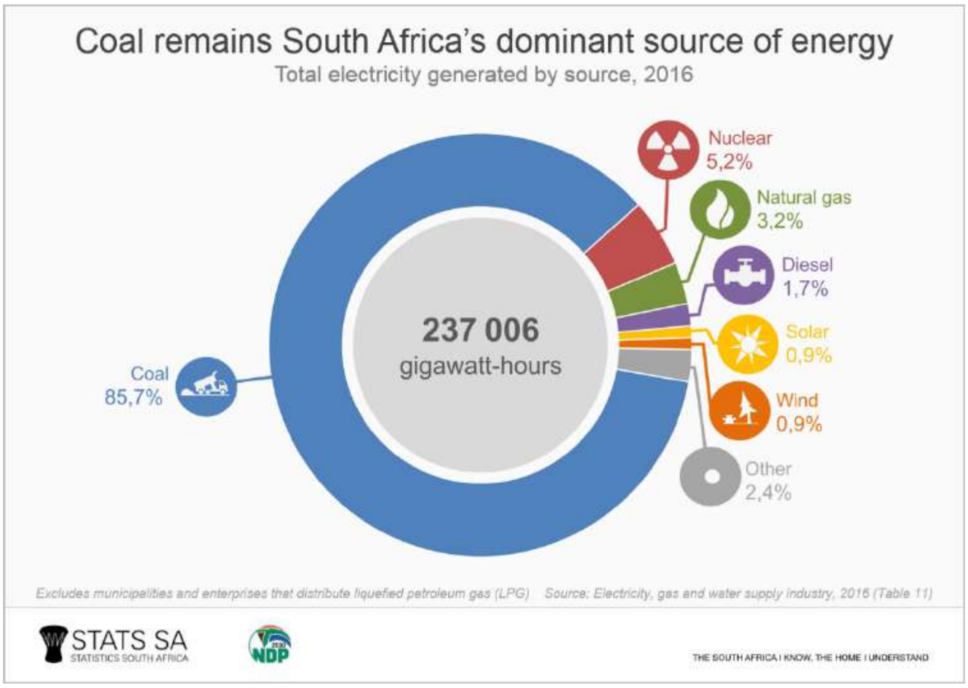

Figure 6.2: Overview of South Africa's electricity generation by source (source: StatsSA 2016 Electricity, gas and water supply industry)

At a provincial level, the Northern Cape vision and over-arching goal (Northern Cape PSDF, 2012) relates to enabling sustainable development, which is set to be achieved through inter-related principles and objectives. The objective which specifically relates to renewable energy refers to the fact that the Province has a significant comparative economic advantage vested in its inherent resources, which includes both renewable and non-renewable resources. The Province considers the sustainable use of such resources as the key to long-term sustainability and growing prosperity. Further to this, the Province considers that the benefits derived from the use of its inherent resources must be undertaken within its renewal capacity, maintain the integrity of the natural systems which produce the resources, minimise or avoid the risk or irreversible change induced by human activity, and avoid or minimise the adverse impacts of the use of non-renewable resources.

The Nama Khoi Local Municipality Spatial Development Framework (SDF) identifies development corridors for the municipal area (**Figure 6.3**). These corridors are relevant to the development of the Namas Wind Farm as the project is partially located within the Wind Energy Corridor, coinciding with the spatial vision for the area.

The Kleinsee area has been confirmed as an area with sufficient wind resources and wind speeds for a wind farm development. Refer to **Figure 6.4**.

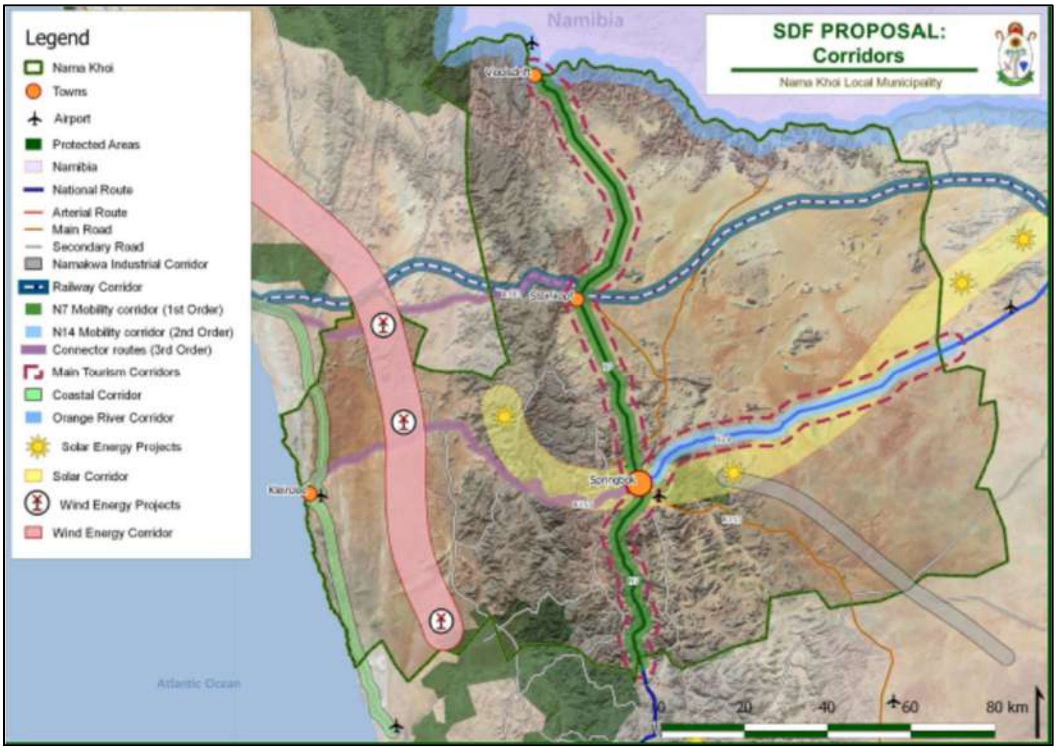

Figure 6.3: Nama Khoi Local Municipality Spatial Development Framework Corridors. The Namas Wind Farm project site is located partially within the wind energy corridor of the Spatial Development Framework

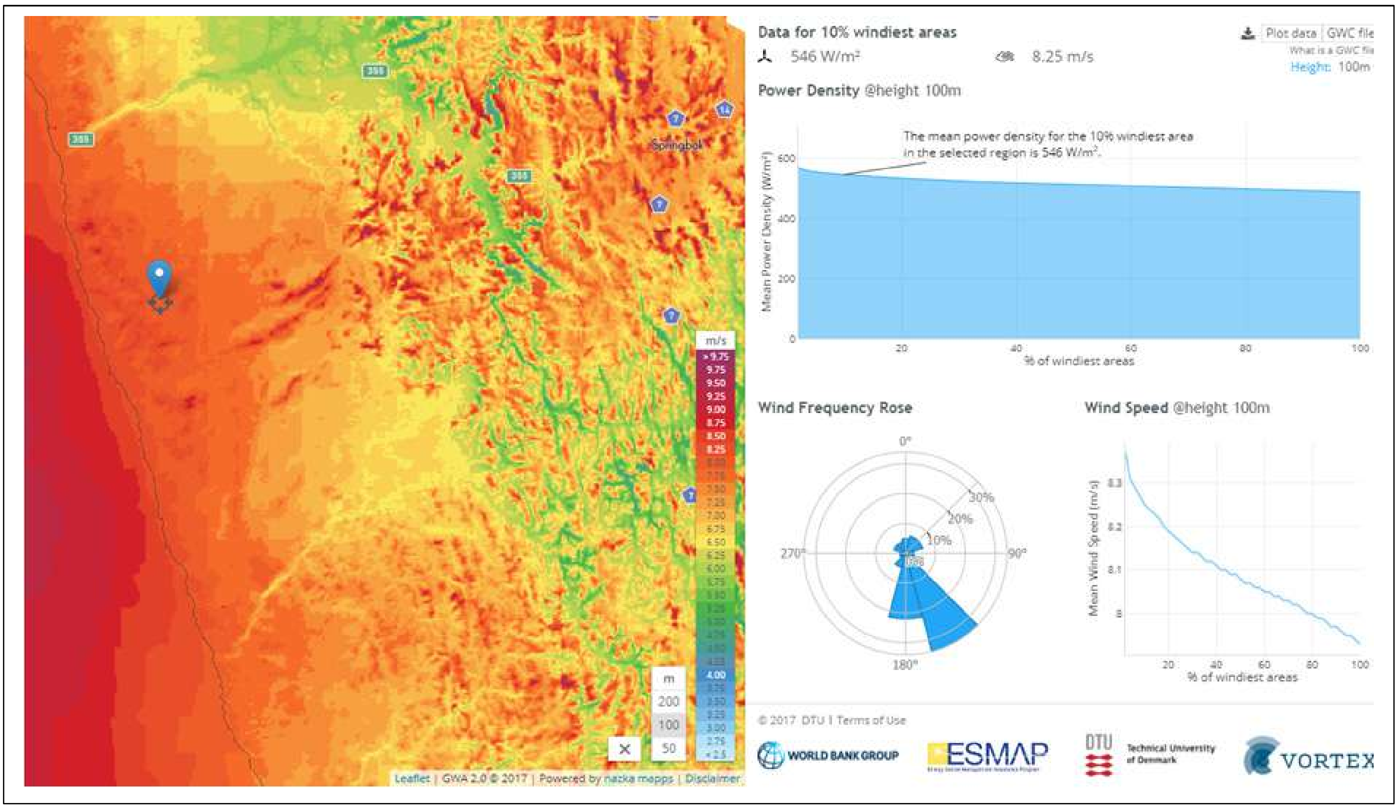

Figure 6.4: Average wind speed expected at the Namas Wind Farm project site (https://globalwindatlas.info/)

Considering the above, it can be confirmed that from a regional perspective there is a need and desirability for the development of wind farms within the Northern Cape and specifically the regional area of the project site.

From a district level the need for the development of the Namas Wind Farm is reflected within the Namakwa District Municipality and Nama Khoi Local Municipality planning documentation. The following planning policies make reference to the need for the development of renewable energy facilities within the District Municipality:

* The Namakwa District Municipality Rural Development Plan (RDP) (2017) considers renewable energy developments to be one of the development priorities within the RDP. The plan also emphasises the need to evaluate localisation possibilities for all renewable energy technologies and identify the relevant localisation roadmaps in consultation with the broader stakeholder community.

* The Namakwa district Municipality Integrated Development Plan (IDP) (2017 – 2022) states that one of its objectives is to oversee and support local municipalities to deliver basic services (water, sanitation, housing, electricity and waste management). The IDP also seeks to establish good governance by enforcing the climate change response plan.

Considering the requirements and needs for the development of a wind farm within the Namakwa District Municipality, it is considered that there is a definite need for developments of such a nature through the District's commitment to the promotion of renewable energy developments, as well as the need for service delivery and development priorities of the municipal area.

6.5 Receptiveness and Desirability of the project site to develop the Namas Wind Farm

The feasibility of the project site for the development of the Namas Wind Farm also provides an indication of the desirability of the development within the site. The section below provides a description of the site-specific considerations that contribute to the desirability of the Namas Wind Farm within the project site.

The Namas Wind Farm is proposed to be constructed outside of the urban edge of the surrounding towns on privately-owned properties currently used for agricultural practises. The affected farm portions have not been considered for an alternative land use such as urban development or mining.

The project site proposed for the development of the Namas Wind Farm displays characteristics which contribute to the overall desirability. These include:

Extent of the project site: The affected properties desirable for and available for the wind farm development cover an area of 5092ha. This area is sufficient to accommodate the proposed Namas Wind Farm, and considered to be sufficient space for the development footprint to be designed and to consider the identified environmental sensitivities. A development footprint of ~35.46ha is required for the wind farm, which is less than 1% of the entire project site.

Site access: Access to the project site is ample with the presence of existing roads. The current formal site access is located off of a provincial gravel minor road that connects from the surfaced MR751 road located to the west of the project site. The project site can also be accessed via a gravel road connecting to the DR2964 north of the site, however this route is an informal access point.

Land availability: The majority of the land in the Kleinsee area is mining land, with only a few properties privately-owned and available for development other than mining. The properties affected by the Namas Wind Farm project site are some of the few available privately-owned land parcels suitable for a wind farm development.

Topographical considerations and existing infrastructure: The Namas Wind Farm project site contains topography which has very few constraints that could have an effect on wind speed and direction. The topography is also favourable for the construction and maintenance activities associated with the development of a wind farm. The location of the project site in relation to the coastal area located to the west, is considered to be an acceptable distance (more than 5km).

Current land use and character: The Namas Wind Farm project site is located within an area that has typically been used for mining and low-intensity agricultural activities. The predominant land-use within the region has been mining, and has resulted in degradation to considerable areas within the general area. The development of renewable energy projects within this region provides an opportunity to relieve the area, to some extent, which has suffered severe socio-economic challenges and degradation due to the closure of mining operations. The current land-use within the project site is agricultural activities, specifically sheep farming and the grazing associated therewith. The development of the Namas Wind Farm on the affected properties will introduce a new land-use to these properties, which is considered a more productive land-use than that of grazing, due to the low carrying capacity and water resource constraints.

Grid connection and capacity*[13]*: The Namas Wind Farm will be connected to the existing Gromis Substation located approximately 26km north of the project site. Eskom has plans to upgrade the existing Gromis Substation, which will be undertaken in conjunction with the construction of the authorised Eskom Gromis-Juno 400kV power line.

Wind resource: This is considered as the primary criteria determining the feasibility of the wind farm development, as the wind resource affects the efficiency and economic viability of the wind farm. The developer has confirmed suitability of the Kleinsee area and the project site from a wind resource perspective. A wind mast was also installed on the Namas Wind Farm project site in April 2017, and the developer has in excess of 12 months of data to confirm the resource. The average wind speed for the project site is approximately between 7.5 and 8 m/s at 100m above ground level (agl).

Proximity to Towns with a Need for Socio-Economic Upliftment: The unemployment rate of the Nama Khoi Local Municipality is 17%, which is largely attributed to the increasing decline in the population in the area, which has likely lead to the out-migration of economically active people and subsequent reduction in the unemployment rate. The challenges faced within the Local Municipality (IDP, 2018/2019) include water shortages, high poverty rates, low rainfall, electricity outages/surges, skills gap within the local population, lack of jobs and economic development, geographically dispersed small population located far from resources of industrial inputs and from markets and low income levels and low spending capabilities.

In terms of the needs of the local community, the IDP identified challenges within the area which need to be addressed. The project has the potential to make a positive contribution towards the identified community needs and challenges. In terms of the economic development requirements of the REIPPP programme, the project will commit benefits to the local community, including job creation, localisation and community ownership. A percentage of the revenue per annum from the operational wind farm will be made available to the community through a social beneficiation scheme, in accordance with the DoE bidding requirements of the REIPPP programme. Therefore, the potential for creation of employment and business opportunities, and the opportunity for skills development and socio-economic upliftment for the local community is significant.

Secondary social benefits can be expected in terms of additional spend in the nearby towns due to the increased demand for goods and services.

Considering the above, it is clear that a need for employment opportunities and skills development is present within the area, as well as the socio-economic benefits which will be associated with it. These benefits would include an increase in the standard of living for the local residents within the area, as well as overall financial and socio-economic upliftment.

Transportation of Material and Components: As material and components would need to be transported to the site during the construction phase of the Namas Wind Farm, accessibility was a key factor in determining the viability of the project, particularly taking transportation costs into consideration (direct and

[13] The construction of the 132kV overhead power line will be assessed as part of a separate Basic Assessment process.

indirect) and the impact of this on project economics. The presence of national roads available for use from the Port of Saldanha is considered beneficial as access to the site is available from the port for equipment during the construction and operation of the wind farm.

6.6 Need for and Benefits of Renewable Energy in the South African Environment

The generation of electricity from renewable energy resources offers a range of potential socio-economic and environmental benefits for South Africa. These benefits include:

Increased energy security: Given that renewables can often be deployed in a short timeframe and in a decentralised manner close to consumers, they offer the opportunity for improving grid strength and supply quality in the short-term, while reducing expensive distribution losses. As a result of the power constraints in the first half of 2015, power generators, meant to be the "barely-ever-used" safety net for the system (diesel-fired gas turbines), were running at > 30% average load factor in the first half of 2015. Load shedding occurred during 82 days in the first half of 2015 (out of 181 days). Results of a CSIR Energy Centre study for the period January to June 2015 (CSIR, August 2015), concluded that the already implemented renewable projects (wind and solar) within the country avoided 203 hours of so-called 'unserved energy'. During these hours the supply situation was so tight that some customers' energy supply would have had to be curtailed ('unserved') if it had not been for the renewables. The avoidance of unserved energy cumulated into the effect that during 15 days from January to June 2015, load shedding was avoided entirely, delayed, or a higher stage of load shedding was prevented due to the contribution of the wind and PV projects[14].

Resource saving: It is estimated that the achievement of the targets in the Renewable Energy White Paper will result in water savings of approximately 16.5 million kilolitres per annum. As an already water-stressed nation, it is critical that South Africa engages in a variety of water conservation measures, particularly due to the detrimental effects of climate change on water availability. Renewable energy also translates into revenue savings, as fuel for renewable energy facilities is free compared to the continual purchase of fuel for conventional power stations. Results of a CSIR Energy Centre study for January to June 2015 (CSIR, August 2015) have quantified the contribution from renewable energy to the national power system and the economy over the first 6 months of 2015 compared to the 12 months of 2014:

2014 (12 months)	2015 (6 months)
R3.64 billion saving in diesel and coal fuel costs	R3.60 billion saving in diesel and coal fuel costs
120 hours of unserved energy avoided, saving at least an additional R1.67 billion for the economy	200 hours of unserved energy avoided, saving at least an additional R1.20 billion–R4.60 billion for the economy
Generated R0.8 billion more financial benefits than cost	Generated R4.0 billion more financial benefits than cost

Exploitation of our significant renewable energy resource: At present, valuable renewable resources including biomass by-products, solar radiation and wind power remain largely unexploited. The use of these energy flows will strengthen energy security through the development of a diverse energy portfolio in South Africa.

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[14] (http://ntww1.csir.co.za/plsql/ptl0002/PTL0002_PGE157_MEDIA_REL?MEDIA_RELEASE_NO=7526896)

Economics: As a result of the excellent resource and competitive procurement processes, both wind power and solar PV power are now proven in South Africa as cheaper forms of energy generation than coal power. They offer excellent value for money to the economy and citizens of South Africa while benefitting society as a whole through the development of clean energy.

Pollution reduction: The release of by-products through the burning of fossil fuels for electricity generation has a particularly hazardous impact on human health and contributes to ecosystem degradation. The use of solar radiation or wind for power generation is a non-consumptive use of a natural resource which produces zero emissions during its operation.

Climate friendly development: The uptake of renewable energy offers the opportunity to address energy needs in an environmentally responsible manner and thereby allows South Africa to contribute towards mitigating climate change through the reduction of greenhouse gas (GHG) emissions. South Africa is estimated to be currently responsible for approximately 1% of global GHG emissions (and circa half of those for which Africa is responsible) and is currently ranked 9th worldwide in terms of per capita carbon dioxide emissions. The renewable energy sector saved South Africa 1.4 million tons of carbon emissions over the first 6 months of 2015[15].

Support for international agreements: The effective deployment of renewable energy provides a tangible means for South Africa to demonstrate its commitment to its international agreements under the Kyoto Protocol and the Paris Agreement, and for cementing its status as a leading player within the international community.

Employment creation: The development, procurement, installation, maintenance and management of renewable energy facilities have significant potential for job creation and skills development in South Africa. The construction phase will create temporary employment opportunities and the operation phase will create limited full-time employment opportunities.

Acceptability to society: Renewable energy offers a number of tangible benefits to society including reduced pollution concerns, improved human and ecosystem health, the use of clean energy and climate friendly development.

Support to a new industry sector: The development of renewable energy offers the opportunity to establish a new industry within the South African economy, which will create jobs and skill local communities and result in community upliftment for the affected areas.

Protecting the natural foundations of life for future generations: Actions to reduce the disproportionate carbon footprint can play an important part in ensuring the human role in preventing dangerous anthropogenic climate change, thereby securing the natural foundations of life for generations to come; this is the basis of sustainable development.

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[15] http://www.iol.co.za/capetimes/renewable-energy-saving-sa-billions-csir-1.1903409#.VkNjdJq6FeU

CHAPTER 7: APPROACH TO UNDERTAKING THE BASIC ASSESSMENT PROCESS

In terms of the EIA Regulations of December 2014 published in terms of the NEMA (Act No. 107 of 1998) as amended, the construction and operation of the Namas Wind Farm is a listed activity requiring environmental authorisation. In terms of GNR114 of February 2018, the application for authorisation is required to be supported by a BA process based on the location of the Namas Wind Farm project site within the Springbok REDZ.

The BA process aims at identifying and describing potential environmental issues associated with the development of the proposed wind farm and associated infrastructure[16]. In order to ensure that a comprehensive assessment is provided to the competent authority and I&APs regarding the impacts of the wind farm, detailed independent specialist studies were undertaken as part of the BA process. In addition, a comprehensive consultation process was conducted, and included I&APs, the competent 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 BA process.

7.1 Legal Requirements as per the EIA Regulations, 2014 (as amended)

This chapter of the BA report includes the following information required in terms of Appendix 1: Content of the BA Report:

Requirement	Relevant Section
3(d)(i) a description of the scope of the proposed activity, including all listed and specified activities triggered and being applied for.	All listed activities triggered as a result of the Namas Wind Farm have been included in section 7.2, **Table 7.1**. The specific project activity relating to the relevant triggered listed activity has also been included in **Table 7.1**.
3(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 for the Namas Wind Farm has been included and described in section 7.3.2.
3(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.	All comments and issues raised to date have been included in the Comments and Responses report (C&R report) as **Appendix C8**. All comments raised during the 30-day review period will also be included as part of the C&R report and submitted as part of the final BA report to DEA for decision-making.
3(h)(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives.	The methodology used to assess the significance of the impacts of the Namas Wind Farm has been included in section 7.4.
(o) a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and	The assumptions and limitations of the BA process being undertaken for the Namas Wind Farm is included in

[16] The Namas Wind Farm will be connected to the existing Gromis Substation located to the north of the project site. The assessment of the 132kV power line will be undertaken as a separate Basic Assessment Process and will be authorised under a separate application for Environmental Authorisation.

mitigation measures proposed.	section 7.5.

7.2 Relevant Listed Activities

Table 7.1 details the listed activities in terms of the EIA Regulations of December 2014 (as amended) which apply to the Namas Wind Farm, and for which an Application for Environmental Authorisation has been submitted. The table also includes a description of the specific project activities which relate to the applicable listed activities.

Table 7.1: Listed activities triggered by the Namas Wind Farm

Indicate the number and date of the relevant notice:	**Activity No (s) (in terms of the relevant notice):**	**Describe each listed activity as per project description**
GN 327, 08 December 2014 (as amended on 07 April 2017)	11(i)	The development of facilities or infrastructure for the transmission and distribution of electricity - (i). outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts. ***The Namas Wind Farm will require the construction and operation of an on-site facility substation with a capacity of 33kV/132kV to facilitate the connection of the wind farm to the national grid.***
GN 327, 08 December 2014 (as amended on 07 April 2017)	24(ii)	The development of a road (ii) with a reserve wider than 13.5 meters or where no reserve exists where the road is wider than 8 meters. ***The Namas Wind Farm requires the construction of internal access roads between the project components which will be approximately 8 m in width.***
GN 327, 08 December 2014 (as amended on 07 April 2017)	28(ii)	Residential, mixed, retail, commercial, industrial, or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare. ***The total area of land to be developed for the Namas Wind Farm is larger than 1 hectare and is currently used for agricultural purposes. The total extent of the development footprint is expected to be 35,46ha.***
GN 325, 08 December 2014 (as amended on 07 April 2017)	1	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more. ***The total electricity output for the Namas Wind Farm will be more than 20MW, with a maximum contracted capacity of up to 140MW.***
GN 325, 08 December 2014 (as amended on 07 April 2017)	15	The clearance of an area of 20 hectares or more of indigenous vegetation. ***The clearance of more than 20 hectares of indigenous vegetation will be required during construction of the Namas Wind Farm. The total extent of the development footprint is expected to be***

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
		~35.46ha.
GN 324, 08 December 2014 (as amended on 07 April 2017)	4(g)(ii)(ee)	The development of a road wider than 4 meters with a reserve less than 13.5 meters (g) in the Northern Cape (ii) outside urban areas (ee) in critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans. ***The development of internal access roads with a width of approximately 8 meters will be required between the project components for the Namas Wind Farm. A Critical Biodiversity Area 2 (as per the Northern Cape Critical Biodiversity Areas map (2017)) is located in the south-western corner of the development footprint which will be impacted by turbine placement and associated infrastructure.***
GN 324, 08 December 2014 (as amended on 07 April 2017)	10(g)(iii)(ee)	The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic meters in the (g) Northern Cape, (iii) outside urban areas, within (ee) critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans. ***The construction and operation phases of the Namas Wind Farm will require the storage and handling of dangerous goods in containers with a combined capacity of ~30 cubic meters. A Critical Biodiversity Area 2 (as per the Northern Cape Critical Biodiversity Areas map (2017)) is located in the south-western corner of the development footprint within which the storing and handling of a dangerous good will take place.***
GN 324, 08 December 2014 (as amended on 07 April 2017)	12(g)(ii)	The clearance of an area of 300 square meters or more of indigenous vegetation (g) in the Northern Cape (ii) within critical biodiversity areas identified in bioregional plans. ***The clearance of more than 300m² of indigenous vegetation will be required for the development of the Namas Wind Farm. The clearance will be required within a Critical Biodiversity Area 2 (as per the Northern Cape Critical Biodiversity Areas map (2017)) located in the south-western corner of the development footprint which will be impacted by turbine placement and associated infrastructure.***
GN 324, 08 December 2014 (as amended on 07 April 2017)	18(g)(ii)(bb)(ee)	The widening of a road by more than 4 meters, or the lengthening of a road by more than 1 kilometre (g) in the Northern Cape, (ii) outside urban areas in (bb) the National Protected Area Expansion Strategy Focus Area and (ee) critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans. ***The main access road providing access to the Namas Wind Farm, located outside of the project site, is required to be upgraded to 10 meters in width for the wind farm. This is an existing road which***

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
		traverses a small section of a primary focus area as identified in the Northern Cape Protected Areas Expansion Strategy. The road also traverses a Critical Biodiversity Area 2 (as per the Northern Cape Critical Biodiversity Areas map (2017)).

7.3 Overview of the Basic Assessment Process for the Namas Wind Farm

Key tasks undertaken for the BA included:

» Consultation with relevant decision-making and regulating authorities (at National, Provincial and Local levels).
» Submission of the completed Application for Environmental Authorisation to the competent authority (i.e. DEA) in terms of Regulations 5 and 6 of the EIA Regulations, 2014 (GNR 326), as amended.
» Undertaking a public participation process in accordance with Chapter 6 of GNR326, and the Department of Environmental Affairs (2017), Public Participation guidelines in terms of NEMA EIA Regulations, Department of Environmental Affairs, Pretoria, South Africa (hereinafter referred to as "the Guidelines") in order to identify issues and concerns associated with the proposed project.
» Undertaking of independent specialist studies in accordance with Appendix 6 of the EIA Regulations, 2014 (GNR326), as amended.
» Preparation of a BA report and EMPr in accordance with the requirements of Appendix 1 and Appendix 4 of GNR326.
» 30-day public and authority review period of the BA report.
» Compilation of a C&R report detailing the comments raised by I&APs, addressing these comments in detail and finalisation of the BA report.
» Submission of a final BA report to the DEA for review and decision-making.

The tasks are discussed in detail in the sub-sections below.

7.3.1. Authority Consultation and Application for Authorisation in terms of the 2014 EIA Regulations (as amended)

In terms of Government Notice 779 of 01 July 2016, the National Department of Environmental Affairs (DEA) is the competent authority for all projects related to the IRP. As the project is located within the Northern Cape Province, the Northern Cape Department of Environment and Nature Conservation (DENC) is the commenting authority. Consultation with the regulating authorities (i.e. DEA and DENC) as well as with all other relevant Organs of State will continue throughout the BA process. To date, this consultation has included the following:

» A pre-application meeting was held with the DEA for the Namas Wind Farm in order to introduce the proposed project to the competent authority and obtain insight in terms of the requirements for the BA process located within a REDZ. The pre-application meeting was held on 14 May 2018 (**Appendix B**).
» Submission of project notification letters to DEA and DENC.
» Submission of the application form for Environmental Authorisation to the DEA.
» Submission of the BA report for review and comment by:
  * The competent and commenting authorities.

- State departments that administer laws relating to a matter affecting the environment relevant to an application for Environmental Authorisation.
- Organs of State which have jurisdiction in respect of the activity to which the application relates.

A record of all authority correspondence undertaken during the BA process is included in **Appendix B** and **Appendix C**.

7.3.2. Public Participation Process

Public Participation is an essential and regulatory requirement for an environmental authorisation process and is guided by Regulations 41 to 44 of the EIA Regulations 2014 (GNR 326) (as amended). The purpose of public participation is clearly outlined in Regulation 40 of the EIA Regulations 2014 (GNR 326) (as amended) and is being followed for this proposed project.

The sharing of information forms the basis of the public participation process and offers the opportunity for I&APs to become actively involved in the BA process from the outset. The public participation process is designed to provide sufficient and accessible information to I&APs in an objective manner. The public participation process affords I&APs opportunities to provide input into and receive information regarding the BA process in the following ways:

During the BA process:

» provide an opportunity to submit comments regarding the project;
» assist in identifying reasonable and feasible alternatives;
» contribute relevant local information and knowledge to the environmental assessment;
» allow registered I&APs to verify that their comments have been recorded, considered and addressed, where applicable, in the environmental investigations;
» foster trust and co-operation;
» generate a sense of joint responsibility and ownership of the environment; 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 containing all relevant facts in respect of the application is made available to potential stakeholders and I&APs for their review.
» The information presented during the public participation process is presented in such a manner, i.e. local language and technical issues, that it avoids the possible alienation of the public and prevents them from participating.
» Public participation is facilitated in such a manner that I&APs are provided with a reasonable opportunity to comment on the project.
» Various ways are provided to I&APs to submit their comments i.e. fax, post, email.
» An adequate review period is provided for I&APs to comment on the findings of the BA report.

In terms of the requirement of Chapter 6 of the EIA Regulations of December 2014, as amended, the following key public participation tasks have been undertaken:

- Fix a notice board at a place conspicuous to the public at the boundary or on the fence of—
  - (i) the site where the activity to which the application relates is or is to be undertaken; and
  - (ii) any alternative site mentioned in the application;
- Give written notice to:
  - (i) the owner or person in control of that land if the applicant is not the owner or person in control of the land;
  - (ii) the occupiers of the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;
  - (iii) owners and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;
  - (iv) the municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area;
  - (v) the municipality which has jurisdiction in the area;
  - (vi) any organ of state having jurisdiction in respect of any aspect of the activity; and
  - (vii) any other party as required by the competent authority.
- Place an advertisement in one local newspaper.
- Open and maintain a register of I&APs and Organs of State.
- Release a BA report for a 30-day review period.
- Prepare a C&R report which documents the comments received on the BA process and the responses provided by the project team.

In compliance with the requirements of Chapter 6: Public Participation of the EIA Regulations, 2014 (as amended), the following summarises the key public participation activities conducted to date.

i. <u>Stakeholder identification and Register of Interested and Affected Parties</u>

42. A proponent or applicant must ensure the opening and maintenance of a register of I&APs and submit such a register to the competent authority, which register must contain the names, contact details and addresses of –
    (a) All persons who, as a consequence of the public participation process conducted in respect of that application, have submitted written comments or attended meetings with the proponent, applicant or EAP;
    (b) All persons who have requested the proponent or applicant, in writing, for their names to be placed on the register; and
    (c) All organs of state which have jurisdiction in respect of the activity to which the application relates.

I&APs have been identified through a process of networking and referral, obtaining information from Savannah Environmental's existing stakeholder database, liaison with potentially affected parties in the greater study area and a registration process involving the completion of a reply form. Key stakeholders and affected and surrounding landowners have been identified and registered on the project database. Other stakeholders are required to formally register their interest in the project. An initial list of key stakeholders identified and registered is listed in **Table 7.2**.

Table 7.2: List of Stakeholders identified for the inclusion in the project database during the public participation process for the Namas Wind Farm

Organs of State
National Government Departments
Department of Agriculture, Forestry and Fisheries (DAFF)
Department of Energy (DoE)
Department of Environmental Affairs (Biodiversity & Conservation Directorate)
Department of Mineral Resources (DMR)

Department of Rural Development and Land Reform (DRDLR)	
Department of Water and Sanitation (DWS)	
Government Bodies and State-Owned Companies	
Eskom Holdings SOC Limited	
National Energy Regulator of South Africa (NERSA)	
South African Civil Aviation Authority (CAA)	
South African Heritage Resources Agency (SAHRA)	
South African National Roads Agency Limited (SANRAL)	
Provincial Government Departments	
Northern Cape Department of Agriculture	
Northern Cape Department of Environment and Nature Conservation (DENC)	
Northern Cape Department of Roads and Public Works	
Ngwao Boswa Kapa Bokone (NBKB)	
Local Government Departments	
Namakwa District Municipality	
Nama Khoi Local Municipality	
Key Stakeholders	
BirdLife South Africa	
Endangered Wildlife Trust (EWT)	
Wildlife and Environment Society of South Africa (WESSA)	
Landowners	
Affected landowners, tenants and occupiers	
Neighbouring landowners, tenants and occupiers	

As per Regulation 42 of the EIA Regulations, 2014 (as amended), all relevant stakeholder and I&AP information has been recorded within a register of I&APs (refer to **Appendix C1** for a listing of the recorded parties). In addition to the above-mentioned EIA Regulations, point 4.1 of the Public Participation Guidelines has also been followed. The register of I&APs contains the names, contact details and addresses of:

- » all persons who requested to be registered on the database in writing and disclosed their interest in the project;
- » all Organs of Sstate which hold jurisdiction in respect of the activity to which the application relates;
- » all persons identified and approached through networking or a chain referral system to identify any other stakeholder (i.e. ratepayers associations); and
- » all persons who submitted written comments or attended meetings during the public participation process.

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

ii. <u>Advertisements and Notifications</u>

40.(2)(a)	Fixing a notice board at a place conspicuous to and accessible by the public at the boundary, on the fence or along the corridor of – (i) The site where the activity to which the application or proposed application relates is or is to be

undertaken; and
(ii) Any alternative site.

40.(2)(b) Giving written notice, in any of the manners provided for in section 47D[17] of the Act, to –
- (i) The occupiers of the site and, if the proponent or applicant is not the owner or person in control of the site on which the activity is to be undertaken, the owner or person in control of the site where the activity is or is to be undertaken and to any alternative site where the activity is to be undertaken;
- (ii) Owners, persons in control of, and occupiers of land adjacent to the site where the activity is or is to be undertaken and to any alternative site where the activity is to be undertaken;
- (iii) The municipal councillor of the ward in which the site and alternative site is situated and any organisation of ratepayers that represent the community in the area;
- (iv) The municipality which has jurisdiction in the area;
- (v) Any organ of state having jurisdiction in respect of any aspect of the activity; and
- (vi) Any other party as required by the competent authority.

40.(2)(c) Placing an advertisement in –
- (i) One local newspaper; or
- (ii) Any official Gazette that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations;

40.(2)(d) Placing an advertisement in at least one provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the metropolitan or district municipality in which it is or will be undertaken: Provided that this paragraph need not be complied with if an advertisement has been placed in an official Gazette referred to in paragraph (c)(ii); and

40.(2)(e) Using reasonable alternative methods, as agreed to by the competent authority, in those instances where a person is desirous of but unable to participate in the process due to –
- (i) Illiteracy;
- (ii) Disability; or
- (iii) Any other disadvantage.

The BA process was announced with an invitation to the Organs of State, potentially affected and neighbouring landowners and general public to register as I&APs and to actively participate in the process. This was achieved via the following:

» Compilation of a background information document (BID) (refer to **Appendix C3**) providing technical and environmental details on the project and how to become involved in the BA process. The BID has been distributed to identified stakeholders and I&APs. The BID is also available electronically on the Savannah Environmental website (http://www.savannahsa.com/public-documents/energy-generation/namas-zonnequa-wind-farms/).

[17] Section 47D of NEMA pertains to the delivery of documents, and states that:
(1) A notice or other document in terms of this Act or a specific environmental management Act may be issued to a person –
(a) By delivering it by hand;
(b) By sending it by registered mail –
(i) To that person's business or residential address; or
(ii In the case of a juristic person, to its registered address or principal place of business;
(bA) By faxing a copy of the notice or other document to the person, if the person has a fax number;
(bB) By e-mailing a copy of the notice or other document to the person, if the person has an e-mail address; or
(bC) By posting a copy of the notice or other document to the person by ordinary mail, if the person has a postal address;
(c) Where an address is unknown despite reasonable enquiry, by publishing it once in the Gazette and once in a local newspaper circulating in the area of that person's last known residential or business address.
(2) A notice or other document issued in terms of subsection (1)(b), (bA), (bB), (bC) or (c) must be regarded as having come to the notice of the person, unless the contrary is proved."

- Placement of site notices announcing the BA process at visible points along the boundary of the project site, in accordance with the requirements of the EIA Regulations. Photographs and the GPS co-ordinates of the site notices are contained in **Appendix C2**.
- Placement of an advertisement announcing the BA process for the project and inviting members of the public to register themselves as I&APs on the project database in Die Plattelander on 17 August 2018. The tear sheet of the newspaper advert is contained in **Appendix C2**.
- BA process notification letters announcing the BA process, notifying Organs of State, potentially affected and neighbouring landowners, as well as stakeholders/I&APs of the Namas Wind Farm, providing background information of the project and inviting I&APs to register on the project's database, were distributed via email on 17 August 2018 and registered post on 21 August 2018 to those without e-mail addresses. The evidence of the distribution of the process notification letters are contained in **Appendix C** of the BA Report.
- Placement of advertisement announcing the availability of, and inviting comment on the BA report in Die Plattelander on 26 October 2018 at the commencement of the 30-day review period. The tear sheet of the newspaper advert will be contained in **Appendix C2** of the final BA Report.
- The BA Report for review has been made available for review by I&APs for a 30-day review period from 25 October 2018 to 23 November 2018. CD and hard copy versions of the BA report have been circulated to Organs of State via courier at the commencement of the review period. The BA report is also available on the Savannah Environmental website. The evidence of distribution of the BA report will be included in the final BA Report, which will be submitted to the DEA.

iii. <u>Public Involvement and Consultation</u>

In order to accommodate the varying needs of stakeholders and I&APs within the greater study area, as well as capture their views, comments, issues and concerns regarding the project, various opportunities have been and will continue to be provided to I&APs to note their comments and issues. I&APs are being consulted through the following means:

Table 7.3: Consultation undertaken with I&APs for the Namas Wind Farm

Activity	Date
Placement of site notices on-site and in public places.	07 July 2018
Distribution of the BID, process notification and stakeholder reply form announcing the BA process and inviting I&APs to register on the project database.	17 August 2018
Advertising of the BA process in Die Plattelander newspaper.	17 August 2018
Focus Group Meetings: » Affected Landowners; » Adjacent Landowners; » Key Stakeholders (including the Northern Cape Department of Environment and Nature Conservation, Eskom and BirdLife). *Note: The BID, process notification letter and reply form was distributed at these meetings.*	18 July 2018, 14 August 2018 and in November 2018
Distribution of notification letters announcing the availability of the BA report for review for a 30-day public review and comment period. These letters were distributed to Organs of State, Government Departments, Ward Councillors, landowners within the greater study area (including neighbouring landowners) and key stakeholder groups.	24 October 2018
Advertising of the availability of the BA Report for a 30-day review period in Die Plattelander newspaper.	26 October 2018

Activity	Date
30-day review period for the BA report for comment.	25 October 2018 to 23 November 2018

Two Focus Group Meetings were held prior to the release of the BA report with:

Stakeholder	Meeting Format	Meeting Date
BirdLife SA Key stakeholder commenting on all issues relating to avifauna impacts	Focus Group Meeting	Wednesday, 18 July 2018 and Tuesday, 14 August 2018
Eskom Holdings SOC Ltd Affected adjacent landowner	Focus Group Meeting	Wednesday, 18 July 2018

The meeting notes of these meetings have been included in **Appendix C6**.

The purpose of the abovementioned meetings were to engage with key stakeholders prior to the release of the BA report in order to ensure that key requirements/comments are noted and addressed ahead of finalising the reporting as the abbreviated process is applicable for the applications for authorisation. This enabled the application to remain within the prescribed timeframes.

Records of all consultation undertaken are included in **Appendix C**.

Table 7.4: Consultation to be undertaken during the BA report 30-day review period for the Namas Wind Farm

Activity	Stakeholder Grouping	Date
Focus Group Meetings		Envisaged to be undertaken in November 2018
Northern Cape Department of Environment and Nature Conservation	Organ of State having jurisdiction in the study area	
Namakwa District Municipality and Nama Khoi Local Municipality	District and Local Municipalities that have jurisdiction in the study area, including the Ward Councillor and CBO (as identified)	
Landowners	Landowners directly affected by the project site	
	Adjacent landowners to the project site	
Ongoing consultation (i.e. telephone liaison; e-mail communication)	All I&APs	Throughout BA report 30-day review period

iv. Registered I&APs entitled to Comment on the BA Report and Plans

43.(1) A registered I&AP is entitled to comment, in writing, on all reports or plans submitted to such party during the public participation process contemplated in these Regulations and to bring to the attention of the proponent or applicant any issues which that party believes may be of significance to the consideration of the application, provided that the interested and affected party discloses any direct business, financial, personal or other interest which that party may have in the approval or refusal of the application.

(2) In order to give effect to section 24O of the Act, any State department that administers a law relating to a matter affecting the environment must be requested, subject to regulation 7(2), to comment within 30 days.

44.(1) The applicant must ensure that the comments of interested and affected parties are recorded in reports and plans and that such written comments, including responses to such comments and records of meetings, are attached to the reports and plans that are submitted to the competent authority in terms of these Regulations.

(2) Where a person desires but is unable to access written comments as contemplated in subregulation (1) due to –

(a) A lack of skills to read or write;
(b) Disability; or
(c) Any other disadvantage;
Reasonable alternative methods of recording comments must be provided for.

I&APs registered on the database have been notified by means of a notification letter (e-mail and registered mail) of the release of the BA report for a 30-day public review period, invited to provide comment on the BA report, and informed of the manner in which, and timeframe within which such comment must be made. The notification was distributed at the commencement of the 30-day review period, on 24 October 2018.

v. Identification and Recording of Comments

Issues and comments raised by I&APs over the duration of the BA process have been synthesised into a C&R report which is included in **Appendix C8**. The C&R Report includes detailed responses from members of the EIA project team and/or the project proponent to the issues and comments raised during the public participation process.

The C&R report will consist of written comments and issues received:

» per e-mail, fax or telephonically; and
» during the 30-day review of the BA report.

Meeting notes will be drafted of all the meetings conducted during the BA Report 30-day review period and will be included in **Appendix C6**.

The C&R report will be included as **Appendix C8** in the final BA Report that will be submitted to the DEA for decision-making.

7.4 Assessment of Issues Identified through the BA Process

Issues identified as requiring investigation, as well as the specialist consultants involved in the assessment of these impacts are indicated in **Table 7.5** below.

