MERINO WIND FARM
NORTHERN CAPE PROVINCE

Environmental Impact Assessment Report

DFFE Reference No.: 14/12/16/3/3/2/2114

May 2022

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PROJECT DETAILS

DEFF Reference No.	:	14/12/16/3/3/2/2114
Title	:	Environmental Impact Assessment Report: Merino Wind Farm, Northern Cape Province
Authors	:	Savannah Environmental (Pty) Ltd Mmakoena Mmola Jo-Anne Thomas
Applicant	:	Great Karoo Renewable Energy (Pty) Ltd
Report Status	:	Revision 0 – Draft Report for Public Review
Date	:	May 2022

When used as a reference this report should be cited as: Savannah Environmental (2022) Environmental Impact Assessment Report: Merino Wind Farm, Northern Cape Province

PURPOSE OF THE EIA REPORT AND INVITATION TO COMMENT

Great Karoo Renewable Energy (Pty) Ltd has appointed Savannah Environmental as the independent environmental consultant to undertake the Environmental Impact Assessment Process for the Merino Wind Farm. The EIA 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). This EIA report has been compiled in accordance with Appendix 3 of the EIA Regulations, 2014 (as amended) and consists of the following sections:

» **Chapter 1** provides background to the Merino Wind Farm and the EIA process.
» **Chapter 2** provides a description of the wind farm and infrastructure associated with the facility.
» **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 proposed facility.
» **Chapter 6** describes the need and desirability of the Merino Wind Farm within the project site.
» **Chapter 7** outlines the process which was followed during the EIA process.
» **Chapter 8** describes the existing biophysical and socio-economic environment affected by the proposed facility.
» **Chapter 9** provides a description and assessment of the potential issues associated with the proposed wind farm and associated infrastructure.
» **Chapter 10** provides a description and assessment of the potential cumulative issues associated with the proposed wind farm and associated infrastructure.
» **Chapter 11** presents the conclusions and recommendations based on the findings of the EIA for the Merino Wind Farm.
» **Chapter 12** provides references used in the compilation of the EIA Report.

The EIA Report is available for review from, **Friday, 13 May 2022 to Monday, 13 June 2022** on the Savannah Environmental website: https://savannahsa.com/public-documents/energy-generation/the-great-karoo-cluster-of-renewable-energy-facilities/

Please submit your comments by **Monday, 13 June 2022** to:
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Comments can be made as written submission via fax, post or email.

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EXECUTIVE SUMMARY

Great Karoo Renewable Energy (Pty) Ltd is proposing the development of a commercial wind farm and associated infrastructure on a site located approximately 35km south-west of Richmond and 80km south-east of Victoria West, within the Ubuntu Local Municipality and the Pixley Ka Seme District Municipality in the Northern Cape Province (refer to **Figure 1**). The facility will have a contracted capacity of up to 140MW and will be known as the Merino Wind Farm. The project is planned as part of a larger cluster of renewable energy projects, which includes three (3) 100MW PV facilities (known as the Moriri Solar PV, Kwana Solar PV, and Nku Solar PV), an additional 140MW Wind Energy Facility (known as the Angora Wind Farm), as well as grid connection infrastructure connecting the renewable energy facilities to the existing Eskom Gamma Substation (refer to **Figure 2**). These projects are proposed by separate Specialist Purpose Vehicles (SPVs)[1], and are assessed through separate Environmental Impact Assessment (EIA) processes.

A technically feasible project site[2], with an extent of ~29 909ha has been identified by Great Karoo Renewable Energy (Pty) Ltd as a technically suitable area for the development of the Merino Wind Farm. A development area[3] of ~6 463ha has been identified within the project site by the proponent for the development. The development area consists of four (4) affected properties, which include:

» Portion 1 of Farm Rondavel 85
» Portion 0 of Farm Rondavel 85
» Portion 9 of Farm Bult & Rietfontein 96
» Portion 0 of Farm Vogelstruisfontein 84

During the Scoping Phase, the full extent of the development area was considered by the specialist assessments, with the aim of determining the suitability from an environmental and social perspective and identifying areas that should be avoided in development planning. Based on the specialist assessments undertaken during the Scoping Phase, areas of environmental sensitivity were identified within the development area. In order to avoid these areas of potential sensitivity and to ensure that potential detrimental environmental impacts are minimised as far as possible, the developer identified a suitable development footprint[4] (~2 800ha in extent) within the larger development area where the wind turbines and other associated infrastructure for the Merino Wind Farm is planned to be constructed. Since the development area assessed during the Scoping Phase is larger than the area required for the development footprint, it provides the opportunity for the optimal placement of the infrastructure, ensuring avoidance of major identified environmental sensitivities.

Infrastructure associated with the Merino Wind Farm will include:

» Up to 35 wind turbines with a maximum hub height of up to 170m and tip height of up to 250m.
» Concrete turbine foundations to support the turbine hardstands.

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[1] The development of the various projects under separate SPVs is in accordance with the DMRE's requirements under the REIPPPP.
[2] The project site is the area with an extent of 29 909ha, within which the Merino Wind Farm development footprint will be located.
3 The development area is that identified area (located within the project site) where the Merino Wind Farm is planned to be located. This area has been selected as a practicable option for the facility, considering technical preference and constraints. The development area is ~6 463ha in extent.
4 The development footprint, which is ~2 800ha in extent, is the defined area (located within the development area) where the wind turbines and other associated infrastructure for the Merino Wind Farm is planned to be constructed. This is the actual footprint of the facility, and the area which would be disturbed.

- Inverters and transformers.
- Temporary laydown areas which will accommodate storage and assembly areas.
- Cabling between the turbines, to be laid underground where practical.
- A temporary concrete batching plant.
- 33/132kV onsite facility substation.
- Underground cabling from the onsite substation to the 132kV collector substation.
- Electrical and auxiliary equipment required at the collector substation that serves the wind energy facility, including switchyard/bay, control building, fences, etc.
- Battery Energy Storage System (BESS).
- Access roads and internal distribution roads.
- Site offices and maintenance buildings, including workshop areas for maintenance and storage.

The Merino Wind Farm is proposed in response to the identified objectives of the national and provincial government and local and district municipalities to develop renewable energy facilities for power generation purposes. It is the developer's intention to bid the Merino Wind Farm under the Department of Mineral Resources and Energy's (DMRE's) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme or a similar programme, with the aim of evacuating the generated power into the national grid. This will aid in the diversification and stabilisation of the country's electricity supply, in line with the objectives of the Integrated Resource Plan (IRP), with the Merino Wind Farm set to inject up to 140MW into the national grid.

From a regional perspective, the area within the Northern Cape identified for the project is considered favourable for the development of a commercial wind farm by virtue of prevailing climatic conditions, relief, the extent of the affected properties, the availability of a direct grid connection (i.e., a point of connection of the national grid) and the availability of land on which the development can take place.

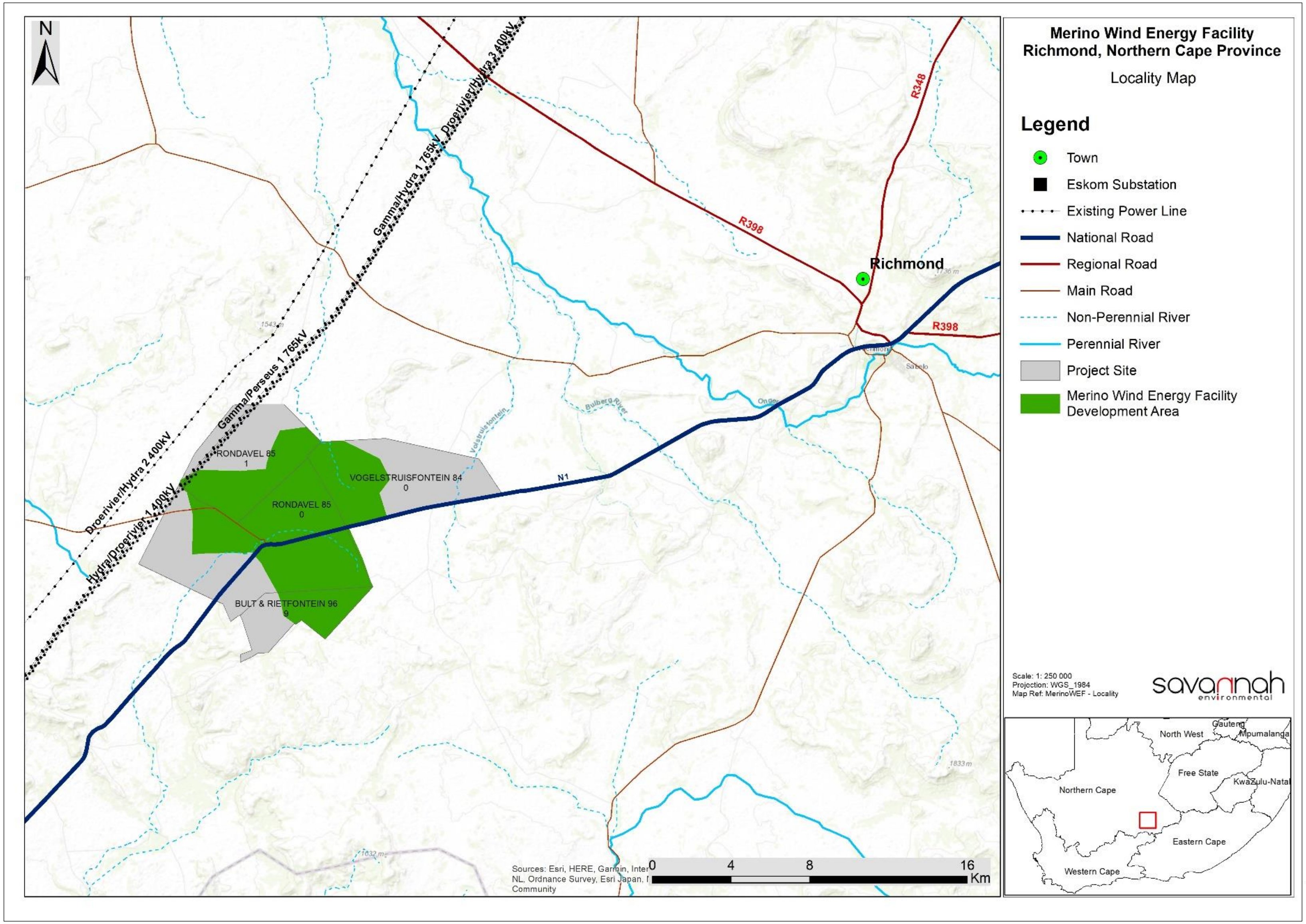

Figure 1: Locality map of the project site within which the Merino Wind Farm is proposed to be developed

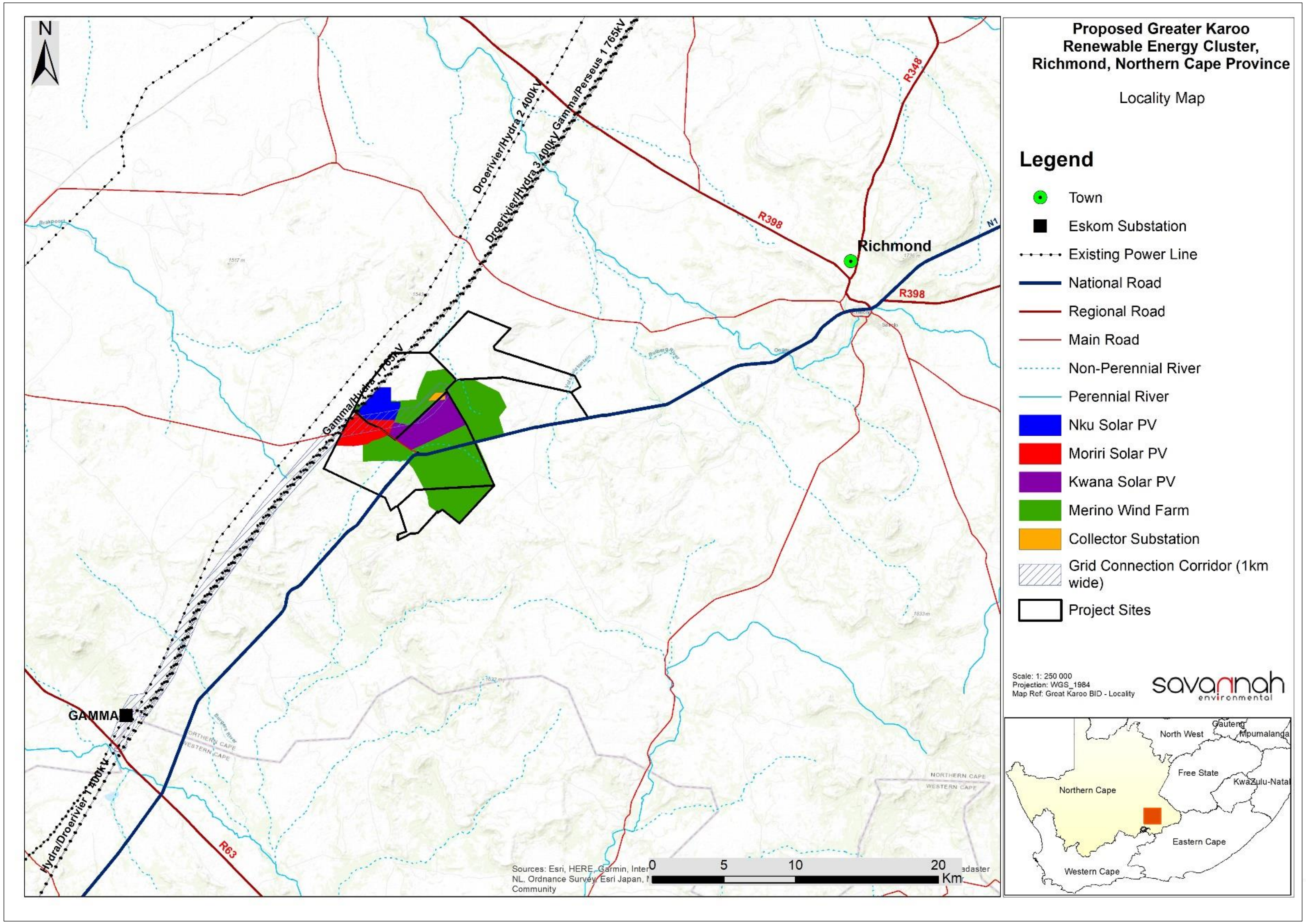

Figure 2: The proposed cluster of renewable energy facilities that the Merino Wind Farm forms part

1. Environmental Permitting Requirements

The Merino Wind Farm and its associated infrastructure trigger the need for following environmental permit:

» **An Environmental Authorisation (EA)** from the National Department of Forestry, Fisheries, and the Environment (DFFE), in consultation with the Provincial Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform (DAEARD & LR), in accordance with the requirements of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and Environmental Impact Assessment (EIA) Regulations (GNR 326), 2014, as amended.

Savannah Environmental has been appointed as the Independent Environmental Assessment Practitioner (EAP) in accordance with NEMA and Regulations 21 to 24 of the 2014 EIA Regulations (GNR 326) to undertake the required S&EIA in support of the application for Environmental Authorisation (EA) and the public participation process for the project, in order to identify and assess all potential environmental impacts associated with the proposed wind farm and recommend appropriate mitigation measures in an Environmental Management Programme (EMPr).

An EIA 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 fore warned of potential environmental issues and allows for the resolution of issues reported on in the Scoping and EIA Reports as well as a dialogue with Interested and Affected Parties (I&APs). Comprehensive, independent environmental specialist studies are required in accordance with the EIA Regulations to provide the competent authority with sufficient information in order to make an informed decision. The EIA process being undertaken for the proposed general waste disposal site comprises two phases – i.e., Scoping and Impact Assessment - and involves the identification and assessment of environmental impacts through specialist studies, as well as public participation. The process followed in these two phases is as follows:

» The **Scoping Phase** includes the identification of potential issues associated with the project through a desktop study (considering existing information), limited field work and consultation with interested and affected parties and key stakeholders. This phase considered the broader project site in order to identify and delineate any environmental fatal flaws, no-go and / or sensitive areas. Following a public review period of the Scoping Report, this phase culminated in the submission of a final Scoping Report and Plan of Study for the EIA to the Competent Authority for consideration and acceptance. The Scoping Report was accepted, and the Plan of Study approved by the DFFE on 27 January 2022.

» The **EIA Phase** involves a detailed assessment of potentially significant positive and negative impacts (direct, indirect, and cumulative) identified in the Scoping Phase. This phase considers a proposed development footprint and includes detailed specialist investigations (including field surveys), consideration of feasible alternatives and public consultation. Recommendations of practical and achievable mitigation and management measures are included in an Environmental Management Programme (EMPr) considering all phases of the project. Following the public review period of the EIA Report and EMPr, this phase culminates in the submission of a Final EIA Report and EMPr to the competent authority for review and decision-making.

2. Potential Impacts Identified

An Environmental Impact Assessment (EIA) was undertaken for the proposed project in accordance with the requirements of the EIA Regulations, 2014 (as amended). The EIA Report, together with the specialist studies contained within **Appendices D-M** provide a detailed assessment of the potential impacts that may result from the development of the Merino Wind Farm.

No environmental fatal flaws or unacceptable impacts 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 area and the removal of the one proposed turbine from the Merino Wind Farm located on the ridgelines, as specified by the specialists.

The potential environmental impacts associated with the Merino Wind Farm assessed through the EIA process include:

» Impacts on terrestrial ecology (flora and fauna).
» Impacts on aquatic ecology.
» Impacts on avifauna.
» Impacts on bats.
» Impacts on land use, 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 social impacts.

The environmental sensitivities identified by the relevant specialists for the project site are illustrated in **Figure 3**. The development footprint, as assessed, has been overlain with the relevant environmental sensitivities.

2.1 Impacts on Ecology

The study area consists mostly of natural habitat that is used for commercial animal husbandry. The proposal to build the Merino Wind Farm on site will therefore have significant effects on natural habitat. The existing biodiversity on site is, however, relatively limited in terms of uniqueness or potential presence of species of concern, with the possible presence of one Critically Endangered mammal species.

The vegetation on site is not considered to be part of any threatened ecosystem and has not been assessed as being of high conservation value due to rates of transformation. The regional vegetation types that occur on site, i.e., Eastern Upper Karoo and Upper Karoo Hardeveld, are both widespread and have low rates of transformation across their geographical range.

There are three plant species listed as Rare (*Anisodontea malavastroides, Aloe broomii var. tarkaensis* and *Tridentea virescens*) that could potentially occur on site, but these are all widespread species that are naturally rare where they are found. None have been previously recorded on this site. There are also two plant species protected according to National legislation (*Crinum bulbispermum and Harpagophytum procumbens*) that could potentially occur in the geographical area, but these are also very widespread

species. The loss of some individuals, if they are found to occur on site, would not affect the conservation status of any of the species. It is, however, unlikely that any of them would be affected.
There are a small number of fauna species of conservation concern that were assessed as having a possibility of occurring on site. The Riverine Rabbit has been previously recorded within the broader project site. At a regional level, the Critical Biodiversity Area (CBA) map for Northern Cape indicates one drainage line, along with a buffer on each side, that is designated as being a CBA1 area. The remaining drainage lines of the study area are indicated as being Ecological Support Areas (ESAs).

Sensitivities that occur specifically within the development area for the Merino Wind Farm that may be vulnerable to damage from the proposed project are as follows:

» Dry stream beds, including the associated riparian habitats and adjacent floodplains (High sensitivity)
» CBA1 (high sensitivity)
» Habitat suitable for Riverine Rabbit (very high sensitivity)
» Ridges (medium to high sensitivity)
» Plains vegetation (medium sensitivity)

The impacts on ecology associated with the Merino Wind Farm are of low or medium significance. If appropriate mitigation measures are put in place, all impacts can be reduced to having low significance, except for loss of habitat, which will remain medium significance after mitigation. The specialist concluded that the project can proceed from an ecological perspective.

2.2 Impacts on Aquatic Ecology

Based on a combination of desktop and in-field delineation, three (3) forms of watercourses were identified and delineated within the 500m regulated area. These include episodic rivers, drainage lines and dams. No natural wetland systems were identified for the development area. The rivers and drainage lines are both classified as a river HGM type system. The dams are regarded as artificial systems and typically formed / created in the preferential flow paths of the river HGM type. The drainage lines are not characterised by riparian vegetation and grasses, these systems represent bare surfaces with evidence of surface run-off.

The results of the habitat assessment indicate natural (class A) and largely natural (class B) instream and riparian conditions for the catchment respectively. The overall ecological importance and sensitivity for the area was determined to be moderate. The overall ecosystem service benefit for the system is high.

The recommended buffer was calculated to be 15m and 22m for the drainage lines and rivers, respectively, for the construction and operational phases. The buffer zone will not be applicable for proposed infrastructure that traverse the systems, however, for all secondary activities such as laydown yards and storage areas, the buffer zone must be implemented.

The pre-mitigation impact significance for all considered aspects is expected to be medium. The expected post-mitigation impact significance is expected to be low should all mitigation measures and recommendations be implemented. It is the opinion of the specialist that no fatal flaws are presented for the proposed project. The project may be considered favourably by the issuing authority, but all mitigation measures and recommendations must be considered for the authorisation.

Since there are watercourses present within the development area of the Merino Wind Farm as identified in the Aquatic Impact Assessment (**Appendix E** of the EIA Report), a water use authorisation for the project will be required from the DWS for water uses identified in Section 21(c) and 21(i) of the National Water Act (Act 36 of 1998).

2.3 Impacts on Avifauna

The South African Bird Atlas Project 2 (SABAP2) data indicates that a total of 165 bird species could potentially occur within the broader area. Of these, 24 species are classified as priority species and 12 of these are South African Red List species. Of the priority species, 17 are likely to occur regularly in the development area, namely, Black Harrier, Black Stork, Blue Crane, Greater Flamingo, Karoo Korhaan, Lanner Falcon, Ludwig's Bustard, Martial Eagle, Secretarybid, Tawny Eagle, Verreaux's Eagle and Cape Vulture.

The following specific environmental sensitivities were identified from an avifaunal perspective:

» **Large dams: 800m turbine No-Go zone**
Surface water in this semi-arid habitat is crucially important for priority avifauna and many non-priority species. It is important to leave open space with no turbines for birds to access and leave the surface water area unhindered. Blue Cranes are also likely to at times roost in the larger dams and could fly in and out of these areas before dawn / after dusk which further necessitates a sufficient buffer around the dams.

» **Boreholes: 200m turbine No-Go zone**
Surface water in this semi-arid habitat is crucially important for priority avifauna and many non-priority species. It is important to leave open space with no turbines for birds to access and leave the surface water area unhindered.

» **Verreaux's Eagle nest: 3.7km all infrastructure No-Go zone and 5.2km medium sensitivity zone**
A 3.7km infrastructure free buffer zone must be implemented around the Verreaux's Eagle (SA status: Vulnerable) nest near the site (at -31.425449° 23.702398°). This is to reduce the collision risk. It is recommended that suitable pro-active mitigation be implemented at all turbines within a 5.2 km radius around the Verreaux's Eagle nest during daylight hours, once the wind farm commences with operations, to reduce the risk of collisions of Verreaux's Eagles with the turbines. Suitable pro-active mitigation measures should be selected prior to commencement of operation, informed by best-available information at the time of implementation.

» **Tawny Eagle nests: 3km all infrastructure No-Go zone**
A 3km infrastructure free buffer zone must be implemented around the Tawny Eagle (SA status: Endangered) nests at (-31.540635°, 23.716886°) and (-31.445988°, 23.583921°). This is to reduce the turbine collision risk.

» **Martial Eagle nests: 5km all infrastructure No-Go zone**
A 5km infrastructure free buffer zone must be implemented around the Martial Eagle (SA status: Endangered) nest (at -31.524550° 23.534279°). This is to reduce the turbine collision risk.

The proposed Merino Wind Farm will have a medium impact on avifauna which, in most instances, could be reduced to a low impact through appropriate mitigation. **The currently proposed 35 turbine lay-out which was assessed in the Avifauna Impact Assessment Report avoids all the recommended avifaunal turbine**

exclusion zones and is therefore deemed acceptable. The development is therefore supported, provided the recommended mitigation measures are strictly applied.

2.4 Impacts on Bats

Several site visits were made to the Merino Wind Farm between December 2020 and December 2021. The passive data indicates that the three bat species most likely to be impacted on by the proposed wind farm are *Laephotis* (formerly *Neoromicia*) *capensis, Miniopterus natalensis* and *Tadarida aegyptiaca*. These more 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.

Due to the extrapolated nature of the national screening tool, further Google Earth satellite imagery and verifications during site visits were used to spatially demarcate areas of the site with high and medium sensitivities relating to bat species ecology and habitat preferences, where high sensitivities and their buffers are no-go zones for turbines and turbine blade overhang. In other words, no turbine blades may intrude into high sensitivity buffers. Medium sensitivities indicate areas of probable increased risk due to seasonal fluctuations in bat activity, but turbines are allowed to be constructed in medium sensitivity areas. Considering the current proposed layout for the Merino Wind Farm, no turbines are intruding onto the high bat sensitivities. The layout respects the bat sensitivity map when applying an 80m blade length.

Based on the bat activity recorded at the Merino Wind Farm, the significance ratings for the majority of the impacts to bats posed by the development are predicted to be medium before mitigation. After mitigation, all impacts are predicted to be low, except for bat mortality due to moving turbines, which is predicted to remain of medium significance after mitigation.

From a bat impact perspective, no reasons have been identified for the Merino Wind Farm development not to proceed to the approval phase. If the proposed Merino Wind Farm is approved, a minimum of 2 years of operational bat mortality monitoring must be conducted from the start of the operation of the facility.

2.5 Impacts on Land Use, Soil and Agricultural Potential

Various soil forms were identified throughout the development area, namely the Tubatse, Oakleaf and Bethesda soil forms. These soil forms are characterised by an orthic topsoil on top of a neocutanic horizon. The Tubatse and Bethesda soil forms are characterised by a lithic and hard rock horizon underneath the neocutanic horizons respectively with the Oakleaf being characterised by a deep neocutanic horizon.

Eight potential land capability classes are located within the proposed development area, namely, Land Capability 1 to 5 (Very Low to Low); and Land Capability 6 to 8 (Low/Moderate to Moderate Sensitivity). The soil forms identified within the development area have been determined to be associated with one land capability, namely LCIII, i.e., Low.

The significance ratings for the impacts of the proposed wind farm on land capability are predicted to be low before and after mitigation. Considering the low sensitivities associated with land potential resources and the low significance of the identified impacts, it is the specialist's opinion that the proposed activities will have an acceptable impact on soil resources and that the proposed activities should proceed as have been planned.

2.6 Impacts on Heritage Resources (archaeology, palaeontology and cultural landscape)

During the site survey four (4) archaeological and heritage resources were identified within the development area for the Merino Wind Farm. The development area is underlain by sediments of very high palaeontological significance and five (5) palaeontological heritage resources were identified during the survey of the development area. The landscape of the development area has been assessed for cultural significance, and found to have five distinct character areas, namely, historic movement corridors, open plains interrupted by low koppies, elevated areas with steep sided mountain ridges, areas of landscape that have been transformed by significant infrastructural development, and remote landscape with wilderness qualities. Based on character area analysis undertaken as part of the cultural landscape assessment, areas classified as no-go, tread lightly (subject to site specific constraints), and developable areas were identified within the development area.

There are limited impacts anticipated to archaeological and palaeontological heritage from this proposed development and as such, the principle of a renewable energy facility in this location is supported from a heritage perspective provided that the infrastructure is located in areas able to tolerate the impact of the high degree of change from a cultural landscape perspective.
A number of the proposed turbines are located on the ridge-lines which have been identified as no-go for turbine development due to the high negative impact anticipated to the existing Karoo sense of place. In order to mitigate this impact, it is recommended that one proposed turbine (i.e., M30) from the Merino Wind Farm be removed or relocated from the ridgelines.

Based on the outcomes of this report, it is not anticipated that the proposed development of the Merino Wind Farm and its associated infrastructure will negatively impact on significant heritage resources on condition that the recommended mitigation measures are implemented, including the removal or relocation of the turbine referred to previously.

2.7 Noise Impacts

Ambient (background) sound levels were measured over a period of three nights from 9 September to 12 September 2021 in accordance with the South African National Standard SANS 10103:2008. The results of the measurements at each location indicate that ambient sound levels in the area are generally low and typical of a rural noise district during low wind conditions.

Considering measurements collected over the past decade at numerous locations during different seasons, ambient sound levels will likely increase as wind speeds increase. Residential areas and potential noise-sensitive developments/receptors/communities (NSRs) were identified using aerial images as well as a physical site visit.

Considering the low significance of the potential noise impacts (with mitigation, inclusive of cumulative impacts) for the proposed Merino Wind Farm and associated infrastructure, it is recommended that the development be authorised. The proposed layout (i.e., turbine placement) is considered to be acceptable from a noise perspective. No further noise studies or additional noise measurements are recommended or required.

2.8 Visual Impacts

A visibility analysis was undertaken from each of the wind turbine positions (35 in total) at an offset of 170m (approximate hub-height) above ground level.

From the viewshed analysis, it is evident that the proposed wind farm would have a larger core area of potential visual exposure within a 5km radius of the development site. This is due to the tall wind turbine structures and the predominantly flat topography. However, there are some ridges and hills to the south (Bakenskop ridge), east and west of the proposed wind turbine structures. The shielding effect of these ridges is noticeable on the viewshed analysis map, where the frequency of visual exposure in these areas is reduced. The wind turbine structures, especially the eight turbines located on the Bakenskop ridge, will also be highly exposed to observers travelling along the N1 national road. The Rondawel to Hutchinson secondary road will similarly be exposed to the wind turbines, as it traverses the proposed development site.

Visual exposure will remain high in the medium distance (i.e., between 5 and 10km). The shielding effect of the hills and ridges surrounding the proposed development site does however create a more scattered viewshed pattern. The Hoëkop, Bobbejaankrans and Kamberg hills shield observers to the north-west and north-east of the proposed development site. Observations from the N1 national road and the Hutchinson secondary road is highly likely, especially the eight turbines located on top of the Bakenskop ridge.

In the medium to longer distance (i.e., between 10 and 20km), visual exposure will be somewhat reduced, especially towards the north-west and the south-east. This zone also includes a number of homesteads that may be exposed to the project infrastructure. Visual exposure beyond a 20km radius is significantly reduced, especially in the south-east. The wind turbine structures may however still be visible from a number of homesteads within the study area.

Overall, the significance of the visual impacts associated with the proposed Merino Wind Farm is expected to be high as a result of the undeveloped character of the landscape. The facility would be visible within an area that contains certain sensitive visual receptors who could consider visual exposure to this type of infrastructure to be intrusive. Visual receptors include people travelling along the public roads (e.g., the N1 national road), residents of rural homesteads and tourists passing through or holidaying in the region.

In terms of the proposed wind turbine layout, the project proponent needs to adhere to all relevant National, Provincial and Local Government regulations and ordinances, including all prescribed health and safety guidelines. If these are not adhered to, the layout may be deemed non-compliant, and may need to be revised in order to ensure compliance. From a visual perspective, the layout is deemed acceptable, and the proposed development is not considered to be fatally flawed.

2.9 Social Impacts

Impacts are expected to occur with the development of the Merino Wind Farm during the construction, operation and decommissioning phases. Both positive and negative impacts are identified and assessed.

Positive impacts during construction includes:

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

Negative impacts during construction includes:

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

Positive impacts during operation includes:

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

Negative impacts during operation includes:

- » Noise impacts associated with the operation of the plant.
- » Visual impacts and associated impacts on sense of place.
- » Potential impact on property values.
- » Potential impact on tourism.

The findings of the SIA indicate that the proposed Merino Wind Farm will result in several social and socio-economic benefits, including creation of employment and business opportunities during both the construction and operational phases. The project will also contribute to local economic development though socio-economic development (SED) contributions. In addition, the development will improve energy security and reduce the carbon footprint associated with energy generation in South Africa. The findings of the SIA also indicate that the potential negative impacts associated with both the construction and operational phases are likely to be Low Negative with mitigation. The potential negative impacts can therefore be effectively mitigated if the recommended mitigation measures are implemented. The establishment of the proposed Merino Wind Farm is therefore supported by the findings of the SIA.

2.10 Impacts on Traffic

It is assumed that if components are imported to South Africa, it will be via the Port of Ngqura, which is located in the Eastern Cape, ~425km from the proposed site. Alternatively, components can be imported via the Port of Saldanha in the Western Cape, which is located ~675km from the proposed site.

The preferred route for abnormal load vehicles will be from the port (i.e., Port of Ngqura), heading north on the R75, passing Wolwefontein and Jansenville, and onto the R63 at Graaff-Reinet. The vehicles will travel on the R63 to the N1, passing Murraysburg, and continue on the N1 to the proposed site.

The proposed access points to the development area are located along the N1, as shown in **Figure 9.19**. Proposed Access Point 1 has a surfaced bellmouth which leads to the existing gravel road to the Hutchinson railway station. Proposed Access Point 2 is an existing gravel farm access road with an unsurfaced bellmouth.

Generally, the road width at the access points needs to be a minimum of 8m and the access roads on site a minimum of 4.5m (preferably 5m). The radius at the access points needs to be large enough to allow for all construction vehicles to turn safely.
Overall, the significance of the impacts on traffic associated with the Merino Wind Farm are predicted to be medium before mitigation, and low following the implementation of mitigation measures. The traffic generated during this the operation phase will be minimal and will have not have any impact on the surrounding road network. From a traffic impact perspective, no reasons have been identified for the Merino Wind Farm development not to proceed to the approval phase.

2.11 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 are several authorised renewable energy projects within a 30km radius of the proposed site, namely:

- Brakpoort Solar PV Facility
- Umsinde Emoyeni Wind Energy Facility
- Aurora Solar PV Facility
- Mainstream Renewable Energy Cluster
- Ishwati Emoyeni Wind Energy Facility
- Trouberg Wind Energy Facility
- Modderfontein Wind Energy Facility
- Nobelsfontein Wind Energy Facility
- Bietjiesfontein Solar Energy Facility
- Karoo Renewable Energy Facility

In addition to the renewable energy facilities listed above, four new renewable energy facilities (three solar PV facilities and one wind farm) are proposed by Great Karoo Renewable Energy (Pty) Ltd adjacent to the Merino Wind Farm, namely:

- Kwana Solar PV Facility
- Moriri Solar PV Facility
- Nku Solar PV Facility
- Angora Wind Farm

All cumulative impacts associated with the Merino Wind Farm will be of a medium or low significance, with impacts of a high significance associated with the visual impacts. A summary of the cumulative impacts is included in **Table 1** below.

Table 1: Summary of the cumulative impact significance for the Merino Wind Farm

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	Medium	Medium
Aquatic Ecology	Low	Medium
Avifauna	Low	Medium
Bats	Medium	Medium
Land use, soil and agricultural potential	Low	Low
Heritage (including archaeology, palaeontology and sense of place)	Medium	Medium
Noise	Low	Low
Visual	High	High
Socio-Economic	*Positive impacts:* Low *Negative impacts:* Medium or Low (depending on the impact being considered)	*Positive impacts:* Medium *Negative impacts:* Medium or Low (depending on the impact being considered)
Traffic	Low	Medium (assuming all projects in the area are constructed at the same time)

Based on the specialist cumulative assessment and findings, the development of the Merino Wind Farm and its contribution to the overall impact of all renewable energy projects to be developed within a 30km radius, it can be concluded that the Merino Wind Farm cumulative impacts will be of a medium to low significance, with impacts of a high significance mainly relating to visual impacts on the landscape. Therefore, the development of the Merino Wind Farm will not result in unacceptable, high cumulative impacts and will not result in a whole-scale change of the environment.

3. Facility Layout and Comparative Assessment of the Site Compound Alternatives

The development footprint assessed within this EIA was designed by the project developer in order to respond to and avoid the sensitive environmental and social features located within the development area (**Figure 2.2**). This approach ensured the application of the mitigation hierarchy (i.e., avoid, minimise, mitigate and offset) to the Merino Wind Farm project, which ultimately ensures that the development is appropriate from an environmental perspective and is suitable for development within the development area.

For the majority of specialists, the impacts associated with the Merino Wind Farm facility layout are of low to medium significance post-mitigation and the assessed layout is considered acceptable. Only the heritage specialist identified one turbine (i.e., M30) to be unacceptably placed within the development footprint (**Figure 4**)

Three (3) alternative locations for the site compound were assessed in this EIA Report. From the specialist studies undertaken, the following conclusions were made regarding the site compound alternatives:

	Alternative 1	Alternative 2	Alternative 3
Terrestrial Ecology	Least Preferred	Acceptable	Preferred
Avifauna	Acceptable	Acceptable	Acceptable
Heritage	Least Preferred	Acceptable	Acceptable

From the above summary of the specialist findings, it was determined that Alternative 1 is least preferred from an ecological and heritage perspective given its location within CBA1 (very high sensitivity), drainage feature (high sensitivity), karroid plains (medium sensitivity) and within the recommended no-go development areas around sites GK037 and GK038. From an ecological perspective, Alternative 2 is situated within karroid plains, drainage features and mountain slopes (medium-high sensitivity) and Alternative 3 is located within karroid plains and mountain slopes. Both Alternative 2 and 3 are no located within any recommended no-go development areas from a heritage perspective. All three alternatives are situated in Karoo scrub, which is not particularly sensitive as far is avifauna is concerned.

Considering the above findings, it can be concluded that either Alternative 2 or Alternative 3 are considered preferred. It should however be noted that the final preferred option will be informed by the final technical preference.

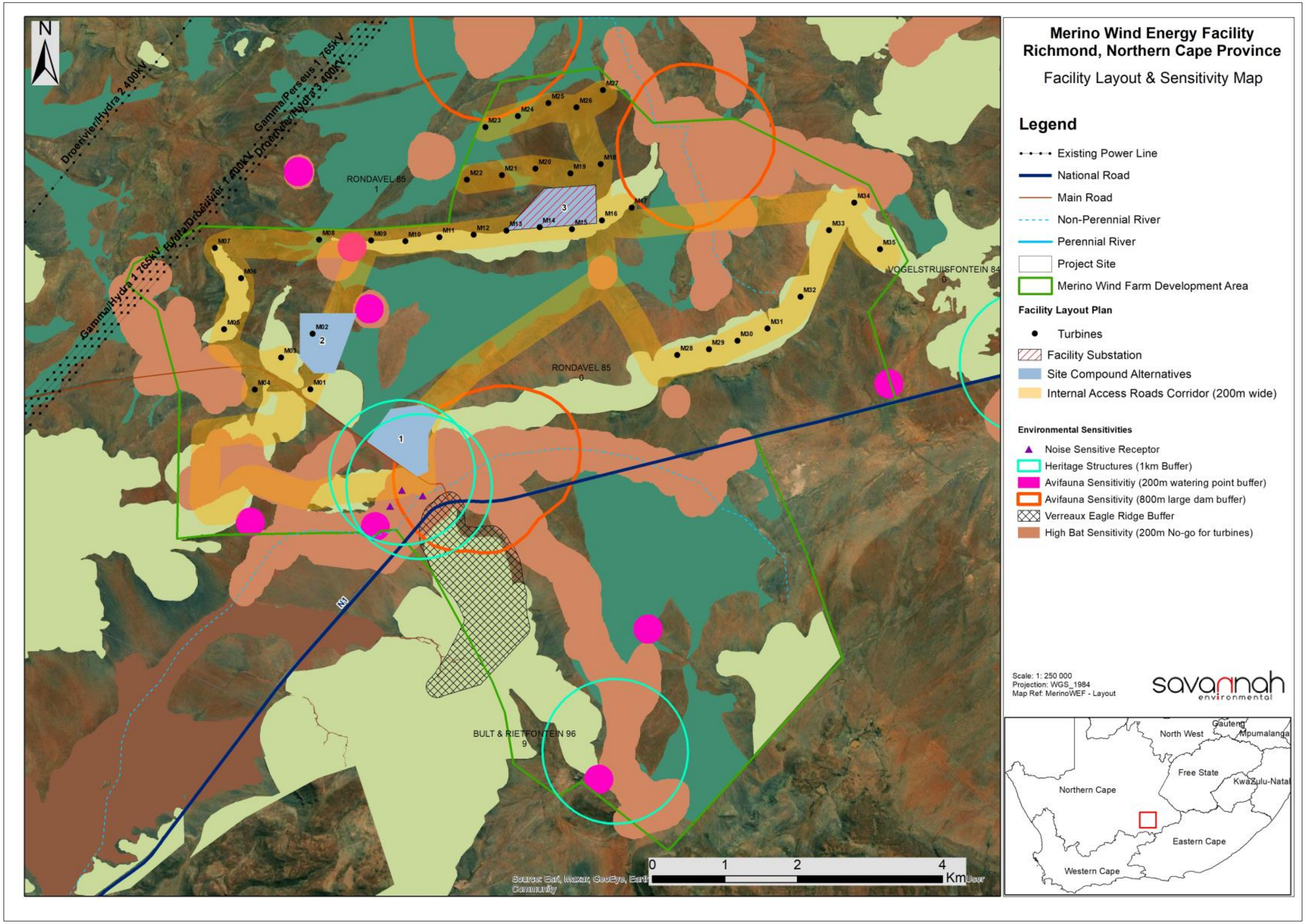

Figure 3: The development footprint, as assessed, overlain with the relevant environmental sensitivities

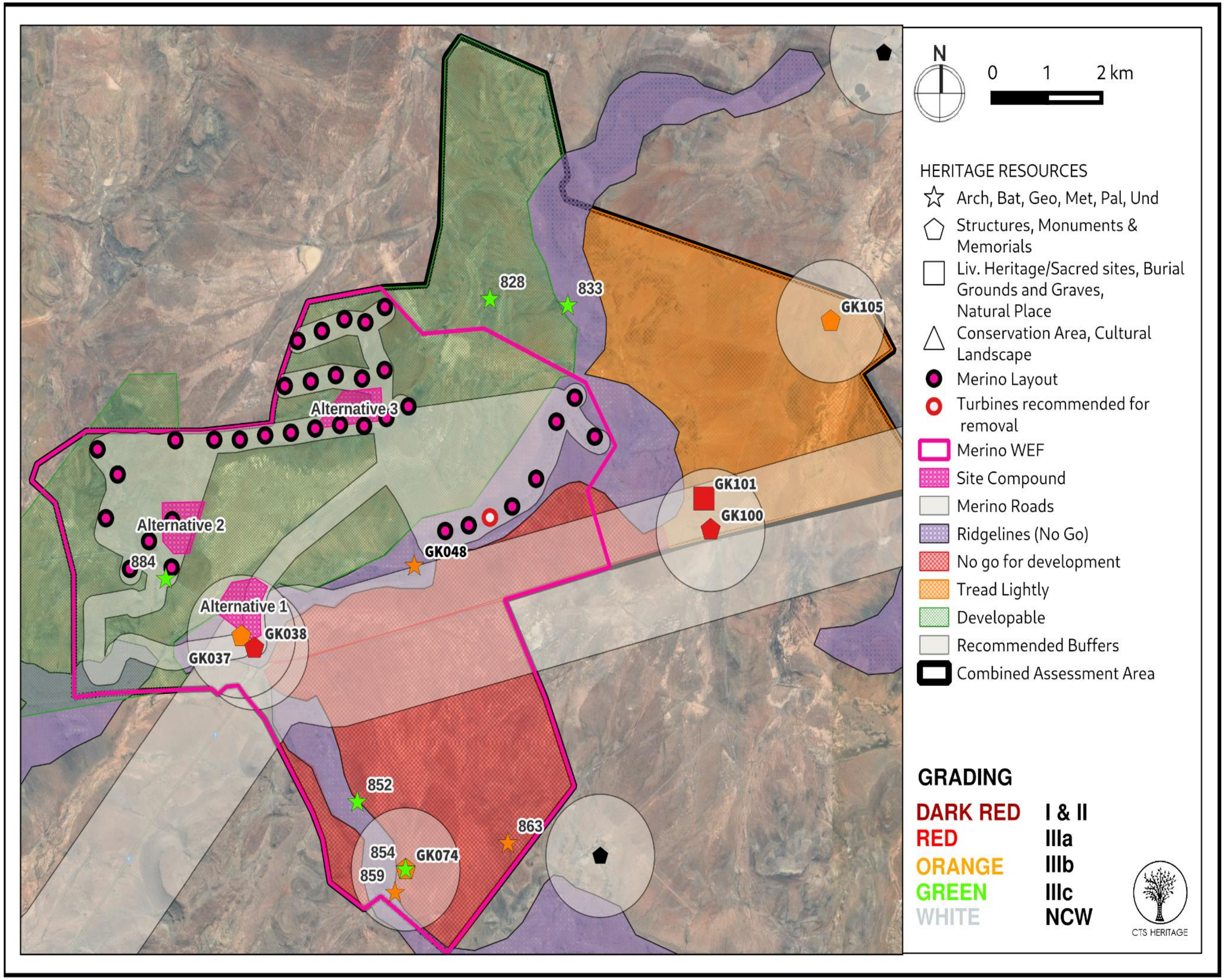

Figure 4: Map showing turbine recommended for removal or relocation

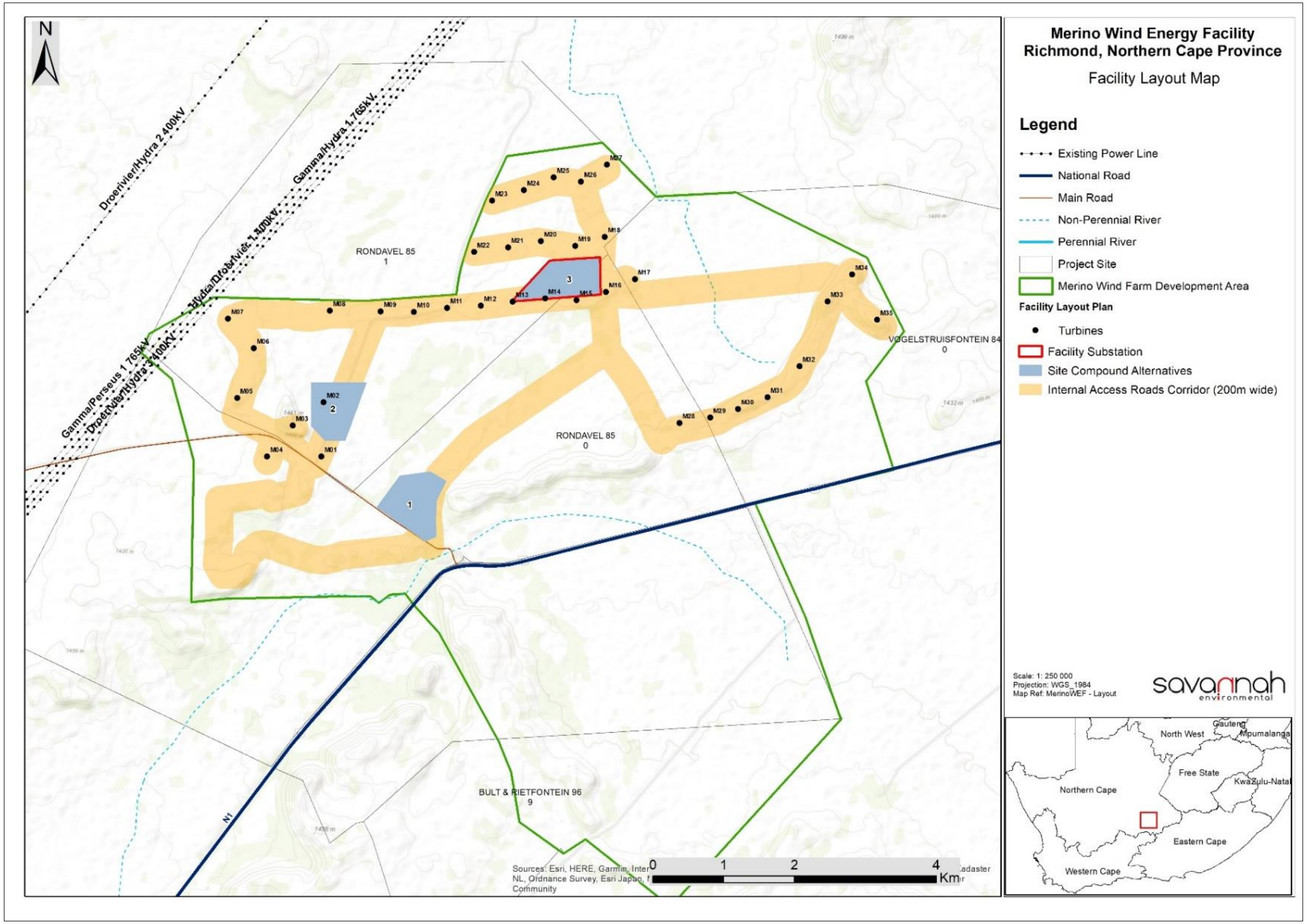

Figure 5: Map showing the development area within which the development footprint for the Merino Wind Farm and associated infrastructure has been placed and assessed as part of this EIA process

4. Overall Conclusion (Impact Statement)

The preferred activity was determined by the developer to be the development of a renewable energy facility on site using wind as the preferred technology, due to the availability of a suitable wind resource. A technically viable development footprint was proposed by the developer and assessed as part of the EIA process. The assessment of the development footprint within the development area was undertaken by independent specialists and their findings have informed the results of this EIA Report.

From a review of the relevant policy and planning framework, it was concluded that the project is well aligned with the policy framework, and a clear need for the project is seen from a policy perspective at a local, provincial and National level.

The specialist findings from the EIA studies undertaken have indicated that there are no identified fatal flaws associated with the implementation of the development footprint within the development area. The developer has designed a project development footprint in response to the identified sensitive environmental features and areas present within the development area. 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). Feedback from the heritage specialist has indicated that one proposed turbine from the Merino Wind Farm be removed or relocated from the ridgelines (refer to **Figure 4**) to ensure a low acceptable impact from a cultural landscape perspective.

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 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.

As detailed in the cost-benefit analysis, the benefits of the Merino 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. From a social perspective, both positive and negative impacts are expected.

Through the assessment of the development footprint within the development area, it can be concluded that the development of the Merino Wind Farm will not result in unacceptable environmental impacts (subject to the implementation of the recommended mitigation measures).

Based on the comparative assessment of the site compound alternatives, it can be concluded that either Alternative 2 or Alternative 3 are considered preferred. It should however be noted that the final preferred option will be informed by the final technical preference.

5. 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 development area, 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 Merino Wind Farm is acceptable within the landscape and can reasonably be authorised subject to the removal or relocation of the one proposed turbine from the Merino Wind Farm located on the ridgelines (i.e., M30) as recommended by the heritage specialist. Considering the findings of the comparative assessment of the site compound location alternatives, it is the reasoned opinion of the EAP that either Alternative 2 or Alternative 3 is acceptable and can be utilised for the establishment of the site compound.