Table 7.5: Specialist consultants appointed to evaluate the potential impacts associated with the Namas Wind Farm

Specialist Name	Specialist Company	Specialist Area of Expertise	Appendices
Simon Todd	Simon Todd Consulting	Ecology	Appendix D
Rob Simmons and Marlei Martins	Birds and Bats Unlimited Consultants	Avifauna	Appendix E
Werner Marais	Animalia	Bats	Appendix F
Garry Paterson	Agricultural Research Council (ARC)	Soils and Agricultural Potential	Appendix G
Jayson Orton (with input from John Pether)	ASHA Consulting	Heritage (including archaeology and palaeontology)	Appendix H
Morné de Jager	Enviro Acoustic Research (EAR)	Noise	Appendix I
Lourens du Plessis	LOGIS	Visual	Appendix J
Elena Broughton	Urban-Econ	Socio-Economic	Appendix K

Specialist Name	Specialist Company	Specialist Area of Expertise	Appendices
Iris Wink	JG Afrika	Traffic	Appendix L

Specialist studies considered direct and indirect environmental impacts associated with the development of all components of the Namas Wind Farm. 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).

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

7.5 Assumptions and Limitations of the BA Process

The following assumptions and limitations are applicable to the studies undertaken within this BA process:

- 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 development footprint for the wind energy facility identified by the developer represents a technically suitable site for the establishment of the Namas Wind Farm which is based on the design undertaken by technical consultants for the project.
- This report and its investigations are project-specific, and consequently the environmental team did not evaluate any other power generation alternatives.

Refer to the specialist studies in **Appendices D – L** for specialist study specific limitations.

7.6 Legislation and Guidelines that have informed the preparation of this Basic Assessment Report

The following legislation and guidelines have informed the scope and content of this BA 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; and
- International guidelines – the Equator Principles, the IFC Performance Standards, the Sustainable Development Goals, World Bank Environmental and Social Framework, and the and World Bank Group Environmental, Health, and Safety Guidelines (EHS Guidelines).

Table 7.6 provides an outline of the legislative permitting requirements applicable to the Namas Wind Farm as identified at this stage in the project process.

Table 7.6: Applicable Legislation, Policies and/or Guidelines associated with the development of the Namas Wind Farm

Legislation / Policy / Guideline	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 however implies that environmental impacts associated with proposed developments are considered separately and cumulatively. It is also important to note that the "right to an environment clause" includes the notion that justifiable economic and social development should be promoted, through the use of natural resources and ecologically sustainable development.
National Environmental Management Act (Act No. 107 of 1998)	The EIA Regulations, 2014, have been promulgated in terms of Chapter 5 of the Act. 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 S24(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 BA process is required to be undertaken for the Namas Wind Farm in accordance with GN114, as formally gazetted on 16 February 2018, due to the	» National Department of Environmental Affairs (DEA) - competent authority. » Northern Cape Department of Environment and Nature Conservation (DENC) - commenting authority.	The listed activities triggered by the Namas Wind Farm have been identified and assessed in the BA process being undertaken. This BA process will culminate in the submission of a final BA report to the competent authority in support of the application for authorisation.

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	location of the project site within the REDZ.		
National Environmental Management Act (Act No. 107 of 1998)	In terms of the "Duty of Care and Remediation of Environmental Damage" provision in Section 28(1) of 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.	» National Department of Environmental Affairs (DEA). » Northern Cape Department of Environment and Nature Conservation (DENC)	While no permitting or licensing requirements arise directly by virtue of the proposed project, this section is applicable during the BA process through the consideration of potential cumulative, direct, and indirect impacts. It will continue to apply throughout the life cycle of the project.
National Environmental Management: Biodiversity Act (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	» Northern Cape Department of Environment and Nature Conservation (DENC).	Under this Act, 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. An Ecological Impact assessment has been undertaken as part of the BA Report (refer to **Appendix D**). As such the potential occurrence of critically endangered, endangered, vulnerable, and protected plant species and the potential for them to be affected has been considered. Species of conservation concern of which four can be confirmed present at the site includes *Aloe arenicola* (NT), *Leucoptera nodosa* (NT), *Wahlenbergia asparagoides* (VU) and *Babiana hirsuta* (NT). However, the abundance of these species is low across most of the site and

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	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).		the local populations would not be compromised by the development. A permit may be required should any listed plant species be disturbed or destroyed as a result of the development of the Namas Wind Farm.
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. Applicable, and exempted alien and invasive species are contained within the Alien and Invasive Species List (GNR 864).	» Northern Cape Department of Environment and Nature Conservation (DENC).	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. The Ecological Impact Assessment (**Appendix D**) requires the development of an Alien Management Plan for the site. The EMPr makes provision for managing and mitigating alien invasion on the site (refer to **Appendix M**).
National Environmental Management: Waste Act, 2008 (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.	» National Department of Environmental Affairs (DEA) – hazardous waste. » North Cape Department of Environment and Nature conservation (DENC) - general waste.	As no waste disposal site is to be associated with the Namas Wind Farm, no permit is required in this regard. Waste handling, storage and disposal during construction and operation is required to be undertaken in accordance with the requirements of the Act, as detailed in the EMPr (refer to **Appendix M**).

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	» 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 prevented.		
National Environmental Management: Air Quality Act (Act No. 39 of 2004) (NEM:AQA)	The National Dust Control Regulations (GNR 827) published under Section 32 of NEM:AQA prescribe the general measures for the control of dust in all areas; and provide a standard for acceptable dustfall rates for residential and non-residential areas. In accordance with the Regulations (GNR 827) any person who conducts any activity in such a way as to give rise to dust in quantities and concentrations that may exceed the dustfall standard set out in Regulation 03 must, upon receipt of a notice from the air quality officer, implement a dustfall monitoring programme.	» Nama Khoi Local Municipality. » Namakwa District Municipality	In the event that the project results in the generation of excessive levels of dust, the possibility could exist that a dustfall monitoring programme would be required for the project; in which case dustfall monitoring results from the dustfall monitoring programme would need to be included in a dust monitoring report and a dust management plan would need to be developed. However, granted that appropriate mitigation measures are implemented, the wind farm is not anticipated to result in significant dust generation.

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	Any person who has exceeded the dustfall standard set out in Regulation 03 must, within three months after submission of the dustfall monitoring report, develop and submit a dust management plan to the air quality officer for approval.		The EMPr however makes provision for managing and mitigating potential dust impacts (refer to **Appendix M**).
National Water Act (Act No. 36 of 1998)	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. 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)).	» Department of Water and Sanitation (DWS). » Lower Orange Catchment Management Agency	The development footprint of the Namas Wind Farm does not impact on any watercourses within the preferred project site. In the event that development activities impede or divert the flow of water in a watercourse, or alter the bed, banks, course or characteristics of watercourse, Section 21(c) and 21 (i) of the NWA would be triggered, and the project proponent would need to apply for a WUL or register a GA with the DWS. Should water be extracted from groundwater/a borehole on site for use within the wind farm, a water use license will be required in terms of sections 21(a) and 21 (b) of the National Water Act.
Environment Conservation Act (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.	» National Department of Environmental Affairs (DEA). » Northern Cape Department of	There is no requirement for a noise permit in terms of the legislation. A Noise Impact Assessment has been undertaken in accordance with SANS 10328. This was completed as part of the BA process for the project, and is included in

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	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).	Environment and Nature Conservation (DENC). » Nama Khoi Local Municipality.	**Appendix I**.
Minerals and Petroleum Resources Development Act (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. 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.	» Department of Mineral Resources (DMR).	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. No borrow pits are expected to be required for the construction of the wind farm, and as a result a mining permit or EA is not required to be obtained. In terms of Section 53 of the MPRDA approval is required from the Minister of Mineral Resources to ensure that the proposed development does not sterilise a mineral resource that might occur on site.
National Heritage Resources Act (Act No. 25 of 1999)	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.	» South African Heritage Resources Agency » Ngwao Boswa Kapa Bokone (NBKB)	A Heritage Impact Assessment (including archaeology and palaeontology) was undertaken as part of the BA process to identify heritage sites (refer to **Appendix H**) as per the requirements of the National Heritage Resources Act.

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	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 of tourism attraction.		The results of the Heritage Impact Assessment indicated that palaeontological materials were not observed on the Namas Wind Farm site but isolated fossil bones could occur within the various sand formations of the area. Archaeological sites were found scattered throughout the sand dune areas with almost nothing present on the intervening plain. Because it is closer to the coast, the western dune cordon had far more sites on it than the eastern one. The sites are all small shell and/or artefact scatters with the amount of shell reducing significantly further from the coast. The landscape does carry cultural significance but this area has been incorporated into a REDZ.
National Forests Act (Act No. 84 of 1998)	According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. Notice of the List of Protected Tree Species under the National Forests Act (No. 84 of 1998) was published in GNR 536 of 2018 (September 2018). 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".	» Department of Agriculture, Forestry and Fisheries (DAFF).	A permit or license is required for the destruction of protected tree species and/or indigenous tree species within a natural forest. No protected tree species have been identified within the development footprint, as per the Ecological Impact Assessment (**Appendix D**).
National Veld and Forest Fire Act (Act 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	» Department of Agriculture, Forestry and Fisheries (DAFF).	While no permitting or licensing requirements arise from this legislation, this Act will find application during the construction and operation phases of the wind farm in terms of the

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	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 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.		preparation and maintenance of firebreaks, and the need to provide appropriate equipment and personnel for firefighting purposes. The relevant management and mitigation measures have been included in the EMPr (**Appendix M**).
Conservation of Agricultural Resources Act (Act No 43 of 1983) (CARA) and Subdivision of Agricultural Land Act (Act 70 of 1970)	Regulation 15 of GN R1048 provides for the declaration of weeds and invader plants, and these are set out in Table 3 of GN R1048. Declared Weeds and Invaders in South Africa are categorised ac-cording to one of the following categories: » Category 1 plants: are prohibited and must be controlled. » Category 2 plants: (commercially used plants) may be grown in demarcated areas providing that there is a permit and that steps are taken to prevent their spread. » Category 3 plants: (ornamentally used plants) may	» Department of Agriculture, Forestry and Fisheries (DAFF).	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 EMPr provides mitigation for soil erosion and weed control and management (refer to **Appendix M**). The development of the Namas Wind Farm does not require the draining of vleis, marshes or water

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	no longer be planted; existing plants may re-main, as long as all reasonable steps are taken to prevent the spreading thereof, except within the floodline of watercourses and wetlands. These regulations provide that Category 1, 2 and 3 plants must not occur on land and that such plants must be controlled by the methods set out in Regulation 15E.		sponges on land outside urban areas. Permission from DAFF will therefore not be required in this regard. 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. » 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.
Hazardous Substances Act (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	» Department of Health (DOH).	It is necessary to identify and list all the Group I, II, III, and IV hazardous substances that may be on the site and in what operational context they are used, stored or handled. If applicable, a license

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	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 » 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.		could be required to be obtained from the Department of Health.
National Road Traffic Act (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.	» South African National Roads Agency Limited - national roads. » Northern Cape Department of Transport, Safety and Liaison – provincial roads	An abnormal load/vehicle permit may be required to transport the various components to site for construction. These include: » Route clearances and permits will be required for vehicles carrying abnormally heavy or abnormally dimensioned loads. » Transport vehicles exceeding the dimensional limitations (length) of 22m. » Depending on the trailer configuration and height when loaded, some of the project components may not meet specified dimensional limitations (height and width).

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	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.		
Astronomy Geographic Advantage Act (Act No. 21 of 2007)	The Astronomy Geographic Advantage (AGA) Act (No. 21 of 2007) provides for the preservation and protection of areas within South Africa that are uniquely suited for optical and radio astronomy; for intergovernmental co-operation and public consultation on matters concerning nationally significant astronomy advantage areas and for matters connected thereto. Chapter 2 of the Act allows for the declaration of astronomy advantage areas whilst Chapter 3 pertains to the management and control of astronomy advantage areas. Management and control of astronomy advantage areas include, amongst others, the following: ∗ Restrictions on use of radio frequency spectrum in astronomy advantage areas ∗ Declared activities in core or central astronomy advantage area ∗ Identified activities in coordinated astronomy advantage area; and ∗ Authorisation to undertake identified activities.	» Department of Science and Technology.	The site proposed for the development of the Namas Wind Farm is located within the Northern Cape Province, however the site falls outside of the areas considered to be uniquely suited in terms of nationally significant astronomy advantage areas.

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
Aviation Act (Act No 74 of 1962) 13th amendment of the Civil Aviation Regulations (CARS) 1997	Any structure exceeding 45m above ground level or structures where the top of the structure exceeds 150m above the mean ground level, the mean ground level considered to be the lowest point in a 3km radius around such structure. Structures lower than 45m, which are considered as a danger to aviation shall be marked as such when specified. Overhead wires, cables etc., crossing a river, valley or major roads shall be marked and in addition their supporting towers marked and lighted if an aeronautical study indicates it could constitute a hazard to aircraft. Section 14 of Obstacle limitations and marking outside aerodrome or heliport – CAR Part 139.01.33 relates specifically to appropriate marking of wind energy facilities.	» Civil Aviation Authority (CAA)	This Act will find application during the operation phase of the Namas Wind Farm. Appropriate marking on the project infrastructure is required to meet the specifications as detailed in the CAR Part 139.01.33. An obstacle approval for the Namas Wind Farm is required to be obtained from the CAA.
Provincial Policies / Legislation			
Northern Cape Nature Conservation Act (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	» Northern Cape Department of Environment and Nature Conservation (DENC).	A collection/destruction permit must be obtained from Northern Cape Nature Conservation for the removal of any protected plant or animal species found on site. The Ecological Impact Assessment (**Appendix D**) did not identify any species protected under this Act within the development footprint.

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	may apply to the current 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.		

7.6.1 *The IFC 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 Namas Wind Farm:

» IFC EHS General Guidelines
» IFC EHS Guidelines for Electric Power Transmission and Distribution

The General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines. 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

7.6.2 IFC Environmental, Health and Safety Guidelines for Wind Energy (August, 2015)

The EHS Guidelines for wind energy include information relevant to environmental, health, and safety aspects of onshore and offshore wind energy facilities. It should be applied to wind energy facilities from the earliest feasibility assessments, as well as the environmental impact assessment, and continue to be applied throughout the construction and operation phases.

The guidelines list issues associated with wind energy facilities which need to be considered. These include:

- Environmental impacts associated with the construction, operation, and decommissioning of wind energy facilities activities may include, among others, impacts on the physical environment (such as noise or visual impact) and biodiversity (affecting birds and bats, for instance).
- Due to the typically remote location of wind energy facilities, the transport of equipment and materials during construction and decommissioning may present logistical challenges (e.g., transportation of long, rigid structures such as blades, and heavy tower sections).
- Environmental issues specific to the construction, operation, and decommissioning of wind energy projects and facilities include the following:
  * Landscape, Seascape, and Visual impacts
  * Noise
  * Biodiversity
  * Shadow Flicker
  * Water Quality

CHAPTER 8: DESCRIPTION OF THE RECEIVING ENVIRONMENT

This chapter provides a description of the local environment. This information is provided in order to assist the reader in understanding the possible effects of the project on the environment within which it is proposed to be developed. Aspects 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 both existing information available for the area as well as collected field data by specialist consultants, and aims to provide the context within which this BA process is being conducted.

8.1 Legal Requirements as per the EIA Regulations, 2014 (as amended)

This chapter of the BA report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 1: Content of basic assessment reports:

Requirement	Relevant Section
3(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 footprint, as well as the broader environment, are described and considered within this chapter and includes the following:
	» The regional setting within which the Namas Wind Farm project site is located is described in section 8.2.
	» The climatic conditions of the area within which the Namas Wind Farm project site is located is discussed in section 8.3.
	» The biophysical characteristics of the project site and the surrounding areas is described in section 8.4. This includes the topography and terrain, geology, soils and agricultural potential and the ecological profile of the site (i.e. vegetation, fine-scale habitats, critical biodiversity areas and broad-scale processes, terrestrial fauna, bats and avifauna).
	» The heritage of the project site and the surrounding areas (including the archaeology, palaeontology and cultural landscape) is discussed in section 8.5.
	» The noise levels and developments sensitive to noise are described in section 8.6.
	» The visual quality of the affected environment is discussed in section 8.7.
	» The current traffic conditions for the area surrounding the project site are included in section 8.8
	» The social context within which the project site is located is described in section 8.9.

A more detailed description of each aspect of the affected environment is included in the specialist reports contained within the **Appendices D - L**.

8.2. Regional Setting

The broader study area and the project site proposed for the development of the Namas Wind Farm is located along the west coast in the Northern Cape Province. The province is situated in the north-western corner of South Africa and has a land area of 372,889 km^2, therefore occupying approximately 30% of South Africa's land area and making it the largest province in South Africa even though it has the smallest population.

The project site is located within Ward 8 of the Nama Khoi Local Municipality and the Namakwa District Municipality. Refer to **Figure 8.1** for a regional map of the study area and the project site. The Nama Khoi local Municipality is a Category B municipality, which means it shares executive and legislative authority with a Category C municipality. The Namakwa District Municipality is a Category C municipality, which denotes that the municipality has executive and legislative authority in an area that includes more than one municipality. Namakwa is the largest of the five district municipalities in the Northern Cape. It is comprised of six local municipalities, namely Nama Khoi, Hantam, Khâi-Ma, Kamiesberg, Karoo Hoogland, and Richtersveld.

The major towns located within the study area, and within the surrounding areas of the project site includes Kleinsee, Port Nolloth, Koingnaas, Komaggas, Springbok and Nigramoep. The towns of Kleinsee, Port Nolloth and Koingnaas are coastal towns located on the west coast. Kleinsee is the town closest to the project site and is located ~20km to the north-west.

Kleinsee was previously viewed as one of the flourishing mining towns, solely managed by De Beers, and characterised as "paradise, an oasis in the desert" by both previous and current residents. Residents had many benefits such as free rent, free water, and free electricity. De Beers also funded recreation activities, which brought communities together. The town, however, experienced a sharp decline in population between 2007 and 2009. By 2007, the diamond production decreased, which led to retrenchment of workers in the same year. By 2008 mining operations ceased completely, leading to the sale of the mines. The population of the town began decreasing as people sought employment in other places within and outside the Province, and foreigners employed in the area returned to their homes. To avoid total loss, the mining town was proclaimed as a public town in 2012 under the Nama Khoi Local Municipality to allow people to continue living in the area. Currently, the region has a very low population density of 3 people per km^2.

Kleinsee was previously visited often by tourists as a part of the diamond route, however, now it is included in the 'shipwreck and daisies route'. The town holds and is located near various tourist attractions such as the Buffels River estuary, which has an abundant bird life, and the Seal colony, which is the largest on-land colony in South Africa with more than 450 000 animals on the beach. In addition, the town boasts a Nature Reserve that has more than 100 indigenous plant species. Other attractions within the district include among others the Molyneux Nature Reserve, Namaqua National Park, Orange River, Blue Mine, and the Goegap Nature Reserve. None of these areas of conservation are present within the Namas Wind Farm project site.

The area is also well-known for its scenic natural beauty (West Coast as a whole) and annual wild flower displays (Namaqualand). This occurs once a year between July and October, depending on a number of environmental factors, including the occurrence and duration of rainfall. The project site land cover is primarily low shrubland with localised areas of exposed rock and sand and limited woodland or open bushland areas.

The mining activities along the coastline have significantly disturbed the area due to the scale and nature of the surface based mining. Other than the mining and prospecting activities, industrial infrastructure within the region includes a network of distribution power lines, a distribution substation at Kleinsee and the Gromis Transmission Substation north of the R355 regional road.

8.3. Climatic Conditions

The climate in Kleinsee is considered to be a desert climate. The town receives virtually no rainfall throughout the year. The average annual temperature of the town is 15.9°C, with an average annual rainfall of 93mm. The driest month for the town is January, with an average temperature of 18.5°C. The coldest month is July with an average temperature of 13°C. **Figure 8.2** below provides a climate graph for the town of Kleinsee.

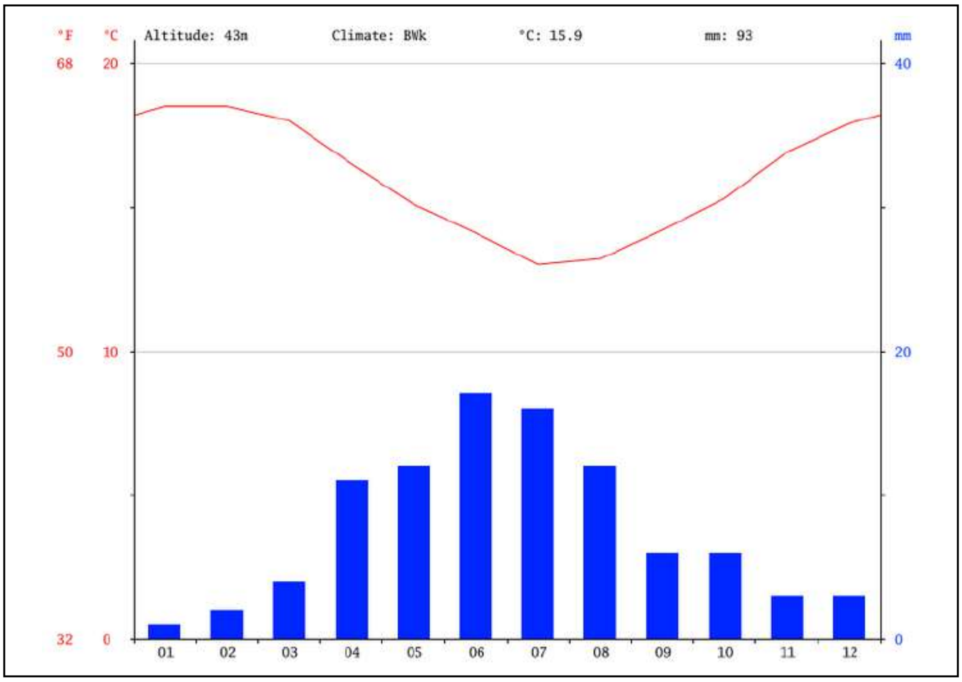

Figure 8.2: Climate graph for the town of Kleinsee, Northern Cape

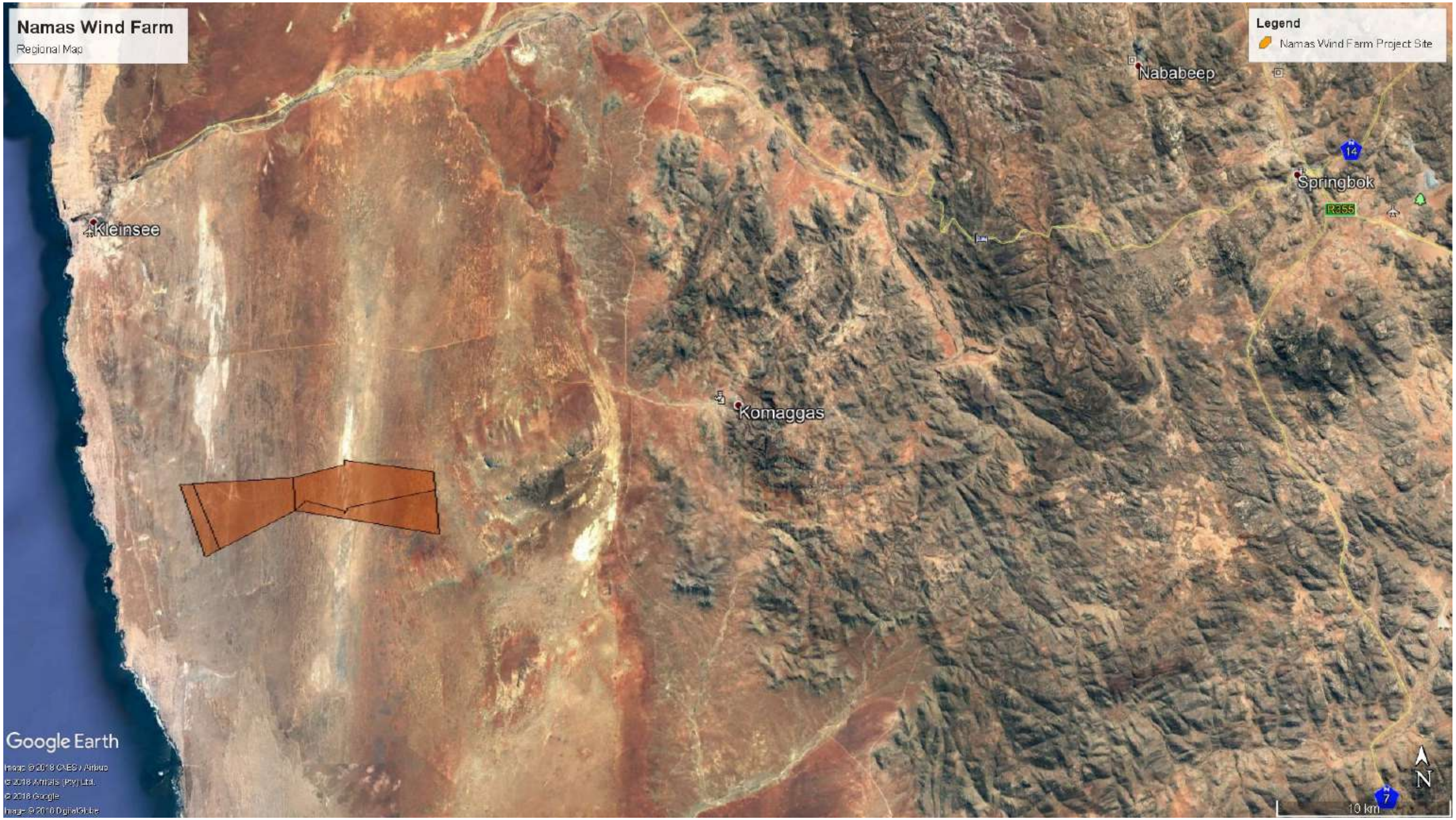

Figure 8.1: Map indicating the regional setting of the Namas Wind Farm project site

8.4. Biophysical Characteristics of the Study Area

8.4.1. Topography and Terrain

The project site is relatively flat but with a north-south trending dune ridge in the west and another far larger one in the east. The project site is located within a very sandy environment with undulating topography.

Varying 'bands' of landscape form across the site from west to east. In the far west the land is relatively flat but with low hills possibly covering old heuweltjies. A single larger hill also occurs in this area. Other similar hills occur further north, outside of the project site and form a low ridgeline. Inland of this low ridge is an area of lower-lying flat land that lies between 7km and 9km from the coast.

In the centre of the project site there is a band (approximately 5km wide) of taller sand dunes that extend north to south. There are several minor ridges within this band but the largest and tallest lies about 12.5 km from the coast. There are occasional 'deflating areas' on some dune tops with proper deflation hollows found to be very rare. A further broad flat plain at least 4km wide lies to the east of the belt of dunes. Refer to **Figure 8.3.**

Figure 8.3: General topography of the area within which the Namas Wind Farm project site is located

No drainage features or watercourses were identified within the project site.

8.4.2. Geology, Soils and Agricultural Potential

Geological Setting of the Project Site

The affected surficial formations present within the project site include early to mid-Holocene dunes of the Hardevlei Formation and earlier late Quaternary coversands of the Koekenaap Formation. Beneath these unconsolidated sands are compact, pedogenically-altered aeolianites termed "Dorbank Formations" which are fossil dune plumes of later mid-Quaternary age. An older dorbank dune plume underlies the eastern part of the project site; a later dorbank dune plume underlies the western part. Between these dune plume ridges is a non-depositional area which is closely underlain by pale pedocrete which is likely to have formed in early mid-Quaternary aeolianites equivalent to the Olifantsrivier Formation.

Soils and Agricultural Potential of the Project Site

The area is underlain by Quaternary sediments, most of which are sandy in nature. The project site is covered by three land types, namely (**Figure 8.4**):

» Ah38 – high base status and red and yellow soils
» Ai13 – high base status and yellow soils
» Hb80 - grey sands and other soils

Table 8.1 below provides the details of the soils and land types present within the project site.

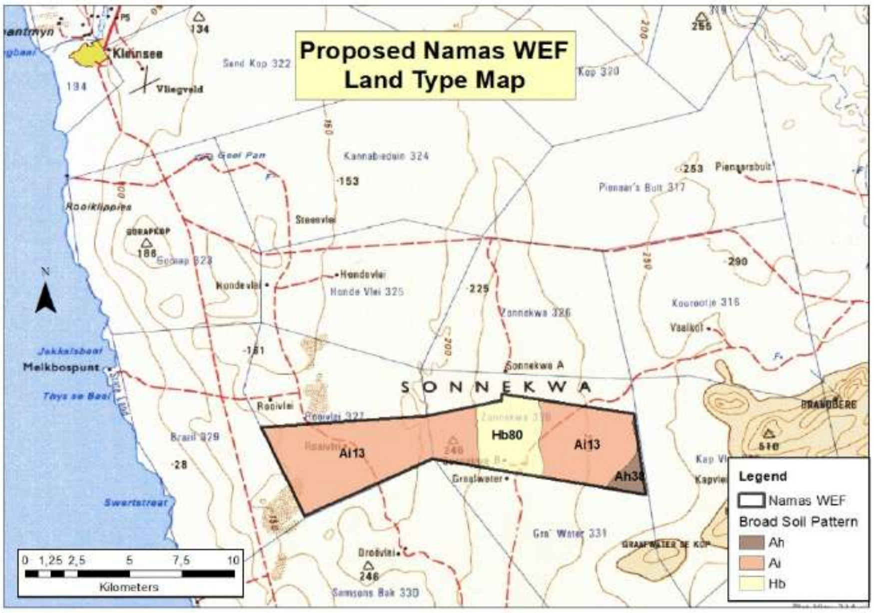

Figure 8.4: Land types present within in the Namas Wind Farm project site

Table 8.1: Details of the soils and land types present within the Namas Wind Farm project site

Land Type	Dominant Soils	Depth (mm)	Percent of land type	Characteristics	Agricultural Potential (%)
Ah38	Hutton & Clovelly 31/41	400-1200	67%	Red and yellow brown, sandy, structureless soils, sometimes calcareous.	High – 0% **Moderate – 100%**
	Vilafontes 11/31	>1200	20%	Grey-brown, sandy, structureless soils.	Low – 0%
Ai13	Clovelly 31/34/41/44	600-1200	63%	Yellow brown, sandy, structureless soils, sometimes calcareous.	High – 0% **Moderate – 92.7%**
	Pinedene 31/34	400-800	13%	Yellow brown, sandy, structureless soils, on gleyed clay.	Low – 7.3%
Hb80	Fernwood 20/21	>1200	36%	Grey-brown, sandy, structureless soils.	High – 0% **Moderate – 76%**
	Pinedene/Kroonstad	400-800	24%	Yellow brown and grey, sandy, structureless soils, on gleyed clay.	Low – 24%

There are no high potential soils present within the project site and the soils are of moderate potential at best due mainly to the sandy texture which leads to rapid water infiltration and the soils drying out. In addition, the low rainfall in the area means that there is little potential for rain-fed arable agriculture in the area. Arable production would, therefore, be possible only by irrigation, and no indications of any irrigated areas within, and surrounding the project site, can be identified.

In general, the soils that do occur within the project site are suited for extensive grazing at best and furthermore the grazing capacity of the area is very low, at around 26-40 ha/large stock unit.

The soils present in the project site are not considered susceptible to erosion by water. However, if the vegetation cover is disturbed (for example by overgrazing and development) and considering the sandy nature of the topsoils, as well as the dry climate, there is a significant possibility of removal of some or all of the topsoil by wind action.

8.4.3. *Ecological Profile of the Broader Study Area and the Project Site*

<u>i. Broad-Scale Vegetation Patterns</u>

The national vegetation types which occur within the project site are the Namaqualand Coastal Duneveld, Namaqualand Strandveld and Namaqualand Salt Pans. These are briefly described below and illustrated in **Figure 8.5**.

» *Namaqualand Coastal Duneveld*
Namaqualand Coastal Duneveld occurs on the coastal plain in the Northern and Western Cape from south of Port Nolloth to near the Groen Rivier mouth. It occupies the coastal peneplain with semi-mobile sand plains to highly mobile, sharp, angular dune plumes usually north of the estuaries. The vegetation consists of a dwarf shrubland dominated by erect succulent shrubs as well as non-succulent shrubs. Spiny grasses (*Cladoraphis*) are common on wind-blown semi-stable dunes. The Namaqualand Coastal Duneveld is classified as Least Concern and about 8% of this unit has been lost to coastal diamond mining. The conservation target for this unit is 26% and some extent is currently conserved within the Namaqua National Park. The abundance of vegetation-type endemic species within this unit is low and the unit shares a high proportion of species with the adjacent vegetation types. Although the abundance of plant species of conservation concern within these areas is not exceptional, this unit is associated with the coastal forelands and the presence of fairly mobile or vegetated dunes that are vulnerable to disturbance. Within the project site, this vegetation type occupies the western third of the site, but in practice it is only the western margin of the site that is well-differentiated from the areas further inland.

» *Namaqualand Strandveld*
Namaqualand Strandveld occurs in the Northern and Western Cape Provinces from the southern Richtersveld as far south as Donkins Bay. Especially in the north of this unit it penetrates up to 40km inland and approaches the coast only near the river mouths of the Buffels, Swartlintjies, Spoeg, Bitter and Groen Rivers. In the south of the unit it is variably narrow and approaches the coast more closely. It consists of flat to undulating coastal peneplain. The vegetation consists of a low species richness shrubland dominated by a plethora of erect and creeping succulent shrubs as well as woody shrubs and in wet years annuals are also abundant. It is associated with deep red or yellowish-red Aeolian dunes and deep sand overlying marine sediments and granite gneisses. Eight endemic species for this vegetation type are listed. Namaqualand Strandveld is classified as Least Threatened and about 10% of this vegetation type has been lost mainly to coastal mining for heavy metals and it is not currently listed. In general, this is not considered to be a highly sensitive vegetation type as it is fairly extensive and generally has a low abundance of species of conservation concern. There may however be specific habitats present that are of limited extent and contain specialised associated species. Within the site, this unit occurs in two broad bands separated by the low-lying valley which traverses the centre of the site and which is classified as Namaqualand Salt Pans.

» *Namaqualand Salt Pans*
The Namaqualand Salt Pans vegetation type occurs in the Northern and Western Cape on the coastal plain including the Sonnekwa, Hindevlei, Bloupan, Dryerspan, and Soutpan as well as parts of the Olifants River mouth. This unit occupies the flat surfaces of depressions, mostly without vegetation and only occasionally covered with sparse salt-tolerant succulent shrubs. Namaqualand Salt Pans are nearly permanently dry and especially in the Kleinsee area they disappear and are buried under layers

of wind-borne sand. This vegetation type is considered to be Least Threatened and has experienced limited impact resulting in transformation. While the low-lying valley that traverses the project site may have had its origin as a salt pan type feature, it clearly does not correspond to this feature today and cannot be considered to be a salt pan any longer as it is well-vegetated and the original basement is no longer apparent, except where it has been uncovered by excavation. This is not a common vegetation unit in the area and offers a different habitat to the surrounding sandy areas.

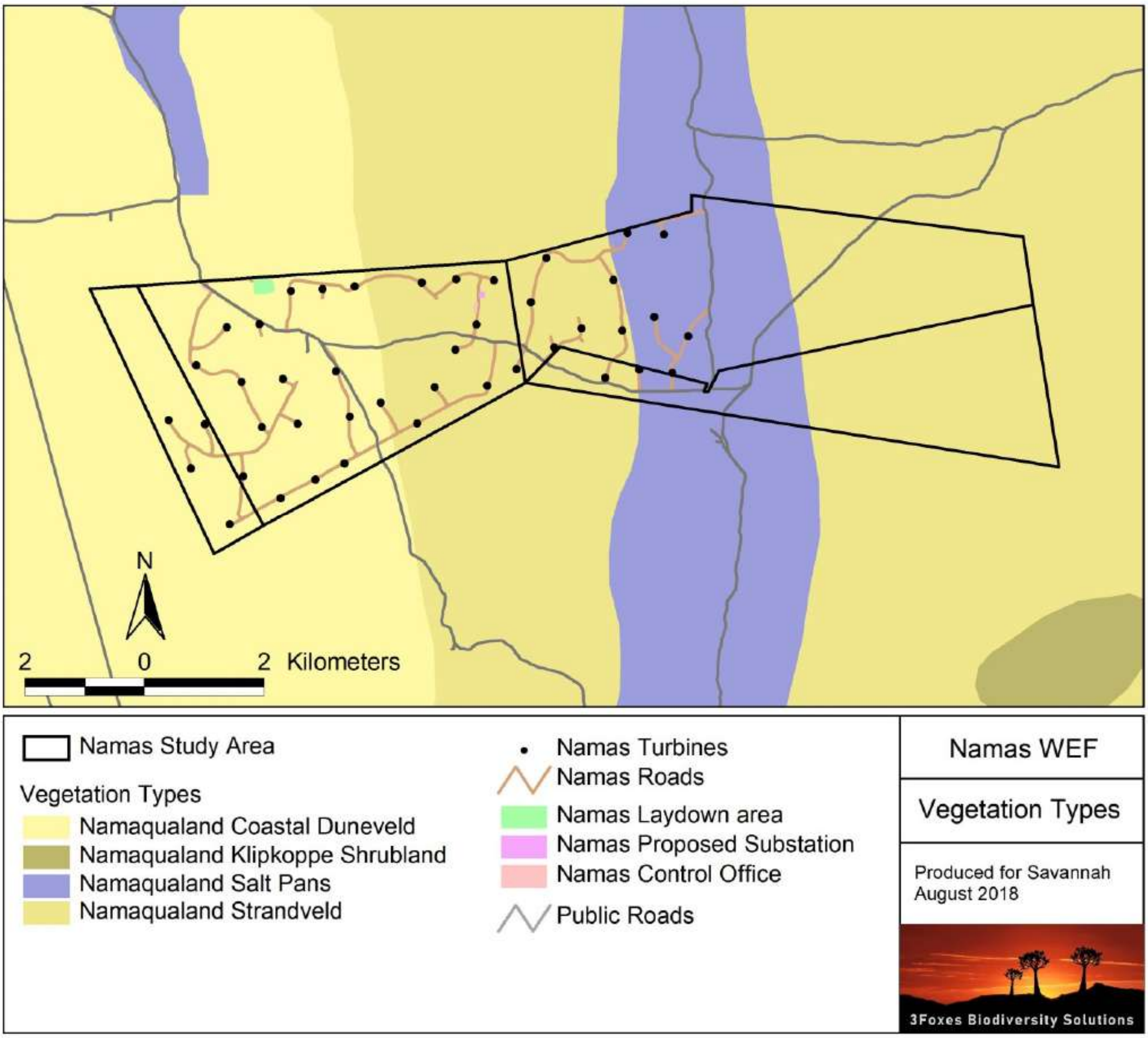

Figure 8.5: Vegetation types, as per the national vegetation map of 2012, for the Namas Wind Farm project site.

<u>ii. Listed Plant Species</u>

More than 500 plant species have been recorded from the broader area from Komaggas to Kleinsee. This includes 25 species of conservation concern of which four were confirmed present at the project site. These include *Aloe arenicola* (Near Threatened), *Leucoptera nodosa* (Near Threatened), *Wahlenbergia asparagoides* (Vulnerable) and *Babiana hirsuta* (Near Threatened) (refer to **Figure 8.6**). However, the abundance of these species is low across most of the project site.

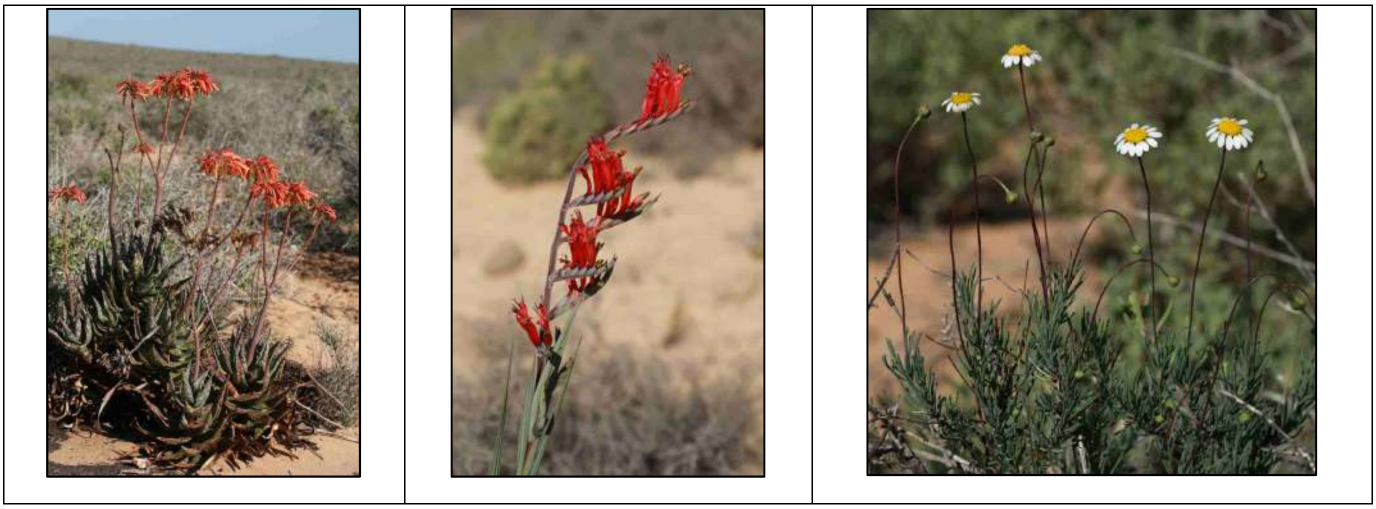

Figure 8.6: Common plant species of concern present at the Namas Wind Farm project site. These include *Aloe arenicola*, *Babiana hirsuta* and *Leucoptera nodosa*

iii. Fine-scale habitats and communities

In order to better inform the vegetation baseline of the site, 30 vegetation samples were collected from a broader study area which includes the Namas Wind Farm project site. This is considered a useful approach as it allows the vegetation of the site to be interpreted in a broader context. Although the specific sites that were sampled in the field were chosen randomly, the sample points were purposely distributed across the wider area to capture the range of habitats present and ensure spatial representation. In order to identify and understand the different plant communities present, the information from the 30 sample sites was subject to cluster analysis, which identifies and groups plots with similar species composition together in a hierarchical structure. The groups resulting from the cluster analysis were then mapped to illustrate the spatial distribution of the communities identified. **Figure 8.7** illustrates the cluster analysis undertaken and **Figure 8.8** the distribution of the different plant communities.

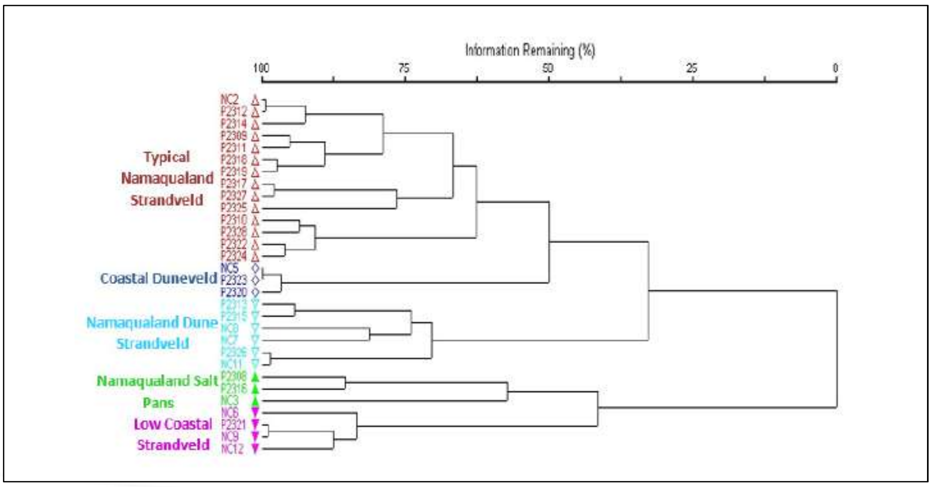

Figure 8.7: Cluster analysis showing the different plant communities that were identified among the plots that were sampled at the Namas Wind Farm project site and in the adjacent areas. Five communities were recognised and named

The cluster analysis illustrates a few patterns of note that can be observed (**Figure 8.8**). The plots from the western part of the project site form two relatively distinct clusters (blue and purple), while there is also clearly a cluster associated with the shallow sands overlying calcrete in the mid-section of the site (green), as well as a cluster on large dunes (blue) and the remaining cluster (red) which represents more typical strandveld on flatter areas. Each of the habitats identified is illustrated, with pictures of these habitats from the site, and described in more detail below (**Table 8.2**).

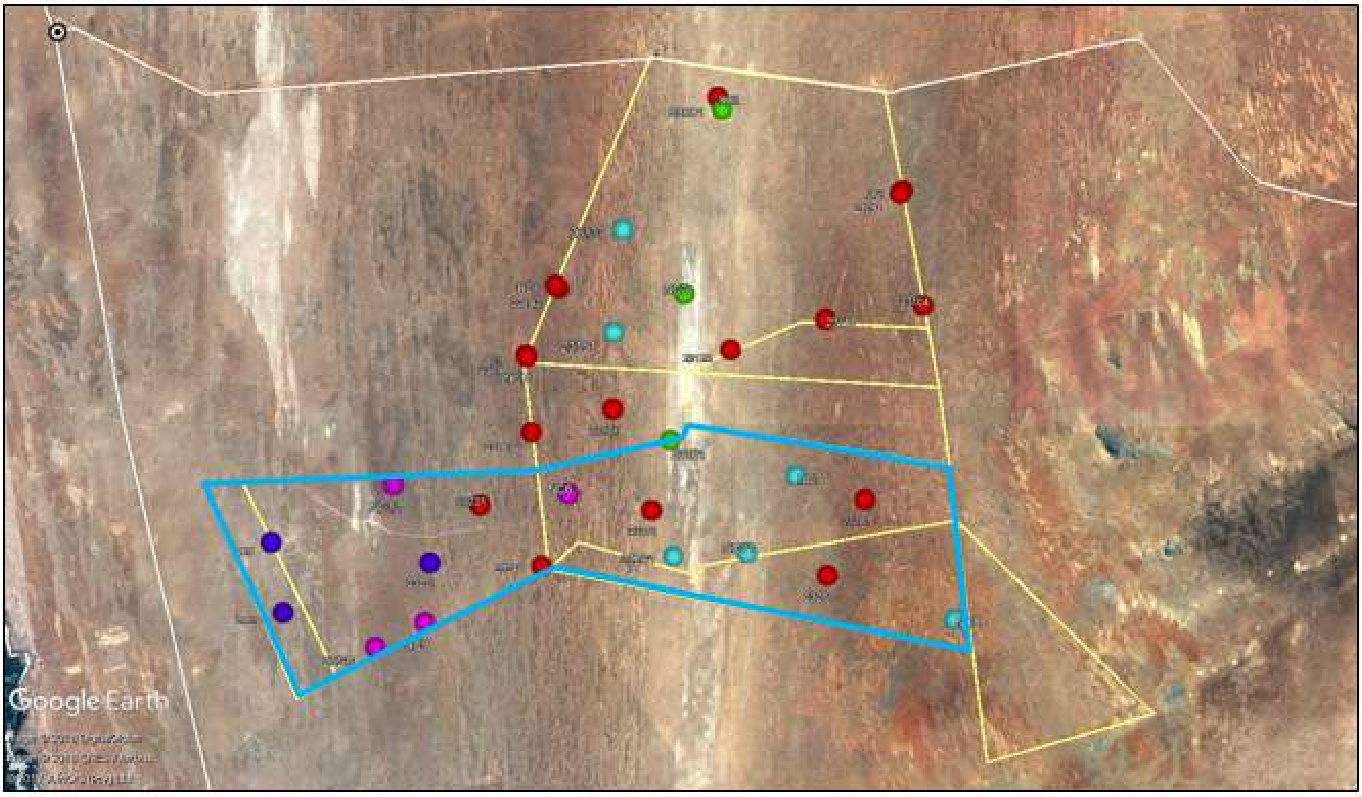

Figure 8.8: The distribution of different plant communities identified within the Namas Wind Farm project site

Table 8.2: Details of the five habitat communities identified within the Namas Wind Farm project site

Community 1: Coastal Duneveld

The western part of the project site falls within the Coastal Duneveld vegetation type which includes two plant communities associated with the western parts of the site. The sample sites mapped occur on pale sands with relatively low vegetation compared to the adjacent Namaqualand Strandveld. Typical species include *Zygophyllum morgsana*, *Tripteris oppositifolia*, *Asparagus capensis*, *Lycium cinereum*, *Tetragonia spicata*, *Othonna sedifolia*, *Hermannia sp.*, *Stoberia utilis*, *Lebeckia halenbergensis*, *Pteronia divaricata*, *Hermannia cuneifolia*, *Salvia lanceolata*, *Manochamys albicans*, *Asparagus fasciculatus*, *Searsia longispina* and *Aloe arenicola*. The abundance of plant species of conservation concern were observed to be moderate with *Aloe arenicola*, *Leucoptera nodosa* and *Babiana hirsuta* observed to be present. This area is considered to be somewhat more sensitive than the adjacent Namaqualand Strandveld due to the greater vulnerability of this area to wind erosion as well as the potential greater importance of this area for fauna associated with the coastal plain, many of which do not penetrate far inland and would not occur further east within the project site.

Community 2: Low Coastal Strandveld

Adjacent to the areas of Coastal Duneveld, are some areas of finer-textured soils dominated by low succulents. These areas are generally flat and not subject to significant sand movement. Dominant and typical species include *Othonna sedifolia*, *Asparagus capensis*, *Amphibolia rupis-arcuatae*, *Tripteris oppositifolia*, *Jordaaniella spongiosa*, *Ruschia goodiae*, *Tylecodon pearsonii*, *Tetragonia spicata*, *Manochamys albicans*, *Ruschia sp.* and *Euphorbia brachiata*. This is not considered to be a highly sensitive habitat type, but as it is of limited extent it is considered more vulnerable.

Community 3: Strandveld on Namaqualand Salt Pans

The vegetation of the areas classified as Namaqualand Salt Pans is well supported as an independent unit, however, it is also clear that the naming is not appropriate and the unit should be called something else as the vegetation does not correspond with a salt pan environment. These areas occur on shallow white sands overlaying weathered calcrete or lime. Water does not collect in these areas as evidenced by observation and the fact that most of the farm houses in the project site are located within this habitat. Although they are currently freely drained, they may once have represented salt pans that have been overlain with wind-blown sands. Typical and dominant species include *Amphibolia rupis-arcuatae*, *Euphorbia brachiata*, *Othonna sedifolia*, *Asparagus capensis*, *Zygophyllum morgsana*, *Ruschia goodiae*, *Cheirodopsis denticulata*, *Aridaria nociflora*, *Othonna cylindrica* and *Ruschia sp*. As this is a habitat of limited extent and offers features that are not found elsewhere in the area, it is considered more sensitive than the surrounding Strandveld.

Community 4: Namaqualand Dune Strandveld

There is a distinct plant community associated with the larger, more mobile dune fields of the project site. These areas are more dynamic than the areas of flatter strandveld and have areas of alternating low cover associated with areas of greater sand movement and areas of taller vegetation occurring in the dune slacks and other more stable situations. Typical and dominant species include *Zygophyllum morgsana*, *Searsia longispina*, *Tripteris oppositifolia*, *Cladoraphis cyperoides*, *Othonna sedifolia*, *Conicosia pugioniformis*, *Asparagus lignosus*, *Hermannia sp. nov*., *Babiana hirsuta*, *Leucoptera nodosa*, *Eriocephalus racemosus*, *Asparagus capensis*, *Lycium cinereum*, *Lebeckia spinescens*, *Tetragonia spicata* and *Diospyros ramulosa*. These areas are considered somewhat more sensitive than the typical surrounding Strandveld due to the large dunes which are vulnerable to disturbance.

Community 5: Typical Namaqualand Strandveld

The majority of the project site consists of typical Namaqualand Strandveld on gently undulating plains. These areas are fairly homogenous but there are some shifts in the dominance of the different plant species present depending on soil texture, depth etc. Typical and dominant species include *Zygophyllum morgsana*, *Tripteris oppositifolia*, *Asparagus capensis*, *Othonna sedifolia*, *Hermannia sp.*, *Lebeckia spinescens*, *Eriocephalus racemosus*, *Searsia longispina*, *Leipoldtia sp.*, *Cladoraphis cyperoides*, *Salvia lanceolata*, *Anthospermum spathulatum*, *Tetragonia spicata*, *Ruschia sp.*, *Helichrysum hebelepis*, *Wahlenbergia asparagoides*, *Asparagus lignosus* and *Euphorbia burmannii*. This is the dominant habitat at the project site and comprises the majority of the area. This is not considered to be a sensitive habitat and while some SCC are present, this is a widespread vegetation type.

iv. Critical Biodiversity Areas (CBA) and Broad-Scale Processes

The majority of the project site lies within an Ecological Support Area (ESA), with some CBA 2 present in the southwest of the project site (refer to **Figure 8.9**). While there are also some areas of CBA 1 in the east, these are located outside of the project site and do not infringe on the project site area. The Northern Cape CBA map does not include any information on why a specific area has been included as a CBA, with the result that it is not possible to interrogate the map to establish the underlying reasons why the areas within the project site have been classified as CBA 2. Therefore, the ecologist has interrogated the environment based on the habitats and quality of the vegetation present in the field.

As the primary purpose of CBAs is to try and secure the broad-scale ecological functioning and resilience of landscapes, it is important to consider the impact that the development may have on ecological processes. As the area is relatively homogenous, it is not likely that there are any specific directional movement corridors within the area that is classified as a CBA. It is, however, likely that the low-lying area that is classified as Namaqualand Salt Pans represents a north-south corridor for species associated with firmer substrates. At a broader level, there are still extensive tracts of similar intact habitat east and west as well as north and south of the project site.

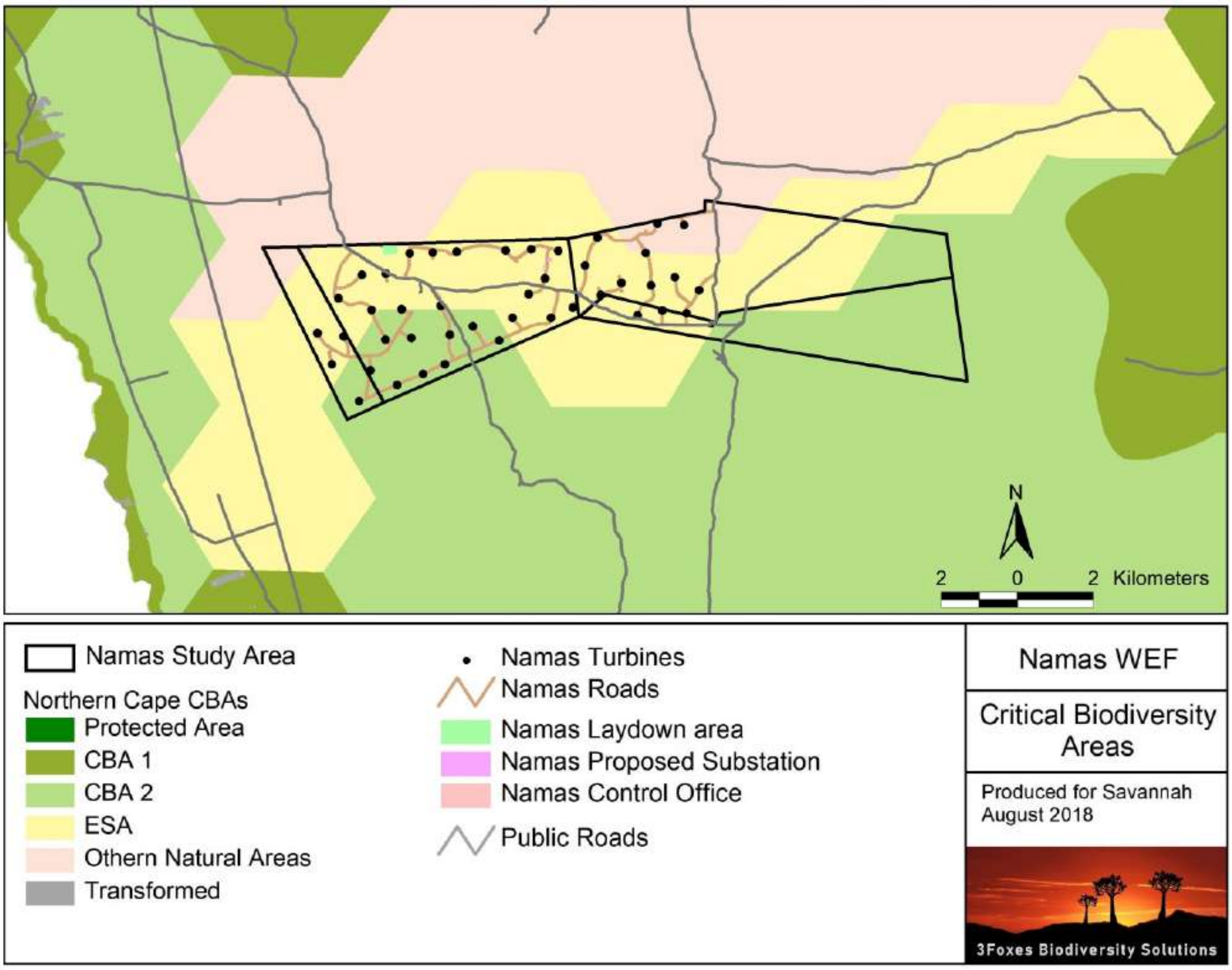

Figure 8.9: Northern Cape Critical Biodiversity Areas map (2017) overlain with the Namas Wind Farm project site and development footprint. The majority of the project site is located within an area demarcated as an ESA, with some CBA 2 present within the southwest of the site

In addition, the project site is not located within a Northern Cape Protected Area Expansion Strategy (NC-PAES) focus area and has, therefore, not been identified as an important area for future conservation area expansion (refer to **Figure 8.10**).

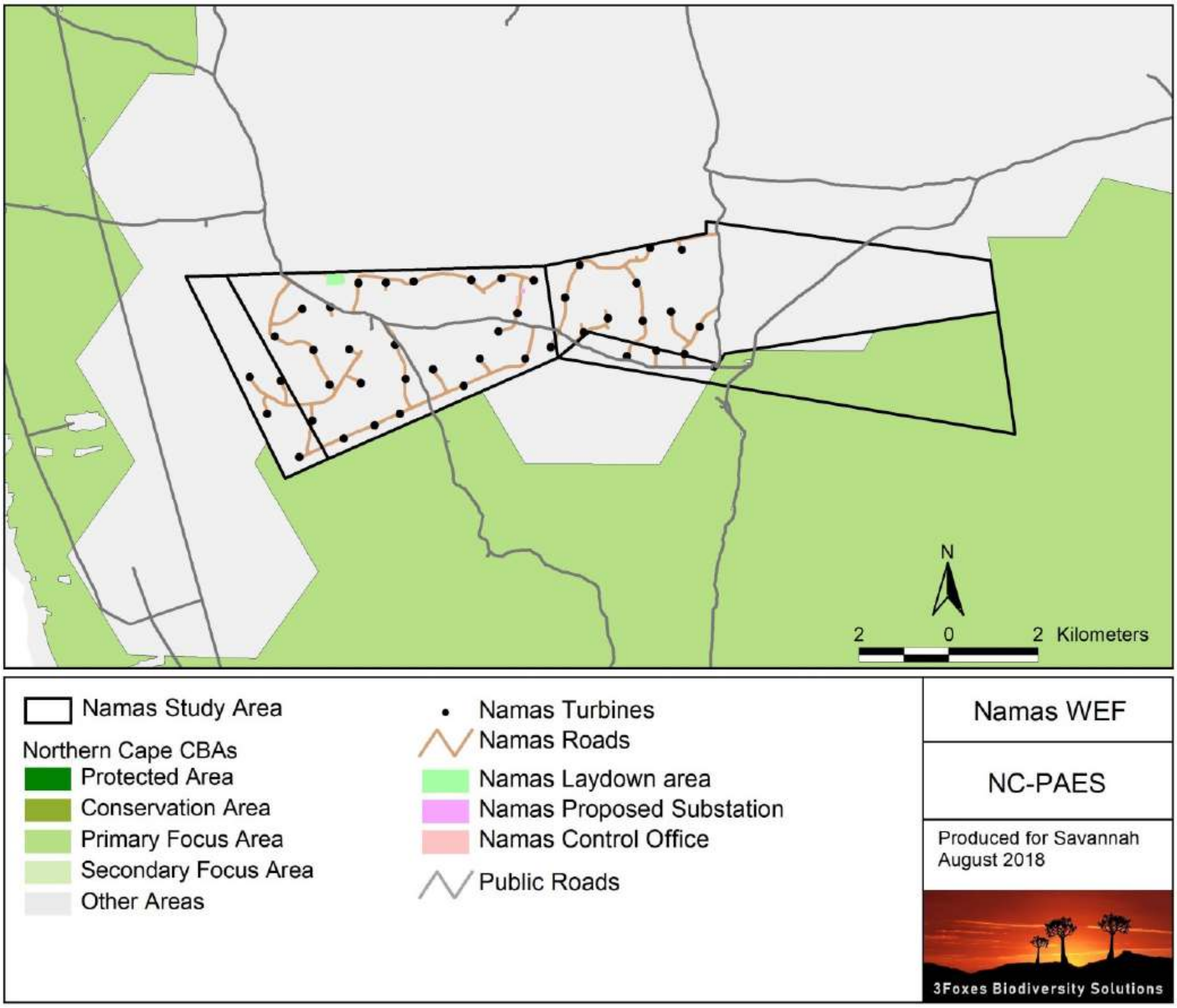

Figure 8.10: Northern Cape Protected Area Expansion Strategy Focus Areas map overlain with the Namas Wind Farm project site and development footprint. The map shows that the Namas Wind Farm does not impact on areas identified as priorities for future conservation expansion

v. Terrestrial Fauna

Mammals

Mammals were captured by camera traps and include (in order of decreasing abundance) Steenbok, Cape Hare, Cape Fox, Bat-eared fox, Striped Polecat, Suricate, Cape Porcupine, Common Duiker, Honey Badger, Small Spotted Genet, Grey Mongoose, Caracal, Yellow Mongoose, African Wild Cat and Slender Mongoose. More than half the observations are from Steenbok and Cape Hare, with Cape Fox, Bat-eared fox, Striped Polecat, Suricate and Cape Porcupine being moderately abundant, and the remaining species uncommon. This represents a fairly typical mammalian community and is similar to that obtained at other sites along the West Coast. A notable absence is the Black-backed Jackal, which occurs in the area but is likely absent as a result of persecution. Small mammals observed or caught in the area with Sherman traps include Hairy-footed Gerbil, Western Rock Elephant Shrew, Namaqua Rock Mouse, Four-striped Mouse, Karoo Bush Rats and Brants' Whistling Rat.

Apart from the species that were observed and can be confirmed present at the project site, four red-listed SCC are known from the wider area. This includes the Leopard *Panthera pardus* (Vulnerable), Littledale's Whistling Rat *Parotomys littledalei* (Near Threatened), African Clawless Otter *Aonyx capensis* (Near Threatened) and Grants' Golden Mole *Eremitalpa granti granti* (Vulnerable). It is not likely that either the Leopard or Otter are present at the site on account of human disturbance or lack of suitable habitat. Golden Moles are confirmed present at the project site, but it is not clear if these are the more common Cape Golden Mole or Grants' Golden Mole. These subterranean animals 'swim' through the soft sand, and hardened surfaces such as roads would pose a significant obstacle for movement.

<u>Reptiles</u>

As many as 45 reptile species are known to occur in the wider area. No species of conservation concern have been recorded for the project site although it is possible that the Speckled Padloper *Chersobius signatus* (Vulnerable) is present in the area, there is very little rocky habitat available at the site for this species and as a result it is not likely to be present. Namaqualand is, however, known as a centre of endemism and diversity for reptiles and the wider area has a high diversity and abundance of local endemics. This appears to be generated at least partly through the high habitat diversity of the area, which includes rocky hills, heuweltjie veld on fine-textured firm soils, loose sands and dunes, stable and vegetated dunes, well-vegetated drainage lines etc. Within the Namas Wind Farm project site, habitat diversity is low and restricted to the various sandy substrates from firm sand lowlands to fairly loose dunes, with the result that species associated with rocky outcrops are likely to be absent.

Species observed at the project site include Angulate Tortoise, Giant Desert Lizard, Common Giant Ground Gecko, Knox's Desert Lizard, Common Sand Lizard, Cape Skink, Coastal Dwarf Legless Skink, Namaqua Sand Lizard, Pink Blind Legless Skink, Dwarf Beaked Snake and Many-horned Adder.

<u>Amphibians</u>

There is no natural permanent or even seasonal standing water at the Namas Wind Farm project site, which is due to the sandy substrate and consequent lack of drainage features where water can gather. As a result, the amphibian community at the site is restricted to species that are relatively independent of water and the project site is consequently of low diversity. The only species confirmed present in the immediate area is the Namaqua Rain Frog which appears to be relatively widespread within the coastal strandveld vegetation types on sandy soils. Other species which are possibly present include the Cape Sand Frog *Tomopterna delalandii* and the Desert Rain Frog *Breviceps macrops* which is classified as Vulnerable. The Desert Rain Frog is however restricted to the coastline and is not known to occur so far inland and as a result is unlikely to occur at the site, although this cannot be discounted.

vi. Bats

Vegetation units and geology are of great importance as these may serve as suitable sites for the roosting of bats and support of their foraging habits. Houses and buildings may also serve as suitable roosting spaces. The importance of the vegetation units and associated geomorphology serving as potential roosting and foraging sites have been described in **Table 8.3**.

Table 8.3: Potential for vegetation to serve as suitable roosting and foraging spaces for bats within the Namas Wind Farm project site

Vegetation Unit	Roosting Potential	Foraging Potential	Comments
Namaqualand Strandveld	Low - Moderate	Low - Moderate	Larger plants, shrubs and small trees can offer limited roosting space, but in general the roosting potential is low on this site and within this vegetation unit. Farm buildings and artificial structures can provide ample roosting. Foraging potential is increased by the small pockets of wind shelter created by the slightly undulating terrain and small dunes.
Namaqualand Salt Pans	Low	Moderate	The sparsely vegetated terrain, low plants and lack of rocky outcrops does not allow for natural roosting space. Only farm buildings and artificial structures can provide ample roosting. Foraging potential is strongly contingent on seasonal changes when the salt depressions may be moist and succulents are flowering.
Namaqualand Coastal Duneveld	Low	Low - Moderate	The coastal environment with its associated insect activities may provide foraging potential in seasons with limited food supplies. The sparsely vegetated terrain, low height of plants and lack of rocky outcrops does not allow for much natural roosting space on the project site. Only farm buildings and artificial structures can provide ample roosting.
Namaqualand Klipkoppe Shrubland	Moderate - High	Moderate - High	Roosting space and wind shelter created by the more variable terrain may increase foraging and roosting potential. This vegetation unit is not present within the project site.

Table 8.4 below provides the details of the bat species that may be roosting or foraging on the Namas Wind Farm project site.

Table 8.4: Species that may be roosting or foraging on the Namas Wind Farm project site, the possible site-specific roosts, and their probability of occurrence based on literature

Species	Common name	Probability of occurrence (%)	Conservation status (2016 Regional Listing)	Possible roosting habitat on site	Possible foraging habitat utilised on site	Likelihood of risk of fatality (Sowler, et al., 2017)
Tadarida aegyptiaca	Egyptian free-tailed bat	Confirmed	Least Concern	Roosts in rock crevices, hollows in trees, and behind the bark of dead trees. The species has also taken to roosting in roofs of buildings, which is more the case on site.	It forages over a wide range of habitats; its preference of foraging habitat seems independent of vegetation. It seems to forage in all types of natural and urbanised habitats.	High

Miniopterus natalensis	Natal long-fingered bat	Confirmed	Near Threatened (2004 National Listing)	Cave and hollow dependent, no known caves close to the site. Will also roost in small groups or individually in culverts and other hollows.	Clutter-edge forager. May forage in more open terrain during suitable weather.	Medium - High
Neoromicia capensis	Cape serotine	Confirmed	Least Concern	Roosts in the roofs of houses and buildings.	It appears to tolerate a wide range of environmental conditions, from arid semi-desert areas to montane grasslands, forests, and savannahs.	Medium - High
Eptesicus hottentotus	Long-tailed serotine	Confirmed	Least Concern	It is a crevice dweller roosting in rock crevices, as well as other crevices in buildings. No rock crevices on site, only building roofs.	It generally seems to prefer woodland habitats, and forages on the clutter edge.	Medium
Cistugo seabrae	Angolan wing-gland bat	20 - 30	Near Threatened	May roost in farm building structures but little is known about roosting habits. Restricted to arid regions of the country.	Clutter edge forager preferring terrain near open water, may possibly be found in man-made gardens, although not likely.	Medium
Sauromys petrophilus	Roberts Flat-headed bat	Confirmed	Least Concern	Farm structures on site. Will utilise roosting space provided by the Namaqualand Klipkoppe Shrubland.	Open air forager that will fly over vast areas of flat terrain.	High
Rhinolophus capensis	Cape horseshoe bat	20 - 30	Near Threatened (2004 National Listing)	Roosts in caves and mine adits, no known caves in the immediate area. May utilise man made hollows.	Forages predominantly in the canopy of trees which may be found in man-made gardens.	Low
Rhinolophus clivosus	Geoffroy's horseshoe bat	20 - 30	Near Threatened (2004 National Listing)	Roosts in caves and mine adits, no known caves in the immediate area. May utilise man made hollows.	It is associated with a variety of habitats including thickets that may be found in man-made gardens.	Low
Nycteris thebaica	Egyptian slit-faced bat	30 - 40	Least Concern	Roosts in hollows, aardvark burrows, culverts under roads and the trunks of dead trees.	It appears to occur throughout the savannah and karoo biomes, but avoids open grasslands. May occur in the thickets of man-made gardens.	Low

Ecology of bat species

There are several bat species in the vicinity of the project site that commonly occur in the area. These species are of importance due to high abundances and certain behavioural traits. The relevant species are discussed below.

» *Tadarida aegyptiaca*
The Egyptian Free-tailed Bat, *Tadarida aegyptiaca*, is a Least Concern species (IUCN Red List 2016) as it has a wide distribution and high abundance throughout South Africa, and is part of the Free-tailed bat family (*Molossidae*). It occurs from the Western Cape of South Africa, north through to Namibia and southern Angola, and through Zimbabwe to central and northern Mozambique. This species is protected by national legislation in South Africa.

They roost communally in small (dozens) to medium-sized (hundreds) groups in caves, rock crevices, under exfoliating rocks, in hollow trees and behind the bark of dead trees. *Tadarida aegyptiaca* has also adapted to roosting in buildings, in particular roofs of houses. Therefore, man-made structures and large trees on the site would be important roosts for this species. *Tadarida aegyptiaca* forages over a wide range of habitats, flying above the vegetation canopy.

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

It roosts individually or in small groups of two to three bats in a variety of shelters, such as under the bark of trees, at the base of aloe leaves, and under the roofs of houses. They will use most man-made structures as day roosts, which can be found throughout the site and surrounding areas. They are tolerant of a wide range of environmental conditions as they survive and prosper within arid semi-desert areas to montane grasslands, forests, and savannas, indicating that they may occupy several habitat types across the project site, and are amenable towards habitat changes. They are clutter-edge foragers, meaning they prefer to hunt on the edge of vegetation clutter mostly, but can occasionally forage in open spaces.

» *Miniopterus natalensis*
Miniopterus natalensis, also commonly referred to as the Natal long-fingered bat, occurs widely across the country but mostly within the southern and eastern regions and is listed as Near Threatened. This bat is a cave-dependent species and identification of suitable roosting sites may be more important in determining its presence in an area than the presence of surrounding vegetation. Culverts and mines have also been observed as roosting sites for either single bats or small colonies. Separate roosting sites are used for winter hibernation activities and summer maternity behaviour, with the winter hibernacula generally occurring at higher altitudes in more temperate areas and the summer hibernacula occurring at lower altitudes in warmer areas of the country.

The Natal long-fingered bat undertakes short migratory journeys between hibernaculum and maternity roosts. Very little is known about the migratory behaviour and paths of *M. natalensis* in South Africa with migration distances exceeding 150 kilometres.

Regarding the foraging habitats of *Miniopteridae,* the individual home ranges of lactating females were significantly larger than that of pregnant females. The bats predominately make use of urban areas (54%) followed by open areas (19.8%), woodlands (15.5%), orchards and parks (9.1%), and water bodies (1.5%) when selecting habitats.

vii. Avifauna

Avian Microhabitats

Bird habitat in the region consists of uniform vegetation type of coastal shrubs and succulent plants. The vegetation includes succulent shrubs such as *Tertragonia, Cephalophyllum* and *Didelta* and non-succulents such as *Eriocephalus*, *Pteronia* and *Salvia*. There are a few alien trees in the project site (Eucalyptus), and farm dams and water points for sheep. Few grasses are found, making the lark species diversity rather slim within the site. One Eskom reticulation line with monopoles is found within the site, providing some perch sites for raptors but no nesting sites.

Species Diversity

Over the course of 12-months of the pre-construction monitoring campaign, only 46 avian species in the project site were recorded. This is a very low total compared with other arid areas in the Northern and Western Capes that have been sampled. Species richness varied over the seasons, with higher totals recorded in summer (38 species) and the lowest in spring and autumn (21 and 22 species respectively). All species were typical residents of the arid Karoo landscape including Chats, Prinias, Titbabbler, Flycatchers, Karoo Larks and Grey Tit *Parus afer*.

Small aerial species included the occasional hirundines such as Rock Martin *Ptyonoprogne fuligula* and groups of up to 90 swifts including Alpine *Tachymarptis melba*, Little *Apus affinis* and Common Swifts *A. apus.* These species were recorded foraging over the east end of the project site.

The average number of species per kilometre was slightly lower in the project site (9.7 species per km) than in the Control site (10.5 species per km). Similarly, the average number of individual birds per kilometre found in the project site (29.6 birds per km) was higher than in the Control (26.3 birds per km). Bird abundance indices were higher in the spring (September) than any other month. Bird species richness on site stayed relatively constant throughout the year, with summer showing the highest numbers. This is not typical for arid areas, where spring is often the most species-rich season following winter rains. It is expected that the totals recorded were lower in terms of diversity and numbers than in a typical year, and more raptors are likely to be present.

Collision-prone and red-listed species

Among the 48-species recorded on the 37 SABAP2 bird atlas cards for this region (June 2013-March 2018) were 8 priority collision-prone species (CPS). Five of the eight species were recorded from the Vantage Point surveys undertaken within the Namas Wind Farm project site. These included two Red Data species (Secretarybird and Ludwig's Bustard). The Ludwig's Bustards were recorded twice, and the Secretarybird once in November 2017 on the site, and a pair were observed in flight together on the adjacent farm Zonnequa in August 2017.

An inactive Secretarybird nest site was recorded on the project site (refer to **Figure 8.11**), which was used as a roost by the territorial bird. The Secretarybird is a very terrestrial species and rarely takes flight (Steyn 1982, Dean and Simmons 2005). Secretarybirds often move sites when their nests disintegrate every ~3 years or so.

Figure 8.11: A single adult Secretarybird was recorded roosting and displaying on an inactive nest near the wind mast in November 2017 at S29°50'41.8" E17°11'41.69"

Table 8.5 below provides a list of the red-listed bird species associated with the Namas Wind Farm project site.

Table 8.5: Red-listed bird species (in red) and collision-prone species recorded on 37 cards by SABAP2 in the four pentads that cover the Namas Wind Farm project site. Those species shaded in dark grey were recorded over the project site during the four site visits (total 20 field-days) from June 2017 to March 2018. Reporting Rate from SABAP2 is given in brackets.

Common Name	Scientific Name	Red-list status	Reporting Rate	Susceptibility to:	
				Collision (Rank)**	**Disturbance**
Ludwig's Bustard	*Neotis ludwigii*	Endangered	2/20 = 10% (11%)	10	Medium
Secretarybird	*Sagittarius serpentarius*	Vulnerable	1/20 = 5% (5%)	12	High
Lanner Falcon	*Falco biarmicus*	Vulnerable	0/20 = 0% (3%)	22	Medium
Southern Black Korhaan	*Afrotis afra*	-	6/20 = 30% (8%)	35	Low
Booted Eagle	*Aquila pennatus*	-	0/20 = 0% (11%)	55	Medium
Black-chested Snake Eagle	*Circaetus cinerescens*	-	0/20 = 0% (8%)	56	Medium
Pale Chanting Goshawk	*Melierax canorus*	-	6/20 = 30% (22%)	73	Low
Greater Kestrel	*Falco rupicolloides*	-	3/20 = 25% (16%)	97	low

8.5. Integrated Heritage including Archaeology, Palaeontology and the Cultural Landscape

8.5.1 Heritage and the cultural landscape

The Namas Wind Farm project site is situated in a remote location and, being only very minimally developed, is largely considered a natural landscape rather than a rural one. The exception, of course, is the mining landscape located to the north end where the human imprint is far greater. Natural heritage also requires consideration because of the visual amenity provided by aesthetically pleasing landscapes. The landscape conveys a sense of remoteness and inhospitability that is a result of the very frequent strong winds, the low scrubby vegetation and seemingly endless sand flats and dunes. Importantly, it is a fairly flat landscape with the tallest anthropogenic features being wind pumps – aside from the mine dump located near the existing Gromis Substation to the north of the project site. The only major change to the natural landscape is the Buffels River valley located ~24km to the north of the project site.

8.5.2. Archaeology

The archaeological cultural landscape consists of a multitude of individual archaeological sites classifiable as a Type 3 precolonial cultural landscape. The project site houses many small archaeological sites. The archaeology is 'banded' following the landscape character. On the pale sand dune areas there are many small sites with marine shells, ostrich eggshell fragments and stone artefacts. One of the biggest sites was at RV2018/005 (waypoint 006). Here there were several spatially related shell scatters with artefacts and some ostrich eggshell. Although just outside the western edge of the site, BZ2018/002 is another larger site that also has some pottery on it. The pottery indicates occupation less than 2000 years ago. Occasional isolated artefacts were also noted on the surface and these included a CCS backed bladelet that likely dates to more than 2000 years ago.

To the east, the flat lands without sand dunes contain minimal archaeology. The one exception noted was an ephemeral scatter of marine shell, ostrich eggshell and stone artefacts on a low hill near the northern edge of Rooivlei. The scatter included an adze made on crypto-crystalline silica (CCS). The only other archaeology seen in this zone was some background scatter artefacts revealed in a borrow pit alongside the access road. These artefacts are of quartz, quartzite and silcrete. They lie atop the dorbank throughout the region and are far older than the material seen on the surface. Such artefacts are seldom revealed in high densities and can generally reveal little more than that people/hominids were here during the Middles-Stone Age.

In the red sand dunes, far taller than the pale dunes to the west, many archaeological sites occur. However, it was noticeable that marine shell was largely absent, with ostrich eggshell fragments and stone artefacts dominating the scatters. The sites tend to be located on dune tops with the artefacts visible in deflated areas.

<u>Graves</u>

No precolonial graves were discovered during the field survey. No historical graves or graveyards were present within the project site. The farm graveyard at Rooivlei has a grave dated 2001, which is the oldest grave present. It is likely that unmarked precolonial graves will be present in the sand dunes but their locations cannot be predicted.

Built Environment

The Rooivlei farm complex on Remainder of the Farm 327 (refer to **Figure 8.12**) appears to contain a heritage building, although the complex is not visible on a 1942 aerial photograph (refer to **Figure 8.13**). Its form suggests early 20th century but it is possible that it dates to as late as the 1940s. By contrast, the Zonnekwa farm complex on Portion 4 of the Farm 328 appears to be largely modern (refer to **Figure 8.14**). It is not visible on the 1942 aerial photograph (refer to **Figure 8.15**). There do not appear to be any significant heritage structures (i.e. built environment) present.

Figure 8.12: View towards the south of the Rooivlei 327 farm complex. The oldest structure appears to be the one behind the wind pump in the centre of the image

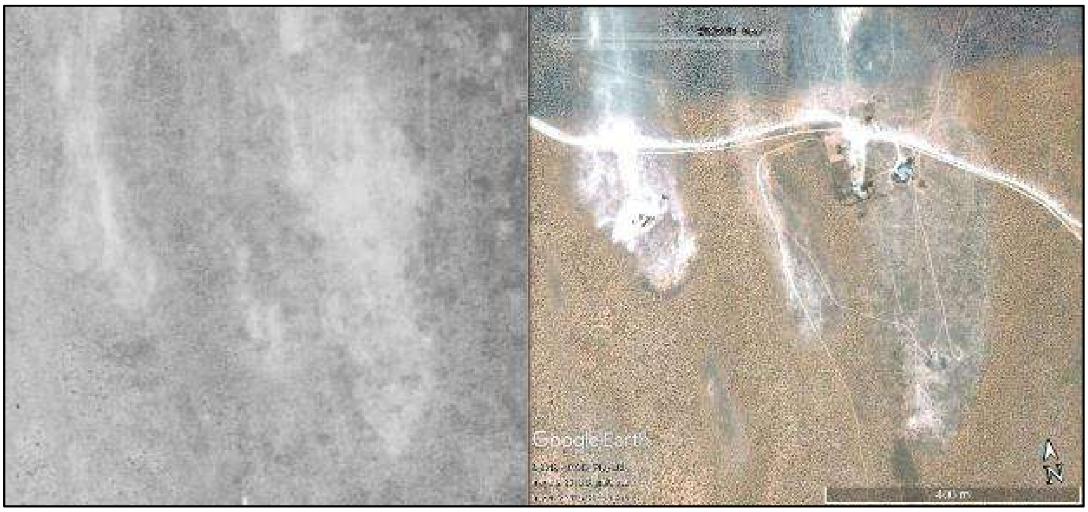

Figure 8.13: Aerial views of the Rooivlei 327 farm complex from 1942 and 2004 showing the complex to be absent in 1942 (it is possible that it lacked sufficient contrast to be visible)

Figure 8.14: View towards the southwest of the Zonnekwa 328 farm complex with the inset showing the main house

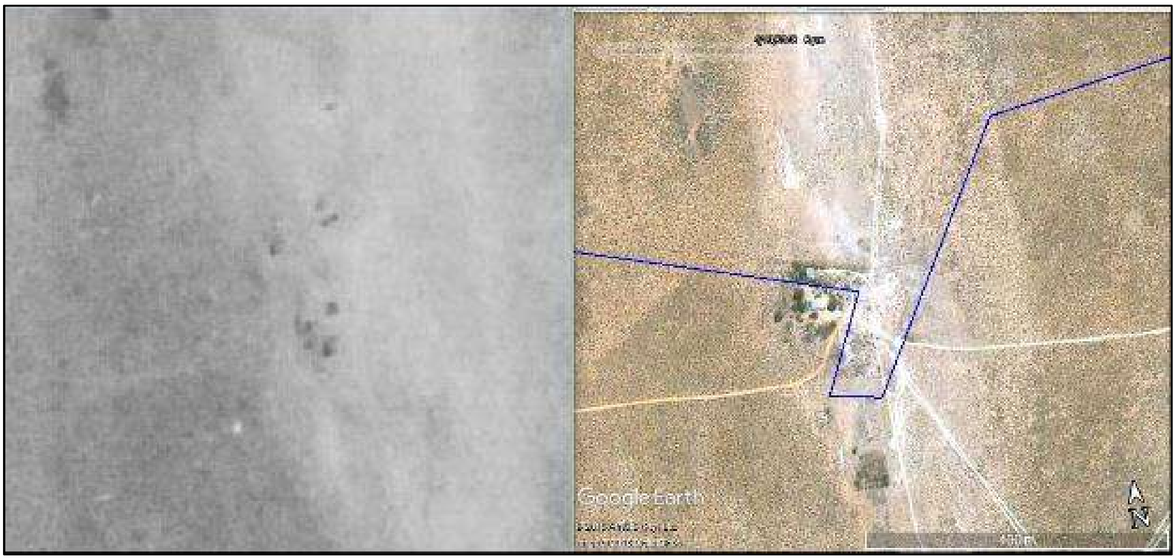

Figure 8.15: Aerial views of the Zonnekwa 328 farm complex from 1942 and 2004 showing the complex to be absent in 1942

8.5.3. Palaeontology

The affected surficial formations include early to mid-Holocene dunes of the Hardevlei Formation and earlier late Quaternary coversands of the Koekenaap Formation. Beneath these unconsolidated sands are compact, pedogenically-altered aeolianites termed "Dorbank Units" which are fossil dune plumes of later mid-Quaternary age. An older dorbank dune plume underlies the eastern part of the broader area, while a later dorbank dune plume underlies the western part where the Namas Wind Farm development footprint will be situated. Between these dune plume ridges is a non-depositional area which is closely underlain by pale pedocrete which is likely to have formed in early mid-Quaternary aeolianites equivalent to the Olifantsrivier Formation.

The primary palaeontological concern is the fossil bones that are sparsely distributed in these aeolian deposits. Although sparse in aeolian Dorbank Units and overlying coversands and dunes, they are of high scientific significance and important for palaeoclimatic, palaeobiological and biostratigraphic studies. The fossil material in these deposits is a sample of the middle and late Quaternary fauna of the Namaqualand coast.

8.6. Ambient noise levels and Noise Sensitive Developments

The ambient sound levels were typical of a rural noise district (during low wind conditions) and the area is considered naturally quiet. The Namas Wind Farm project site is far from any significant roads or any other significant noise sources.

Five Noise Sensitive Developments (NSDs) were identified, of which two are located within the Namas Wind Farm project site (refer to **Figure 8.16**). Noise measurements were taken at two points within the project site and at one point outside of the project site (refer to **Figure 8.16**). Within the project site, wind induced noises were documented and generally dominant, as well as bird communication, sheep bleating and human voices. Outside of the project site, wind-induced noises from a windmill were documented, as well as bird communication.

Figure 8.16: Noise-sensitive developments located within the surrounding area and the project site of the Namas Wind Farm

8.7. Visual Quality

i Viewer Incidence

Viewer incidence relates to the number of observers, and their perception of a structure determines the concept of visual impact. If there are no observers or if the visual perception of the structure is favourable to all the observers, there would be no visual impact.

Viewer incidence is generally low within the region, but may fluctuate according to tourism activity. Typically, during peak holiday seasons, over weekends, and particularly the flowering season in early spring, viewer incidence is expected to be higher than normal.

Additional sensitive visual receptors are located at the farm residences (homesteads) throughout the project site. It is expected that the viewer's perception, unless the observer is associated with (or supportive of) the wind farm, would generally be negative.

Viewers located within the area include the following homesteads and roads:

- Melkbospunt
- Manelsvlei
- Taaiboskrop
- Steenvlei (Die Houthoop).
- Geelpan
- Gorab
- Hondevlei
- Hoë Heuwel
- Lewies se Duin
- Kapvlei
- Sonnekwa A
- Sonnekwa
- Graafwater
- Rooivlei
- Droëvlei
- Elandsklip
- The Kommagas to Kleinsee secondary road
- The Koingnaas to Kleinsee secondary road

Figure 8.17 provides an indication of the proximity analysis and potential visual sensitive receptors associated with the Namas Wind Farm.

ii Visual Absorption Capacity

Overall, the Visual Absorption Capacity (VAC) of the receiving environment, and especially the area in close proximity to the Namas Wind Farm project site, is deemed low by virtue of the nature of the vegetation and the absence of urban development. The land cover of the project site is dominated by low shrubland. Low shrubland can be described as natural/semi-natural low shrub dominated areas, typically with < ± 2m canopy height, specifically associated with the Fynbos Biome. It includes a range of canopy densities encompassing sparse to dense canopy covers. Very sparse covers may be associated with the bare ground class.