The Merino Wind Farm with a contracted capacity of up to 140MW, located on the project site consisting of four affected properties (Portion 1 of Farm Rondavel 85, Portion 0 of Farm Rondavel 85, Portion 9 of Farm Bult & Rietfontein 96, and Portion 0 of Farm Vogelstruisfontein 84) includes the following infrastructure (to be included within an authorisation issued for the project):

» Up to 35 wind turbines with a maximum hub height of up to 170m and tip height of up to 250m.
» Concrete turbine foundations to support the turbine hardstands.
» Inverters and transformers.
» Temporary laydown areas which will accommodate storage and assembly areas.
» Cabling between the turbines, to be laid underground where practical.
» A temporary concrete batching plant.
» 33/132kV onsite facility substation.
» Underground cabling from the onsite substation to the 132kV collector substation.
» Electrical and auxiliary equipment required at the collector substation that serves the wind energy facility, including switchyard/bay, control building, fences, etc.
» Battery Energy Storage System (BESS).
» Access roads and internal distribution roads.

The key conditions listed in Chapter 11 would be required to be included within an authorisation issued for the Merino Wind Farm.

DEFINITIONS AND TERMINOLOGY

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

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

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

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

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

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

Development area: The development area is that identified area (located within the project site) (~6 463ha in extent) where the Merino Wind Farm is planned to be located.

Development footprint: The development footprint is the defined area (~2 800ha in extent) (located within the development area) where the wind turbines and other associated infrastructure for the Merino Wind Farm is planned to be constructed. This is the actual footprint of the facility, and the area which would be disturbed.

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

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

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

Endangered species: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.
Emergency: An undesired/ unplanned event that results in a significant environmental impact and requires the notification of the relevant statutory body, such as a local authority.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Project site: The project site is the area with an extent of 29 909ha, within which the Merino Wind Farm development footprint will be located.

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

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

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

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

Waste: means—

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

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

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

ACRONYMS

CBA	Critical Biodiversity Area
DFFE	Department of Forestry, Fisheries, and Environment (National)
DWS	Department of Water and Sanitation
CBA	Critical Biodiversity Area
CR	Critically Endangered
CSIR	Council for Scientific and Industrial Research
DM	District Municipality
DMRE	Department of Mineral Resources Energy
EAP	Environmental Assessment Practitioner
EGIS	Environmental Geographic Information System
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMP	Environmental Management Plan
EMPr	Environmental Management Programme
EN	Endangered
EP	Equator Principles
ESA	Ecological Support Area
GA	General Authorisation
GHG	Greenhouse Gas
IBA	Important Bird Area
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
IEP	Integrated Energy Plan
IFC	International Finance Corporation
IPP	Independent Power Producer
IRP	Integrated Resource Plan
IUCN	International Union for Conservation of Nature
I&AP	Interested and Affected Party
km	Kilometre
kWh	Kilowatt hour
LC	Least Concern
LM	Local Municipality
LNG	Liquid Natural Gas
m	Metre
m^2	Square meters
m^3	Cubic meters
m amsl	Metres Above Mean Sea Level
MW	Megawatts
NDP	National Development Plan
NEMA	National Environmental Management Act (No. 107 of 1998)
NEM:AQA	National Environmental Management: Air Quality Act (No. 39 of 2004)
NEM:BA	National Environmental Management: Biodiversity Act (No. 10 of 2004)
NEM:WA	National Environmental Management: Waste Act (No. 59 of 2008)

NFA	National Forests Act (No. 84 of 1998)
NFEPA	National Freshwater Ecosystem Priority Area
NHRA	National Heritage Resources Act (No. 25 of 1999)
NT	Near Threatened
NWA	National Water Act (No. 36 of 1998)
ONA	Other Natural Area
PA	Protected Area
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SAIAB	South African Institute for Aquatic Biodiversity
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
TOPS	Threatened or Protected Species
VU	Vulnerable

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APPENDICES LIST

CHAPTER 1: INTRODUCTION

Great Karoo Renewable Energy (Pty) Ltd is proposing the development of a commercial wind farm and associated infrastructure on a site located approximately 35km south-west of Richmond and 80km south-east of Victoria West, within the Ubuntu Local Municipality and the Pixley Ka Seme District Municipality in the Northern Cape Province (refer to **Figure 1.1**). The facility will have a contracted capacity of up to 140MW and will be known as the Merino Wind Farm. The project is planned as part of a larger cluster of renewable energy projects, which includes three (3) 100MW PV facilities (known as the Moriri Solar PV, Kwana Solar PV, and Nku Solar PV), an additional 140MW Wind Energy Facility (known as the Angora Wind Farm), as well as grid connection infrastructure connecting the renewable energy facilities to the existing Eskom Gamma Substation (refer to **Figure 1.2**). These projects are proposed by separate Specialist Purpose Vehicles (SPVs)[5], and are assessed through separate Environmental Impact Assessment (EIA) processes.

The Merino Wind Farm is proposed in response to the identified objectives of the national and provincial government and local and district municipalities to develop renewable energy facilities for power generation purposes. It is the developer's intention to bid the Merino Wind Farm under the Department of Mineral Resources and Energy's (DMRE's) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme or a similar programme, with the aim of evacuating the generated power into the national grid. This will aid in the diversification and stabilisation of the country's electricity supply, in line with the objectives of the Integrated Resource Plan (IRP), with the Merino Wind Farm set to inject up to 140MW into the national grid.

From a regional perspective, the area within the Northern Cape identified for the project is considered favourable for the development of a commercial wind farm by virtue of prevailing climatic conditions, relief, the extent of the affected properties, the availability of a direct grid connection (i.e., a point of connection of the national grid) and the availability of land on which the development can take place.

1.1. Requirement for an Environmental Impact Assessment Process

Section 24 of South Africa's National Environmental Management Act (No. 107 of 1998) (NEMA) pertains to Environmental Authorisations (EA), and requires that the potential consequences for, or impacts of, listed or specified activities on the environment be considered, investigated, assessed, and reported on to the Competent Authority (CA). The 2014 Environmental Impact Assessment (EIA) Regulations, as amended (GNR 326) published under NEMA prescribe the process to be followed when applying for Environmental Authorisation (EA), while the Listing Notices (Listing Notice 1 (GNR 327), Listing Notice 2 (GNR 325), and Listing Notice 3 (GNR 324)) contain those activities which may not commence without EA from the CA.

As the project has the potential to impact on the environment, an EA is required from the National Department of Forestry, Fisheries, and the Environment (DFFE) subject to the completion of a full Scoping and Environmental Impact Assessment (S&EIA) process, as prescribed in Regulations 21 and 24 of the 2014 EIA Regulations (GNR 326), as amended. The requirement for EA subject to the completion of a full S&EIA process is triggered by the inclusion of, amongst others, Activity 1 of Listing Notice 1 (GNR 325), namely:

"The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20MW or more."

[5] The development of the various projects under separate SPVs is in accordance with the DMRE's requirements under the REIPPPP.

In terms of GNR 779 of 01 July 2016, the DFFE has been determined as the CA for all projects which relate to the IRP for Electricity 2010 – 2030, and any updates thereto. Through the decision-making process, the DFFE will be supported by the Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform as the commenting authority.

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

This EIA Report has been prepared in accordance with the requirements of the EIA Regulations published on 08 December 2014 (and amended on 07 April 2017) promulgated in terms of Chapter 5 of the National Environmental Management Act (Act No 107 of 1998). This chapter of the EIA Report includes the following information required in terms of Appendix 3: Scope of Assessment and Content of Environmental Impact Assessment Report:

Requirement	Relevant Section
3(a)(i) the details of the EAP who prepared the report; and (ii) the expertise of the; including a curriculum vitae	The details of the EAP and the expertise of the EAP have been included in **section 1.5**. The Curriculum Vitae of the Savannah Environmental team have been included as **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 coordinates of the boundary of the property or properties	The location of the project site proposed for the development of the Merino Wind Farm is included as **Figure 1.1**. The details of the affected properties, including the property names and numbers, as well as the SG-codes are included in **Table 1.1**.
3(c) a plan which locates the proposed activity or activities applied as well as the associated structures and infrastructure at an appropriate scale, or, if it is (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken	The locality of the project site is illustrated on a locality map included as **Figure 1.1**. The centre point co-ordinates of the project site are included in **Table 1.1**.

This EIA Report consists of twelve chapters, as follows:

» **Chapter 1** provides background to the Merino Wind Farm and the EIA process.
» **Chapter 2** provides a description of the wind farm and infrastructure associated with the facility.
» **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 proposed facility.
» **Chapter 6** describes the need and desirability of the Merino Wind Farm within the project site.
» **Chapter 7** outlines the process which was followed during the EIA process.
» **Chapter 8** describes the existing biophysical and socio-economic environment affected by the proposed facility.
» **Chapter 9** provides a description and assessment of the potential issues associated with the proposed wind farm and associated infrastructure.

- **Chapter 10** provides a description and assessment of the potential cumulative issues associated with the proposed wind farm and associated infrastructure.
- **Chapter 11** presents the conclusions and recommendations based on the findings of the EIA for the Merino Wind Farm.
- **Chapter 12** provides references used in the compilation of the EIA Report.

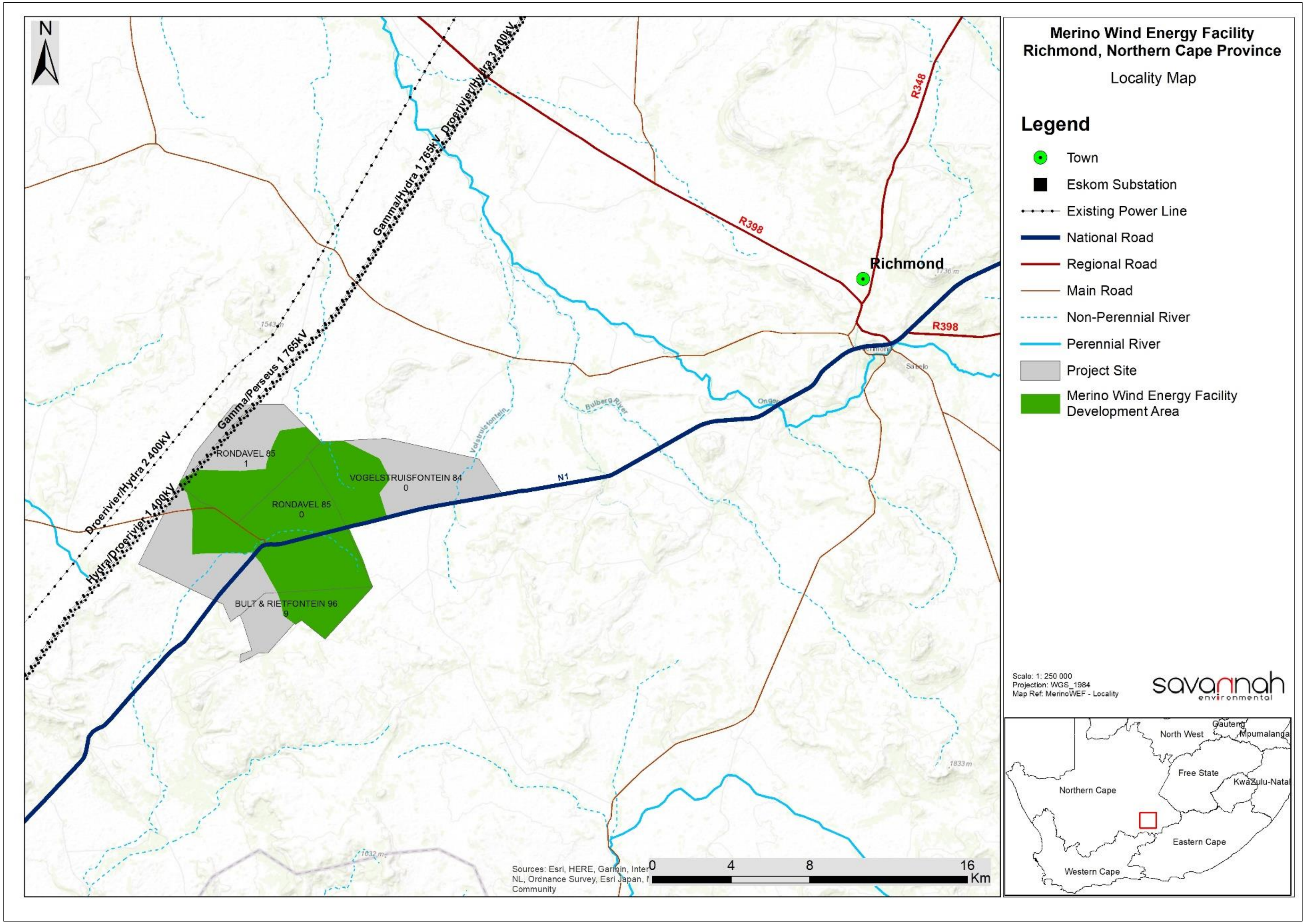

Figure 1.1: Locality map of the project site within which the Merino Wind Farm is proposed to be developed (refer to **Appendix P** for A3 Map).

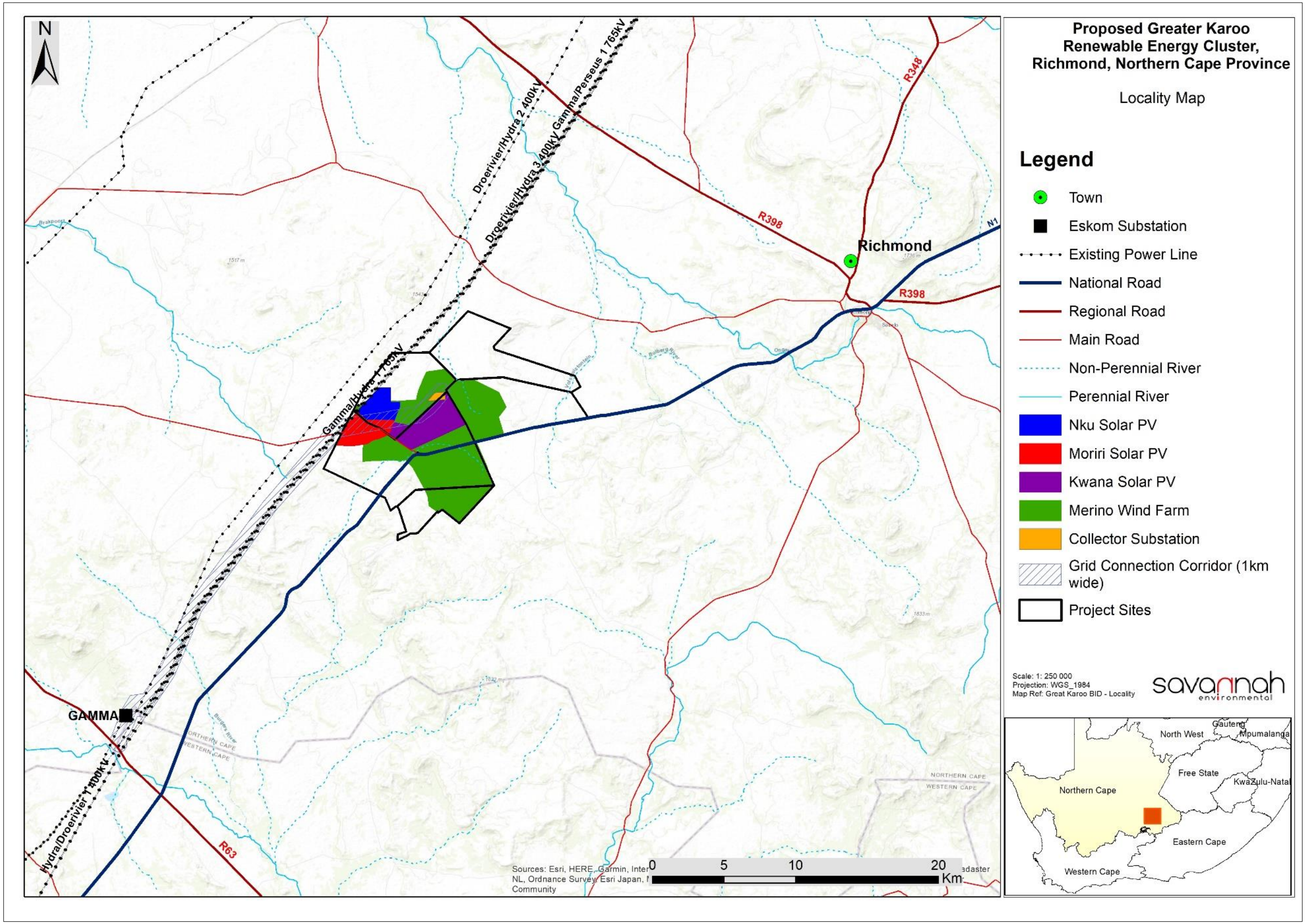

Figure 1.2: The proposed cluster of renewable energy facilities that the Merino Wind Farm forms part (refer to **Appendix P** for A3 Map).

1.3. Project Overview

A technically feasible project site[6], with an extent of ~29 909ha has been identified by Great Karoo Renewable Energy (Pty) Ltd as a technically suitable area for the development of the Merino Wind Farm. A development area[7] of ~6 463ha has been identified within the project site by the proponent for the development. The development area consists of four (4) affected properties, which include:

» Portion 1 of Farm Rondavel 85
» Portion 0 of Farm Rondavel 85
» Portion 9 of Farm Bult & Rietfontein 96
» Portion 0 of Farm Vogelstruisfontein 84

During the Scoping Phase, the full extent of the development area was considered by the specialist assessments, with the aim of determining the suitability from an environmental and social perspective and identifying areas that should be avoided in development planning. Based on the specialist assessments undertaken during the Scoping Phase, areas of environmental sensitivity were identified within the development area. In order to avoid these areas of potential sensitivity and to ensure that potential detrimental environmental impacts are minimised as far as possible, the developer identified a suitable development footprint[8] (~2 800ha in extent) within the larger development area where the wind turbines and other associated infrastructure for the Merino Wind Farm is planned to be constructed. Since the development area assessed during the Scoping Phase is larger than the area required for the development footprint, it provides the opportunity for the optimal placement of the infrastructure, ensuring avoidance of major identified environmental sensitivities. An overview of the project development site is provided in **Table 1.1**.

Infrastructure associated with the Merino Wind Farm will include:

» Up to 35 wind turbines with a maximum hub height of up to 170m and tip height of up to 250m.
» Concrete turbine foundations to support the turbine hardstands.
» Inverters and transformers.
» Temporary laydown areas which will accommodate storage and assembly areas.
» Cabling between the turbines, to be laid underground where practical.
» A temporary concrete batching plant.
» 33/132kV onsite facility substation.
» Underground cabling from the onsite substation to the 132kV collector substation.
» Electrical and auxiliary equipment required at the collector substation that serves the wind energy facility, including switchyard/bay, control building, fences, etc.
» Battery Energy Storage System (BESS).
» Access roads and internal distribution roads.
» Site offices and maintenance buildings, including workshop areas for maintenance and storage.

The key infrastructure components proposed as part of the Merino Wind Farm are described in greater detail in Chapter 2 of this EIA Report.

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[6] The project site is the area with an extent of 29 909ha, within which the Merino Wind Farm development footprint will be located.
7 The development area is that identified area (located within the project site) where the Merino Wind Farm is planned to be located. This area has been selected as a practicable option for the facility, considering technical preference and constraints. The development area is ~6 463ha in extent.
8 The development footprint, which is ~2 800ha in extent, is the defined area (located within the development area) where the wind turbines and other associated infrastructure for the Merino Wind Farm is planned to be constructed. This is the actual footprint of the facility, and the area which would be disturbed.

The overarching objective for the Merino Wind Farm is to maximise electricity production through exposure to the available wind resource, while minimising infrastructure, operational and maintenance costs, as well as potential social and environmental impacts in accordance with the principles of sustainable development. Local level environmental and planning issues have been assessed through the EIA process with the aid of site-specific specialist studies in order to delineate areas of sensitivity within the development area. These site-specific specialist studies have assisted in informing and optimising the design of the wind farm.

Table 1.1: Detailed description of the Merino Wind Farm development area

Province	**Northern Cape Province**
District Municipality	Pixley Ka Seme District Municipality
Local Municipality	Ubuntu Local Municipality
Ward Number (s)	Ward 3
Nearest town(s)	Richmond (~35km south-west) and Victoria West (~80km south-east)
Affected Properties: Farm name(s), number(s) and portion numbers	» Portion 1 of Farm Rondavel 85 » Portion 0 of Farm Rondavel 85 » Portion 9 of Farm Bult & Rietfontein 96 » Portion 0 of Farm Vogelstruisfontein 84
SG 21 Digit Code (s)	» Portion 1 of Farm Rondavel 85: C06300000000008500001 » Portion 0 of Farm Rondavel 85: C06300000000008500000 » Portion 9 of Farm Bult & Rietfontein 96: C06300000000009600009 » Portion 0 of Farm Vogelstruisfontein 84: C06300000000008400000
Current zoning	Agriculture
Site Coordinates (centre of development area)	31°29'36.88"S; 23°37'50.76"E
Site Coordinates (corner/bend points of development area)	31°27'26.73"S; 23°37'29.27"E 31°27'19.38"S; 23°38'19.97"E 31°27'43.44"S; 23°38'49.10"E 31°27'40.66"S; 23°39'31.87"E 31°28'8.95"S; 23°40'42.67"E 31°28'42.34"S; 23°41'3.58"E 31°29'5.72"S; 23°40'43.88"E 31°29'45.85"S; 23°40'59.67"E 31°30'2.93"S; 23°39'46.23"E 31°31'40.82"S; 23°40'34.80"E 31°33'8.23"S; 23°39'6.12"E 31°32'38.57"S; 23°38'19.82"E 31°32'45.18"S; 23°38'8.25"E 31°32'31.25"S; 23°37'44.32"E 31°32'8.62"S; 23°37'39.32"E 31°31'5.99"S; 23°36'59.12"E 31°30'47.91"S; 23°36'40.43"E 31°30'48.54"S; 23°36'32.36"E 31°30'52.51"S; 23°36'26.47"E 31°30'49.61"S; 23°36'22.03"E 31°30'54.24"S; 23°34'46.08"E 31°29'49.60"S; 23°34'45.64"E 31°29'12.31"S; 23°34'33.02"E 31°29'0.55"S; 23°34'16.33"E 31°28'51.83"S; 23°34'20.27"E 31°28'34.40"S; 23°34'54.59"E 31°28'34.46"S; 23°36'15.22"E

	31°28'30.43"S; 23°37'3.90"E

1.4. Overview of the Environmental Impact Assessment (EIA) Process

An EIA 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 the resolution of the issues reported on in the Scoping and EIA reports as well as dialogue with interested and affected parties (I&APs).

The EIA process comprises of two (2) phases (i.e., Scoping and Impact Assessment) and involves the identification and assessment of potential environmental impacts through the undertaking of independent specialist studies, as well as public participation. The processes followed in these two phases is as follows:

» The **Scoping Phase** includes the identification of potential issues associated with the project through a desktop study (considering existing information), limited field work and consultation with interested and affected parties and key stakeholders. This phase considered the broader project site in order to identify and delineate any environmental fatal flaws, no-go and / or sensitive areas. Following a public review period of the Scoping Report, this phase culminated in the submission of a final Scoping Report and Plan of Study for the EIA to the Competent Authority for consideration and acceptance. The Scoping Report was accepted, and the Plan of Study approved by the DFFE on 27 January 2022.

» The **EIA Phase** involves a detailed assessment of the potentially significant positive and negative impacts (direct, indirect, and cumulative) identified in the Scoping Phase. This phase considers a proposed development footprint within the project site and includes detailed specialist investigations as well as public consultation. Following a public review period of the EIA Report, this phase culminates in the submission of a final EIA Report and an Environmental Management Programme (EMPr), including recommendations of practical and achievable mitigation and management measures, to the CA for final review and decision-making.

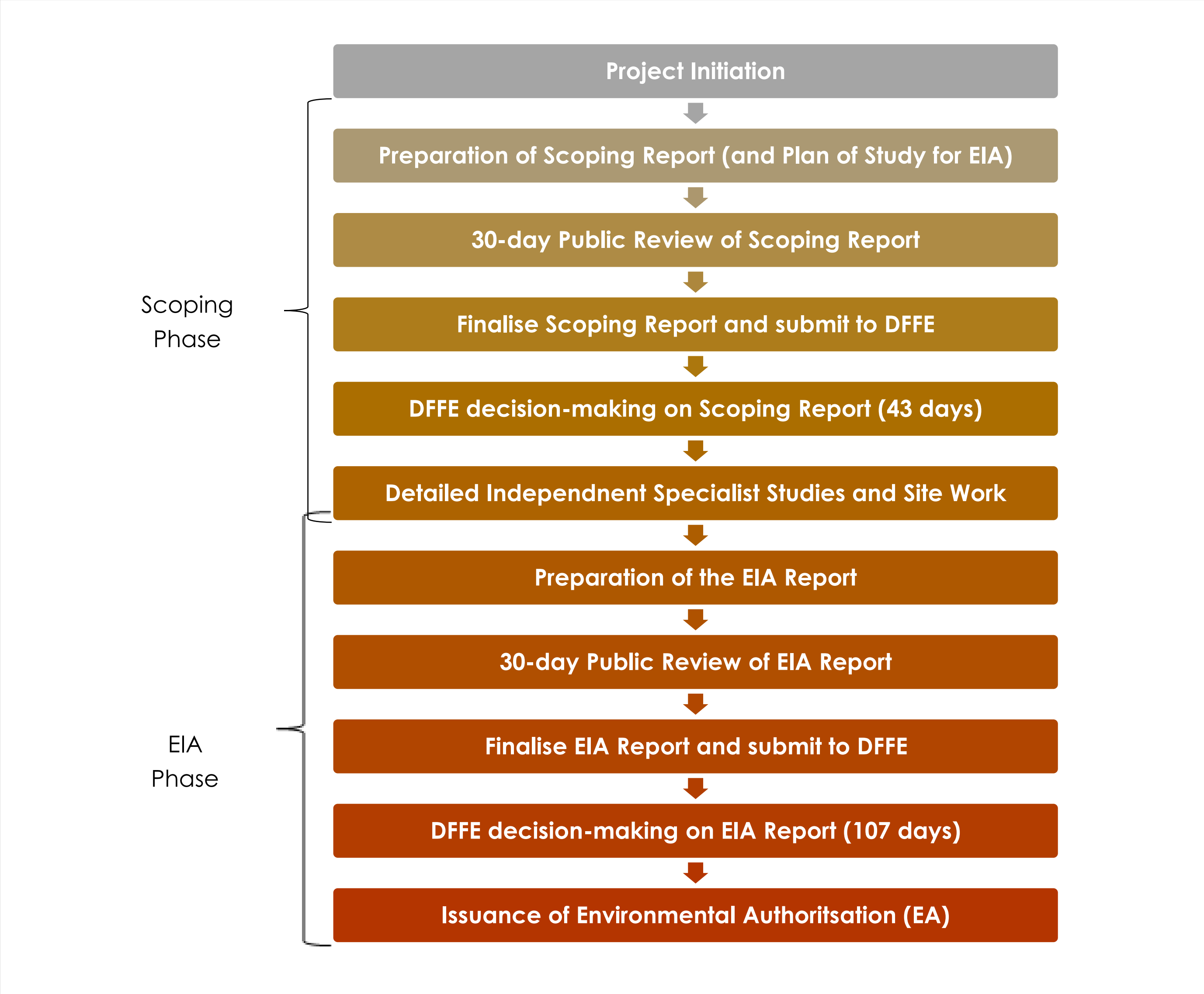


Figure 1.3: Regulated timeframe of an Environmental Impact Assessment (EIA) Process

1.5. Details of Environmental Assessment Practitioner and Expertise to conduct the S&EIA Process

In accordance with Regulation 12 of the 2014 EIA Regulations (GNR 326), Great Karoo Renewable Energy (Pty) Ltd has appointed Savannah Environmental (Pty) Ltd as the independent Environmental consultant responsible for managing the Application for EA and supporting Scoping and Environmental Impact Assessment (S&EIA) process; inclusive of comprehensive, independent specialist studies. The application for EA and S&EIA process will be managed in accordance with the requirements of NEMA, the 2014 EIA Regulations (GNR 326), and all other relevant applicable legislation.

Neither Savannah Environmental nor any of its specialists are subsidiaries or are affiliated to the applicant. Furthermore, Savannah Environmental does not have any interests in secondary developments that may arise out of the authorisation of the proposed facility.

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.

» **Mmakoena Mmola**, the principal author of this EIA Report, holds a BSc Honours in Geochemistry from the University of the Witwatersrand and over 4 years of experience in the environmental management field. Her key focus is on undertaking environmental impact assessments, environmental permitting and authorisations, compliance auditing, public participation, and environmental management programmes. She is registered as a Professional Natural Scientist with the South African Council for Natural Scientific Professions (SACNASP), Registration Number: 126748 and an Environmental Assessment Practitioner with the Environmental Assessment Practitioners Association of South Africa, Number: 2019/260.

» **Jo-Anne Thomas**, the principal EAP on this project, is a registered EAP with the Environmental Assessment Practitioners Association of South Africa (EAPASA - 2019/726) and a registered Professional Natural Scientist with the South African Council for Natural Scientific Professions (SACNASP). She provides technical input for projects in the environmental management field, specialising in Strategic Environmental Advice, Environmental Impact Assessment studies, environmental auditing and monitoring, environmental permitting, public participation, Environmental Management Plans and Programmes, environmental policy, strategy and guideline formulation, and integrated environmental management. Her key focus is on integration of the specialist environmental studies and findings into larger engineering-based projects, strategic assessment, and providing practical and achievable environmental management solutions and mitigation measures. Responsibilities for environmental studies include project management (including client and authority liaison and management of specialist teams); review and manipulation of data; identification and assessment of potential negative environmental impacts and benefits; review of specialist studies; and the identification of mitigation measures.

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

In order to adequately identify and assess potential environmental impacts associated with the proposed Merino Wind Farm, the following specialist sub-consultants have provided input into this EIA Report:

Specialist	Area of Expertise
David Hoare of David Hoare Consulting (Pty) Ltd	Ecology
Chris van Rooyen of Chris van Rooyen Consulting	Avifauna
Werner Marais of Animalia	Bats
Ivan Baker of the Biodiversity Company	Freshwater and Soils
Morné de Jager of Enviro-Acoustic Research	Noise
Lourens du Plessis of LoGIS	Visual
Tony Barbour of Tony Barbour Environmental Consulting	Social

Specialist	Area of Expertise
Jenna Lavin of CTS Heritage	Heritage (including Archaeology Palaeontology and Cultural Heritage)
Iris Wink of JG Afrika	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 Merino Wind Farm and details the project scope which includes the planning/design, construction, operation, and decommissioning activities required for the development. It must be noted that the project description presented in this Chapter may change to some extent based on the outcomes and recommendations of detailed engineering and other technical studies, the findings and recommendations of the EIA and supporting specialist studies, and any licencing, permitting, and legislative requirements.

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

This chapter of the EIA Report includes the following information required in terms of the EIA Regulations, 2014, as amended - Appendix 3: Scope of Assessment and Content of the Environmental Impact Assessment Report:

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 project is detailed in Chapter 1, Table 1.1, as well as **section 2.2.1** below.
3(d) (i) a description of the proposed activity, including (ii) a description of the associated structures and infrastructure related to the development.	A description of the activities to be undertaken with the development of project is included in **Table 2.1** and **Table 2.2**.

2.2 Nature and Extent of the Merino Wind Farm

In responding to the growing electricity demand within South Africa, the need to promote renewable energy and sustainability within the Northern Cape Province, as well as the country's targets for renewable energy, Great Karoo Renewable Energy (Pty) Ltd is proposing the development of a commercial wind farm and associated infrastructure to add new capacity to the national electricity grid. The Merino Wind Farm will be developed in a single phase and will comprise up to 35 wind turbines with a contracted capacity of up to 140MW. The optimum turbine for use at the project site is yet to be determined; however, it is considered that each turbine could have a generating capacity of up to 4MW[9], with a hub height of up to 170m. 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 potential environmental constraints.

[9] The 4MW 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 facility layout and technical and environmental considerations.

2.2.1. Overview of the Project Site

The project is to be developed on a site located approximately 35km south-west of Richmond and 80km south-east of Victoria West. The project site falls within Ward 3 of the Ubuntu Local Municipality of the Pixley Ka Seme District Municipality in the Northern Cape Province. The full extent of the development area (i.e., ~6 463ha), located within the project site (i.e., 29 909ha), was considered during the Scoping Phase of the EIA process, within which the Merino Wind Farm will be appropriately located from a technical and environmental sensitivity perspective. The development area includes the following four (4) affected properties:

- » Portion 1 of Farm Rondavel 85
- » Portion 0 of Farm Rondavel 85
- » Portion 9 of Farm Bult & Rietfontein 96
- » Portion 0 of Farm Vogelstruisfontein 84

A development footprint of ~2 800ha was identified within the larger development area and defined through the Scoping Evaluation of the site and has been assessed for the construction of the facility and its associated infrastructure. The optimal position for each turbine was determined taking into consideration the environmental sensitivities identified through the Scoping Evaluation. The turbines have been appropriately placed to optimise the energy generating potential of the wind resource while also minimising impacts on environmental sensitivities.

Access to the project site is ample with the presence of existing roads mainly consisting of national and regional roads. The project site is bisected by the N1 national road, which provides access to the project site and development area (refer to **Figure 2.1**). The R398 and R63 are located to the north-east and south-west of the project site, respectively. The gravel main access road which is bisected by the project site provides direct access to the project site and the development area and will therefore be utilised for accessing the project site and development area (refer to **Figure 2.2**).

Figure 2.1: Location of the N1 national road, the R398 and R63 in relation to the site proposed for the development of the Merino Wind Farm (development area in red).

Figure 2.2: Location of the development area (outline in red) in relation to the gravel main access road that bisects the site and provides direct access to the site.

2.2.2. *Components of the Merino Wind Farm*

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

» Up to 35 wind turbines with a maximum hub height of up to 170m and tip height of of up to 250m.
» Concrete turbine foundations to support the turbine hardstands.
» Inverters and transformers.
» Temporary laydown areas which will accommodate storage and assembly areas.
» Cabling between the turbines, to be laid underground where practical.
» A temporary concrete batching plant.
» 33/132kV onsite facility substation.
» Underground cabling from the onsite substation to the 132kV collector substation.
» Electrical and auxiliary equipment required at the collector substation that serves the wind energy facility, including switchyard/bay, control building, fences, etc.
» Battery Energy Storage System (BESS).
» Access roads and internal distribution roads.
» Site offices and maintenance buildings, including workshop areas for maintenance and storage.

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

Table 2.1: Details or dimensions of typical infrastructure required for the 140MW Merino Wind Farm

Infrastructure	Footprint and dimensions
Number of turbines	Up to 35 turbines
Hub Height	Up to 170m
Tip Height	Up to 250m
Contracted Capacity	Up to 140MW (individual turbines up to 4MW in capacity each)
Area occupied by the wind turbines and associated infrastructure (development footprint)	~2 800ha
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	~1000m x 700m
Capacity of on-site facility substation	33kV/132kV
Underground cabling between the turbines	Underground cabling will be installed at a depth of up to 1.5m to connect the turbines to the on-site facility substation. The cabling will have a capacity of up to 33kV.
Cabling from the onsite substation to the 132kV collector substation	Underground cabling will be installed at a depth of up to 1.5m to connect the on-site substation to the 132kV collector substation. The cabling will have a capacity of up to 132kV.
Area occupied by the electrical and auxiliary equipment required at the collector substation	100 x 100m
Area occupied by laydown area	~1000m x 700m

Infrastructure	Footprint and dimensions
Access and internal roads	Wherever possible, existing access roads will be utilised to access the project site and development area. It is unlikely that access roads will need to be upgraded as part of the proposed development. Internal roads of up to 4.5m in width will be required to access each turbine and the on-site substation.
Turbine hardstand	~80m x 35m
Turbine foundation	Diameter of up to 25m per turbine
Grid connection	The 33/132kV on-site substation will be connected to the proposed 132kV central collector substation via underground cabling with a capacity of up to 132kV. A new 132kV single- or double-circuit power line will run from the central collector substation and tie into the existing Eskom Gamma Substation. The switching station forming part of the 132kV collector substation and the new 132kV single- or double-circuit will be assessed as part of a separate Basic Assessment process in support of an application for Environmental Authorisation.
Temporary infrastructure	Temporary infrastructure, including laydown areas, 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.

Table 2.2 below provides details regarding the requirements and the activities to be undertaken during the Merino Wind Farm 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 to the Merino Wind Farm.

2.2.3 Project Development Phases Associated with the Merino Wind Farm

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

Construction Phase	
Requirements	» Project receives Environmental Authorisation from the DFFE, preferred bidder allocation granted by DMRE, a generating license issued by NERSA, and a Power Purchase Agreement secured with Eskom. In addition to bidding into the REIPPPP, the developer is also considering options such as Private Power Purchase Agreements and Wheeling Agreements with Eskom to deliver the generated power to Private Offtakers. » Duration dependent on number of turbines, expected to be 15-18 months for Merino Wind Farm. » Create direct construction employment opportunities. Approximately 350 employment opportunities will be created. » No on-site labour camps. Employees to be accommodated in the nearby towns such as Richmond and Victoria West 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, where possible. Waste containers, including containers for hazardous waste, will be located at easily accessible locations /turbine positions on site when construction activities are undertaken. » Electricity required for construction activities will be generated by a generator. Where low voltage connections are possible, these will be considered. » Water required for the construction phase will be supplied by the municipality. In addition, where possible, borehole water will be used. Should water availability at the time of construction be limited, water will be transported to site via water tanks. Water will be used for sanitation and potable water on site as well as construction works.
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, and survey of the on-site collector substation site to determine and confirm the locations of all associated infrastructure.
Establishment of access roads to the Site	» 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. It is unlikely that access roads will need to be upgraded as part of the proposed development. » 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 4.5m wide. To be determined by the final micro-siting or positioning of the wind turbines.
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 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 ~80m x 35m in extent. » 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 a diameter of up to 25m 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 include 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 most feasible port of entry, which is deemed to be the Port of Ngqura in the Eastern Cape Province. Alternatively, components can be imported via the Port of Saldanha in the Western Cape. » 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 infrastructures to be transported to site. » Transportation will take place via appropriate National and Provincial roads, and the dedicated access/haul road to the 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 collector substation to be constructed within the development footprint. » Substation will be constructed with a high-voltage (HV) yard footprint of up to 1000m x 700m.

Connection of wind turbines to the substation	» Each wind turbine to be connected to the on-site collector substation via underground electrical cables. » Excavation of trenches is 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	» Site offices and maintenance buildings, including workshop areas for maintenance and storage will be required. » Establishment will require the clearing of vegetation, levelling, and the excavation of foundations prior to construction.
Connect substation to the power grid	» A 132/33kV on-site collector substation to be connected to a proposed 132kV central collector substation via a 132kV underground cabling.
Undertake site rehabilitation	» Commence with rehabilitation efforts once construction completed in an area, and all construction equipment is removed. » On commissioning, access points to the site not required during 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 project. » Employment opportunities relating mainly to operation activities and maintenance. Approximately 20 full-time employment opportunities will be available 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 Merino 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 » Regarding the foundation body and sub-base of the tower, the concrete will undergo crushing and be used as combined base/wearing course » 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 their original land-use (i.e. primarily grazing) once the Merino 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 Merino Wind Farm (Source: www.alamy.com/stock-photo/wind-turbine-construction.html; www.medianet.com.au/releases/178350/; www.industrycrane.com/blog/wind-turbines-installation-process.html)

CHAPTER 3: CONSIDERATION OF ALTERNATIVES

This Chapter provides an overview of the various alternatives considered for the Merino Wind Farm as part of the Scoping & EIA Process.

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

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

Requirement	Relevant Section
3(g) a motivation for the preferred site, activity, and technology alternative	The identification and motivation for the preferred project site, the development area within the project site, the proposed activity and the proposed technology is included in **sections 3.3.1, 3.3.3 and 3.3.4**.
3(h)(i) details of the development footprint alternatives considered	The details of all alternatives considered as part of the Merino Wind Farm are included in **sections 3.3.1 – 3.3.5**.
3(h)(ix) if no alternative development footprints for the activity were investigated, the motivation for not considering such	Where no alternatives have been considered, motivation has been included. This is included in **section 3.3**.
3(h)(x) a concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report	Refer to **section 3.3.1**. for a concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report

3.2 Alternatives Considered during the EIA Process

In accordance with the requirements of Appendix 3 of the 2014 Environmental Impact Assessment (EIA) Regulations (GNR 326), reasonable and feasible alternatives including but not limited to site and technology alternatives, as well as the "do-nothing" alternative should be considered. Several other renewable energy facilities are planned within the broader study area, supporting the suitability of the area for renewable energy projects.

The DFFE Guideline for determining alternatives states that the key criteria for consideration when identifying alternatives are that they should be "practicable", "feasible", "relevant", "reasonable" and "viable". Essentially there are two types of alternatives:

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

In this instance, 'the project' refers to Merino Wind Farm, a wind energy facility with capacity of up to 140MW and associated infrastructure proposed to be developed by an Independent Power Producer (IPP) and intended to form part of the DMRE's REIPPP Programme, or other similar programme.

3.2.1 *Consideration of Fundamentally Different Alternatives*

Fundamentally different alternatives are usually assessed at a strategic level and, as a result, project specific EIAs are therefore limited in scope and ability to address fundamentally different alternatives. At a strategic level, electricity generating alternatives have been addressed as part of the DMRE's current Integrated Resource Plan for Electricity 2010 – 2030 (IRP)[10], and will continue to be addressed as part of future revisions. In this regard, the need for renewable energy power generation from wind energy facilities has been identified as part of the technology mix for power generation in the country for the next 20 years.

The fundamental energy generation alternatives were assessed and considered within the development of the IRP and the need for the development of renewable energy projects has been defined. Therefore, fundamentally different alternatives to the proposed project are not considered within this EIA process.

3.2.2 *Consideration of Incrementally Different Alternatives*

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

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

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

The sections below describe the incrementally different alternatives being considered as part of the Merino Wind Farm. Where no alternative is being considered, a motivation has been provided as required by the EIA Regulations, 2014.

3.3 Project Alternatives under Consideration for the Merino Wind Farm

Table 3.1 provides an overview of the alternatives being considered as part of the project:

Table 3.1: Summary of the alternatives considered as part of the Merino Wind Farm project.

Nature of Alternatives Considered	Description of the Alternatives relating to the Merino Wind Farm
Property/location and Layout Alternatives	One preferred project site has been identified for the development of the Merino Wind Farm due to site specific characteristics such as the wind resource, land availability, topographical considerations, proximity to a viable grid connection and environmental features. The project site is ~29 909ha in extent which is considered to be sufficient for the development of a wind farm with a contracted capacity of up to 140MW. A development area of ~6 463ha has been identified by the proponent within the project site for the development. A facility layout within this development area for the construction of the

[10] The Integrated Resource Plan (IRP) is legislated policy which regulates power generation planning.

Nature of Alternatives Considered	Description of the Alternatives relating to the Merino Wind Farm
	facility and its associated infrastructure required to generate up to 140MW of electricity has been provided by the applicant and has been assessed in this EIA Report.
Activity Alternatives	Only the development of a renewable energy facility is considered by Great Karoo Renewable Energy (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., livestock farming).
Technology Alternatives	Only the development of a wind farm is considered due to the characteristics of the site, including the natural resources available. The use of wind turbines for the generation of electricity is considered to be the most efficient technology for the project site.
'Do-nothing' Alternative	This is the option to not construct and operate the Merino Wind Farm. No impacts (positive or negative) are expected to occur on the social and environmental sensitive features or aspects located within the project site or the surrounds. The opportunities associated with the development of the wind farm for the affected area and other surrounding towns in the area will also not be realised.

These alternatives are described in more detail in the sections which follow.

3.3.1. Property or Location Alternatives

The Merino Wind Farm is located south-east of Victoria West and south-west of Richmond. The preferred project site for the development of the Merino Wind Farm was identified through an investigation of prospective sites and properties in the area within the Northern Cape Province. The investigation involved the consideration of specific characteristics within the province and specifically within the areas near Richmond and Victoria West including:

» Wind resource characteristics (including speed);
» Land availability;
» Land use and geographical and topographical considerations;
» Access to the national grid, including distance and capacity to connect the proposed project to the network;
» Site accessiblity; and
» Environmental and social aspects.

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 and potentially hinder such development.

» **Wind resource**: Wind resource is the first main driver of site selection and project viability when considering the development of wind farms. The project site, which is located near the towns of Richmond and Victoria West in the Northern Cape Province has good wind resource potential. Through the consideration of the datasets, involving wind presence and wind speed, as well as meteorological information and geographical factors taken from measurements on site, it was confirmed that the area is suitable for the development of a wind farm.

- **Land Availability:** In order to develop the Merino Wind Farm with a contracted capacity of up to 140MW, sufficient space is required. The properties included in the project site are privately-owned parcels available in the area for a development of this nature through agreement with the landowners and are deemed technically feasible by the project developer for such development to take place. The combination of the affected properties (i.e., the development area) has an extent of ~6 463ha, which was considered by the developer as sufficient for the development of the Merino Wind Farm. A development footprint of ~2 800ha within the development area for the placement of infrastructure has been identified considering environmental constraints and sensitivities identified within the development area through the Scoping Evaluation and is being assessed as part of this EIA Report.

- **Land Use, Geographical and Topographical Considerations**: The character of the greater area surrounding the project site can be described as a rural, Karoo landscape characterised by livestock farming. There are a number of farm dwellings located in the vicinity of the site, including three farm dwellings within the boundary of the site. The land use identified within the greater area surrounding the project site (i.e., livestock farming) is generally preferred for developments of this nature as the livestock farming activities can continue on the affected properties in tandem with the operation of the wind farm.

  The project site is located within a 30km of several authorised renewable energy facilities and therefore compliments planned future land use. Development of the Merino Wind Farm presents an opportunity to bring some relief to the area and affected landowners and surrounding communities in terms of socio-economic development, skills development, and upliftment.

  The topography in the wider area surrounding the project site is characterised by a largely flat to undulating landscape interspead with areas of high elevation in the form of hills, koppies, ridges and/or mountains. In the wider area, a range of located hilly/mountainous topography with high elevations can be found to the south-east and north of the site, respectively. As such, there are very few physical contraints present which would have an effect on the wind speed, as well as on the construciton of a wind farm. Based on the preferebletopography present, the site was identified as being technically preferred for the planned development.

- **Access to the National Electricity Grid** – A key factor in the siting of any generation project is a viable grid connection. The anticipated grid connection solution (subject to a separate environmental assessment and authorisation process) is a 132kV central collector substation and a 132kV power line to enable connection to the existing Gamma Substation. The developer consulted with the Eskom network planners to understand the current capacity of the existing grid connection infrastructure and to identify feasible connection points for the wind farm. The existing Gamma Substation, located to the south-west of the site was identified as the preferred grid connection point for the project.

- **Site access**: Access to the project site is ample with the presence of existing roads mainly consisting of national and regional roads. The project site is bisected by the N1 national road, which provides access to the project site and development area. The R398 is located to the north-east of the project site and the R63 is located to the south-west of the project site. The gravel main access road which also bisects the project site provides direct access to the project site and the development area and will therefore be utilised for accessing the project site and development area.

Based on the above considerations, the Merino 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. As a result, no property/location alternatives are proposed as part of this EIA process.

3.3.2. Design and Layout Alternatives

The overall aim of the facility layout (i.e., development footprint) is to maximise electricity production through exposure to the wind resource, while minimising infrastructure, operation, and maintenance costs, and social and environmental impacts.

Following the confirmation of the Merino Wind Farm preferred project site as being technically feasible for the development for a wind farm, the developer commenced with the scoping assessment of the site to evaluate the main constraints and opportunities and determine whether or not there are any fatal flaws or significant no-go areas within the site that might compromise or limit the development of the Merino Wind Farm and the potential to generate 140MW. The scoping process included specialist investigations of a broader area based on desktop studies and where possible, field assessments.

The purpose of this phase of the project was to identify sensitive and no-go areas, as well as to determine appropriate buffers to be considered within the development of the project layout. The sensitivity spatial data as compiled by the specialist team during the Scoping Phase for the project site was provided to the applicant. This is a common approach in the development of renewable energy projects in order to inform the placement of infrastructure for further investigation in the EIA Phase.

Through integration of the specialist sensitivity data obtained, based on field-survey and desktop studies, as well as consideration of technical aspects, the developer designed the layout to avoid areas and features of high environmental sensitivity. Where avoidance was not possible, appropriate mitigation and management measures (in this instance the development of technical mitigation solutions as well as recommendations from the various environmental specialists) have been proposed for implementation during the construction and operation of the proposed wind farm. This has resulted in the consideration of a development footprint as part of the EIA process which is designated to be environmentally appropriate as far as possible.

An overall environmental sensitivity map has been provided in order to illustrate the sensitive environmental features located within the project site which needs to be considered and, in some instances completely avoided by the development footprint (refer to Chapter 11).

3.3.3. Activity Alternatives

Great Karoo Renewable Energy (Pty) Ltd is a renewable energy project developer and as such is only considering renewable energy activities in accordance with the need for such development within the IRP. 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 renewable energy facility within the preferred project site.

The project site is located near the towns of Richmond and Victoria West in the Northern Cape Province which has above average wind resource potential. Based on the wind data collected from the area over the past 12 months, the available wind resource has been confirmed. Based on available information, it is concluded by the developer that there are a limited number of sites in South Africa with a wind resource considered viable to support the development of a technically and economically feasible wind farm. The project site is therefore considered best suited for the development of a wind farm. In addition, grid connection infrastructure to connect the wind farm to the national grid is present in the surrounding area which enables connection.

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 livestock farming and compatibility thereof, the activity (i.e., the development of a wind farm) is considered to be appropriate. Therefore, not activity alternatives are considered within this EIA Report.

3.3.4. Technology Alternatives

Environmental constraining factors have been determined through the Scoping Evaluation. Great Karoo Renewable Energy (Pty) Ltd has considered various wind turbine options based on the identified environmental constraining factors. The preferred option has been 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 Merino Wind Farm will be up to 4MW in capacity. The turbines are proposed to have a hub height of up to 170m, with an overall tip height of up to 250m.

There is a limited range of alternative technologies (turbines) available for commercial-scale wind energy facilities. In addition, the technology is constantly evolving. **Table 3.2** summarises the types of variables associated with existing wind turbine technologies.

Table 3.2: 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 are dictated by the size of the wind turbine and local geotechnical considerations. The foundation for the Merino Wind Farm is estimated a diameter of up to 25m per turbine.
Tower	Towers are typically constructed from steel and/or concrete and can be hybrid. The towers used for the Merino Wind Farm will be up to 170m 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.

Great Karoo Renewable Energy (Pty) Ltd therefore confirms wind energy technology as the preferred technology alternative for the development of the Merino Wind Farm. No further technology alternatives are considered within this EIA Report.