Where homesteads and settlements occur, some more significant vegetation and trees may have been planted, which would contribute to visual absorption.

8.8 Traffic Conditions

The public roads located within the surrounding area of the project site includes:

» The DR2964 gravel road, which is well maintained and shows signs of frequent blading;
» The MR751 surface road, which used to be a private road with checkpoint access and maintained by the De Beers Mining Company. However, when the mine was closed the route was converted into a public road; and
» A minor gravel road still to be allocated a route number.

The Namas Wind Farm project site can be accessed from the:

» west via the MR751 (surfaced) and a minor road yet to be allocated a route number; and
» north via the DR2964 and an internal farm road.

The current traffic volumes on the routes within the area surrounding the project site are very low. This low volume is due to the following:

» low development density;
» the closure of the De Beers mining operations, which led to a drastic drop in the population in the area; and
» a lack of schools in the area.

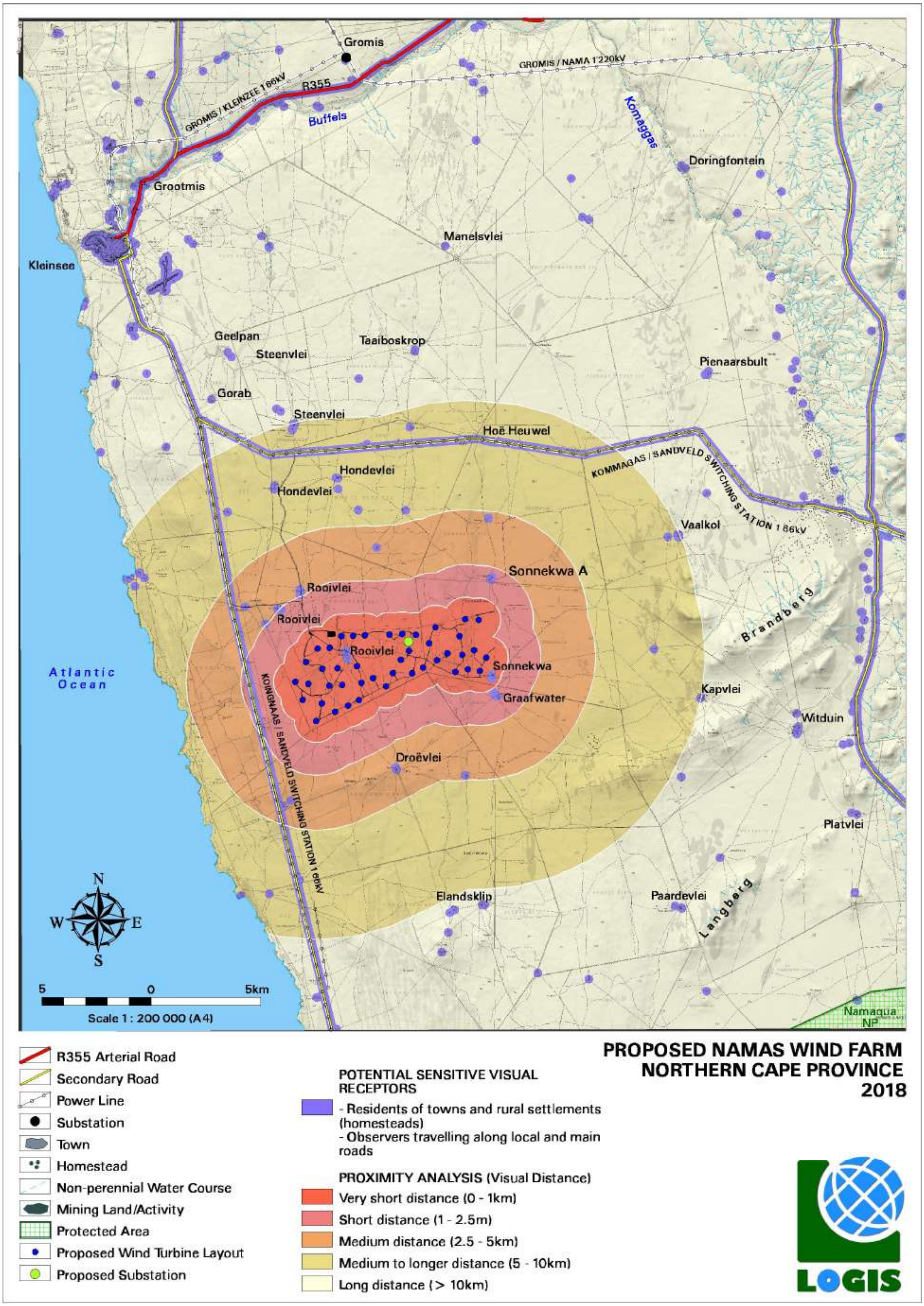

Figure 8.17: Proximity analysis and potential sensitive visual receptors that may be affected by the development of the Namas Wind Farm

8.9 Social Context

The Nama Khoi Local Municipality has a population of approximately 48 681, with a total of 13 515 households. This is indicative of an average household size of 3.6 in the municipality. The Nama Khoi Local Municipality constitutes 4% of the provincial population and 9% of the Namakwa District Municipality population. Furthermore, only 10% of the total households in the Namakwa District Municipality are located in the Nama Khoi Local Municipality. The population has continuously declined in the past ten years, attributed to the mine closures and limited other job opportunities, which resulted in net out-migration of people. The local communities are in dire need of job opportunities that will enable improvement in their livelihoods.

The working age population of Nama Khoi Local Municipality was about 35 344, which constitutes 67% of the population. Among these, 16 334 were economically active. Not economically active persons are those who were neither employed nor unemployed, including discouraged job seekers. The Municipality had 19 009 not economically active persons in 2011. The employed labour in the municipality was estimated at 12 615 (36%), whilst the unemployed labour was about 3 720. This results in an unemployment rate of 17%, which is much lower than the national unemployment rate. However, this is largely attributed to the increasing decline in the population in the area.

In the Namakwa District Municipality, Nama Khoi Local Municipality and the town of Kleinsee, the adult population with no schooling constitutes 11%, 6% and 2%, respectively. The majority of residents have some secondary schooling and 7% have acquired higher education qualifications. The education levels are therefore moderate to poor and seek addressing. With regard to skills, close to half the labour force in the formal sector are semi-skilled. In both the district and local municipalities, only a fifth of the labour force are skilled. The low-skilled labour force is 36% and 33% in the district and local municipality, respectively. Therefore, the supply of skilled labour in the local area is highly limited.

Mining is the highest contributing economic sector in the Nama Khoi Local Municipality despite it being amongst the sectors experiencing decline. The agriculture sector is the economic sector with the least contribution to the Gross Domestic Product per Region (GDP R) of the municipality.

Almost 94% of the households in the Nama Khoi Local Municipality have access to electricity, while approximately 5% of the households use candles and the remaining 1% uses alternative energy sources such as solar, gas, paraffin and other unspecified sources. The municipality is directly responsible for the provision of electricity.

Over half of the Nama Khoi households have piped water within their dwellings, 32% have piped water within yards, and 20% have access to piped water on community stands, while less than 10% uses other sources such as borehole, rain-water tanks, or wells. Nama Khoi has serious water challenges, as does the whole province, and Nama Khoi presents a need to conserve the water sources and improve their capacity for sustainability purposes.

The properties affected by the Namas Wind Farm project site are privately-owned and mainly used for sheep farming and grazing activities. The landowners employ workers on the farms to assist with the farming activities being undertaken.

CHAPTER 9: ASSESSMENT OF IMPACTS

This chapter serves to assess the significance of the positive and negative environmental impacts (direct, indirect, and cumulative) expected to be associated with the development of the Namas Wind Farm and associated infrastructure. This assessment has considered the construction of a wind farm with a contracted capacity of up to 140MW, within a development footprint[18] of approximately 35.46ha. The development footprint includes the following infrastructure:

» Up to 43 wind turbines with a maximum hub height of up to 130m. The tip height of the turbines will be up to 205m;
» Concrete turbine foundations and turbine hardstands;
» Temporary laydown areas which will accommodate the storage and assembly area;
» Cabling between the turbines, to be laid underground where practical;
» An on-site substation of 100m x 100m to facilitate the connection between the wind farm and the electricity grid;
» Access roads to the site (with a width of up to 10m) and between project components (with a width of approximately 8m);
» A temporary concrete batching plant; and
» Operation and maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitors centre.

The full extent of the project site was considered through the BA process. On-site sensitivities were identified through the review of existing information, desk-top evaluations and field surveys. The identification of a development footprint for the wind farm within the project site, was designed and proposed by the developer through consideration of the sensitive environmental features and areas. The specialist assessments undertaken as part of this BA process have considered the entire project site, as well as the proposed development footprint (refer to **Figure 9.1**) which was provided by the developer.

[18] The development footprint of the Namas Wind Farm will be located within the 5092ha project site and will be a much smaller area within which the wind turbines and associated infrastructure (excluding the 300m power line corridor within which the new 132kV power line is proposed) will be constructed and operated. The development footprint has been subject to detailed design by the developer through the consideration of sensitive environmental features that need to be avoided by the wind farm.

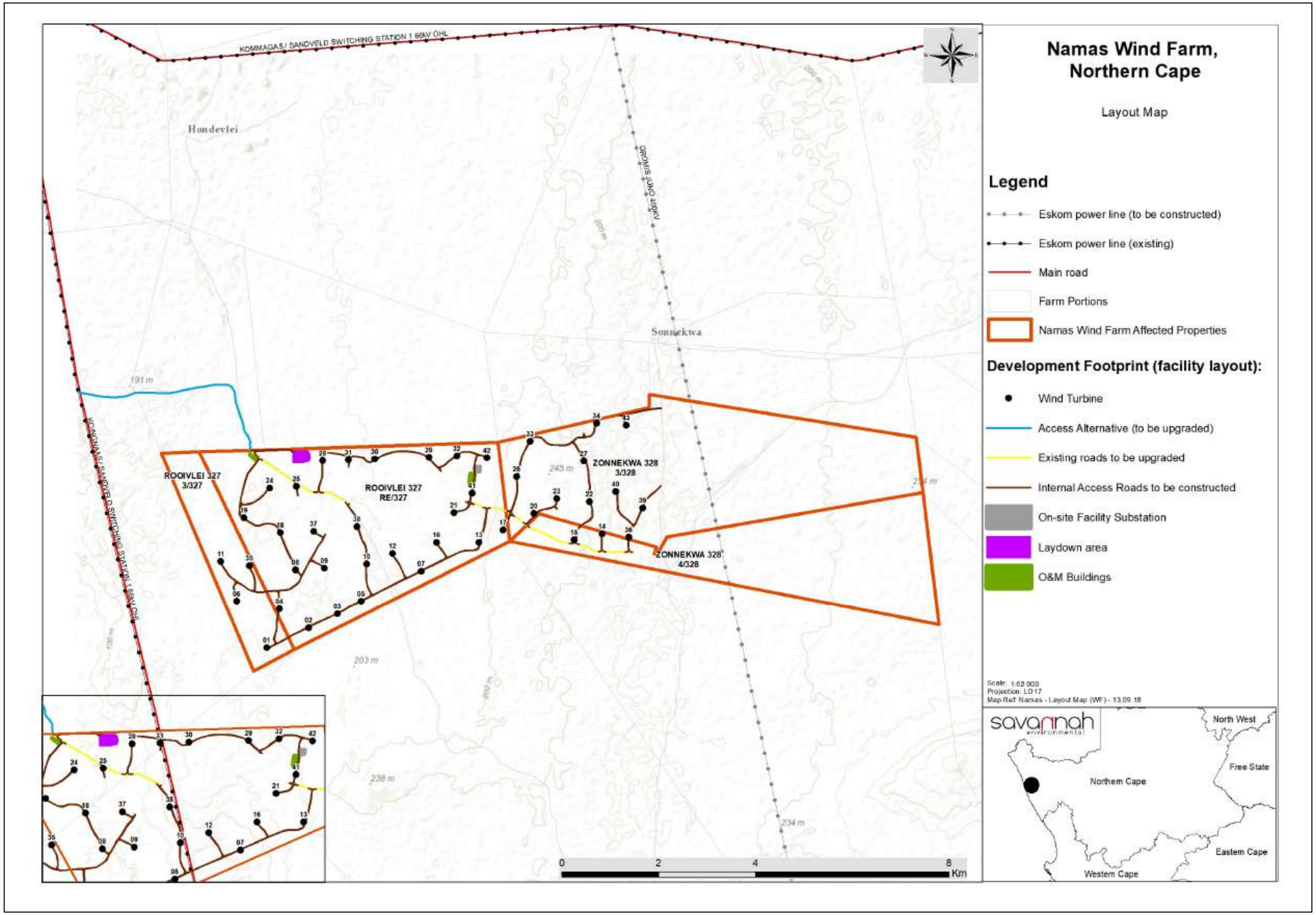

Figure 9.1: Map showing the proposed development footprint for the Namas Wind Farm and associated infrastructure located within the project site assessed as part of this BA process (refer to **Appendix R** for A3 maps).

The development of the Namas Wind Farm will comprise the following phases:

» *Pre-Construction and Construction* – will include pre-construction surveys; site preparation; establishment of access roads, construction camps, batching plant laydown areas, and facility infrastructure; construction of foundations involving excavations and cement pouring; the transportation of components/construction equipment to site, manoeuvring and operating cranes for unloading and installation of equipment; laying cabling; and commissioning of new equipment and site rehabilitation. The construction phase for the Namas Wind Farm is dependent on the number of turbines to be erected, but is estimated at 24 months.
» *Operation* – will include the operation of the wind farm and the generation of electricity, which will be fed into the national grid via the facility on-site substation and an overhead power line[19]. The operation phase of the Namas Wind Farm is expected to be approximately 20 - 25 years (with maintenance).
» *Decommissioning* – depending on the economic viability of the wind farm, 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 wind farm, clearance of the relevant infrastructure at the site 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 wildlife through mortality, injury and disturbance, impacts to sites of heritage value, soil erosion, and nuisance noise from the movement of vehicles transporting equipment and materials during decommissioning.

9.1. Legal Requirements as per the EIA Regulations, 2014 (as amended)

This chapter of the BA report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 1: Content of basic assessment reports:

Requirement	Relevant Section
3(h)(v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts (aa) can be reversed, (bb) may cause irreplaceable loss of resources, and (cc) can be avoided, managed or mitigated.	The impacts and risk associated with the development of the Namas Wind Farm, including the nature, significance, consequence, extent, duration and probability of the impacts and the degree to which the impact can be reversed and cause an irreplaceable loss of resources are included in sections 9.3.3, 9.4.3, 9.5.3, 9.6.3, 9.7.3, 9.8.3, 9.9.3, 9.10.3 and 9.11.3.
3(h)(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing	The positive and negative impacts associated with the development of the Namas Wind Farm are included in sections 9.3.3, 9.4.3, 9.5.3, 9.6.3, 9.7.3, 9.8.3, 9.9.3, 9.10.3

[19] The construction and operation of the 132kV overhead power line to connect the wind farm to the national grid will be assessed as a separate Basic Assessment process.

Requirement	Relevant Section
on the geographical, physical, biological, social, economic, heritage and cultural aspects	and 9.11.3.
3(h)(viii) the possible mitigation measures that could be applied and the level of residual risk.	The mitigation measures that can be applied to the impacts associated with the Namas Wind Farm are included in sections 9.3.3, 9.4.3, 9.5.3, 9.6.3, 9.7.3, 9.8.3, 9.9.3, 9.10.3 and 9.11.3.
3(i) a full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures,.	A description of all environmental impacts identified for the Namas Wind Farm during the BA process, and the extent to which the impact significance can be reduced through the implementation of the recommended mitigation measures provided by the specialists are included in sections 9.3.3, 9.4.3, 9.5.3, 9.6.3, 9.7.3, 9.8.3, 9.9.3, 9.10.3 and 9.11.3.
3(j) an assessment of each identified potentially significant impact and risk, including (i) cumulative impacts, (ii) the nature, significance and consequences of the impact and risk, (iii) the extent and duration of the impact and risk, (iv) the probability of the impact and risk occurring, (v) the degree to which the impact and risk can be reversed, (vi) the degree to which the impact and risk may cause irreplaceable loss of resources and, (vii) the degree to which the impact and risk can be avoided, managed or mitigated.	An assessment of each impact associated with the development of the Namas Wind Farm, including the nature and significance, the extent and duration, the probability, the reversibility, and the potential loss of irreplaceable resources, as well as the degree to which the significance of the impacts can be mitigated are included in sections 9.3.3, 9.4.3, 9.5.3, 9.6.3, 9.7.3, 9.8.3, 9.9.3, 9.10.3 and 9.11.3.
3(m) based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management outcomes for the development for inclusion in the EMPr.	Mitigation measures recommended by the various specialists for the reduction of the impact significance are included in sections 9.3.3, 9.4.3, 9.5.3, 9.6.3, 9.7.3, 9.8.3, 9.9.3, 9.10.3 and 9.11.3.

9.2. Quantification of Areas of Disturbance on the Site

Site-specific impacts associated with the construction and operation of the Namas Wind Farm relate to the direct loss of vegetation and species of special concern, disturbance of animals and loss of habitat and impacts on soils. A wind farm is, however, dissimilar to most other power generation facilities in that it does not result in whole-scale disturbance or loss to a site (from a biophysical perspective). In order to assess the impacts associated with Namas Wind Farm, it is necessary to understand the extent of the affected area.

The development footprint (**Figure 9.1**) will include affected areas, which will comprise turbine footprints (maximum of 43), a crane pad at each turbine, internal access roads (up to 8m in width), one 33kV/132kV substation footprint (maximum of 100m x 100m), and an operation and maintenance buildings area (maximum of 1ha). The maximum area of disturbance is approximated to be 35.46ha in extent (this is also the extent of the development footprint).

It should be noted that the site currently has several existing access roads (farm tracks) which are used for farming activities. It is planned that where existing access roads are able to be utilised within the development footprint, these are widened and upgraded for the wind farm, essentially reducing the extent of disturbance resulting from access road construction.

Based on the above, it can be concluded that considering the 43 turbine layout, less than 1% of the entire extent of the project site will be transformed and disturbed for the development footprint of the Namas Wind Farm.

9.3. 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).

9.3.1 Results of the Ecological Impact Assessment

<u>Vegetation:</u>

The national vegetation types present within the project site of the Namas Wind Farm includes the Namaqualand Coastal Duneveld, Namaqualand Strandveld and the Namaqualand Salt Pans. All the vegetation types present within the project site are classified as Least Threatened.

» The *Namaqualand Coastal Duneveld* is associated with the coastal forelands and the fairly mobile or vegetated dune are vulnerable to disturbance. Within the project site this vegetation type occupies the western third of the site, but in practice it is only the western margin of the site that is well-differentiated from the areas further inland.

» The *Namaqualand Strandveld* may house specific habitats that are of limited extent and contain specialised associated species. Within the project site, this unit occurs in two broad bands, separated by the low-lying valley, classified as Namaqualand Salt Pans, which traverses the centre of the site.

» The *Namaqualand Salt Pans* present may have had their origin as a salt pan type feature, however the name does not correspond to the feature today and the habitat cannot be considered to be a salt pan any longer as it is well-vegetated and the original basement is no longer apparent, except where it has been uncovered by excavation. As this is not a common vegetation unit in the area and offers different habitat to the surrounding sandy areas, it is considered more sensitive than the surrounding areas.

Five habitats and communities have been identified by the ecological specialist within the project site. The habitats include Coastal Duneveld, Low Coastal Strandveld, Strandveld on Namaqualand Salt Pans, Namaqualand Dune Stranveld and typical Namaqualand Strandveld.

» The *Coastal Duneveld* community is considered to be somewhat more sensitive than the adjacent Namaqualand Strandveld due to vulnerability to wind erosion, as well as the potential greater importance of this area for fauna associated with the coastal plain, many of which do not penetrate far inland and would not occur further east within the site.

» The *Low Coastal Strandveld* is not considered to be a highly sensitive habitat type, but as it is of limited extent it is considered more vulnerable to cumulative habitat loss. No specific avoidance of this habitat is recommended as it does not have a high abundance of species of concern.

» *Strandveld on Namaqualand Salt Pans* is a habitat of limited extent and offers features that are not found elsewhere in the area, it is considered more sensitive than the surrounding Strandveld and the overall development footprint in this habitat should be kept low, but some development in these areas is considered acceptable.

» Areas considered as *Namaqualand Dune Strandveld* are considered somewhat more sensitive than the typical surrounding Strandveld due to the large dunes which are vulnerable to disturbance. No specific avoidance of this habitat is recommended, but some additional mitigation is likely to be required to reduce wind erosion risk during the construction phase.

» *Typical Namaqualand Strandveld* is the dominant habitat at the projects site and comprises the majority of the area. This is not considered to be a sensitive habitat and while some species of conservation concern are present, a significant impact on the local populations of these species is not likely as this is a widespread vegetation type.

Within the project site 4 species of conservation concern (SCC) were confirmed including *Aloe arenicola* (Near Threatened), *Leucoptera nodosa* (Near Threatened), *Wahlenbergia asparagoides* (Vulnerable) and *Babiana hirsuta* (Near Threatened). However, the abundance of these species is low across most of the project site.

Critical Biodiversity Areas and Broad-Scale Processes:

The majority of the project site lies within an Ecological Support Area (ESA), with some Critical Biodiversity Area 2 (CBA 2[20]) in the southwest of the site.

As the area is relatively homogenous, it is not likely that there are any specific directional movement corridors within the area that are classified as a CBA. It is likely that the low-lying area, that is classified as Namaqualand Salt Pans, represents a north-south corridor for species associated with firmer substrates. However, the development footprint proposed in this area is limited and unlikely to compromise this function. At a broader level, there are still extensive tracts of similar intact habitat within the surrounding areas of the project site with the result that it is not likely that the Namas Wind Farm would cause significant disruption of the ecological processes.

Given the limited footprint, wind energy development is seen as compatible with ESA, provided that measures are implemented to reduce erosion and similar risks. With the implementation of the appropriate mitigation measures it is highly unlikely that the Namas Wind Farm would compromise the functioning of the ESA.

[20] CBA 2 areas are considered to be near-natural landscapes where the ecosystem and species are largely intact and undisturbed. These areas have an intermediate irreplaceability or some flexibility in terms of the extent of the area required to meet the biodiversity targets – there are options for loss of some biodiversity components without compromising the ability to achieve the targets. CBA 2 landscapes are approaching but have not passed their limits of acceptable change.

Based on the above considerations, the overall impact of the Namas Wind Farm on CBAs and broad scale ecological processes is considered to be relatively low and no major impacts to dispersal ability or faunal movement patterns are likely to be generated. As such, no additional mitigation measures (including the need for an offset) would be warranted to counter the potential impact of the wind farm on the CBA 2 affected in the southwest of the project site, as there is sufficient scope to reduce on-site impacts to an acceptable level and there are no features present in this area of the project site that are not widely available in the surrounding areas.

The project site has not been identified as falling within a Northern Cape Protected Area Expansion Strategy (NC-PAES) focus area and has, therefore, not been identified as an important area for future conservation area expansion, which further supports the potential need for an offset at the project site.

Fauna:

Mammals captured by the camera traps include, in order of decreasing abundance, Steenbok, Cape Hare, Cape Fox, Bat-eared fox, Striped Polecat, Suricate, Cape Porcupine, Common Duiker, Honey Badger, Small Spotted Genet, Grey Mongoose, Caracal, Yellow Mongoose, African Wild Cat and Slender Mongoose. More than half the observations are from Steenbok and Cape Hare, with Cape Fox, Bat-eared fox, Striped Polecat, Suricate and Cape Porcupine being moderately abundant and the remaining species uncommon. This represents a fairly typical mammalian community and is similar to that obtained at other sites along the West Coast. The major impacts on mammals would occur during the construction phase when there would be significant noise and disturbance generated at the project site. However, in the long-term, impacts on mammals would be low as additional habitat loss would be minimal and the resident species would be those that are tolerant of human activity and a modified landscape. Therefore it is unlikely that any species would be significantly affected by the Namas Wind Farm.

Reptile species observed at the project site include Angulate Tortoise, Giant Desert Lizard, Common Giant Ground Gecko, Knox's Desert Lizard, Common Sand Lizard, Cape Skink, Coastal Dwarf Legless Skink, Namaqua Sand Lizard, Pink Blind Legless Skink, Dwarf Beaked Snake and Many-horned Adder. For most species the major impact of the Namas Wind Farm would be loss of habitat equivalent to the footprint of the development. For most species this is not considered highly significant as there are large intact tracts of similar habitat available in the surrounding area. Subterranean species associated with sandy substrates may be vulnerable to habitat disruption due to the construction of roads which may fragment the continuity of the sandy substrate. However, overall, the impacts of the wind farm on reptiles are likely to be of local significance only as there are no species with a very narrow distribution range or of high conservation concern present at the project site that may be compromised by the development.

There is no natural permanent or even seasonal standing water present at the Namas Wind Farm project site, which is due to the sandy substrate and consequent lack of drainage features where water can gather. As a result, the amphibian community at the project site is restricted to species that are relatively independent of water and is consequently of low diversity. The only species confirmed present in the immediate area is the Namaqua Rain Frog which appears to be relatively widespread within the coastal strandveld vegetation types on sandy soils. Given the absence of important amphibian habitats at the project site and the low diversity of amphibians, a significant impact on amphibians is not likely.

Figure 9.2 provides the details of the ecological sensitivities located within the project site and the proposed development footprint. The map confirms that turbines and access roads avoid areas of sensitivity not considered to be appropriate for development.

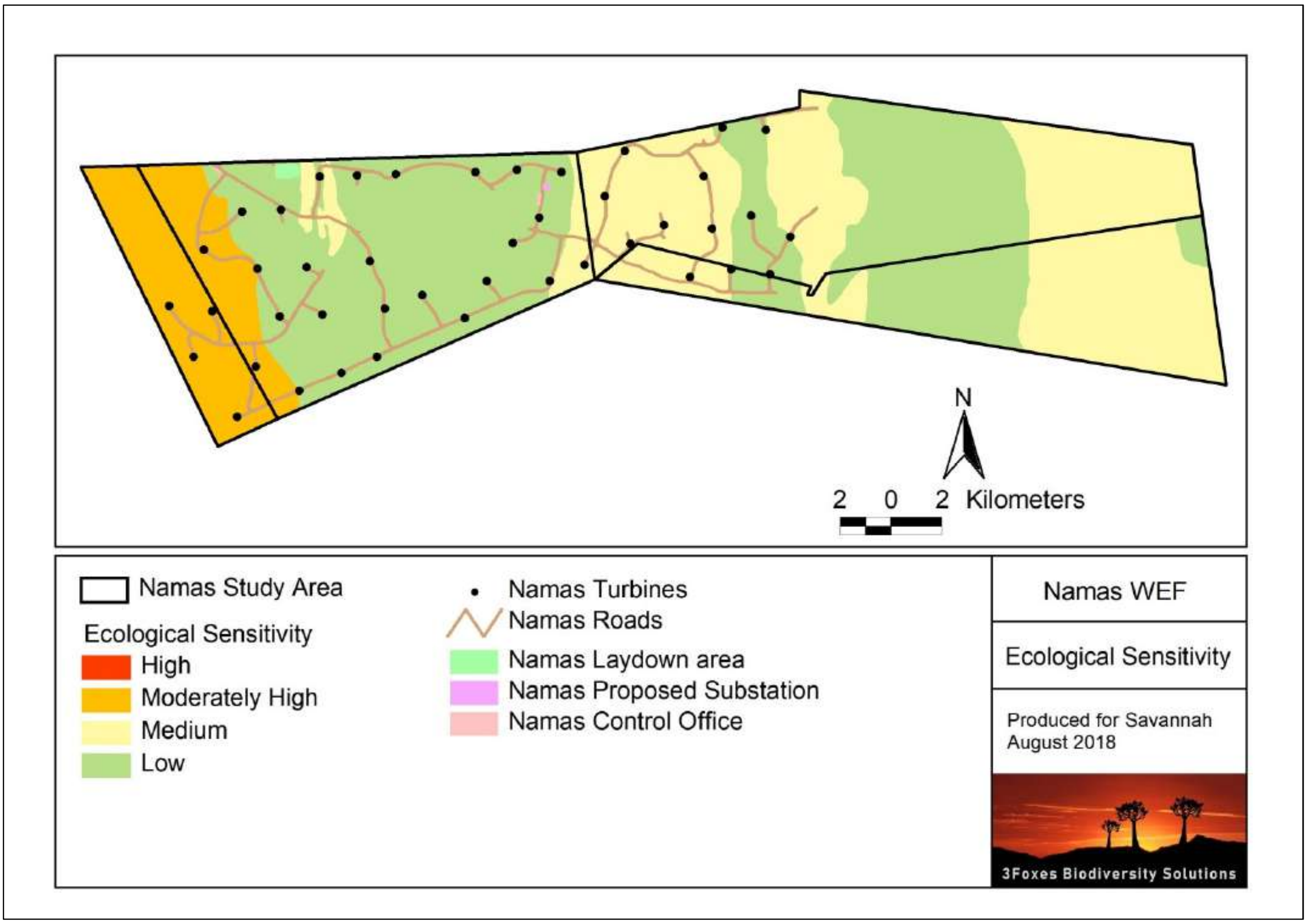

Figure 9.2: Ecological sensitivity map of the Namas Wind Farm overlain with the proposed development footprint

The majority of the project site consists of Namaqualand Strandveld considered to be of low or moderate sensitivity. Development in these areas would generate low ecological impacts as these habitats are widely available in the area. The areas classified as Namaqualand Salt Pans are clearly not salt pans and while the vegetation survey confirmed that they are well-differentiated from the adjacent strandveld, they are not currently acting as hydrological features and hence they are not considered to be as sensitive as pans would be. Development within these areas is considered acceptable, but should be limited to some degree as this is not a very extensive habitat type with the result that it is considered more vulnerable to cumulative impacts. In the west, the Coastal Duneveld is considered as moderately high sensitivity[21]. There are six turbines and their associated internal access roads located within this area, which is considered to be an acceptable impact to this area. The main risks associated with development within this moderately high sensitivity area is wind erosion of the sandy soils and potential impacts on plant species of conservation concern. Both these impacts can be mitigated to low levels, with the result that

[21] The classification of a moderately high sensitivity for the area is related to the fact that the sensitivity of the area appeared to be of intermediate sensitivity with respect to the two defining sensitivity categories (i.e. medium and high).

this is considered to represent an acceptable risk and impact. Overall the development is likely to generate moderate pre-mitigation impacts, which in most cases can be reduced to low or moderate impacts after the implementation of the recommended mitigation.

9.3.2 Description of Ecological Impacts

Impacts on the ecology of the project site are expected to occur during the construction, operation and decommissioning phases of the Namas Wind Farm.

During the construction phase the following impacts are expected:

» Impacts on vegetation due to construction activities - The development of the Namas Wind Farm would require vegetation clearing for turbines, roads, the on-site substation, internal cable trenches and other hard infrastructure. Direct impacts include the direct loss of vegetation within the development footprint, and impact on listed and protected species. As the abundance of species of conservation concern in the area is moderate to low, the impact on species of conservation concern is likely to be relatively low and the primary impact would be on gross habitat loss of the affected Strandveld and Duneveld vegetation types. Since the surrounding landscape is still largely intact and there are no very high value plant habitats within the development footprint, post-mitigation impacts are likely to be of a medium significance.

» Faunal impacts due to construction activities - Increased levels of noise, pollution, disturbance and human presence during construction will be detrimental to fauna. Sensitive and shy fauna are likely to move away from the area during the construction phase as a result of the noise and human activities present, while some slow-moving species might not be able to avoid the construction activities and might be killed. Traffic during the construction phase will pose a risk of collisions with susceptible fauna, with slower types such as tortoises, snakes and amphibians being the most susceptible. Some mammals and reptiles may be vulnerable to an increase in the potential for illegal collection or poaching during the construction phase. Many of these impacts can, however, be effectively managed or mitigated. After mitigation, faunal impacts are likely to be of a low significance. Faunal habitat loss cannot be mitigated and would persist for the operational lifetime of the facility.

» Increased soil erosion risk during construction - Disturbance as a result of construction activities will leave the project site vulnerable to soil erosion, especially given the sandy soils and high winds that the area experiences. Normal dust suppression techniques do not work well in this environment because the major agent of erosion is wind, and the soil binders that are usually used for dust suppression may not be very effective on the sandy soils. Once mobilised, the sand may suffocate the vegetation, which will result in the potential loss of vegetation (binder of soil) and therefore creating additional sources of sand, allowing such erosion to propagate in the dominant wind direction. Measures to limit erosion will need to be a key element of the mitigation measures at the project site during construction as well as operation. Although this impact is potentially an impact of concern it is likely that it can be mitigated to a low significance.

During the operation phase the following impacts are expected:

» Faunal impacts due to operation - Although noise and disturbance levels during operation will be significantly reduced compared to during construction, some noise and disturbance impacts will persist due to operational activities on the wind farm and noise generated by the turbines themselves.

Although most fauna are likely to quickly become habituated to the presence of the turbines, some fauna may be negatively affected due to noise or other reasons and may avoid the proximity of the turbines and would therefore experience greater long-term habitat loss. This is, however, likely to be a small subset of the species present and this effect has not been documented in Namaqualand or elsewhere for wind farms. As the affected areas (including the project site) are not considered to be of a very high faunal sensitivity, the post-mitigation operational impacts on fauna are likely to be of a low significance.

» Negative impact on ESAs, CBAs and broad-scale ecological processes - The Namas Wind Farm lies partly within an ESA and partly within a CBA 2. The development of the Namas Wind Farm will potentially negatively impact the biodiversity value and ecological functioning of these areas. Development of a wind farm within the ESA is seen as acceptable provided that the impacts can be effectively mitigated. The footprint within the CBA is low and highly unlikely to significantly affect either the functioning or biodiversity value of the CBA. However, the presence of the development would impact habitat quality to some degree within the affected areas, which would potentially have a low-intensity, long-term impact on some species. With mitigation, this impact is likely to be of a low significance.

» Increased soil erosion risk during operation - Disturbance as a result of construction activities will leave the project site vulnerable to soil erosion for years into the operation phase, especially given the sandy soils and high winds the area experiences. The soil disturbance associated with the Namas Wind Farm will render the impacted areas vulnerable to wind erosion and measures to limit erosion will need to be a key element of mitigation measures at the project site. Although this impact is of potential concern it can be mitigated to a low significance.

During the decommissioning phase the following impacts are expected:

» Faunal Impacts due to decommissioning - The impacts on fauna at decommissioning would be similar to those at construction, but of a lower severity as the activity will be taking place within the development footprint. The increased levels of noise, pollution, disturbance and human presence during decommissioning will be detrimental to fauna. Sensitive and shy fauna are likely to move away from the area during this period as a result of the noise and human activities present, while some slow-moving species might not be able to avoid the decommissioning activities and might be killed. Traffic during the decommissioning phase will pose a risk of collisions with susceptible fauna, with slower types such as tortoises, snakes and amphibians being the most susceptible. Some mammals and reptiles may be vulnerable to an increase in the potential for illegal collection or poaching during the decommissioning phase. This would however be a transient impact which would ultimately result in an increase in available habitat for some fauna. After mitigation, faunal impacts due to decommissioning are likely to be of a low significance.

» Soil erosion risk due to decommissioning - The removal and clearing of the project infrastructure would result in some soil disturbance which would leave these areas vulnerable to erosion, which if left unchecked could spread significantly. The disturbed areas should be rehabilitated at decommissioning with indigenous species sourced from the local environment to reduce this risk. Although this is an impact of potential concern it can be well mitigated to a low significance.

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

The impacts assessed below apply to the development footprint, including the turbines and associated infrastructure for the Namas Wind Farm. Due to the current development footprint, which already avoids sensitive features, the significance of the impacts before and after mitigation is moderate to low.

Construction Phase Impacts

Nature: Impacts on vegetation due to construction activities Impacts on vegetation will occur due to disturbance and vegetation clearing associated with the construction of the wind farm. In addition, it is highly likely that some loss of individuals of plants of species of conservation concern (SCC) will occur.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Medium (6)	Medium (5)
Probability	Certain (5)	Highly likely (4)
Significance	**Medium (55)**	**Medium (40)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	Yes, this impact can only be mitigated to a certain extent as the loss of vegetation is unavoidable and is a certain outcome of the development.	
Mitigation: » The final layout including roads and underground cables should be subject to a pre-construction walk-through before construction commences and adjusted where required to reduce impacts on SCC and habitats of concern. » Search and Rescue of SCC should be conducted prior to clearing activities. » Pre-construction environmental induction should be implemented for all construction staff on site to ensure that basic environmental principles are adhered to. This includes topics such as no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimising wildlife interactions, remaining within the demarcated construction areas etc. » All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving is to be allowed once the site has been pegged for construction. » Temporary laydown areas should be located within previously transformed areas or areas that have been identified as being of low sensitivity. » The extent of the development footprint should be minimised as far as possible and disturbed areas that are no longer required by the operation phase of the development rehabilitated.		
Residual Impacts: As the loss of currently intact vegetation is an unavoidable consequence of the development, the habitat loss associated with the Namas Wind Farm remains a residual impact even after mitigation and avoidance of more sensitive areas.		

Nature: Faunal impacts due to construction activities Disturbance, transformation and loss of habitat will have a negative effect on resident fauna during construction. Due to noise and operation of heavy machinery, faunal disturbance will extend well beyond the footprint and extend into adjacent areas. This will however be transient and restricted to the construction phase.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)

Duration	Short term (2)	Short term (2)
Magnitude	Medium (6)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium (36)**	**Low (28)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, although the large amounts of noise and disturbance generated at the site during construction is largely unavoidable, impacts such as those resulting from the presence of construction personnel at the site can be easily mitigated.	

Mitigation:

» Site access should be controlled and no unauthorised persons should be allowed onto the site.

» Any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person.

» The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off the demarcated construction site.

» Fires should not be allowed on site.

» All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.

» All construction vehicles should adhere to a low speed limit (30km/h max) to avoid collisions with susceptible species such as snakes and tortoises.

» If any parts of the facility are to be fenced, then no electrified strands should be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution from electric fences because they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks.

Residual Impacts:

It is probable that some individuals of susceptible species will be lost to construction-related activities despite mitigation. However, this is not likely to impact the viability of the local population of any fauna species.

Nature: *Increased soil erosion risk during construction*

Disturbance during construction will leave the site vulnerable to erosion.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long term (4)	Long term (3)
Magnitude	Medium (7)	Low (4)
Probability	Certain (5)	Likely (3)
Significance	**Medium (60)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	Moderate	Low
Can impacts be mitigated?	Yes, with proper management and avoidance, this impact can be mitigated to a low level.	

Mitigation:

» Erosion management at the site should take place according to the Erosion Management Plan and Rehabilitation Plan.

» All roads and other hardened surfaces should have runoff control features which redirects water flow and dissipates any energy in the water that may pose an erosion risk.

» Regular monitoring for erosion should be done during construction to ensure that no erosion problems are developing as a result of the disturbance, as per the Erosion Management and Rehabilitation Plans for the project.

» All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.

» All cleared areas should be revegetated with indigenous perennial species from the local area.
Residual Impacts:
Some erosion is likely to occur even with the implementation of erosion control measures, due to the strong winds the area experiences and the likely difficulty in re-establishing vegetation cover in cleared areas.

Operation Phase Impacts

Nature: *Faunal impacts due to operation* The operation and presence of the wind farm may lead to disturbance or persecution of fauna within the project site, or within the areas adjacent to the facility.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low to Minor (3)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, to a large extent, but some low-level residual impact due to turbine noise and human disturbance is likely.	
Mitigation: » No unauthorised persons should be allowed onto the site. » Any potentially dangerous fauna, such as snakes, or fauna threatened by the maintenance and operational activities should be removed to a safe location. » The collection, hunting or harvesting of any plants or animals at the site or in the surrounding areas should be strictly forbidden. » If the site must be lit at night for security purposes, this should be done with low-UV type lights (such as most LEDs), which do not attract insects. » All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. » All vehicles accessing the site should adhere to a low speed limit (30km/h max) to avoid collisions with susceptible species such as snakes and tortoises.		
Residual Impacts: Turbine noise and disturbance from maintenance activities cannot be fully mitigated but since they occur at a low level most species are likely to be able to adapt to the new environment.		

Nature: *Negative impacts on ESAs, CBAs and broad-scale ecological processes* Development of the wind farm may impact ESAs, CBAs and broad-scale ecological processes such as the ability of fauna to disperse.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low-Minor (3)
Probability	Probable (3)	Probable (3)
Significance	**Low (30)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, only partly, as a significant proportion of the impacts result	

	from the presence and operation of the wind farm which cannot be mitigated.

Mitigation:

- An open space management plan should be developed for the site, which should include the management of biodiversity within the affected areas, as well as that in the adjacent intact strandveld on the affected land portions.

Residual Impacts:

Since the intact habitats in the development footprint will not be significantly affected, residual risks on fauna would be very low.

Nature: *Increased soil erosion risk during operation*

Disturbance created during construction will leave the site vulnerable to erosion for several years into the operation phase.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long term (4)	Long term (3)
Magnitude	Medium (6)	Low (4)
Probability	Certain (5)	Likely (3)
Significance	**Medium (55)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	Moderate	Low
Can impacts be mitigated?	Yes, with proper management and avoidance, this impact can be mitigated to a low level.	

Mitigation:

- Erosion management at the site should take place according to the Erosion Management Plan and Rehabilitation Plan.
- All roads and other hardened surfaces should have runoff control features that redirect water flow and dissipate any energy in the water which may pose an erosion risk.
- Regular monitoring for erosion should be done during operation to ensure that no erosion problems have developed as result of the disturbance, as per the Erosion Management and Rehabilitation Plans for the project.
- All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.
- There should be follow-up rehabilitation and revegetation of any remaining bare areas with indigenous perennial shrubs and succulents from the local area.

Residual Impacts:

Some erosion is likely to occur even with the implementation of erosion control measures, due to the strong winds that the area experiences and the likely difficulty in re-establishing vegetation cover in cleared areas.

Decommissioning Phase Impacts

Nature: *Faunal impacts due to decommissioning*

The decommissioning of the wind farm may lead to disturbance or persecution of fauna within or within areas adjacent to the facility

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (21)**	**Low (15)**
Status (positive or negative)	Negative	Negative

Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, to a large extent, but disturbance will occur regardless.	

Mitigation:

- » No unauthorised persons should be allowed onto the site.
- » Any potentially dangerous fauna, such as snakes, or fauna threatened by the decommissioning activities should be removed to a safe location.
- » The collection, hunting or harvesting of any plants or animals at the site or in the surrounding areas should be strictly forbidden.
- » If the site must be lit at night for security purposes, this should be done with low-UV type lights (such as most LEDs), which do not attract insects.
- » All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
- » All vehicles accessing the site should adhere to a low speed limit (30km/h max) to avoid collisions with susceptible species such as snakes and tortoises.

Residual Impacts:

Since the intact habitats at the site will not be significantly affected, residual risks on fauna would be very low.

Nature: *<u>Soil erosion risk due to decommissioning</u>*

Decommissioning of the wind farm will create a lot of disturbance at the site which will leave the site vulnerable to erosion.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long term (4)	Long term (3)
Magnitude	Medium (5)	Low (4)
Probability	Highly Probable (4)	Improbable (3)
Significance	**Medium (40)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	Low	No
Can impacts be mitigated?	Yes, with the proper erosion control and management, erosion can be reduced to a low level.	

Mitigation:

- » Erosion management at the site should take place according to the Erosion Management Plan and Rehabilitation Plan.
- » Regular monitoring for erosion should be done after decommissioning for at least 5 years to ensure that no erosion problems have developed as a result of the disturbance, as per the Erosion Management Plan and Rehabilitation Plan for the project.
- » All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.
- » All cleared areas resulting from decommissioning should be revegetated with indigenous perennial species from the local area.

Residual Impacts:

It is likely that some soil erosion will occur regardless of the mitigation implemented, due to the high winds that the area experiences. However, this can be reduced to a low level and residual risks can be reduced to an acceptable level.

9.3.4 Implications for Project Implementation

With the implementation of mitigation measures by the developer, contractors, and operational staff, the significance of ecological impacts of the Namas Wind Farm can be reduced to low or medium, depending on the impact being considered. From the outcomes of the studies undertaken, it is concluded that the wind farm can be developed. On-site mitigation is viewed as the most practical and appropriate action, and viable options for reducing the overall impact of the development on these areas is detailed below:

» The final layout including roads and underground cables should be subject to a pre-construction walk-through before construction commences and adjusted where required to reduce impacts on SCC and habitats of concern.
» An open space management plan should be developed for the site, which should include the management of biodiversity within the affected areas, as well as that in the adjacent intact strandveld on the affected land portions.
» Erosion management at the site should take place according to the Erosion Management Plan and Rehabilitation Plan.

9.4. Potential Impacts on Avifauna

The significance of the impacts on avifauna expected with the development of the Namas Wind Farm has been assessed as low with the implementation of mitigation measures. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix E** for more details).

9.4.1 Results of the Avifauna Impact Assessment

The bird community located within the project site has been confirmed through an avifauna pre-construction monitoring campaign undertaken within the full-extent of the project site from June 2017 to March 2018. Over the course of the pre-construction monitoring campaign, only 46 avian species were recorded during the four equally spaced seasonal site visits. This result is a very low total compared with other arid areas in the Northern and Western Cape Provinces. Species richness varied over the seasons with higher totals recorded in summer (38 species) and the lowest in spring and autumn (21 and 22 respectively). All species were typical residents of the arid Karoo landscape including Chats, Prinias, Titbabbler, Flycatchers, Karoo Larks and Grey Tit *Parus afer*.

Small aerial species that may be affected by a new wind farm included the occasional hirundines such as Rock Martin *Ptyonoprogne fuligula* and groups of up to 90 swifts including Alpine *Tachymarptis melba*, Little *Apus affinis* and Common Swifts *A. apus.* These species were recorded foraging in the east of the project site.

The average number of species per kilometre was slightly lower in the Namas Wind Farm project site (9.7 species per km) than in the Control site (10.5 species per km). Similarly, the average number of individual birds per kilometre found in the project site (29.6 birds per km) was higher than in the Control (26.3 birds per km). Bird abundance indices were higher in the spring (September) than any other month. Bird species richness on site stayed relatively constant throughout the year, with summer showing the highest numbers. This is not typical for arid areas, where spring is often the most species-rich season following winter rains. These numbers are expected to have been lower in terms of diversity and numbers than in a typical year.

Among the 48-species recorded on the 37 SABAP2 bird atlas cards for this region (June 2013-March 2018) were 8 priority collision-prone species. Five of the eight species were recorded from the Vantage Point surveys in the project site over the course of the monitoring campaign. These included two Red Data species (Secretarybird and Ludwig's Bustard *Neotis ludwigii*). The Ludwig's Bustards were recorded twice, and the Secretarybirds just once in November 2017; a pair, however, was observed in flight together on the adjacent farm Zonnequa in August 2017. An inactive Secretarybird nest site was discovered on the Namas Wind Farm project site and this was used as a roost by the territorial bird. This suggests a pair could occur more often when conditions are less arid.

For the priority Red Data species alone (comprising the Secretarybird and the Ludwig's Bustard) the Passage Rates were very low, averaging just 0.01 birds per hour in the project site and 0.19 birds per hour in the Control site. Therefore, while two Red Data species were present on site, their Passage Rates and their likelihood of occurrence were both low, making the risk of collision unlikely. These data were collected at a time of drought and these are likely to be lower than normal.

The flight heights recorded indicate that if Ludwig's Bustards occurred in the wind farm project site they would be the least at-risk species with 0% of their flights recorded within the rotor-swept area. Only one bustard is known to have been killed by turbines in South Africa at an Eastern Cape wind farm. At first sight, Secretarybirds appear to be at risk 0% of the time on the Namas Wind Farm project site. However, Secretarybirds do undertake soaring flights. For example, at an Eastern Cape wind farm Secretarybirds were recorded at similar Rotor Swept Height (58-203 m) 85% of the time when in flight despite their terrestrial lifestyle. Areas where two or more of the Red Data species overlap are designated as medium- or high-risk areas where turbine development is not recommended. Locations of the nests of Red data species are also to be avoided.

One high risk area was identified within the project site and is considered to be an avifauna no-go area. The sensitivity associated with the area is based on an inactive Secretarybird nest (S29°50'41.8"; E17°11'41.69"). A precautionary 1km no-go buffer has been allocated to the inactive Secretarybird nest. The 1km buffer around the known but inactive Secretarybird nest is designed to reduce the possibility of disturbance by construction or operation of the Namas Wind Farm for this vulnerable Red Data species, if it is ever used. This is also designed to reduce the possibility of direct impacts for these species.

No other areas hold more than one Red data species and no areas overlap for other collision prone species.

Figure 9.3 provides an avifaunal sensitivity map for the larger project site, inclusive of the proposed development footprint being assessed for the Namas Wind Farm.

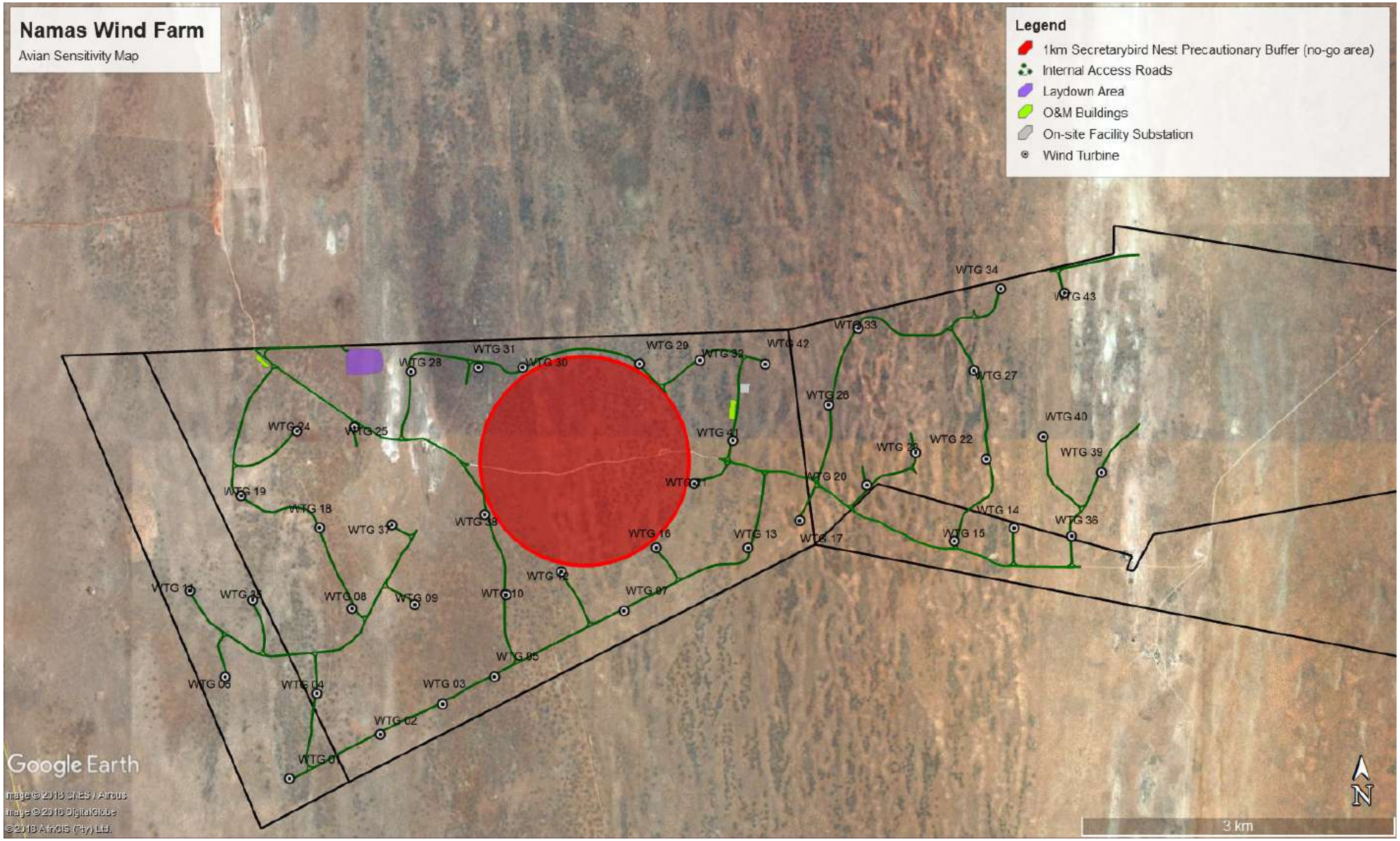

Figure 9.3: Map illustrating the avifaunal sensitivity within the Namas Wind Farm project site overlain with the proposed development footprint

Justification for the precautionary 1km buffer around the Secretarybird nest

There are no Birdlife South Africa guidelines for Secretarybirds (as there are for Verreaux's Eagles and vultures) so expert opinion was sought to inform appropriate mitigation for the nest structure found on the proposed Namas Wind Farm project site. The following is based on email discussions with Dr A Kemp (ex-Transvaal Museum), E Retief and S Ralston (BLSA), Dr C. Whittington-Jones (Ornithologist, Gauteng Department of Agriculture and Rural Development); reviewing satellite tagging studies of juvenile birds (E Retief unpublished); and published work (Steyn 1982, Dean and Simmons 2005).

The 1km buffer (precautionary) for the Secretarybird nest is considered to be feasible for the following reasons:

» The Secretarybird nest is not an active breeding site (the farmers report that it has not been used successfully) and therefore the 1km buffer is proposed as a precautionary measure;
» The Secretarybird is a very terrestrial species and rarely takes flight;
» 2500m is considered a sensitive area around a Secretarybird nest;
» There is only one recorded death of a Secretarybird in over 200 raptor deaths as a result of wind farm collisions across South Africa. There are more deaths due to fences than there are from wind farms;
» For satellite-tagged young Secretarybirds, the ranges were not as large as expected. Tagged juveniles rarely ranged beyond 1.3km from the nest. Habitat (grassland of < 0.5 m tall) may be a good predictor of habitat use;
» There is no published usage data (i.e. 90% kernel assessments) to show what size and where the high use areas are for Secretarybirds. However, unpublished data from satellite-tagged juveniles showed that home ranges averaged 1.2 km^2 to 1.4 km^2;
» Data for a breeding pair of Secretarybirds at an Eastern Cape wind farm indicates that breeding adult and juvenile Secretarybirds flew for just 36 minutes in 321 hours when at least one Secretarybird was on site. Therefore, for only ~0.19% of the time; and
» From 169 records of focal birds in flight over the same time period, 85% of all flights occurred in the Blade-swept Area between 58 and 205m (the blade heights of 130m hub height with 75m blades).

Therefore, the rarity of flight in this species (< 0.2% of 321 hours) and the death of only one (1) Secretarybird in over 200 recorded raptor fatalities at South African wind farms, suggests that the risk of collision for this species is very low. Considering the above, and because the Secretarybird nest on the Namas Wind Farm project site is not an active site, it is recommended that a 1km precautionary buffer will be sufficient to avoid disturbance.

These data were presented to BirdLife South Africa (BLSA) on 14 August 2018 in a joint meeting with the EAP and the developer, and the size of the buffer was deemed acceptable by BLSA given that the nest is inactive as per the findings of the specialist collected during the avifauna pre-construction monitoring campaign.

The level of risk for this Red Data species is related to (i) their presence on the site (they were not observed on every site visit during the pre-construction monitoring conducted by the specialist) and (ii) if they breed (because they will then probably perform display flights within the Blade-swept Area). Because another new, but inactive nest was found on the adjacent Zonnequa site (where two birds were briefly seen), and only one bird was ever seen on the Namas wind Farm project site, it may be that this inactive nest site is an alternative site, and may be used very rarely. If birds are killed, despite the precautionary 1km buffer for this inactive nest, then additional mitigation measures, particularly the black-blade mitigation or similar (UV-reflective paint) will be required to be considered for implementation.

9.4.2 Description of Avifaunal Impacts

The nature of the impact expected on avifauna from the development of the Namas Wind Farm will generally be negative for birds given the certainty that: (i) habitat associated with the development footprint will be transformed and the associated habitat potentially fragmented, and (ii) birds may be killed directly if they fly into the wind turbines. Some displacement may also occur. The extent of the impact will be local. The duration of the impacts will be long-term, for the lifetime of the wind farm and apply to all collision-prone species. The magnitude is expected to be low.

The probability of occurrence of raptors (including Secretarybirds) and bustards having interaction with the wind farm is considered to be medium due to their low passage rates and occurrence within the project site. This does not mean that there is no risk as Secretarybirds do fly at such heights.

The avifauna impacts expected with the development of the Namas Wind Farm relate to the three collision-prone Red Data species likely to be impacted. The impacts include direct fatalities, disturbance and loss of foraging habitat. The three Red Data species include Secretarybird, Lanner Falcon and Ludwig's Bustard.

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

Nature: Impacts on the three, main, collision-prone Red Data species likely to be impacted A negative impact is expected due to direct impact fatalities, disturbance and loss of foraging habitat around the Namas Wind Farm project site for the Red-listed bird groups identified.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (5) – SB	Low (3) - SB
	Minor (1) - LF	Minor (1) - LF
	Low (4) - LB	Low (3) - LB
Probability	Probable (3) – SB	Improbable (2) - SB
	Improbable (2) - LF	Improbable (2) - LF
	Improbable (2) - LB	Improbable (2) - LB
Significance	**Medium (30) - SB**	**Low (16) - SB**
	Low (12) - LF	**Low (12) - LF**
	Low (18) - LB	**Low (16) - LB**
Status (positive or negative)	Negative	Negative
Reversibility	Yes, if turbines avoid the areas identified as high risk.	Yes, if turbines avoid the areas identified as high risk.
Irreplaceable loss of resources?	No, Secretarybird populations are relatively low in the area (not their core habitat). Ludwig's Bustards are nomadic visitors to this area.	-
Can impacts be mitigated?	Yes. If the areas identified as high-risk are avoided.	
Mitigation:		

» Position the turbines away from risk areas of high aerial traffic or nests of collision-prone species; this applies to the Secretarybird nest on site via the 1km buffer. » If turbines impact the birds (i.e. through collision) then paint a single blade black (or with UV-paint) for those select turbines known to kill most birds to reduce impacts for eagles and other raptors (Stokke et al. 2017). » Selective feathering or stopping of turbines can be implemented during high-use seasons or times in the day for turbines that continue to kill unsustainable numbers of raptors. » If raptors continue to be attracted into the site then habitat can be manipulated to reduce the attractiveness (from a prey point of view) for the raptors. Reducing the attractiveness from a food resources point of view will reduce raptor use of the area. This can be achieved by increasing the stocking density of sheep or goats. One of the mitigations above (black-blade mitigations) is dependent upon knowing which turbines are responsible for the most deaths. Therefore, it is recommended that Genesis Namas Wind (Pty) Ltd implement 12-24 months post-construction monitoring to assess the mortality of birds in the wind farm, through direct observation and carcass searches. This will assist in determining where individual turbine-specific mitigation measures are required to be implemented.
Residual Impacts: After mitigation, direct mortality through collision, or area avoidance, by the species identified above may still occur and further research and mitigation measures should be suggested. This can only be undertaken in conjunction with a systematic monitoring programme.

* The Secretarybird (= SB), and possibly the Lanner Falcon (= LF) recorded on the project site as an incidental are the only raptors species likely to be impacted as well as the nomadic Ludwig's Bustard (= LB).

9.4.4 *Implications for Project Implementation*

With the implementation of mitigation measures by the developer, contractors, and operational staff, the significance of avifauna impacts associated with the Namas Wind Farm can be reduced to low. Only one area has been identified as high risk and to be avoided by the development, which is associated with the presence of an inactive Secretarybird nest.

From the outcomes of the studies undertaken, it is concluded that the wind farm can be developed and impacts on avifauna managed by taking the following into consideration:

» Position the turbines away from risk areas of high aerial traffic or nests of collision-prone species; this applies to the Secretarybird nest on site via the 1km precautionary buffer.
» Implement 12-24 months post-construction monitoring to assess the mortality of birds in the wind farm, through direct observation and carcass searches.
» If through the monitoring birds are found to be highly impacted, those turbines responsible for the most deaths should have a single blade painted black (or with UV-paint) as an adaptive management mitigation strategy.

9.5. Potential Impacts on Bats

The impacts of the Namas Wind Farm on bats have been assessed as a low significance with the implementation of the recommended mitigation measures. The potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix F** for more details).

9.5.1 *Results of the Bat Impact Assessment*

The bat community located within the project site has been confirmed through a bat pre-construction monitoring campaign undertaken within the full-extent of the project site from May 2017 to June 2018. The pre-construction monitoring campaign informed the bat specialist of the bat activity present within the project site.

Five bat species were detected by the passive systems and during the driven transects, namely Miniopterus natalensis, Neoromicia capensis, *Eptesicus hottentotus*, *Sauromys petrophilus* and *Tadarida aegyptiaca*. The *T. aegyptiaca* (Egyptian Free-tailed bat) were the most dominant at all passive recording systems. Although this species has a conservation status of least concern, such abundant species are of a large value to the local ecosystems as they provide a greater contribution to most ecological services than the rarer species, due to their higher numbers.

The monitoring systems detected the migratory species *Miniopterus natalensis*. The species displayed seasonal peaks that coincided with the peaks in activity of other bat species on site, except at SM2 the seasonal peak was slightly later in autumn. This is not clearly evident of a migration event, however the possibility still exists that the species move into the area in late autumn, but may not necessarily be at risk of impact since its activity at 97m was only 1 bat pass for the entire 12 months of monitoring.

The annual average mean number of bat passes per hour for the met mast system is indicating a Low Risk level for bat impacts at 97m with 0.04 average passes per hour, and a High Risk at 10m with 0.34 average passes per hour. The highest annual average mean number of bat passes per hour was at SM2 at 10m with 0.86 average passes. Above 0.13 is considered to be High potential risk, and below 0.07 is considered Low potential risk.

The site displays a very strong gradient of bat activity levels with height above ground, where the met mast detected 7.7 times less bats at 97m than at 10m. These activity gradients are in general exponential, meaning the activity becomes progressively less with height. This indicates that higher and larger turbine models, with a higher lowest rotor swept height, can significantly reduce the risk of impacts on bats.

During the monitoring campaign, sensitive areas within the project site were identified based on features considered to be important for foraging and roosting of the species most likely to occur within the project site. The bat sensitivity map is therefore based on the species ecology and habitat preferences. Refer to **Figure 9.4**.

Moderate and high sensitivity areas were identified. Areas considered to be of a moderate sensitivity received a 100m buffer and areas considered to be of a high sensitivity received a 200m buffer. The areas and buffers considered to be of a moderate sensitivity are areas of foraging habitat or roosting sites considered to have significant roles for bat ecology. Turbines within these areas and their buffers may acquire priority (not excluding all other turbines) during post-construction studies, and in some instances there is a higher likelihood that mitigation measures may need to be applied to them. The areas and buffers considered to be of a high sensitivity are areas that are deemed critical for resident bat populations, capable of elevated levels of bat activity and support greater bat diversity/activity than the rest of the site. These areas are 'no-go' zones and turbines (including turbine blades) must not be placed in these areas and their associated buffers. The features associated with the medium sensitive areas relate

to different vegetation types and landforms. Dunes and slopes can offer airspace sheltered from wind for insect prey and subsequently attract insectivorous bats. Larger woody shrubs can offer similar sheltered airspace. Very seasonal water sources that may have some accessible water only for a few days a year can attract bats.
The features associated with the high sensitive areas are a kraal with a cement farm dam, residences, an excavation that may accumulate water over time, and a wind pump.

9.5.2 Description of Bat Impacts

The construction and operation of the Namas Wind Farm is likely to impact bats through the destruction of foraging habitat by the clearance of vegetation, bat mortalities due to the moving turbine blades, and an increase in bat mortalities due to increased insect numbers as a result of the light attraction caused by the wind farm.

The identified impacts are considered to be of a medium to low significance prior to the implementation of the recommended mitigation measures by the specialist. Following the implementation of the mitigation measures the significance of the impacts is reduced to low.

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

Construction Phase Impacts

Nature: Destruction of foraging habitat by clearing of vegetation During construction some very limited foraging habitat will inevitably be destroyed to clear vegetation and ground for the Namas Wind Farm. Apart from the hardstands this includes roads, substations, laydown areas, etc., and especially vegetation cleared temporarily for construction purposes. However, the destruction of foraging habitat through the clearing of vegetation is not considered to have a significant effect on bat populations. The *Tadarida. aegyptiaca* species, found to have a high occurrence on site, have a very wide habitat tolerance and will be able utilise the open spaces on site for foraging.		
	Without mitigation	**With mitigation**
Extent	Low (1)	Low (1)
Duration	Short term (2)	Short term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Definite (5)	Definite (5)
Significance	**Low (25)**	**Low (25)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Rehabilitate cleared vegetation where possible at areas such as laydown areas.		
Residual Impacts: Disturbed vegetation will be minimal and can be rehabilitated, therefore the residual risk is low.		

High bat sensitivity area	High bat sensitivity buffer (200m)
Moderate bat sensitivity area	Moderate bat sensitivity buffer (100m)

Figure 9.4: Map illustrating the bat sensitivity within the Namas Wind Farm project site, overlain by the proposed development footprint. The sensitive features include a kraal (number 8), houses (numbers 10 and 12), an excavated area (number 11), and a wind pump (number 15)

Operation Phase Impacts

Nature: *Bat mortalities due to moving turbine blades* Foraging and/or migrating bats can be killed by moving turbine blades, this happens either by direct impact or due to barotrauma.		
	Without mitigation	**With mitigation**
Extent	Medium (3)	Medium (3)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	Moderate (6)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (45)**	**Low (26)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	High
Irreplaceable loss of resources?	Medium	Low
Can impacts be mitigated?	Yes	
Mitigation: » Make adjustments to the turbine layout to avoid high sensitivities and their buffers (already implemented). » Where needed, reduce blade movement at selected turbines and during high-risk bat activity times/weather conditions, if the operational bat mortality study finds bat mortalities to be above sustainable levels. If reducing blade movements is not technically feasible, alternative and equally effective mitigations should be recommended during the operational bat mortality monitoring study. Acoustic deterrents are developed well enough to be trialled, if needed.		
Residual Impacts: Prolonged mortalities to bats in an area can alter bat population genetics permanently, and also shift species compositions of populations in an area. If impacts are high and unmitigated, the residual effect over time can be high.		

Nature: *Increased bat mortalities due to light attraction* Security and/or operational lights used close to or on turbines will attract higher insect numbers and thereby attract additional insectivorous bat activity. This will highly increase the likelihood of impacts by turbine blades. This is not applicable to red aviation lights. If not mitigated, all species found to be dominant on site will be significantly impacted since they will all be attracted to the increased insect numbers at outside lights, as opposed to cave dwelling bat species which may be repelled by light sources. Cave dwelling bat species did not occur in high numbers on site. This impact can have detrimental effects if not mitigated, however it is extremely simple and cost effective to mitigate.		
	Without mitigation	**With mitigation**
Extent	Medium (3)	Medium (3)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	Minor (2)
Probability	Probable (3)	Very improbable (1)
Significance	**Medium (45)**	**Low (9)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	High
Irreplaceable loss of resources?	Medium	None
Can impacts be mitigated?	Yes	
Mitigation: » Only use lights with low sensitivity motion sensors that switch off automatically when no persons are nearby, to prevent the creation of regular insect gathering pools.		
Residual Impacts: Prolonged mortalities to bats in an area can alter bat population genetics permanently, and also shift species		

compositions of populations in an area. If impacts are high and unmitigated, the residual effect over time can be high.

9.5.4 Implications for Project Implementation

With the implementation of mitigation measures by the developer, contractors, and operational staff, the significance of bat impacts of the wind farm can be reduced to low.

Areas of bat significance considered to be highly sensitive and regarded as no-go areas have been avoided by the turbine positions associated with the Namas Wind Farm development footprint.

From the findings of the studies undertaken, it is concluded that the wind farm can be developed and impacts on bat species managed by taking the following into consideration:

» Use lights with low sensitivity motion sensors that switch off automatically when no persons are nearby, to prevent the creation of regular insect gathering pools.
» Avoid high sensitivities and their buffers (already implemented), and where needed reduce blade movement at selected turbines and during high-risk bat activity times/weather conditions, if the operational bat mortality study finds bat mortalities to be above sustainable levels.
» It is recommended that Level 3 mitigation be applied to all turbines on site from the start of operation, from sunset until sunrise every night for the months of March, April, May, August and September. This implies 90-degree feathering below the manufacturer's cut in speed to minimise free-wheeling, which does not result in high production loss but can lessen the likelihood of bat impacts significantly. If this mitigation is not technically feasible based on the model of turbine to be used, the bat specialist conducting the operational bat mortality study must recommend a technically feasible alternative. The specialist conducting the operational bat mortality monitoring may also, after the first year of operational monitoring, recommend Level 3, or other required mitigations, to be applied to selected turbines only, based on the bat mortality results. This is an adaptive management approach and the effectiveness of the adaptive management will have to be determined during the second year of the operational monitoring study.
» A minimum of 2 years of operational bat mortality monitoring must be conducted, initiating from the commencement of the wind farm's operation.

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

The impact of the Namas Wind Farm on the soils, land use, land capability and agricultural potential has been assessed as low (after mitigation). Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix G** – Soils Impact Assessment for more details).

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

The current land use of the project site is extensive grazing (specifically by sheep) and the site is dominated by natural vegetation. The site also includes a significant proportion of sand dunes.

The soils present in most of the project site are not considered susceptible to erosion by water. However, if the vegetation cover is disturbed (for example by overgrazing or construction activities) and considering the sandy nature of the topsoils, as well as the dry climate, there is a significant possibility of removal of some or all of the topsoil by wind action. This can be mitigated by ensuring that a minimum area is disturbed, and that rehabilitation of surface vegetation is carried out as soon as possible.

There are no high potential soils present within the project site and the soils are of moderate potential at best, due mainly to the sandy texture which will lead to rapid water infiltration and the soils drying out. In addition, the low rainfall in the area means that there is little potential for rain-fed arable agriculture. Arable production would, therefore, be possible only by irrigation, and no indications of any irrigated areas, within and surrounding the project site, can be identified on aerial imagery, including Google Earth.

In general, the soils that do occur within the project site are suited for extensive grazing at best and furthermore the grazing capacity of the area is very low, at around 26-40 ha/large stock unit.

The prevailing potential of the soils for rain-fed cultivation throughout most of the area, as well as the use of irrigation activities for cultivation, is low. Considering the land types and soils located within the project site and the current land-use activities, it is recommended that no further detailed soil investigation is required for the Namas Wind Farm.

9.6.2 Description of Land Use, Soil and Agricultural Potential Impacts

Two impacts have been identified to be associated with the development of the Namas Wind Farm from a soils perspective. These impacts include:

» *Loss of potential agricultural land* - the major impact on the natural soil resources of the project site would be the loss of potential agricultural land due to the construction of the turbines and associated infrastructure. However, considering the project site, this impact would be of extremely limited significance and would be local in extent, if at all.

» *Increased risk of wind erosion* - In this area, the sandy soils, coupled with the dry climate, means that a possible impact would be the increased risk of wind erosion of the topsoil when vegetation cover is removed or disturbed. This would be especially relevant for the construction of access roads, turbines and other associated infrastructure.

The main activity that will result in the impacts on soil relates to the excavations required for the wind turbines and associated infrastructure (i.e. roads, buildings, cables etc.).

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

Nature: Loss of agricultural land The loss of potentially productive agricultural land during both the construction and operation phases of the Namas Wind Farm.		
	Without mitigation	**With mitigation**
Extent	Low (1)	Low (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	**Low (27)**	**Low (14)**
Status (positive or negative)	Negative	Negative

Reversibility	Low	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

» Avoid any cultivated land (if present).
» Minimise the footprint of construction as much as possible.

Residual Impacts:

Likely to be low since the implementation of the appropriate mitigation measures will enable more or less complete rehabilitation during and after the life of the project.

Nature: *Soil erosion*

Increases in soil erosion by wind during the construction and operation phases of the Namas Wind Farm.

	Without mitigation	**With mitigation**
Extent	Medium (3)	Low (1)
Duration	Permanent (5)	Short term (2)
Magnitude	High (8)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**High (64)**	**Low (10)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	Very possible	No
Can impacts be mitigated?	Yes	

Mitigation:

» Minimise the footprint of construction as much as possible.
» Where soil is removed/disturbed, ensure it is stored for rehabilitation and re-vegetated as soon as possible.
» Implement all appropriate soil conservation measures, including contouring, culverts etc. (for road construction), geotextiles and slope stabilisation (for all infrastructure).

Residual Impacts:

If mitigation is not carried out, long-term wind erosion, with results such as loss of valuable topsoil, may occur.

9.6.4 Implications for Project Implementation

With the implementation of mitigation measures by the developer, contractors, and operational staff, the significance of impacts of the Namas Wind Farm can be reduced to low. From the outcomes of the studies undertaken, it is concluded that the wind farm can be developed and impacts on soils managed by taking the following into consideration:

» Avoid cultivated land
» Minimise the footprint of the construction of the wind farm
» Implement soil conservation measures including contouring, culverts, geotextiles and slope stabilisation.

9.7. Assessment of Impacts on Heritage Resources

Negative impacts on heritage resources will be due to loss during construction activities and an impact on the cultural landscape during the operation of the Namas Wind Farm. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix H**).

9.7.1 Results of the Heritage Impact Assessment (including archaeology, palaeontology and cultural landscape)

Palaeontological materials were not observed on the wind farm site but isolated fossil bones could occur within the various sand formations of the area. Archaeological sites were found scattered throughout the sand dune areas with almost nothing present on the intervening plain. Because it is closer to the coast, the western dune cordon had far more sites on it than the eastern one. The sites are all small shell and/or artefact scatters with the amount of shell reducing significantly further from the coast. The various farm buildings present are all 20th century and none are of any significance. A farm graveyard occurs close to the farm buildings.

The landscape does carry cultural significance. The project site is situated in a remote location and, being only very minimally developed, is largely considered a natural landscape rather than a rural one. The exception, of course, is the mining landscape located to the north where the human imprint is far greater. Natural heritage also requires consideration because of the visual amenity provided by aesthetically pleasing landscapes. The landscape conveys a sense of remoteness and inhospitability that is a result of the very frequent strong winds, the low scrubby vegetation and seemingly endless sand flats and dunes.

The Namas Wind Farm development footprint has been designed to avoid all currently known archaeological sites, although it is likely that more will still be found in places.

9.7.2 Description of the Heritage Impacts

The impacts expected to occur on heritage resources with the development of the Namas Wind Farm will include impacts to palaeontological resources, impacts to archaeological resources, impacts to graves and impacts to the cultural landscape.

Impacts to palaeontological resources would occur only during the construction phase when foundations and cable trenches are excavated. The impacts would be direct since the excavations might damage or destroy fossils as they are uncovered. The probability of impacts occurring is probable with the resultant significance of the impacts being medium. With mitigation, the status becomes positive because of the potential gain in knowledge from access to deposits and fossils that would otherwise have remained buried and undiscovered. The significance would be medium following the implementation of mitigation measures. There are no fatal flaws expected from a palaeontological perspective.

Impacts to archaeological resources would occur only during the construction phase when foundations and cable trenches are excavated and land is cleared and levelled for access roads, laydown areas and ancillary infrastructure. The impacts would be direct since the excavations might damage or destroy archaeological materials. The probability of impacts occurring is probable with the resultant significance of the impacts being medium. With mitigation the magnitude and probability of the impact would be reduced and the significance will be reduced to low. There are no fatal flaws expected to occur with regards to archaeological resources.

Impacts on graves would occur only during the construction phase when foundations and cable trenches are excavated and land is cleared and levelled for access roads, laydown areas and ancillary infrastructure. The impacts would be direct since the excavations might damage or destroy graves. The probability of impacts occurring is very improbable with the resultant significance of impacts being low.

With mitigation the magnitude of the impact would be reduced but the significance remains low. There are no fatal flaws considering graves.

Impacts to the cultural landscape would occur during all phases of the Namas Wind Farm. Impacts would arise due to the presence in the landscape of industrial features, especially the very large wind turbines and cranes required for their erection, and from the clearing of natural vegetation and transformation of the natural land surface. The impacts would be direct and occur both through the destruction of elements of the natural landscape such as vegetation and dunes and through contextual impacts where the visual qualities of the landscape deteriorate as a result of the presence of industrial infrastructure and equipment. If the Namas Wind Farm is constructed, the impacts will definitely occur and the resultant significance of impacts would be of a medium significance. With mitigation, the magnitude of the impact would be reduced slightly but the significance remains medium. There are no fatal flaws associated with the development of the Namas Wind Farm within the current cultural landscape.

9.7.3 Impact tables summarising the significance of impacts on heritage related to the wind turbines and associated infrastructure during construction and operation (with and without mitigation)

Nature: Impacts to Palaeontological Resources
Direct destruction of or damage to fossil bones or resources through excavation of foundations and trenches.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2). If an important fossil find occurs, the rating will increase to regional – international (3-5)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (33)**	**Medium (33)**
Status (positive or negative)	Negative	Positive
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources?	Yes	Partly
Can impacts be mitigated?	Yes, but only partial mitigation is possible. Valuable fossils may be lost in spite of management actions to mitigate such loss.	

Mitigation:
- » Monitoring of all construction-phase excavations by project staff and ECO.
- » Inspection, sampling and recording of selected exposures in the event of fossil finds.
- » Reports and fossils deposited in scientific institution.

Residual Impacts:
It will never be possible to spot and rescue all fossils, which means that there will always be some loss and therefore residual impact. This would be of unknown significance because of the sparse distribution of fossils in the broader landscape. Positive impacts would continue to be felt with successful mitigation because of the scientific implications of the resulting research opportunities.

Nature: Impacts to archaeological resources
Direct destruction of or damage to archaeological resources during the excavation of foundations and trenches and during clearing of land for roads, laydown areas and ancillary infrastructure.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)

Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (33)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: » A walk down survey of all road alignments and the footprints of all turbines and other associated infrastructure must be undertaken and any mitigation still required should be effected prior to the commencement of construction.		
Residual Impacts: Entirely buried archaeological sites within the development footprint would likely be damaged or destroyed but the chances of significant buried sites being present in this landscape is deemed to be very low. Impacts to remaining materials after mitigation has been carried out, at specific sites, are insignificant.		

Nature: Impacts to graves Direct destruction of or damage to graves during excavation of foundations and trenches and during the clearing of land for roads, laydown areas and ancillary infrastructure.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Very high (10)	Moderate (6)
Probability	Very improbable (1)	Very improbable (1)
Significance	**Low (16)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: » Rescue of any graves found during the construction phase.		
Residual Impacts: There may still be graves that are not seen during earthworks and that get lost entirely.		

Nature: Impacts to the cultural landscape The landscape does carry cultural significance. The project site is situated in a remote location and, being only very minimally developed, is largely considered a natural landscape rather than a rural one. Direct impacts to the landscape will occur through the introduction of industrial electrical infrastructure (turbines) which will change the current landscape.		
	Without mitigation	**With mitigation**
Extent	Local (3)	Local (3)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (5)	Low (4)
Probability	Definite (5)	Definite (5)
Significance	**Medium (60)**	**Medium (55)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, however not fully.	
Mitigation:		

Mitigation measures should include rehabilitation of any disturbed areas not in use during operation and any other general measures as listed in the Visual Impact Assessment, but due to the size of the structures such measures would have minimal effect on the impact ratings.
Residual Impacts: Regardless of mitigation measures, the wind farm will still be visible in the cultural landscape and therefore result in a residual impact.

9.7.4 Implications for Project Implementation

With the implementation of mitigation measures by the developer, contractors, and operational staff, the significance of impacts of the Namas Wind Farm will be medium to low. From the outcomes of the studies undertaken, it is concluded that the wind farm can be developed and impacts on heritage managed by taking the following into consideration:

» An archaeologist should be appointed to conduct a final pre-construction survey of the approved wind farm layout at least 6 months prior to the commencement of construction.
» A chance finds procedure must be implemented for the rescuing of any fossils discovered during construction.
» All work is to be carried out within the authorised development footprint. Any new areas that may need to be disturbed must be surveyed for archaeological sites prior to disturbance.
» Where possible, built elements should be painted in a colour to match the surrounding landscape.
» Any disturbed areas not required during operation must be rehabilitated after construction.
» If any archaeological material or human burials are uncovered during the course of the development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

9.8. Assessment of Noise Impacts

Wind turbines produce sound, primarily due to mechanical operations and aerodynamic effects of the blades. Modern wind turbine manufacturers have virtually eliminated the noise impact caused by mechanical sources and instituted measures to reduce the aerodynamic effects. But, as with many other activities, the wind turbines emit sound power levels at a level that can impact on areas at some distance away. When potentially sensitive receptors are nearby, care must be taken to ensure that the operations at the wind farm do not cause undue annoyance or otherwise interfere with the quality of life of the receptors. Potential noise impacts and the relative significance of the impacts are summarised below (refer to **Appendix I**).

9.8.1. Results of the Noise Monitoring

The ambient sound levels were typical of a rural noise district (during low wind conditions) and the area is considered naturally quiet. The Namas Wind Farm project site is far from any significant roads or any other significant noise sources. Five Noise Sensitive Developments (NSD) were identified, of which two are located within the Namas Wind Farm project site (refer to **Figure 9.5**). Noise measurements were taken at two points within the project site and at one point outside of the project site. Within the project site wind induced noises were documented and generally dominant, as well as bird communication, sheep bleating and human voices. Outside of the project site wind-induced noises from a windmill were documented, as well as bird communication. It is extremely unlikely that a potential noise-sensitive receptor staying further than 2 000m from a wind turbine would experience any noise impact. The NSD which is considered to be of a concern is NSD04 due to potential cumulative noise effects of the wind turbines associated with the Namas Wind Farm development footprint.

The data of the sound levels measured in the project site indicates that the area has the potential to be very quiet at night, though ambient sound levels may increase as the wind speed increases. The expected daytime ambient sound levels would be around 40 – 50 dBA with night-time ambient sound levels around 25 - 35 dBA during low wind conditions.

Considering the findings, the increase in noise levels is not considered to be a fatal flaw.

9.8.2 Description of Noise Impacts

During the construction phase, the undertaking of specific activities will result in noise impacts. The activities include:

- Site survey and preparation;
- Establishment of site entrance, internal access roads, contractors compound and passing places;
- Civil works to sections of the public roads to facilitate turbine delivery;
- Construction of foundations;
- Transport of components and equipment to site;
- Establishment of laydown and hard standing areas;
- Erection of the turbines;
- Construction of the substation;
- Establishment of ancillary infrastructure; and
- Site rehabilitation.

The construction phase of the wind farm will lead to an increase in the ambient sound level with more than 7dB during the daytime, or daytime rating levels higher than 52dBA. Should construction activities be undertaken during the night-time an increase of 7dB in the ambient sound levels is expected, which will create night-time rating levels higher than 42dBA.

During the operation phase, activities relating to routine servicing and maintenance will be undertaken. The noise impact from maintenance activities will be insignificant, with the main noise source being the rotating wind turbine blades and the nacelle. The operation phase of the wind farm will lead to an increase in the ambient sound level with more than 7dB during the daytime, or daytime rating levels higher than 52dBA. With the operation of the wind farm, a night-time increase of 7dB in the ambient sound levels is expected, which will result in night-time rating levels higher than 42dBA.

- The significance of the noise impact relating to daytime construction of the wind turbines will be low.
- The significance of the noise impact relating to night-time construction of the wind turbines will be low.
- The significance of the operational daytime noises will be low.
- The significance of the operational night-time noises may be medium (without the implementation of mitigation). This is a precautionary rating considering the projected noise levels on NSD04 as well as the low ambient sound levels measured.

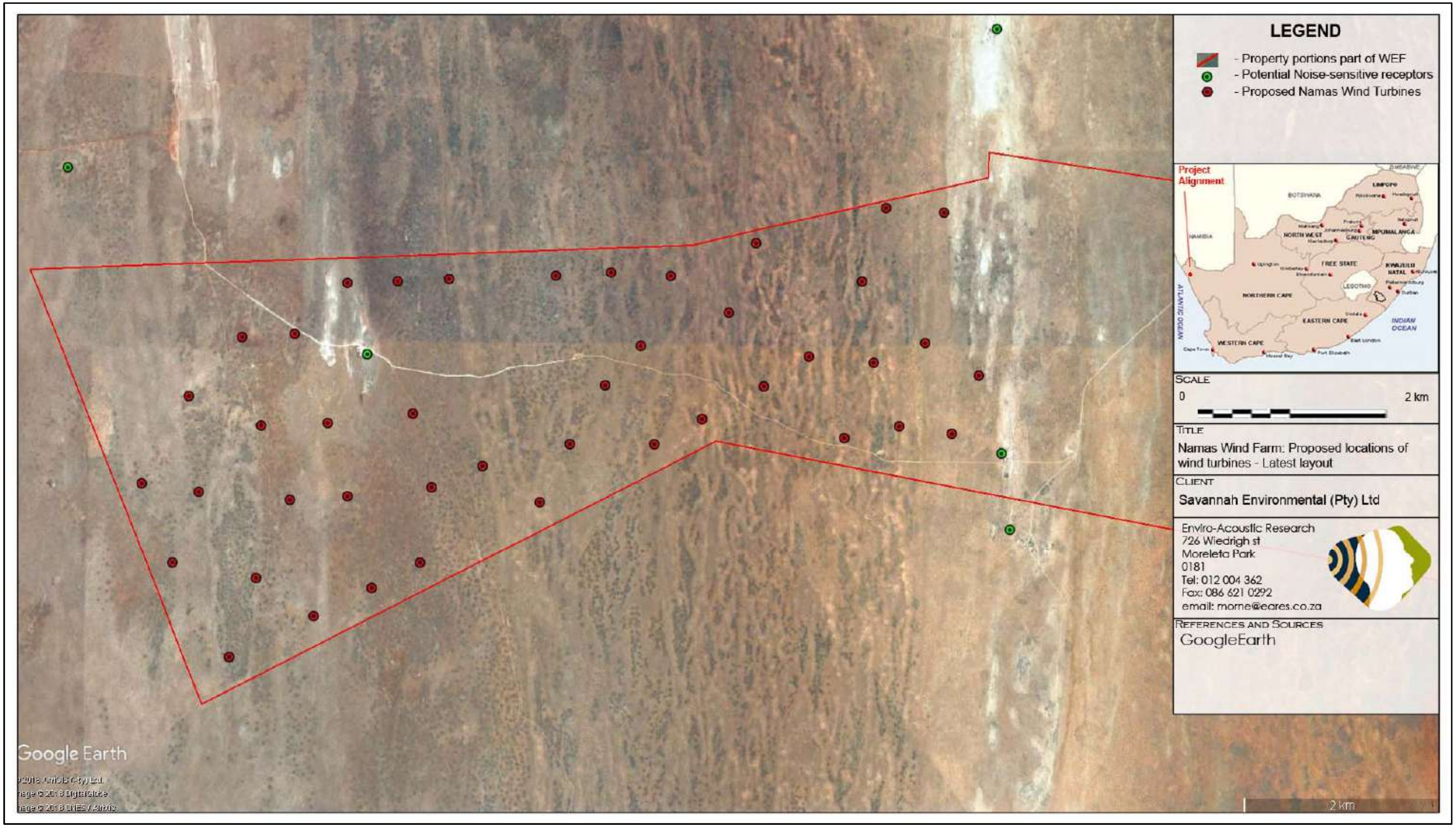

Figure 9.5: Noise-sensitive developments located within the project site of the Namas Wind Farm and the surrounding area . The map also illustrates the wind turbine positions associated with the development footprint.