3.3.5. The 'Do-Nothing' Alternative

The 'do-nothing' alternative is the option of not constructing and operating the Merino Wind Farm. Should this alternative be selected, there would be no environmental impacts or benefits as a result of construction and operation activities associated with a wind energy facility. The 'do-nothing' alternative will therefore likely result in minimising the cumulative impact on the land, although it is expected that pressure to develop the site for renewable energy purposes will be actively pursued due to the same factors which make the site a viable option for renewable energy development. The 'do-nothing' alternative has been assessed as part of the EIA Phase (refer to **Chapters 9** and **11** of this EIA Report).

CHAPTER 4: WIND AS A POWER GENERATION TECHNOLOGY

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.

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.

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

4.1. Wind Resource as a Power Generation Technology

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 farm 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 wind masts installed in 2011.

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).
» 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 and what are the associated infrastructure?

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 the ground, they can take advantage of the faster and less turbulent wind. Turbines catch the wind's energy with their propeller-like blades. 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 Project will have a generating capacity of 4MW, a hub height of up to 170m, and a tip height of up to 250m. The capacity of the wind farm will depend on the wind turbine selected by the Developer (turbine capacity and model that will be deemed most suitable for the site). A maximum of 35 turbines are proposed for the project site.

Other infrastructure associated with the facility includes internal access roads, facility substation, Battery Energy Storage System (BESS), electrical and auxiliary equipment required at the collector substation that serves the wind energy facility (including switchyard/bay, control building, fences, etc.), and operation and maintenance buildings. The construction phase of the wind energy facility is dependent on the number of turbines erected and is estimated at a maximum of approximately 15-18 months (including all infrastructure). The lifespan of the facility (i.e., operation phase) is approximated at 20 to 25 years.

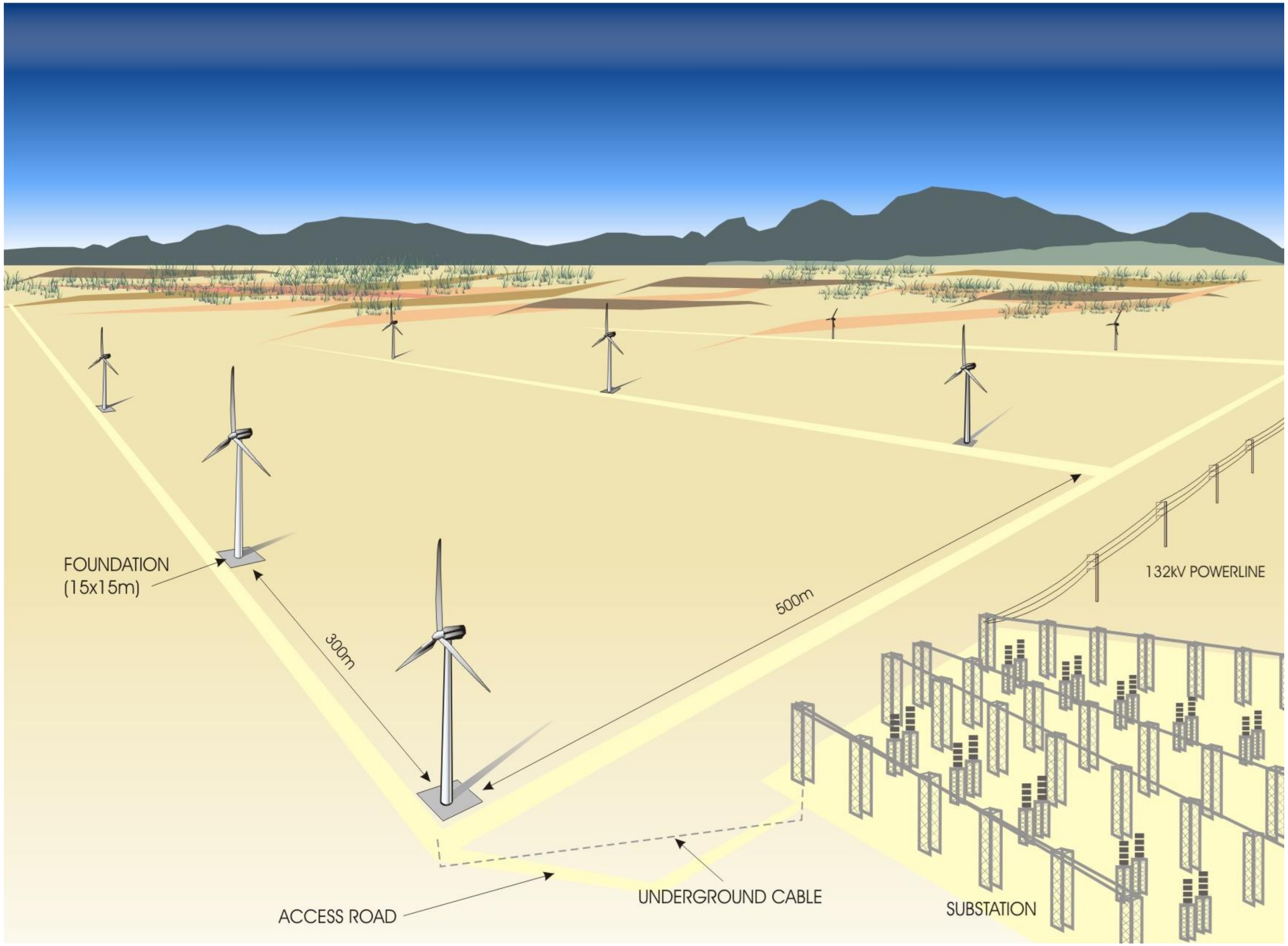


Figure 4.1: Artist's impression of a portion of a typical wind energy facility, illustrating the various components and associated infrastructure. Note that distances and measurements shown are indicative and for illustrative purposes only.

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

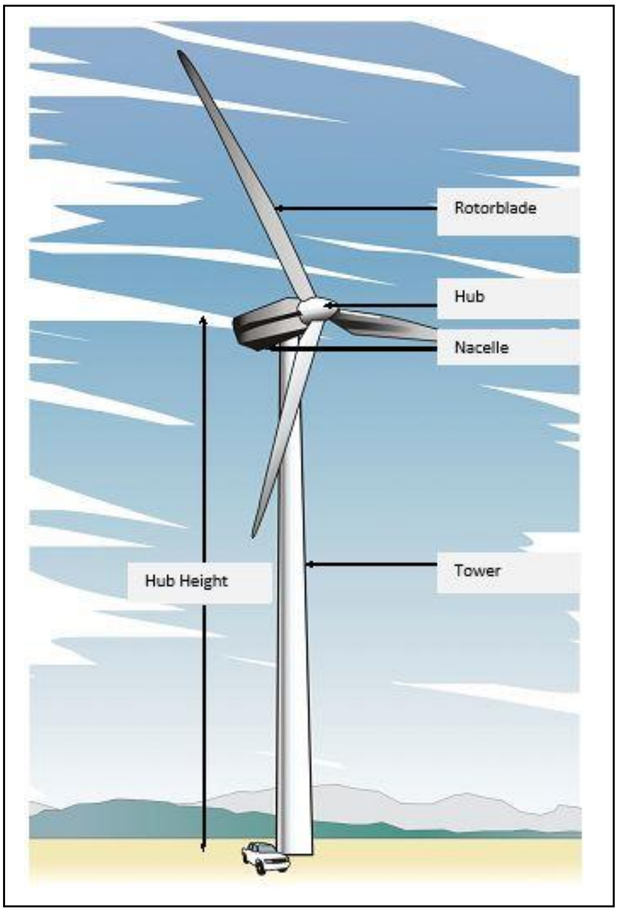


Figure 4.2: Illustration of the main components of a wind turbine

The foundation
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).

The tower
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 170m 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.

Figure 4.3: 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.

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.

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.

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: POLICY AND LEGISLATIVE CONTEXT

This Chapter provides an overview of the policy and legislative context within which the development of a wind farm, such as the Merino Wind Farm, is proposed. It identifies environmental legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process which may be applicable to or have bearing on the proposed project.

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

This chapter of the EIA Report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 3: Content of Environmental Impact Assessment Report:

Requirement	Relevant Section
3(e) a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process.	Chapter 5 as a whole provides an overview of the policy and legislative context which is considered to be associated with the development of the Merino Wind Farm. The regulatory and planning context has been considered at national, provincial and local levels.

5.2. Strategic Electricity Planning in South Africa

The need to expand electricity generation capacity in South Africa is based on national policy and informed by on-going strategic planning undertaken by the Department of Mineral Resources and Energy (DMRE). The hierarchy of policy and planning documentation that support the development of renewable energy projects such as the Merino Wind Farm is illustrated in **Figure 5.1**. 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 proposed project.

The South African energy industry is evolving rapidly, with regular changes to legislation and industry role-players. The regulatory hierarchy for an energy generation project 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. As wind farm developments are a multi-sectoral issue (encompassing economic, spatial, biophysical, and cultural dimensions) various statutory bodies are likely to be involved in the approval process of a wind farm project and the related statutory environmental assessment process.

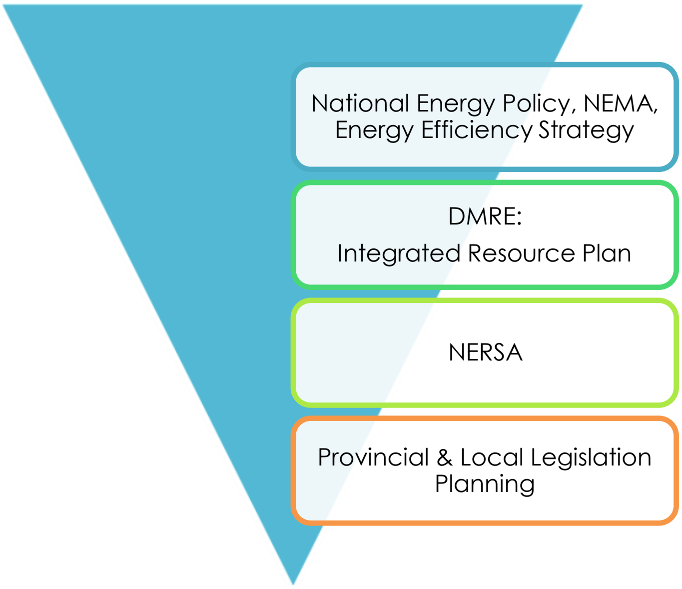


Figure 5.1: Hierarchy of electricity and planning documents

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

- **Department of Mineral Resources and Energy (DMRE):** This Department is responsible for policy relating to all energy forms and for compiling and approving the Integrated Resource Plan (IRP) for electricity. Furthermore, the Department is also responsible for granting approvals for the use of land which is contrary to the objects of the Mineral and Petroleum Resource Development Act (Act No. 28 of 2002) (MPRDA) in terms of Section 53 of the Act. Therefore, in terms of the Act, approval from the Minister is required to ensure that the proposed activities do not sterilise mineral resources that may occur within the project site and development area.
- **National Energy Regulator of South Africa (NERSA):** NERSA is responsible for regulating all aspects of the electricity sector and will ultimately issue licenses for IPP projects to generate electricity.
- **Department of Forestry, Fisheries and the Environment (DFFE):** This Department is responsible for environmental policy and is the controlling authority in terms of NEMA and the EIA Regulations, 2014 (GN R326) as amended. DFFE is the Competent Authority for this project (as per GN R779 of 01 July 2016), and is charged with granting the EA for the project under consideration.
- **The South African Heritage Resources Agency (SAHRA):** SAHRA is a statutory organisation established under the National Heritage Resources Act (No. 25 of 1999) (NHRA), as the national administrative body responsible for the protection of South Africa's cultural heritage.
- **South African National Roads Agency Limited (SANRAL):** This Agency is responsible for the regulation and maintenance of all national road routes.
- **Department of Water and Sanitation (DWS):** This Department is responsible for effective and efficient water resource management to ensure sustainable economic and social development. This Department is also responsible for evaluating and issuing licenses pertaining to water use (i.e., Water Use License (WUL) and General Authorisation).
- **The Department of Agriculture, Rural Development and Land Reform (DARDLR):** This Department is the custodian of South Africa's agricultural resources and is primarily responsible for the formulation and implementation of policies governing the agriculture sector. Furthermore, the Department is also responsible for issuing permits for the disturbance or destruction of protected tree species listed under Section 15 (1) of the National Forest Act (No. 84 of 1998) (NFA).

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

» **Provincial Government of the Northern Cape – Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform (DAEARD&LR):** This Department is the commenting authority for the EIA process for the project and is responsible for issuing of biodiversity and conservation-related permits.
» **Northern Cape Department of Transport, Safety and Liaison:** This Department provides effective co-ordination of crime prevention initiatives, provincial police oversight, traffic management and road safety towards a more secure environment.
» **Ngwao-Boswa Ya Kapa Bokone (NBKB):** This Department identifies, conserves and manages heritage resources throughout the Northern Cape Province.

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

5.3. International Policy and Planning Context

A brief review of the most relevant international policies relevant to the establishment of the Merino Wind Farm are provided below in **Table 5.1**. The Merino Wind Farm is considered to be aligned with the aims of these policies, even if contributions to achieving the goals therein are only minor.

Table 5.1: International policies relevant to the Merino Wind Farm

Relevant policy	Relevance to the Merino Wind Farm
United Nations Framework Convention on Climate Change (UNFCCC) and Conference of the Party (COP)	The Conference of the Parties (COP), established by Article 7 of the UNFCCC, is the supreme body and highest decision-making organ of the Convention. It reviews the implementation of the Convention and any related legal instruments and takes decisions to promote the effective implementation of the Convention. The Conference of the Parties (COP) 21 was held in Paris from 30 November to 12 December 2015. From this conference, an agreement to tackle global warming was reached between 195 countries. South Africa signed the Agreement in April 2016 and ratified the agreement on 01 November 2016. The Agreement was assented to by the National Council of Provinces on 27 October 2016, and the National Assembly on 1 November 2016. The Paris Agreement set out that every 5 years countries must set out increasingly ambitious climate action. This meant that, by 2020, countries needed to submit or update their plans for reducing emissions, known as nationally determined contributions (NDCs). The COP26 summit held on 2021 brought parties together to accelerate action towards the goals of the Paris Agreement and the UN Framework Convention on Climate Change. On 13 November 2021, COP26 concluded in Glasgow with all countries agreeing the Glasgow Climate Pact to keep 1.5˚C alive and finalise the outstanding elements of the Paris Agreement.

	South Africa's National Climate Change Response Policy (NCCRP) establishes South Africa's approach to addressing climate change, including adaptation and mitigation responses. The NCCRP formalises Government's vision for a transition to a low carbon economy, through the adoption of the 'Peak, Plateau and Decline' (PPD) GHG emissions trajectory whereby South Africa's emissions should peak between 2020 and 2025, plateau for approximately a decade, and then decline in absolute terms thereafter, and based on this the country has pledged to reduce emissions by 34% and 42% below Business As Usual (BAU) emissions in 2020 and 2025, respectively. The policy provides support for the Merino Wind Farm which will contribute to managing climate change impacts, supporting the emergency response capacity, as well as assist in reducing GHG emissions in a sustainable manner.
The Equator Principles IV (July 2020)	The Equator Principles (EPs) IV constitute a financial industry benchmark used for determining, assessing, and managing project's environmental and social risks when financing projects. 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 (such as the Merino Wind Farm) and apply globally to all industry sectors. Such an assessment should propose measures to minimise, mitigate, and offset adverse impacts in a manner relevant and appropriate to the nature and scale of the Merino Wind Farm. 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 Merino Wind Farm is currently being assessed in accordance with the requirements of the 2014 EIA Regulations, as amended (GN R326), 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 and Environmental and Social Sustainability (January 2012)	The International Finance Corporation's (IFC) Performance Standards (PSs) on Environmental and Social Sustainability were developed by the IFC and were last updated on 1 January 2012. Performance Standard 1 requires that a process of environmental and social assessment be conducted, and an Environmental and Social Management System (ESMS) appropriate to the nature and scale of the project, and commensurate with the level of its environmental and social risks and impacts, be established and maintained. The above-mentioned standard is the overarching standard to which all the other standards relate. Performance Standards 2 through to 8 establish specific requirements to avoid, reduce, mitigate, or compensate for impacts on people and the environment, and to improve conditions where appropriate. While all relevant social and environmental risks and potential impacts should be considered as part of the assessment, the standards 2 and 8 describe potential social and environmental impacts that require particular attention specifically within emerging markets. Where social or environmental impacts are anticipated, the developer is required to manage them through its ESMS consistent with Performance Standard 1. Given the nature of the Merino Wind Farm, it is anticipated (at this stage of the process) that Performance Standards 1, 2, 3, 4, 6, and 8 may be applicable to the project.

5.4. National Policy and Planning Context

Further to the South African government's commitment in August 2011 to support the development of renewable energy capacity, the DMRE initiated the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) to procure renewable energy from the private sector in a series of rounds. According to the IPP Procurement Programme overview report (2021), as at March 2021, 6 422MW of renewable energy capacity from 112 independent power producers (IPPs) has been procured in seven bid rounds[11], with 5 078MW from 79 IPP projects operational and made available to the grid[12]. National policies have to be considered for the construction and operation of the solar PV facility to ensure that the development is in line with the planning of the country.

A brief review of the most relevant national policies is provided below in **Table 5.2**. The development of Merino Wind Farm is considered to align with the aims of these policies, even if contributions to achieving the goals therein are only minor.

Table 5.2: Relevant national legislation and policies for Merino Wind Farm

Relevant legislation or policy	Relevance to Merino Wind Farm
Constitution of the Republic of South Africa, 1996	Section 24 of the Constitution pertains specifically to the environment. It 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. The Constitution outlines the need to promote social and economic development. Section 24 of the Constitution therefore requires that development be conducted in such a manner that it does not infringe on an individual's environmental rights, health, or well-being. This is especially significant for previously disadvantaged individuals who are most at risk to environmental impacts.
National Environmental Management Act (No. 107 of 1998) (NEMA)	The NEMA is South Africa's key piece of environmental legislation and sets the framework for environmental management in South Africa. The NEMA is founded on the principle that everyone has the right to an environment that is not harmful to their health or well-being as contained within the Bill of Rights. The national environmental management principles state that the social, economic, and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed, and evaluated, and decisions must be appropriate in the light of such consideration and assessment. The need for responsible and informed decision-making by government on the acceptability of environmental impacts is therefore enshrined within the NEMA.
National Energy Act (No. 34 of 2008)	The purpose of the National Energy Act (No. 34 of 2008) is to ensure that diverse energy resources are available, in sustainable quantities and at affordable prices, to the South

11 Bid windows1, 2 ,3 ,3.5 ,4 and small BW1(1S2) and small BW2(2S2). 2 583 MW of renewable energy capacity was awarded to IPPs in the REIPPPP bid window 5 in October 2021.

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

	African economy in support of economic growth and poverty alleviation, while taking into account environmental management requirements and interactions amongst economic sectors, as well as matters relating to renewable energy. The National Energy Act also provides for energy planning, increased generation and consumption of renewable energies, contingency energy supply, holding of strategic energy feedstocks and carriers, adequate investment in, appropriate upkeep and access to energy infrastructure. The Act provides measures for the furnishing of certain data and information regarding energy demand, supply, and generation, and for establishing an institution to be responsible for promotion of efficient generation and consumption of energy and energy research. The Act provides the legal framework which supports the development of power generation facilities.
White Paper on the Energy Policy of the Republic of South Africa (1998)	The White Paper on Energy Policy places emphasis on the expansion of energy supply options to enhance South Africa's energy security. This can be achieved through increased use of renewable energy and encouraging new entries into the generation market. The policy states that the advantages of renewable energy include, minimal environmental impacts during operation in comparison with traditional supply technologies, generally lower running costs, and high labour intensities. Disadvantages include higher capital costs in some cases, lower energy densities, and lower levels of availability, depending on specific conditions, especially with sun and wind-based systems. Nonetheless, renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future.
White Paper on the Renewable Energy Policy of the Republic of South Africa (2003)	The White Paper on Renewable Energy Policy supplements Government's predominant policy on energy as set out in the White Paper on the Energy Policy of the Republic of South Africa (DME, 1998). The policy recognises the potential of renewable energy and aims to create the necessary conditions for the development and commercial implementation of renewable energy technologies. The White Paper on Renewable Energy sets out Government's vision, policy principles, strategic goals, and objectives for promoting and implementing renewable energy in South Africa. The country relies heavily on coal to meet its energy needs due to its abundant, and fairly accessible and affordable coal resources. However, massive renewable energy resources that can be sustainable alternatives to fossil fuels, have so far remained largely untapped. The White Paper on Renewable Energy of 2003 set a target of 10 000GWh to be generated from renewable energy by 2013 to be produced mainly from biomass, wind, solar and small-scale hydro. The target was subsequently reviewed in 2009 during the renewable energy summit of 2009. The policy supports the investment in renewable energy facilities as they contribute towards ensuring energy security through the diversification of energy supply, reducing GHG emissions and the promotion of renewable energy sources.
The Electricity Regulation Act (No. of 2006)	The Electricity Regulation Act of 2006 replaced the Electricity Act (No. 41 of 1987), as amended, with the exception of Section 5B, which provides funds for the energy regulator for the purpose of regulating the electricity industry. The Act establishes a national regulatory framework for the electricity supply industry and introduces the National Energy Regulator (NERSA) as the custodian and enforcer of the National Electricity Regulatory Framework. The Act also provides for licences and registration as

	the manner in which the generation, transmission, distribution, trading, and import and export of electricity are regulated.
National Development Plan 2030	The National Development Plan (NDP) 2030 is a plan prepared by the National Planning Commission in consultation with the South African public which is aimed at eliminating poverty and reducing inequality by 2030. In terms of the Energy Sector's role in empowering South Africa, the NDP envisages that, by 2030, South Africa will have an energy sector that promotes: » Economic growth and development through adequate investment in energy infrastructure. The sector should provide reliable and efficient energy service at competitive rates, while supporting economic growth through job creation. » Social equity through expanded access to energy at affordable tariffs and through targeted, sustainable subsidies for needy households. » Environmental sustainability through efforts to reduce pollution and mitigate the effects of climate change. The NDP aims to provide a supportive environment for growth and development, while promoting a more labour-absorbing economy. The development of Merino Wind Farm supports the NDP through the development of energy-generating infrastructure which will not lead to the generation of GHGs and will result in economic development and growth of the area surrounding the development area.
Integrated Energy Plan (IEP), November 2016	The purpose and objectives of the Integrated Energy Plan (IEP) are derived from the National Energy Act (No. 34 of 2008). The IEP takes into consideration the crucial role that energy plays in the entire economy of the country and is informed by the output of analyses founded on a solid fact base. It is a multi-faceted, long-term energy framework which has multiple aims, some of which include: » To guide the development of energy policies and, where relevant, set the framework for regulations in the energy sector. » To guide the selection of appropriate technologies to meet energy demand (i.e., the types and sizes of new power plants and refineries to be built and the prices that should be charged for fuels). » To guide investment in and the development of energy infrastructure in South Africa. » To propose alternative energy strategies which are informed by testing the potential impacts of various factors such as proposed policies, introduction of new technologies, and effects of exogenous macro-economic factors. A draft version of the IEP was released for comment on 25 November 2016. The purpose of the IEP is to provide a roadmap of the future energy landscape for South Africa which guides future energy infrastructure investments and policy development. The development of the IEP is an ongoing continuous process. It is reviewed periodically to take into account changes in the macroeconomic environment, developments in new technologies and changes in national priorities and imperatives, amongst others. The 8 key objectives of the integrated energy planning process are as follows: » Objective 1: Ensure security of supply. » Objective 2: Minimise the cost of energy. » Objective 3: Promote the creation of jobs and localisation.

	» Objective 4: Minimise negative environmental impacts from the energy sector. » Objective 5: Promote the conservation of water. » Objective 6: Diversify supply sources and primary sources of energy. » Objective 7: Promote energy efficiency in the economy. » Objective 8: Increase access to modern energy.
Integrated Resource Plan for Electricity (IRP) 2010-2030	The Integrated Resource Plan (IRP) for Electricity 2010 – 2030 is a subset of the IEP and constitutes South Africa's National electricity plan. The primary objective of the IRP is to determine the long-term electricity demand and detail how this demand should be met in terms of generating capacity, type, timing, and cost. The IRP also serves as input to other planning functions, including amongst others, economic development and funding, and environmental and social policy formulation. The promulgated IRP 2010–2030 identified the preferred generation technology required to meet expected demand growth up to 2030. It incorporated government objectives such as affordable electricity, reduced greenhouse gas (GHG) emissions, reduced water consumption, diversified electricity generation sources, localisation and regional development. Following the promulgation of the IRP 2010–2030, implementation followed in line with Ministerial Determinations issued under Section 34 of the Electricity Regulation (Act No. 4) of 2006. The Ministerial Determinations give effect to planned infrastructure by facilitating the procurement of the required electricity capacity. According to the IPP Procurement Programme overview report (2021), as at 31 March 2021,a total of 6 422MW has been procured under the REIPPP Programme from 112 IPPs in seven bid rounds, with 5 078MW being currently operational and made available to the grid. IPPs have commissioned 1005MW from two (2) Open Cycle Gas Turbines (OCGT) peaking plants. Under the Eskom Build Programme, 1 332MW has been procured from the Ingula Pumped Storage Project, 1 588MW and 800MW from the Medupi and Kusile power stations and 100MW from the Sere Wind Farm. Provision has been made for the following new capacity by 2030: » 1 500MW of coal » 2 500MW of hydro » 6 000MW of solar PV » 14 400MW of wind » 1 860MW of nuclear » 2 088MW of storage » 3 000MW of gas/diesel » 4 000MW from other distributed generation, co-generation, biomass and landfill technologies Based on the IRP 2019, 1 474MW has been installed for solar PV facilities, whereas, 814MW has already been procured. In addition, 1 600MW has been allocated for wind facilities from 2022 to 2030. This will bring the total installed capacity of solar PV facilities by 2030 to 17 742MW. Therefore, the development of the Merino Wind Farm is supported by the IRP 2019.
New Growth Path (NGP) Framework, 23 November 2010	The purpose of the New Growth Path (NGP) Framework is to provide effective strategies towards accelerated job-creation through the development of an equitable economy and sustained growth. The target of the NGP is to create 5 million jobs by 2020; with economic growth and employment creation as the key indicators

	identified in the NGP. The framework seeks to identify key structural changes in the economy that can improve performance in terms of labour absorption and the composition and rate of growth. 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.
National Climate Change Bill, 2018	On 08 June 2018, the Minister of Environmental Affairs published the National Climate Change Bill ("the Bill") for public comment. The 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. Merino Wind Farm is a renewable energy generation facility and would not result in the generation or release of emissions during its operation.
National Climate Change Response Policy, 2011	South Africa's National Climate Change Response Policy (NCCRP) establishes South Africa's approach to addressing climate change, including adaptation and mitigation responses. The NCCRP formalises Government's vision for a transition to a low carbon economy, through the adoption of the 'Peak, Plateau and Decline' (PPD) GHG emissions trajectory whereby South Africa's emissions should peak between 2020 and 2025, plateau for approximately a decade, and then decline in absolute terms thereafter, and based on this, the country has pledged to reduce emissions by 34% and 42% below Business As Usual (BAU) emissions in 2020 and 2025, respectively. As an integral part of the policy, a set of near-term priority flagship programmes will be implemented to address the challenges of climate change, one of which includes the Renewable Energy Flagship Programme. This flagship programme includes a scaled-up renewable energy programme, based on the current programme specified in the IRP 2010, and using the evolving South African Renewables Initiative led by the Department of Public Enterprise and Department of Trade and Industry (DTI), as a driver for the deployment of renewable energy technologies. The programme will be informed by enhanced domestic manufacturing potential and the implementation of energy efficiency and renewable energy plans by local government. The development of the Merino Wind Farm is aligned with the Renewable Energy Flagship Programme identified under South Africa's NCCRP and could therefore be argued to be aligned with the country's approach to addressing climate change.
National Climate Change Response Strategy for South Africa, 2004	The need for a national climate change policy for South Africa was identified as an urgent requirement during the preparations for the ratification of the UNFCCC in 1997. A process to develop such a policy was thus instituted under the auspices of the National Committee for Climate Change (NCCC), a non-statutory stakeholder body set up in 1994 to advise the Minister on climate change issues and chaired by the then Department of Environmental Affairs and Tourism (DEAT). It was determined that a national climate change response strategy will promote integration between the programmes of the various government departments involved to maximise the benefits to the country as a whole, while minimising negative impacts. Further, as climate change response actions can potentially act as a significant factor in boosting sustainable economic and social development, a national strategy specifically designed to bring this about is clearly in the national interest, supporting the major objectives of the government, including poverty alleviation and the creation of jobs.

	A number of principles and factors guided the conception of the strategy and are required to be implemented. These are: » Ensuring that the strategy is consistent with national priorities, including poverty alleviation, access to basic amenities including infrastructure development, job creation, rural development, foreign investment, human resource development and improved health, leading to sustainable economic growth. » Ensuring alignment with the need to consistently use locally available resources. » Ensuring compliance with international obligations. » Recognizing that climate change is a cross cutting issue that demands integration across the work programmes of other departments and stakeholders, and across many sectors of industry, business, and the community. » Focussing on those areas that promote sustainable development. » Promoting programmes that will build capacity, raise awareness, and improve education in climate change issues. » Encouraging programmes that will harness existing national technological competencies. » Reviewing the strategy constantly in the light of national priorities and international trends. » Recognizing that South Africa's emissions will continue to increase as development is realised. The strategy was devised through an integrated approach and considers policies and programmes of other government departments and the fact that South Africa is a developing country. This will ensure that the principles of sustainable development are adequately served and do not conflict with existing development policies.
Strategic Integrated Projects (SIPs)	The Presidential Infrastructure Coordinating Committee (PICC) is integrating and phasing investment plans across 18 Strategic Infrastructure Projects (SIPs) which have five core functions: to unlock opportunity, transform the economic landscape, create new jobs, strengthen the delivery of basic services, and support the integration of African economies. A balanced approach is being fostered through greening of the economy, boosting energy security, promoting integrated municipal infrastructure investment, facilitating integrated urban development, accelerating skills development, investing in rural development, and enabling regional integration. SIP 8 and 9 of the energy SIPs supports the development of the wind energy facility: » SIP 8: Green energy in support of the South African economy: Support sustainable green energy initiatives on a national scale through a diverse range of clean energy options as envisaged in the Integrated Resource Plan (IRP 2010 – 2030) and supports bio-fuel production facilities. » SIP 9: Electricity generation to support socio-economic development: The proposed Merino Wind Farm is a potential SIP 9 Project as electricity will be generated and social and economic upliftment, development and growth will take place within the surrounding communities. It would become a SIP 9 project if selected as a Preferred Bidder project by the Department Mineral Resources and Energy. 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 imbalances.

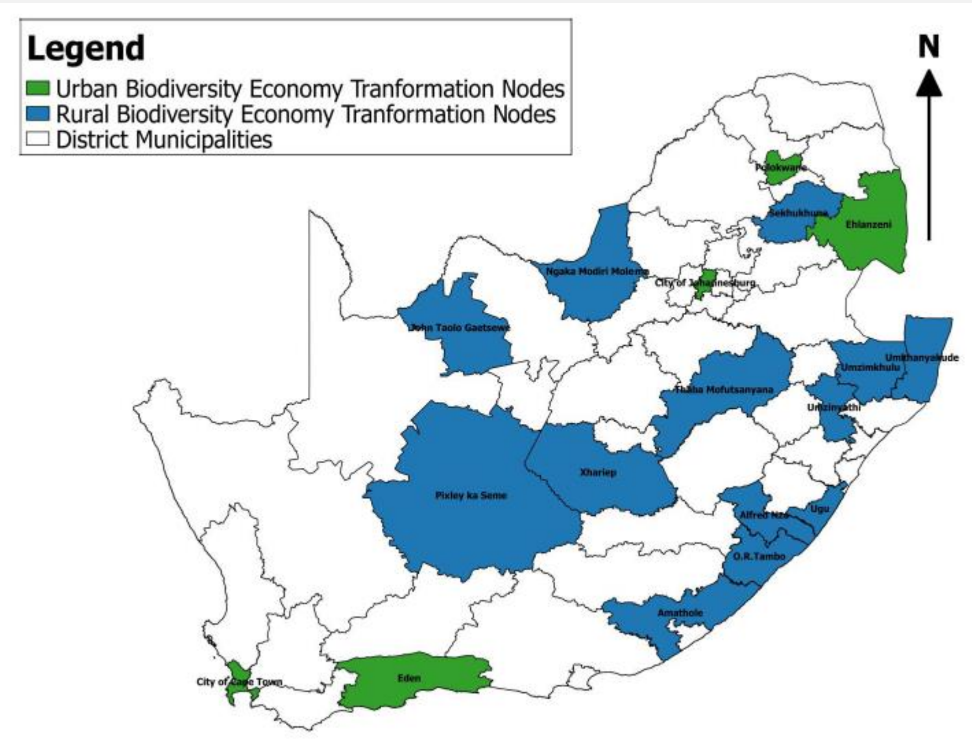
	The Merino Wind Farm could be registered as a SIP project once it is under development. The project would then contribute to the above-mentioned SIPs.
National Biodiversity Economy Strategy (NBES) (March 2016)	The biodiversity economy of South Africa encompasses the businesses and economic activities that either directly depend on biodiversity for their core business or that contribute to conservation of biodiversity through their activities. The commercial wildlife and the bioprospecting industries of South Africa provide cornerstones for the biodiversity economy and are the focus of this strategy. Both the wildlife and bioprospecting sub-sectors of the biodiversity economy have already demonstrated the potential for significant future development and growth. In the study commissioned on the situational analysis of the biodiversity economy, the contribution of the biodiversity economy to the national economy can be measured in terms of Gross Domestic Product (GDP), with the wildlife and bioprospecting industries contributing approximately R3 billion to GDP in 2013. Growth in the wildlife and bioprospecting industries can make a significant impact on the national economy, while contributing to national imperatives such as job creation, rural development and conservation of our natural resources. The Wildlife Industry value chain is centred on game and wildlife farming/ranching activities that relate to the stocking, trading, breeding, and hunting of game, and all the services and goods required to support this value chain. The key drivers of this value chain include domestic hunters, international hunters and a growing retail market demand for wildlife products such as game meat and taxidermy products. This sector is therefore characterised by an interesting combination of agriculture, eco-tourism and conservation characteristics. Over the period 2008-2013, the total Wildlife Industry market grew by more than 14% per year. This growth comprised an average annual growth exceeding 6% in domestic hunting, a decrease in international hunting, and an exponential growth in live auction sales. It is considered likely that the consolidated Wildlife Industry has the potential to experience a weighted average annual growth rate of between 4 %-14 % per year up to 2030. In order for the wildlife and bioprospecting sub-sectors of the biodiversity economy to achieve its full potential, a strategic partnership between the state, private sector and communities is required. To this end, a National Biodiversity Economy Strategy (NBES) is required to guide the sustainable growth of the wildlife and bioprospecting industries and to provide a basis for addressing constraints to growth, ensuring sustainability, identifying clear stakeholder's responsibilities and monitoring progress of the Enabling Actions. The Vision of NBES is to optimise the total economic benefits of the wildlife and bioprospecting industries through its sustainable use, in line with the Vision of the Department of Environmental Affairs. The purpose of NBES is to provide a 14-year national coordination, leadership and guidance to the development and growth of the biodiversity economy. NBES has set an industry growth goal stating that by 2030, the South African biodiversity economy will achieve an average annualised GDP growth rate of 10% per annum. This envisioned growth curve extends into the year 2030 and is aligned to the efforts of the country's National Development Plan, Vision 2030. The NBES seeks to contribute to the transformation of the biodiversity economy in South Africa through inclusive

economic opportunities, reflected by a sector which is equitable - equitable access to resources, equitable and fair processes and procedures and equitable in distribution of resources (i.e. business, human, financial, indigenous species, land, water) in the market.

To address these transformation NBES imperatives, NBES has the principles of:

- Conservation of biodiversity and ecological infrastructure
- Sustainable use of indigenous resources
- Fair and equitable beneficiation
- Socio-economic sustainability
- Incentive driven compliance to regulation
- Ethical practices
- Improving quality and standards of products.

The NBES provides the opportunity to redistribute South Africa's indigenous biological/ genetic resources in an equitable manner, across various income categories and settlement areas of the country. The NBES has prioritised nodes in the country for biodiversity economy transformation, referred to as BET nodes. NBES prioritises 18 BET nodes, 13 rural and 5 urban districts across the nine provinces of the country, with communities having been prioritised for development of small and medium size enterprises and community-based initiatives which sustainably use of indigenous biological and/or genetic resources. The Pixley Ka Seme District Municipality within which the Merino Wind Farm is proposed is identified as a Rural Biodiversity Economy Transformation Node.



5.5. Provincial Policy and Planning Context

A brief review of the most relevant provincial policies is provided below in **Table 5.3**. The proposed development is considered to align with the aims of these policies, even if contributions to achieving the goals therein are only minor.

Table 5.3: Relevant provincial legislation and policies for Merino Wind Farm

Relevant policy	Relevance to Merino Wind Farm
Northern Cape Provincial Spatial Development Framework (PSDF) 2012	The Northern Cape Provincial Spatial Development Framework (PSDF) 2012 states that the overarching goal for the province is to enable sustainability through sustainable development. The province considers social and economic development as imperative in order to address the most significant challenge facing the Northern Cape, which is poverty. The PSDF identifies key sectoral strategies and plans which are considered to be the key components of the PSDF. Sectoral Strategy 19 refers to a provincial renewable energy strategy. Within the PSDF, a policy has been included which states that renewable energy sources (including the utilisation of solar energy) are to comprise 25% of the province's energy generation capacity by 2020. The overall energy objective for the province also includes promoting the development of renewable energy supply schemes which are considered to be strategically important for increasing the diversity of domestic energy supply and avoiding energy imports, while also minimising the detrimental environmental impacts. The implementation of sustainable renewable energy is also to be promoted within the province through appropriate financial and fiscal instruments. The development of Merino Wind Farm supports the overall energy objective of the province to have 25% of its electricity from renewable energy sources.
Northern Cape Provincial Spatial Development Framework (PSDF) 2018 Review - Executive Summary	The review of the Northern Cape PSDF (2018) refers to infrastructure investment and that a balance must be maintained between investments aimed at meeting the social needs of communities and investments aimed at promoting economic development and job creation. The Spatial Development Strategy identified in the PSDF for basic infrastructure includes achieving the provision of green infrastructure which includes renewable energy. As part of the Vision 2040 of the PSDF, key opportunities are identified for the province. The strengthening of the development triangle that is formed by the linking of Kimberley, Vryburg, Upington and De Aar. The development triangle sustains a diverse economy with strong mining, agricultural and renewable energy sectors. It is stated in the PSDF that a sustainable and viable economic network must be driven within the development triangle to improve the return of public investment in the province. The development of the Merino Wind Farm will contribute to the economic network of the province specifically in terms of the renewable sector, albeit it does not fall within the development triangle.
Northern Cape Provincial Growth and Development Strategy	The Northern Cape Provincial Growth and Development Strategy (NCPGDS) identifies poverty reduction as the most significant challenge facing the government and its partners. All other societal challenges that the province faces emanate

Relevant policy	Relevance to Merino Wind Farm
	predominantly from the effects of poverty. The NCPGDS notes that the only effective way to reduce poverty is through long-term sustainable economic growth and development. The sectors where economic growth and development can be promoted include: » Agriculture and Agro-processing. » Fishing and Mariculture. » Mining and mineral processing. » Transport. » Manufacturing. » Tourism. However, the NCPGDS also notes that economic development in these sectors also requires: » Creating opportunities for lifelong learning. » Improving the skills of the labour force to increase productivity. » Increasing accessibility to knowledge and information. The achievement of these primary development objectives depends on the achievement of a number of related objectives that, at a macro-level, describe necessary conditions for growth and development. These are: » Developing requisite levels of human and social capital. » Improving the efficiency and effectiveness of governance and other development institutions. » Enhancing infrastructure for economic growth and social development. The NCPGDS makes reference to the need to ensure the availability of inexpensive energy. The section notes that in order to promote economic growth in the Northern Cape, the availability of electricity to key industrial users at critical localities at rates that enhance the competitiveness of their industries must be ensured. At the same time, the development of new sources of energy through the promotion of the adoption of energy applications that display a synergy with the province's natural resource endowments must be encouraged. In this regard the NCPGDS notes "the development of energy sources such as solar energy, the natural gas fields, bio-fuels, etc., could be some of the means by which new economic opportunity and activity is generated in the Northern Cape". The NCPGDS also highlights the importance of close co-operation between the public and private sectors in order for the economic development potential of the Northern Cape to be realised. The NCPGDS also highlights the importance of enterprise development and notes that the current level of private sector development and investment in the Northern Cape are low. In addition, the province also lags in the key policy priority areas of SMME Development and Black Economic Empowerment. The development of the Merino Wind Farm therefore has the potential to create employment opportunities, promote skills development, create opportunities to promote private sector investment and the development of SMMEs in the Northern Cape Province.
The Northern Cape Climate Change Response Strategy	The key aspects of the Northern Cape Climate Change Response Strategy (NCCCRS) Report are summarised in the MEC's (NCPG: Environment and Nature Conservation) 2011 budget speech: "*The Provincial Climate Change Response Strategy will be underpinned by specific critical sector climate change adaptation and mitigation*

Relevant policy	Relevance to Merino Wind Farm
	strategies that include the Water, Agriculture and Human Health sectors as the 3 key Adaptation Sectors, the Industry and Transport alongside the Energy sector as the 3 key Mitigation Sectors with the Disaster Management, Natural Resources and Human Society, livelihoods and Services sectors as 3 remaining key. Sectors to ensure proactive long-term responses to the frequency and intensity of extreme weather events such as flooding and wildfire, with heightened requirements for effective disaster management". Key points from the MEC address include the NCPG's commitment to develop and implement policy in accordance with the National Green Paper for the National Climate Change Response Strategy (2010), and an acknowledgement of the Northern Cape Province's extreme vulnerability to climate-change driven desertification. The development and promotion of a provincial green economy, including green jobs, and environmental learnership is regarded as an important provincial intervention in addressing climate change. The renewable energy sector, including solar and wind energy (but also biofuels and energy from waste), is explicitly indicated as an important element of the Provincial Climate Change Response Strategy. The development of the Merino Wind Farm will assist in achieving (although only to a limited extent) the promotion of the provincial green economy of the Northern Cape.
Northern Cape Province Green Document	The NCP Green Document (2017-2018) was prepared by the Northern Cape Department of Economic Development and Tourism and provides an impact assessment of IPPs on the communities in the province located within a 50km radius from existing facilities. The document notes that the NCP is nationally a leader in commercial-scale renewable energy projects. By 2018, a total of 23 IPP projects in the province had been integrated into the national grid. These projects include Solar PV, Concentrated Solar, and Wind Energy Facilities. The document notes that through their economic development obligations, these projects have already made a significant positive contribution to affected communities. Much of the effort has been directed at supporting local education. The document also notes that, as these projects are committed to 20-year minimum lifespans, they collectively hold a tremendous potential for socio-economic upliftment. The development of the Merino Wind Farm will contribute towards further socio-economic upliftment in the Northern Cape Province.

5.6. Local Policy and Planning Context

The local tiers of government relevant to the Merino Wind Farm are the Ubuntu Local Municipality and the Pixley Ka Seme District Municipality. Instruments and/or policies at both the district and local level contain objectives which align with the development of Merino Wind Farm. These include, economic growth, job creation, community upliftment and poverty alleviation.

Table 5.4: Relevant district and local legislation and policies for Merino Wind Farm

Relevant policy	Relevance to Merino Wind Farm
Pixley Ka Seme District Municipality Integrated	The vision for the PKSDM is "Developed and Sustainable District for Future Generations" The mission statement that underpins the vision is:

Relevant policy	Relevance to Merino Wind Farm
Development Plan (IDP) (2019-2020)	» Supporting our local municipalities to create a home for all in our towns, settlements, and rural areas to render dedicated services. » Providing political and administrative leadership and direction in the development planning process. » Promoting economic growth that is shared across and within communities. » Promoting and enhancing integrated development planning in the operations of our municipalities. » Aligning development initiatives in the district to the National Development Plan. The Strategic Objectives to address the vision that are relevant to the project include the promotion of economic growth in the district and enhancement of service delivery. Chapter 4 of the IDP, Development of Strategies, highlights the key strategies of the PKSDM. The IDP also notes that the growth and development context in the district has also changed radically since 2013 (after it had been stagnant for decades) owing mainly to private and public investments in the area as a hub for renewable energy generation and astronomy. The IDP notes that the economy in the Pixley Ka Seme municipal area is characterised by: » High levels of poverty and low levels of education. » Low levels of development despite the strategic location in terms of the national transport corridors. » High rate of unemployment, poverty, and social grant dependence. » Prone to significant environmental changes owing to long-term structural changes (such as climate change, energy crises and other shifts). Of specific relevance, the IDP highlights the potential for renewable energy to help address some of these challenges. The development of the Merino Wind Farm will promote economic development in the Pixley Ka Seme municipal area, thereby assisting in addressing some the challenges faced by the district municipality as detailed in the IDP.
Pixley Ka Seme District Municipality Spatial Development Framework (SDF) (2017)	The SDF notes that the vision for the PKSDM is "Pixley Ka Seme District Municipality, pioneers of development, a home and future for all". The Mission Statement that underpins the vision refers to: » Effective and efficient service delivery. » Optimal human and natural resource development. » Local economic growth and development, job creation and poverty alleviation. » A vibrant tourism industry. » To participate in the fight to reduce the infection rate and lessen the impact of HIV/AIDS and other communicable diseases. » A safe, secure and community friendly environment. The SDF identifies the opportunities and constraints associated with the district. An opportunity of relevance to the Merino Wind Farm is renewable energy and the identification of a renewable energy hub in the region.
Ubuntu Local Municipality Integrated Development Plan (IDP) (2019 – 2020)	The vision of ULM is "By 2030, Ubuntu Municipality shall be the best rural municipality through relentless pursuit of excellence through focused governance, efficient administration, and effective service delivery for inclusive targeted social and economic development against all odds".

Relevant policy	Relevance to Merino Wind Farm
	The mission is to: » Maximize the utility of the municipal resources in a sustainable, developmental, and economic manner to better the life of all. » Improve institutional effectiveness and efficiency. » Optimally develop our human, financial and natural resources. » Create an enabling environment for local economic growth in order to create employment opportunities and alleviate poverty. » Work with all our existing and prospective partners to establish a vibrant tourism industry. » Participate in the fight to reduce the HIV/AIDS infection rate and lessen the impact thereof. » Focus on youth development, women empowerment and enabling the disabled to play a meaningful role in unlocking human potential. » Ensure a safe, secure and community friendly environment. » Maintain sound and sustainable management of financial and fiscal affairs. The IDP identifies a number of challenges facing the area in terms of economic development and growth. Of relevance to the project these include: » Unemployment and poverty. » Shortage of critical skills » Needs of vulnerable groups, including women, disabled and youth. » Access to basic services such as water, sanitation, electricity and housing. » Improved access to services in education, health and social services. » Reduction in the rate of crime. These issues can be addressed by supplier and enterprise development and enterprise development spend linked to the Merino Wind Farm.

CHAPTER 6: NEED AND DESIRABILITY

Appendix 3 of the 2014 EIA Regulations (GNR 326) requires that an EIA Report includes a motivation for the need and desirability of the proposed development, including the need and desirability of the activity in the context of the preferred location. The need and desirability of the development needs to consider whether it is the right time and the right place for locating the type of land-use/activity being proposed. The need and desirability of a proposed development is, therefore, associated with the wise use of land, and should be able to respond to questions such as, but not limited to, what the most sustainable use of the land may be.

This Chapter provides an overview of the need and desirability, and perceived benefits of the project specifically.

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

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

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

6.2. Need and Desirability from an Energy Perspective

Electricity is essential for most human activities and for South Africa's social and economic development. The development of large-scale electricity generation projects contributes towards security of supply and assists in minimising the costs of energy. In order for the benefits associated with electricity to be realised, it needs to be readily available, easily accessible, and affordable. It should also be generated in a sustainable manner, while minimising adverse social and environmental impacts. In addition to energy provision, large-scale electricity generation projects, such as wind farms, have the ability to contribute positively to the creation of skilled, unskilled, and semi-skilled employment opportunities and mitigate climate change.

An increased supply of electricity within or to an area is also considered beneficial from a development perspective as the availability of electricity and other services can act as a pull factor attracting new development and industry.

6.3. Need and Desirability from an International Perspective

The need and desirability of Merino 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 a 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 global socio-economic challenges such as poverty, hunger, health, education, climate change, gender equality, water, sanitation, energy, urbanisation, environment, and social justice. The SDGs consist of 17 global goals set by the United Nations. The 17 SDGs are characterised by 169 targets, and 304 indicators.

Goal 7 of the SDGs 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 infrastructure and clean energy technology.	7.A.1	Mobilised amount of United States dollars per year starting in 2020 accountable towards the $100 billion commitment.
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 Merino Wind Farm would contribute positively towards Goal 7 (and specifically 7.2.1) of the SDGs through the following means:

» By generating up to 140MW (contracted capacity) of affordable and clean energy. Wind power technology is one of the cleanest electricity generation technologies, as it 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 for the development of the Merino 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 Merino 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.

6.4. Need and Desirability from a National Perspective

Following the energy crisis in 2008, South African Government started to introduce renewable energy developments on a large scale and further enhanced the promotion of energy efficiency in all sectors to meet the demand of energy while reducing CO_2 emissions and creating jobs13. As a consequence, significant investment in renewable energy and energy efficient technologies is required. Increasing the diversity of South Africa's electricity mix is important, not only for enhancing the crucially important security of supply of the country, but also to support job creation and mitigate climate change.

The National Development Plan (NDP) envisages that, by 2030, South Africa will have an energy sector that provides reliable and efficient energy service at competitive rates; that is socially equitable through expanded access to energy at affordable tariffs; and that is environmentally sustainable through reduced emissions and pollution. Historically, coal has provided the primary fuel resource for baseload electricity generation in South Africa. Consequently, Eskom, who is the main electricity generating company in the country, generates approximately 85% of the country's electricity from coal resources (Stats SA, 2016), resulting in a large carbon footprint. Taking into consideration the need to ensure adequate supply of electricity and meet international obligations in terms of addressing climate change, Government has identified the need to diversify the energy mix within the country.

South Africa needs to build about 40 000MW of new generation capacity to meet demand requirements. According to the NDP, 17 800MW should be provided by renewable energy projects. To achieve this, the government plans to install 8 400 MW of wind energy, 8 400MW of solar photovoltaic energy, and 1 000 MW of concentrated solar power by 2030.

The Merino Wind Farm is proposed in specific response to a National Government initiative, the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) or a similar 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 Merino Wind from a national perspective can largely be linked 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 plans have been developed by National Government to consider South Africa's current energy production, 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 energy plans 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.

[13] https://energypedia.info/wiki/South_Africa_Energy_Situation

The IEP is intended to provide a roadmap of South Africa's future energy landscape and guide future energy infrastructure investments and policy development. The Plan considered the three pillars of sustainable development, and list the following as the eight key energy planning objectives:

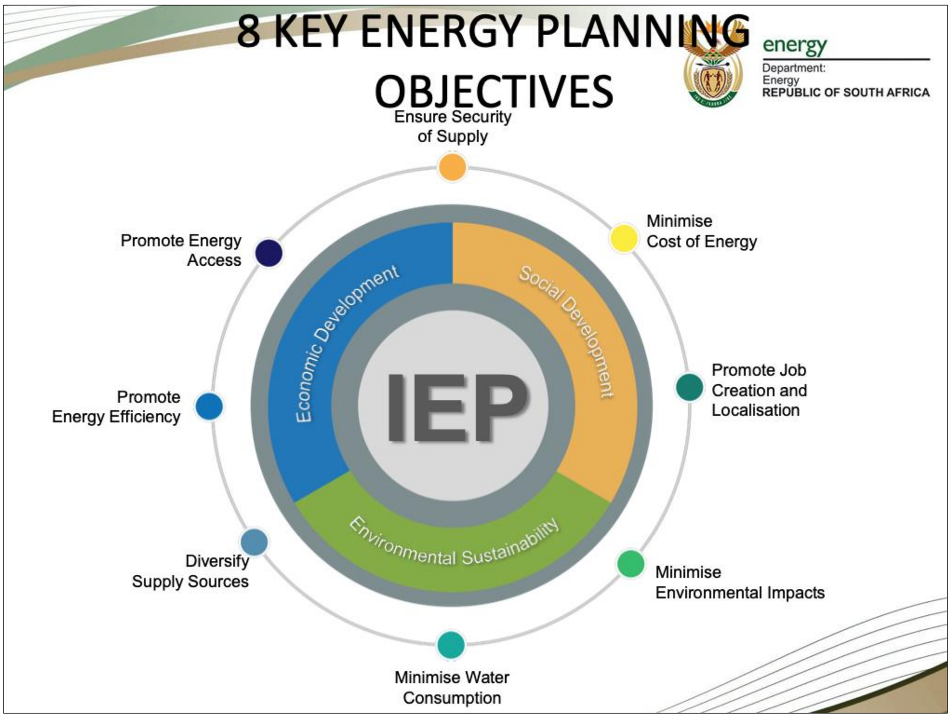


Figure 6.1: Eight key energy objectives as listed in the IEP, 2016 (extract from DOE presentation, December 2016)

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 (gazetted in 2019) is a subset of the IEP and constitutes South Africa's current gazetted energy plan. The purpose of the plan is to ensure sustainable electricity development which takes into consideration technical, economic, and social constraints, and identifies investments in the electricity sector which are required to meet the country's forecasted electricity demands at minimum costs. This plan provides for the development of 17 743MW of capacity from large scale wind energy facilities by 2030, with an annual contribution of 1600MW from 2022.

Provision has been made for new additional capacities in the IRP 2019 (refer to **Table 6.1**).

Table 6.1: Overview of the total installed capacity expected by 2030

IPP Procurement Programme	Technology	MW	Total
Renewables	Wind	17 742MW	31 320MW
	Solar CSP	600MW	
	Solar Photovoltaic	8 288MW	
	Hydro	4 600MW	

IPP Procurement Programme	Technology	MW	Total
Coal	Coal	33 364MW	33 364MW
Nuclear	Nuclear	1 860MW	1 860MW
Gas & Diesel	Gas & Diesel	3 000MW	3 000MW
Other (Distributed Generation, CoGen, Biomass, Landfill)	Other (Distributed Generation, CoGen, Biomass, Landfill)	4 000MW	4 000MW

Renewable resources are valuable in contributing towards electricity generation and diversifying South Africa's electricity mix, while contributing towards South Africa's response to Climate Change. A number of IPP Procurement Programmes have been initiated to secure electricity generated from a range of resources from the private sector (i.e., from Independent Power Producers, or 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 DMRE and a Power Purchase Agreement (PPA) with Eskom as the buyer.

Between 2011 and 2021, the South African Government, through its IRP 2010 - 2020, have successfully launched and completed five bidding windows under the REIPPPP[14] (refer to Table **Figure 6.2**[15]).

REIPPPP Bid Windows	1	2	3	3.5	4	4 (additional)	4.5 (expedited)	5	[...13] (up to 2030)	Total
Bid Date	04-Nov-11	05-Mar-12	19-Aug-13	03-Mar-14	17-Aug-14	17-Aug-14	11-Nov-15	16-Aug-21	TBD	-
Pref. Bidders ("PB") announced	07-Dec-11	21-May-12	31-Dec-13	14-Dec-14	16-Apr-15	07-Jun-15		TBD	TBD	-
Financial Close ("FC") - from	19-Jun-12	13-Dec-12	30-Jul-14	01-May-21	30-Apr-18	30-Apr-18		TBD	TBD	-
Years betwen PB annoucement & FC	0.54	0.57	0.58	6.39	3.05	2.90		TBD	TBD	-
Projects Bid	53	79	93	3	74	-		102	TBD	**404.0**
Projects awarded	28	19	17	2	13	13	CANCELLED	TBD	TBD	**92.0**
Capacity offered (MW)	3,625	1,275	1,473	300	1,105	1,170		2,600	[29,000*]	**11,548.0**
Capacity awarded (MW)	1,426	1,040	1,457	200	1,121	1,084		TBD	TBD	**6,327.9**
Total investment ($bn)	6.2	4.2	4.5	1.8	2.0	1.9		TBD	TBD	**20.5**
Avg. Real IRR (ZAR)	17.0%	15.5%	11.0%	13.75%	9.5%	9.5%		[3%-7%*]	TBD	-

*Estimation; TBD – To be Determined

Source: Finergreen

Figure 6.2: Overview of bid windows 1 to 5

Figure 6.2 shows that between 2011 and 2015 (excluding bid window 5), 302 bids were submitted, with around 30% (92) of the projects receiving approval. From those 92 projects, close to 70% (4.41GW) are already in operation, with wind and solar PV projects compromising most of the projects awarded (roughly 86%). In addition, of the 11.5GW of total capacity offered, 6.3GW (roughly 71%) was allocated, with wind and solar PV projects comprising the majority of projects.

Preferred bidders identified under any IPP Procurement Programme, including the REIPPPP, 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, IPP Procurement Programmes also contribute positively towards socio-economic development of a region, over and above job creation.

[14]https://www.pv-magazine.com/2021/09/30/reippp-one-of-the-worlds-best-renewable-energy-tenders-but-theres-room-for-improvement/

[15] At the time of publication of this data, Bid Window 5 had been launched, but not completed. 2 583 MW of renewable energy capacity was awarded to IPPs in the REIPPPP bid window 5 in October 2021.

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

In addition to the policy considerations detailed above, Government has prioritised post COVID-19 turnaround plans in terms of renewable energies within the Just Energy Transition (JET), coupled with key development objectives of the various spheres of government. These policies share the same ideals, such as:

» The utilisation, application and investment in renewable energy resources in South Africa is considered to be an essential means of reducing the carbon footprint of the country,
» Diversifying the national economy,
» Reducing poverty, and
» Providing critical additional energy to that of Eskom.

Government has compiled an Economic Reconstruction and Recovery Plan which was presented to Parliament in October 2020. According to this plan, the economic survey will rely on a massive investment in infrastructure, including energy, telecommunications, ports and rail. The core elements of the Economic Reconstruction and Recovery Plan are as follows:

1. Priority interventions for economic recovery: the plan sets out eight priority interventions that will ignite South Africa's recovery and reconstruction effort. These are the flagship initiatives that all of society will rally around to build a new economy (**Figure 6.3**).
2. Enabling conditions for growth: these are growth-enhancing reforms and other preconditions for an inclusive, competitive and growing economy.
3. Macroeconomic framework: economic reconstruction and recovery requires careful mobilisation of resources to ensure fiscal sustainability.
4. Institutional arrangements: the plan focuses on execution and is supported by enhanced institutional arrangements to ensure implementation and accountability.

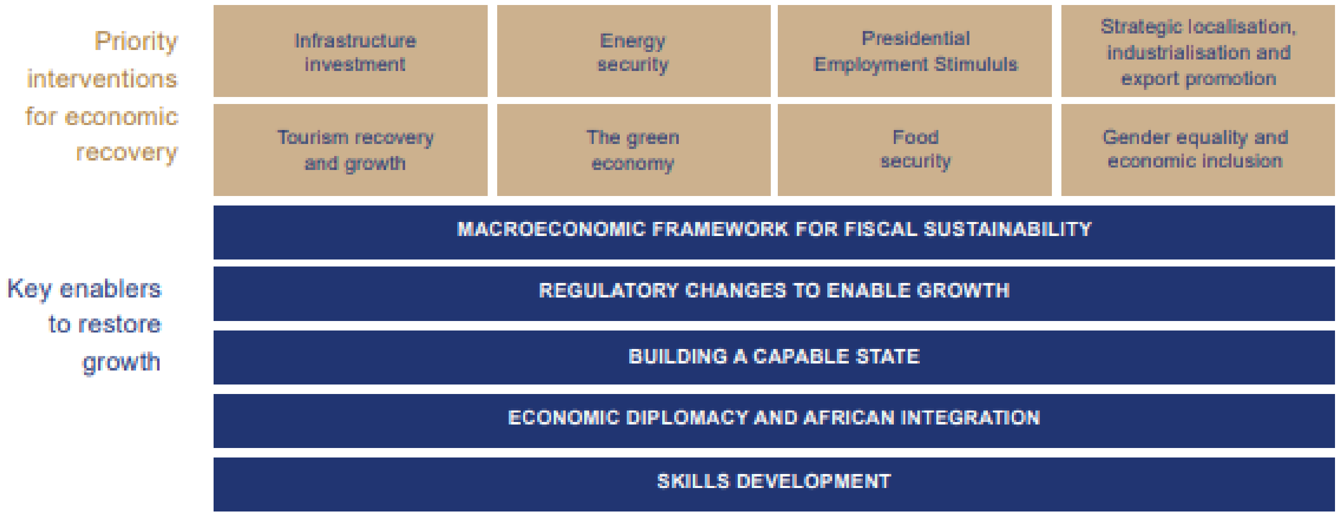


Figure 6.3: Core elements of the Economic Reconstruction and Recovery Plan (source: Building a new economy - Highlights of the Reconstruction and Recovery Plan, Presidency of the Republic of South Africa)

The plan recognises energy security as the most important prerequisite for the recovery agenda and states that renewed investment in a diversified energy mix can be achieved within a short time horizon, while alleviating a crippling energy crisis and facilitating a necessary transition to a less carbon-intensive economy. One of the key commitments of the plan is therefore to implement the IRP 2019 without delay to provide a substantial increase in the contribution of renewable energy sources by 2030, alongside other sources including battery storage, gas and clean coal. The transition to green energy is recognised as contributing towards the realisation of the low-carbon, climate-resilient and inclusive economy envisaged by the National Development Plan.

The South African government has identified the green economy as one of 12 job drivers that could help contribute to creating 5 million additional jobs by 2020. The New Growth Path, in which the sectoral jobs targets are disaggregated, envisages that as many as 300 000 new direct jobs could be created in the areas of natural resource management and renewable energy construction (Department of Energy, 2019). Even though the project will not form part of the REIPPP programme, the Applicant will implement similar social and economic development strategies, including amongst others, job creation, local content, skills development, enterprise and supplier development, and socio-economic development. In addition to electricity generation and supply the project will therefore also contribute positively towards socio-economic development of a region, over and above job creation.

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 reaffirmed at COP26, and provision has been made for the inclusion of new wind power generation capacity in South Africa's energy mix. The implementation of the Merino Farm, therefore, has the potential to contribute positively towards the identified national 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 the Just Energy Transition of the country. In addition, by making use of wind power technology, the project would have reduced water requirements, when compared with some other generation technologies such as coal and gas, 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).

6.5. Need and Desirability of the project from a Regional Perspective

South Africa's electricity generation mix has historically been dominated by coal. However, up to 2030, a new capacity demand will be driven by the decommissioning of existing coal-fired power stations. A further 24 100MW (**Figure 6.4**) of coal power is expected to be decommissioned in the period 2030 to 2050. Therefore, additional capacity will be required from renewable energy sources, particularly wind with 14 400MW being allocated for the period up to 2030.

	Coal	Cost (Decommissioning)	Nuclear	Hydro	Storage	PV	Wind	CSP	GAS/ Diesel	Other (Distributed Generation, Cogeri, Biomass, Landfill
Current	31715		1860	2100	2912	1474	1980	300	3830	499
2019	2155	-2372	-	-	-	-	244	300	-	Allocation to the intent of the short term capacity and energy gap
2020	1433	-557	-	-	-	114	300	-	-	
2021	1433	-1403	-	-	-	300	818	-	-	
2022	755	-344	-	-	513	400 1000	1600	-	-	
2023	750	-555	-	-	-	1000	1600	-	-	500
2024	1 000	-	1660	-	-	-	1600	-	1000	500
2025	7 000	-	-	-	-	1000	1600	-	-	500
2026	-	-1734	-	-	-	-	1600	-	-	500
2027	750	-547	-	-	-	-	1600	-	2000	500
2028	-	-475	-	-	-	1000	1600	-	-	500
2029	-	-1654	-	-	1575	1000	1600	-	-	500
2030	-	-1656	-	1500	-	1000	1600	-	-	500
Total Installed Capacity by 2030 (MW)	33164		1660	4600	5000	8288	17742	600	6380	-
% Total Installed Capacity (% of MW)	43		2.36	5.84	6.35	10.52	22.53	0.76	8.1	-
% Annual Energy Contribution (% of MWh)	58.3		4.5	0.3	1.2	6.3	17.8	0.6	1.3	-

Figure 6.4: A snapshot of the Energy Mix as per the IRP 2019

Although the majority of South Africa's electricity generation infrastructure (coal-fired power stations) is currently located within Mpumalanga due to the location of coal resources within this province, the Northern Cape Province has been identified as an area where electricity generation from wind energy facilities is highly feasible and a viable option. The location of the study area and project site within the Northern Cape is therefore considered to support the Province/Region's generation targets.

The overarching objective for the Merino Wind Farm 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. From a regional site selection perspective, this region is considered to be preferred for wind energy development by virtue of its abundant wind resource. The wind speed for the area derived from the Wind Atlas for South Africa (WASA) High Resolution Wind Resource Map is within the range of 6.5m.s^{-1} to 8m.s^{-1}, which is considered favourable for the development of a wind farm (refer to **Figure 6.5**).

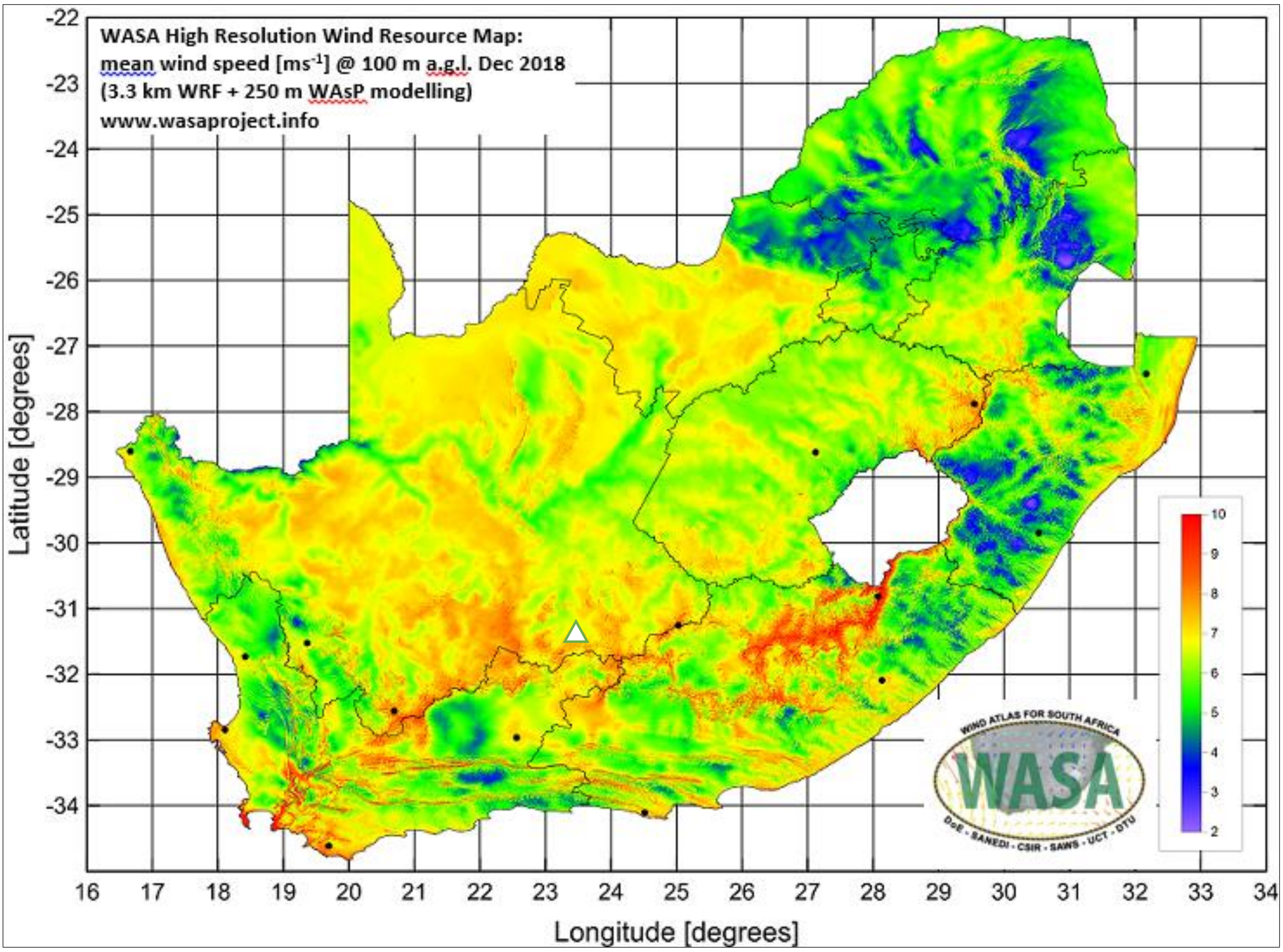


Figure 6.5: Wind resource map for South Africa, with the position of Merino Wind Farm shown by the white triangle (Source: wasaproject.info)

The Northern Cape Provincial Spatial Development Framework 2021 states that the overarching goal for the province is to enable sustainable development, and that the province considers social and economic development as imperative in order to address the most significant challenge facing the Norther Cape, which is poverty. The Provincial Spatial Development Framework identified key sectoral strategies and plans which are considered to be the key components of the Provincial Spatial Development Framework. Sectoral Strategy 19 refers to a provincial renewable energy strategy. Within the PSDF, a policy has been included which states that renewable energy sources (including the utilisation of solar energy) are to comprise 25% of the province's energy generation capacity by 2020.

The development of the Merino Wind Farm would contribute positively towards increased electricity provision in the Northern Cape Province, which could be used in the development of socio-economic infrastructure within the province, as well as to increase employment opportunities. The development of the wind farm also supports the overall energy objective of the province to have 25% of its electricity from renewable energy sources.

The Northern Cape Provincial Growth and Development Strategy identifies poverty reduction as the most significant challenge facing the government and its partners. All other societal challenges that the province faces emanate predominantly from the effects of poverty. The development of the Merino Wind Farm has the potential to create employment opportunities, promote skills development, create opportunities to promote private sector investment and the development of SMMEs in the Northern Cape Province.

According to the Pixley Ka Seme District Municipality Integrated Development Plan (2019 – 2020), the vision of the District Municipality is "Developed and Sustainable District for Future Generations". The Strategic Objectives to address the vision that are relevant to the project include the promotion of economic growth in the district and enhancement of service delivery. The development of the Merino Wind Farm will promote economic development in the Pixley Ka Seme municipal area, thereby assisting in addressing some the challenges faced by the district municipality as detailed in the IDP.

The Ubuntu Local Municipality IDP (2019 – 2020) identified unemployment and poverty, shortage of critical skills, access to basic services such as water, sanitation, electricity and housing, as well as improved access to services in education, health and social services as some of the challenges facing the area in terms of economic development and growth. These issues can be addressed by supplier and enterprise development and enterprise development spend linked to the Merino Wind Farm.

6.6. Benefits of Renewable Energy and the Need and Desirability 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:

***Socio-economic upliftment of local communities*:** The Merino Wind Farm has the potential to create much needed employment for unskilled locals during the construction phase. Training opportunities will also be afforded to qualified local people who can be upskilled to undertake certain roles during the construction and operation phases. Some of the challenges facing the Local and District municipalities, as detailed in the IDPs include high rates of unemployment, high levels of poverty, and low levels of development despite the strategic local in terms of the national transport corridors. The Local and District municipalities are therefore in need of economic development, sustainable employment opportunities and growth in personal income levels.

Since inception of the REIPPPP in 2011, approximately 59 071 job years for South African citizens to date have been created.

Merino Wind Farm has the potential to make a positive contribution towards the identified community needs. In terms of the economic development requirements of the REIPPPP, the project will commit benefits to the local community in the form of job creation, localisation, and community ownership. In accordance with the DMRE's bidding requirements of the REIPPPP, a percentage of the revenue generated per annum during operation will be made available to local communities through a social beneficiation scheme. Therefore, the potential for creation of employment and business opportunities, and the opportunity for skills development for local communities is significant. Secondary social benefits can be expected in terms of additional spend in nearby towns due to the increased demand for goods and services. These socio-economic benefits would include an increase in the standard of living for local residents within the area as well as overall financial and economic upliftment.

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. According to CSIR's power sector statistics (2021), South Africa experienced loadshedding for 650 hours in the first half of 2021 (15% of the time) wherein 963GWh of estimated energy was shed (mostly stage 2 load shedding). This is 76% of the total loadshedding experienced during 2020[16]. It is important to note that although extensive load shedding continued during the first half of 2021, record relative variable renewable energy contributions were recorded.

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, while compared to the continual purchase of fuel for conventional power stations.

According to the IPP Procurement Programme overview report dated 31 March 2021, water savings of 71.7 million kilolitres has been realised by the programme from inception to the date of this publication, of which 4.2 million kilolitres is in the 2021 reporting quarter included in this report.

Exploitation of significant renewable energy resource: At present, valuable renewable resources, including biomass by-products, solar irradiation 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.

According to the IPP Procurement Programme overview report, as of 31 March 2021, the REIPPPP had made the following significant impacts in terms of energy supply:

» 6 422MW of electricity had been procured from 112 Renewable Energy Independent Power Producers (IPPs) in seven bid rounds[17].
» 5 078 MW of electricity generation capacity from 79 IPP projects has been connected to the national grid.
» 59 761GWh of energy has been generated by renewable energy sources procured under the REIPPPP since the first project became operational in November 2013. Renewable energy IPPs have proved to be very reliable. Of the 79 projects that have started operations, 67 projects have been operational for longer than a year. The electrical energy generated over the past 12-month period for the 67 projects is 11 679GWh, which is 94% of their annual energy contribution projections of 12 481GWh over a 12-month delivery period. Twenty-six (26) of the 67 projects (39%) have individually exceeded their projections.

In August 2021, Bid Window 5, which had aimed to sign up 2 600MW of power, including 1 600MW of wind and 1 000MW of solar was open. It attracted 102 bids, offering capacity of 9 644MW. 25 Preferred Bidders were selected to provide a total of 2 583MW from wind and solar developments.

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.

[16] https://www.csir.co.za/csir-releases-power-sector-statistics-first-half-2021

[17] Bid windows1, 2 ,3 ,3.5 ,4 and small BW1(1S2) and small BW2(2S2). 2 583 MW of renewable energy capacity was awarded to IPPs in the REIPPPP bid window 5 in October 2021.

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.

The following has been achieved by the IPP programme (March 2021) in terms of investment and economics:

» Investment (equity and debt) to the value of R209.7 billion was attracted in seven bid rounds.
» Socio-economic development contributions of R1.5 billion to date, of which R103.5 million was spent in this 2021 reporting quarter.
» Enterprise development contributions of R463.5 million to date, of which R34.8 million was spent in this 2021 reporting quarter.

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 irradiation or wind for power generation is a non-consumptive use of a natural resource which produces zero emissions during its operation.

The overview of the Independent Power Producers Procurement Report (March 2021) indicates that a carbon emission reduction of 60.7 Mton CO_2 has been realised by the IPP programme from inception to date, of which 3.6 Mton is in the 2021 reporting quarter.

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 GHG emissions. According to the Climate Transparency Report (2020), total GHG emissions in South Africa (excluding land use) have increased by 41% since 1990, but emissions in recent years have been almost constant, owing largely to low economic growth and a sharp rise in electricity prices. South Africa is ranked 12th worldwide in terms of per capita carbon dioxide emissions as of 2021[18]. Since its inception, the REIPPPP has achieved carbon emission reductions[19] of 60.7 Mton of CO_2. The development of Merino Wind Farm, and the associated electricity generated as a result of the facility, will result in considerable savings on tons of CO_2 emissions.

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 350 temporary employment opportunities and the operation phase will create 20 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 and climate friendly development.

[18] https://www.polity.org.za/article/south-africa-the-12th-biggest-source-of-greenhouse-gases-yes-but-thats-not-the-only-measure-that-matters-2021-04-19

[19] Carbon emission reduction is calculated based on a displacement of power, from largely coal-based to more environmentally friendly electrical energy generation, using a gross Eskom equivalent emissions factor of 1.015 tons CO_2/MWh.

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 which have potential for further renewable energy projects.

Protecting the natural foundations of life for future generations: Actions to reduce our disproportionate carbon footprint can play an important part in ensuring our 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.

6.7. Receptiveness of and desirability of the project site to develop the Merino Wind Farm

The placement of a wind farm is strongly dependent on several factors including climatic conditions (wind speed), topography, the location of the site, availability of grid connection, the extent of the site and the need and desirability for the project. From a local level perspective, the project site and development area have specifically been identified by the proponent as being highly desirable from a technical perspective for the development of a wind farm due to the following site characteristics:

» **Wind resource**: The economic viability of a Wind Energy Facility is directly dependent on the wind speed. The wind speed for the area derived from the Wind Atlas for South Africa (WASA) High Resolution Wind Resource Map is within the range of $6.5m.s^{-1}$ to $8m.s^{-1}$, which is considered favourable for the development of a wind farm.

» **Land Availability**: Availability of relatively level land of sufficient extent can be a restraining factor to wind farm development. The project site is ~29 909ha in extent, which is sufficient to the development of a wind farm with a contracted capacity of up to 140MW, while allowing for the avoidance of environmental sensitivities. A development area of ~6 463ha has been identified within the project site within which the wind farm will be sited. A development footprint of ~2 800ha within the development area for the placement of infrastructure has been defined considering environmental constraints and sensitivities identified during the development area through the Scoping Evaluation. The extent of land available for the construction and operation of Merino Wind Farm and the opportunity provided for the avoidance of environmental sensitivities contributes to the need and desirability of the development in the proposed location.

» **Land Use**: The current land use of the development area is an important consideration in site selection in terms of limiting disruption to existing land use practices. The project site is currently used for agricultural purposes, specifically livestock farming, which is generally preferred for developments of this nature as the livestock farming can continue on the project site in tandem with the operation of the wind farm. Other land uses present within the vicinity of the development area include power line servitudes and the future development of other renewable energy facilities which have received EAs from the DFFE. The proposed development is compatible with the surrounding land uses and does not present a conflicting land use.

» **Topographical Considerations**: Sites that facilitate easy construction conditions, (i.e., relatively flat topography, lack of major rock outcrops, limited watercourse crossings, etc.) are favoured by developers during the site selection process. As a result, the development area for the Merino Wind Farm consists of a largely flat to undulating landscape interspersed with area of high elevation in the form if localised hills, koppies, ridges and/or mountains. These characteristics are preferred for the construction and operation of a wind energy facility such as the Merino Wind Farm.

» **Access to Road Infrastructure and Site access**: **Site access**: Access to the project site is ample with the presence of existing roads mainly consisting of national and regional roads. The project site is bisected by the N1 national road, which provides access to the project site and development area. The R398 is located to the north-east of the project site and the R63 is located to the south-west of the project site. The gravel main access road which also bisects the project site provides direct access to the project site and the development area and will therefore be utilised for accessing the project site and development area (refer to **Figure 6.6**). As material and components would need to be transported to the development area during the construction phase, accessibility to the project site is a key factor in determining the viability of the Merino Wind Farm, particularly taking transportation costs (direct and indirect) into consideration and the impact of this on the project economics and the ability to submit a competitive bid under the DMRE's REIPPP Programme or a similar programme.

Figure 6.6: Location of the development area (outline in red) in relation to the gravel main access road located to the north-east of the project site, which provides direct access to the project site and development area and the N1 national road. This infrastructure will primarily be used to gain access to the development area.

» **Grid access:** A key factor in the sitting of any generation project is a viable grid connection. The anticipated grid connection solution (subject to a separate environmental assessment and authorisation process) is a 132kV central collector substation and a 132kV power line to enable connection to the Existing Gamma Substation.

» **Landowner Support:** The selection of a site where the landowner is supportive of the development of renewable energy is essential for ensuring the success of the project. The four landowners affected by the proposed Merino Wind Farm do not view the development as a conflict with their current land use practices. The support from the landowners for the development to be undertaken on the affected properties has been solidified by the provision of consent for the project to proceed on the property through the signing of consent forms.

» **Proximity *to Towns with a Need for Socio-Economic Upliftment:*** The official unemployment rate in the Ubuntu Local municipality in 2011 was 18.1%, while 44.2% were employed, and 33.2% were regarded as not economically active. The figures for Ward 3 (i.e., the affected ward) in 2011 were 6.8% unemployed, 62.5% employed and 28.4% not economically active. With the development of the Merino Wind Farm, 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.

Taking into consideration the wind resource, grid access, land availability, landowner support, access to road infrastructure, the current land use of the project site and development area, the development of the Merino Wind Farm is considered to be desirable and will ultimately contribute to, and further develop the successful power generation activities already being undertaken within the Northern Cape.

CHAPTER 7: APPROACH TO UNDERTAKING THE EIA PROCESS

In terms of the EIA Regulations of December 2014 (as amended) published in terms of the NEMA (Act No. 107 of 1998) as amended, the construction and operation of Merino Wind Farm is a listed activity requiring Environmental Authorisation (EA). The application for EA is required to be supported by an Environmental Impact Assessment (EIA) process based on the contracted capacity of the facility being 140MW and Activity 1 of Listing Notice 2 (GNR 325) being triggered.

An EIA process refers to the process undertaken in accordance with the requirements of the 2014 EIA Regulations (GNR 326), as amended, which involves the identification and assessment of direct, indirect, and cumulative environmental impacts associated with a proposed project or activity. The EIA process comprises two main phases: i.e., **Scoping** and **EIA Phase**, and is illustrated in **Figure 7.1**. Public participation forms an important component of the process and is undertaken throughout both phases.

Figure 7.1: The Phases of an Environmental Impact Assessment (EIA) Process

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

This chapter includes the following information required in terms of Appendix 3: Content of Environmental Impact Assessment 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 and (ii) a description of the activities to be undertaken, including associated structures and infrastructure.	All listed activities triggered and applied for are included in s**ection 7.2**.
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 public participation process followed throughout the EIA process for the Merino Wind Farm is included in s**ection 7.5.2** and copies of the supporting documents and inputs are included in **Appendix C**.

Requirement	Relevant Section
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 received from the commencement of the EIA Process, are included in the Comments and Responses Report in **Appendix C9**. Notes of meetings held are included in **Appendix C8**. All comments raised during the 30-day review and comment period of the EIA Report and through on-going consultation with I&APs will be included and responded to as part of the C&RR (**Appendix C9**) to be submitted as part of the final EIA Report to the DFFE 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 in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks is included in **section 7.5.3**.
3(p) a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed.	The assumptions and limitations of the EIA process being undertaken for the Merino Wind Farm are included in s**ection 7.6**.

7.2. Relevant legislative permitting requirements

The legislative permitting requirements applicable to Merino Wind Farm, as identified at this stage in the process and considered within this EIA process, are described in more detail under the respective sub-headings.

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

The NEMA is South Africa's key piece of national environmental legislation that provides for the authorisation of certain controlled activities known as "listed activities". In terms of Section 24(1) of the NEMA, the potential impact on the environment associated with listed activities must be considered, investigated, assessed, and reported on to the Competent Authority (the decision-maker) charged by NEMA with granting of the relevant Environmental Authorisation (EA). Since the A Merino Wind Farm is a power generation project and therefore relates to the IRP for Electricity 2010 – 2030, the National Department of Forestry, Fisheries, and the Environment (DFFE) has been determined as the Competent Authority (CA) in terms of GNR 779 of 01 July 2016. The Provincial Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform (DAEARD & LR) is the Commenting Authority on the project.

The need to comply with the requirements of the EIA Regulations published under NEMA ensures that developers are provided the opportunity to consider the potential environmental impacts of their activities early in the project development process, and also allows for an assessment to be made as to whether environmental impacts can be avoided, minimised or mitigated to acceptable levels. Comprehensive, independent environmental studies are required to be undertaken in accordance with the EIA Regulations to provide the Competent Authority with sufficient information in order for an informed decision to be taken regarding the Application for EA.

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

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

Table 7.1: Listed activities as per the EIA Regulations that are triggered by the Merino Wind Farm

Notice Number	Activity Number	Description of listed activity
Listing Notice 1 (GNR 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 275kV. ***Internal electrical infrastructure required to connect the Merino Wind Farm to the grid connection infrastructure will consist of a 132kV onsite substation and 132kV cabling (buried or overhead) and will collectively exceed 2km outside an urban area.***
Listing Notice 1 (GNR 327) 08 December 2014 (as amended on 07 April 2017)	12(ii)(a)(c)	The development of – (ii) Infrastructure or structures with a physical footprint of 100 square metres or more Where such development occurs- (a) within a watercourse; or (c) within 32 metres of a watercourse. ***The construction and operation of the Merino Wind Farm and associated infrastructure will include the development of some infrastructure within seepage wetlands, rivers, and floodplains, as well as within 32m of these watercourses. The infrastructure will have a physical footprint of more than 100 square metres.***
Listing Notice 1 (GNR 327) 08 December 2014 (as amended on 07 April 2017)	14	The development and related operation of facilities and infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres. ***The development of the Merino Wind Farm will require the construction and operation of facilities and infrastructure for the storage and handling of dangerous goods (combustible and flammable liquids, such as oils, lubricants, solvents)***

Notice Number	Activity Number	Description of listed activity
		associated with the on-site substations, where such storage will occur inside containers with a combined capacity exceeding 80 cubic meters but not exceeding 500 cubic meters.
Listing Notice 1 (GNR 327) 08 December 2014 (as amended on 07 April 2017)	19(i)	The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a (i) Watercourse. ***Parts of the development area for the Merino Wind Farm are located within watercourses. Therefore, during the construction phase, 10 cubic metres or more of rock will be removed from the watercourses.***
Listing Notice 1 (GNR 327) 08 December 2014 (as amended on 07 April 2017)	24(ii)	The development of a road – (ii) with a reserve wider than 13.5m, or where no reserve exists where the road is wider than 8m. ***The construction of the Merino Wind Farm will require the construction of new access roads in areas where no road reserve exists to provide access to the facility. These will exceed 8m in width.***
Listing Notice 1 (GNR 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 1ha. ***The total area to be development (i.e., the development footprint) for the Merino Wind Farm is greater than 1ha and occurs outside an urban area in an area currently zoned for agriculture.***
Listing Notice 1 (GNR 327) 08 December 2014 (as amended on 07 April 2017)	56(ii)	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre (ii) where no reserve exists, where the existing road is wider than 8 metres. ***Existing farm roads within the project site may require widening, and access roads will be widened by more than 6 metres.***
Listing Notice 2 (GNR 325)	1	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20MW or more.

Notice Number	Activity Number	Description of listed activity
08 December 2014 (as amended on 07 April 2017)		***The project comprises a renewable energy generation facility, which will utilise wind power technology and will have a generation capacity of up to 140MW.***
Listing Notice 2 (GNR 325) 08 December 2014 (as amended on 07 April 2017)	15	The clearance of an area of 20ha or more of indigenous vegetation[20]. ***The facility is located on agricultural land where the predominant land use is livestock grazing and is therefore likely to comprise indigenous vegetation. The project would therefore result in the clearance of indigenous vegetation within an area in excess of 20ha for the development of infrastructure.***
Listing Notice 3 (GNR 325) 08 December 2014 (as amended on 07 April 2017)	4(g)(ii)(ee)	The development of a road wider than 4 metres with a reserve less than 13,5 metres. g. Northern Cape ii. Outside urban areas: (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans. ***The development of the Merino Wind Farm and associated infrastructure will require the development of roads wider than 4m within a CBA, specifically CBA 1, outside urban areas within the Northern Cape Province.***
Listing Notice 3 (GNR 325) 08 December 2014 (as amended on 07 April 2017)	10(g)(ii)(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 metres g. Northern Cape ii. Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland. iii. Outside urban areas: (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.

[20] "Indigenous vegetation" as defined by the 2014 EIA Regulations (GNR 326) refers to vegetation consisting of indigenous plant species occurring naturally in an area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years.

Notice Number	Activity Number	Description of listed activity
		The development of the Merino Wind Farm will require the construction and operation of facilities for the storage and handling of a dangerous goods (combustible and flammable liquids, such as oils, lubricants, solvents) associated with the on-site substations, where such storage will include insider containers with a capacity of 80 cubic meters within CBA areas. There are watercourses located within parts of the development area for the Merino Wind Farm, namely seepage and channelled valley bottom wetlands and rivers. The development area also falls within a CBA1, outside an urban area and within the Northern Cape Province.
Listing Notice 3 (GNR 325) 08 December 2014 (as amended on 07 April 2017)	12(g)(ii)	The clearance of an area of 300 square metres or more of indigenous vegetation g. Northern cape ii. Within critical biodiversity areas identified in bioregional plans. ***The development of the Merino Wind Farm will require the clearance of more than 300 square meters of indigenous vegetation within a CBA1 in the Northern Cape Province.***
Listing Notice 3 (GNR 325) 08 December 2014 (as amended on 07 April 2017)	14(ii)(a)(c)(g)(ii)(ff)	The development of— (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (a) within a watercourse; or (c) within 32 metres of a watercourse, measured from the edge of a watercourse. g. Northern Cape ii. Outside urban areas: (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans. ***The development of the Merino Wind Farm will require the establishment of infrastructure with a physical footprint exceeding 10m² within seepage wetlands, rivers, and floodplains, as well as within 32m of these watercourses. The project site comprises areas classified as CBA1 and Ecological Support Areas and falls outside of an urban area.***
Listing Notice 3 (GNR 325)	18(g)(ii)(ee)(ii)	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.

Notice Number	Activity Number	Description of listed activity
08 December 2014 (as amended on 07 April 2017)		g. Northern Cape ii. Outside urban areas: (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans. (ii) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland. ***The development of the Merino Wind Farm will require the widening of roads by more than 4m, outside urban areas, within areas classified as CBA1, and within a watercourse or wetland and within 100m from the edge of a watercourse or wetland (i.e., seepage and channelled valley bottom wetlands and rivers) in the Northern Cape Province.***

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

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

Table 7.2 lists the possible Water Uses associated with the proposed project and identified in terms of the NWA which require licensing either in the form of a General Authorisation (GA), or in the form of a Water Use License (WUL). The table also includes a description of those project activities which relate to the applicable Water Uses.

Table 7.2: List of Water Uses published under Section 21 of NWA, as amended.

Notice No.	Activity No.	Description of Water Use
NWA (No. 36 of 1998)	Section 21 (c)	Impeding or diverting the flow of water in a watercourse ***The development area considered for the establishment of the Merino Wind Farm is associated with the presence of watercourses. Activities pertaining to the establishment of the wind farm might encroach on watercourses which may lead to an impediment and diversion of the flow in the watercourses.***
NWA (No. 36 of 1998)	Section 21 (i)	Altering the bed, banks, course or characteristics of a watercourse. ***The development area considered for the establishment of the Merino Wind Farm is associated with the presence of watercourses. Activities pertaining to the establishment of the***

Notice No.	Activity No.	Description of Water Use
		wind farm might encroach on watercourses which may lead to the altering of the characteristics of the watercourses.

In the event that the flow of water in the watercourses is affected and the bed, banks or course characteristics are altered then a water use authorisation would be required. This will need to be in accordance with the requirements of the Regulations Regarding the Procedural Requirements for Water Use License Applications and Appeals (GN R267), or a GA registered in accordance with the requirements of Revision of General Authorisation. The process of applying for a WUL or GA registration will only be completed once a positive EA has been received and the project selected as Preferred Bidder under the REIPPPP or similar programme. Should the developer choose the option This is in line with the requirements of the Department of Water and Sanitation (DWS).

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

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

Section 38: Heritage Resources Management

1). *Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as –*
   - a. *the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;*
   - b. *the construction of a bridge or similar structure exceeding 50m in length;*
   - c. *any development or other activity which will change the character of a site –*
     - i). *exceeding 5 000m² in extent; or*
     - ii). *involving three or more existing erven or subdivisions thereof; or*
     - iii). *involving three or more erven or divisions thereof which have been consolidated within the past five years; or*
     - iv). *the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority.*

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

In terms of Section 38(8), approval from the heritage authority is not required if an evaluation of the impact of such development on heritage resources is required in terms of any other legislation (such as NEMA), provided that the consenting authority ensures that the evaluation of impacts fulfils the requirements of the relevant heritage resources authority in terms of Section 38(3) and any comments and recommendations of the relevant resources authority with regard to such development have been taken into account prior to the granting of the consent. However, should heritage resources of significance be affected by the proposed development, a permit is required to be obtained prior to disturbing or destroying such resources as per the requirements of Section 48 of the NHRA, and the South African Heritage Resources Agency (SAHRA) Permit Regulations (GNR 668).

7.3. Overview of the Scoping Phase

The final Scoping Report submitted to the DFFE on 13 January 2022 and subsequently accepted on 27 January 2022 documented the evaluation of potential environmental impacts of the Merino Wind Farm. The Scoping Phase was conducted in accordance with the requirements of the 2014 EIA Regulations (GNR 326), as amended, and therefore aimed to:

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

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

» Identify the policies and legislation relevant to the project.
» Motivate the need and desirability of the proposed project, including the need and desirability of the activity in the context of the preferred project location.
» Identify and confirm feasible alternatives for the project.
» Identify and described potential impacts associated with the undertaking of the identified activities and proposed technology.
» Identify areas of high sensitivity to be avoided by the development footprint within the development area.
» Identify preferred areas for the development in the form of a development footprint within areas associated with low to medium environmental sensitivity within the development area through a desktop level scoping process and on-going consultative process. The development footprint and proposed facility layout are assessed within this EIA Report.
» Identify and list key issues associated with the project to be addressed during the EIA Phase through further detailed study and ground-truthing.
» Agree on the level of assessment, including the methodology to be applied, the expertise required, and the extent of further consultation to be undertaken in the EIA Phase of the process, with the aim of determining the extent of impacts associated with the activities through the life cycle of the project (i.e., construction, operation, and decommissioning).
» Identify suitable measures to avoid, manage or mitigate identified impacts and to determine the extent of the residual risks that need to be managed and monitored.

Key tasks undertaken within the Scoping Phase included:

» Consultation with relevant decision-making and regulating authorities (at National, Provincial and Local levels).
» Submission of the completed Application for EA to the competent authority (i.e., the DFFE) in terms of Regulations 5 and 16 of the 2014 EIA Regulations (GNR 326), as amended.

» Undertaking a public participation process in accordance with Chapter 6 of GNR326, the approved public participation plan submitted to DEFF, and the Department of Environmental Affairs (2017) Public Participation guidelines in terms of NEMA EIA Regulations (hereinafter referred to as "the Guidelines") in order to obtain comments on and 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, and the requirements of the Specialist Protocols published in Regulation GNR 320, issued 20 March 2020 and GNR 1150 of 30 October 2020, where relevant, as well as other relevant guidelines.
» Preparation of a Scoping Report and Plan of Study for the EIA in accordance with the requirements of Appendix 2 of the 2014 EIA Regulations (GNR 326).
» Provision of a 30-day public and authority review period for the Scoping Report.
» Preparation of a Comments and Response (C&R) Report detailing all comments raised by I&APs and responses provided as part of the Scoping Phase.
» Submission of a Final Scoping Report, including a Plan of Study for the EIA, to the DFFE for review, acceptance on 13 January 2022.

Table 7.3 provides a summary of the public participation process undertaken during the Scoping Phase.

Table 7.2: Summary of the Public Participation Process (during the Scoping Phase)

Activity	**Date**
Announcement of the EIA process in one local newspaper: » De Aar Echo Newspaper (English advertisement)	23 September 2021
Distribution of the BID, process notification letters and stakeholder reply form announcing the EIA process and inviting I&APs to register on the project database. The BID and electronic reply form was also made available on the online stakeholder engagement platform.	21 October 2021
Placement of site notices at the project site, including placement of further notices in the town of Richmond.	28 – 30 September 2021
Announcement of the availability of the Scoping Report for a 30-day review and comment period, including details on how to access the Scoping Report via the online stakeholder engagement platform, in one local newspaper: » De Aar Echo Newspaper (English advertisement)	12 November 2021
Radio Live Read by RSG regarding the Scoping Report comment period, and the details on how to get involved and how contact with Savannah Environmental can be made. A further radio live read segment was also broadcasted on RSG as a reminder of the availability of the Scoping Report for review and comment.	13 November 2021 and 29 November 2021
Distribution of notification letters announcing the availability of the Scoping Report for a 30-day review and comment period. These letters were distributed to Organs of State, Government Departments, Ward Councillors, landowners within the surrounding area (including neighbouring landowners), registered I&APs and key stakeholder groups.	10 November 2021

Activity	Date
30-day review and comment period of the Scoping Report.	Friday, 12 November 2021 to Monday, 13 December 2021
Virtual meetings through the use of virtual platforms as determined through discussions with the relevant stakeholder group: » Landowners » Authorities and key stakeholders (including Organs of State, local municipality and official representatives of community-based organisations). » Where an I&AP does not have access to a computer and/or internet to participate in a virtual meeting telephonic discussions (including WhatsApp video call) will be set-up and minuted for inclusion. The preferred language of the I&AP has been considered when setting up these discussions. Direct in-person consultation will only take place in limited numbers and where sanitary conditions can be maintained at all times.	» Focus group meetings were held with key stakeholders on **Tuesday, 23 November 2021 at 11h00and 13h30 – 15h00** and on **Monday, 06 December 2020 at 14h00** via a virtual platform, where relevant. » An information session was held at the Richmond Show Grounds in the Northern Cape Province on **Thursday, 02 December 2021 from 14h00 – 17h00** (this took the format of a poster display). » A meeting was held with land occupiers at the Rondawel Guest Farm on **Thursday, 02 December 2021 at 18h00**.
On-going consultation (i.e., telephone liaison; e-mail communication) with all I&APs.	Throughout the EIA process

Acceptance of the Scoping Report and approval of the Plan of Study for the EIA Phase was received on 27 January 2022, marking the start of the EIA Phase (refer to **Appendix B**). Additional Information requested by the DFFE in the acceptance of the Scoping Report and the location of the requested information in this EIA Report is detailed in **Table 7.4**.

Table 7.4: DFFE requirements and response/ reference to section in the EIA Report

DFFE Requirement for EIA	Response/ Location in this EIA Report
(a) Listed Activities (i) Please ensure that all relevant listed activities are applied for, are specific and that it can be linked to the development activity or infrastructure as described in the project description.	All relevant activities applied for in the application for Environmental Authorisation (EA) and included in this EIA Report are relevant to the Merino Wind Farm and its associated infrastructure as described in the project description (refer to **Section 7.2.1, Table 7.1**).
(ii) Ensure that all relevant listed activities and sub-activities are correctly numbered as per the relevant listing notices.	All relevant listed activities and sub-activities are correctly numbered as per the relevant listing notices (refer to **Section 7.2.1, Table 7.1**).
(iii) If the activities applied for in the application form differ from those mentioned in the draft EIAr,, an amended application form must be submitted.	The listed activities applied for in the application form submitted on 12 November 2021 are the same as those included in this EIA Report. No amended application form is submitted with the EIA Report as no changes have been introduced to the application form since the version submitted to the DFFE on 12 November 2021 (refer to **Section 7.2.1, Table 7.1**).
(iv) Please note that the Department's application form template has been amended and can be downloaded from the following link https://www.environment.gov.za/documents/forms.	It can be confirmed that the latest version of the application form, dated April 2021, as available from the DFFE's website, has been used for this project
(v) The EIAr must provide an assessment of the impacts and mitigation measures for each of the listed activities applied for.	An assessment of impacts and recommended mitigation measures are included in this EIA Report (refer to **Chapter 9 and Chapter 10**).
(b) Public Participation (i) Please ensure that comments from all relevant stakeholders are submitted to the Department with the EIAr. This includes but is not limited to Northern Cape: DAEARDLR, the provincial Department of Agriculture, SANRAL, the Ubuntu Local Municipality, the Pixley Ka Seme District Municipality, the Department of Human Settlements, Water and Sanitation, the South African Heritage Resources Agency (SAHRA), the Endangered Wildlife Trust (EWT), BirdLife SA, the Department of Mineral Resources and Energy, the Department of Rural Development and Land Reform, and the Department of Forestry, Fisheries and the Environment: Directorate Biodiversity and Conservation.	All comments received to date have been included within the Comments and Responses Report (**Appendix C9**). Where comments have not been obtained, proof that attempts were made to obtain comments have been included in **Appendix C5** and **Appendix C6**. The database detailing registered I&APs is included as **Appendix C2** in the EIA Report.
(ii) Please ensure that all issues raised and comments received during the circulation of the draft SR and draft EIAr from registered I&APs and organs of state which have jurisdiction in respect of the proposed activity are adequately addressed in the final EIAr.	All comments received during the Scoping phase (included in **Appendix C7** and **Appendix C9**) have been addressed throughout this EIA report. Comments received during the 30-day review and comment period of the draft EIA Report will be captured and addressed in the Comments and Reponses Report (**Appendix C9**) to be submitted with the final EIA Report to the DFFE for decision-making.