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

Construction Phase Impacts

Nature: *Daytime construction of wind turbines*

Increase in ambient sound levels that can raise the ambient sound level with more than 7dB or daytime rating levels higher than 52dBA.

The Namas Wind Farm wind turbines will be constructed further than 500m from the identified receptors. Projected daytime noise levels could be as high as 43dBA for a portion of the construction period at NSDs 02 and 04. This is because of cumulative noises from various activities taking place at more than one location close to these receptors.

	Without mitigation	**With mitigation**
Extent	Site (2)	Site (2)
Duration	Short term (2)	Short term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (12)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	High - with the completion of the construction phase	High - with the completion of the construction phase
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, but not required.	

Mitigation:

» Significance of the noise impact is low for the scenario as conceptualised and mitigation is not required.

Residual Impacts:

Potential for residual noise impact is low.

Nature: *Night-time construction of wind turbines*

Increase in ambient sound levels that can raise the ambient sound level with more than 7dB or night-time rating levels higher than 42dBA.

The Namas Wind Farm turbines will be constructed further than 500m from the receptors. Construction activities closer than 340m from receptors will result in noise levels higher than 42dBA and the sounds may be highly audible during quiet times.

Due to cumulative effects (numerous equipment operating simultaneously), noise levels could be as high as 43dBA at NSD04. Temporary, very high noise levels (especially when it contains impulsive noises) at night could be disturbing and could impact on the quality of sleep of the closest receptors.

	Without mitigation	**With mitigation**
Extent	Site (2)	Site (2)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	**Low (30)**	**Low (30)**
Status (positive or negative)	Negative	Negative
Reversibility	High - with the completion of the construction phase	High - with the completion of the construction phase
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, but not required.	

Mitigation:
» Significance of noise impact is low for the scenario as conceptualised and mitigation is not required.
Residual Impacts:
Potential for residual noise impact is low.

Operation Phase Impacts

Nature: _Daytime operation of wind turbines_

Increase in ambient sound levels that can raise the ambient sound level with more than 7dB or daytime rating levels higher than 52dBA.

The Namas Wind Farm turbines are located further than 500m from the structures identified as possible houses, but cumulative effects due to numerous wind turbines operating within 1 000m of these dwellings would increase noise levels (mainly NSD04). In the unmitigated scenario, noise rating levels could be as high as 42dBA at NSD04, less than the proposed noise level at wind speeds exceeding 7 m/s.

The change in ambient sound levels may be higher than 7dBA at wind speeds less than 7 m/s (depending on the sound power emission levels of the selected wind turbine). Ambient sound level measurements highlighted average daytime sound levels of more than 40dBA.

	Without mitigation	**With mitigation**
Extent	Site (2)	Site (2)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Very improbable (1)	Very improbable (1)
Significance	**Low (8)**	**Low (8)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, but not required	
Mitigation:		
» Significance of noise impact is low for the scenario as conceptualised for daytime operational activities.		
Residual Impacts:		
Potential for residual noise impact is low.		

Nature: _Night-time operation of wind turbines_

Increase in ambient sound levels that can raise the ambient sound level with more than 7dB or night-time rating levels higher than 42dBA.

The Namas Wind Farm turbines are located further than 500m from the receptors, but cumulative effects due to numerous wind turbines operating simultaneously within 2 000m from a receptor would increase noise levels.

In the unmitigated scenario the maximum noise rating levels could be as high as 42dBA at NSD04 at night. In a quiet environment this may be a disturbance, though it is less than the 45dBA permitted for residential use (WHO guidelines).

The change in ambient sound levels may be higher than 7dB at wind speeds less than 7 m/s.

	Without mitigation	**With mitigation**
Extent	Local (3)	Local (3)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (39)**	**Low (22)**

Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: Mitigation options could involve: » The relocation of the people living in the zone where the 45dBA Noise Limit can be exceeded (NSD04 – Cumulative effect). » Redesign of the layout to allow a larger buffer zone around NSD04 (at least 800 m for all wind turbines located within the surroundings of NSD04, without increasing the number of wind turbines due to cumulative effects). » Reducing the number of wind turbines within 2 000m from NSD04. » The use of a quieter wind turbine around NSD04, or developing a noise curtailment programme to manage the noise level for certain wind turbines during certain wind speeds or directions. Should the dwellings (including those used by the farm workers) at NSD04 not be used for residential purposes at night, these mitigation options can fall away.		
Residual Impacts: Potential for residual noise impact is low.		

9.8.4 Implications for Project Implementation

The significance of noise during the construction phase is low and no additional mitigation measures are recommended or required. The noise impact is considered to be of a medium significance (prior to the implementation of mitigation) for NSD04 only, which can be reduced to low with the implementation of mitigation measures. The mitigation measures could be one or more of the following measures:

» The developer must investigate any reasonable and valid noise complaint if registered by a receptor staying within 2 000m from the location where construction activities are taking place or from an operational wind turbine.
» The potential noise impact must again be evaluated should the layout be changed where any wind turbines are located closer than 1 000m from a confirmed NSD, or if the layout is changed where additional wind turbines are added within 1 000m from any NSD.
» The developer must measure ambient sound levels over at least a two (2) night period during the winter months to allow analysis of the data prior to the development of the wind farm. The data must be used to develop ambient sound levels versus wind speed curves.
» The developer must ensure that no receptor is subjected to total noise levels exceeding 45dBA at night due to the development of the wind farm.
» Operational noise measurements should be collected over at least 48 hours during the operation phase (winter period) to ensure that noise levels are less than 45dBA (considering the pre-construction ambient sound level measurements), or that the change in ambient sound levels is less than 7dB. The acoustician measuring noise levels can advise whether further measurements are required.
» Operational noise measurements should be collected over at least 48 hours during the operation phase (winter period) to ensure that noise levels are less than 42dBA at NSD04 with people staying at this farm dwelling. The acoustician measuring noise levels can advise whether further measurements are required.

9.9. Assessment of Visual Impacts

Negative impacts on visual receptors will occur during the undertaking of construction activities and the operation of the Namas Wind Farm. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix J**).

9.9.1 Results of the Visual Impact Assessment

The area within which the development of the Namas Wind Farm is located has a low development density and low viewer incidence. The viewer incidence may fluctuate according to the tourism activity experienced within the area. The land use of the area includes limited farming practises and mining activities. The down-scaling of mining operations within the Kleinsee area has resulted in an out-migration of people which contributes to the low viewer incidence and the low development density present.

The construction and operation of the Namas Wind Farm and its associated infrastructure will have a visual impact on the surrounding area, especially within (but not restricted to) a 5km radius. The visual impact will differ between viewpoints, depending on the distance from the facility.

Overall, the significance of the visual impact is expected to range from high to low as a result of the generally undeveloped character of the landscape. The wind farm would be visible within an area that incorporates certain sensitive visual receptors including people travelling along roads, residents of rural homesteads and settlements, and tourists passing through or holidaying in the region. However, the density of the receptors will not be high due to the remote location of the area and the down-scaling and degradation of the surrounding towns.

9.9.2 Visual Assessment

During the construction phase of the Namas Wind Farm a noticeable increase in heavy vehicles utilising the roads will occur. This will result in a visual nuisance to other road users and landowners within the surrounding area. The significance of the visual impacts of the construction phase will be low with the implementation of the recommended mitigation measures. The impact is expected to be of a short duration and will be of a local extent.

The operation of the Namas Wind Farm will have a high visual impact on observers travelling along the Kommagas to Kleinsee and the Koingnaas to Kleinsee secondary roads, as well as the residents of homesteads within a 5km radius of the wind farm. It is not possible to mitigate this impact to a lower significance, however general mitigation and management measures are recommended as best practice by the specialist. The duration of the impact will be long term and will have a local extent. The impact of high significance is however not considered to be a fatal flaw for the Namas Wind Farm.

Within a 5-10km radius of the operational Namas Wind Farm, a moderate visual impact is expected to occur on observers travelling along the Kommagas to Kleinsee and the Koingnaas to Kleinsee secondary roads, as well as the residents of homesteads. It is not possible to mitigate this impact to a lower significance, however general mitigation and management measures are recommended as best practice by the specialist. The duration of the impact will be long term and will have a regional extent.

The operation of the Namas Wind Farm may result in shadow flicker. The specialist identified a 480m buffer along the edge of the outer most turbines which is the zone within which there is a risk of shadow flicker occurring. There are no major roads or places of residence within the 480m buffer and therefore the significance of shadow flicker is anticipated to be low to negligible. The impact duration will be long term and of a local extent.

During the operation of the Namas Wind Farm operational, safety and security lighting will be required at night which may impact observers in close proximity. The significance of the impact will be low with the implementation of the recommended mitigation measures. The impact duration will be long term and will be of a local extent.

The operation of the ancillary infrastructure associated with the Namas Wind Farm may have a visual impact on observers in close proximity to the wind farm. The significance of the impact will be low following the implementation of the mitigation measures recommended by the specialist. The construction of the substation is expected to have a limited influence on the overall visual exposure of the larger wind turbine structures. The duration of the impact will be long term and will be of a local extent.

The operation of the Namas Wind Farm will have an impact on the regional visual quality and, by implication, an impact on the sense of place. The significance of the impact on the sense of place will be of a moderate significance, with the implementation of the recommended mitigation measures. This is due to the relatively low viewer incidence within close proximity to the project site, the presence of the existing mining activities, electricity infrastructure, and the distance of the Namas Wind Farm from the coast. The duration of the impact will be long term and will be of a regional extent.

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

Construction Phase Impacts

Nature: *Visual impact of construction activities on sensitive visual receptors in close proximity to the Namas Wind Farm* During the construction of the wind farm there may be a noticeable increase in heavy vehicles utilising the roads to the project site that may cause, at the very least, a visual nuisance to other road users and landowners in the area. Construction activities may potentially result in a moderate temporary visual impact that may be mitigated to low.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (40)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable	Recoverable
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: Planning: » Retain and maintain natural vegetation immediately adjacent to the development footprint. Construction:		

- Ensure that vegetation is not unnecessarily removed during the construction phase.
- Plan the placement of lay-down areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.
- Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.
- Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.
- Reduce and control construction dust using approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).
- Restrict construction activities to daylight hours whenever possible in order to reduce lighting impacts.
- Rehabilitate all disturbed areas immediately after the completion of construction works.

Residual Impacts:
None, provided that the rehabilitation works are carried out as specified.

Operation Phase Impacts

Nature: *Potential visual impact on sensitive visual receptors within a 5km radius of the wind turbine structures*
The Namas Wind Farm is expected to have a high visual impact on observers traveling along the roads and residents of homesteads within a 5km radius of the wind turbine structures. No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Very high (10)	Very high (10)
Probability	Highly probable (4)	Highly probable (4)
Significance	**High (64)**	**High (64)**
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable	Recoverable
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	

Mitigation:
Planning:
- Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint.

Operation:
- Maintain the general appearance of the facility as a whole.

Decommissioning:
- Remove infrastructure not required for the post-decommissioning use.
- Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.

Residual Impacts:
The visual impact will be removed after decommissioning, provided that the wind farm infrastructure is removed. Failing this, the visual impact will remain.

Nature: *Potential visual impact on sensitive visual receptors within the region (5-10km radius)*
Visual impact on observers travelling along the roads and residents at homesteads within a 5 – 10km radius of the wind turbine structures. The Namas Wind Farm could have a moderate visual impact. No mitigation of this impact is possible, but general mitigation and management measures are recommended as best practice.

	Without mitigation	**With mitigation**
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)

Probability	Probable (3)	Probable (3)
Significance	**Medium (39)**	**Medium (39)**
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable	Recoverable
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	

Mitigation:

Planning:

» Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint.

Operation:

» Maintain the general appearance of the facility as a whole.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use.
» Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.

Residual Impacts:

The visual impact will be removed after decommissioning, provided that the wind farm infrastructure is removed. Failing this, the visual impact will remain.

Nature: *Visual impact of shadow flicker on sensitive visual receptors in close proximity to the wind farm*

Shadow flicker only occurs when the sky is clear, and when the turbine rotor blades are between the sun and the receptor. A 480m buffer along the edge of the outer most turbines is submitted as the zone within which there is a risk of shadow flicker occurring.

There are no major roads or places of residence within the 480m buffer. The significance of shadow flicker is therefore anticipated to be low to negligible.

	Without mitigation	With mitigation
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (20)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable	Recoverable
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	N/A due to the low probability of occurrence.	

Mitigation:

N/A

Residual Impacts:

N/A

Nature: *Potential visual impact of operational, safety and security lighting of the wind farm at night on observers in close proximity to the wind farm*

The area immediately surrounding the Namas Wind Farm has a relatively low incidence of receptors and light sources, so light trespass and glare from the security and after-hours operational lighting for the wind farm will have some significance for visual receptors in close proximity.

Another source of glare light, albeit not as intense as flood lighting, is the aircraft warning lights mounted on top of the hub of the wind turbines. These lights are less aggravating due to the toned-down red colour, but have the potential to be visible from a great distance.

Last is the potential lighting impact known as sky glow. Sky glow is the condition where the night sky is illuminated when light reflects off particles in the atmosphere such as moisture, dust or smog. The sky glow intensifies with the increase in the amount of light sources. Each new light source, especially upwardly directed lighting, contributes to the increase in sky glow.

This anticipated lighting impact is likely to be of moderate significance and can be mitigated to low.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	Moderate (6)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (42)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable	Recoverable
Irreplaceable loss of resources?	No	no
Can impacts be mitigated?	Yes	

Mitigation:

Planning and operation:

» Limit aircraft warning lights to the turbines on the perimeter, thereby reducing the overall requirement.
» Investigate aircraft warning lights that only activate when the presence of an aircraft is detected.
» Shield the sources of light by physical barriers (walls, vegetation, or the structure itself).
» Limit mounting heights of lighting fixtures, or alternatively use foot-lights or bollard level lights.
» Make use of minimum lumen or wattage in fixtures.
» Make use of down-lighters, or shielded fixtures.
» Make use of Low Pressure Sodium lighting or other types of low impact lighting.
» Make use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.

Residual Impacts:

The visual impact will be removed after decommissioning, provided that the wind farm and ancillary infrastructure is removed. Failing this, the visual impact will remain.

Nature: *Visual impact of the ancillary infrastructure on the observers in close proximity to the structures*

On-site ancillary infrastructure associated with the wind farm includes the smaller substations (inverters), 33kV cabling between the wind turbines, internal access roads, and workshop and office buildings. The anticipated visual impact resulting from this infrastructure is likely to be of low significance both before and after mitigation.

The construction of the substation is expected to have a limited influence on the overall visual exposure of the larger wind turbine structures.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (20)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable	Recoverable
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	

Mitigation:

Planning:

» Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint.

Operation:

» Maintain the general appearance of the infrastructure. Decommissioning: » Remove infrastructure not required for the post-decommissioning use. » Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.		
Residual Impacts: The visual impact will be removed after decommissioning, provided that the ancillary infrastructure is removed. Failing this, the visual impact will remain.		

Nature: *The potential visual impact of the wind farm on the sense of place in the region* Sense of place refers to a unique experience of an environment by a user, based on his or her cognitive experience of the place. An impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light. The greater environment has a rural, undeveloped character and a natural appearance. These generally undeveloped landscapes are considered to have a high visual quality. The coastal areas have an even greater visual attraction due to their ocean views and West Coast character. The anticipated visual impact of the Namas Wind Farm on the regional visual quality, and by implication, on the sense of place, is difficult to quantify, but is generally expected to be of moderate significance. This is due to the relatively low viewer incidence within close proximity to the project site, the presence of the existing mining activities, electricity infrastructure, and the distance of the Namas Wind Farm from the coast.		
	Without mitigation	**With mitigation**
Extent	Region (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	**Moderate (39)**	**Moderate (39)**
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable	Recoverable
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented.	
Mitigation: Planning: » Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint. Operation: » Maintain the general appearance of the facility as a whole. Decommissioning: » Remove infrastructure not required for the post-decommissioning use. » Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.		
Residual Impacts: The visual impact will be removed after decommissioning, provided that the wind farm infrastructure is removed. Failing this, the visual impact will remain.		

9.9.4 Implications for Project Implementation

The primary visual impact, namely the appearance of the wind farm (i.e. wind turbines) is not possible to mitigate. The appearance of the turbines cannot be changed in order to reduce the visual impacts due to the limited design variations of commercially available wind turbines. Overall, the significance of the visual impacts is expected to range from high to low as a result of the generally undeveloped character of the landscape. The overall potential for mitigation is, therefore, generally low or non-existent. The following mitigation is, however, possible:

- Vegetation cover (i.e. either natural or cultivated) be maintained immediately adjacent to the actual development footprint, both during construction and operation of the proposed facility. This will minimise visual impact as a result of cleared areas and areas denuded of vegetation.
- Existing roads should be utilised wherever possible. New roads should be planned taking due cognisance of the topography to limit cut and fill requirements.
- In terms of on-site ancillary buildings and structures, it is recommended that it be planned so that clearing of vegetation is minimised.
- The Civil Aviation Authority (CAA) prescribes that aircraft warning lights be mounted on the turbines. However, it is possible to mount these lights on the turbines representing the outer perimeter of the wind farm. In this manner, fewer warning lights can be utilised to delineate the wind farm as one large obstruction, thereby lessening the potential visual impact.
- Investigate aircraft warning lights that only activate when the presence of an aircraft is detected.
- Mitigation of other lighting impacts includes the pro-active design, planning and specification lighting for the wind farm. The correct specification and placement of lighting and light fixtures for the wind farm and ancillary infrastructure will go far to contain rather than spread the light.
- Mitigation of visual impacts associated with the construction phase, albeit temporary, would entail proper planning, management and rehabilitation of the construction site.
- During operation, the maintenance of the turbines and ancillary structures and infrastructure will ensure that the facility does not degrade, therefore, aggravating the visual impact.
- Roads must be maintained to forego erosion and to suppress dust, and rehabilitated areas must be monitored for rehabilitation failure.
- Once the wind farm has exhausted its life span, the facility and all associated infrastructure not required for the post rehabilitation use of the site should be removed and all disturbed areas appropriately rehabilitated. An ecologist should be consulted to give input into rehabilitation specifications.
- All rehabilitated areas should be monitored for at least a year following decommissioning, and remedial actions implemented as and when required.
- Where sensitive visual receptors (including viewers traveling on the roads in the area and homesteads) are likely to be affected, it is recommended that the developer enter into negotiations regarding the potential screening of visual impacts at the receptor site. This may entail the planting of vegetation, trees or the construction of screens. Ultimately, visual screening is most effective when placed at the receptor itself.

9.10. Assessment of Socio-economic Impacts

Potential social and socio-economic impacts and the relative significance of the impacts associated with the development of the Namas Wind Farm are summarised below (refer to **Appendix K**).

9.10.1 Results of the Socio-economic Impact Assessment

The area within which the development of the Namas Wind Farm is located has a low development density. The land use of the area includes limited farming practises and mining activities. The down-scaling of mining operations within the Kleinsee area has resulted in an out-migration of people which contributes to the low development density present.

Through the assessment of the socio-economic impacts both positive and negative impacts are expected to occur. These include:

- Construction Phase
  - Stimulation of the economy
  - Temporary employment creation due to construction activities
  - Household income attainment due to employment opportunities
  - Skills development and enhancement due to construction activities
  - Change in sense of place due to construction activities
  - Potential increase in theft related crimes
  - Increase in government revenue due to rates and taxes

- Operation Phase
  - Stimulation of the economy
  - Long-term employment creation due to operation and maintenance activities
  - Household income attainment due to employment opportunities
  - Skills development and enhancement due to operation activities
  - Change in sense of place due to visual impact of wind turbines
  - Renewable energy security
  - Increase in local government revenue due to rates and taxes

- Decommissioning Phase
  - Temporary increase in production in the economy and reuse of recovered metallic and non-metallic materials

9.10.2 Description of Socio-economic Impacts

The significance of the positive impacts expected during the construction phase will be high to medium, with the implementation of the recommended enhancement measures. The extent of the positive impacts ranges from national to regional.

The significance of the negative impacts expected during the operation phase will be medium to low with the implementation of the recommended mitigation measures. The extent of the negative impacts is expected to be regional.

During the operation phase only positive impacts are expected to occur, and no negative impacts. The significance of the positive impacts ranges from high to medium. The extent of the positive operational impacts will be national to regional.

During the decommissioning phase positive impacts are expected to occur. The impacts will be of a medium significance and will be of a national extent.

9.10.3 *Impact tables summarising the significance of socio-economic impacts during construction and operation (with and without mitigation measures)*

Construction Phase Impacts

Nature: Increase in production and Gross Domestic Product per Region (GDP-R) Expenditure associated with the construction of the Namas Wind Farm will impact on the production of the local and national economies directly and indirectly.		
	Without enhancement	**With enhancement**
Extent	National (5)	National (5)
Duration	Short term (2)	Short term (2)
Magnitude	High (8)	High (8)
Probability	Definite (5)	Definite (5)
Significance	**High (75)**	**High (75)**
Status (positive or negative)	Positive	Positive
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, impacts can be enhanced	
Mitigation/Enhancement: » The project developer should procure goods and services, as far as practically possible, from the local and district municipalities. » Local Small and Medium Enterprises should be approached to investigate the opportunities for supplying inputs required for the construction of the facility, as far as feasible. The above mitigation (enhancement) measures are meant to increase the positive impact on the local and district municipalities, but it will not change the rating of the impact on the "national" scale.		
Residual Impacts: There will be no residual impact associated with the Namas Wind Farm, but residual benefits are possible such as the continuation of production in the economy.		

Nature: Creation of temporary employment The construction of the Namas Wind Farm will positively impact on the local and national economies by creating temporary job opportunities directly and indirectly (albeit temporary).		
	Without enhancement	**With enhancement**
Extent	National (5)	National (5)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Moderate (6)
Probability	Definite (5)	Definite (5)
Significance	**High (65)**	**High (65)**
Status (positive or negative)	Positive	Positive
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, impacts can be enhanced	
Mitigation/Enhancement: » Organise local community meetings to inform the local labour force of the Namas Wind Farm that is planned to be established and the jobs that can potentially be applied for. » Establish a local skills desk to identify the skills set of the local residents available for the construction and operation phases of the wind farm.		
Residual Impacts:		

There will be no residual impact associated with the Namas Wind Farm, but residual benefits are possible such as experience gained by the employees employed during the construction phase.

Nature: *Attainment of household income* Employed individuals will increase the income of their respective households and therefore improve their standard of living.		
	Without enhancement	**With enhancement**
Extent	National (5)	National (5)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Moderate (6)
Probability	Definite (5)	Definite (5)
Significance	**High (65)**	**High (65)**
Status (positive or negative)	Positive	Positive
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, impacts can be enhanced	
Mitigation/Enhancement: » Hire mainly local residents, which will boost the local economy through expenditure that empowers local businesses and economy.		
Residual Impacts: There will be no residual impact associated with the Namas Wind Farm, but residual benefits are possible such as an improved standard of living following the completion of the construction phase (even if only for a limited time).		

Nature: *Skills development and enhancement* Employees will develop and enhance skills thereby increasing experience and knowledge.		
	Without enhancement	**With enhancement**
Extent	Regional (3)	Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Moderate (6)
Probability	Highly probable (4)	Definite (5)
Significance	**Medium (36)**	**Medium (55)**
Status (positive or negative)	Positive	Positive
Reversibility	Low	Low
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, impacts can be enhanced	
Mitigation/Enhancement: » In order to maximise the positive impact, it is suggested that the project company provide training courses for employees where feasible to ensure that employees notably gain from the work experience. » Facilitation of the transfer of knowledge between experienced employees and lower-skilled staff is recommended.		
Residual Impacts: The skills obtained by the employed labour force are permanent and will therefore be retained.		

Nature: *Influx of migrant labour and job seekers* An impact on the demographics of the area will occur as a result of in-migration in response to job opportunities.		
	Without mitigation	**With mitigation**
Extent	Regional (3)	Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (44)**	**Medium (33)**

Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

- Where feasible, effort must be made to employ local labour in order to create maximum benefit for the local communities and limit in-migration.
- Provide training for unemployed local community members with insufficient skills and therefore increase absorption of local labour thereby decreasing in-migration.
- In collaboration with the local municipality, manage recruitment and marketing for vacancies with a preference for residents within the municipality.
- Implement health awareness campaigns to curb the potential of spreading disease, use of drugs or alcohol abuse for example; special attention should be paid to drug abuse, which is very common in the area.

Residual Impacts:

A negligible amount of migrant job seekers will not be employed by the Namas Wind Farm.

Nature: *Change in sense of place*

A change in the sense of place will take place due to the construction of the Namas Wind Farm.

	Without mitigation	**With mitigation**
Extent	Regional (3)	Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (44)**	**Medium (33)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	

Mitigation:

- Implement mitigation measures proposed by the various specialists, including traffic, visual, and noise specialists.
- The provision of public transport alternatives for workers so as to decrease the number of vehicles on the road during peak hours is recommended.
- Partner with local municipal authorities and other prominent users of the local roads to upgrade them if necessary to meet the required capacity and intensity of the vehicles related to the construction of the wind farm.

Residual Impacts:

Construction activities will change the sense of place; however, if the project requires roads to be upgraded for the purpose of transporting necessary materials to the project site then improved road conditions are likely to benefit the local area.

Nature: *Potential stock theft and security issues*

Potential security and theft risk due to increased volume of people on site during construction.

	Without mitigation	**With mitigation**
Extent	Regional (3)	Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (44)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	

Mitigation:
» Engage with the local landowners to understand their security concerns, requirements and rules for accessing their land (if applicable), and consider proposals to address the concerns associated with possible theft of stock and other criminal activities as well as agree on compensation protocols. » Ensure strict security checks to and from the construction site, as well as proper fencing around the site to deter illegal entry. » Work with the local landowners on implementing the necessary controls. » Engage with the landowners of Portion 2 of Farm Rooivlei 327 with regard to the access to the project site across this property.
Residual Impacts:
No residual impacts are applicable.

Nature: Increase in government revenue Government revenue will be derived from the Namas Wind Farm in the form of rates and taxes.		
	Without enhancement	**With enhancement**
Extent	National (5)	National (5)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Low (4)
Probability	Definite (5)	Definite (5)
Significance	**Medium (55)**	**Medium (55)**
Status (positive or negative)	Positive	Positive
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	**No**	
Mitigation/Enhancement: No mitigation / enhancement measures are required.		
Residual Impacts: There will be no residual impact associated with the Namas Wind Farm, but residual benefits are possible such as an increased government revenue following the completion of the construction phase which may be used in the area.		

Operation Phase Impacts

Nature: Stimulation of the economy Expenditure associated with the operation of the wind farm will impact on the production of the local economy.		
	Without enhancement	**With enhancement**
Extent	National (5)	National (5)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Definite (5)	Definite (5)
Significance	**High (65)**	**High (65)**
Status (positive or negative)	Positive	Positive
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, impacts can be enhanced	
Mitigation/Enhancement: » The project developer should make effort to use locally sourced inputs where feasible in order to maximise the benefit to the local economy. » Local Small and Medium Enterprises should be approached to investigate the opportunities for supplying inputs required for the maintenance and operation of the facility, as far as feasible; alternatively, creation of new small enterprises to support operations and maintenance of the wind farm should be considered where feasible.		

Residual Impacts:
There will be no residual impact associated with the Namas Wind Farm, but residual benefits are possible such as the continuous operation of developed businesses associated with the wind farm.

Nature: *Creation of long-term employment* The operation of the Namas Wind Farm will positively impact on the community by creating a number of job opportunities.		
	Without enhancement	**With enhancement**
Extent	Regional (3)	Regional (3)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Low (4)
Probability	Definite (5)	Definite (5)
Significance	**Medium (45)**	**Medium (55)**
Status (positive or negative)	Positive	Positive
Reversibility	High	High
Irreplaceable loss of resources?	No	no
Can impacts be mitigated?	Yes, impacts can be enhanced	
Mitigation/Enhancement: » Where feasible, effort must be made to employ locally in order to create maximum benefit for the local communities in the surrounding areas.		
Residual Impacts: The indirect and induced employment created will possibly continue post the project's operations period.		

Nature: *Increase in household income* Employed individuals will increase the income of their respective households and therefore improve their standard of living.		
	Without enhancement	**With enhancement**
Extent	Regional (3)	Regional (3)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Low (4)
Probability	Definite (5)	Definite (5)
Significance	**Medium (45)**	**Medium (55)**
Status (positive or negative)	Positive	Positive
Reversibility	High	High
Irreplaceable loss of resources?	No	Np
Can impacts be mitigated?	Yes, impacts can be enhanced.	
Mitigation/Enhancement: » Employing locally will increase the benefit to local households and inadvertently the local economy.		
Residual Impacts: The economy will be stimulated.		

Nature: *Positive impact on skills development* Employees will develop and enhance skills thereby increasing experience and knowledge.		
	Without enhancement	**With enhancement**
Extent	Regional (3)	Regional (3)
Duration	Medium term (3)	Medium term (3)
Magnitude	Low (4)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (40)**	**Medium (48)**
Status (positive or negative)	Positive	Positive

Reversibility	Low	Low
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, impacts can be enhanced	
Mitigation/Enhancement: » In order to maximise the positive impact, it is suggested that the project company provide training courses for employees where feasible to ensure that employees gain as much as possible from the work experience. » The transfer of knowledge between experienced employees and the local staff should be facilitated. » A skills audit to determine the potential skills that could be sourced in the area for the operation of the wind farm should be undertaken during the planning phase.		
Residual Impacts: The beneficiaries will retain the skills for periods beyond the project life.		

Nature: <u>*Increase in government revenue*</u> Government revenue will be derived from the Namas Wind Farm during the operation phase.		
	Without enhancement	**With enhancement**
Extent	National (5)	National (5)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Definite (5)	Definite (5)
Significance	**Medium (55)**	**Medium (55)**
Status (positive or negative)	Positive	Positive
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation/Enhancement: No mitigation or enhancement measures are required.		
Residual Impacts: No residual risks are applicable.		

Decommissioning Phase Impacts

Nature: <u>*Impacts expected during the decommissioning phase*</u> During the decommissioning, the project will create a number of temporary employment opportunities and will stimulate demand for services of transport and construction companies. In addition, the decommissioning will result in the extraction of metallic and non-metallic materials from the site that could be re-used in other projects, contributing to the efficient production in the economy.		
	Without enhancement	**With enhancement**
Extent	National (5)	National (5)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (44)**	**Medium (44)**
Status (positive or negative)	Positive	Positive
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, impacts can be enhanced	
Mitigation: » Develop and implement a material recovery strategy to optimise the use of valuable metallic materials and, where applicable, recycle non-metallic materials comprising various components of the Namas Wind Farm.		
Residual Impacts:		

No residual risks are applicable.

9.10.4 *Implications for Project Implementation*

The significance of the positive impacts associated with the socio-economic aspects that will be affected by the Namas Wind Farm ranges from high to medium with the implementation of the enhancement measures recommended. These enhancement measures include:

» Procurement of goods and services, as far as practically possible, from the local municipality.
» Local Small and Medium Enterprises should be approached to investigate the opportunities for supplying inputs required for the construction of the wind farm, as far as feasible.
» Establish a local skills desk to identify the skills set of the local residents available for the construction and operation phases of the wind farm.
» Hire mainly local residents, which will boost the local economy through expenditure that empowers local businesses and economy.
» In order to maximise the positive impact, it is suggested that the project company provide training courses for employees where feasible to ensure that employees notably gain from the work experience.
» A skills audit to determine the potential skills that could be sourced in the area for the operation of the wind farm should be undertaken during the planning phase.

The significance of the negative impacts associated with the socio-economic aspects that will be affected by the Namas Wind Farm ranges from medium to low with the implementation of the recommended mitigation measures. The mitigation measures include:

» Provide training for unemployed local community members with insufficient skills and therefore increase absorption of local labour thereby decreasing in-migration.
» In collaboration with the local municipality, manage recruitment and marketing for vacancies with a preference for residents within the municipality.
» Implement health awareness campaigns to curb the potential of spreading disease, use of drugs or alcohol abuse for example; special attention should be paid to drug abuse, which is very common in the area.
» The provision of public transport alternatives for workers so as to decrease the number of vehicles on the road during peak hours is recommended.
» Partner with local municipal authorities and other prominent users of the local roads to upgrade them if necessary to meet the required capacity and intensity of the vehicles related to the construction of the wind farm.
» Engage with the local landowners to understand their security concerns, requirements and rules for accessing their land (if applicable), and consider proposals to address the concerns associated with possible theft of stock and other criminal activities as well as agree on compensation protocols.
» Ensure strict security checks to and from the construction site, as well as proper fencing around the site to deter illegal entry.
» Engage with the landowners of Portion 2 of Farm Rooivlei 327 with regard to the access to the project site across this property.

9.11. Assessment of Impacts on Traffic

Potential impacts on the traffic components of the affected area and the relative significance of the impacts associated with the development of the Namas Wind Farm are summarised below (refer to **Appendix L**).

9.11.1 Results of the Traffic Impact Assessment

The Traffic Impact Assessment concluded that the current volumes on the routes within the area are very low due to the low development density of the area. The closure of the mining operations in the area resulted in a loss of employment opportunities and an out-migration of the population to other areas, which contributes to the low traffic volumes of the area. There is also a lack of schools within the area which contributes to the low traffic volumes.

It was also identified that the local routes within the vicinity of the project site can accommodate moderate to high traffic volumes due to the historical mining operations and the usage of the roads for the mines within the area.

The only notable traffic that would be associated with the Namas Wind Farm will be during the construction and decommissioning phases. It is expected that the trips generated during these phases will occur for short period of time.

9.11.2 Description of Traffic Impacts

The traffic expected to be generated by the development of the Namas Wind Farm can be divided into the three phases of the project, namely:

» *Construction Phase* – The construction phase includes the transportation of people, construction materials and equipment to the project site. This phase also includes the construction of roads, excavation of turbine footings, trenching for electrical cables and other ancillary construction works that will temporarily generate the largest amount of traffic.

» *Operation Phase* – During the operation phase (including the undertaking of maintenance activities) it is expected that staff and security will periodically visit the turbines. The traffic generated during this phase will be minimal and will not have significant impact on the surrounding road network. The maintenance and replacement of wind turbine components would require a crane and abnormal vehicles. Although abnormal load vehicles will be required, the maintenance or replacement of components can be staggered, and the transportation of the components would therefore take place over a short period of time. Traffic disruptions can be minimised by transporting the components during off-peak hours. The operation phase is expected to generate minimal traffic.

» *Decommissioning Phase* – The decommissioning phase will generate construction related traffic including the transportation of people, construction materials, water and equipment (i.e. abnormal trucks transporting turbine components). It is therefore expected that the decommissioning phase will generate the same impact as that of the construction phase.

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

Construction Phase Impacts

Nature: *Traffic impacts expected during the construction phase*

With the transportation of the wind turbine, three abnormal loads will be required for the turbine blades, seven abnormal loads for the tower sections and another abnormal load for the nacelle. All other components will be transported with normal limitations haulage vehicles. With approximately eleven abnormal load trips, the total for a maximum of 43 wind turbines will be approximately 473 trips. These trips are expected to be staggered.

The construction of roads and concrete footings will have a significant impact on the surrounding road network as vehicles deliver materials to the site. A concrete footing generates approximately 80 trips by concrete trucks to the surrounding road network.

	Without mitigation	**With mitigation**
Extent	Regional (3)	Regional (2)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Very likely (4)	Very likely (4)
Significance	**Medium (44)**	**Medium (32)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

- » Stagger turbine component delivery to the site.
- » Stagger the construction of the turbines.
- » The use of mobile batching plants and quarries in close proximity to the project site would decrease the impact on the surrounding road network.
- » Staff and general trips should occur outside of peak traffic periods.
- » For the access points, it is recommended that the 228m sight triangle area be kept clear of obstructions.

Residual Impacts:

Impact on the local traffic will remain moderate.

Operation Phase Impacts

Nature: *Traffic impacts expected during the operation phase*

Vehicle trips expected to be generated during the operation phase will be low and will have a negligible impact on the external road network.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Small (0)	Small (0)
Probability	Very likely (4)	Very likely (4)
Significance	**Low (24)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

» Staff and general trips can occur outside of peak traffic hours.
Residual Impacts:
None

Decommissioning phase Impacts

Nature: *Traffic impacts expected during the decommissioning phase* The decommissioning phase will result in the same impacts as the construction phase as similar vehicles and trips are expected to dismantle and appropriately dispose of the wind farm components.		
	Without mitigation	**With mitigation**
Extent	Regional (3)	Regional (2)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Very likely (4)	Very likely (4)
Significance	**Medium (44)**	**Medium (32)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Stagger the removal of turbines, foundations, crane pads etc. » Staff and general trips should occur outside of peak traffic periods. » For the access points, it is recommended that the 228m sight triangle area be kept clear of obstructions.		
Residual Impacts: Impact on the local traffic will remain moderate.		

9.11.4 Implications for Project Implementation

With the implementation of mitigation measures by the developer, contractors, and operational staff, the significance of traffic impacts of the Namas Wind Farm can be reduced to low or medium, depending on the impact being considered. From the outcomes of the studies undertaken, it is concluded that the wind farm can be developed, with on-site mitigation viewed as the most practical and appropriate action, and a viable option for reducing the overall impact of the development on these areas is detailed below:

» For the access points, it is recommended that the 228m sight triangle area be kept clear of obstructions.
» It needs to be noted that all access and internal roads should be investigated for their topographical suitability, i.e. feasibility for haulage trucks and especially abnormal loads to navigate and have sufficient height clearance for any Eskom lines, Telkom lines or similar.
» All bellmouths along the chosen site accesses to the wind turbine locations need to be in line with the required geometric standards to accommodate abnormal haulage vehicles. The exact location and upgrades of the internal access roads will need to be established at detailed design stage.
» The chosen access and circulation roads will have to be upgraded to suit abnormal load vehicle requirements. It needs to be ensured that if the access and circulation roads to the site are to remain as gravel roads, the routes need to be maintained during the additional loading experienced during the construction phase and be reinstated once construction is complete.
» It is recommended that the respective haulage company conducts a route test to determine the restrictions relevant to the haulage vehicle to be utilised. With some routes, road signs may need to be moved, overhead cables may need to be raised and bellmouths may need temporary widening to

accommodate abnormal loads. A route test will help establish relevant changes specific to the abnormal load truck used to deliver the components and materials.

9.12. Assessment of the 'Do Nothing' Alternative

The 'do-nothing' alternative (i.e. no-go alternative) is the option of not constructing the Namas Wind Farm. Should this alternative be selected, there would be no environmental impacts on the site due to the construction and operation activities of a wind farm.

a) Land use and agriculture

There are no high potential soils in the project site, and all soils present are of a moderate potential. Every land type is dominated by structureless soils which are sandy. There is little potential to increase the agricultural potential in the form of irrigation development as the irrigable soils are very limited and the soils present will lead to rapid water infiltration and the soils drying out. Water availability is limited (scarce and of variable quality) and the low rainfall experienced in the area means that there is little potential for rain-fed arable agriculture. The soils present are considered to be suitable for extensive grazing at best, however the grazing capacity of the area is very low with around 24-40ha/large stock unit. The proposed development footprint of the Namas Wind Farm would allow the on-going current grazing and sheep farming activities to continue on areas of the affected properties that will not house wind farm infrastructure. The development footprint of the Namas Wind Farm is less than 1% of the total extent of the project site. Therefore the current land-use will be retained, while also generating renewable energy from the wind. The impact on agricultural activities as a result of the project is, therefore, expected to be low.

Therefore, the implementation of the 'do-nothing' alternative would leave the land-use restricted to the current livestock grazing, losing out on the opportunity to generate renewable energy from wind as additive thereto (i.e. current livestock grazing would continue). Therefore, from a land-use perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of a viable and compatible land use.

In addition, the landowner would obtain an income from the facility (as the developer would pay a percentage of the revenue generated to the landowner in accordance with the lease agreement for the use of the land). This would contribute towards the financial stability of the landowner which would in turn contribute to the financial viability of the farming practices on the property. The implementation of the 'do nothing' alternative would retain the current land-use, fore-going the opportunity to generate renewable energy from the wind and at the same time continue the current agricultural activities (i.e. grazing and sheep farming) on areas that fall outside of the Namas Wind Farm infrastructure.

The 'do nothing' alternative would result in a lost opportunity for the landowner (in terms of implementing a compatible land use option, while still retaining the current land use, as well as a loss in long-term revenue) and the country (in terms of renewable energy). From this perspective the no-go alternative is not preferred when considering land use and agricultural potential of the project site.

b) Socio-economic impact

Social: The impacts of pursuing the no-go alternative are both positive and negative as follows:

- » The benefits would be that there is no disruption from an influx of jobseekers into the Kleinsee area, nuisance impacts (noise and dust during construction), visual impacts and safety and security impacts. The impact is therefore neutral.
- » There would also be an opportunity lost in terms of job creation, skills development and associated economic business opportunities for the local economy, as well as a loss of the opportunity to generate energy from a renewable resource without creating detrimental effects on the environment.

Foregoing the proposed development would not necessarily compromise the development of renewable energy facilities in South Africa. However, the socio-economic benefits for local communities at this location and within the surrounding area would be forfeited. The area has experienced social challenges including a loss of employment due to the closure of mining operations and an out-migration of the population to other areas, which has contributed to a low development density.

Therefore, from a socio-economic perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of socio-economic benefits, when considering the current socio-economic conditions of the area.

New Business: Some of the positive spin off effects that are to ensue from the project expenditure will be localised in the communities located near the site, such as the town of Kleinsee. The local services sector and specifically the trade, transportation, catering and accommodation, renting services, personal services and business services are expected to benefit the most from the project activities during the construction phase. New business sales that will be stimulated as a result of the establishment of the wind farm, albeit for a temporary period, will be lost with the implementation of the 'do nothing' alternative. Therefore from a business perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of new business opportunities.

Employment: Approximately 400 full time equivalent jobs will be created during the 18-24 months construction phase. The majority of low-skilled and semi-skilled opportunities are likely to be available to local workers. The Nama Khoi Local Municipality's employment rate stands at 17%. The development of the Namas Wind Farm within the Nama Khoi Local Municipality will aid in a reduction of the unemployment rate, however if the wind farm is not developed then the unemployment rate will not be positively influenced by the proposed development. The upliftment and socio-economic benefits for individuals within local communities would be forfeited with the implementation of the 'do nothing' alternative. Therefore, from an employment perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of employment opportunities.

Skills development: The establishment of the Namas Wind Farm will offer numerous opportunities for skills transfer and development. This is relevant for both on-site activities and manufacturing activities. Various wind farms are proposed to be developed in the area and in the Northern Cape Province, which means that the transfer of skills from foreign experts to the local engineers and construction workers will take place, similar to what has taken place where wind farms have been constructed and operated within the

Province. The skills training and transfer benefits for individuals within local communities would be forfeited with the implementation of the 'do nothing' alternative.

Municipal goals: The opportunity to contribute to the high wind energy generation zone near Springbok as identified by the Nama Khoi Local Municipality will not be met should the Namas Wind Farm not be constructed with the implementation of the 'do nothing' alternative.