DFFE Requirement for EIA	Response/ Location in this EIA Report
(iii) Proof of correspondence with the various stakeholders must be included in the final EIAr. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments.	All comments received to date have been included within the Comments and Responses Report (**Appendix C9**). Where comments have not been obtained, proof that attempts were made to obtain comments have been included in **Appendix C5** and **Appendix C6**. Comments received during the 30-day review and comment period of the draft EIA Report will be included within the Comments and Responses Report (**Appendix C9**) to be submitted with the final EIA Report to the DFFE for decision-making. Where comments have not been obtained, proof that attempts were made to obtain comments will be included in **Appendix C5** and **Appendix C6**.
(iv) A Comments and Response trail report (C&R) must be submitted with the final EIAr. The C&R report must incorporate all comments for this development. The C&R report must be a separate document from the main report and the format must be in the table format as indicated in Appendix 1 of this comments letter. Please refrain from summarising comments made by I&APs. All comments from I&APs must be copied verbatim and responded to clearly. Please note that a response such as "noted" is not regarded as an adequate response to I&AP's comments.	All comments received during the Scoping Phase, and the 30-day review and comment period of the draft EIA Report, including those of the DFFE, will be included within the Comments and Responses Report (to be included as **Appendix C9** to the final EIA Report).
(v) The Public Participation Process must be conducted in terms of Regulation 39, 40, 41, 42, 43 & 44 of the EIA Regulations, 2014, as amended and the Public Participation Plan (PPP).	The Public Participation Process has been conducted in terms of Regulation 39, 40, 41, 42, 43 & 44 of the EIA Regulations 2014, as amended (GNR 326), as well as in accordance with the approved Public Participation Plan (refer to **Appendix C1**) I&APs and Organs of State were notified of the availability of the EIA Report for a 30-day review and comment period from **Friday, 06 May 2022** until **Monday, 06 June 2022** as follows: » An advertisement was placed in the De Aar Echo Newspaper (tearsheet to be included in **Appendix C3** of the final EIA Report) on **Thursday, 05 May 2022**. » A notification letter was distributed to all registered I&APs on the project database, including the Organs of State Officials on **Thursday, 05 May 2022**. Proof of notification is included in **Appendices C5** and **C6** of the EIA Report.

DFFE Requirement for EIA	Response/ Location in this EIA Report
	All registered I&APs and Organs of State Officials will receive reminder notifications regarding the nearing of the end of the review and comment period of the EIA Report (proof to be included in **Appendices C5** and **C6** of the final EIA Report).
(c) Alternatives (i) Please provide a description of each of the preferred alternative type and provide detailed motivation on why it is preferred.	An overview of the various alternatives (i.e., property/location alternatives, design and layout alternatives, activity alternatives, technology alternatives and the 'do-nothing' alternative) considered for the Merino Wind Farm is included in Chapter 3 of the EIA Report.
(ii) The EAP must ensure that all relevant alternatives and/or alternative combinations are adequately assessed in the EIAr.	An assessment of all relevant alternatives considered for the Merino Wind Farm is included in Chapter 3 of the EIA Report. The 'do-nothing' alternative is assessed in detail in Chapter 9 of the EIA Report.
(d) Layout and Sensitivity Maps (i) The EIAr must provide coordinate points for the proposed development site (note that if the site has numerous bend points, at each bend point coordinates must be provided) as well as the start, middle and end point of all linear activities.	The EIA Report includes coordinate points of the proposed development site (centre and corner points) (refer to **Table 1.1., Chapter 1**).
(ii) All preferred turbine positions must be clearly numbered. The turbine position numbers must be consistently used in all maps to be included in the final EIAr.	All turbine positions are clearly numbered and the turbine position numbers are consistently used in all maps included in the EIA Report (refer to **Figure 11.2**).
(iii) The final EIAr must provide the technical details of the proposed facility in a table format as well as their description and/or dimensions.	The EIA Report includes technical details of the proposed facility in a table format as well as their description and dimensions (refer to **Table 2.1, Chapter 2**).
(iv) A copy of the final layout map must be submitted with the final EIAr. All available biodiversity information must be used in the finalisation of the layout map. Existing infrastructure must be used as far as possible, e.g. roads. The layout map must indicate the following: a) The envisioned area for the wind energy facility, i.e. placing of wind turbines and all associated infrastructure should be mapped at an appropriate scale. b) All supporting onsite infrastructure such as laydown area, guard house, control room, and buildings, including accommodation etc. c) All necessary details regarding all possible locations and sizes of the proposed BESS, the main substation and internal power lines. d) All existing infrastructure on the site, especially internal road infrastructure.	An appropriate facility layout map indicating the infrastructure listed in this comment is included as **Figure 11.2, under Chapter 11, and Appendix P**).
(v) Please provide an environmental sensitivity map which indicates the following:	An Environmental Sensitivity Map indicating all environmentally sensitive features is included as **Figure 11.1, under Chapter 11, and Appendix P**).

DFFE Requirement for EIA	Response/ Location in this EIA Report
a) The location of sensitive environmental features on site, e.g. CBAs, protected areas, heritage sites, wetlands, drainage lines etc. that will be affected by the facility and its associated infrastructure; b) Buffer areas; and c) All "no-go" areas.	
(vi) The above layout map must be overlain with the sensitivity map and a cumulative map which shows neighbouring energy developments and existing grid infrastructure.	A combined Layout and Environmental Sensitivity Map indicating all environmentally sensitive features and proposed infrastructure is included as **Figure 11.1 under Chapter 11, and Appendix P**).
(e) Specialist Assessments (i) The final BAR and all the attached specialist studies must indicate and adequately assess a consistent number of turbines.	The EIA Report, as well as the attached specialist studies, adequately assess a consistent number of turbines (i.e., 35 turbines).
(ii) The EAP must ensure that the terms of reference for all the identified specialist studies must include the following: a) A detailed description of the study's methodology; indication of the locations and descriptions of the development footprint, and all other associated infrastructures that they have assessed and are recommending for authorisation. b) Provide a detailed description of all limitations to the studies. All specialist studies must be conducted in the right season and providing that as a limitation will not be allowed. c) Please note that the Department considers a 'no-go' area, as an area where no development of any infrastructure is allowed; therefore, no development of associated infrastructure including access roads is allowed in the 'no-go' areas. d) Should the specialist definition of 'no-go' area differ from the Department's definition; this must be clearly indicated. The specialist must also indicate the 'no-go' area's buffer if applicable. e) All specialist studies must be final, and provide detailed/practical mitigation measures for the preferred alternative and recommendations, and must not recommend further studies to be completed post EA. f) Bird and Bat specialist studies must have support from Birdlife South Africa and SABAA and adhere to the latest guidelines in this regard.	The identified specialist studies include a detailed description of the methodology followed as well as an indication of the location and description of the development and all other associated infrastructure. Furthermore, the specialist studies provide a detailed description of the limitations to the studies. The specialist's definition of 'no-go' area is the same as that of the Department and various 'no-go' areas, including their associated buffer areas, have been recommended by the specialists and have been by the developer when designing the facility layout. The attached specialist studies (refer to **Appendix D -M**) include an assessment of the identified potential impacts, as well as practical mitigation measures, and where relevant, enhancement measures. The mitigation and enhancement measures proposed by the specialists are included in **Chapters 9 and 10** of the EIA Report, as well as the project EMPr which is attached as **Appendix N and O** to the EIA Report. The Bird and Bat specialist studies have been undertaken in accordance with the approved guidelines for bird and bat studies for wind energy developments. These

DFFE Requirement for EIA	Response/ Location in this EIA Report
g) Should a specialist recommend specific mitigation measures, these must be clearly indicated. h) Should the appointed specialists specify contradicting recommendations, the EAP must clearly indicate the most reasonable recommendation and substantiate this with defendable reasons; and were necessary, include further expertise advice.	guidelines are supported by Birdlife South Africa and the South African Bat Assessment Association (SABAA).
(iii) It is further brought to your attention that Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation, which were promulgated in Government Notice No. 320 of 20 March 2020 (i.e. "the Protocols"), and in Government Notice No. 1150 of 30 October 2020 (i.e. protocols for terrestrial plant and animal species), have come into effect. Please note that specialist assessments must be conducted in accordance with these protocols.	The specialist studies have been conducted in accordance with Government Notice No. 320 of 20 March 2020 (i.e., "the protocols"), and Government Notice No. 1150 of 30 October 2020 (i.e., protocols for terrestrial plant and animal species).
(iv) As such, the Specialist Declaration of Interest forms must also indicate the scientific organisation registration/member number and status of registration/membership for each specialist.	Signed and commissioned specialist declarations, including the scientific organisation registration/member number, and status of registration/membership for each specialist are contained in **Appendix R** of the EIA Report.
(f) Cumulative Assessments (i) If there other similar facilities proposed within a 30km radius of the proposed development site, a cumulative impact assessment must be conducted for all identified and assessed impacts which must be refined to indicate the following: a) Identified cumulative impacts must be clearly defined, and where possible the size of the identified impact must be quantified and indicated, i.e. hectares of cumulatively transformed land. b) Detailed process flow and proof must be provided, to indicate how the specialist's recommendations, mitigation measures and conclusions from the various similar developments in the area were taken into consideration in the assessment of cumulative impacts and when the conclusion and mitigation measures were drafted for this project. c) The cumulative impacts significance rating must also inform the need and desirability of the proposed development.	Ten authorised renewable energy facilities within a 30km radius of the proposed development have been identified as detailed in **Chapter 10** of the EIA Report. An evaluation of potential cumulative impacts is included in **Chapter 10** of the EIA Report.

DFFE Requirement for EIA	Response/ Location in this EIA Report
d) A cumulative impact environmental statement on whether the proposed development must proceed.	
(g) Specific Comments (i) The EAP must provide details of the specific locations in the EIAr, and not provide vague locations of the proposed developments. All associated infrastructure must be clearly indicated in the EIAr and its associated layout plans.	The details of the location of the proposed development, including the centre and corner coordinates of the development site, as well as the names of the affected farm properties, are provided in **Chapter 1, Table 1.1**. Infrastructure associated with the facility is listed in **Chapters 1 and 2,** and a detailed Layout Map of the proposed infrastructure is included as **Figure 11.2, under Chapter 11, and Appendix P**).
(ii) The EAP must identify and provide a map which shows this development and its associated infrastructure in relation to the other proposed facilities in the area.	A cumulative map showing the location of the Great Karoo Cluster of renewable energy facilities in relation to other proposed facilities within a 30km radius of the Great Karoo Cluster as included as **Figure 10.1, under Chapter 10, and Appendix P**).
(iii) The EAP must clearly identify and provide a final list of all applicable listed activities. If any activities are to be removed, motivation for their removal must be included in the EIAr.	All relevant activities applied for in the application for an Environmental Authorisation (EA) submitted on 12 November 2021 are included in this EIA Report (refer to **Section 7.2.1, Table 7.1**). None of the activities applied for a being removed, and as such, amended application form is not being submitted with the EIA Report.
(vi) When submitting the EIAr and future documents kindly name each of the documents and attachments according to the information it contains. E.g., instead of only naming it Appendix A, it must be Appendix A: Maps, Appendix B: EAP Declaration etc.	The EIA Report is named correctly and its associated appendices are named according to the information they contain.
(h) General (i) The EIAr must provide the technical details for the proposed facility in a table format as well as their description and/or dimensions.	The EIA Report includes technical details of the proposed facility in a table format as well as their description and dimensions (refer to **Table 2.1, Chapter 2**).
(ii) The EAP must provide landowner consent for all non-linear infrastructure proposed on the farm portions affected by the proposed project.	Landowner's consents for all non-linear infrastructure proposed on the farm portions affected by the proposed project were attached as **Appendix 4** to the application for Environmental Authorisation submitted on 12 November 2021.
(iii) A construction and operational phase EMPr that includes mitigation and monitoring measures must be submitted with the final EIAr.	A facility EMPr that includes mitigation and monitoring measures for the construction and operational phase of the Merino Wind Farm is included as **Appendix N** to the EIA Report, and a Generic EMPr for the Development and Expansion of Substation Infrastructure for the Transmission and Distribution of Electricity (for the onsite facility substation) is included as **Appendix O** of the EIA Report.

DFFE Requirement for EIA	Response/ Location in this EIA Report
(iv) The final EIAr must include a list providing a clear description of the infrastructure associated with the development.	A list of, and clear description of the infrastructure associated with the development is included in **Chapter 2** of the EIA Report.
(v) The EAP must provide an outline of where in the final Report each of this Department's comments are addressed. This must be a separate document and must submitted as an appendix to the EIAr.	An outline of relevant sections and appendices in this report where the Department's comments are addressed is included in **Table 7.3** of this EIA Report, and within the Comments and Responses Report (**Appendix C9**). Comments received form the Department during the 30-day review and comment period of the draft EIA Report will be captured and addressed in the Comments and Reponses Report to be submitted with the final EIA Report for decision-making.

7.4. Overview of the EIA Phase

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

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

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

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

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

In terms of GNR 779 of 1 July 2016, the National DFFE is the competent authority for all projects which relate to the IRP and any updates thereto. As the project is proposed within Northern Cape Province, the Northern Cape DAEARD & LR is the provincial commenting authority for the project.

Consultation with these authorities has been undertaken during the Scoping Phase and has continued throughout the EIA process. To date, this consultation has included the following:
» Submitting a pre-application meeting request form, together with the Public Participation Plan to the DFFE via email for approval on **02 September 2021**. Following submission of the Public Participation Plan, the DFFE provided approval of the submitted plan via email on **15 September 2021** (refer to **Appendix C1**).

» Submission of the application form for Environmental Authorisation and the draft Scoping Report to the DFFE via the DFFE Novell Filr System on **12 November 2021**.
» Submission of the final Scoping Report on **13 January 2022**.
» Receipt of acceptance of the Scoping Report and approval of the Plan of Study for the EIA Phase on **27 January 2022**.

The following steps are to be undertaken as part of the EIA Phase of the process:

» Make the draft EIA Report available for a 30-day public review and comment period from **06 May 2022** to **06 June 2022**.
» Notification and consultation with stakeholders, I&APs and Organs of State that may have jurisdiction over the project, including provincial and local government departments, and State-Owned Enterprises.
» Incorporating comments received during the 30-day public review and comment period into the final EIA Report.
» Submission of the final EIA Report to DFFE for decision making.

The submissions, as listed above, were undertaken electronically, as required by the DFFE. A record of all authority correspondence undertaken prior to and within the EIA Phase is included in **Appendix B**, **Appendix C5** and **Appendix C6**.

7.4.2 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 (GN R326), as amended. The purpose of public participation is clearly outlined in Regulation 40 of the EIA Regulations 2014 (GN R326, as amended, and is being followed for this proposed project.

The Public Participation Process undertaken for the proposed development of the Merino Wind Farm considers the restrictions and limitations imposed by Government through Section 27 (2) of the Disaster Management Act (Act No. 57 of 2002) of 2002 and the Directions issued by the Minister of Forestry Fisheries and the Environment (DFFE) in terms of consultations with I&APs to limit the risks associated with COVID-19. A Public Participation Plan was prepared and submitted to the DFFE in accordance with the DFFE requirements. Approval of the Plan was provided by the DFFE Case Officer via email on **15 September 2021** (refer to **Appendix B**).

The traditional means and opportunities available for the undertaking of public participation will still be covered and implemented as part of the public participation plan considering the current limitations. Alternative means of undertaking consultation have been designed and implemented by Savannah Environmental to ensure that I&APs are afforded sufficient opportunity to access project information and raise comments on the project through an interactive web-based platform (i.e. online stakeholder engagement platform) readily available and accessible to any person registering their interest in the project, and ensures that the public participation process is undertaken in line with Regulations 41 to 44 of the EIA Regulations, 2014, as amended. The Public Participation Plan (**Appendix C1**) considers the limitations applied by the Disaster Management Act Regulations prohibiting the gathering of people, as well as limitations which certain I&APs may have in terms of access to computers and internet as well as access to public spaces which may not be open for operation that inhibits access to hard copy documentation. The online stakeholder engagement platform implemented by Savannah Environmental for the project allowed the EAP to visually present details regarding the project as well as consultation documentation, including project maps and plans, presentations, and posters. The platform also contains the Scoping Report available for review. The use of an online tool enables stakeholders and I&APs to explore the project-specific content in their own time, and still enables them to participate in a meaningful way in the consultation process. Where parties do not have access to electronic systems to access the project information, opportunity for them to engage with the project team is facilitated through alternative means, such as consultation with the Ward Councillor, community representatives or one-on-one engagement, where the relevant Regulations to minimise risks associated with COVID-19 can be adhered to.

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 EIA 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 EIA process in the following ways:

During the **Scoping Phase**:
» Identify issues of concern and suggestions for enhanced benefits.
» Verify that their issues have been recorded.
» Assist in identifying reasonable alternatives.
» Contribute relevant local information and knowledge to the environmental assessment.

During the **EIA Phase**:
» Contribute relevant local information and knowledge to the environmental assessment.
» Verify that issues have been considered in the environmental investigations as far as possible as identified within the Scoping Phase.
» 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 following sections detail the tasks undertaken as part of the public participation process within the EIA Phase.

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

The availability of the EIA Report for review and comment was announced to the Organs of State, potentially affected and adjacent landowners, tenants and occupiers, and general public via the following:

» Notification letter distributed to all registered parties advising them of the availability of the EIA Report for review on comment on **13 May 2022.**
» An advertisement announcing the availability of and inviting comment on the EIA Report in the De Aar Echo Newspaper (English advertisement) on **13 May 2022**. A copy of the newspaper advert as sent to the newspaper and the advert tear sheet are included in **Appendix C3** of the EIA Report.
» A Live Read on RSG on **14 May 2022** at the commencement of the 30-day review and comment period (**Appendix C3**). A further radio live read segment will be broadcasted on RSG as a reminder of the availability of the EIA Report for review and comment on **04 June 2022**. RSG is one of the local radio stations accessible in the study area.
» The EIA Report was made available for review by I&APs for a 30-day review and comment period from **13 May 2022 to 13 June 2022**. The EIA Report has been made available on the Savannah Environmental

website (https://savannahsa.com/public-documents/energy-generation/the-great-karoo-cluster-of-renewable-energy-facilities/) and all registered I&APs have been notified of the availability on **13 May 2022**. I&APs have been encouraged to view the EIA Report and submit written comment. The EIA Report has been circulated to Organs of State via electronic transfer (Dropbox, WeTransfer, etc), or CD and/or hardcopy as per individual request. Evidence of distribution of this EIA Report has been included in this EIA Report (refer to **Appendix C5** and **Appendix C6**).

ii. Public Involvement and Consultation

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

- Opportunity to review the EIA Report for a 30-day review and comment period from **13 May 2022** to **13 June 2022**.
- Comments received during this review period will be captured within a Comments and Responses Report (**Appendix C9**), which will be included within the final EIA Report.
- Focus group meetings: Virtual focus group meetings will be held with key government departments, stakeholders and landowners during the 30-day review and comment period of the EIA Report. The purpose of these focus group meetings is to provide an overview of the findings of the EIA studies in order to facilitate comments on the EIA process and EIA Report, as well as to record any issues or concerns raised by stakeholders regarding the project. As per the approved public participation plan, these meetings will be held via virtual platform. The minutes of these meetings will be included in the final EIA Report as **Appendix C8**.
- An information session will be held at Richmond Town Hall on Thursday, 26 May 2022 at 17h00. The Information Session will start with a poster display at 17h00 after which those that are interested in attending the presentation can attend the presentation which will start at 17h30.
- Telephonic consultation sessions.
- Written, faxed or e-mail correspondence.

Table 7.5: Public involvement for the Merino Wind Farm (during EIA Phase)

Activity	Date
» Advertising of the availability of the EIA Report for a 30-day review and comment period in the De Aar Echo Newspaper (English advertisement).	13 May 2022
Radio Live Read by RSG regarding the EIA Report comment period, and the details on how to get involved and how contact with Savannah Environmental can be made. A further radio live read segment will be broadcasted on RSG as a reminder of the availability of the EIA Report for review and comment.	14 May 2022 and 04 June 2022
Distribution of notification letters announcing the availability of the EIA Report for a 30-day review and comment period. These letters were distributed to Organs of State, Government Departments, Ward Councillors, landowners within the surrounding area (including neighbouring landowners), registered I&APs and key stakeholder groups.	13 May 2022

Activity	Date
30-day review and comment period of the EIA Report.	Friday, 13 May 2022 to Monday, 13 June 2022
Virtual meetings through the use of virtual platforms as determined through discussions with the relevant stakeholder group: » Landowners » Authorities and key stakeholders (including Organs of State, local municipality and official representatives of community-based organisations). » Where an I&AP does not have access to a computer and/or internet to participate in a virtual meeting telephonic discussions (including WhatsApp video call) will be set-up and minuted for inclusion. The preferred language of the I&AP has been considered when setting up these discussions. Direct in-person consultation will only take place in limited numbers and where sanitary conditions can be maintained at all times.	» Focus group meetings will be held with key stakeholders during the 30-day review and comment period of the EIA Report via a virtual platform, where relevant. » An information session will be held at Richmond Town Hall on Thursday, 26 May 2022 at 17h00. The Information Session will start with a poster display at 17h00 after which those that are interested in attending the presentation can attend the presentation which will start at 17h30.
On-going consultation (i.e., telephone liaison; e-mail communication) with all I&APs.	Throughout the EIA process

iii. Registered I&APs entitled to Comment on the EIA Report

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 of the release of the EIA Report for a 30-day review and comment period, invited to provide comment on the EIA Report, and informed of the manner in which, and timeframe within which such comment must be made. The report has been made available in soft copies to I&APs in accordance with the approved PP Plan. No hard copies of the report have been made available for review and comment. These can be provided on requested, on condition that sanitary conditions can be maintained.

The EIA Report has been made available on the Savannah Environmental website (i.e., online stakeholder engagement platform) (https://savannahsa.com/public-documents/energy-generation/the-great-karoo-cluster-of-renewable-energy-facilities/). A notification letter to all registered parties was distributed prior to commencement of the 30-day review and comment period, on **Friday, 13 May 2022**. Where I&APs are not able to provide written comments (including SMS and WhatsApp), other means of consultation, such as telephonic discussions and discussions at the information session to be held in the project area will be used. All comments raised as part of the discussions and written comments submitted during the 30-day review and comment period will be recorded and included in **Appendix C7** of the EIA Report.

iv. Identification and Recording of Comments

Comments raised by I&APs to date have been included into a Comments and Responses (C&R) Report, which is included in **Appendix C9** of this EIA Report. 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. The C&R Report will be updated with all comments received during the 30-day review and comment period of the EIA Report and will be included as **Appendix C9** in the Final EIA Report submitted to the DFFE for decision-making.

Notes of all the telephonic discussions, virtual meetings, and the information session to be conducted during the 30-day review and comment period of the EIA Report will be included in **Appendix C8** of the Final EIA Report.

7.5. Outcomes of the DFFE Web-Based Screening Tool

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

The requirement for the submission of a Screening Report (included as **Appendix Q** of the EIA Report) for the Merino Wind Farm is applicable as it triggers Regulation 19 of the EIA Regulations, 2014, as amended. **Table 7.5** provides a summary of the specialist assessments identified in terms of the screening tool and responses to each assessment from the project team considering the development area under consideration.

Table 7.5: Sensitivity ratings from the DFFE's web-based online Screening Tool associated with the development of the Merino Wind Farm

Specialist Assessment	Sensitivity Rating as per the Screening Tool (relating to the need for the study)	Project Team Response
Agricultural Assessment	Very high	A Soils, Land Use and Agriculture Impact Assessment is included in this EIA Report as **Appendix H**.
Landscape/Visual Assessment	Very high	A Visual Impact Assessment has been undertaken for the wind farm and is included in this EIA Report as **Appendix K.**
Archaeological and Cultural Heritage Assessment	Low	A Heritage Impact Assessment (including an assessment of archaeological resources and the cultural landscape) has been undertaken for the wind farm and is included in this EIA Report as **Appendix I**.

Specialist Assessment	Sensitivity Rating as per the Screening Tool (relating to the need for the study)	Project Team Response
Palaeontology Assessment	Very high	A Heritage Impact Assessment (including an assessment of palaeontological resources) has been undertaken for the wind farm and is included in this EIA Report as **Appendix I**.
Terrestrial Biodiversity Assessment	High	An Ecological Impact Assessment (including flora and fauna) has been undertaken for the wind farm and is included as **Appendix D** of the EIA Report.
Aquatic Biodiversity Assessment	Very high	An Aquatic Impact Assessment has been undertaken for the wind farm and is included as **Appendix E** of the EIA Report.
Avian Assessment	Low	An Avifauna Impact Assessment Report (including 12-months pre-construction monitoring as per the BirdLife SA Best Practice Guidelines) has been undertaken for the wind farm and is included as **Appendix F** of the EIA Report.
Civil Aviation Assessment	Medium	The Civil Aviation Authority will be consulted throughout the EIA process to obtain comment.
Defence Assessment	Low	The project site is not located within close proximity of any military base.
RFI Assessment	Medium	The project site under consideration for the development of the Merino Wind Farm is located within an area that is classified as having low sensitivity for telecommunication; between 26km and 48km of an SKA receptor; and more than 60km from a weather radar installation. The South African Radio Astronomy Observatory (SARAO) will be consulted during the 30-day review and comment period of the EIA Report to provide written comment on the proposed development.
Noise Assessment	Very high	A Noise Impact Assessment has been undertaken for the wind farm and is included as **Appendix J** of the EIA Report.
Flicker Assessment	Very high	A Visual Impact Assessment has been undertaken for the wind farm and is included in this EIA Report as **Appendix K.** The impact of shadow flicker associated with the development has been considered in detail in the Visual Impact Assessment.
Traffic Assessment	The screening report does not indicate a rating for this theme.	A Traffic Impact Assessment has been undertaken for the wind farm and is included as **Appendix M** of the EIA Report.
Social Assessment	The screening report does not indicate a rating for this theme.	A Social Impact Assessment has been undertaken and is included in the EIA Report as **Appendix L**.
Plant Species Assessment	Medium	An Ecological Impact Assessment (including flora and fauna) has been undertaken for the Merino Wind Farm and is included as **Appendix D** of the EIA Report.
Animal Species Assessment	High	An Ecological Impact Assessment (including flora and fauna) has been undertaken for the Merino Wind Farm and is included as **Appendix D** of the EIA Report.
Bats Assessment	High	A Bat Impact Assessment (including 12-months pre-construction monitoring) has been undertaken for the Merino Wind Farm and is included as **Appendix G** to the EIA Report.

7.6. Assessment of Issues Identified through the EIA Process

Based on the outcomes of the Scoping Phase evaluation of the project, the following issues were identified as requiring detailed assessment, The specialist consultants involved in the assessment of these impacts are indicated in **Table 7.6** below.

Table 7.6: Specialist studies undertaken as part of the EIA Phase

Specialist	Specialist Study	Appendix
David Hoare of David Hoare Consulting (Pty) Ltd	Ecology Impact Assessment	Appendix D
Ivan Baker of the Biodiversity Company	Aquatic Ecology Impact Assessment	Appendix E
Chris van Rooyen of Chris van Rooyen Consulting	Avifauna Impact Assessment (including 12-months pre-construction monitoring)	Appendix F
Werner Marais of Animalia	Bats Impact Assessment (including 12-months pre-construction monitoring)	Appendix G
Ivan Baker of the Biodiversity Company	Soils and Agricultural Potential Impact Assessment	Appendix H
Jenna Lavin of CTS Heritage	Heritage Impact Assessment (including Archaeology, Palaeontology and Cultural Heritage)	Appendix I
Morné de Jager of Enviro-Acoustic Research	Noise Impact Assessment	Appendix J
Lourens du Plessis of LoGIS	Visual Impact Assessment	Appendix K
Tony Barbour of Tony Barbour Environmental Consulting	Social Impact Assessment	Appendix L
Iris Wink of JG Afrika	Traffic Impact Assessment	Appendix M

Specialist studies considered direct and indirect environmental impacts associated with the development of all components of the facility. Identified impacts are 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)

Specialist studies also considered cumulative impacts associated with similar developments within a 30km radius of the proposed project. The purpose of the cumulative assessment is to test if such impacts are relevant to the proposed project in the proposed location (i.e., whether the addition of the proposed project in the area will increase the impact). In this regard, specialist studies considered whether the construction of the proposed development will result in:

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

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

As the developer has the responsibility to avoid or minimise impacts and plan for their management (in terms of the requirements of NEMA and the 2014 EIA Regulations (GNR 326)), 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 Environmental Management Programme (EMPr) that includes all the mitigation measures recommended by the specialists for the management of significant impacts is included as **Appendix N** and **O** to this EIA Report.

7.7. Assumptions and Limitations of the EIA Process

The following assumptions and limitations are applicable to the EIA process for the Merino Wind Farm:

» All information provided by the developer and I&APs to the environmental team was correct and valid at the time it was provided.
» The development area identified by the developer represents a technically suitable site for the establishment of the Merino Wind Farm, which is based on the design undertaken by technical consultants for the project.
» The development footprint (the area that will be affected during the operation phase) will include the footprint for the wind farm and associated infrastructure (i.e., internal access roads, BESS, and grid connection infrastructure).
» Conclusions of the specialist studies undertaken, and this overall impact assessment assume that any potential impacts on the environment associated with the proposed development will be avoided, mitigated, or offset in accordance with the relevant recommendations made.
» 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 contained in **Appendices D - M** for limitations specific to the independent specialist studies.

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

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

» National Environmental Management Act (Act No. 107 of 1998).
» EIA Regulations of December 2014, published under Chapter 5 of NEMA (as amended).
» Department of Environmental Affairs (2017), Public Participation guidelines in terms of NEMA EIA Regulations.
» Department of Environmental Affairs (2017), Integrated Environmental Management Guideline: Guideline on Need and Desirability.
» Procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for environmental authorisation; and
» International guidelines – the Equator Principles, 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).

Several other Acts, standards or guidelines have also informed the project process and the scope of issues addressed and assessed in this EIA Report. A review of legislative requirements applicable to the proposed project as identified at this stage in the process is provided in **Table 7.7**.

Table 7.7: Relevant legislative permitting requirements applicable to the Merino Wind Farm

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Legislation			
Constitution of the Republic of South Africa (No. 108 of 1996)	In terms of Section 24, the State has an obligation to give effect to the environmental right. The environmental right states that: "*Everyone has the right –* » *To an environment that is not harmful to their health or well-being, and* » *To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:* ∗ *Prevent pollution and ecological degradation,* ∗ *Promote conservation, and* ∗ *Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development*."	Applicable to all authorities	There are no permitting requirements associated with this Act. The application of the Environmental Right however implies that environmental impacts associated with proposed development 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 (No. 107 of 1998) (NEMA)	The 2014 EIA Regulations have been promulgated in terms of Chapter 5 of NEMA. Listed activities which may not commence without EA are identified within the Listing Notices (GNR 327, GNR 325 and GNR 324) which form part of these Regulations (GNR 326). In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these listed activities must be assessed and reported on to the competent authority charged by NEMA with granting of the relevant environmental authorisation. Considering the capacity of the proposed Merino Wind Farm (i.e., contracted capacity of 140MW) and the triggering of	DFFE – Competent Authority Northern Cape DAEARD&LR – Commenting Authority	The listed activities triggered by the proposed project have been identified and are being assessed as part of the EIA process currently underway for the project. The EIA process will culminate in the submission of a Final EIA Report to the DFFE for decision-making.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	Activity 1 of Listing Notice 2 (GNR 325), a full Scoping and EIA process is required in support of the Application for EA.		
National Environmental Management Act (No 107 of 1998) (NEMA)	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.	DFFE Northern Cape DAEARD&LR	While no permitting or licensing requirements arise directly by virtue of the proposed project, this section finds application through the consideration of potential cumulative, direct, and indirect impacts. It will continue to apply throughout the life cycle of the project.
Environment Conservation Act (No. 73 of 1989) (ECA)	The Noise Control Regulations in terms of Section 25 of the ECA contain regulations applicable for the control of noise in the Provinces of Limpopo, North-West, Mpumalanga, Northern Cape, Eastern Cape, and KwaZulu-Natal Provinces. The Noise Control Regulations cover the powers of a local authority, general prohibitions, prohibitions of disturbing noise, prohibitions of noise nuisance, use of measuring instruments, exemptions, attachments, and penalties. In terms of the Noise Control Regulations, no person shall make, produce, or cause a disturbing noise, or allow it to be made, produced or caused by any person, machine, device or apparatus or any combination thereof (Regulation 04).	DFFE Northern Cape DAEARD&LR Ubuntu Local Municipality	Noise impacts are expected to be associated with the construction and operation phases of the project. A Noise Impact Assessment (**Appendix J**) has been undertaken for the Merino Wind Farm which indicates that the impact of the project from a noise perspective will be of low significance.
National Water Act (No. 36 of 1998) (NWA)	A water use listed under Section 21 of the NWA must be licensed with the Regional DWS, unless it is listed in Schedule 1	Regional Department of Water and Sanitation	Watercourses are present within the development area of the Merino Wind Farm as identified in the Aquatic Impact Assessment

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	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)).		(**Appendix E**). As a result, a water use authorisation for the project will be required from the DWS; however, the process will only be completed once a positive EA has been received and the project selected as Preferred Bidder by the DMRE or a private offtaker. This is in line with the requirements from the DWS.
Minerals and Petroleum Resources Development Act (No. 28 of 2002) (MPRDA)	In accordance with the provisions of the MPRDA a mining permit is required in accordance with Section 27(6) of the Act where a mineral in question is to be mined, including the mining of materials from a borrow pit.	Department of Mineral Resources and Energy (DMRE)	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 project, and as a result a mining permit or EA in this regard is not required to be obtained.
	Section 53 of the MPRDA states that any person who intends to use the surface of any land in any way which may be contrary to any object of the Act, or which is likely to impede any such object must apply to the Minister for approval in the prescribed manner.		In terms of Section 53 of the MPRDA, approval is required from the Minister of Mineral Resources and Energy to ensure that the proposed development does not sterilise a mineral resource that might occur on site.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Environmental Management: Air Quality 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. 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.	Northern Cape DAEARD&LR / Pixley ka Seme 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.
National Heritage Resources Act (No. 25 of 1999) (NHRA)	Section 07 of the NHRA stipulates assessment criteria and categories of heritage resources according to their significance. Section 35 of the NHRA provides for the protection of all archaeological and palaeontological sites, and meteorites. Section 36 of the NHRA provides for the conservation and care of cemeteries and graves by SAHRA where this is not the responsibility of any other authority. Section 38 of the NHRA lists activities which require developers or any person who intends to undertake a listed activity to notify the responsible heritage resources authority and furnish it with	South African Heritage Resources Agency (SAHRA) Ngwao Boswa Kapa Bokone (NBKB) – provincial heritage authority	A full Heritage Impact Assessment has been undertaken as part of the EIA process (refer to **Appendix I** of this EIA Report). Sites of varying significance have been identified within the development area and specific mitigation measures have been recommended by the specialist with regards to each identified find. Furthermore, the site was found to form part of an intact cultural landscape representative of the Central Plateau of the Great Karoo possessing heritage value for historical, aesthetic, architectural, social and scientific reasons. Sensitive areas identified in this regard have been avoided by the layout.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	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.		Should a heritage resource be impacted upon, a permit may be required from SAHRA or Ngwao Boswa Kapa Bokone (NBKB) in accordance with Section 48 of the NHRA, and the SAHRA Permit Regulations (GN R668). This will be determined as part of the final walk-through survey once the final location of the development footprint and its associated infrastructure has been determined.
National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA)	Section 53 of NEM:BA provides for the MEC / Minister to identify any process or activity in such a listed ecosystem as a threatening process. Three government notices have been published in terms of Section 56(1) of NEM:BA as follows: » Commencement of TOPS Regulations, 2007 (GNR 150). » Lists of critically endangered, vulnerable and protected species (GNR 151). » TOPS Regulations (GNR 152). It provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), and vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (NEM:BA: National list of ecosystems that are threatened and in need of protection, (Government Gazette 37596, GNR 324), 29 April 2014).	DFFE Northern Cape DAEARD&LR	Under NEM:BA, a permit would be required for any activity that 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 EIA process (**Appendix D**). No protected species which require a permit under the NEM:BA were identified within the development area.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
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).	DFFE Northern Cape DAEAR&LR	An Ecological Impact Assessment (**Appendix D**) was undertaken as part of the EIA process to identify any alien invasive plants present on site. No alien and invasive species listed under the Alien and Invasive Species List were recorded within the development area.
Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA)	Section 05 of CARA provides for the prohibition of the spreading of weeds. Regulation 15 of GN R1048 published under CARA provides for the classification of categories of weeds and invader plants, and restrictions in terms of where these species may occur. Regulation 15E of GN R1048 published under CARA provides requirement and methods to implement control measures for different categories of alien and invasive plant species.	Department of Agriculture, Land Reform and Rural Development (DALRD)	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. In terms of Regulation 15E (GN R1048), 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

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
			has as its object the control of plants concerned, subject to the provisions of sub-regulation 4. » A combination of one or more of the methods prescribed, save that biological control reserves and areas where biological control agents are effective shall not be disturbed by other control methods to the extent that the agents are destroyed or become ineffective.
National Forests Act (No. 84 of 1998) (NFA)	According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. Notice of the List of Protected Tree Species under the National Forests Act (No. 84 of 1998) was published in GNR 734. The prohibitions provide that "no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister".	Department of Agriculture, Land Reform and Rural Development (DALRD)	A licence is required for the removal of protected trees. It is therefore necessary to conduct a survey that will determine the number and relevant details pertaining to protected tree species present in the development footprint for the submission of relevant permits to authorities prior to the disturbance of these individuals. An Ecological Impact Assessment undertaken as part of the EIA included the identification of any protected tree species which may require a license in terms of the NFA (No. 84 of 1998) within the development area (refer to **Appendix D** of this EIA Report). There is a single species protected under the National Forest Act that is known to have a geographical distribution in the area, namely *Boscia albitrunca*.
National Veld and Forest Fire Act (No. 101 of 1998) (NVFFA)	Chapter 4 of the NVFFA places a duty on owners to prepare and maintain firebreaks, the procedure in this regard, and the	DFFE	While no permitting or licensing requirements arise from this legislation, this Act will be

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	role of adjoining owners and the fire protection association. Provision is also made for the making of firebreaks on the international boundary of the Republic of South Africa. The applicant must ensure that firebreaks are wide and long enough to have a 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.		applicable during the construction and operation of the Merino Wind Farm, in terms of the preparation and maintenance of firebreaks, and the need to provide appropriate equipment and trained personnel for firefighting purposes.
Hazardous Substances Act (No. 15 of 1973) (HAS)	This Act regulates the control of substances that may cause injury, or ill health, or death due to their toxic, corrosive, irritant, strongly sensitising or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger, to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products. » Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc., nature or because it generates pressure through decomposition,	Department of Health (DoH)	It is necessary to identify and list all Group I, II, III, and IV hazardous substances that may be on site and in what operational context they are used, stored or handled. If applicable, a license would be required to be obtained from the DoH.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	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.		
National Environmental Management: Waste Act (No. 59 of 2008) (NEM:WA)	The Minister may by notice in the Gazette publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. The Minister may amend the list by – » Adding other waste management activities to the list. » Removing waste management activities from the list. » Making other changes to the particulars on the list. In terms of the Regulations published in terms of NEM:WA (GNR 912), a BA or EIA is required to be undertaken for identified listed activities. Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that: » The containers in which any waste is stored, are intact and not corroded or in » Any other way rendered unlit for the safe storage of waste. » Adequate measures are taken to prevent accidental spillage or leaking. » The waste cannot be blown away.	DFFE – Hazardous Waste Northern Cape DAEARD&LR – General Waste	No waste listed activities are triggered by the Merino Wind Farm, therefore, no Waste Management License is required to be obtained. General and hazardous waste handling, storage and disposal will be required during construction and operation. The National Norms and Standards for the Storage of Waste (GNR 926) published under Section 7(1)(c) of NEM:WA will need to be considered in this regard.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	» 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 Road Traffic Act (No. 93 of 1996) (NRTA)	The technical recommendations for highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts. The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.	South African National Roads Agency (SANRAL) – national roads Northern Cape Department of Transport, Safety and Liaison	An abnormal load / vehicle permit may be required to transport the various components to site for construction. These include route clearances and permits required for vehicles carrying abnormally heavy or abnormally dimensioned loads and transport vehicles exceeding the dimensional limitations (length) of 22m. Depending on the trailer configuration and height when loaded, some of the on-site substation and BESS components may not meet specified dimensional limitations (height and width) which will require a permit.
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.	Northern Cape DAEARD&LR	A collection/destruction permit must be obtained from Northern Cape DAEARD&LR for the removal of any protected plant or animal species found on site. An Ecological Impact Assessment has been undertaken as part of the EIA process (refer to

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	Amongst other regulations, the following 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 flora and fauna species for the Province.		**Appendix D**). Plant species protected under this Act were found on site. From the field surveys, this includes the following: Chasmatophyllum musculinum (Aizoaceae), Delosperma lootsbergense (Aizoaceae), Delosperma multiflorum (Aizoaceae), Drosanthemum hispidum (Aizoaceae), Drosanthemum lique (Aizoaceae), Galenia africana (Aizoaceae), Galenia glandulifera (Aizoaceae), Galenia procumbens (Aizoaceae), Galenia pubescens (Aizoaceae), Galenia secunda (Aizoaceae), Hereroa incurva (Aizoaceae), Mesembryanthemum coriarium (Aizoaceae), Mesembryanthemum crystallinum(Aizoaceae), Mesembryanthemum nodiflorum (Aizoaceae), Pleiospilos compactus (Aizoaceae), Ruschia cradockensis(Aizoaceae), Ruschia intricata (Aizoaceae), Ruschia spinosa (Aizoaceae), Trichodiadema attonsum (Aizoaceae), Trichodiadema rogersiae (Aizoaceae), Trichodiadema setuliferum (Aizoaceae), Bulbine abyssinica (Asphodelaceae), ,Haworthia bolusii var. blackbeardiana (Asphodelaceae) Haworthia bolusii var. bolusii (Asphodelaceae), Haworthia marumiana var. marumiana (Asphodelaceae), Haworthiopsis tessellata (Asphodelaceae) ,Kniphofia stricta (Asphodelaceae) Trachyandra acocksii (Asphodelaceae), Trachyandra karrooica (Asphodelaceae), Aloe broomii

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
			(Asphodolaceae), Aloe claviflora (Asphodolaceae), Euphorbia caterviflora (Euphorbiaceae), Euphorbia clavarioides (Euphorbiaceae), Euphorbia decepta (Euphorbiaceae), Euphorbia mauritanica (Euphorbiaceae), Euphorbia rhombifolia (Euphorbiaceae), Euphorbia stellispina (Euphorbiaceae), Pelargonium abrotanifolium (Geraniaceae), Pelargonium alchemilloides (Geraniaceae), Pelargonium aridum (Geraniaceae), Pelargonium karooicum (Geraniaceae), Pelargonium minimum (Geraniaceae), Pelargonium proliferu (Geraniaceae), Pelargonium tragacanthoides (Geraniaceae), Babiana bainesii (Iridaceae), Babiana hypogaea (Iridaceae), Babiana sambucina subsp. sambucina (Iridaceae), Dierama pendulum (Iridaceae), Gethyllis longistyla (Iridaceae), Hesperantha longituba (Iridaceae), Lapeirousia plicata subsp. plicata (Iridaceae), Moraea polystachya(Iridaceae), Romulea macowanii var. alticola (Iridaceae), Syringodea concolor (Iridaceae), Tritonia karooica (Iridaceae), Tritonia laxifolia (Iridaceae).

7.9.1 Best Practice Guidelines Birds & Wind Energy (2015)

The Best Practice Guidelines for Birds and Wind Energy (2015) proposed by the Birds and Renewable Energy Specialist Group (BARESG) (convened by BirdLife South Africa and the Endangered Wildlife Trust) contain guidelines for assessing and monitoring the impact of wind energy facilities on birds in Southern Africa. These guidelines recognise the impact that wind energy facilities may have on birds, through for example, creating a barrier to movement, displacing sensitive species, affecting breeding success and/or altering habitat. The guidelines were developed to ensure that negative impacts on threatened, or potentially threatened bird species are identified and mitigated using structured, methodical and scientific methods.

The guidelines are aimed at Environmental Assessment Practitioners (EAPs), avifaunal specialists, developers and regulators and propose a tiered assessment process as listed below:

(i) Scoping – a brief site visit informs a desktop assessment of likely avifauna present, possible impacts, and the design of a site-specific survey and monitoring protocols.
(ii) Pre-construction monitoring and impact assessment – a full assessment of the significance of likely impacts and available mitigation options, based on the results of systematic and quantified monitoring over at least 4 seasons.
(iii) Construction phase monitoring – not always necessary but can assist in determining whether the proposed mitigation measures are implemented and are effective and identify triggers of any observed changes.
(iv) Post-construction monitoring – repetition of the pre-construction monitoring, plus the collection of mortality data, to develop a complete before and after picture of impacts and refine mitigation measures.
(v) If warranted, more detailed and intensive research on affected threatened or potentially threatened species.

The following species-specific guidelines are also of relevance to consider during the pre-construction monitoring phase:

» Verreauxs' Eagle and Wind Farms: Guidelines for impact assessment, monitoring, and mitigation (March 2017)
» Cape Vulture and Wind Farms: Guidelines for impact assessment, monitoring and mitigation (July 2018)

For the Merino Wind Farm, the scoping assessment and the 12-month pre-construction bird monitoring as required by the guidelines have been completed at the project site. The results from the monitoring were used to inform both the development footprint as well as the Avifauna Impact Assessment report which has been completed and attached as **Appendix F** to the EIA Report.

7.9.2 South African Best Practice Guidelines for Pre-Construction Monitoring of Bats at Wind Energy Facilities (2020)

The South African Best Practice Guidelines for Pre-Construction Monitoring of Bats at Wind Energy Facilities prepared by Inkululeko Wildlife Services (Pty) Ltd, Bats without Borders and Arcus Consultancy Services South Africa (Pty) Ltd seek to provide technical guidance for consultants charged with carrying out impact assessments for proposed Wind Energy Facilities, to ensure that pre-construction monitoring surveys produce the required level of detail and answers for authorities evaluating applications for Wind Energy Facility developments. These guidelines outline basic requirements of best practice and highlight specific considerations relating to the pre-construction monitoring of proposed Wind Energy Facility sites for bats.

The results from pre-construction bat monitoring are required to inform the final layout, the BA or Scoping and EIA assessments and to provide adequate information to the competent authority for them to make an informed decision.

Bat activity is monitored using active and passive bat monitoring techniques. Active monitoring is carried out on site visits by the means of driven transects. A bat detector mounted on a vehicle is used, and transect routes are chosen based on road accessibility. Sampling effort and prevalent weather conditions are considered for each transect.

For the Merino Wind Farm, a passive bat monitoring technique was utilised. 12 months of pre-construction bat monitoring has been completed and 12 months of passive bat activity data has been gathered, which provides comparative bat activity and species assemblages across all seasons as well as various habitats, terrain and/or areas of the site.

7.9.3 South African Good Practice Guidelines for Operational Monitoring for Bats at Wind Energy Facilities (2019)

The South African Good Practice Guidelines for Operational Monitoring for Bats at Wind Energy Facilities are used as a guideline in developing protocols for operational monitoring of bat activity and fatalities at operating Wind Energy Facilities in South Africa. The objective of these guidelines is to provide practitioners with a standard protocol to monitor and estimate bat mortality, facilitating comparison between fatality rates across different Wind Energy Facilities.

According to these guidelines, the first two years of a Wind Energy Facility's operation are the most important period in which to collect post-construction information as this is when any change in bat activity and mortalities are likely to occur. Where more severe impacts have been identified or predicted, an extended period of data collection might be required to assess the effectiveness of any mitigation proposed. Examples of operational bat monitoring protocols include acoustic monitoring and carcass searches.

For the Merino Wind Farm, the bat specialist has recommended that a minimum of 2 years of operational bat mortality monitoring should be conducted from the commencement of operation of the facility. These guidelines will be used to develop the protocols for operational monitoring of bat activity and fatalities at the Merino Wind Farm.

7.9.4 The IFC Environmental Health and Safety (EHS) Guidelines

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

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

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

7.9.5 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 AFFECTED ENVIRONMENT

This chapter provides a description of the environment that may be affected by the development of the Merino Wind Farm. This information is provided in order to assist the reader in understanding the pre-development environment and the possible effects of the proposed project on the environment within which it is proposed to be development. 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 undertaken by specialist consultants and aims to provide the context within which this EIA process is being conducted. The full impact assessments undertaken by the independent specialists, including details of the affected environment, are included in **Appendices D – M**.

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

This chapter includes the following information required in terms of the EIA Regulations, 2014 - Appendix 3: Scope of Assessment and Content of the Environmental Impact Assessment Report:

Requirement	Relevant Section
(h)(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	The environmental attributes associated with the development of the Merino Wind Farm are included as a whole within this chapter. The environmental attributes that are assessed within this chapter include the following:
	» The regional setting of the broader study area and the project site indicates the geographical aspects associated with the Merino Wind Farm. This is included in **Section 8.2**.
	» The climatic conditions present within Richmond have been included in **Section 8.3**.
	» The biophysical characteristics of the project site and the surrounding areas are included in **Section 8.4**. The characteristics considered are topography and terrain, geology, soils and agricultural potential and the ecological profile which includes the vegetation patterns, listed plant species, critical biodiversity areas and broad-scale processes, freshwater resources, terrestrial fauna, bats, and avifauna.
	» The heritage and cultural aspects (including archaeology and palaeontology) have been included in **Section 8.5**.
	» The visual quality of the surrounding area and the project site has been considered in **Section 8.6**.
	» The ambient noise levels and quality of the surrounding area and the project site has been considered in **Section 8.7**.
	» The traffic conditions within the broader study area and the project site have been considered in **Section 8.8**.
	» The social and socio-economic characteristics associated with the broader study area and the project site have been included in **Section 8.9**.

8.2. Regional Setting

The Merino Wind Farm development area is located approximately 35km south-west of Richmond and 80km south-east of Victoria West, within the Ubuntu Local Municipality and the Pixley Ka Seme District Municipality in the Northern Cape Province.

The Northern Cape Province is the largest province in South Africa, taking up nearly a third of the country's land area. It covers an area of ~ 372 889km² and has a population of 1 193 780, the least populous of South Africa's provinces. The Northern Cape Province is bordered by Namibia and Botswana to the north, and south-east, Free State, and North-West provinces to the east, Botswana, and Namibia, to the north, and the Atlantic Ocean to the west. The Northern Cape is the only South African province which borders Namibia and plays an important role in terms of providing linkages between Namibia and the rest of South Africa. The Orange River, which is South Africa's largest river, is a significant feature and is also the main source of water in the province, while also constituting the international border between South Africa and Namibia.

The Northern Cape is rich in minerals including alluvial diamonds, iron ore, asbestos, manganese, fluorspar, semi-precious stones and marble. The mining sector in the province is the largest contributor of the provincial Gross Domestic Product (GDP) and of a great importance to South Africa as it produces ~37% of the country's diamonds, 44% of its zinc, 70% of its silver, 84% of its iron ore, 93% of its lead and 99% of its manganese.

The province has fertile agricultural land in the Orange River Valley, especially at Upington, Kakamas and Keimoes, where grapes and fruit are cultivated intensively. The interior Karoo relies on sheep farming, while the karakul-pelt industry is one of the most important in the Gordonia District of Upington. Wheat, fruit, peanuts, maize, and cotton are produced at the Vaalharts Irrigation Scheme near Warrenton. The agricultural sector employs approximately 19.5% of the total formally employed individuals. The sector is also experiencing significant growth in value-added activities, including game-farming, while food production and processing for the local and export markets is also growing significantly (PGDS, July 2011). Furthermore, approximately 96% of the land in the province is used for livestock and game farming, while only approximately 2% is used for crop farming, mainly under irrigation in the Orange River Valley and the Vaalharts Irrigation Scheme.

The Northern Cape offers unique tourism opportunities including wildlife conservation destinations, natural features, historic sites, festivals, cultural sites, star gazing, adventure tourism, agricultural tourism, ecotourism, game farms, and hunting areas, etc. The province is home to the Richtersveld Botanical and Landscape World Heritage Site, which comprises a United Nations Educational, Scientific and Cultural Organisation (UNESCO) World Heritage Site under the World Heritage Convention. The province also includes to two (2) Transfrontier National Parks, namely the Kgalagadi Transfrontier Park, and the Richtersveld /Ai-Ais Transfrontier Park, as well as five (5) national parks and six (6) provincial reserves. In addition, the province plays a significant role in South Africa's science and technology sector, as it is home to the Square Kilometre Array (SKA), the Southern African Large Telescope (SALT), and the Karoo Array Telescope (MeerKAT). In addition, the Augrabies National Park, a major tourist destination in the province is located 120km east of Upington near the town of Kakamas.

The capital city of the Northern Cape Province is Kimberley. Other important towns include Upington, Springbok, Kuruman and De Aar. The province is rich in minerals and has fertile agricultural land in the Orange River Valley. The interior Karoo relies on sheep farming, while the karakul-pelt industry is one of the most important in the Gordonia District of Upington. The Northern Cape Province comprises five district municipalities, namely, Francis Baard, John Taolo Gaetsewe, Namakwa, Pixley ka Seme, and ZF Mgcawu, which contain twenty-six local municipalities collectively (refer to **Figure 8.1**).

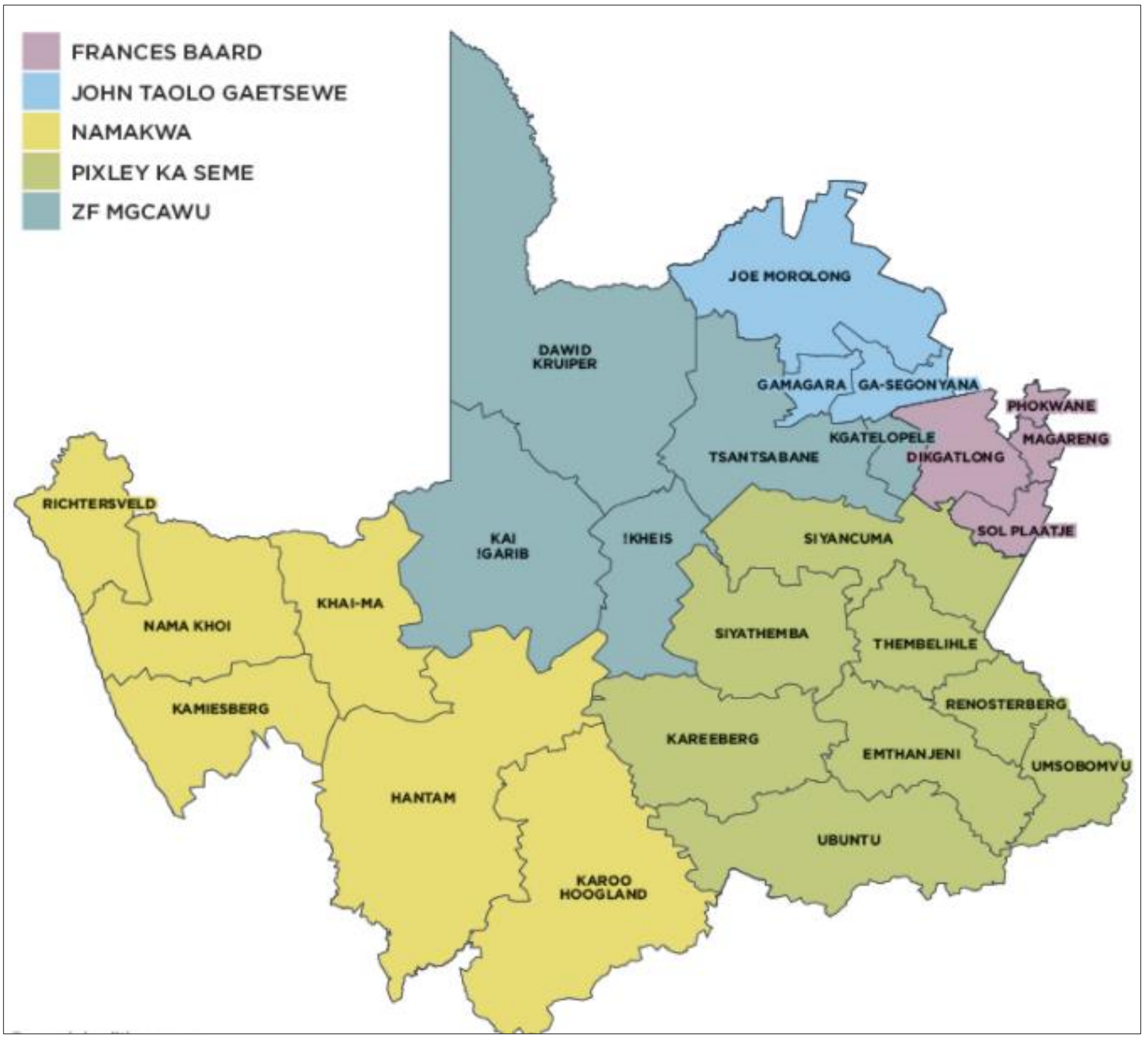


Figure 8.1: District municipalities of the Northern Cape Province (Source: Municipalities of South Africa).

The Pixley ka Seme District Municipality is a Category C municipality situated in the south-east of the Northern Cape Province. It shares it border with three other provinces, namely, the Free State to the east, the Eastern Cape to the south-east, and the Western Cape to the south-west. The Pixley ka Seme District Municipality covers an area of ~ 103 411km², making it the second-largest district of the five in the province. Two of the major dams in South Africa, the Vanderkloof and Gariep Dams, are situated on the borders of the district municipality. The Pixley ka Seme District Municipality comprises eight local municipalities, namely, Ubuntu, Umsobomvu, Emthanjeni, Kareeberg, Renosterberg, Thembelihle, Siyathemba and Siyancum (refer to **Figure 8.2**). Its main town is De Aar. According to StatsSA 2011 and the Community Survey 2016, the Pixley ka Seme District Municipality's population sits at 195 595. The main economic sectors in the Pixley ka Seme District Municipality are community services (26.6%), agriculture (16.6%), transport (15.1%), trade (12.9%), finance (12.8%), electricity (7.0%), construction (3.3%), manufacturing (3.2%), and mining (2.6%).

Figure 8.2: Local Municipalities of the Pixley Ka Seme District Municipality (Source: Municipalities of South Africa)

The broader project site for the establishment of the Merino Wind Farm and associated infrastructure is located within the Ubuntu Local Municipality. The Ubuntu Local Municipality is a Category B municipality within the Pixley Ka Seme District in the Northern Cape Province. It is bordered by Kareeberg and Emthanjeni in the north, the Western Cape and Eastern Cape Provinces in the south, the Eastern Cape in the east, and the Namakwa District in the west. The Ubuntu Local Municipality covers an area of ~ 20 393km², making it the largest of the eight local municipalities that make up the district. Cities and/or towns within the municipality include Hutchinson, Loxton, Richmond and Victoria West. The agricultural sector is the main economic sector in the Ubuntu Local Municipality. According to census 2011, the population of the Ubuntu Local Municipality grew from 16 375 in 2001 to 18 601 in 2001, indicating an annual population growth rate of 1.6%.

Areas surrounding the project site are generally sparsely populated, with the highest concentration of people living in the town of Richmond (5 122). The project site and the areas surrounding the site consist of a landscape that can be described as remote due to its considerable distance from any major metropolitan centres or populated areas. The scarcity of water and other natural resources has influenced settlement within this region, keeping numbers low, and distribution limited to the availability of water. Settlements, where they occur, are usually rural homesteads or farm dwellings.

The project site is situated directly adjacent to the N1 national road. The R398 and R63 are located to the north-east and south-west of the project site, respectively. The gravel main access road located to the north-east of the project site provides direct access to the project site and the development area and will used to access the project site and development area during the project lifecycle.

8.3. Climatic Conditions

The region within which the project site is located is relatively dry. Rainfall occurs mainly in Summer and Autumn, peaking in March, with a Mean Annual Precipitation (MAP) ranging from 180 to 430mm (from west to east respectively). The area is characterised by a high frost occurrence rate ranging from just below 30 to 80 days per year. The mean minimum and maximum temperatures in the area are -7.2℃ and 36.1 ℃ for July and January, respectively (also see **Figure 8.3** for more information).

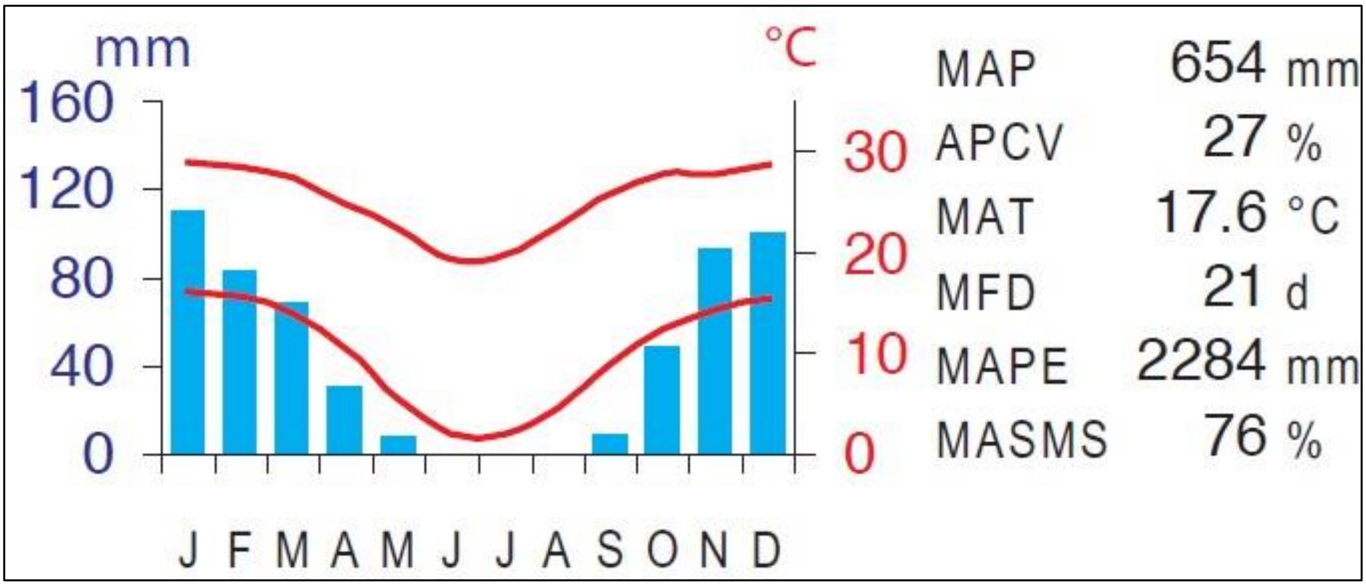


Figure 8.3: Climatic graph for Richmond area, Northern Cape within which the proposed project site is located

8.4. Biophysical Characteristics of the Project Site

The following section provides an overview and description of the biophysical characteristics of the study area and has been informed by specialist studies (**Appendix D-M**) undertaken for this EIA Report.

8.4.1. Topographical profile

The project site occurs on land that ranges in elevation from approximately 1 170m (in the south-western corner of the study area) to 1 830m (at the top of the mountains to the east). The terrain surrounding the site is predominantly flat to the north and south, with a ridge traversing the centre pf the site from the east to the west. The proposed development area itself is located at an average elevation of 1 389m above sea level. The overall terrain morphological description of the project site is described as *undulating plains* (lowlands), with *ridges*, *hills* and *mountains*. These hills and mountains are often referred to as *inselbergs* (island mountains) due to their isolated nature, or *mesas* (table mountains) due to their flat-topped summits.

The scope percentage of the development area has been calculated and most of the development area is characterised by a slope percentage between 0 and 20%, with some smaller patches within the development area characterised by a slope percentage in excess of 82% (refer to **Figure 8.4**).

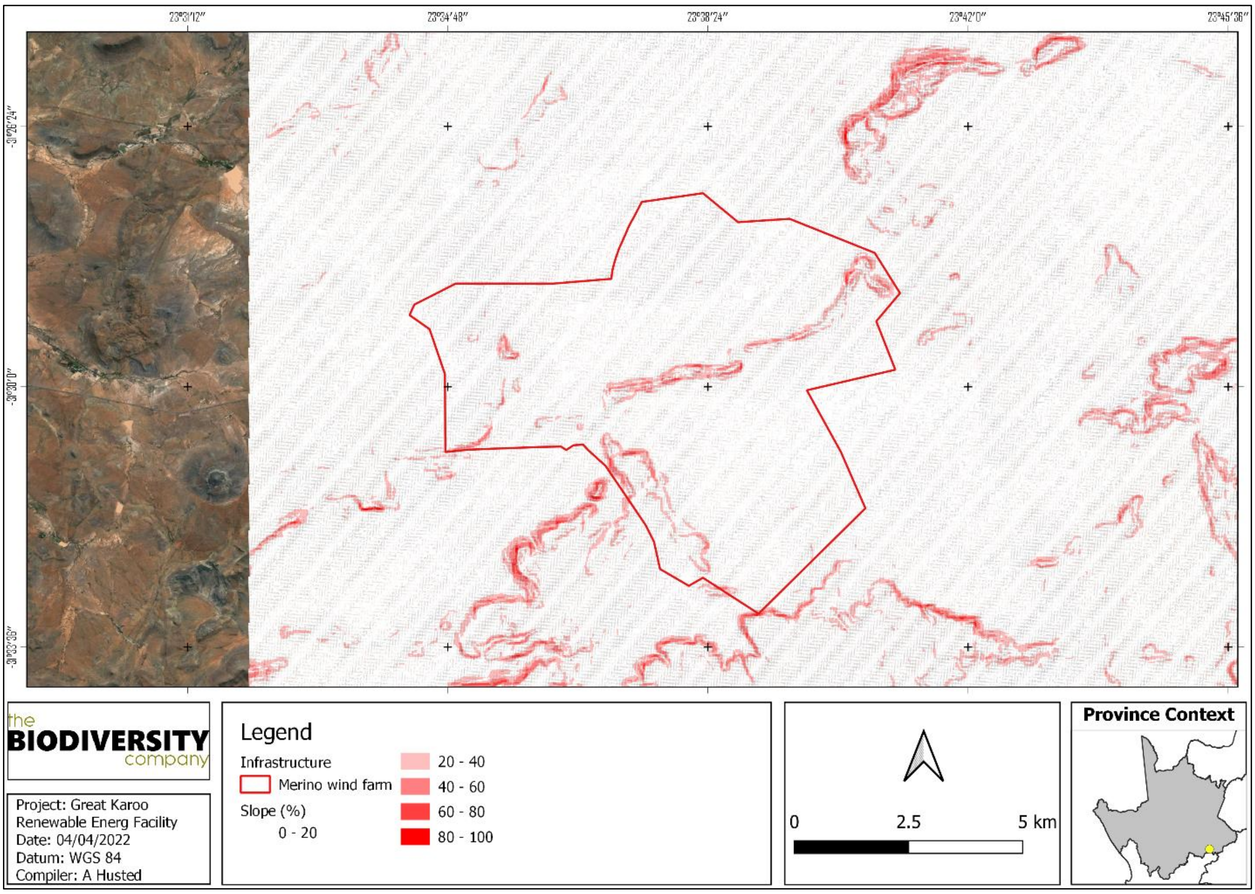


Figure 8.4: Slope percentage calculated for the development area within which the Merino Wind Farm is proposed

8.4.2. Geology, Soils and Agricultural Potential

Geological Setting of the Development Area

The geology of the project site is characterised by sandstones and mudstones from the Beaufort Group (including the Tarkastad and Adelaide Subgroups), which supports pedocutanic and prismacutanic diagnostic horizons. The geology of the proposed Merino Wind Farm is indicated in **Figure 8.5** below.

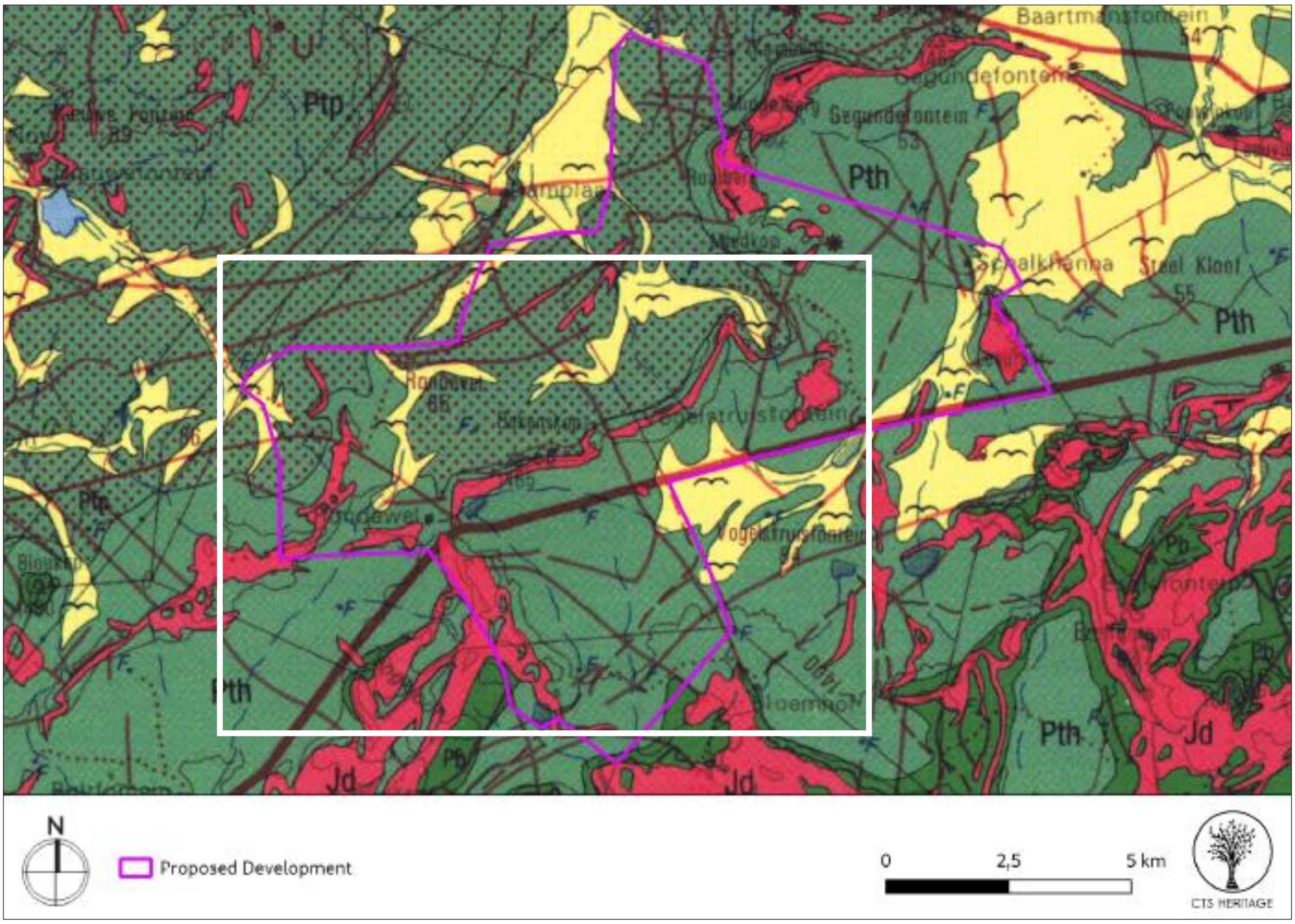


Figure 8.5: Extract from the CGS 3122 Victoria West Map indicating that the development area for the Merino Wind Farm (indicated on the map with the white block) is underlain by sediments of Ptp: Poortjie Member and Pth: Hoedemaker Member of the Teekloof Formation of the Adelaide Subgroup and Jd: Jurassic Dolerite as well as Quaternary Sands

Land Type, Soil Forms, Land Capability/ Agricultural Potential of the Development Area

Land Type

According to the land type database (Land Type Survey Staff, 1972 - 2006), the development area is characterised by the Da 76, Da 147, Fc 131, Fb 488, Ib 125, Fb 126 and Fb 397 land types (refer to **Figure 8.6**). The Da land type is characterised by prismacutanic and/or pedocutanic horizons with the possibility of red apedal B-horizons occurring.

The Fb land type consists of Glenrosa and/or Mispah soil forms with the possibility of other soils occurring throughout. Lime is generally present within the entire landscape. The Ib land type consists of miscellaneous land classes including rocky areas with miscellaneous soils. The Fc land type consists of Glenrosa and/or Mispah soil forms with the possibility of other soils occurring throughout. Lime is rare or absent within this land type in upland soils but generally present in low-lying areas.

Even though the soil depth, texture and permeability of various soil forms expected throughout the development area ensure high land capability, the climatic capability of the area often reduces the land potential considerably. Therefore, very few areas characterised by "High" land potential are expected.

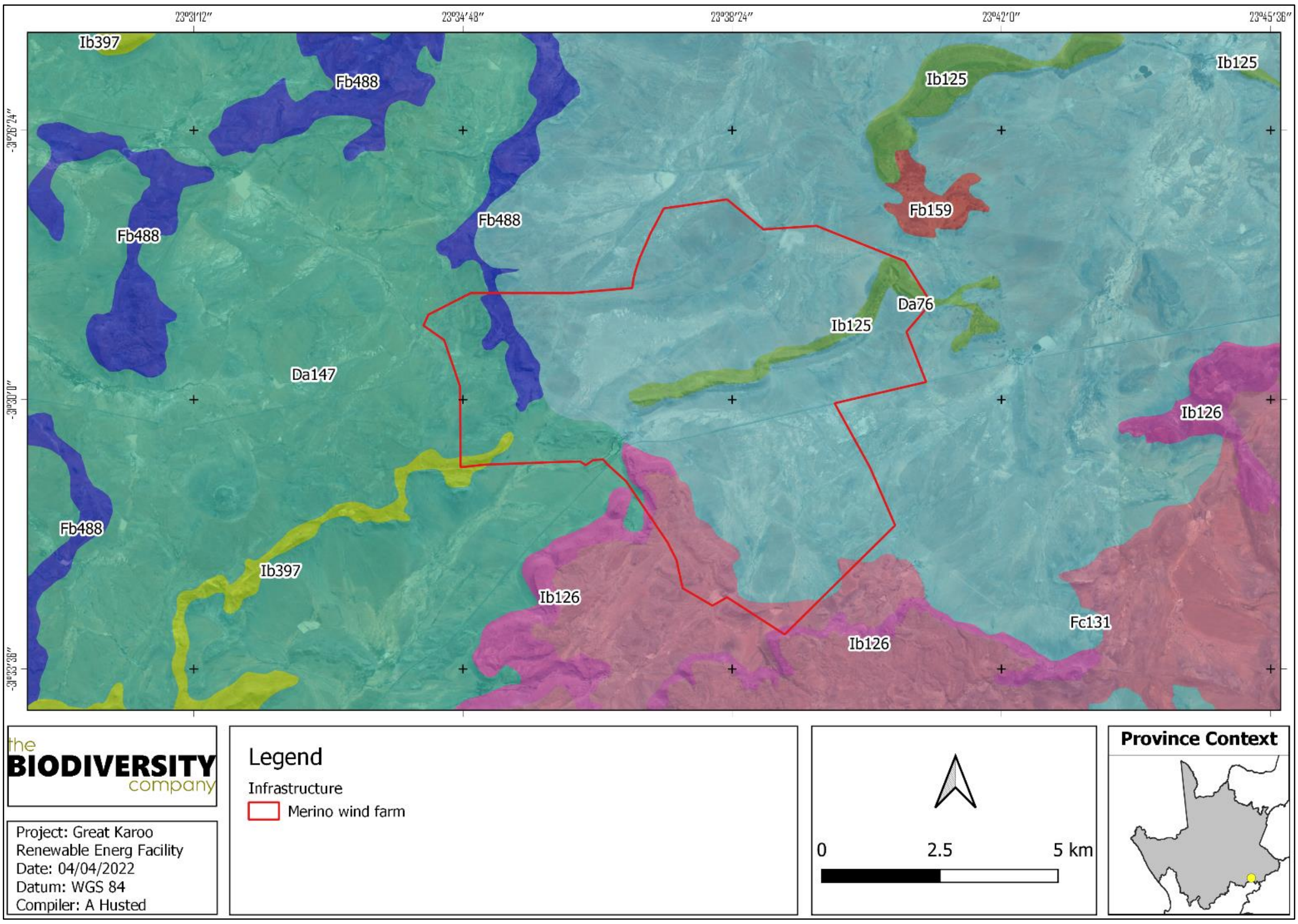


Figure 8.6: Land types present within the development area for the Merino Wind Farm

Soil Forms

Various soil forms were identified throughout the development area. The most sensitive soil forms include the Tubatse, Oakleaf and Bethesda soil forms. These soil forms are characterised by an orthic topsoil on top of a neocutanic horizon. The Tubatse and Bethesda soil forms are characterised by a lithic and hard rock horizon underneath the neocutanic horizons respectively with the Oakleaf being characterised by a deep neocutanic horizon.

Orthic topsoils are mineral horizons that have been exposed to biological activities and varying intensities of mineral weathering. The climatic conditions and parent material ensure a wide range of properties differing from one orthic topsoil to another (i.e. colouration, structure etc) (Soil Classification Working Group, 2018).

The neocutanic horizon is associated with recent depositions and unconsolidated soils. Any soil form can develop out of a neocutanic horizon, depending on the climatic and topographical conditions). Some properties pertaining to other diagnostic soil horizons will be present within a Neocutanic horizon but will lack main properties necessary to classify the relevant soil type (Soil Classification Working Group, 2018).

For the Lithocutanic horizon, *in situ* weathering of rock underneath topsoil results in a well-mixed soil-rock layer. The colour, structure and consistency of this material must be directly related to the parent material of the weathered rock. The Lithocutanic horizon is usually followed by a massive rock layer at shallow depths.

Hard rock, permeable rock and horizontally layered shale usually is not associated with the weathering processes involved with the formation of this diagnostic horizon. The hard rock layer disallows infiltration of water or root systems and occur in shallow profiles. Horizontally layered, hard sediments without evidence of vertical seems fall under this category.

Land Capability/Agricultural Potential

The above-mentioned soil forms have been determined to have a land capability class of "III" and a climate capability level 8 given the low Mean Annual Precipitation (MAP) and the high Mean Annual Potential Evapotranspiration (MAPE) rates. The combination between the determined land capabilities and climate capabilities results in a land potential "L6". The "L6" land potential level is characterised by very restricted potential. Regular and/or severe limitations are expected due to soil, slope, temperatures or rainfall. This land potential is regarded as non-arable.

Fifteen land capabilities have been digitised by DAFF (2017) across South Africa, of which eight potential land capability classes are located within the proposed footprint area's assessment area, including:

» Land Capability 1 to 5 (Very Low to Low); and
» Land Capability 6 to 8 (Low/Moderate to Moderate Sensitivity.

The baseline findings and the sensitivities as per the Department of Agriculture, Forestry and Fisheries (DAFF, 2017) national raster file concur with one another. It therefore is the specialist's opinion that the land capability and land potential of the resources in the regulated area is characterised by a maximum of "Moderate" sensitivities (refer to **Figure 8.7**), which conforms to the requirements of an agricultural compliance statement only. It is worth noting that various high sensitivity crop boundaries were identified by means of the DFFE Screening tool (2021). These areas represent high sensitivity agricultural land use rather than high sensitivity soil resources.

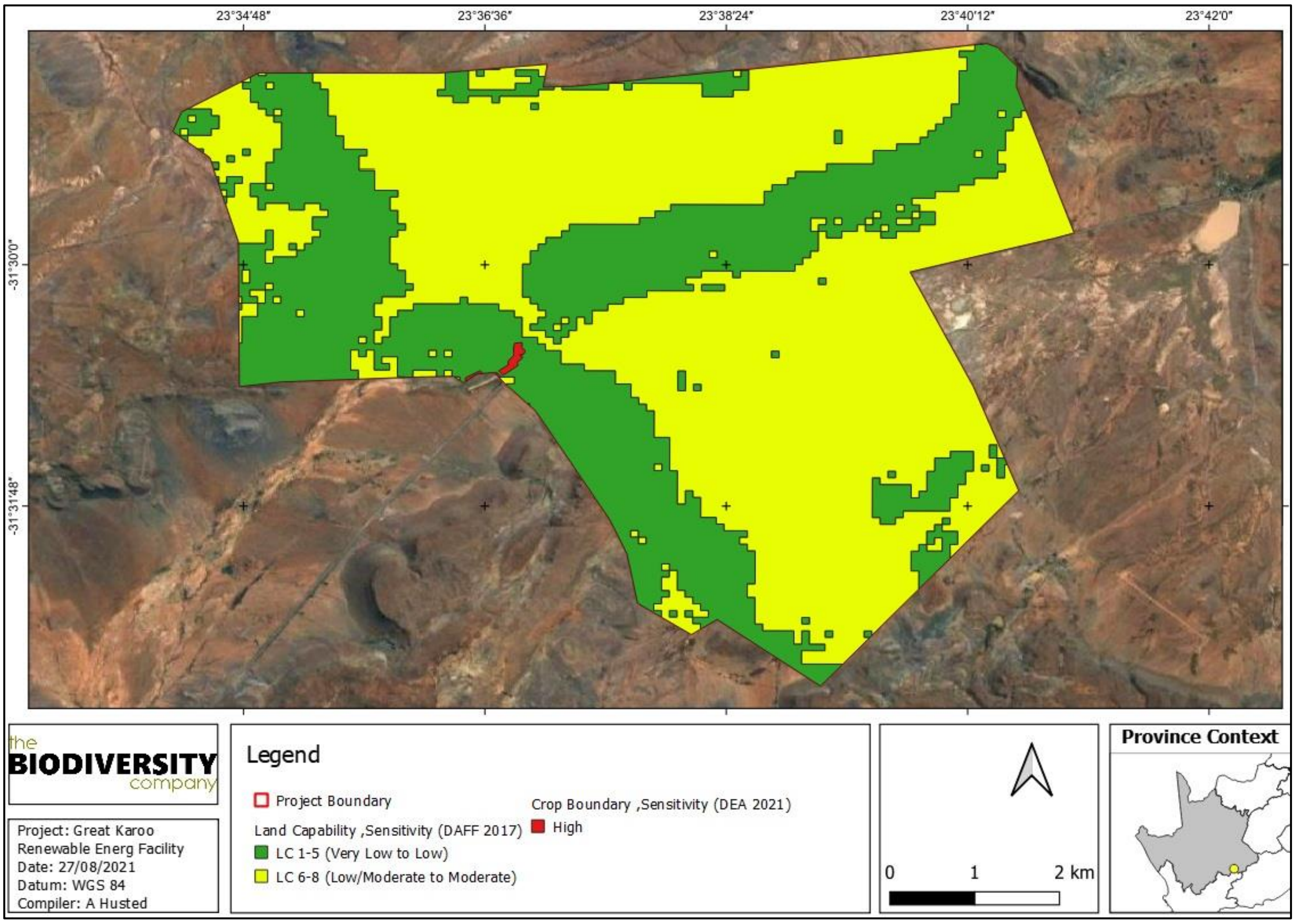


Figure 8.7: Land capability sensitivity of the development area for the Merino Wind Farm

8.4.3. Land Use

The predominant land use in the area is stock farming (predominantly sheep, game, or goat farming). Since rainfall is low and water is scarce, crop farming accounts for only a small portion of the land use and is largely confined to the more fertile floodplain valleys. Due to the low carrying capacity, farms are large and usually at least about 5km apart.

There are no designated protected areas within the region and no major tourist attractions, or destinations were identified within the project site. There are however two overnight facilities, namely the Bloemhof Karoo Farmstay and the Rondawel Guest Farm. The latter facility appears to be located on the farm identified for the Merino Wind Farm.

In spite of the rural and natural character of the area within which the project site is proposed, there are a large number of overhead power lines, all congregating at either the Gamma or Victoria Cap Substations. These include, Droërivier/Hydra 1, 2 & 3 400kV; Gamma/Hydra 1 765kV; and Gamma/Perseus 1 765kV. These power lines traverse the north-western boundary of the proposed development area. Additional power lines to the north-west of the study area (at the Brakpoort Substation) include the Brakpoort/Hutchinson 1 132kV and Brakpoort/Laken 1 132kV lines.

8.4.4. Ecological Profile of the Broader Study Area and the Project Site

i. Broad-Scale Vegetation Patterns

The national vegetation map for the development area is depicted in **Figure 8.8**. The Merino Wind Farm is mapped as falling within two vegetation types, namely, the Eastern Upper Karoo, which occurs across most of the site, and the Upper Karoo Hardeveld, which is associated with low mountains. The vegetation types that occur within the development area are briefly described below.

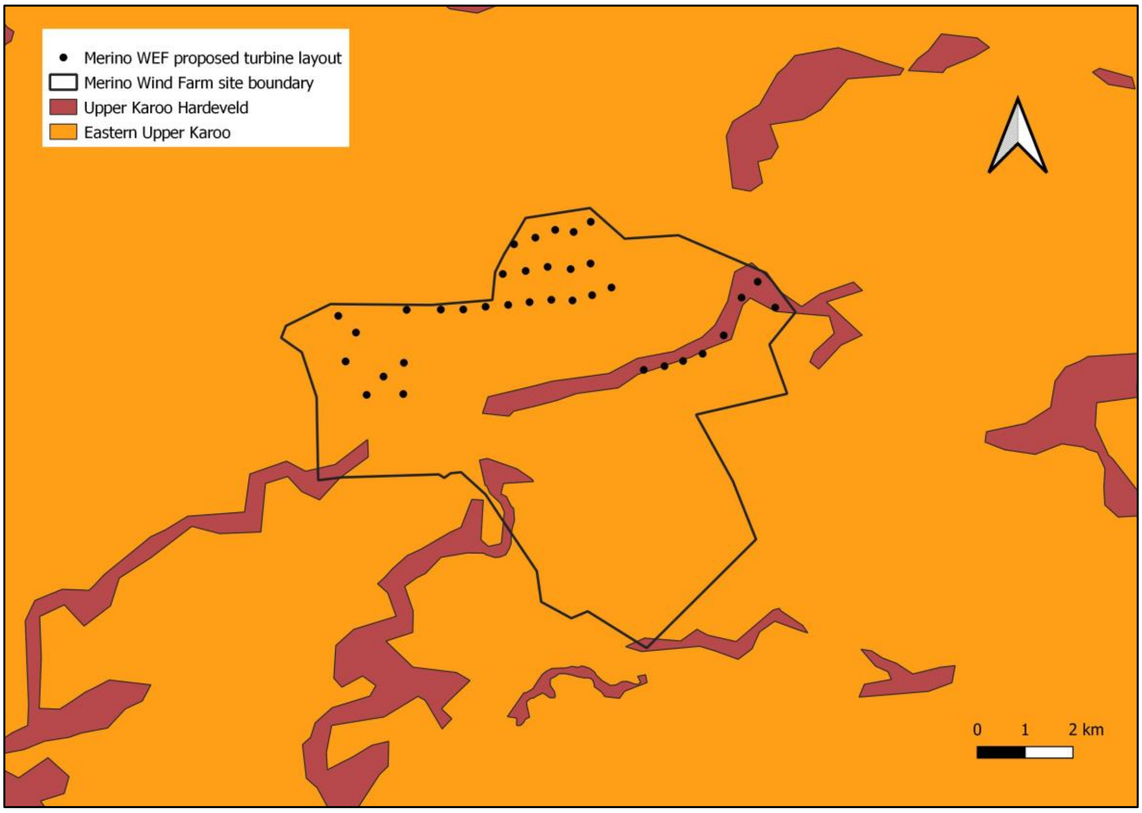


Figure 8.8: National vegetation map of the development area showing that the Merino Wind Farm) falls within the Eastern Upper Karoo and the Upper Karoo Hardeveld vegetation types.

Upper Karoo Hardeveld (NKu2)

Distribution:
Northern, Western and Eastern Cape Provinces: Discrete areas of slopes and ridges including dolerite dykes and sills in the region spanning Middelpos in the west and Strydenburg, Richmond and Nieu-Bethesda in the east. Most crest areas and steep slopes of the Great Escarpment facing south between Teekloofpas (connecting Leeu-Gamka and Fraserburg) and eastwards to Graaff-Reinet. Altitude varies mostly from 1 000–1 900m.

Vegetation and Landscape Features:
Steep slopes of koppies, butts, mesas and parts of the Great Escarpment covered with large boulders and stones supporting sparse dwarf Karoo scrub with drought-tolerant grasses of genera such as *Aristida, Eragrostis* and *Stipagrostis*.

Important Taxa:

- **Tall Shrubs:** *Lycium cinereum* (d), *Rhigozum obovatum* (d), *Cadaba aphylla*, *Diospyros austro-africana*, *Ehretia rigida* subsp. *rigida*, *Lycium oxycarpum*, *Melianthus comosus*, *Rhus burchellii*.
- **Low Shrubs**: *Chrysocoma ciliata* (d), *Eriocephalus ericoides* subsp. *ericoides* (d), *Euryops lateriflorus* (d), *Felicia muricata* (d), *Limeum aethiopicum* (d), *Pteronia glauca* (d), *Amphiglossa triflora*, *Aptosimum elongatum*, *A. spinescens*, *Asparagus mucronatus*, *A. retrofractus*, *A. striatus*, *A. suaveolens*, *Eriocephalus spinescens*, *Euryops annae*, *E. candollei, E. empetrifolium, E. nodosus, Felicia filifolia* subsp. *filifolia*, *Garuleum latifolium*, *Helichrysum lucilioides*, *H. zeyheri*, *Hermannia filifolia* var. *filifolia*, *H. multiflora*, *H. pulchella*, *H. vestita*, *Indigofera sessilifolia*, *Jamesbrittenia atropurpurea*, *Lessertia frutescens*, *Melolobium candicans*, *M. microphyllum*, *Microloma armatum*, *Monechma incanum*, *Nenax microphylla*, *Pegolettia retrofracta*, *Pelargonium abrotanifolium*, *P. ramosissimum*, *Pentzia globosa*, *P. spinescens*, *Plinthus karooicus*, *Polygala seminuda*, *Pteronia adenocarpa*, *P. sordida*, *Rosenia humilis*, *Selago albida*, *Solanum capense*, *Sutera halimifolia*, *Tetragonia arbuscula*, *Wahlenbergia tenella*.
- **Succulent Shrubs:** *Aloe broomii*, *Drosanthemum lique*, *Faucaria bosscheana*, *Kleinia longiflora*, *Pachypodium succulentum*, *Trichodiadema barbatum*, *Zygophyllum flexuosum*.
- **Semiparasitic Shrub**: *Thesium lineatum* (d). Herbs: *Troglophyton capillaceum* subsp. *capillaceum*, *Dianthus caespitosus* subsp. *caespitosus*, *Gazania krebsiana*, *Lepidium africanum* subsp. *africanum*, *Leysera tenella*, *Pelargonium minimum*, *Sutera pinnatifida*, *Tribulus terrestris*.
- **Geophytic Herbs:** *Albuca setosa*, *Androcymbium albomarginatum*, *Asplenium cordatum*, *Boophone disticha*, *Cheilanthes bergiana*, *Drimia intricata*, *Oxalis depressa*, Graminoids: *Aristida adscensionis* (d), *A. congesta* (d), *A. diffusa* (d), *Cenchrus ciliaris* (d), *Enneapogon desvauxii* (d), *Eragrostis lehmanniana* (d), *E. obtusa* (d), *Sporobolus fimbriatus* (d), *Stipagrostis obtusa* (d), *Cynodon incompletus*, *Digitaria eriantha*, *Ehrharta calycina*, *Enneapogon scaber*, *E. scoparius*, *Eragrostis curvula*, *E. nindensis, E. procumbens*, *Fingerhuthia africana*, *Heteropogon contortus*, *Merxmuellera disticha*, *Stipagrostis ciliata*, *Themeda triandra*, *Tragus berteronianus*, *T. koelerioides*.

Endemic Taxa:

- **Succulent Shrubs**: *Aloe chlorantha*, *Crassula barbata* subsp. *broomii*, *Delosperma robustum, Sceletium expansum*, *Stomatium suaveolens*.
- **Low Shrubs**: *Cineraria polycephala*, *Euryops petraeus*, *Lotononis azureoides*, *Selago magnakarooica*.
- **Tall Shrub**: *Anisodontea malvastroides*.
- **Herbs**: *Cineraria arctotidea*, *Vellereophyton niveum*. **Succulent Herbs**: *Adromischus fallax*, *A. humilis*.
- **Geophytic Herbs**: *Gethyllis longistyla*, *Lachenalia auriolae, Ornithogalum paucifolium* subsp. *karooparkense*.

Eastern Upper Karoo (NKu4)

Distribution:

Northern Cape, Eastern Cape and Western Cape Provinces: Between Carnarvon and Loxton in the west, De Aar, Petrusville and Venterstad in the north, Burgersdorp, Hofmeyr and Cradock in the east and the Great Escarpment and the Sneeuberge-Coetzeesberge mountain chain in the south. Altitude varies between mostly 1 000–1 700 m.

Vegetation and Landscape Features:

Flats and gently sloping plains (interspersed with hills and rocky areas of Upper Karoo Hardeveld in the west, Besemkaree Koppies Shrubland in the northeast and Tarkastad Montane Shrubland in the southeast), dominated by dwarf microphyllous shrubs, with 'white' grasses of the genera *Aristida* and *Eragrostis* (these become prominent especially in the early autumn months after good summer rains). The grass cover increases along a gradient from southwest to northeast.

<u>Important Taxa:</u>

- **Tall Shrubs**: *Lycium cinereum* (d), *L. horridum*, *L. oxycarpum*.
- **Low Shrubs**: *Chrysocoma ciliata* (d), *Eriocephalus ericoides* subsp. *ericoides* (d), *E. spinescens* (d), *Pentzia globosa* (d), *P. incana* (d), *Phymaspermum parvifolium* (d), *Salsola calluna* (d), *Aptosimum procumbens*, *Felicia muricata*, *Gnidia polycephala*, *Helichrysum dregeanum*, *H. lucilioides*, *Limeum aethiopicum*, *Nenax microphylla*, *Osteospermum leptolobum*, *Plinthus karooicus*, *Pteronia glauca*, *Rosenia humilis*, *Selago geniculata*, *S. saxatilis*.
- **Succulent Shrubs**: *Euphorbia hypogaea*, *Ruschia intricata*.
- **Herbs**: *Indigofera alternans*, *Pelargonium minimum*, *Tribulus terrestris*.
- **Geophytic Herbs**: *Moraea pallida* (d), *Moraea polystachya*, *Syringodea bifucata*, *S. concolor*.
- **Succulent Herbs**: *Psilocaulon coriarium*, *Tridentea jucunda, T. virescens.*
- **Graminoids**: *Aristida congesta* (d), *A. diffusa* (d), *Cynodon incompletus* (d), *Eragrostis bergiana* (d), *E. bicolor* (d), *E. lehmanniana* (d), *E. obtusa* (d), *Sporobolus fimbriatus* (d), *Stipagrostis ciliata* (d), *Tragus koelerioides* (d), *Aristida adscensionis*, *Chloris virgata*, *Cyperus usitatus*, *Digitaria eriantha*, *Enneapogon desvauxii*, *E. scoparius*, *Eragrostis curvula*, *Fingerhuthia africana*, *Heteropogon contortus*, *Sporobolus ludwigii*, *S. tenellus*, *Stipagrostis obtusa*, *Themeda triandra*, *Tragus berteronianus*.

<u>Endemic Taxa:</u>

- **Succulent Shrubs:** *Chasmatophyllum rouxii*, *Hertia cluytiifolia*, *Rabiea albinota*, *Salsola tetrandra*.
- **Tall Shrub:** *Phymaspermum scoparium*.
- **Low Shrubs:** *Aspalathus acicularis* subsp. *planifolia*, *Selago persimilis*, *S. walpersii*.

<u>ii. Conservation Status of Broad Vegetation Types</u>

On the basis of a scientific approach used at national level by the South African National Biodiversity Institute (SANBI), vegetation types can be categorised according to their conservation status which is, in turn, assessed according to the degree of transformation relative to the expected extent of each vegetation type. The status of a habitat or vegetation type is based on how much of its original area still remains intact relative to various thresholds. On a national scale the thresholds are as depicted in **Table 8.1** below, as determined by best available scientific approaches. The level at which an ecosystem becomes Critically Endangered differs from one ecosystem to another and varies from 16% to 36%.

Table 8.1: Conservation status of different vegetation types occurring in the project site

Vegetation Type	Target (%)	Conserved (%)	Transformed (%)	Conservation status	
				Driver *et al.* 2005; Mucina *et al.*, 2006	**National Ecosystem List (NEM:BA)**
Eastern Upper Karoo	21	0.7	2	Least Threatened	Not listed
Upper Karoo Hardeveld	21	2.9	<1	Least Threatened	Not listed

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

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

According to scientific literature (Driver *et al.*, 2005; Mucina *et al.*, 2006), as shown in **Table 8.1**, both vegetation types are listed as Least Threatened.

The National List of Ecosystems that are Threatened and in need of protection (GN1002 of 2011), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004), lists national vegetation types that are afforded protection on the basis of rates of transformation. The thresholds for listing in this legislation are higher than in the scientific literature, which means there are fewer ecosystems listed in the National Ecosystem List versus in scientific literature.

Neither vegetation types are listed in the National List of Ecosystems that are Threatened and in need of protection (GN1002 of 2011).

iii. Habitats on Site

Six habitat types were identified within the development area for the Merino Wind Farm (refer to **Figure 8.9**), namely, karroid plains, mountain slopes, drainage areas, drainage scrub, and open water and no natural habitat. These are discussed in detail below.

Karroid Plains

The plains on the lowlands have gently undulating topography. They are found between the hills throughout the site. The vegetation in these areas is mostly a dwarf karroid shrubland. These areas have been moderately to heavily grazed throughout the study area.

Mountain Slopes

The site is characterised by the presence of a range of hills that form a mini-escarpment parallel to the national road. The topography within these areas is relatively steep and rugged. There are also various low hills and the free-standing Bloukop inland of the mini escarpment. The vegetation in these areas is a grassy dwarf karroid shrubland.

Drainage Areas

In the lowest parts of the plains, often in wide bands, are areas that are shaped by fluvial processes and are either channelled in places or eroded from water movement. The soils are mostly deep sands where they have not been eroded away. The vegetation is a karroid dwarf shrubland or a sparse weedy community in eroded areas.

Drainage Scrub

This forms part of the drainage areas but has been mapped as a separate unit due to the clearly different vegetation structure and composition. The vegetation is a scrub or shrubland with shrubs up to 3m high in places. The vegetation is relatively dense, and the soils are deep and sandy. It constitutes and important refuge for wildlife, both in terms of the dense vegetation cover as well as the deep sands which are ideal for burrowing animals. Although considered unlikely that it would occur on site, this is the habitat that most closely matches the habitat requirements of the Critically Endangered Riverine Rabbit.

Open Water

There are a number of farm dams on site. These are all man-made, but they nevertheless constitute an important water resource for wildlife. There is a possibility that the Protected Giant Bullfrog occurs in the general area, in which case these areas of open water may constitute important habitat for them.

No natural habitat

All areas where natural habitat has been lost have been included in this map unit. This includes farmhouses, roads, cultivated areas, previously cultivated areas, quarries, and other disturbed areas.

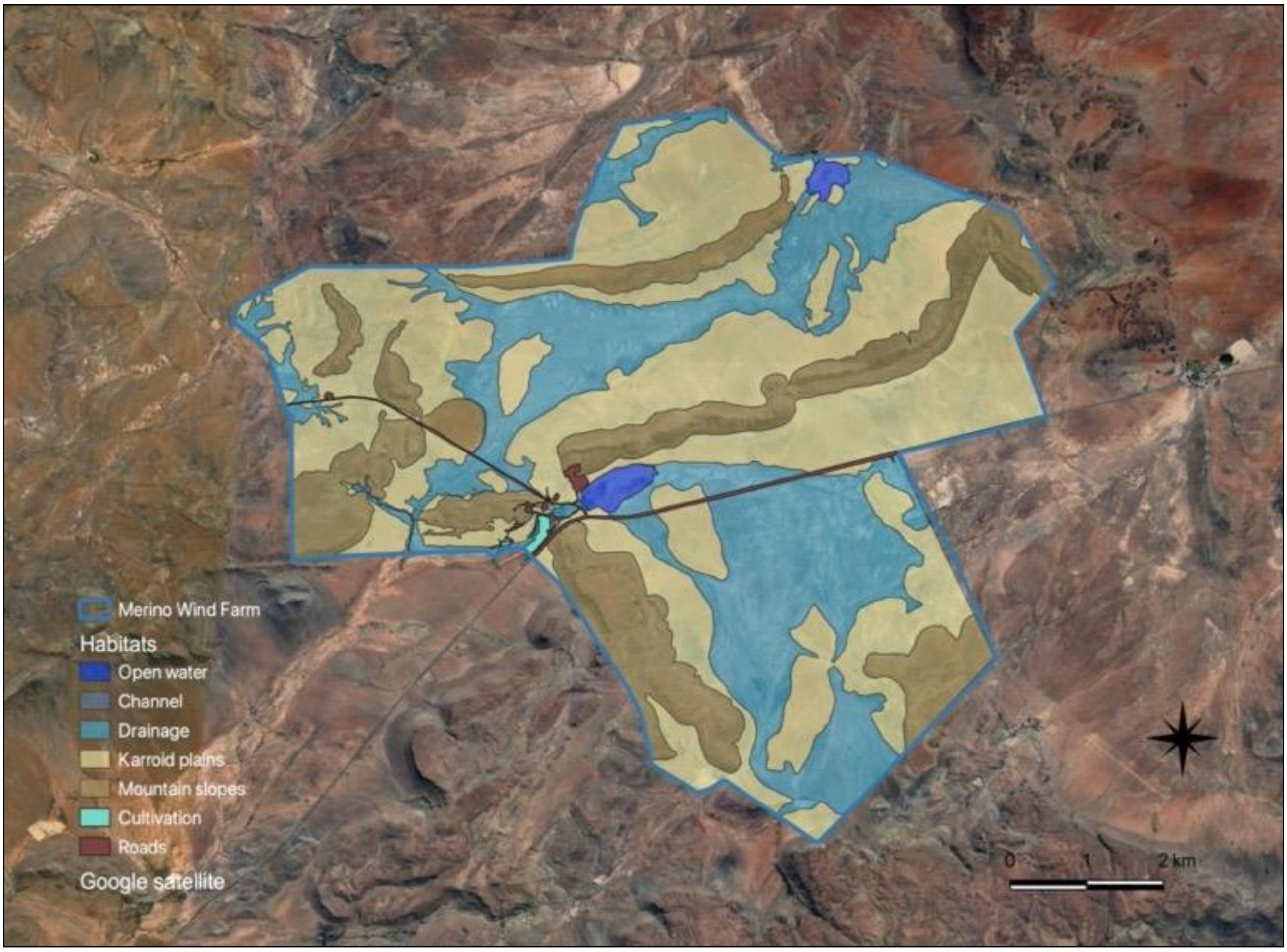


Figure 8.9: Habitats identified within the development area for the Merino Wind Farm

iv. Protected Areas and Proposed Protected Areas

According to an online database hosted by the DFFE (South African Protected, Conservation and Marine Protected Areas Data), there are no protected areas on site or in the near vicinity. The nearest protected area is more than 50km away.