The no-go alternative will therefore result in the above economic benefits not being realised and a subsequent loss of income and opportunities to local people. From this perspective the no-go alternative is not preferred.

c) Regional scale impact

At a broader scale, the benefits of additional capacity to the electricity grid and those associated with the introduction of renewable energy would not be realised. The Northern Cape has an ample wind resource. Although the Namas Wind Farm is only proposed to contribute a contracted capacity of up to140MW to the grid capacity, this would assist in meeting the electricity demand throughout the country and would also assist in meeting the government's goal for renewable energy and the energy mix. The generation of electricity from renewable energy resources offers a range of potential socio-economic and environmental benefits for South Africa. These benefits include (refer to section 6.7 of Chapter 6):

» Increased energy security;
» Resource saving (i.e. fossil fuels and water);
» Exploitation of South Africa's significant renewable energy resource;
» Pollution reduction;
» Climate friendly development;
» Support for international agreements;
» Employment creation;
» Acceptability to society; and
» Support to a new industry sector.

At present, South Africa is some way off from fully exploiting the diverse gains from renewable energy and from achieving a considerable market share in the renewable energy industry. South Africa's electricity supply remains heavily dominated by coal-based power generation, with the country's significant renewable energy potential largely untapped to date.

The Integrated Resource Plan (IRP) includes 17.8GW of renewables, 9.6GW of nuclear, 6.25GW of coal, and approximately 8.9GW of other generation sources such as hydro, and gas. On this basis, Ministerial determinations have called for a procurement of 8 100MW of wind energy by the end of 2030 (Department of Energy, 2018). The IRP essentially drives the assortment of energy to be implemented for South Africa which is known as the energy mix of the country, considering various generation technologies.

The 'do-nothing' alternative will do little to influence the renewable energy targets set by government due to competition in the sector, and the number of renewable energy projects being bid to the Department of Energy. However, as the project site experiences ample wind resource and optimal grid connection opportunities are available, and not developing the Namas Wind Farm would see such an opportunity being lost. As current land use activities can continue on the site once the project is operational, the loss of the land to this project during the operation phase (less than 1% of the larger project site) is not considered significant. In addition, the Northern Cape Province will not benefit from additional generated power being evacuated directly into the Province's grid. Therefore, from a regional perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of benefits for the regional area.

From the specialist studies undertaken, no environmental fatal flaws were identified to be associated with the Namas Wind Farm. All impacts associated with the project can be mitigated to acceptable levels. If the wind farm is not developed the following positive impacts will not be realised:

- Job creation from the construction and operation phases.
- Economic benefit to participating landowners due to the revenue that will be gained from leasing the land to the developer.
- Meeting of energy generation mix in a most economic and rapid manner.
- Provision of clean, renewable energy in an area where it is optimally available.

As detailed above, the 'do-nothing' alternative will result in a number of lost opportunities. The 'do nothing' alternative is therefore not preferred and not proposed to be implemented for the development of the Namas Wind Farm.

CHAPTER 10: ASSESSMENT OF POTENTIAL CUMULATIVE IMPACTS

As identified and assessed in Chapter 9, a wind farm development may have effects (positive and negative) on natural resources, the social environment and on the people living in a project area. The preceding impact assessment chapter has reported on the assessment of the impacts associated with the Namas Wind Farm largely in isolation (from other similar developments).

The DoE, under the REIPPP Programme, released in 2011 a request for proposals (RFP) to contribute towards Government's renewable energy target and to stimulate the industry in South Africa. The REIPPP Programme has been rolled out in bid windows (rounds) over the past 7 years, in which developers submit planned renewable energy projects for evaluation and selection. The bid selection process considers a number of qualification and evaluation criteria. The proposed tariff, as well as socio-economic development contributions by the project and the bidder are the main basis for selection after the qualification criteria have been met.

As a result of the REIPPP Programme, there has been a substantial increase in interest in wind farm developments in South Africa (largely in the Northern, Western and Eastern Cape provinces), with a number of wind farms selected as Preferred Bidder projects and 22 wind farms operational (SAWEA, 2018). It is, therefore, important to follow a precautionary approach in accordance with NEMA to ensure that the potential for cumulative impacts[22] are considered and avoided where possible.

The Namas Wind Farm falls within the Springbok REDZs which has been identified by the DEA as an area highly suitable for wind farms given a range of factors considered. Therefore, DEA envisage dealing with multiple applications and cumulative issues within a REDZ area. The REDZ are of strategic importance for large scale wind and solar photovoltaic development, in terms of Strategic Integrated Project (SIP) 8. These zones are considered to be areas where significant negative impacts on the environment are limited and socio-economic benefits to the country can be enhanced.

This chapter assesses the potential for the impacts associated with the project to become more significant when considered in combination with the other known or proposed wind farm projects within the area.

10.1. Legal Requirements as per the EIA Regulations, 2014 (as amended)

This chapter of the BA report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 1: Content of basic assessment reports:

Requirement	Relevant Section
3(j)(i) an assessment of each identified potentially significant impact and risk, including cumulative impacts.	The cumulative impacts associated with the development of the Namas Wind Farm are included and assessed within this chapter.

[22] 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.

10.2 Approach taken to Assess Cumulative Impacts

The cumulative impacts that have the potential to be compounded through the development of the wind farm 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 Namas Wind Farm within the project site being considered for the development:

» Unacceptable loss of threatened or protected vegetation types or species through clearing, resulting in an impact on the conservation status of such flora or ecological functioning;
» Unacceptable risk to avifauna through collision, avoidance and displacement;
» Unacceptable risk to bats through loss of habitat, infringement on roosting or breeding areas, or risk to collision-prone species;
» Unacceptable loss of high agricultural potential areas presenting a risk to food security and increased soil erosion;
» Complete or whole-scale change in sense of place and character of an area and unacceptable visual intrusion;
» Unacceptable loss of heritage resources; and
» Unacceptable increase in ambient noise levels, resulting in an impact on the normal functioning of the occupants of the area.

Figure 10.1 indicates the location of the Namas Wind Farm in relation to all other known and viable wind farms located within a radius of 30km from the project site. These projects were identified using the Department of Environmental Affairs Renewable Energy Database and current knowledge of projects being proposed in the area. In the case of the Namas Wind Farm, there are three (3) wind farms located within a 30km radius of the project site (refer to **Figure 10.1** and **Table 10.1**), all at various stages of approval. At the time of writing this BA report one facility had been authorised, and two facilities are still in process of obtaining Environmental Authorisation[23]. The potential for cumulative impacts are summarised in the sections which follow and have been considered within the specialist studies (refer to **Appendices D – L**).

Table 10.1: Wind farms located within the broader area (within a 30km radius) of the Namas Wind Farm project site

Project Name	Capacity	Location from the Namas Wind Farm project site	Project Status
Eskom Kleinzee Wind Farm	300MW	Adjacent to the north west	Authorised
Genesis Zonnequa Wind Farm	140MW	Directly adjacent to the north	In process
Juwi Kap Vley Wind Farm	up to 300MW	Directly adjacent to the south and east	In process

[23] Applications for Environmental authorisation for numerous wind farms have been undertaken within the area, however some of these applications have lapsed and are no longer considered to be valid and are therefore not considered as part of the cumulative impact assessment. Projects no longer considered to be valid include the Koingnaas Wind Energy Facility and the Project Blue Wind Energy Facility.

It should be noted that not all the wind farms presently under consideration by various wind farm developers will be built for operation. Not all proposed developments will be granted the relevant permits by the relevant authorities (DEA, DOE, NERSA and Eskom) and this is because of the following reasons:

» There may be limitations to the capacity of the existing or future Eskom grid;
» Not all applications will receive a positive environmental authorisation;
» There are stringent requirements to be met by applicants in terms of the REIPPP Programme and a highly competitive process that only selects the best projects;
» Not all proposed wind farms will be viable because of lower wind resources on some sites, and the best wind resource areas should be utilised first;
» Not all proposed wind farms will be able to reduce the associated negative impacts to acceptable levels or be able to mitigate the impacts to acceptable levels (fatally flawed);
» Not all proposed facilities will eventually be granted a generation license by NERSA and sign a Power Purchase Agreement with Eskom; and
» Not all developers will be successful in securing financial support to advance their projects further.

As there is uncertainty whether all the above-mentioned wind farms will be implemented, it is also difficult to quantitatively assess the potential cumulative impacts. The cumulative impacts of other known wind farms in the broader area and the Namas Wind Farm are therefore qualitatively assessed in this Chapter.

It is important to explore the potential for cumulative impacts on a quantitative basis 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 wind farm developments throughout South Africa, while the significance of the cumulative impact on visual amenity may only be influenced by wind farm developments that are in closer proximity to each other, up to 30 km to 50 km apart. For practical purposes a sub-regional scale of 30km has been selected for this cumulative impact evaluation.

In the sections below the potential for a cumulative impact resulting from several wind farms within a 30km radius of the Namas Wind Farm are explored.

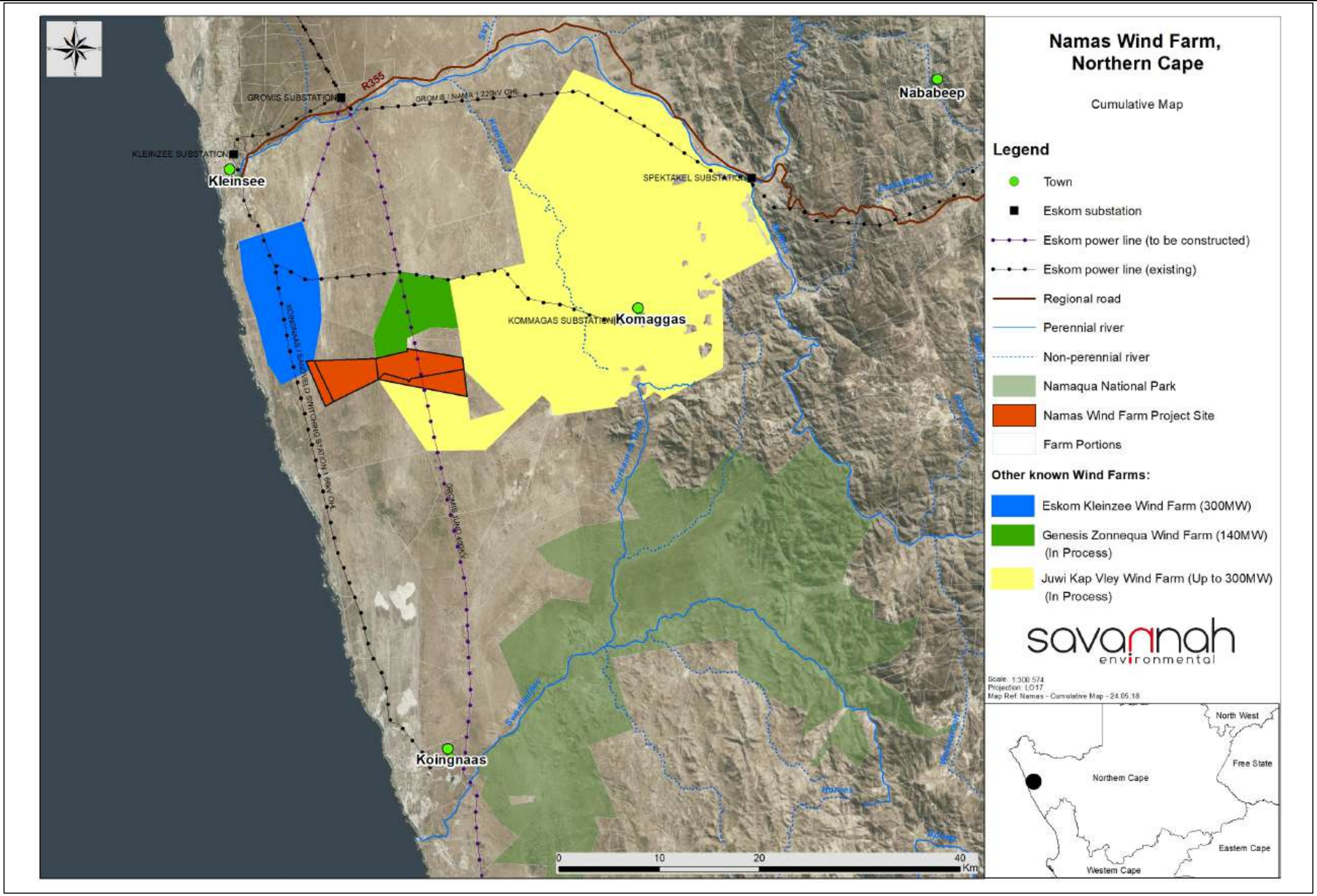

Figure 10.1: Viable wind farm projects located within a 30km radius of the Namas Wind Farm project site that are considered as part of the cumulative impact assessment for the Namas Wind Farm

10.3 Cumulative Impacts on Ecological Processes

From an ecological perspective, and considering the area, the main cumulative impact will be habitat loss and an impact on the ecological functioning of the area due to the development of multiple wind farms within the area. The impacts will occur due to the construction and operation of the wind energy facilities.

Although there are a number of wind energy facilities in the broader area around the Namas Wind Farm project site, not all of these are within a similar environment and would not affect the same range of habitats as present at the Namas Wind Farm site. To the east is the Kap Vley Wind Farm which has a footprint of approximately 130ha which is distributed between sand fynbos, strandveld and Namaqualand Klipkoppe habitat types. The Kap Vley Wind Farm site is considered to be considerably more sensitive than the Namas Wind Farm project site due to the exceptional habitat diversity present with the rocky hills and the presence of dunes overlying rocky areas and the very high abundance of species of conservation concern in that area, which is not replicated on the Namas Wind Farm project site. The Namas Wind Farm project site is restricted to the lower sensitivity sandy strandveld habitats. To the west is the Eskom Kleinzee 300MW Wind Farm which would have an approximate footprint of 250ha, restricted largely to the Namaqualand Coastal Duneveld vegetation type. Adjacent and to the north is the Zonnequa Wind Farm which would have a similar footprint to the Namas Wind Farm, but would be restricted largely to the Namaqualand Strandveld and Namaqualand Salt Pans habitat types. However, none of these projects have been built and the existing impact in the area is largely restricted to the coastal forelands where diamond mining has had a significant impact on this environment. There are also a number of diamond mines on ancient alluvial terraces along the Buffels River located to the north of the site. Overall, existing impacts on the coastal plain away from the actual coastline are relatively low and the contribution of the footprint of the Namas Wind Farm is not considered highly significant in the context of the receiving environment.

The Namas Wind Farm will result in habitat loss and fragmentation of the receiving environment, however this will be limited due to the current conditions and limited sensitivities located within the project site. Considering the other facilities located within the area, each may generate an acceptable, low impact when considered in isolation, however cumulatively the developments can result in impacts on fauna and flora, as well as future conservation-use options for the wider area.

Also, the area is a declared REDZ which means that clustering of wind farms here will help reduce ecological impacts in other areas located outside of the REDZ.

Although the affected vegetation types are not listed ecosystems, they are not well protected and extensive loss of the ecosystems may result in impacts to the ecosystems. However, without the implementation of mitigation measures the impact is likely to be of a medium significance.

Nature: *Cumulative impact of habitat loss and an impact on the ecological functioning* The development of the Namas Wind Farm will potentially contribute to cumulative habitat loss and other ecological cumulative impacts in the wider, Kleinsee-coastal plain area, including an impact on the ecological functioning.		
	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)	Medium (5)

Probability	Improbable (2)	Probable (3)
Significance	**Low (18)**	**Medium (33)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	Yes, to a large degree, but through direct avoidance with little other avenue for mitigation.	
Mitigation: » Promote sustainable land use practices in the area and especially on wind farm properties to improve the quality of the habitat for fauna and flora. Reducing grazing pressure on the wind farm properties is identified as a particularly important mitigation measure to improve habitat quality. » Avoid areas considered to be sensitive, including areas considered to be important for broad-scale ecological processes such as CBAs. » Ensure that the alien management plan and erosion management plan are effectively implemented at the site.		

10.4 Cumulative Impacts on Avifauna

Cumulative impacts from an avifauna perspective are those impacts which will affect the general avian communities in and around the Namas Wind Farm project site due to the combined cumulative effect of all the projects located within the areas. These impacts will be due to collision, avoidance and displacement.

Over the course of the 12-months pre-construction monitoring campaign, only 46 avian species in the Namas Wind Farm project site were recorded. This is a very low total compared with other arid areas in the Northern and Western Capes that have been sampled. Species richness varied over the seasons, with higher totals recorded in summer (38 species) and the lowest in spring and autumn (21 and 22 species respectively). All species were typical residents of the arid Karoo landscape including Chats, Prinias, Titbabbler, Flycatchers, Karoo Larks and Grey Tit *Parus afer*. The average number of species per kilometre was slightly lower in the project site (9.7 species per km) than in the Control site (10.5 species per km). Similarly, the average number of individual birds per kilometre found in the project site (29.6 birds per km) was higher than in the Control (26.3 birds per km). Bird abundance indices were higher in the spring (September) than any other month. Bird species richness on site stayed relatively constant throughout the year, with summer showing the highest numbers.

The national review of post-construction data, including data from West Coast wind farms indicates that South African wind farms kill about 4.1 birds per turbine per year, similar to the international mean of about 5.25 birds per turbine per year. Of concern is that 36% of the fatalities recorded are raptors. The equivalent number of fatalities per Megawatt lies between 1.87 and 5.5 birds per MW per year (Ralston et al. 2017). Using a median value of 3.7 bird fatalities per MW per year it is possible to conservatively calculate the number of birds likely to be killed per megawatt:

» 740MW x 1.87 fatalities per MW per year = 1384 birds per year (wind).
» If 36% of these are likely to be raptors, then 498 raptor fatalities are predicted per year.
» If ~20% of these raptors are Red Data species (Ralston et al. 2017) then the conservative cumulative impact is estimated to be 100 threatened raptors killed annually by the three wind farms within 30km of the Namas Wind Farm project site.

It should be noted that the figures above are likely to be liberal estimates for the possible fatalities for the project site, due to the following reasons: First, the Passage Rates for raptors and bustards through this area when typically dry conditions occur is very low. Second, the fatality rates derived from Ralston et al (2017) were from areas with higher raptor concentrations (Eastern Cape, wet Western Cape sites) than here in the arid far-west. Also, high (99%) avoidance rates are known for raptors around wind farms (Madders & Whitfield 2006). Therefore, it is likely that these figures are inflated fatality estimates.

Furthermore, the area is a declared REDZ, which means that clustering of wind farms here will help reduce impacts in other areas located outside of the REDZ.

The cumulative avifauna impacts, considering the development of the Namas Wind Farm and the other wind farms within the surrounding area will be of a medium significance.

Nature: Negative cumulative impacts on avifauna due to disturbance, displacement and collision

The direct potential impact of the 3 wind farms was gauged using data released in 2017 by Birdlife South Africa for fatalities at 8 wind farms in South Africa (Ralston et al. 2017).

About 4.1 birds per turbine per year, or ~3.7 birds per MW per year are killed annually. The lower mortality rate of 1.87 birds/MW/yr was used because dry areas will have lower species richness and abundance than more mesic areas.

If a total of 740MW (wind power) is generated per year from all wind farms within 30 km, it is estimated that a maximum of 1384 birds could be killed annually, of which 36% (498) are likely to be raptors. Since about 20% of these raptors are threatened Red Data species, about 100 are estimated to be killed. These estimates are likely over-estimates given the very low passage rates recorded in the project site, and 10% of this figure is expected in dry periods. Therefore, the likely impact will be medium without mitigation. Careful mitigation can reduce this to low levels.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (7)
Probability	Probable (3)	Probable (3)
Significance	**Medium (33)**	**Medium (42)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	Likely	Likely
Can impacts be mitigated?	Yes	

Mitigation:

Reducing avian impacts at wind farms is in its infancy in South Africa. Recommended measures include:

» Avoiding all migration routes and major flyways in the placement of such facilities.
» Avoiding all nest areas and foraging/roosting areas of Red Data species in the siting of said facilities.
» Employ radar or video detection of collision-prone birds and audible or visual deterrence to deter birds from approaching the turbines (both are quite expensive).
» Painting one turbine blade black (or equivalent such as UV) and selective stopping of turbines should both be tested for efficacy.
» Introduce livestock into the area to reduce the attractiveness of the habitat to raptors through increased grazing pressure, thereby reducing prey populations.

10.5 Cumulative Impacts on Bats

The main cumulative impact for bats relates to bat mortalities. Bat mortalities can have significant ecological consequences as the bat species at risk are insectivorous and thereby contribute significantly to the control of flying insects at night.

There are several bat species in the vicinity of the Namas Wind Farm project site that commonly occur in the area. These species are of importance due to high abundances and certain behavioural traits. The relevant species include *Tadarida aegyptiaca*, *Neoromicia capensis* and *Miniopterus natalensis*.

An increased number of facilities in an area will increase the risk levels of bat fatalities. **Table 10.2** below provides an indication of the bat impact risks for the Namas Wind Farm and the surrounding wind energy facilities, and considers the highest average bat passes/ hour/ year (at a height >40m above ground).

Table 10.2: Bat impact risks for the Namas Wind Farm and the surrounding wind energy facilities

Wind Farm	Highest average bat passes/ hour/ year (>40m above ground)	Risk Level (Sowler *et al.*, 2017)
Eskom Kleinsee	0.60	High
Juwi Kap Vley	0.03	Low
Genesis Zonnequa	0.04	Low
Average of facilites without Namas	**0.22**	**High**
Namas	0.04	Low
Average of facilites with Namas	**0.18**	**High**

The bat impact risks are calculated according to the "Estimated turbine related bat fatality risk levels based on bat activity levels for different terrestrial ecoregions"[24] as depicted in the "South African Good Practice Guidelines for Surveying Bats at Wind Energy Facility Developments - Pre-construction: Edition 4.1" (Sowler et al., 2017) (**Table 10.3**).

Table 10.3: Estimated turbine related bat fatality risk levels based on bat activity levels for different terrestrial ecoregions (Sowler et al., 2017)

Risk Level*	Annual average ranges of mean number of bat passes per hour per Terrestrial Ecoregion (Olson et al. 2001) at 60m						
	Montane Fynbos & Renosterveld	Lowland Fynbos & Renosterveld	Succulent Karoo	Nama Karoo	Drakensberg Montane Grasslands, Woodlands and Forest	KwaZulu-Cape Coastal Forest Mosaic	Maputuland Coastal Forest Mosaic**
Low	0.0 – 0.17	0.0 – 0.55	0.0 – 0.07	0.0 – 0.71	0.0 – 0.22	0.0 – 14.60	0.12 – 28.59
Medium	0.18 – 0.31	0.56 – 0.86	0.08 – 0.13	0.72 – 1.15	0.23 – 0.35	14.61 – 19.84	28.60 – 34.53
High	> 0.31	> 0.86	> 0.13	> 1.15	> 0.35	> 19.84	> 34.53

24 The wind farms included in the cumulative map (**Figure 10.1**), including the Namas Wind Farm, are located within the Succulent Karoo ecoregion, with a small patch of Montane Fynbos and Renosterveld in the proposed Kap Vley facility.

It must be noted that the information included in **Table 10.2** does not consider the undisturbed areas in between the wind energy facilities. It is considered that these undisturbed areas contribute towards the support of a much larger bat population. This contribution results in a slightly decreased risk level with the addition of the development of the Namas Wind Farm.

Furthermore, the area is a declared REDZ, which means that clustering of wind farms here will help reduce impacts in other areas located outside of the REDZ.

The cumulative bat impacts, considering the development of the Namas Wind Farm and the other wind farms within the surrounding area will be of a medium significance.

Nature: *Cumulative bat mortalities due to moving turbine blades* Foraging and/or migrating bats can be killed by moving turbine blades, this happens either by direct impact or due to barotrauma. Local extinctions of populations can occur in an area if the impacts are very severe. Mortalities of bats during foraging and migration due to wind turbines can have significant ecological consequences as the bat species at risk are insectivorous and thereby contribute significantly to the control of flying insects at night. On a project specific level, insect numbers in a certain habitat can increase if significant numbers of bats are killed. But if such an impact is present on multiple projects in close vicinity of each other, insect numbers can increase regionally and possibly cause outbreaks of colonies of certain insect species.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Regional (4)	Regional (4)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	High (8)
Probability	Improbable (2)	Probable (3)
Significance	**Low (28)**	**Medium (48)**
Status (positive or negative)	Negative	Negative
Reversibility	High	Medium
Irreplaceable loss of resources?	Low	Medium
Can impacts be mitigated?	Yes	
Mitigation: All wind energy facilities in the area must avoid high sensitivities and their associated buffers (already implemented for the Namas Wind Farm), and where needed reduce blade movement at selected turbines and during high-risk bat activity times/weather conditions, if the operational bat mortality study finds bat mortalities to be above sustainable levels. If reducing blade movements is not technically feasible, alternative and equally effective mitigation measures should be recommended during the operational bat mortality monitoring study. Acoustic deterrents are developed well enough to be trialled, if needed. Each wind energy facility needs to adhere to its specific recommended mitigation measures.		

10.6 Cumulative Impacts on Land Use, Soil and Agricultural Potential

From a soils perspective, the likelihood of cumulative impacts for wind erosion is significant if not mitigated. When considering the impact of wind erosion solely within the Namas Wind Farm project site the impact is identified as having a medium extent with a permanent duration without the implementation of appropriate mitigation measures. With the implementation of the appropriate mitigation measures at the Namas Wind Farm project site, the impact will have a low extent with a short-term duration.

When considering the other wind energy facilities within the surrounding area, it is assumed that the impact of erosion and appropriate mitigation measures at a site-specific level for each of the facilities have been considered and the mitigation measures recommended are sufficient for the management and mitigation of erosion. Therefore, considering that the impact of erosion at each facility will be low in extent, subject to the implementation of the recommended mitigation measures, and managed for each facility separately, the cumulative impact for erosion is considered to be low. Under these circumstances, the loss associated with erosion is, therefore, considered to be acceptable loss, without detrimental consequences. However, if there is large scale development of wind energy facilities in the area, any failure to prevent wind erosion of topsoil on one project could lead to that material being deposited on any or all neighbouring properties.

Also, the area is a declared REDZ which means that clustering of wind farms here will help reduce impacts in other areas located outside of the REDZ.

Nature: _Cumulative wind erosion impacts_ The main cumulative impact expected to occur with the development of the Namas Wind Farm and the other wind energy facilities within the area is wind erosion.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Low (1)	Low (2)
Duration	Short term (2)	Short term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (10)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » To minimise the footprint of construction as much as possible. » Where soil is removed/disturbed, ensure it is stored for rehabilitation and re-vegetated as soon as possible. » Implement all appropriate soil conservation measures, including contouring, culverts etc. (for road construction), geotextiles and slope stabilisation (for all infrastructure). » Ensure that equal responsibility and co-operation is accepted if more than one facility will be using the same access road, or if the possibility exists of sediment transfer (by wind or water) from one site to another.		

10.7 Cumulative Impacts on Heritage (including archaeology, palaeontology and cultural landscape)

Cumulative Impacts to palaeontology are likely to be of low significance because of the generally sparse distribution of fossils in the broader landscape. With mitigation, the significance is reduced because of the positive aspect of rescuing scientific samples and the retrieval of data. Nevertheless, negative impacts will continue to accumulate when numerous projects commence with construction.

The development of many wind energy facilities in the area could result in the loss of many archaeological sites. Although data from coastal and near-coastal archaeological sites is sufficiently available, the loss of multiple sites further away from the coast where most projects are planned could result in significant cumulative impacts if no mitigation is implemented. It is also notable that the density of archaeological sites reduces away from the coast with impacts becoming consequently less likely. Although impacts to individual archaeological sites are still negative after mitigation, if many sites are sampled over multiple projects then a positive cumulative impact could be realised because of the advance of scientific knowledge that may result from the mitigation work.

Because graves are very sparsely distributed, very few are impacted by development, and the cumulative impacts on graves are of low significance.

Several other wind energy facilities have been proposed in the region but from a cultural landscape perspective clustering of impacts is more desirable than spreading them widely. Although cumulative impacts are likely to occur, having them concentrated within a node reduces their significance. Also, the area is a declared REDZ which means that clustering of wind farms here will help reduce impacts in other areas and the associated cultural landscapes.

Overall the impacts to all heritage for the Namas Wind Farm alone are considered to be of medium significance, while impacts when considering all proposed projects would be slightly greater but still calculate to a medium significance. This is due to the diversity of heritage resources, and the overall effectiveness of mitigation measures required to be implemented.

Nature: *Cumulative heritage impacts* Direct impacts to fossils, archaeology and graves during construction work and direct impacts to the landscape through the introduction of generally incompatible electrical infrastructure (turbines and substation).		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (2)	Local (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (3)	Moderate (5)
Probability	Definite (5)	Definite (5)
Significance	**Medium (45)**	**Medium (60)**
Status (positive or negative)	Negative, but with some positive aspects after mitigation	Negative, but with some positive aspects after mitigation
Reversibility	Low for some aspects and high for others	Low for some aspects and high for others
Irreplaceable loss of resources?	Yes for some aspects and no for others	Yes for some aspects and no for others
Can impacts be mitigated?	Yes for some aspects and no for others	
Mitigation: » It will never be possible to spot and rescue all fossils, which means that there will always be some loss and therefore residual impact. This would be of unknown significance because of the sparse distribution of fossils in the broader landscape. Positive impacts would continue to be felt with successful mitigation because of the scientific implications of the resulting research opportunities. » A walk down survey of all road alignments and the footprints of all turbines and other associated infrastructure must be undertaken and any mitigation still required should be effected prior to construction. » Rescue of any graves found during construction. » Mitigation measures should include rehabilitation of any disturbed areas not in use during operation and any other measures as listed in the Visual Impact Assessments but due to the size of the structures such measures would have minimal effect on the impact ratings.		

10.8 Cumulative Noise Impacts

Potential cumulative noise impacts relate to an increase in the noise of an area with the development of numerous wind energy facilities.

The ambient sound levels of the Namas Wind Farm project site were typical of a rural noise district (during low wind conditions) and the area is considered naturally quiet. The Namas Wind Farm project site is far from any significant roads or any other significant noise sources. Five Noise Sensitive Developments (NSDs) were identified, of which two are located within the Namas Wind Farm project site. Within the project site, wind induced noises were documented and generally dominant, as well as bird communication, sheep bleating and human voices. Outside of the project site, wind-induced noises from a windmill were documented, as well as bird communication.

Environmental authorisation was granted for the Eskom Kleinzee Wind Farm located directly adjacent and to the north-west of the Namas Wind Farm project site, but the cumulative noise will be less than 1 dBA for all receptors. The cumulative impact for the Namas Wind Farm is considered to be of a low significance.

Furthermore, the area is a declared REDZ, which means that clustering of wind farms here will help reduce impacts in other areas located outside of the REDZ which could possibly have a higher number of NSDs.

Nature: *Cumulative noise impacts* Cumulative noise impacts from other wind energy facilities or significant noise sources will not increase the noise levels by more than 1 dB.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site (2)	Site (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (2)	Low (2)
Probability	Low (1)	Low (1)
Significance	**Low (8)**	**Low (8)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No mitigation required	
Mitigation: No mitigation required.		

10.9 Cumulative Visual Impacts

The proposed Namas Wind Farm and Zonnequa Wind Farm are located immediately adjacent to each other. They are also located in close proximity to the authorised (but not yet constructed) Eskom Kleinzee Wind Farm and the proposed Kap Vley Wind Farm (in process). For the purpose of the assessment of visual cumulative impacts, the wind turbines proposed for the wind farms are analysed[25].

The visual exposure of these wind turbines is analysed in order to determine whether there is a significant correlation between the turbine layouts, or whether the construction of these wind farms would contribute to the potential cumulative visual exposure of wind turbine structures within the region.

[25] The wind turbine positions were not available for the Kap Vley Wind Farm and are therefore excluded from this spatial data analysis.

The result of the cumulative viewshed analysis is displayed on **Figure 10.2** below. The area of combined visual exposure is indicated in orange. This means that wind turbines (or part thereof) from the listed wind farms could be visible within this area. The yellow areas are indicative of land where turbines from two wind farms may be visible. This could be turbines from any two of the three wind farms. Green areas indicate land where only turbines from (any) one wind farm may be visible.

There is a very good correlation between the visual exposures of the three tested wind turbine layouts (this excludes the Kap Vley Wind Farm, which is not yet authorised). This is due to the close proximity of the wind farms to each other. The Eskom Kleinzee Wind Farm will create additional exposure northwards towards the coast line and Kleinsee (the town), while the Namas Wind Farm will spread the visual exposure marginally further southwards. The Zonnequa Wind Farm will extend the visual exposure to the north-east.

The construction of the Namas, Zonnequa, Kleinzee and Kap Vley Wind Farms will increase the cumulative visual impacts of industrial type infrastructure within the region. On the other hand, the location of the wind farms within a REDZ will contribute to the consolidation of wind turbine structures in this area and avoid a potentially scattered proliferation of wind energy infrastructure throughout the region.

The anticipated cumulative visual impact of the wind farms is expected to be of a medium significance, which is considered to be acceptable from a visual perspective. This is once again due to the relatively low viewer incidence within close proximity to the project sites and the presence of the existing mining activities and electricity infrastructure within the area.

Nature: *Potential cumulative visual impacts*
The potential cumulative visual impact of the wind farms on the visual quality of the landscape.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	High (8)
Probability	Probable (3)	Probable (3)
Significance	**Medium (39)**	**Medium (45)**
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable	Recoverable
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented.	

Mitigation:
Planning:
» Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint.
Operations:
» Maintain the general appearance of the facility as a whole.
Decommissioning:
» Remove infrastructure not required for the post-decommissioning use.
» Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.

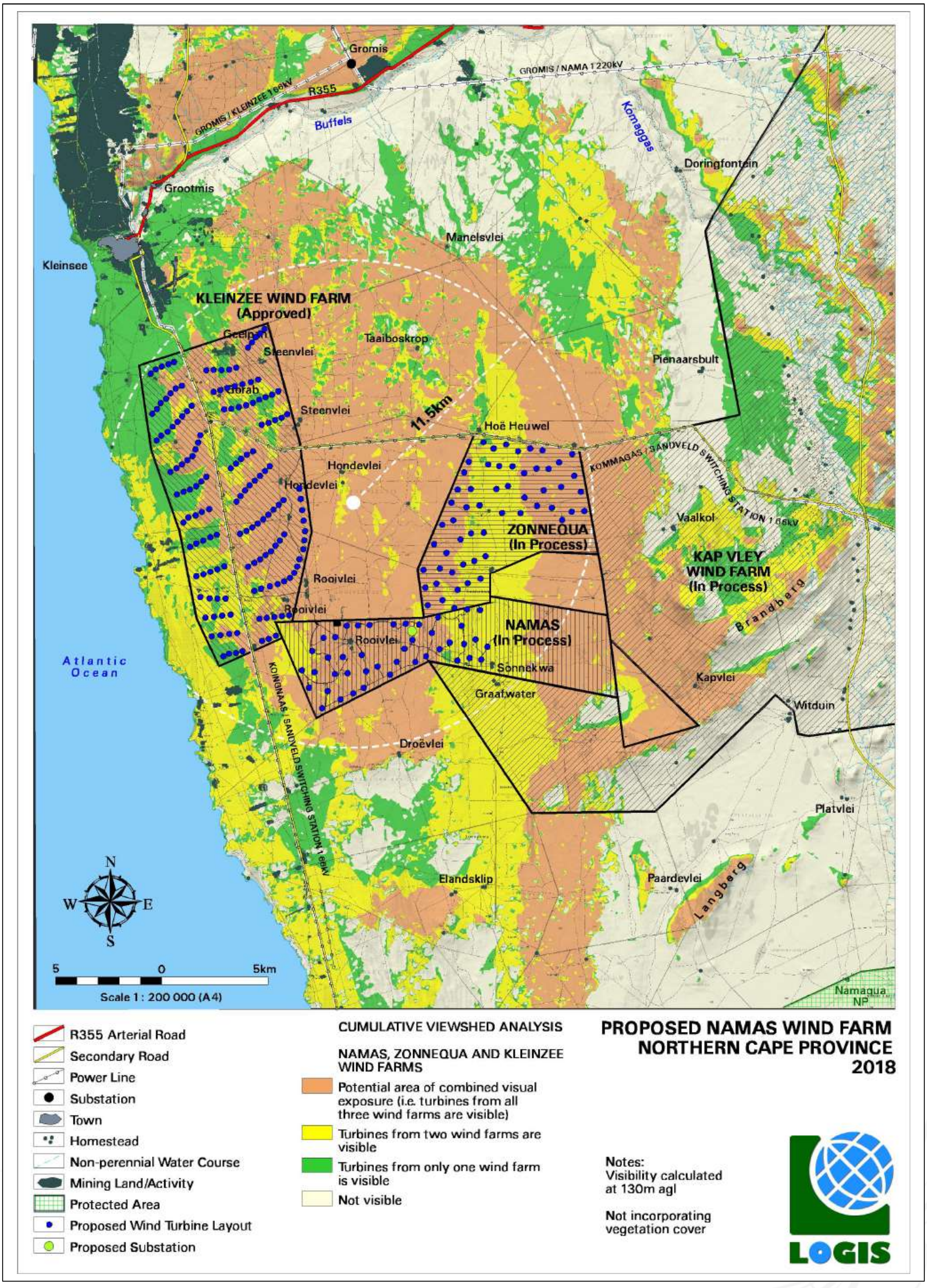

Figure 10.2: Cumulative viewshed analysis for the Namas Wind Farm

10.10 Cumulative Socio-Economic Impacts

Considering the Namas Wind Farm, the only cumulative impact of concern from a socio-economic perspective is the potential influx of migrant labour and job seekers to the area if the various wind farm projects are to be developed at the same time. This may likely result in an influx of people that the local communities will not be able to absorb or the local government would not be able to manage adequately, considering the potential increase in demand for various services (accommodation, utilities, etc.), as well as the potential increase in social ills that are generally associated with an influx of male-dominated workers located far away from their families.

Considering that the area within which the Namas Wind Farm is proposed has been designated as a REDZ, it is highly likely that it will see heightened development in the future irrespective whether the proposed Namas Wind Farm is developed or not. This means that the issue of in-migration into the area will likely be notable, but the Namas Wind Farm is unlikely to have a significant influence on this trend alone and will not unacceptably increase the impact or result in an unacceptable risk or loss of resources. The impact is not entirely irreversible but cannot be reversed completely either, as some of the workers may decide to remain in the area with the hope of finding employment opportunities on other projects that may be developed in the future.

The downscaling of the mining operations within the area and the development of multiple wind farms within the area is considered to be a positive cumulative impact as the development of the wind farms will enable economic and social growth within the area which has experienced challenges due to the mining sector.

Furthermore, the area is a declared REDZ, which means that clustering of wind farms here will help reduce negative impacts in other areas located outside of the REDZ and increase and concentrate positive impacts within the REDZ and the surrounding communities of the project site.

The overall cumulative impact of the Namas Wind Farm and the other wind farms located within the surrounding area will be of a medium significance.

Nature: Socio-economic cumulative impacts Influx of migrant labour and job seekers due to job opportunities presented by numerous projects may lead to an increase in social ills. Positive contribution of the development of various wind farms within the area will enable social and economic development and growth. This will enable the area to overcome some of the challenges experienced due to the downscaling of the mining operations within the area.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Regional (3)	Regional (3)
Duration	Short term (2)	Medium term (3)
Magnitude	Moderate (6)	High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (44)**	**Medium (56)**
Status (positive or negative)	Negative - influx of job seekers	Negative – influx of job seekers

	Positive – development and growth	Positive – development and growth
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?		

Mitigation/Enhancement:

» Engage with other project developers and prominent community members, including West Coast Resources, Local Municipality, etc. to form a forum to discuss the concerns and possible mitigation measures that could be introduced collectively to manage the potential adverse effects of in-migration, to plan and deal with other potential negative consequences, as well as to discuss opportunities to develop the local communities.
» Engage with the local municipality to set up a skills desk that could be used by all project developers in the area.
» Engage with the local municipality, the provincial authority, and IPP office to organise a supplier day aimed at informing the community and local businesses of the REDZ, the opportunities that may arise from the development of wind farm projects, and how these opportunities could be applied for.

10.11 Cumulative Traffic Impacts

From a cumulative traffic impact perspective, only the construction and decommissioning phases of the Namas Wind Farm will generate traffic, which can be considered as significant relative to the current traffic experienced within the area. The duration of these phases are short term, i.e. the impact of the Namas Wind Farm traffic on the surrounding road network is temporary, and when wind farms are operational they do not add any significant traffic to the road network.

Even if all the wind farms are constructed and decommissioned simultaneously, the 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: *Cumulative traffic impacts during the construction phase*

It is considered that the construction phase of the Namas Wind Farm and the other wind farms within the surrounding area will generate significant traffic impacts due to the requirements for the transportation of the project components and equipment to the various project sites.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Regional (2)	Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Moderate (6)
Probability	Very likely (4)	Very likely (4)
Significance	**Medium (32)**	**Medium (44)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

» Stagger turbine component delivery to the site.
» Stagger the construction of turbines.
» The use of mobile batching plants and quarries in close proximity to the site would decrease the impact on the surrounding road network.
» Staff and general trips should occur outside of peak traffic periods.

Nature: Cumulative traffic impacts during the operation and maintenance phase

A significant contribution of traffic to the road network is not expected to occur during the operation phase of the Namas Wind Farm and the other wind farms located within the surrounding area due to the limited traffic expected to be generated during this phase. Traffic will relate mainly to maintenance activities and limited daily travel to and from the various project sites.

	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	Small (0)	Small (0)
Probability	Very likely (4)	Very likely (4)
Significance	**Low (20)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

» Staff and general trips should occur outside of peak traffic periods.

Nature: Cumulative traffic impacts during the decommissioning phase

It is considered that the decommissioning phase of the Namas Wind Farm and the other wind farms within the surrounding area will generate significant traffic impacts due to the requirements for the transportation of the project components and equipment to and from the various project sites.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Regional (2)	Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Moderate (6)
Probability	Very likely (4)	Very likely (4)
Significance	**Medium (32)**	**Medium (44)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

» Stagger the removal of turbines, foundations, crane pads etc.

» Staff and general trips should occur outside of peak traffic periods.

10.12 Conclusion regarding Cumulative Impacts

Cumulative impacts are expected to occur with the development of the Namas Wind Farm throughout all phases of the project life cycle and within all areas of study considered as part of this BA report. The main aim for the assessment of cumulative impacts considering the Namas Wind Farm 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 the Namas Wind Farm impacts in isolation and compared to the cumulative impacts of the Namas Wind Farm and other wind farms within a 30km radius from the proposed project site. The following conclusions can be drawn regarding the cumulative impacts associated with the project:

» There will be no unacceptable loss of threatened or protected vegetation types or species due to the development of the Namas Wind Farm and other wind farms within the surrounding area.
» There will be no unacceptable risk to avifauna with the development of the Namas Wind Farm and other wind farms within the surrounding area.
» There will be no unacceptable risk to bats due to habitat loss, infringement on roosting or breeding areas or on collision-prone species with the development of the Namas Wind Farm and other wind farms within the surrounding area.
» There will be no unacceptable loss of high agricultural potential areas due to the development of the Namas Wind Farm and other wind farms within the surrounding areas.
» Change to the sense of place and character of the area is expected, however the change is not considered to be unacceptable.
» There will be no unacceptable loss of heritage resources associated with the development of the Namas Wind Farm and other wind farms within the surrounding areas.
» No unacceptable increase in ambient noise levels is expected to occur with the development of the Namas Wind Farm and other wind farms within the surrounding areas.

All cumulative impact associated with the Namas Wind Farm will be of a medium or low significance, with no cumulative impacts identified to be of a high significance. A summary of the cumulative impacts are included in **Table 10.3** below.