According to the National Protected Areas Expansion Strategy (NPAES), there are no areas within the development area that have been identified as priority areas for inclusion in future protected areas. The project site is therefore outside the NPAES focus area. There are many areas outside of the development area, to the north, south, east and west that are included as being part of future protected areas, but not within or adjacent to the site itself.

v. Listed Plant Species

There are three species listed as Rare that are considered to occur within the geographical area under consideration and could potentially occur on site, namely, *Anisodontea malavastroides, Aloe broomii* var. *tarkaensis* and *Tridentea virescens* (refer to **Table 8.2**). These are all species with wide geographical distributions, but which are rarely encountered. None of these species are considered to be threatened and none were observed on site.

Table 8.2: Plant species of conservation importance (Threatened, Near Threatened and Declining) that have historically been recorded in the study area

Family	Taxon	Status	Habitat	Likelihood of occurrence on site
Apocynaceae	*Tridentea virescens*	RARE	Warmbad in southern Namibia to Kakamas and Prieska in the Nortern Cape stretching east to Prince Albert and Aberdeen. Stony ground, or hard loam in floodplains.	**MEDIUM**
Malvaceae	*Anisodontea malavastroides*	RARE	This species is endemic to the mountains of the Great Karoo, where it occurs in the Nuweveld and Sneeuberg mountains between Beaufort West and Middelburg. It occurs in arid grassland on summit plateaus and escarpments.	**MEDIUM**
Asphodelaceae	*Aloe broomii* var. *tarkaensis*	LC	Tarkastad, Middelburg and Graaff-Reinet districts, possibly also in the Victoria West district. Low, stony ridges.	**MEDIUM**

vi. Plants Protected in terms of the National Environmental Management: Biodiversity Act and the Northern Cape Conservation Act

No plant species protected under the National Environmental Management: Biodiversity Act (No. 10 of 2004) were identified on site. However, several have a geographical distribution that includes the project site. Numerous plant species protected under the Northern Cape Nature Conservation Act (No. 9 of 2009) were identified on site. Despite not being threatened, any impacts on these species will require a permit from the relevant authority. There is a possibility that there may be additional protected plant species present on site that were not detected during the field survey. A comprehensive walk-through survey of the final footprint is required to compile a complete list of these protected species.

vii. Plant Species Flagged for the Study Area

According to the National Web-Based Environmental screening tool, 2 plant species have been flagged as of concern for the area the current project is in, these are listed below. A description of each species is provided.

Hereroa concava (Aizoaceae)

Vulnerable B1ab(iii)

Due to taxonomic uncertainty, this species' distribution range is not well known. It appears to be endemic to a small area in the Great Karoo between Beaufort West, Richmond and De Aar. It is known to occur in Eastern Upper Karoo and Upper Karoo Hardeveld vegetation types. Plants occur sheltered among shrubs on flats and plateaus with shale outcrops. There are very few records of this species, and these known records are scattered over a wide area. Herbarium collections, where the identity is confirmed, indicate that it is common in the Karoo National Park. Its abundance elsewhere is not well known. Known records from iNaturalist include the plains above the mountains north of Beaufort West, and a hilltop north of Hanover. The study site is almost exactly half way between these two locations and habitat on site fits the description of locations where this species has been previously recorded. There are two records of *Hereroa* species on site that have only been identified to genus level. Based on the distribution of known taxa, it is highly likely that they are *Hereroa concava*. It is therefore assumed that it probably occurs on site, and that rocky hills are the most likely habitat on site.

Sensitive species 945

A Near Threatened geophyte known from the summits of rocky dolerite ridges in the Nama Karoo. It is endemic to the karoo, occurring in the Sneeuberg, Agter-Sneeuberg and Nuweveld Mountains, extending inland to the area between Hanover and Beaufort West, broadly following the N1 road. There is a known photographic observation within the broad renewable energy cluster assessed for this overall project, which is near to the current Merino Wind Farm project. It is likely, based on the habitat requirements and distribution, that the species occurs on site, and that rocky hills are the most likely habitat on site.

Additional listed plant species for the study area

A database search identifies a number of additional listed plant species that could possibly occur on site that are not flagged in the Screening Tool output. This includes the following:

- Tridentia virescens (Apocynaceae) (Rare): Warmbad in southern Namibia to Kakamas and Prieska in the Nortern Cape stretching east to Prince Albert and Aberdeen. Stony ground, or hard loam in floodplains. It has a very wide geographical distribution but is rarely found. A relatively recent (2017) observation was made in the Doornkloof Nature Reserve north of Colesberg (www.ispotnature.org) and it was documented in 1957 from near Murraysburg in habitat similar to that found on site. There is therefore at least a moderate probability that it occurs on site.
- Anisodontea malvastroides (Rare): This species is endemic to the mountains of the Great Karoo, where it occurs in the Nuweveld and Sneeuberg mountains between Beaufort West and Middelburg in arid grassland on summit plateaus and escarpments. It has also been recorded on an inselberg-like outcrop north of Richmond. It could possibly occur on site, in which case it is likely to be found on the summit of prominent hills.
- Aloe broomii var tarkaensis (Rare) is found from Tarkastad and Middelburg to Graaff-Reinet in low stony ridges associated with the escarpment. The distribution of var. tarkaensis is to the south-east of the current site. Two observations of Aloe broomii were made on site, but both are from var. broomii and not var. tarkaensis. Aloe broomii var tarkaensis is therefore unlikely to occur on site.

viii. Plant Species Recorded in the Study Areas

A total of seventy-two (72) plant species were recorded during the field surveys (Appendix 2 of the Terrestrial Plant Species Compliance Statement) If other observation data is taken into account from other ad hoc surveys in the area, then there are close to 200 plant species that are known to occur in the direct study area and nearly 470 that are known from the general area that includes the site. This is relatively diverse for an arid environment.

ix. Trees Protected in Terms of the National Forests Act

There is a single tree species protected under the National Forests Act (No. 84 of 1998) that is known to have a geographical distribution within the project site, namely, *Boscia albitrunca* (Shepherd's Tree / Witgatboom), which occurs in semi-desert areas and bushveld, often on termitaria, but is common on sandy to loamy soils and calcrete soils.

x. Critical Biodiversity Areas

An extract of the 2016 Northern Cape Critical Biodiversity Area Map for the study area is illustrated below (**Figure 8.10**). This biodiversity assessment identifies Critical Biodiversity Areas (CBAs) which represent biodiversity priority areas which should be maintained in a natural to near natural state. The CBA maps indicate the most efficient selection and classification of land portions requiring safeguarding in order to maintain ecosystem functioning and meet national biodiversity objectives.

The development area for the Merino Wind Farm overlaps with a CBA One (CBA 1), Other Natural Areas (ONA) and an Ecological Support Area (ESA).

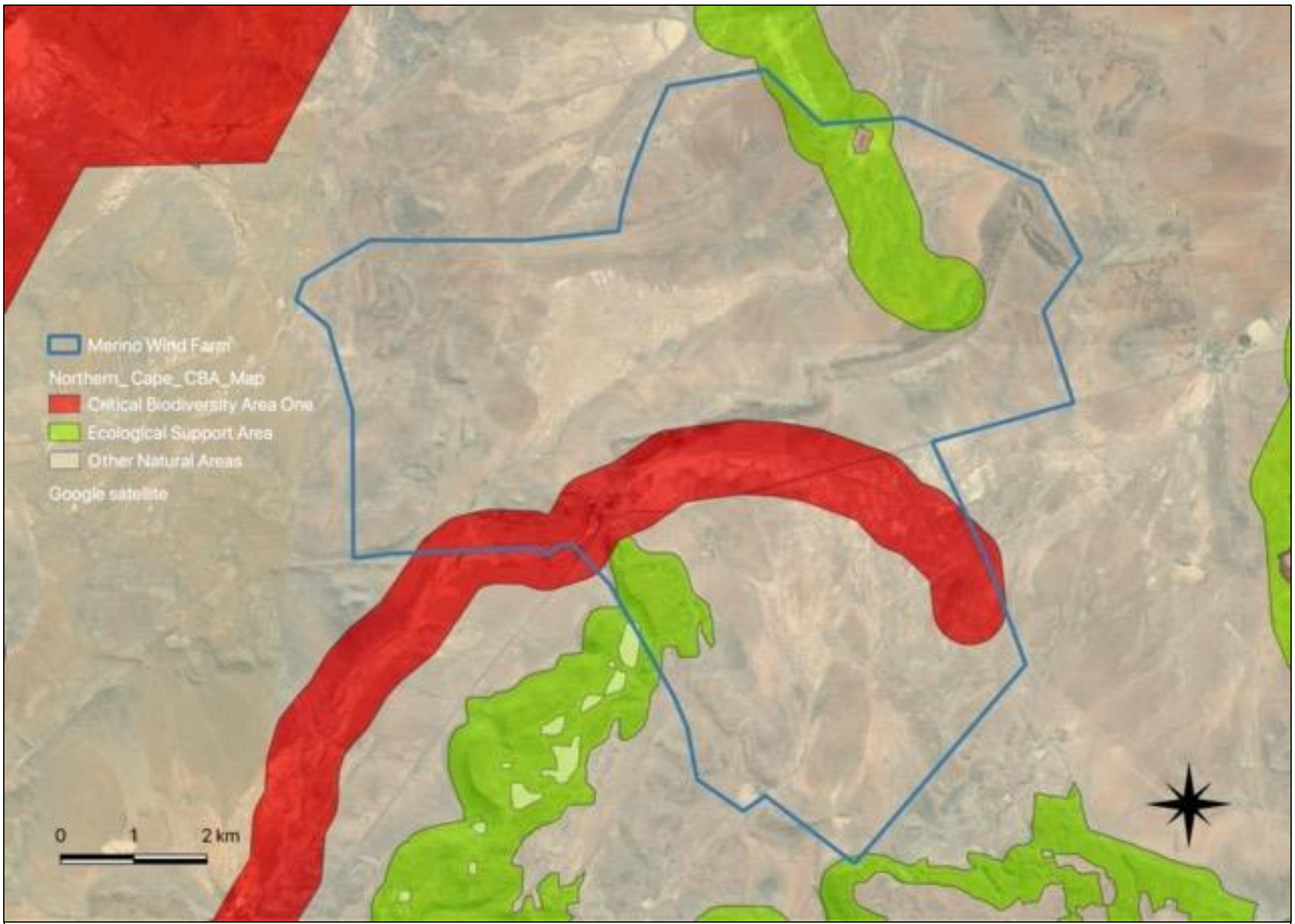


Figure 8.10: Critical Biodiversity Areas (CBAs), as per the 2016 Northern Cape Critical Biodiversity Area Map, located within the Merino Wind Farm development area

xi. Wetlands and Freshwater Resources

Delineated Systems

Freshwater systems were delineated in accordance with the DWAF (2005) guidelines. Vegetation is used as the primary wetland indicator. However, whilst wetland vegetation is adapted to life in saturated soil under normal circumstances, such features are not always present in arid to semi-arid environments such as the Northern Cape (based on experience within the region) due to the typically arid conditions of the region. Therefore, additional indicators, as provided by Day *et al* (2010) were utilised.

Based on a combination of desktop and in-field delineation, three (3) forms of a watercourse were identified and delineated within the 500m regulated area applied (refer to **Figure 8.11**). These include episodic rivers, drainage lines and dams. No natural wetland systems, or even cryptic wetlands were identified within the development area. Episodic river refers to systems formed from run-off channels in very dry regions. The rivers and drainage lines are both classified as a river HGM type system. The dams are regarded as artificial systems and typically formed / created in the preferential flow paths of the river HGM type. The drainage lines are not characterised by riparian vegetation and grasses, these systems represent bare surfaces with evidence of surface run-off.

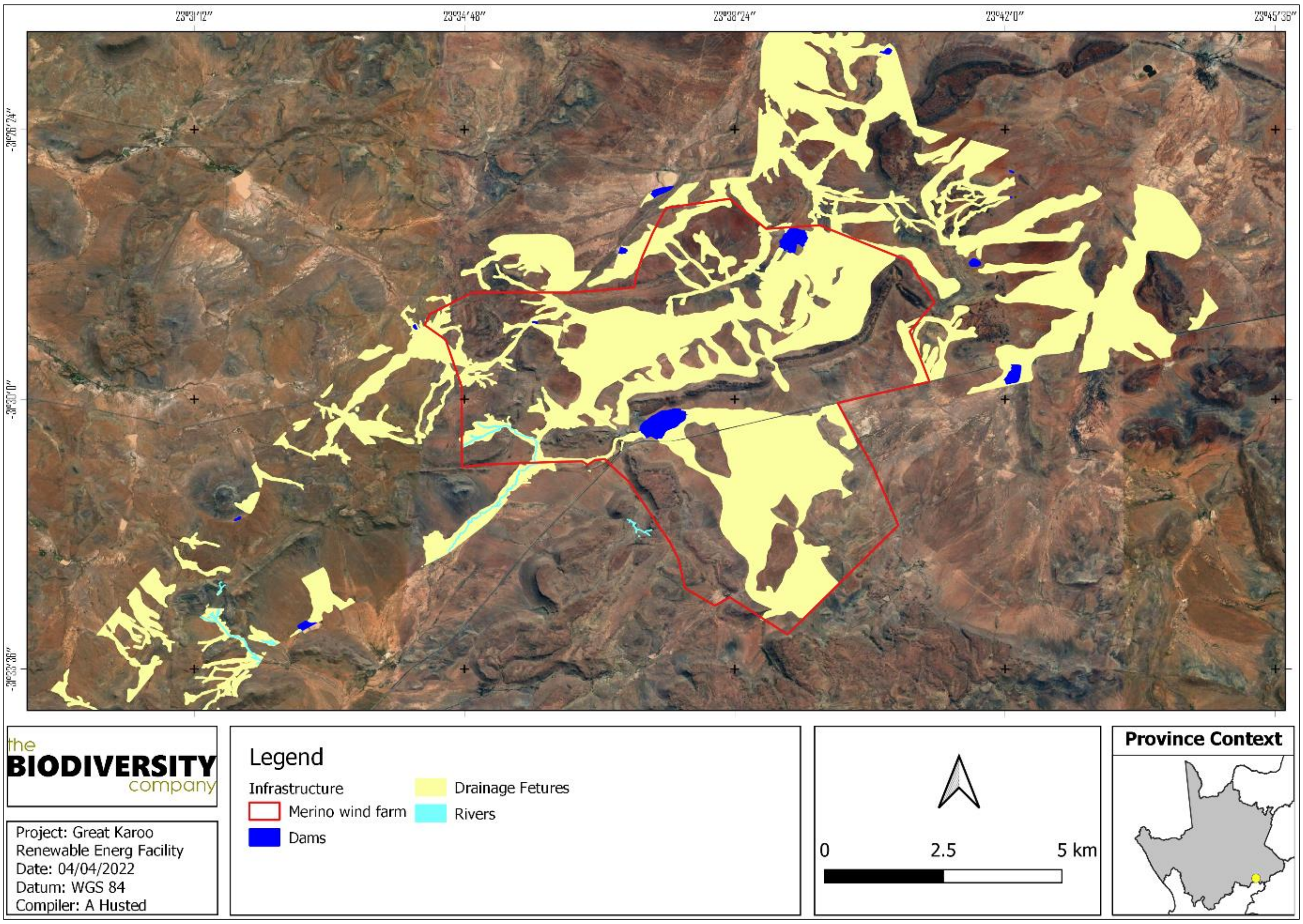


Figure 8.11: Delineated systems in relation to the development area

Inland Rivers

The National Biodiversity Assessment (NBA) (2018) spatial rivers dataset is part of the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) which was released with the (NBA) 2018. In the NBA 2018 the NFEPA rivers GIS layer was used to represent the diversity of rivers nationally. The extent of rivers associated with the development area, and the corresponding threat status and protection level are presented in **Figure 8.12**. The river system to the north is classified as Least Threatened, and Not Protected. The river system located centrally is classified as Critically Endangered / Endangered and is also Not Protected.

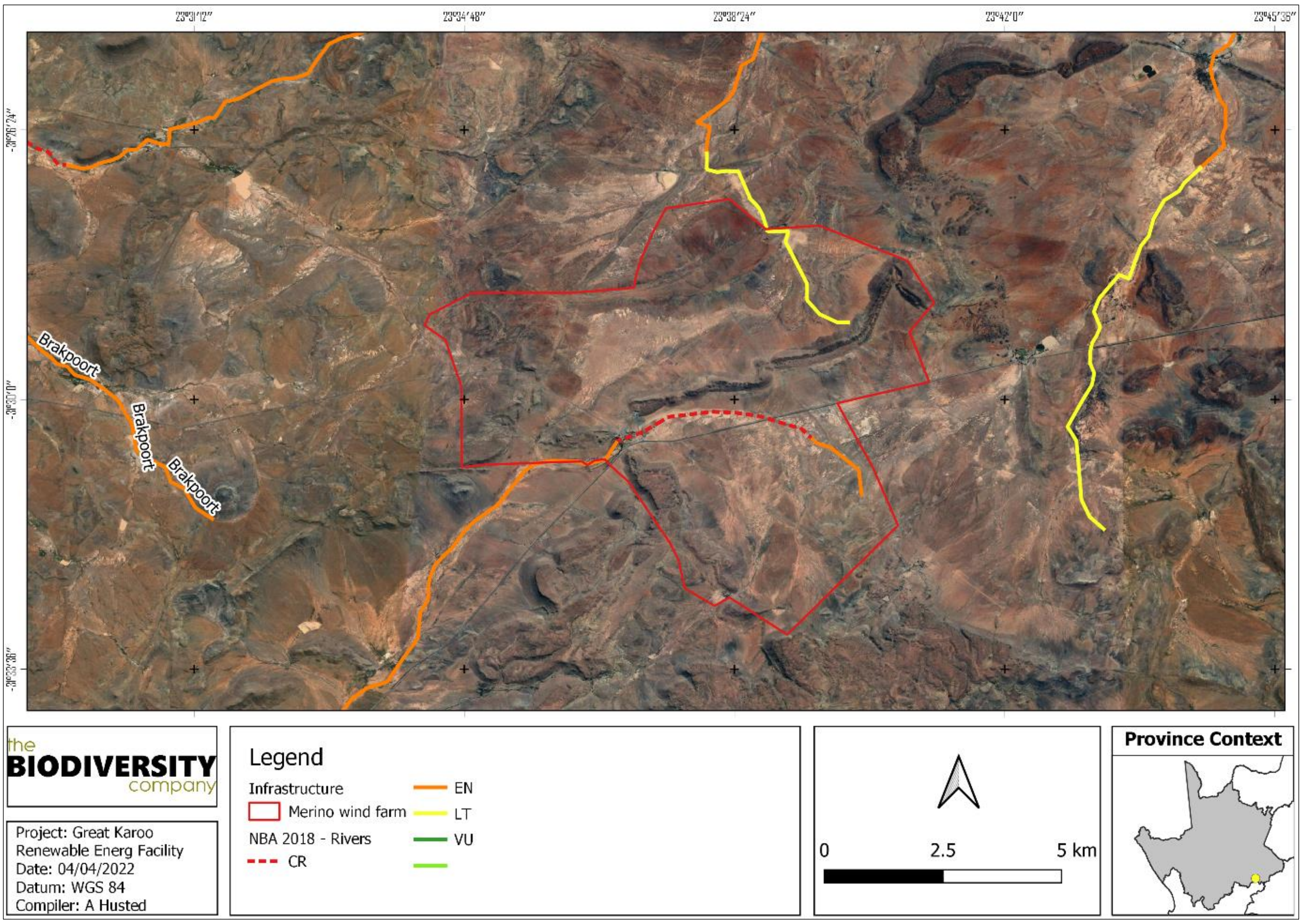


Figure 8.12: The NBA (2018) rivers in relation to the development area

Importance and Sensitivity of the HGM Type and Buffer Analysis

The Importance and Sensitivity (IS) ratings for the HGM type is provided below. Several factors were considered when establishing the IS of the systems. Regional to national scale considerations included NFEPA river or wetland status, protected areas as well as Ramsar wetlands. Local considerations included habitat integrity and diversity, likelihood of supporting conservation important species and potential for hosting significant congregations of local or migratory species. The overall IS for the area was determined to be high (refer to **Table 8.3**).

Table 8.3: Ecological Importance and Sensitivity of the HGM Type

HGM Type	Wet Veg			NBA Rivers		SWSA (Y/N)	Calculated IS
	Type	Ecosystem Threat Status	Ecosystem Protection Level	Wetland Condition	Ecosystem Threat Status 2018		
Rivers	Upper Nama Karoo	Critically Endangered / Endangered	Not Protected	A/B	Critically Endangered / Endangered	No	**High**

In order to determine a "site specific" buffer zone for the proposed activity the "Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries" (Macfarlane, *et al*., 2014) was used. According to the buffer guideline (Macfarlane *et al*., 2014), a high-risk activity would require a buffer that is

95% effective to reduce the risk of the impact to a low-level threat. The tool is regarded as a guideline, adjustments have been made to provide a better suited buffer width. According to the Macfarlane *et al*. (2014) buffer tool, the required pre-mitigation buffer is 42m for the construction phase and 35m for the operational phase.

The expected risks were reduced to Low with the prescribed mitigation measures and therefore the recommended buffer was calculated to be 22m for the drainage lines and rivers for both the construction and operational phases.

The buffer zone will not be applicable for proposed infrastructure that traverse the systems, however, for all secondary activities such as laydown yards and storage areas, the buffer zone must be implemented

xii. Terrestrial Fauna Communities in the Study Area

Mammals

The semi-arid area south of Richmond is known for a low diversity of mammals firstly related to the lack of open water and secondly the long history of farming in the region. The impact of the sheep farming is that the migration corridors of larger mammals were restricted and over time, many species have been lost to the area. In recent years with the increase in hunting, some farmers have reintroduced some of the mammals that were previously present in the area. The obvious threat of predators to livestock further contributes to the low diversity of mammals occurring in the area. The smaller cats e.g., *Genetta genetta, Felis nigripes* (Vulnerable) and the less feared small fox, *Otocyon megalotis* were recorded recently in the QDS (FitzPatrick Institute of African Ornithology – Virtual Museum, Mammal Records, 2021 and i-Naturalist, 2021) (**Table 8.4**). There was some rodent activity (active burrows and tracks) observed, but the species were not identified during the survey.

The endangered *Bunolagus monticularis* is not expected in the area (known distribution range further south).

Table 8.4: Summary of expected mammals associated with the QDS 3123DA (shaded species represent either observation or signs of activity)

Family	***Genus and species name***	**Common name**	**Conservation status**
Bathyergidae	*Cryptomys hottentotus*	African Mole-rat	Least Concern
Bovidae	*Raphicerus campestris*	Steenbok	Least Concern
Bovidae	*Antidorcas marsupialis*	Springbok	Least Concern
Bovidae	*Pelea capreolus*	Grey Rhebok	Least Concern
Canidae	*Otocyon megalotis*	Bat-eared Fox	Least Concern
Cercopithecidae	*Papio ursinus*	Cape Baboon	Least Concern
Felidae	*Felis nigripes*	Black-footed Cat	Vulnerable
Herpestidae	*Suricata suricatta*	Meerkat	Least Concern
Herpestidae	*Herpestes pulverulentus*	Cape Grey Mongoose	Least Concern
Leporidae	*Lepus saxatilis*	Scrub Hare	Least Concern
Leporidae	*Lepus capensis*	Cape Hare	Least Concern
Muridae	*Rhabdomys pumilio*	Four-striped Grass Mouse	Least Concern
Mustelidae	*Ictonyx striatus*	Striped polecat	Least Concern
Orycteropodidae	*Orycteropus afer*	Aardvark	Least Concern
Pedetidae	*Pedetes capensis*	Springhare	Least Concern
Procaviidae	*Procavia capensis*	Rock hyrax	Least concern
Sciuridae	*Geosciurus inauris*	Cape Ground Squirrel	Least Concern

Family	*Genus and species name*	Common name	Conservation status
Viverridae	*Genetta genetta*	Small-spotted Genet	Least Concern

Amphibians

According to the records (FitzPatrick Institute of African Ornithology – Virtual Museum, Frog Records, 2021), only two (2) amphibian species (**Table 8.5**) were recently collected within the area (QD 3123DA). These are the Common Caco (*Cacosternum boettgeri*) and Tandy's Sand Frog (*Tomopterna tandyi*), both with a listed conservation status of "Least Concern". Due to the recent droughts, the probability of encountering any specimens within the project is low.

Table 8.5: List of Amphibians associated with the QDS (3123DA) of the study area

Family	*Genus and species name*	Common name	Conservation status
Pyxicephalidae	*Cacosternum boettgeri*	Common Caco	Least Concern
Pyxicephalidae	*Tomopterna tandyi*	Tandy's Sand Frog	Least Concern

Reptiles

One will expect a more extensive list of reptiles for the study, but the combined list for the QDS (FitzPatrick Institute of African Ornithology – Virtual Museum, Mammal Records, 2021 and i-Naturalist, 2021) gives a short list of recently confirmed specimens (**Table 8.6**). This can be a result of the recent extensive drought and modified landscape (grazing and vegetation modification) associated with the agricultural activities. There are no species listed as red data for the area.

Table 8.6: List of expected reptiles on the area of the proposed development (FitzPatrick Institute of African Ornithology – Virtual Museum, Reptile Records, 2021 and i-Naturalist, 2021)

Family	*Genus and species name*	Common name	Conservation status
Agamidae	*Agama atra*	Southern Rock Agama	Least Concern
Agamidae	*Agama aculeata*	Ground Agama	Least Concern
Colubridae	*Lamprophis aurora*	Aurora House Snake	Least Concern
Cordylidae	*Karusasaurus polyzonus*	Karoo Girdled Lizard	Least Concern
Cordylidae	*Cordylus cordylus*	Cape Girdled Lizard	Least Concern
Gekkonidae	*Afroedura karroica*	Karoo Flat Gecko	Least Concern
Lacertidae	*Meroles suborbitalis*	Spotted Sand Lizard	Least Concern
Lacertidae	*Pedioplanis namaquensis*	Namaqua Sand Lizard	Least Concern
Scincidae	*Trachylepis sulcata*	Western Rock Skink	Least Concern
Scincidae	*Plestiodon gilberti*	Gilbert's Skink	Least Concern
Testudinidae	*Stigmochelys pardalis*	Leopard Tortoise	Least Concern
Varanidae	*Varanus albigularis*	Rock Monitor	Least Concern

Arachnida

A number of scorpions (**Table 8.7**) are listed for the larger area around the study site (African Snake Bite Institute, 2021) and a number of active burrows of these animals were noted during the survey.

Table 8.7: List of possible Scorpions that can occur on the study site, as these are listed in the larger area surrounding Richmond)

Family	*Genus and species name*	Common name	Conservation status
Buthidae	*Parabuthus granulatus*	Rough Thicktail Scorpion	Least Concern
Buthidae	*Parabuthus mossambicensis*	Mozambique Thicktail Scorpion	Least Concern
Buthidae	*Uroplectes carinatus*	Common Lesser-Thicktail Scorpion	Least Concern

Family	*Genus and species name*	Common name	Conservation status
Buthidae	*Uroplectes triangulifer*	Highveld Lesser-Thicktail Scorpion	Least Concern
Scorpionidae	*Opistophthalmus carinatus*	Radiant Burrower	Least Concern
Scorpionidae	*Opistophthalmus karrooensis*	Karroo Burrower	Least Concern

From the surveys conducted, it is clear that the animal diversity is low, and it can be linked to the current drought conditions and the semi-arid conditions associated with the region, as well as the history of habitat management associated with livestock production.

xiii. Bats

Bats play a critical role in many ecosystems and are important indicators of biodiversity and ecosystem health. They provide many essential ecosystem services which increase human well-being such as pollination, seed dispersal and the consumption of important agricultural pests.

Currently Confirmed, Previously Recorded and Literature-Based Species Probability of Occurrence

Table 8.8 indicates the species of bat which have been confirmed to occur on site, those unconfirmed species which may potentially occur on site, as well as those occurring in the broader area of the site based on literature review. For each species, the risk of impact by wind energy infrastructure was assigned by MacEwan et al. (2020) based on their distributions, altitudes at which they fly, and foraging ecology.

Ecology of Bat Species that may be Impacted by the most by the Merino Wind Farm

There are several bat species in the vicinity of the site that occur commonly in the area. Some of these species are of special importance based on their likelihood of being impacted by the proposed wind farm, due to high abundances and certain behavioural traits. They have also been dominating records of fatalities at wind farms in South Africa. 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 (Monadjem *et al*. 2020). This species is protected by national legislation in South Africa (ACR 2020).

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

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

<u>Neoromicia capensis</u>

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.

High mortality rates of this species due to wind turbines would be a cause for concern as *N. capensis* is abundant and widespread and as such has a more significant role to play within the local ecosystem than the rarer bat species. *N. capensis* does not undertake migrations and is thus considered a resident of the site.

It roosts individually or in small groups of two to three bats in a variety of shelters, such as under the bark of trees, at the base of aloe leaves, and under the roofs of houses. It will use most man-made structures as day roosts which can be found throughout the site and surrounding areas (Monadjem *et al*. 2020).

N. capensis is tolerant to a wide range of environmental conditions as it survives and prospers across arid and semi-arid areas to montane grasslands, forests, and savannas; indicating that it may occupy several habitat types across the site and is amenable towards habitat changes. It is however a clutter-edge forager, meaning it prefers to hunt on the edge of vegetation clutter mostly, but can occasionally forage in open spaces. It is thought to have a Medium-High likelihood of risk of fatality due to wind turbines and is currently displaying moderate to high numbers of mortalities at operational wind farms in South Africa.

<u>Miniopterus natalensis</u>

Miniopterus natalensis, 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 Least Concern. This bat is a cave-dependent species and identification of suitable roosting sites may be more important in determining its presence in an area than the presence of surrounding vegetation. It occurs in large numbers when roosting in caves with approximately 260 000 bats observed making seasonal use of the De Hoop Guano Cave in the Western Cape, South Africa. Culverts and mines have also been observed as roosting sites for either single bats or small colonies. 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. Due to this migratory behaviour, it is considered to be at high risk of fatality from wind turbines if a wind farm is placed within a migratory path. The mass movement of bats during migratory periods could result in mass casualties if wind turbines are positioned over a mass migratory route and such turbines are not effectively mitigated. Very little is known about the migratory behaviour and paths of *M. natalensis* in South Africa, with migration distances exceeding 150km.

M. natalensis faces a medium to high risk of fatality due to wind turbines. The species is currently displaying low to moderate numbers of mortalities at operational wind farms in South Africa.

Table 8.8: Species currently confirmed on site, previously recorded in the area, or potentially occurring. Roosting and foraging habitats in the study area, conservation status and risk of impact are also briefly described per species

Species	Common name	Occurrence in area*	Conservation status (SANBI & EWT, 2016)	Possible roosting habitat in the larger area of the site	Possible foraging habitat in the larger area of the site	Risk of impact (MacEwan *et al.* 2020 for WEF)
Tadarida aegyptiaca	Egyptian free-tailed bat	Confirmed on site	Least Concern (2016 Regional Listing)	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.	It forages over a wide range of habitats; its preferences of foraging habitat seem independent of vegetation. It seems to forage in all types habitats.	High
Laephotis (formerly *Neoromicia*) *capensis*	Cape serotine	Confirmed on site	Least Concern (2016 Regional Listing)	Roosts in the roofs of houses and buildings, and also under the bark of trees.	It appears to tolerate a wide range of environmental conditions from arid semi-desert areas to montane grasslands, forests, and savannahs. But is predominantly a medium height clutter edge forager on site.	Medium - High
Miniopterus natalensis	Natal long-fingered bat	Confirmed on site	Least Concern (2016 Regional Listing)	No known caves in the vicinity of the site. Small groups or individuals may roost in culverts or other hollows.	Clutter-edge forager. May forage in more open terrain during suitable weather.	Medium - High
Eptesicus hottentotus	Long-tailed serotine	Confirmed on site	Least Concern (2016 Regional Listing)	It is a crevice dweller roosting in	It generally seems to prefer woodland	Medium

Species	Common name	Occurrence in area*	Conservation status (SANBI & EWT, 2016)	Possible roosting habitat in the larger area of the site	Possible foraging habitat in the larger area of the site	Risk of impact (MacEwan *et al.* 2020 for WEF)
				rock crevices, as well as other crevices in buildings. Rock crevices in valleys on site.	habitats, and forages on the clutter edge. But may still forage over open terrain occasionally.	
Sauromys petrophilus	Robert's flat-headed bat	Confirmed on site	Least Concern (2016 Regional Listing)	Roosts mainly in rock crevices.	It forages over a wide range of habitats and may utilise higher air spaces.	High
Epomophorus wahlbergi	Wahlberg's epauletted fruit bat	Literature	Least Concern (2016 Regional Listing)	Roosts in dense foliage of large, leafy trees and may travel several kilometres each night to reach fruiting trees.	Feeds on fruit, nectar, pollen and flowers. If and where available on site.	Medium - High
Nycteris thebaica	Egyptian slit-faced bat	Museum record from greater area	Least Concern (2016 Regional Listing)	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 possibly occur in the thickets of man-made gardens, and in aardvark burrows.	Low
Cistugo lesueuri	Lesueur's wing-gland bat	Museum record from greater area	Least Concern (2016 Regional Listing)	It is a crevice dweller roosting in rock crevices. Exposed rocky	Areas with available drinking water. Clutter edge forager. May forage in more open	Medium – High

Species	Common name	Occurrence in area*	Conservation status (SANBI & EWT, 2016)	Possible roosting habitat in the larger area of the site	Possible foraging habitat in the larger area of the site	Risk of impact (MacEwan *et al.* 2020 for WEF)
				cliffs and rocky koppies.	terrain during suitable weather.	
Rhinolophus darlingi	Darling's horseshoe bat	ACR 2020 record	Least Concern (2016 Regional Listing)	May utilise man made hollows, Aardvark burrows or hollows formed by rocky boulder koppies.	It is associated with a variety of habitats including thickets that may be found in the vegetated drainage areas.	Low
Eidolon helvum	African straw-coloured fruit bat	Literature	Least Concern (2016 Regional Listing) (Globally Near-threatened)	It's a non-breeding migrant with sparse scattered records in the karoo.	Feeds on fruit, nectar, pollen and flowers. If and where available on site.	Medium - High

xv. Avifauna

Important Bird and Biodiversity Areas (IBA)

There are no Important Bird Areas (IBA) within a 50km radius of the proposed Merino wind Farm. The closest IBA to the project site is the Platberg-Karoo Conservancy IBA SA037, which is just over 50km away. It is therefore highly unlikely that the proposed development will have a negative impact on any IBA due to the distance from the project site.

Avifauna Micro-habitats

The project site within which the development area is located falls within the Nama Karoo biome. It consists of a flat plain with a number of inselbergs containing steep, boulder-strewn slopes, exposed rocky ridges and low cliffs. Two vegetation types are found in the development site, the dominant one being Eastern Upper Karoo, which is found on the plains and Upper Karoo Hardeveld occurring on the ridges.

Whilst the distribution and abundance of the bird species in the development area are typical of the broad vegetation type, it is also necessary to examine bird habitats in more detail as they may influence the distribution and behaviour of priority species. These are discussed in more detail below.

Nama Karoo: The vegetation at the development area consists of Karoo shrub.

Surface Water: The development area contains one source of permanent surface water, namely boreholes with water troughs. There are also two large dams on the western and southern border of the site, and one large dam on the development area itself. The dams contain water periodically. When they did contain water, flocks of Blue Cranes were observed roosting in them at night, as well as a number of Greater Flamingos.

High voltage lines: There are a number of high voltage lines that run to the north-west of the development area. Transmission lines are an important breeding substrate for raptors in the Karoo, due to the lack of large trees. There is a Tawny Eagle nest (FPTE1) situated approximately 6.3km from the development area border on the Droërivier – Hydra 2 400kV transmission line. The nest was last inspected in July 2021, when an adult bird was recorded on the nest.

Rocky ridges: The development area contains two ridges with steep, boulder-strewn slopes and exposed rock faces. One of the ridges extend beyond the development area in an easterly direction and contains a Verreaux's Eagle nest (FPVE3) (-31.425449° 23.702398°) approximately 2.5km from the closest border of the development area. There is also a Jackal Buzzard nest (-31.453311° 23.679073°) on a rocky outcrop.

Agricultural lands: Cultivation in the development area is limited to a few irrigated lands in the south of the development area where lucerne is cultivated.

Alien trees: The development area is largely devoid of trees, except for alien trees which have been planted in rows between the lucerne fields and at the homestead.

Bird Community within the Surrounding Area and the Project Site

The South African Bird Atlas Project 2 (SABAP2) data indicates that a total of 165 bird species could potentially occur within the broader area. Of these, 24 species are classified as priority species and 12 of these are South African Red List species. Of the priority species, 17 are likely to occur regularly in the development area. **Table 8.9** below lists all the priority species that are likely to occur regularly and the possible impact on the respective species by the proposed wind farm.

Table 8.9: Priority species potentially occurring at the development area (Red List species are indicated in red font) (where **NT = Near threatened, VU = Vulnerable** and **EN = Endangered**

Species	Taxonomic name	SABAP2 reporting rate		Conservation status		Recorded during surveys	Likelihood of regular occurrence	Habitat feature						Potential impact				
		Full protocol reporting rate	ad hoc protocol reporting rate	Global status	Regional status			Nama Karoo	Surface water	Agriculture	Ridges	Alien trees	HV lines	Collisions with turbines	Displacement: Disturbance associated with construction	Displacement: Habitat transformation	Electrocution: MV lines	Collisions: MV OHL
African Fish Eagle	*Haliaeetus vocifer*	2.08	0.00				L		x			x		x			x	
African Harrier-Hawk	*Polyboroides typus*	6.25	3.03			x	M	x	x			x		x			x	
Black Harrier	*Circus maurus*	2.08	0.00	EN	EN		L	x	x					x				
Black Stork	*Ciconia nigra*	4.17	0.00	LC	VU	x	M		x		x			x			x	x
Black-winged Kite	*Elanus caeruleus*	2.08	0.00				L	x		x		x		x			x	
Blue Crane	*Grus paradisea*	62.50	18.18	VU	NT	x	H	x	x	x				x	x	x		x
Booted Eagle	*Hieraaetus pennatus*	6.25	0.00			x	M	x	x			x		x			x	
Common Buzzard	*Buteo buteo*	2.08	7.58			x	M	x	x	x		x	x	x			x	
Greater Flamingo	*Phoenicopterus roseus*	4.17	1.52	LC	NT	x	M		x					x				x
Greater Kestrel	*Falco rupicoloides*	31.25	3.03			x	H	x				x	x	x			x	
Jackal Buzzard	*Buteo rufofuscus*	43.75	16.67			x	H	x	x		x	x	x	x			x	
Karoo Korhaan	*Eupodotis vigorsii*	52.08	7.58	LC	NT	x	H	x						x	x	x		x
Lanner Falcon	*Falco biarmicus*	2.08	3.03	LC	VU	x	M	x	x	x	x	x	x	x			x	
Lesser Kestrel	*Falco naumanni*	2.08	1.52			x	L	x		x		x	x	x			x	
Ludwig's Bustard	*Neotis ludwigii*	45.83	7.58	EN	EN	x	H	x		x				x	x	x		x
Martial Eagle	*Polemaetus bellicosus*	10.42	1.52	VU	EN	x	H	x	x			x	x	x			x	
Northern Black Korhaan	*Afrotis afraoides*	72.92	21.21			x	H	x						x	x	x		x
Pale Chanting Goshawk	*Melierax canorus*	45.83	13.64			x	H	x	x			x	x	x			x	
Secretarybird	*Sagittarius serpentarius*	12.50	6.06	VU	VU		L	x	x					x				x
Spotted Eagle-Owl	*Bubo africanus*	8.33	0.00				M	x				x		x	x		x	

Species	Taxonomic name	SABAP2 reporting rate		Conservation status				Habitat feature						Potential impact				
		Full protocol reporting rate	ad hoc protocol reporting rate	Global status	Regional status	Recorded during surveys	Likelihood of regular occurrence	Nama Karoo	Surface water	Agriculture	Ridges	Alien trees	HV lines	Collisions with turbines	Displacement: Disturbance associated with construction	Displacement: Habitat transformation	Electrocution: MV lines	Collisions: MV OHL
Tawny Eagle	*Aquila rapax*	12.50	3.03	VU	EN	x	H	x	x			x	x	x			x	
Verreaux's Eagle	*Aquila verreauxii*	18.75	1.52	LC	VU	x	H		x		x		x	x			x	
Western Barn Owl	*Tyto alba*	2.08	0.00				L			x		x		x			x	
Cape Vulture	*Gyps coprotheres*	0.00	0.00	EN	EN	x	L	x			x		x	x			x	

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

The area proposed for the Merino Wind Farm is located approximately 35km south-west of Richmond and 80km south-east of Victoria West outside of the identified Beaufort West REDZ, along the N1. The town of Richmond was established in 1843 to service the needs of the growing farming community. It was renowned as a resort town in the 1800s for European aristocrats suffering lung disease due to its clean air and mineral-rich waters.

8.5.1. Archaeology

Four (4) archaeological and heritage resources were identified during the survey of the development area for the Merino Wind Farm. **Table 8.10** provides a photographic record of some of the archaeological heritage finds and **Figure 8.13** provides a locality map of the archaeological and heritage resources identified within the development area.

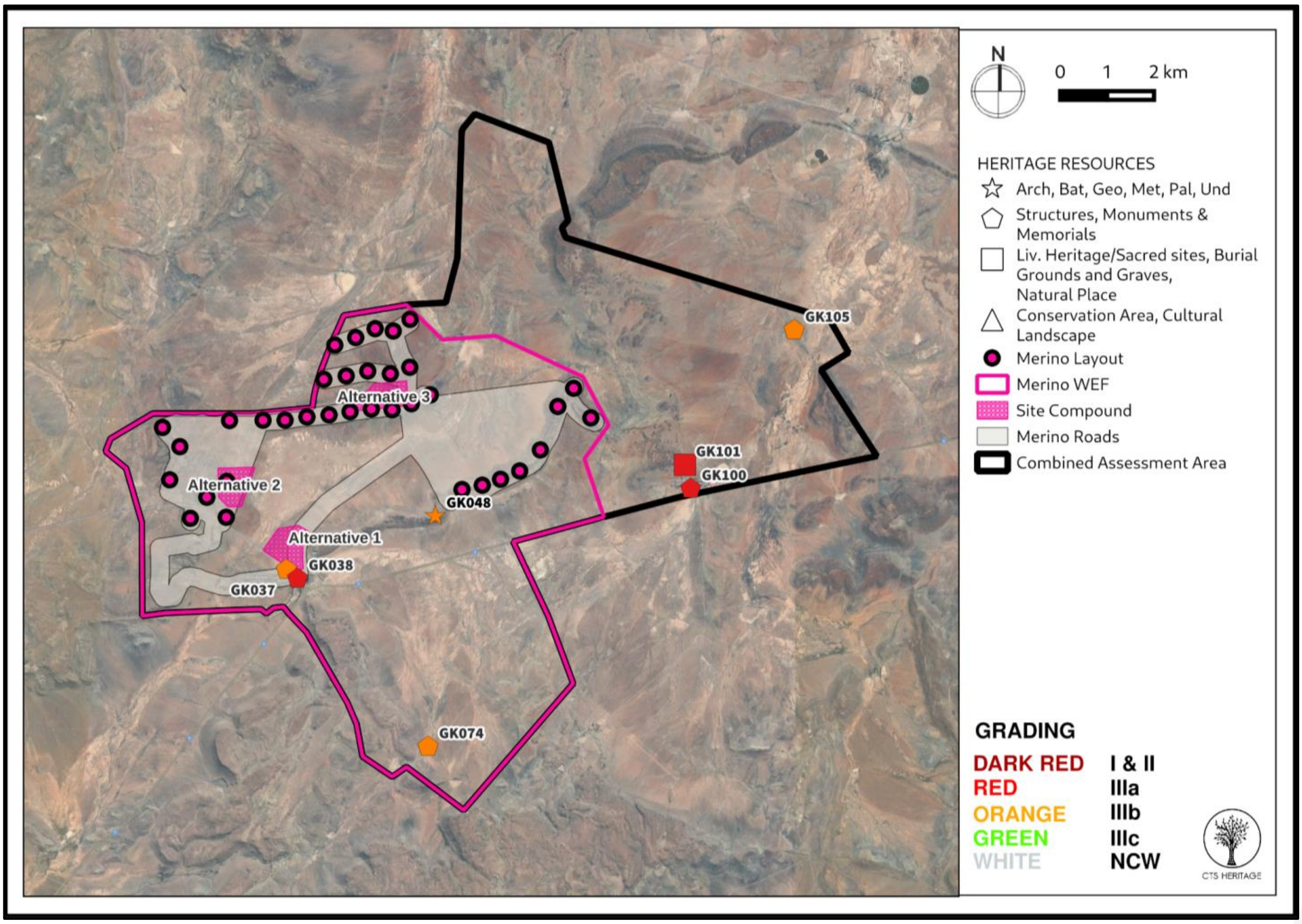


Figure 8.13: Map of archaeological and heritage resources identified within the proposed development area

Table 8.10: Archaeological and heritage resources identified during the field assessment of the development area for the Merino Wind Farm

POINT ID	Photograph	Period	Description	Co-ordinates		Grading	Mitigation
GK037		Historic	Stone walled ruins x 2	-31.506165	23.611848	IIIB	No-go development buffer of 500m
GK038		Historic	Rondawel farmhouse complex	-31.507875	23.614365	IIIA	No-go development buffer of 1km

POINT ID	Photograph	Period	Description	Co-ordinates		Grading	Mitigation
GK048	 	LSA, MSA	Lower, ground, grindstone, greywacke flakes, cores	-31.49589	23.64534	IIIB	No-go development buffer of 50m
GK074		Historic	Stone walled ruin	-31.54013	23.64369	IIIB	No-go development buffer of 500m

8.5.2. Palaeontology

According to the SAHRIS Palaeosensitivity Map (**Figure 8.14**), the area proposed for development is underlain by sediments of very high paleontological sensitivity. According to the extract from the Council for GeoSciences Map 3122 for Victoria West, the development area is underlain by the Abrahamskraal and Teekloof Formations, both of the Adelaide Subgroup of the Beaufort Group of sediments. According to the SAHRIS Fossil Heritage Browser and the Palaeotechnic Report for the Western Cape (Almond and Pether, 2008), the Beaufort Group sediments are known to preserve diverse terrestrial and freshwater tetrapods of *Tapinocephalus* to *Lystrosaurus* Biozones (amphibians, true reptiles, synapsids – especially therapsids), palaeoniscoid fish, freshwater bivalves, trace fossils (including tetrapod trackways) and sparse vascular plants (*Glossopteris* Flora, including petrified wood).

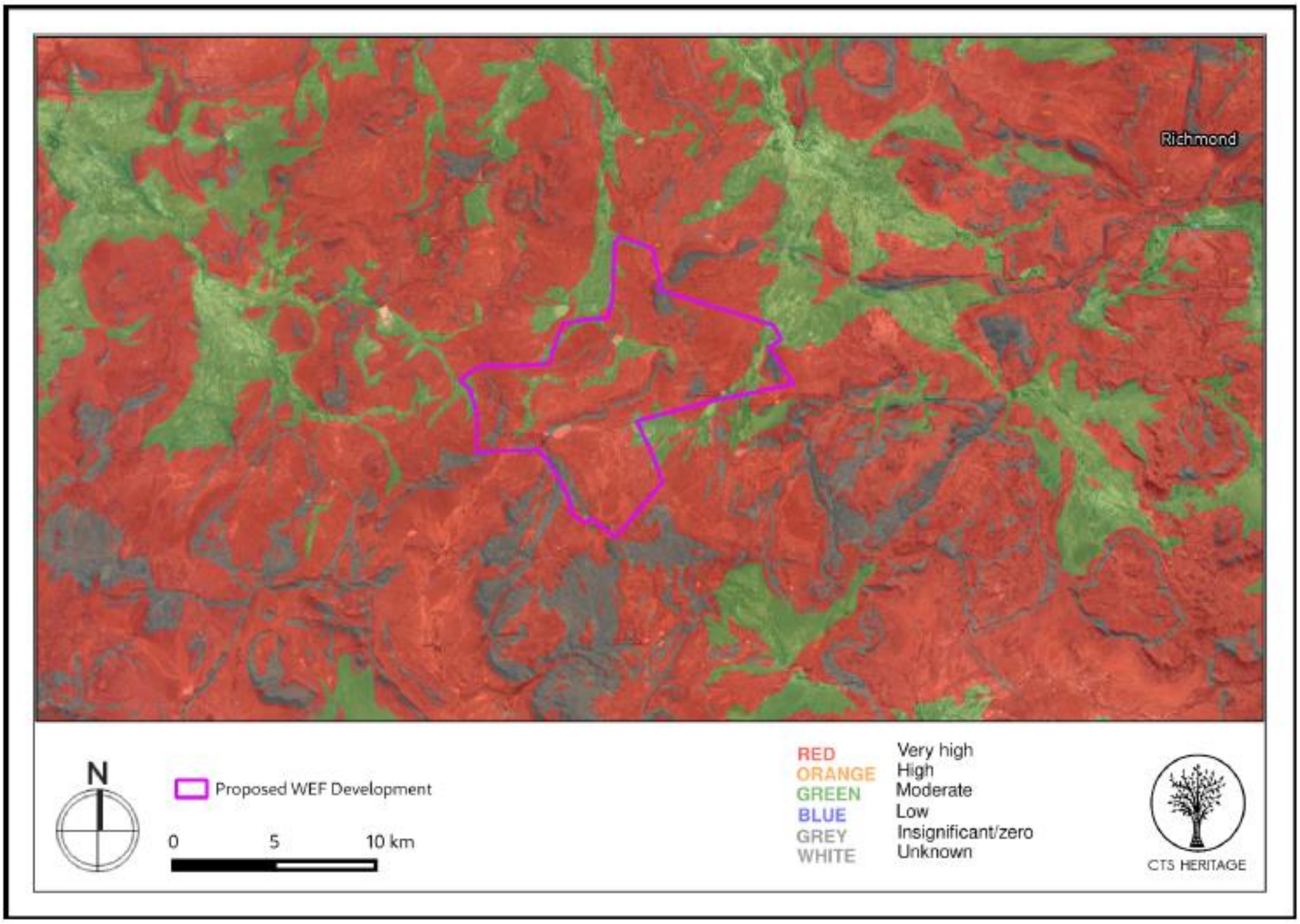


Figure 8.14: Palaeosensitivity map indicating fossil sensitivity underlying the study area, including the development area for the Merino Wind Farm.