Table 10.3: Summary of the cumulative impact significance for the Namas Wind Farm 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	Medium	Medium
Bats	Low	Medium
Land use, soil and agricultural potential	Low	Low
Heritage (archaeology, palaeontology and cultural landscape)	Medium	Medium
Noise	Low	Low
Visual	Medium	Medium
Socio-Economic	Medium	Medium
Traffic	*Construction and Decommissioning:* Medium	*Construction and Decommissioning:* Medium
	Operation: Low	*Operation:* Low

The location of the Namas Wind Farm project site and the surrounding wind farms being considered as part of this cumulative impact assessment within a REDZ, is considered to assist with the concentration of the negative impacts within an area, as well as the focussing of positive impacts and benefits. The REDZ are considered to be areas within which significant negative impacts on the natural environment are limited and socio-economic benefits are enhanced. Therefore the development of wind farms within a REDZ reduces the negative impacts in areas located outside of the REDZ and concentrates the positive impacts within the REDZ thereby creating a positive contribution to the communities present.

The following can be concluded regarding the cumulative impacts of the Namas Wind Farm:

» ***Ecological processes:*** The cumulative impact on the ecological processes, including the loss of habitat, is low for the Namas Wind Farm and will be medium for all the wind energy facilities within the area. The contribution of all the wind energy facilities is considered to be acceptable and will not result in an unacceptably high cumulative impact.
» **Avifauna:** The cumulative impact on the avifauna of the area will be of a medium significance for the Namas Wind Farm and will continue to be of a medium significance with the development of the other wind energy facilities within the area. The contribution of all the wind energy facilities in terms of cumulative impact will remain as a medium impact and will not result in a high cumulative impact. Therefore, the cumulative impact is considered to be acceptable.
» **Bats:** The cumulative impact on the bats of the area will be of a low significance for the Namas Wind Farm and will be of a medium significance for all the wind energy facilities within the area. Even though the impact will increase to medium significance with the development of the other wind energy facilities, it is not considered to be high and will be acceptable within the area under consideration.
» **Land Use, Soils and Agricultural Potential:** The cumulative impact on the land use, soil and agricultural potential for the site (which relates mainly to wind erosion) is low for the Namas Wind Farm and will remain low with the development of other wind energy facilities within the area. As the impacts are considered to be low for the development of the Namas Wind Farm and with the development of the other wind energy facilities within the area, no unacceptable or wholescale change is expected to occur.
» **Heritage (including archaeology, palaeontology and cultural landscape):** The cumulative impacts on heritage can be either of a positive or negative nature depending on the scientific values that can be derived from the find. The cumulative impact on heritage for the Namas Wind Farm will be medium and will remain medium with the development of the other wind energy facilities within the area. The contribution of all the wind energy facilities in terms of cumulative impact will remain as a medium impact and will not result in a high cumulative impact. Therefore, the impact is considered to be acceptable.
» **Noise:** The cumulative impacts on noise is low for the Namas Wind Farm and will remain low with the development of other wind energy facilities within the area. As the impacts are considered to be low for the development of the Namas Wind Farm and with the development of the other wind energy facilities within the area, no unacceptable impact is expected to occur, and the cumulative noise impacts are expected to be acceptable.
» **Visual:** The cumulative visual impact for the Namas Wind Farm will be medium and will remain medium with the development of the other wind energy facilities within the area. The contribution of all the wind energy facilities in terms of cumulative impact will remain as a medium impact and will not result in a high cumulative impact. Therefore, the impact is considered to be acceptable.

» **Socio-economic:** The cumulative socio-economic impact for the Namas Wind Farm will be medium and will remain medium with the development of the other wind energy facilities within the area. The contribution of all the wind energy facilities in terms of cumulative impact will remain as a medium impact and will not result in a high cumulative impact. Therefore, the impact is considered to be acceptable.
» **Traffic:** The cumulative traffic impact during the construction and decommissioning phases for the Namas Wind Farm will be medium and will remain medium with the development of the other wind energy facilities within the area. The cumulative traffic impacts during the operation phase will be low for the Namas Wind Farm and will remain low with the development of the other wind energy facilities within the area. The cumulative impacts on traffic will not result in a high significance and are considered to be acceptable without whole-scale change.

Based on the specialist cumulative assessment and findings, the development of the Namas Wind Farm and its contribution to the overall impact of all wind energy facilities to be developed within a 30km radius, it can be concluded that the Namas Wind Farm cumulative impacts will be of a medium to low significance with no impacts of high significance expected. Therefore, the development of the Namas Wind Farm will not result in unacceptable, high cumulative impacts and will not result in a whole-scale change of the environment.

CHAPTER 11: CONCLUSIONS AND RECOMMENDATIONS

Genesis Namas Wind (Pty) Ltd is proposing the development of a 140MW wind farm and associated infrastructure on a site located approximately 20km south-east of Kleinsee. The wind farm is known as the Namas Wind Farm and is located within the Nama Khoi Local Municipality and the Namakwa District Municipality in the Northern Cape Province.

A preferred project site, consisting of 4 affected properties, has been identified by Genesis Namas Wind (Pty) Ltd for the development of a wind farm. The preferred project site has an extent of ~5092ha and is considered sufficient in extent (allowing sufficient space to avoid any major environmental sensitivities which may be identified within the site) and suitable for the development of up to 43 wind turbines from a technical perspective. The project site is located ~20km south-east of Kleinsee (Northern Cape), with the entire extent of the project site located within the Springbok REDZ. The wind farm is to be constructed within the project site, and together with the associated infrastructure, the wind farm will have a development footprint of less than 1% (~35.46ha) of the total project site. The wind farm is proposed within the following farm portions:

» Portion 3 of the Farm Zonnekwa 328
» Portion 4 of the Farm Zonnekwa 328
» Remaining Extent of the Farm Rooivlei 327
» Portion 3 of the Farm Rooivlei 327

The development footprint of the wind farm, to be located within the larger project site, will accommodate the wind turbines as well as the associated infrastructure. The grid connection required in order to connect the facility to the national grid at the existing Gromis Substation will primarily be located outside of the project site, and will be assessed as part of a separate Basic Assessment process. The Namas Wind Farm will consist of the following components:

» Up to 43 wind turbines with a maximum hub height of up to 130m. The tip height of the turbines will be up to 205m;
» Concrete turbine foundations and turbine hardstands;
» Temporary laydown areas which will accommodate the storage and assembly area;
» Cabling between the turbines, to be laid underground where practical;
» An on-site substation of 100m x 100m to facilitate the connection between the wind farm and the electricity grid;
» Access roads to the site (with a width of up to 10m) and between project components (with a width of approximately 8m);
» A temporary concrete batching plant; and
» Operation and maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitors centre.

Genesis Namas Wind (Pty) Ltd has confirmed that the project site is suitable for a wind energy development from a technical perspective due to the quality of the prevailing wind resources (based on site data collected for more than a 12-month period a wind mast located within the project site), access to the electricity grid, current land use, land availability and site-specific characteristics including topography.

A summary of the recommendations and conclusions for the proposed project is provided in this Chapter.

11.1. Legal Requirements as per the EIA Regulations, 2014 (as amended)

This chapter of the BA report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 1: Content of basic assessment reports:

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 the Namas Wind Farm has been included in section 11.2.
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 and negative impacts and risks of the proposed activity and identified alternatives.	An environmental impact statement containing the key findings of the environmental impacts of the Namas Wind Farm has been included as section 11.5. An Environmental Sensitivity and Layout map of the Namas Wind farm has been included as **Figure 11.1** which overlays the development footprint of the wind farm with the environmental sensitive features located within the project site. A summary of the positive and negative impacts associated with the Namas Wind Farm has been included in section 11.2.
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 Namas Wind Farm has been included in section 11.6.
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 Namas Wind Farm should be authorised has been included in section 11.6.

11.2 Evaluation of the Namas Wind Farm

The preceding chapters of this report together with the specialist studies contained within **Appendices D-L** provide a detailed assessment of the potential impacts that may result from the development of the Namas Wind Farm. This chapter concludes the environmental assessment of the wind farm by providing a summary of the results and conclusions of the assessment of both the project site and development footprint for the Namas Wind Farm. In so doing, it draws on the information gathered as part of the BA 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 sensitive features within the development footprint and the undertaking of the construction and operational monitoring, as specified by the specialists. The development footprint was designed by the project developer in order to respond to and avoid the sensitive environmental and social features located within the project site. This approach ensured the application of the mitigation hierarchy (i.e.

avoid, minimise and offset) to the Namas Wind Farm project, which ultimately ensures that the development is appropriate from an environmental perspective and is suitable for development within the project site. This approach therefore applied the mitigation hierarchy (i.e. avoid, minimise, mitigate) to the Namas Wind Farm project to enable a development that is considered appropriate from an environmental perspective and suitable for development within the site-specific context. The application of the mitigation hierarchy was undertaken by the developer prior to the commencement of the BA process for Environmental Authorisation, as detailed in Chapter 3. Therefore, it is concluded that the development footprint is suitable and appropriate from an environmental perspective for the wind farm, and all detrimental or adverse impacts on sensitive features were avoided, reduced and/ or mitigated as far as possible.

The potential environmental impacts associated with the Namas Wind Farm identified and assessed through the BA process include:

» Impacts on ecology, flora and fauna.
» Impacts on avifauna and bats.
» Impacts to soils and agricultural potential.
» Impacts on heritage resources, including archaeology, palaeontology and the cultural landscape.
» Noise impacts due to the construction and operation of the wind farm.
» Visual impacts on the area imposed by the components of the facility.
» Positive and negative socio- economic impacts.
» Traffic impacts, including increased pressure on the existing road network.

11.2.1 Impacts on Ecology

Based on the nature and significance of the post-mitigation ecological impacts, the Namas Wind Farm project site is considered as a broadly suitable environment for wind farm development from an ecological perspective. There are no specific long-term impacts likely to be associated with the wind farm that cannot be reduced to an acceptable level through mitigation and avoidance, including a low post-mitigation impact on ESAs and CBAs. Consequently, there are no high residual impacts or fatal flaws associated with the development and it can be supported from a terrestrial ecology perspective. It is therefore the reasoned opinion of the specialist that the Namas Wind Farm should be authorised, subject to the implementation of the recommended mitigation measures.

The Ecological Impact Assessment (**Appendix D**) assessed the impact of the Namas Wind Farm on the sensitive ecological features present within the project site for the life-cycle of the project. The Ecological Impact Assessment identified impacts within the construction, operation and decommissioning phases of the project.

During the construction phase, the impacts expected to occur include impacts on vegetation due to disturbance and clearing, impacts on fauna due to disturbance, loss of habitat and transformation of the area and an increased risk for soil erosion due to construction activities and the associated disturbance. The significance of the construction phase impacts ranges from medium to low, following the implementation of the recommended mitigation measures by the specialist. No impacts of a high significance were identified prior to the implementation of mitigation.

During the operation phase, the anticipated impacts include faunal impacts due to the presence of the wind farm and the associated disturbance, negative impacts on ESAs, CBAs and broad-scale ecological processes due to the presence of the wind farm within the landscape and an increased soil erosion risk due to increased vulnerability of the site following the undertaking of the construction activities. The significance of the impacts for the operation phase will be low following the implementation of the recommended mitigation measures by the specialist. No impacts of a high significance were identified for the project.

Two impacts on the ecology are expected to occur during the project decommissioning phase. These impacts include faunal impacts as a result of disturbance and soil erosion due to the impact of the decommissioning activities which increase the vulnerability of the site. The significance of the impacts during the decommissioning phase will be low following the implementation of the recommended mitigation measures by the specialist. No ecological impacts of high significance were identified for the decommissioning of the project.

11.2.2 Impacts on Avifauna

From the results of the avifauna assessment, it can be concluded that no impacts of high significance will occur on the avifauna communities within the area and the project site.

The Avifauna Impact Assessment (**Appendix E**) is based on the findings of the avifauna pre-construction monitoring campaign which was conducted between June 2017 and March 2018. The avifauna impacts identified to be associated with the Namas Wind Farm will be negative and local in extent. The duration of the impacts will be long-term, for the lifetime of the wind farm and apply to all collision-prone species. The magnitude is expected to be low.

The avifauna impacts identified relate specifically to three collision-prone Red Data Species likely to be impacted. These species include Secretarybird, Lanner Falcon and Ludwig's Bustard. The probability of occurrence of raptors (including Secretarybirds) and bustards having interaction with the wind farm is rated medium due to their low passage rates and occurrence within the project site. This, however, does not imply zero risk, as Secretarybirds are known to fly at the rotor swept area heights.

The avifauna impacts expected to occur include direct impact fatalities, as well as disturbance and loss of foraging habitat. The significance of the impacts on the three collision-prone Red Data species will be low following the implementation of the recommended mitigation measures of the specialists.

11.2.3 Impacts on Bats

Considering the findings of the bat pre-construction monitoring campaign and the impact assessment, it is concluded by the specialist that the development of the Namas Wind Farm is acceptable from a bat impact perspective, subject to the implementation of the recommended mitigation measures.

The Bat Impact Assessment (**Appendix F**) identified impacts on bats during the construction and operation of the Namas Wind Farm. The results of the Bat Impact Assessment is based on the bat pre-construction monitoring campaign conducted within the project site between May 2017 and June 2018.

During the construction phase, the impacts include the destruction of foraging habitat through the clearing of vegetation. This construction phase impact has been assessed as being of a low significance with the implementation of the recommended mitigation measures as identified by the specialist.

During the operation phase the impacts to bats include bat mortalities due to direct impact or barotrauma caused by the wind turbines and an increase in bat mortalities due to increased insect numbers as a result of the light attraction caused by the wind farm. Both of the impacts expected during the operation phase will be of a low significance with the implementation of the recommended mitigation measures as specified by the specialist.

11.2.4 Impacts on Land Use, Soil and Agricultural Potential

Following the assessment of the associated impacts, the specialist concluded that the proposed activities associated with the development of the Namas Wind Farm are acceptable from a soils perspective considering the characteristics and the potential of the soils present within the project site.

The current land use of the project site is extensive grazing (specifically by sheep) and the site is dominated by natural vegetation. The site also includes a significant proportion of sand dunes.

The soils present in most of the project site are not considered susceptible to erosion by water. However, if the vegetation cover is disturbed (for example by overgrazing or construction activities) and taking into account the sandy nature of the topsoils and dry climate, there is a significant possibility of loss of significant quantities of topsoil through wind erosion..

This can be mitigated by minimising the disturbed surface area, and ensuring rehabilitation of surface vegetation is carried out as soon as possible following disturbance.

There are no soils of high agricultural potential present within the project site and the soils are of moderate agricultural potential at best, due mainly to the sandy texture which will lead to rapid water infiltration and the soils drying out. In addition, the low rainfall in the area means that there is little potential for rain-fed arable agriculture. Arable production would therefore be possible only by irrigation, and no indications of any irrigated areas, within and surrounding the project site, can be identified on Google Earth.

In general, the soils that do occur within the project site are suited mainly for extensive grazing as the grazing capacity of the area is very low (around 26-40 ha/large stock unit).

The prevailing potential of the soils for rain-fed cultivation throughout most of the area, as well as the use of irrigation activities for cultivation, is low.

Impacts have been identified for both the construction and operation phases for the Namas Wind Farm (**Appendix G**). The impacts associated with land use, soil and agricultural potential include the loss of agricultural land and soil erosion. Both of these impacts can be mitigated to a low significance with the implementation of the recommended mitigation measures.

11.2.5 Impacts on Heritage Resources

The heritage specialist concluded that the palaeontological and archaeological resources are the main concerns for the Namas Wind Farm, although fossils are less likely to be found than archaeological sites. While fossils would be revealed by excavations during construction, and would require reporting when found, archaeological sites will be readily located during a final pre-construction survey and can be rescued through archaeological excavation before construction starts.

There are no fatal flaws and the development of the Namas Wind Farm is acceptable from a heritage perspective, subject to the implementation of the recommended mitigation measures. Buffers around known archaeological sites have been respected by the development footprint and no further buffers require implementation.

The Heritage Impact Assessment (**Appendix H**) identified impacts associated with the construction and operation of the Namas Wind Farm. The impact on heritage resources include the archaeology, palaeontology and cultural landscape of the project site.

Impacts on palaeontological resources, archaeological resources and graves may occur during the construction phase should direct destruction or damage arise through the activities associated with excavations for foundations and trenches, or the clearing of land for roads, laydown areas and ancillary infrastructure. The significance of these impacts ranges from medium to low with the implementation of the recommended mitigation measures. No impacts of a high significance are expected to occur.

One impact is expected to occur during the operation phase, which relates to the impacts to the cultural landscape through the introduction of wind turbines into an area where there are currently none. The significance of this impact will be medium with the implementation of the recommended mitigation measures.

11.2.6 Noise Impacts

The noise specialist concluded that the Namas Wind Farm could have a noise impact on the surrounding environment, however the impacts can be mitigated to a low significance. The increase in the noise levels is not considered to be a fatal flaw and the project is considered to be acceptable from a noise perspective.

The Noise Impact Assessment (**Appendix I**) identified specific activities during the construction and operation of the Namas Wind Farm which will create noise impacts.

The construction phase of the wind farm will lead to an increase in the ambient sound level of more than 7dB during the daytime, or daytime rating levels higher than 52dBA. Should construction activities be conducted during the night-time, an increase of 7dB in the ambient sound levels is expected, which will create night-time rating levels higher than 42dBA.

During the operation phase, activities relating to routine servicing and maintenance will be undertaken. The noise impact from maintenance activities will be insignificant, with the main noise source being the rotating wind turbine blades and the nacelle.

The operation phase of the wind farm will lead to an increase in the ambient sound level with more than 7dB during the daytime, or daytime rating levels higher than 52dBA. With the operation of the wind farm a night-time increase of 7dB in the ambient sound levels is expected, which will result in night-time rating levels exceeding 42dBA.

Five Noise Sensitive Developments (NSD) were identified, of which two are located within the Namas Wind Farm project site. Noise measurements were taken at two points within the project site and at one point outside of the project site. Within the project site, wind induced noises were documented and generally dominant, as well as bird communication, sheep bleating and human voices. Outside of the project site wind-induced noise from a windmill was recorded, as well as bird communication. It is extremely unlikely that a potential noise-sensitive receptor staying further than 2 000 m from a wind turbine would experience any noise impact.

The significance of the construction phase during both the daytime and night-time was rated as low. The significance of the daytime operation of the wind farm will be low, however the significance of the night-time operation will be medium without mitigation, and low with the implementation of the mitigation measures.

11.2.7 Visual Impacts

The visual specialist concluded that the anticipated visual impacts on sensitive visual receptors in close proximity to the Namas Wind Farm remains high, but that the impact is not considered to be a fatal flaw. The specialist further concluded, that subject to the recommended mitigation measures being implemented, the proposed wind farm development may be supported regardless of the impacts and the significance thereof.

The Visual Impact Assessment (**Appendix J**) identified negative impacts on visual receptors during the undertaking of construction activities and during construction and operation of the Namas wind Farm. The visual impact decreases with increasing distance from the wind farm, but remains greatest within the first 5km of the wind farm.

During the construction phase the undertaking of construction activities will impact on sensitive visual receptors in close proximity to the Namas Wind Farm. The construction phase will result in a noticeable increase in heavy vehicles which may cause a visual nuisance to other road users and landowners in the area. The construction phase visual impacts will have a low significance following the implementation of the recommended mitigation measures.

Visual impacts expected to occur during the operation phase includes impact on sensitive visual receptors within a 5km radius of the wind turbines, visual impact on sensitive visual receptors within the broader region, visual impact of shadow flicker, impact on observers of operational, safety and security lighting at night close to the wind farm, visual impact of the ancillary infrastructure and the visual impact of the wind farm on the sense of place. The significance of the visual impacts range from high to low with the implementation of the recommended mitigation measures. The high visual impacts relate to the visual impact on sensitive visual receptors within a 5km radius of the wind turbine structure. No mitigation is possible for this impact (i.e. the wind turbines will be visible regardless), however general management measures have been recommended by the specialist as best practice.

11.2.8 Socio-economic Impacts

The specialist concluded that the socio-economic benefits outweigh the negative socio-economic effects that the development of the Namas Wind Farm could create, and that there are no objections to the development of the Namas Wind Farm from a socio-economic perspective.

The Socio-Economic Impact Assessment (**Appendix K**) identified positive and negative impacts which are expected to occur during the construction, operation and decommissioning phases of the Namas Wind Farm.

During the construction phase the majority of the impacts will be positive, which includes an increase in production and GDP-R, the creation of temporary employment opportunities, attainment of household income, skills development and enhancement and an increase in government revenue. The significance of the positive construction phase impacts ranges from high to medium with the implementation of the recommended enhancement measures. The negative impacts associated with the construction phase of the wind farm includes an influx of migrant labour and job seekers, a change in the sense of place and potential stock theft and security issues. The significance of the negative impacts ranges from medium to low with the implementation of the recommended mitigation measures. The only impacts of high significance expected during the construction phase will be the positive impacts. No negative impacts of a high significance are expected.

During the operation phase of the Namas Wind Farm, only positive impacts are expected to occur. No negative impacts were identified. The positive operation phase impacts include stimulation of the economy, the creation of long-term employment, increase in household income, skills development and an increase in government revenue. The significance of the positive operational impacts ranges from high to medium with the implementation of the recommended enhancement measures.

Positive impacts are also expected to occur during the decommissioning phase of the Namas Wind Farm. The positive impacts include the creation of temporary employment opportunities, as well as stimulation of the demand for services from transport and construction companies. In addition, the decommissioning will result in the extraction of metallic and non-metallic materials from the site that could be re-used in other projects. The significance of the decommissioning phase impacts will be medium with the implementation of the recommended enhancement measures.

11.2.9 Impacts on Traffic

The specialist concluded that the development of the Namas Wind Farm is supported from a traffic engineering perspective, subject to the implementation of the stipulated recommendations.

The Traffic Impact Assessment (**Appendix L**) identified impacts expected to occur during the construction, operation and decommissioning phases.

During the construction phase approximately 473 trips will be required for the transportation of the project components and the required equipment. Therefore an increase in traffic on the surrounding road network is likely. The significance of the traffic impacts during the construction phase will be medium with the implementation of the recommended mitigation measures.

The operation phase of the Namas Wind Farm will generate limited vehicle trips. The significance of the operation phase impacts is rated as low with the implementation of the recommended mitigation measures, and it is expected that the operation phase will have a negligible impact on the road network.

The decommissioning phase will result in the same impacts identified and assessed for the construction phase as similar vehicles and number of trips are expected. The significance of the impacts is rated as medium with the implementation of the recommended mitigation measures.

11.2.10 Assessment of Cumulative Impacts

Cumulative impacts and benefits on various environmental and social receptors will occur to varying degrees with the development of several renewable energy facilities in South Africa. The degree of significance of these cumulative impacts is difficult to predict without detailed studies based on more comprehensive data/information on each of the receptors and the site-specific developments. The alignment of renewable energy developments with South Africa's National Energy Response Plan and the global drive to move away from the use of non-renewable energy resources and to reduce greenhouse gas emissions is undoubtedly positive. The economic benefits of renewable energy developments at a local, regional and national level have the potential to be significant.

The Namas Wind Farm falls within the Springbok REDZs which has been identified by the DEA as an area highly suitable for wind farms given a range of factors considered. Within a 30km radius of the Namas Wind Farm project site, there are three other wind farms which were considered as part of the cumulative impact assessment for the Namas Wind Farm; these include the Eskom Kleinzee Wind Farm located directly adjacent to the north west (authorised facility), the Juwi Kap Vley Wind Farm located directly adjacent to the south and east and the Genesis Zonnequa Wind Farm located directly adjacent to the north. The cumulative impacts associated with the Namas Wind Farm have been assessed to be acceptable, with no unacceptable loss or risk expected (refer to **Table 11.1** and Chapter 10).

Table 11.1: Summary of the cumulative impact significance for the Namas Wind Farm

Specialist assessment	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Ecology	Low	Medium
Avifauna	Medium	Medium
Bats	Low	Medium
Land use, soil and agricultural potential	Low	Low
Heritage (archaeology, palaeontology and cultural landscape)	Medium	Medium
Noise	Low	Low
Visual	Medium	Medium
Socio-Economic	Medium	Medium
Traffic	*Construction and Decommissioning:* Medium	*Construction and Decommissioning:* Medium
	Operation: Low	*Operation:* Low

Based on the findings of the specialist cumulative assessment and the contribution of the development of the Namas Wind Farm to the overall impact of all wind energy facilities being considered within a 30km radius of the project site, it can be concluded that cumulative impacts are of a medium to low significance, with no impacts of high significance anticipated. Therefore, the development of the Namas Wind Farm will not result in unacceptable, high cumulative impacts and will not result in a whole-scale change of the environment.

11.3. Environmental Sensitivity Mapping

From the specialist investigations undertaken for the Namas Wind Farm, the following sensitive areas/environmental features have been identified and demarcated within the project site and avoided by the development footprint (refer to **Figure 11.1** and **Appendix N**):

» **Ecology** - The majority of the project site consists of Namaqualand Strandveld considered to be of a low or moderate sensitivity. Development in these areas would generate low ecological impacts as these habitats are widely available in the broader area. The areas classified as Namaqualand Salt Pans have been confirmed in the field to not be salt pans, and while the vegetation survey confirmed that they are well-differentiated from the adjacent strandveld, they are not currently acting as hydrological features and are not considered to be as sensitive as a pan feature would be. Development within these areas is considered acceptable, but should be limited to some degree as this is not a very extensive habitat type, with the result that it is considered more vulnerable to cumulative impacts. In the west, the coastal duneveld is considered to be of a moderately high ecological sensitivity. There are six turbines and their associated internal access roads located within this area, which are considered to be an acceptable impact to this area. The main risks associated with development within this moderately high sensitivity area is wind erosion of the sandy soils as well as potential impacts on plant species of conservation concern. Both of these impacts can be mitigated to low levels, with the result that this is considered to represent an acceptable risk and impact.

» **Bird Habitat and Sensitive Areas** – One avifaunal no-go area was identified within the western portion of the project site - an inactive Secretarybird nest. The specialist has identified a 1km buffer for the nest which is considered to be sufficient for the reduction of possible disturbance during the construction and operation phases, and will reduce the possibility of direct impacts. This no-go area has been incorporated into the design plans of the Namas Wind Farm, and is subsequently entirely avoided in terms of the layout of the facility.

» **Bat Habitat and Sensitive Areas** – Areas considered to be sensitive from a bats perspective have been identified within the project site. These sensitive areas support specific features which are relevant to the bat populations present on site. The high bat sensitivity areas are considered to be critical for resident bat populations, capable of elevated levels of bat activity while supporting greater bat diversity/activity than the rest of the project site. These areas were deemed no-go areas and turbines (including turbine blades) may not be placed in these areas or their associated buffers. Features considered to be of a high bat sensitivity have been allocated a 200m buffer. The features associated with the highly sensitive areas are a kraal with a cement farm dam, residences, an excavation that may accumulate water over time, and a wind pump. All areas of high bat sensitivity, including the associated buffers have been incorporated into the design layout by the developer.

» **Heritage Sites:** Archaeological sites were identified by the specialist during the field survey of the project site and a 50m buffer has been applied. The archaeological cultural landscape consists of a multitude of individual archaeological sites classifiable as a Type 3 precolonial cultural landscape. The project site houses many small archaeological sites. On the pale sand dune areas there are many small sites with marine shells, ostrich eggshell fragments and stone artefacts. One of the biggest sites was at RV2018/005 (waypoint 006). Here there were several spatially related shell scatters with artefacts and some ostrich eggshell. Although just outside the western edge of the site, BZ2018/002 is another larger site that also has some pottery on it. The pottery indicates occupation less than 2000 years ago. Occasional isolated artefacts were also noted on the surface and these included a CCS backed bladelet that likely dates to more than 2000 years ago. The development footprint avoids all heritage sites identified by the specialist.

» **Noise Sensitive Developments (NSDs):** Noise sensitive developments, including residences located within the project site, occur in and around the project site and may be impacted by the Namas Wind Farm. It is unlikely that a potential noise-sensitive receptor staying further than 2 000m from a wind turbine would experience any noise impact.

11.4. Environmental Costs of the Wind Farm versus Benefits of the Wind Farm

Environmental costs (including those to the natural environment, economic and social environment) can be anticipated at a local and site-specific level, and are considered acceptable provided the mitigation measures as outlined in the BA report and the EMPr are implemented and adhered to. No fatal flaws have been identified. These environmental costs could include:

» *A loss of biodiversity, flora and fauna due to the clearing of land for the construction and utilisation of land for the wind farm* - The cost of loss of biodiversity has been minimised/avoided through the limited placement of project components and infrastructure within the Coastal Duneveld considered to be of a moderately high sensitivity.
» *An increase in traffic* - The Namas Wind Farm construction, operations and decommissioning will create an increase in traffic, however traffic volumes can be accommodated on the affected road network with ease as these roads were previously used for mining operations and are able to accommodate medium-high traffic volumes and the expected traffic associated with the Namas Wind Farm.
» *Visual impacts associated with the wind farm* - The Namas Wind Farm will be visible and of a high significance within a 5km radius of the project. No mitigation of this impact is possible (i.e. the structures will be visible in the landscape), but general mitigation and management are required as best practise to minimise secondary visual impacts which may arise from mismanagement of the site.
» *Change in land-use and loss of land available for grazing and sheep farming within the development footprint* - The environmental cost is anticipated to be limited due to the development footprint of the wind farm (less than 1% of the project site), the moderate agricultural potential of the project site, and the fact that current agricultural activities can continue on the remainder of the site during construction and operation.

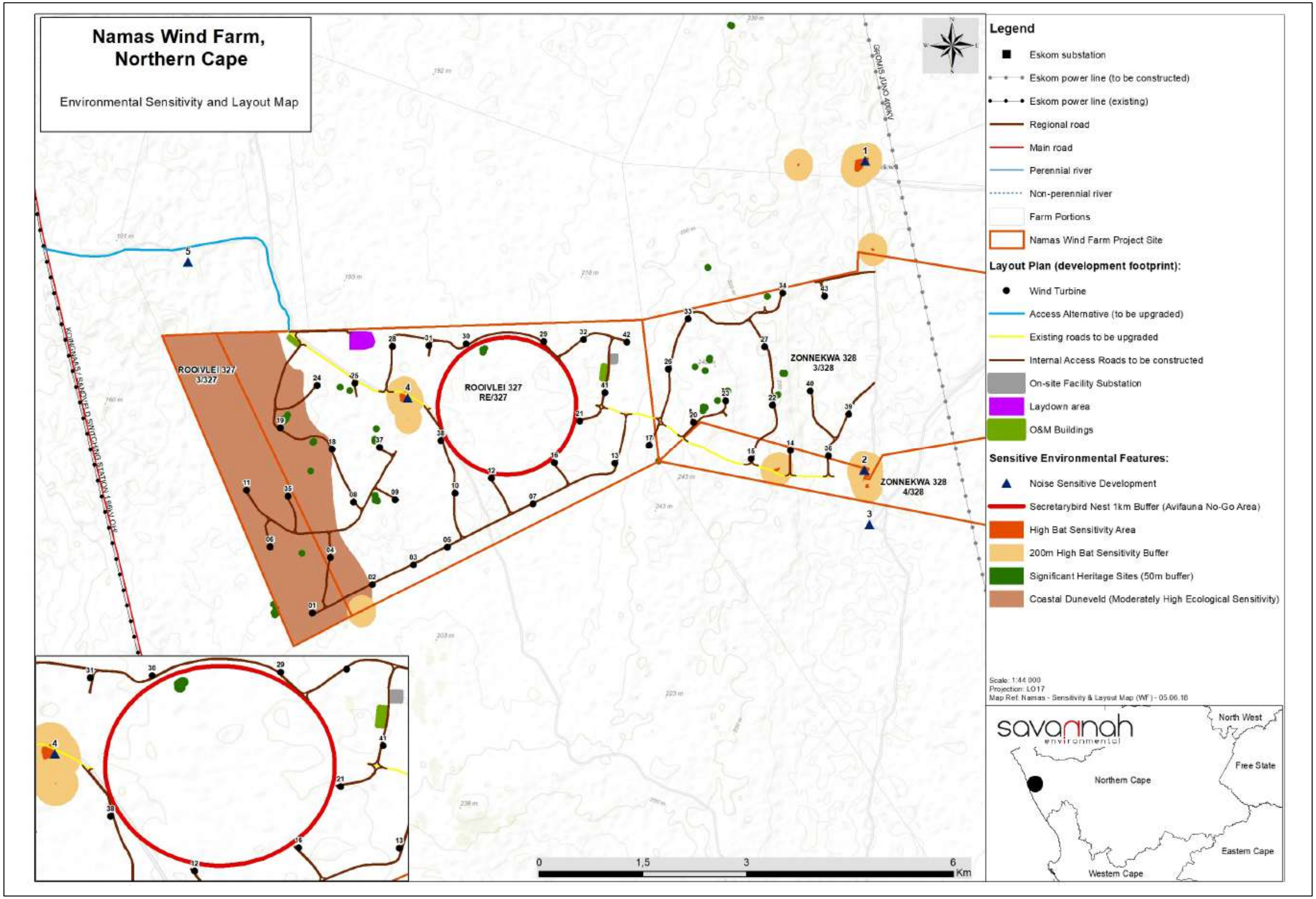

Figure 11.1: The development footprint (~35.46ha) of the Namas Wind Farm overlain on the identified environmental sensitive features (**Appendix N**)

Benefits of the Namas Wind Farm include the following:

- » The project will result in important economic benefits at the local (specifically Kleinsee) and regional scale through job creation, income and other associated downstream economic development. These will persist during the preconstruction, construction, operation and decommissioning phases of the project.
- » The project contributes towards the Provincial and Local goals for the development of renewable energy as outlined in the respective IDPs.
- » The project serves to diversify the economy and electricity generation mix of South Africa through the addition of wind energy.
- » The water requirement for a wind farm is negligible compared to the levels of water used by coal-based technologies. This generation technology is therefore supported in dry climatic areas.
- » South Africa's per capita greenhouse gas emissions are amongst the highest in the world due to the reliance on fossil fuels. The Namas Wind Farm will contribute to achieving goals for implementation of renewable energy and sustaining a 'green' economy within South Africa.

The benefits of the Namas Wind Farm are expected to occur at a national, regional and local level. As the costs to the environment at a site-specific level have been largely limited through the appropriate placement of infrastructure on the project site within lower sensitive areas through the avoidance of features and areas considered to be sensitive, the benefits of the project are expected to partially offset the localised environmental costs of the wind farm.

11.5. Overall Conclusion (Impact Statement)

The construction and operation of a wind farm with a contracted capacity of up 140MW on a project site located approximately 20km south-east of Kleinsee in the Nama Khoi Local Municipality has been proposed by Genesis Namas Wind (Pty) Ltd. A technically viable development footprint was proposed by the developer and assessed as part of the BA process. The assessment of the development footprint within the project site was undertaken by independent specialists and their findings have informed the results of this BA report.

The specialist findings have indicated that there are no identified fatal flaws associated with the implementation of the development footprint within the project site. The developer has designed a project development footprint in response to the identified sensitive environmental features and areas present within the project site. This approach is in line with the application of the mitigation hierarchy, where all the sensitive areas which could be impacted by the development have been avoided (i.e. tier 1 of the mitigation hierarchy). The impacts that are expected to remain after the avoidance of the sensitive areas have been reduced through the recommendation of specific mitigation measures by the specialists. The minimisation of the significance of the impacts is in line with tier 2 of the mitigation hierarchy.

Therefore, impacts can be mitigated to acceptable levels or enhanced through the implementation of the recommended mitigation or enhancement measures. This is however not relevant for the visual impact within a 5km radius of the wind farm as the turbines will be visible regardless of the mitigation applied. This high significance rating is, however, not considered as a fatal flaw by the specialist due to the spatial location of the project in the landscape and the low population density present.

Through the assessment of the development footprint within the project site it can be concluded that the development of the Namas Wind Farm is environmentally acceptable (subject to the implementation of the recommended mitigation measures).

11.6. Overall Recommendation

Considering the findings of the independent specialist studies, the impacts identified, the development footprint proposed by the developer, the avoidance of the 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 Namas Wind Farm is acceptable within the landscape and can reasonably be authorised (**Figure 11.2**).

The following infrastructure would be included within an authorisation issued for the project:

» Up to 43 wind turbines with a maximum hub height of up to 130m. The tip height of the turbines up to 205m;
» Concrete turbine foundations and turbine hardstands;
» Temporary laydown areas which will accommodate the storage and assembly area;
» Cabling between the turbines, to be laid underground where practical;
» An on-site substation of 100m x 100m to facilitate the connection between the wind farm and the electricity grid;
» Access roads to the site (with a width of up to 10m) and between project components (with a width of approximately 8m);
» A temporary concrete batching plant; and
» Operation and maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitors centre.

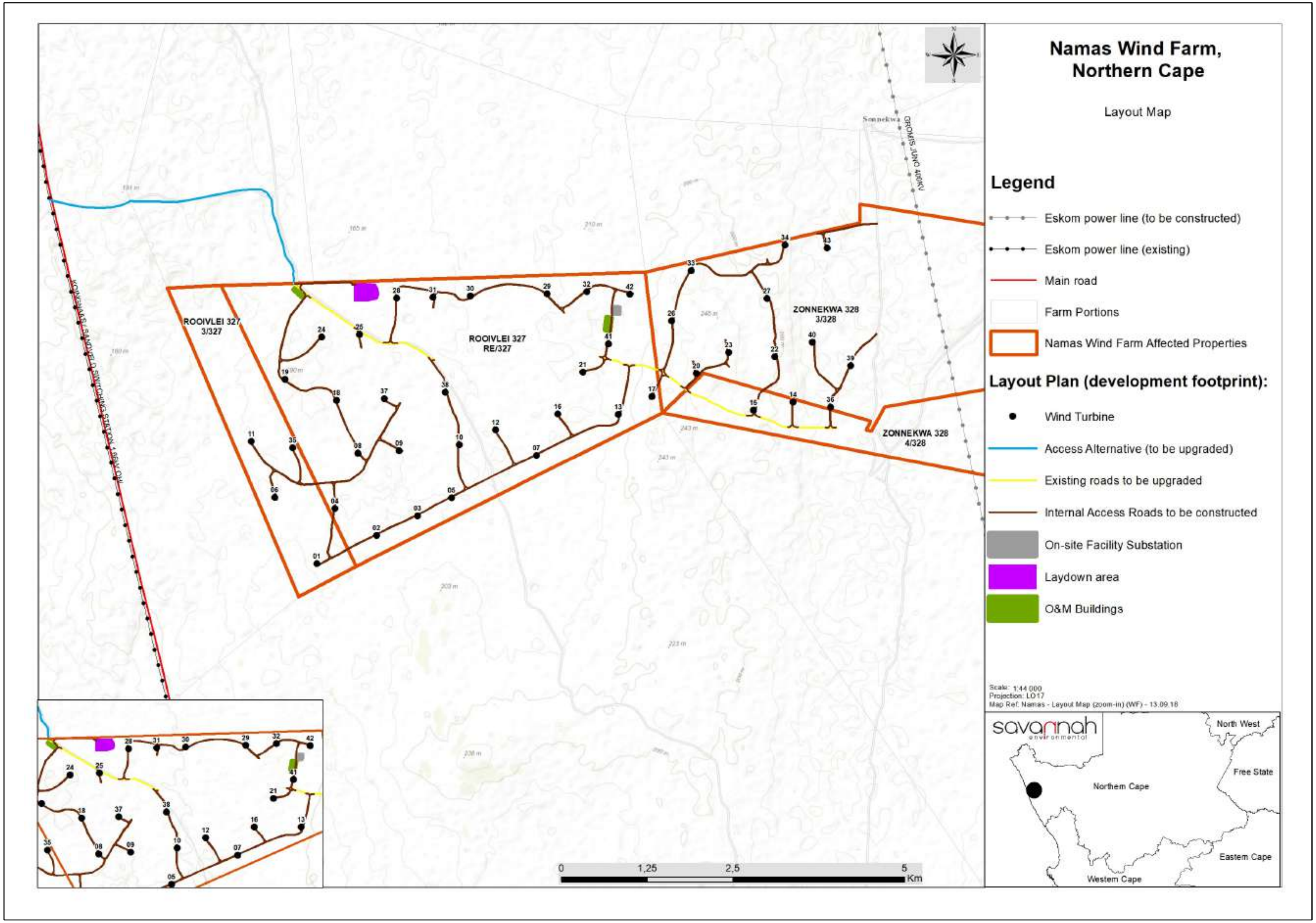

Figure 11.2: Final preferred development footprint for the Namas Wind Farm, as was assessed as part of the BA process (A3 map included in **Appendix N**)

The following key conditions would be required to be included within an authorisation issued for the Namas Wind Farm:

» All mitigation measures detailed within this BA report, as well as the specialist reports contained within **Appendices D to L**, are to be implemented.
» The EMPr as contained within **Appendix M** of this BA report should form part of the contract with the Contractors appointed to construct and maintain the wind farm in order to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of the Namas Wind Farm is considered key in achieving the appropriate environmental management standards as detailed for this project.
» Following the final design of the Namas Wind Farm, a revised layout must be submitted to DEA for review and approval prior to commencing with construction. No development is permitted within the identified no-go areas as detailed in **Figure 11.1.**
» A preconstruction walk-through of the final layout, including roads and underground cables, should be undertaken before construction commences and adjusted where required to reduce impacts on species of conservation concern and habitats of concern.
» An open space management plan should be developed for the site, which should include the management of biodiversity within the affected areas, as well as that in the adjacent intact strandveld on the affected land portions.
» Erosion management at the site should take place according to the Erosion Management Plan and Rehabilitation Plan.
» Position the turbines outside of the prescribed 1km buffer around the inactive Secretarybird nest to avoid the identified high aerial traffic risk area.
» Implement 12-24 months post-construction monitoring campaign to assess the mortality of birds in the operational wind farm, through direct observation and carcass searches.
» If turbines impact birds then paint a single blade black (or with UV-paint) for those select turbines known to kill the most birds.
» Implement Level 3 mitigation[26] to all turbines from the start of operation for the protection of bats, from sunset until sunrise every night for the months of March, April, May, August and September. If this mitigation is not technically feasible based on the model of turbine to be used, the bat specialist conducting the operational long-term bat mortality monitoring must recommend a technically feasible alternative. The specialist conducting the operational bat mortality monitoring may also, after the first year of operational monitoring, recommend Level 3, or other required mitigations, to be applied to selected turbines only, based on the bat mortality results. This is an adaptive management approach and the effectiveness of the adaptive management will have to be determined during the second year of the operational monitoring study.

[26] This implies 90-degree feathering below the manufacturer's cut in speed to minimise free-wheeling, which does not result in high production loss but can lessen the likelihood of bat impacts significantly.

- Implement a minimum of 2 years of operational bat mortality monitoring, initiating from the commencement of the wind farm's operation.
- Appoint an archaeologist to conduct a final pre-construction survey of the approved wind farm layout at least 6 months prior to the commencement of construction.
- Implement a chance finds procedure for the rescuing of any fossils or heritage resources discovered during construction.
- If any archaeological material or human burials are uncovered during construction activities, work in the immediate area should be halted, the find reported to the heritage authorities and inspected by an archaeologist. Such heritage is the property of the State and may require excavation and curation in an approved institution.
- Operational noise measurements should be collected over at least 48 hours during the operation phase (winter period) to ensure that noise levels are less than 42dBA at NSD04 with people staying at this farm dwelling.
- Maintain vegetation cover (i.e. either natural or cultivated) immediately adjacent to the actual development footprint, both during construction and operation of the proposed facility in order to minimise visual impact as a result of cleared areas and areas denuded of vegetation.
- Mount aircraft warning lights on the turbines representing the outer perimeter of the wind farm, as prescribed by the Civil Aviation Authority (CAA).
- Monitor all rehabilitated areas for one year following decommissioning, and implement remedial actions as and when required.
- At access points, ensure the 228m sight triangle area is kept clear of obstructions.
- All access and internal roads must be investigated for their topographical suitability, all bellmouths need to be in line with the required geometric standards, access and circulation roads will have to be upgraded to suit abnormal load vehicle requirements and the respective haulage company must conducts a route test to determine the restrictions relevant to the haulage vehicle to be utilised.

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