Five (5) palaeontological heritage resources were identified during the survey of the development area for the Merino Wind Farm. **Table 8.11** provides a description of the palaeontological finds and **Figure 8.15** provides a locality map of the palaeontological heritage resources identified within the development area.

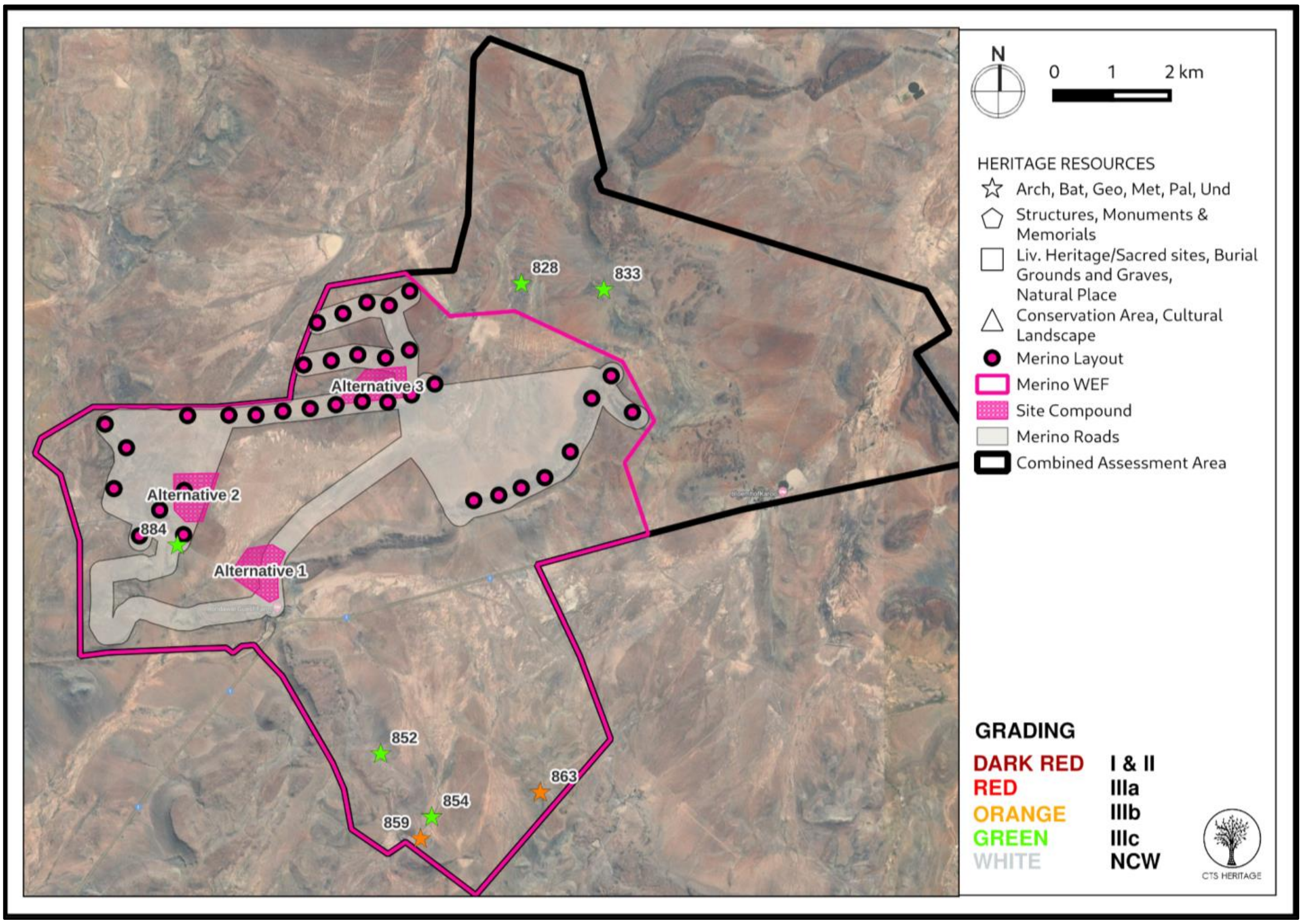


Figure 8.15: Map of palaeontological heritage resources within the proposed development area

Table 8.11: Palaeontological observations made during the field assessment for the proposed Wind Farm

POINT ID	Project Area	Description	Co-ordinates		Grading	Mitigation
852	**Merino**	Rondavel 85. Stratigraphic level uncertain – possibly Oukloof Member / "Balfour Fm". Possible but equivocal tetrapod burrow cast (c. 25-30 cm wide), straight, inclined, infilled with grey-green sandstone and surrounded by crumbly purple, brown mudrock. Proposed Field Rating IIIC Local Resource. No mitigation recommended.	-31.5303	23.63432	IIIC	NA
854	**Merino**	Rondavel 85. Flaggy slabs of greenish-grey sandstone (stratigraphic provenance unclear) associated with ruined farm building showing probable sandstone-infilled mudcracks, wave rippled palaeosurfaces and invertebrate bioturbation and / or plant stem casts. Proposed Field Rating IIIC Local Resource. No mitigation recommended.	-31.54013	23.64365	IIIC	NA
859	**Merino**	Rondavel 85. "Balfour Fm" (Oukloof Member of Teeklof Fm). Distorted / crushed, baked (v. white) skeletal material - possibly a small (c. 5 cm long)	-31.54351898	23.64159099	IIIB	20m no-go buffer

POINT ID	Project Area	Description	Co-ordinates		Grading	Mitigation
		skull - embedded within mudflake-rich debris flow deposit. Proposed Field Rating IIIB. Professional palaeontological collection only necessary of specimen lies < 20 from project footprint.				
863	**Merino**	Rondavel 85. "Balfour Fm" (Oukloof Member of Teekloof Fm). Surface concentration of coffee-brown ferruginous concretionary material including several blocks containing bone preserved as moulds or silicified. Symmetrical array of low convexity, rounded plates with a radial ornamentation suggests pareiasaur reptile affinity (dermal scutes) – possibly juvenile or dwarf form. Proposed Field Rating IIIB. Professional palaeontological collection only necessary of specimen lies < 20 from project footprint.	-31.53631297	23.66347597	IIIB	20m no-go buffer
884	**Merino**	Rondavel 85. Hoedemaker Member. Thin crevasse splay sandstone exposed in shallow borrow pit with sandstone-infilled mudcracks, microbial mat textures, small-scale invertebrate trace fossils (narrow horizontal burrows of undermat miners), possible vertical burrows or plant stem casts. Proposed Field Rating IIIC Local Resource. No mitigation recommended.	-31.49779201	23.59721803	IIIC	NA

8.5.3. Cultural Landscape

The landscape of the development area has been assessed for cultural heritage significance, and found to have five distinct character areas:

» Historic movement corridors.
» Open plains interrupted by low koppies.
» Elevated areas with steep sided mountain ridges.
» Areas of landscape that have been transformed by significant infrastructural development.
» Remote landscape with wilderness qualities.

Of the five distinct character areas identified in the Cultural Landscape Assessment (Winter, 2021), the development area for the proposed Merino Wind Farm falls within all five areas (refer to **Figure 8.16**). **Table 8.12** provides a description of the different cultural landscape character areas identified within the development area.

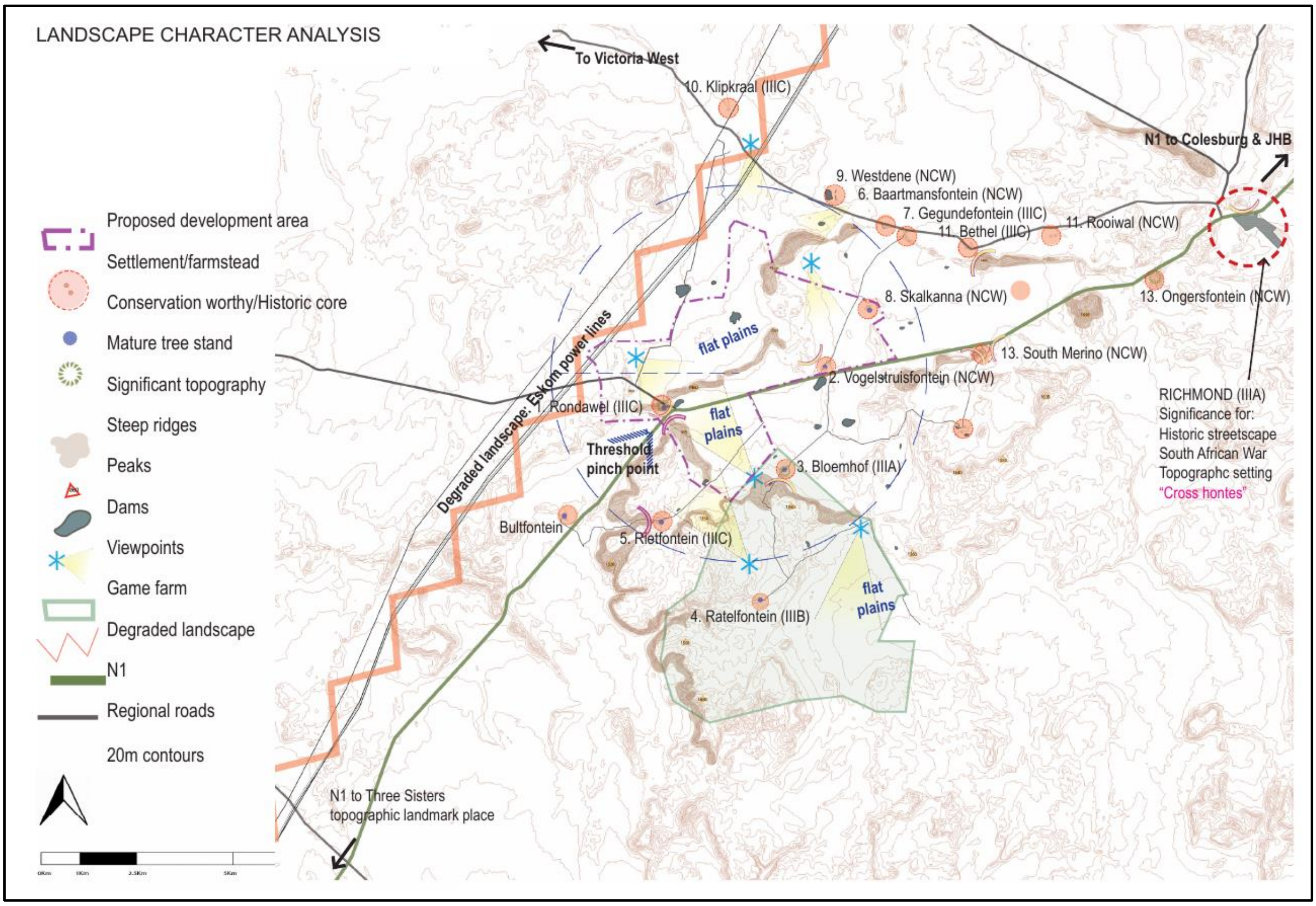


Figure 8.16: Cultural landscape elements identified within the development area for the Merino Wind Farm

Table 8.12: Cultural landscape character areas identified within the development area for the Merino Wind Farm

Significance	**Character**	**Carrying Capacity**
1. Historic Route corridors: N1 following alignment of a major historical linkage route with the interior, and along which a pattern of settle-ment has occurred	**N1 corridor:** National transport route across an open plain. Linkage between Richmond and Three Sisters. Long views framed by mountains and koppies. The section between Rondawel and Richmond traversing an intact and representative landscape of the Central Plateau of the Karoo region. Poort-like quality of the section of the N1, with koppies either side, as it passes Rondawel Minimal visual intrusions.	**N1 corridor:** Infrastructure to be set back from the N1 corridor. Infrastructure to be one-sided. Retain openness of views pre-dominantly to the south. Retain the visual quality of the N1 in terms of uninterrupted views towards ridgelines, and the absence of visual intrusion (except for telecommunication towers).
Richmond - Victoria West corridor follows alignment of a strong, historical linkage route between two	**Richmond-Victoria West corridor:** Low traffic volume country road. Regular pattern of settlement;	**Richmond-Victoria West corridor:** Infrastructure to be set back from the corridor. Infrastructure to be one

Significance	Character	Carrying Capacity
towns established in the 1840s, and along which a pattern of settlement has occurred.	farmsteads located beside the road. Wide lateral views across open plains.	sided, may transfer from side to side. Retain the uninterrupted lateral visual quality across plains.
2. Open plains Distinctive landscape setting and edges	Extensive, framed, layered views interrupted by koppies. Distinctive landscape setting and edge conditions for farmstead settlements contributes to the overall 'sense of fit' within the landscape.	Well suited to PV infrastructure. Landscape can tolerate clustered infrastructure provided buffer areas are observed. No orthogonal rows of turbine development.
3. Elevated ridgelines and peaks Steep sided slopes and ridgelines of high visual significance. Significant contribution to landscape quality of this sector of the Central Karoo Plateau.	Ridgelines and steep slopes highlight visible to long views. Steep sided slopes to ridgeline height +/-1450m ASL; ridgetop peaks +/-1550m ASL. Elevated zones of surveillance. Important ridgetop watershed. Contribute strong landscape structuring element. Homesteads back onto foothills of steep ridges; forward facing to open plains.	Ridgelines and peaks are highly sensitive to development. No development on visually sensitive ridgelines. No development on visually sensitive mountain slopes. Infrastructure to be clustered and positioned in dips and on contours below the ridgeline.
4. Transformed landscape Electricity grid parallel to and set back from (4Km) the N1 corridor south of site.	Introduction of industrial activities and intrusion of large-scale infrastructure in agricultural areas. Visual cluttering of the landscape by non-agricultural development.	Infrastructure can be concentrated in this area.
5. Remote Karoo landscape Landscape altered by farming practice but minimal-nil infrastructural development.	Sense of isolation: minimal visual interruption of long landscape views	Limited carrying capacity. Maintain scenic qualities of wilderness-type landscape. Avoid development on elevated exposed slopes because of their high visibility from surroundings.

8.6. Visual Quality

The study area occurs on land that ranges in elevation from approximately 1 170m (in the south-western corner of the study area) to 1 830m (at the top of the mountains to the east). The terrain surrounding the site is predominantly flat to the north and the south, with a ridge traversing the centre of the site from the east to the west.

The proposed development site itself is located at an average elevation of 1 389m above sea level. The overall terrain morphological description of the study area is described as *undulating plains* (lowlands), with *ridges*, *hills,* and *mountains*.

The majority of the study area is sparsely populated (less than 1 person per km^2). The study area consists of a landscape that can be described as remote due to its considerable distance from any major metropolitan centres or populated areas. Settlements, where they occur, are usually rural homesteads or farm dwellings. The photographs below aid in describing the general environment within the study area and surrounding the proposed project infrastructure.

The N1 national road traversing the study site

Ridges near the proposed development area

Typical Karoo homestead

Typical Karoo Scene

Figure 8.17: Photographs showing the general environment within the area.

The following potential sensitive visual receptors were identified:

<u>0 – 5km</u>

Exposed receptor sites within this zone include the following homesteads:

- Damplaas
- Vogelstruisfontein
- Schalkhanna
- Rondawel

The wind turbine structures, especially the eight turbines located on the Bakenskop ridge, will also be highly exposed to observers travelling along the N1 national road. The Rondawel to Hutchinson secondary road will similarly be exposed to the wind turbines, as it traverses the proposed development site.

5 – 10km

Exposed receptor sites within this zone include the following homesteads:

- Excelsior
- Westdene
- Gedundefontein
- Baardmansfontein
- Bloemhof (Bloemhof Karoo Farmstay)
- Bultfontein
- Roggefontein
- Nieuwefontein
- De Novo

It is expected that the wind turbine structures would be clearly visible from the abovementioned receptor sites.

10 – 20km

In the medium to longer distance (i.e., between 10 and 20km), visual exposure will be somewhat reduced, especially towards the north-west and the south-east. This zone also includes a number of homesteads that may be exposed to the project infrastructure. These include:

- Alexandria
- Klipkraal
- Witsloot
- Patrysfontein
- Jandelangesfontein
- Taaiboslaagte
- Rooiwal
- Bethel
- South Merino
- Rietwal
- Eselsfontein
- De Hoop
- De Brak
- Ouplaas
- Taaibosfontein
- Poortjie
- Graafwaterdam
- Disselkuil
- Vleiplaas

It is expected that the wind turbine structures would still be visible and recognisable from the abovementioned receptor sites.

<u>> 20km</u>

Visual exposure beyond a 20km radius is significantly reduced, especially in the south-east. The wind turbine structures may however still be visible from a number of homesteads within the study area, namely:

» Booysens
» Retreat
» Oufontein
» Kleinfontein
» Kraanvoelvlei
» Kruisaar
» Boomanulla

8.7. Ambient Noise Levels and Sensitive Noise Developments

8.7.1 Baseline Sound Levels

Ambient (background) noise levels were measured from 8 -11 September 2021 in accordance with the South African National Standard (SANS) 10103:2008, with the ambient sound levels measured at three different locations. Excluding locations up to an estimated distance of 1 000m from the N1 road, ambient sound levels are expected to be low and are typical of a rural noise district. The acceptable zone sound level (noise rating level) during low and no-wind conditions would be typical of a rural noise district:

» **45 dBA for the daytime period** (defined as 06:00 to 22:00); and
» **35 dBA for the night-time period** (defined as 22:00 to 06:00).

Considering measurements collected over the past decade at numerous locations during different seasons, ambient sound levels will likely increase as wind speeds increase.

8.7.2 Potential Noise Sources

Increased noise levels are directly linked with the various activities associated with the construction of the proposed Merino Wind Farm and related infrastructure, as well as the operation phase of the activity.

During the construction, activities such as the use of construction equipment, the use of a concrete batching plant and borrow pits (if required), blasting and construction traffic will result in increased noise levels. For the construction phase, increased noise levels will result from routine servicing (access road and traffic light) and unscheduled maintenance. The primary source of noise during the operation phase will come from the rotation of the wind turbines.

8.7.3 Noise-Sensitive Developments

Residential areas and potential noise-sensitive developments/receptors/communities (NSRs) were identified using aerial images as well as a physical site visit. This highlighted that there are a number of residential activities in the area that should be considered noise-sensitive. The noise-sensitive developments as identified are indicated in **Figure 8.18**.

Also indicated on this figure are generalized 500m, 1 000m and 2 000m buffer zones. Generally, noises from wind turbines:

» Could be significant within 500 m, with receptors21 staying within 500 m from operational wind turbines subject to noises at a potentially sufficient level to be considered disturbing;
» Are normally limited to a distance of approximately 1,000m from operational wind turbines (subject to WTG layout, as the WTG cumulative contribute to noise levels with 2,000m from WTG). Night-time ambient sound levels could be elevated and the potential noise impact measurable;
» Likely to be audible up to a distance of 2,000m at night; and
» Are of a low concern at distance greater than 2,000m. During certain metrological phenomena the sound of the WTGs may be audible, but the sound level will be low.

It should be noted that each dot may represent a number of different dwellings that are, or could be used for residential activities.

[21] Depending on the layout as well as the specific sound power emission levels of the selected wind turbine.

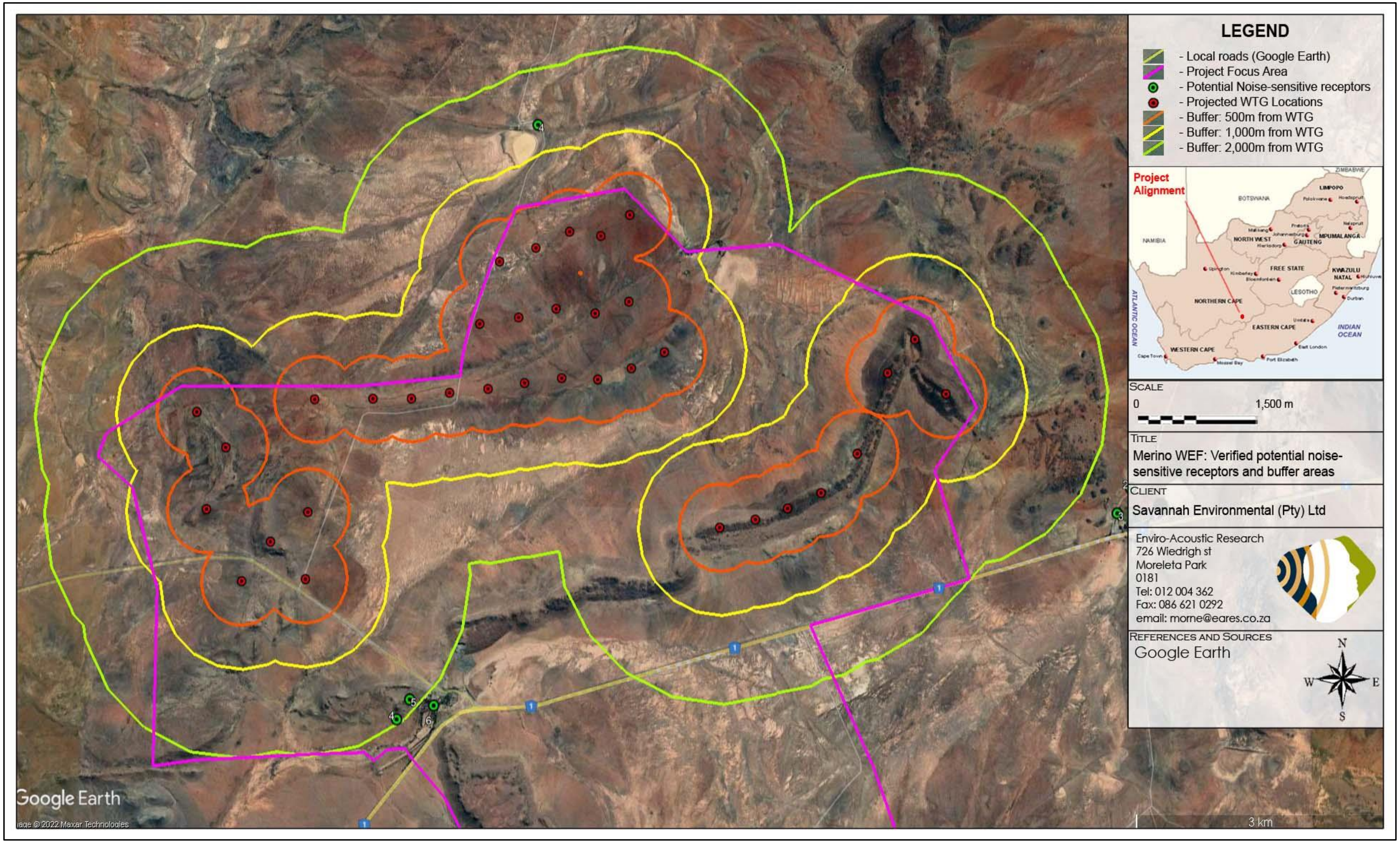


Figure 8.18: Study area and potential noise-sensitive receptors close to the Merino Wind Farm

8.8. Traffic Conditions

It is assumed that if components are imported to South Africa, it will be via the Port of Ngqura, which is located in the Eastern Cape, ~425km from the proposed site. Alternatively, components can be imported via the Port of Saldanha in the Western Cape, which is located ~675km from the proposed site.

The preferred route for abnormal load vehicles will be from the port (i.e., Port of Ngqura), heading north on the R75, passing Wolwefontein and Jansenville, and onto the R63 at Graaff-Reinet. The vehicles will travel on the R63 to the N1, passing Murraysburg, and continue on the N1 to the proposed site (refer to **Figure 8.19**).

Figure 8.19: Proposed route from the Port of Ngqura to the proposed site.

The proposed access points to the development area are located along the N1, as shown in **Figure 8.20.** Proposed Access Point 1 has a surfaced bellmouth which leads to the existing gravel road to the Hutchinson railway station. Proposed Access Point 2 is an existing gravel farm access road with an unsurfaced bellmouth.

Generally, the road width at the access points needs to be a minimum of 8m and the access roads on site a minimum of 4.5m (preferably 5m). The radius at the access points needs to be large enough to allow for all construction vehicles to turn safely.

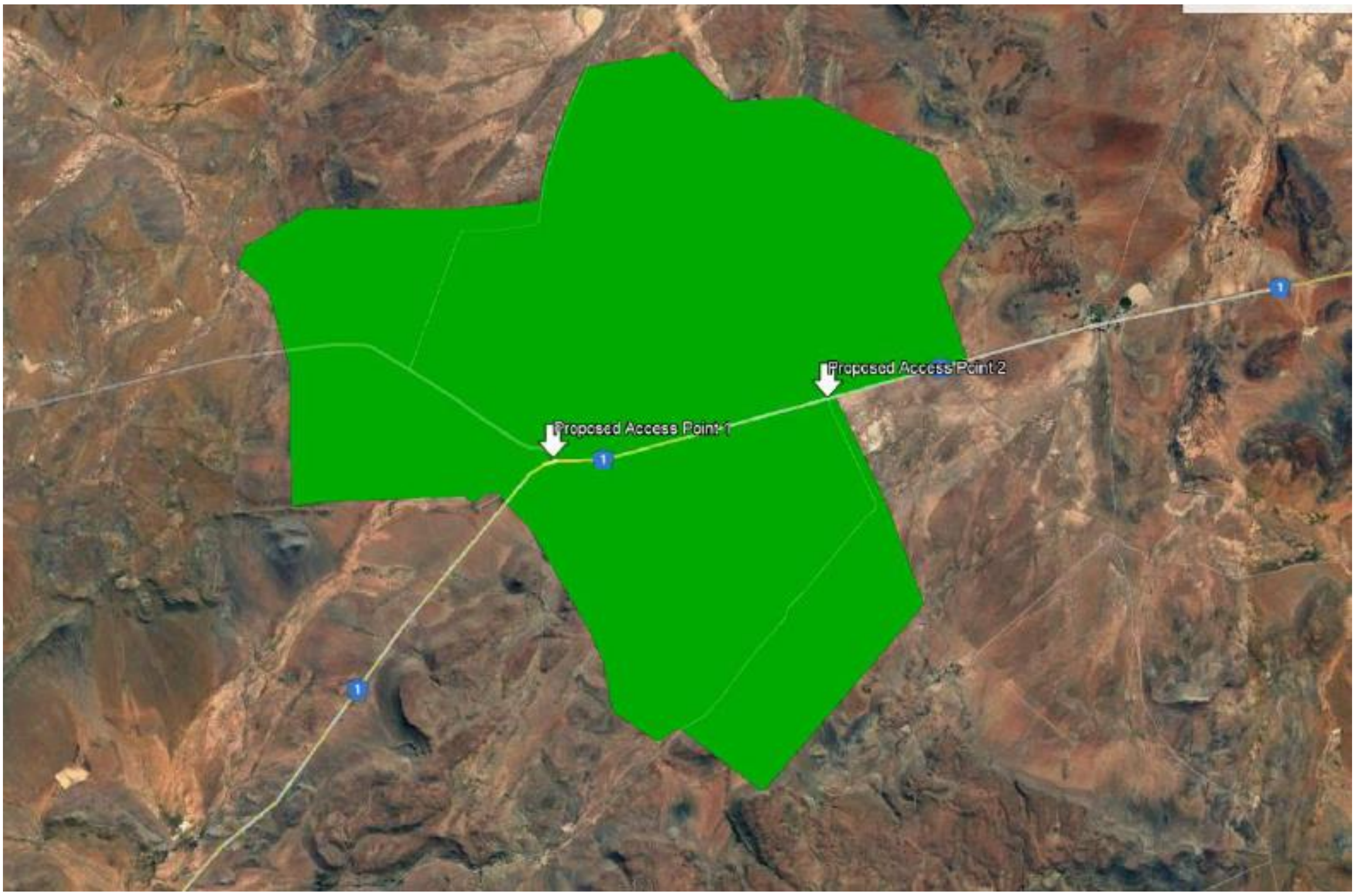


Figure 8.20: Proposed access point to the project site

8.9. Socio-Economic Profile

8.9.1. Profile of the Broader Area

The project site is located within Ward 3 of the Ubuntu Local Municipality, which forms part of the Pixley Ka Seme District Municipality.

Population

According to the Community Household Survey conducted in 2016, the Ubuntu Local Municipality has a population of 19 471. Of this total, 38.6% are under the age of 18, 55.9% between 18 and 64, and the remaining 5.5% are 65 and older. According to the 2011 StatsSA data, the population of Ward 3 is 4 715. Of this total 37% under the age of 18, 58% between 18 and 64, and the remaining 5% are 65 and older. The Ubuntu Local Municipality and the Ward 3 therefore have a high percentage of the population that falls within the economically active group of 18 – 65.

Employment

The official unemployment rate in the Ubuntu Local Municipality in 2011 was 18.1%, while 44.2% were employed, and 33.2% were regarded as not economically active. The figures for Ward 3 in 2011 were 6.8% unemployed, 62.5% employed and 28.4% not economically active. The unemployment rates for the Ubuntu Local Municipality and Ward 3 are lower than the Provincial rate of 14.5% and the District rate of 14.8%.

Recent figures released by Stats South Africa also indicate that South Africa's unemployment rate is in the region of 36%, the highest formal unemployment rate in the world.

<u>Education</u>

In terms of education levels, the percentage of the population over 20 years of age in the Ubuntu Local Municipality and Ward 3 with no schooling was 11.8% (2016) and 20.7% (2011), respectively, compared to 7.9% and 11.1% for the Northern Cape Province in 2016 and 2011, respectively. The percentage of the population over the age of 20 with matric was 23.2% and 15.6%, respectively, compared to 29.1% (2016) and 25.2% (2011) for the Northern Cape. The lower education levels are linked to the rural, isolated nature of the area.

8.9.2. Profile of the Immediate Affected Area

The Great Karoo Cluster of Renewable Energy Facilities is located to the north of the N1, between Three Sisters and Richmond. The closest towns to the site are Richmond, which is located approximately 35km south-west of the site, and Victoria West, which is located approximately 80km south-east the site. The bulk of the site is located to the north of the N1 with a small portion located to the south.

The town of Richmond was established in 1843 when a new congregation was formed for the area. The town was named after the Duke of Richmond from Kent, who was the father-in-law of the Governor of the Cape at that time, Sir Peregrine Maitland. Historically the town served as resort town for European aristocratic tuberculosis patients in the 1800s due to its clean air and mineral rich waters. The Pixley Ka Seme District Municipality Spatial Development Framework identifies Richmond as an Urban Satellite Town. These are towns that already have some services and infrastructure and have the potential to grow. The economy of the town is linked to providing services to the surrounding farming areas and through traffic associated with the N1.

The town of Victoria West was named after Queen Victoria of England and established in 1843. Victoria West forms the starting point of the Diamond Way and lies on the main route from Cape Town to Kimberley. Diamond fever was sparked in 1866 with the discovery at Hopetown and then at Kimberley. The Pixley Ka Seme District Municipality Spatial Development Framework identifies Victoria West as an Urban Centre. These towns are administrative centres within the respective eight municipalities in the district. These centres' administrative functions should be further enhanced, and it is recommended that programs for urban rehabilitation of these centres should focus on the stimulation of economic growth in these areas. The economy of the town is linked to providing services to the surrounding farming areas and through traffic associated with the N12 and R63.

The landscape associated with the site is a typical Karoo landscape consisting of dolerite koppies and ridges separated by valley bottoms. The land uses are linked to livestock farming. The character of the area can be described as a rural, Karoo landscape. There are a number of farm dwellings located in the vicinity of the site, including three farm dwellings within the boundary of the site. Most of the farm dwellings are located in the area to the west and north of the site. The Rondavel Guest Farm is located adjacent to the N1, within the boundary of the site.

CHAPTER 9: ASSESSMENT OF IMPACTS

This chapter serves to assess the significance of the positive and negative environmental impacts (direct and indirect) expected to be associated with the development of the Merino 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[22] of approximately 2 800ha. The development footprint includes the following infrastructure:

» Up to 35 wind turbines with a maximum hub height of up to 170m. The tip height of the turbines will be up to 250m.
» Concrete turbine foundations to support the turbine hardstands.
» Inverters and transformers.
» Temporary laydown areas which will accommodate storage and assembly areas.
» Cabling between the turbines, to be laid underground where practical.
» A temporary concrete batching plant.
» 33/132kV onsite facility substation.
» Underground cabling from the onsite substation to the 132kV collector substation.
» Electrical and auxiliary equipment required at the collector substation that serves that wind energy facility, including switchyard/bay, control building, fences, etc.
» Battery Energy Storage System (BESS).
» Access roads and internal distribution roads.
» Site offices and maintenance buildings, including workshop areas for maintenance and storage.

The full extent of the project site (~29 909ha) and development area (~6 463ha) was considered through the Scoping Phase of the EIA process by the independent specialists and the EAP. On-site sensitivities were identified through the review of existing information, desktop evaluations and detailed field surveys. The identification of a development footprint for the wind farm within the development area was undertaken by the developer through consideration of the sensitive environmental features and areas, and application of a mitigation hierarchy which aimed at avoidance as the first level of mitigation. The specialist assessments undertaken as part of this EIA process have considered the development area, as well as the proposed development footprint (refer to **Figure 9.1**) which was provided by the developer.

The sections which follow provide a summary of the specialist input for each field of study in terms of the impacts which are expected to occur, the significance of the impacts, the opportunity for mitigation of the impacts to an acceptable level and the appropriate mitigation measures recommended for the reduction of the impact significance. 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. This section of the report must be read together with the detailed specialist studies contained in **Appendix D** to **M**.

22 The development footprint of the Merino Wind Farm will be located within the ~6 463ha development area and will be a much smaller area within which the wind turbines and associated infrastructure 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 identified by independent specialists, during the Scoping Phase of the EIA process, which need to be avoided by the wind farm.

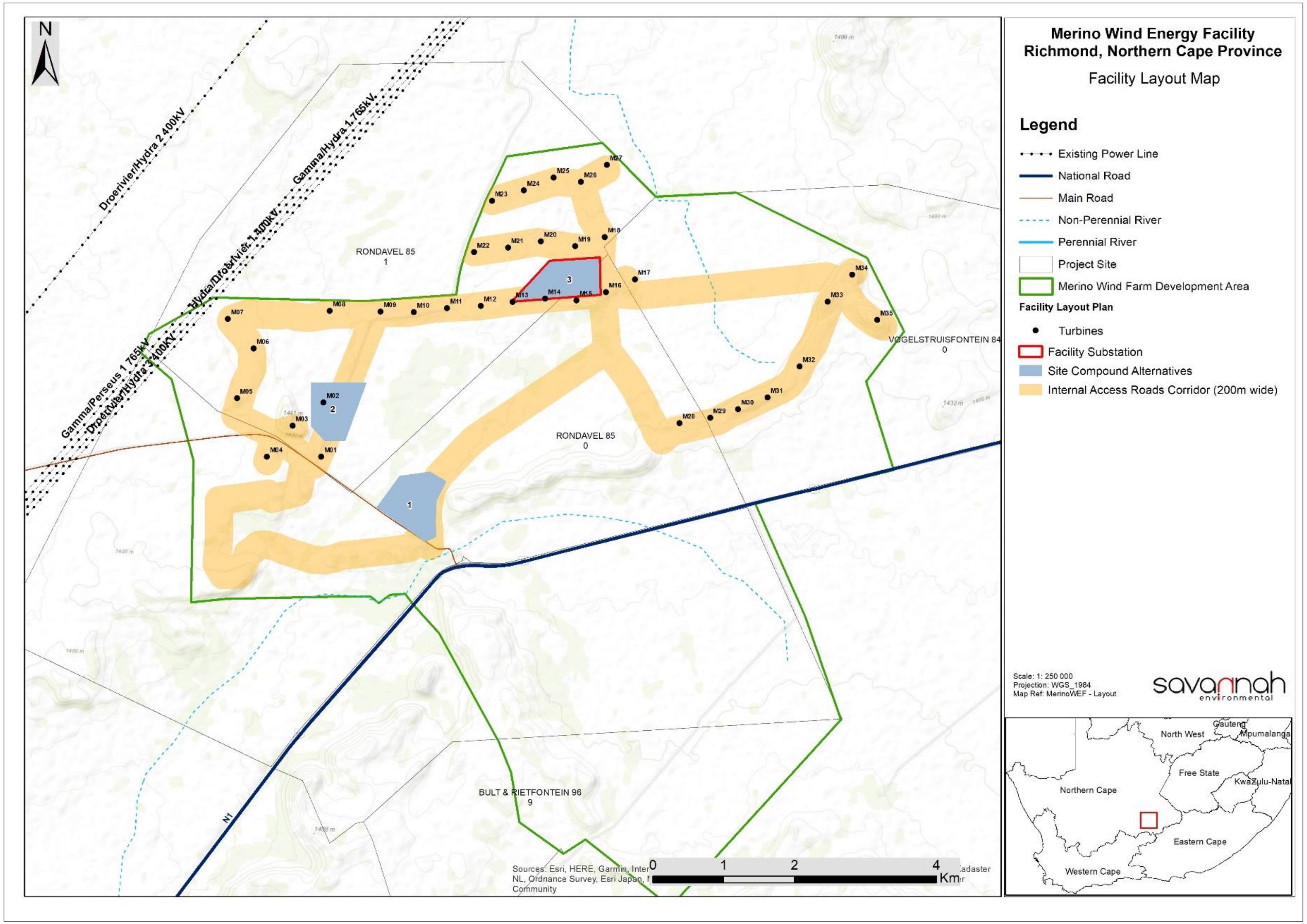


Figure 9.1: Map showing the development area within which the development footprint for the Merino Wind Farm and associated infrastructure has been placed and assessed as part of this EIA process (refer to **Appendix P** for A3 maps).

The development of the Project 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 Merino Wind Farm is dependent on the number of turbines to be erected, but is estimated at 15 - 18 months.

» *Operation* – will include the operation of the wind farm and the generation of electricity, which will be fed into the national grid via a new 33/132kV onsite facility substation and underground cabling from the onsite facility substation to be connected to a proposed 132kV collector substation and a 132kV overhead power line[23] that will connect to the existing Gamma Substation. The operation phase of the Merino 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 - 25 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.

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

This chapter of the EIA Report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 3: : Scope of Assessment and Content of Environmental Impact Assessment Report:

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 risks associated with the development of the Merino 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 9.3.2, 9.4.2, 9.5.2, 9.6.2, 9.7.2, 9.8.2, 9.9.2, 9.10.2, 9.11.2** and **9.12.2.**
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 on the geographical, physical, biological, social, economic, heritage and cultural aspects	The positive and negative impacts associated with the development of the Merino Wind Farm are included in **sections 9.3.2, 9.4.2, 9.5.2, 9.6.2, 9.7.2, 9.8.2, 9.9.2, 9.10.2, 9.11.2** and **9.12.2.**
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 Merino Wind Farm are included in **sections 9.3.2, 9.4.2, 9.5.2, 9.6.2, 9.7.2, 9.8.2, 9.9.2, 9.10.2, 9.11.2** and **9.12.2.**
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	A description of all environmental impacts identified for the Merino Wind Farm during the EIA process, and the extent to which the impact significance can be reduced

[23] The 132kV collector substation and 132kV overhead powerline will be subject to a sperate EA process

Requirement	Relevant Section
(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,.	through the implementation of the recommended mitigation measures provided by the specialists are included in **sections 9.3.2, 9.4.2, 9.5.2, 9.6.2, 9.7.2, 9.8.2, 9.9.2, 9.10.2, 9.11.2** and **9.12.2.**
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 Merino 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 9.3.2, 9.4.2, 9.5.2, 9.6.2, 9.7.2, 9.8.2, 9.9.2, 9.10.2, 9.11.2** and **9.12.2.**
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 9.3.2, 9.4.2, 9.5.2, 9.6.2, 9.7.2, 9.8.2, 9.9.2, 9.10.2, 9.11.2** and **9.12.2.**

9.2. Quantification of Areas of Disturbance on the Site

Site-specific impacts associated with the construction and operation of the Merino 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 Merino 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 of turbine footprints (maximum of 35 each with a hardstand of 80mx35m and a foundation of a diameter of up to 25m per turbine, internal access roads (permanent width of up to 4.5m) and access roads, an onsite facility substation (with an extent of 1000m x 700m), a temporary laydown area (with an extent of 1000m x 700m), a Battery Energy Storage System (2 -10ha in extent)(BESS) to be located within the footprint of the onsite facility substation, temporary concrete batching plant, site offices and maintenance buildings, including workshop areas for maintenance and storage, and electrical and auxiliary equipment required at the collector substation (with an extent of 100m x 100m). The maximum area of disturbance is approximated to be ~2 800ha in extent (this is also the extent of the development footprint), some of which will be temporary and will be rehabilitated following construction.

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.

9.3. Potential Impacts on Ecology (Flora and Fauna)

The development of the Project is likely to result in a variety of impacts associated largely with the disturbance, loss and transformation of intact vegetation and faunal habitat to hard infrastructure such as turbine foundations and service areas, roads, operations buildings etc. 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

The study area consists mostly of natural habitat that is used for commercial animal husbandry. The proposal to build the Merino Wind Farm on site will therefore have significant effects on natural habitat. The existing biodiversity on site is, however, relatively limited in terms of uniqueness or potential presence of species of concern, with the possible presence of one Critically Endangered mammal species.

The vegetation on site is not considered to be part of any threatened ecosystem and has not been assessed as being of high conservation value due to rates of transformation. The regional vegetation types that occur on site, i.e., Eastern Upper Karoo and Upper Karoo Hardeveld, are both widespread and have low rates of transformation across their geographical range.

There are three plant species listed as Rare (*Anisodontea malavastroides, Aloe broomii var. tarkaensis* and *Tridentea virescens*) that could potentially occur on site, but these are all widespread species that are naturally rare where they are found. None have been previously recorded on this site. There are also two plant species protected according to National legislation (*Crinum bulbispermum and Harpagophytum procumbens*) that could potentially occur in the geographical area, but these are also very widespread species. The loss of some individuals, if they are found to occur on site, would not affect the conservation status of any of the species. It is, however, unlikely that any of them would be affected.

There are a small number of fauna species of conservation concern that were assessed as having a possibility of occurring on site. The Riverine Rabbit has been previously recorded within the broader project site.

To determine sensitivity within the development area, local and regional factors were considered. There are some habitats within the development area that have been described as sensitive in their own right, irrespective of regional assessments. This includes primarily the dry stream beds and associated riparian zones. Rocky outcrops and steep slopes are more sensitive than surrounding areas, mainly due to higher floristic diversity and the likelihood of plant species with low local abundance occurring there.

At a regional level, the Critical Biodiversity Area (CBA) map for Northern Cape indicates one drainage line, along with a buffer on each side, that is designated as being a CBA1 area. The remaining drainage lines of the study area are indicated as being Ecological Support Areas (ESAs).

In terms of other species of concern and overall biological diversity, including both plants and animals, the low hills and mountain ranges are the areas with the most species as well as being most likely to contain any species of concern. However, the southern main drainage line is the most likely habitat for the Critically Endangered Riverine Rabbit, if it occurs on site, which is unknown but possible.

Sensitivities that occur specifically within the development area for the Merino Wind Farm that may be vulnerable to damage from the proposed project are as follows:

» Dry stream beds, including the associated riparian habitats and adjacent floodplains;
» CBA1;
» Ridges;
» Plains vegetation; and
» Habitat suitable for Riverine Rabbit.

Based on this information, a map of habitat sensitivity on site is provided in **Figure 9.2**. This shows main habitat sensitivity classes on site, namely VERY HIGH for habitat suitable for Riverine Rabbit, HIGH for other CBA1 areas and riparian habitats, MEDIUM-HIGH for ridges, outcrops, hills and mountain slopes, and MEDIUM for plains vegetation.

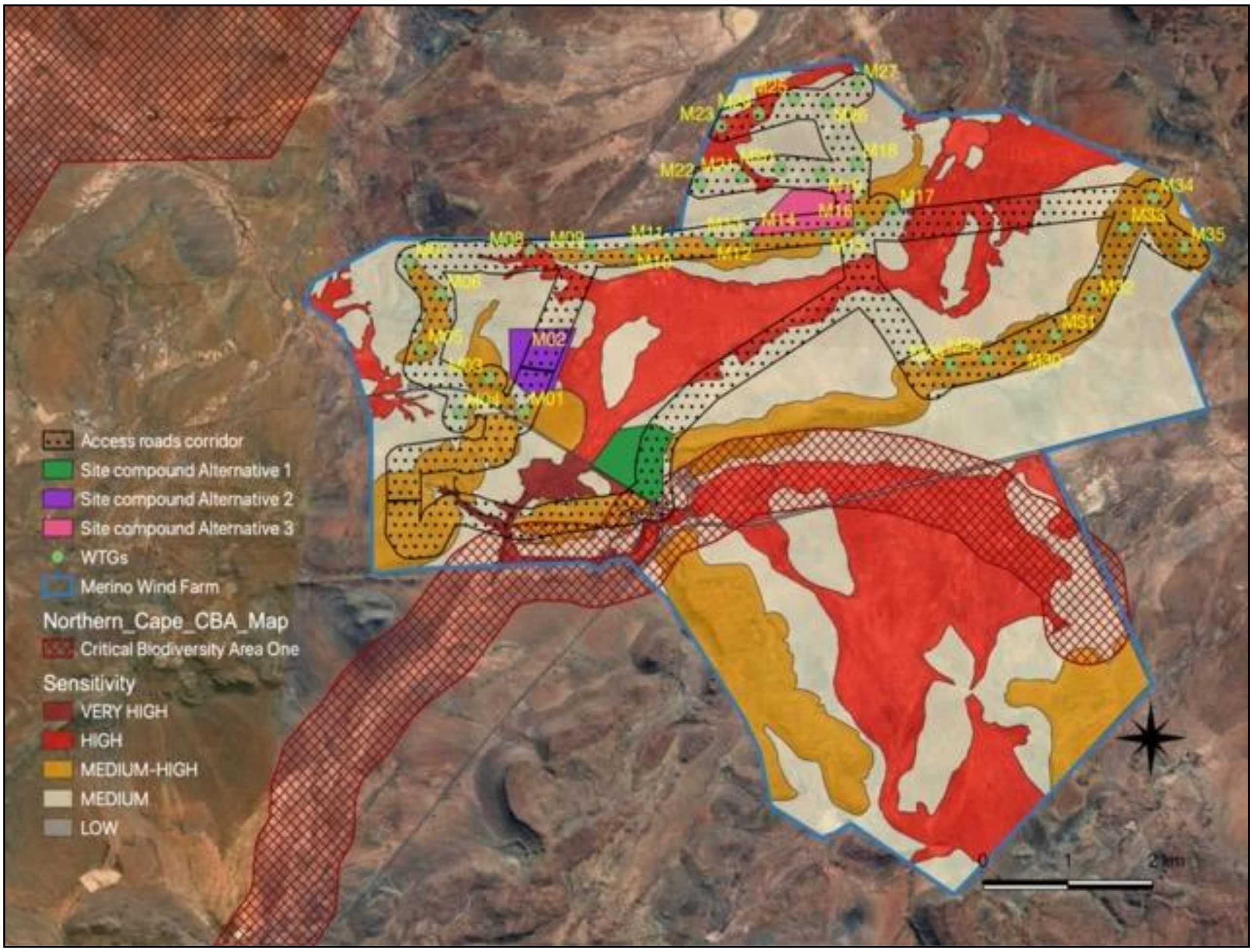


Figure 9.2: Location of the proposed infrastructure relative to habitat sensitivity of the development area for the Merino Wind Farm

9.3.2 *Description of Ecological Impacts*

A summary of the potential ecological issues for the study area is as follows:

» Presence of natural vegetation on site, some of which has high conservation value due to being within Critical Biodiversity Areas (CBA1). Designated-natural vegetation on site is vulnerable to disturbance, especially direct habitat loss and habitat fragmentation.
» Possible presence of Critically Endangered mammal on site.

» Presence of dry stream beds and associated riparian vegetation on site, assessed as being sensitive to impacts associated with development as well as being important habitat for various plant and animal species.
» Presence of various plant species protected according to the Northern Cape Nature Conservation Act (Act 9 of 2009) (assessed separately). The identity of such species requires detailed floristic surveys within the footprint of the proposed project.
» Potential invasion of natural habitats by alien invasive plants, thus causing additional impacts on biodiversity features.

Direct and indirect Impacts associated with the construction, operation and decommissioning phases of the proposed wind farm and associated infrastructure on ecology include the following:

<u>Construction Phase:</u>

Direct impacts:
» Loss and/or fragmentation of indigenous natural vegetation due to clearing.

Indirect impacts:
» Establishment and spread of alien invasive plants due to the clearing and disturbance of indigenous vegetation; and
» Increased runoff and erosion due to clearing of vegetation, construction of hard surfaces and compaction of surfaces, leading to changes in downslope areas.

<u>Operation Phase:</u>

Direct impacts:
» Continued disturbance to natural habitats due to general operational activities and maintenance.

Indirect impacts:
» Continued establishment and spread of alien invasive plant species due to the presence of migration corridors and disturbance vectors; and
» Continued runoff and erosion due to the presence of hard surfaces that change the infiltration and runoff properties of the landscape.

<u>Decommissioning Phase:</u>

Direct impacts:
» Loss and disturbance of natural vegetation due to the removal of infrastructure and need for working sites.

Indirect impacts:
» Continued establishment and spread of alien invasive plant species due to the presence of migration corridors and disturbance vectors; and
» Continued runoff and erosion due to the presence of hard surfaces that change the infiltration and runoff properties of the landscape.

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

The impacts assessed below apply to the development footprint, including the turbines and associated infrastructure for the Merino Wind Farm.

Construction Phase Impacts

Nature: Direct loss and/or fragmentation of indigenous natural vegetation The impact will occur due to clearing of natural habitat for construction of infrastructure.		
	Without mitigation	**With mitigation**
Extent	Site (1)	Site (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Low (5)
Probability	Definite (5)	Definite (5)
Significance	**Medium (50)**	**Medium (50)**
Status (positive or negative)	Negative	
Reversibility	Partly reversible	
Irreplaceable loss of resources?	Marginal	
Can impacts be mitigated?	It is not possible to completely avoid impacts on indigenous vegetation for this project.	
Mitigation: » Restrict impact to development footprint only and limit disturbance creeping into surrounding areas. » As far as possible, locate infrastructure within areas that have been previously disturbed or in areas with lower sensitivity scores. » Avoid sensitive features and habitats when locating infrastructure. » Compile a Rehabilitation Plan. » Compile an Alien Plant Management Plan, including monitoring, to ensure minimal impacts on surrounding areas. » Where possible, access roads should be located along existing farm and district roads. » Access to sensitive areas should be limited during construction. » Undertake monitoring to evaluate whether further measures would be required to manage impacts. » Footprints of infrastructure, laydown areas, construction sites, roads and substation sites should be clearly demarcated. » No additional clearing of vegetation should take place without a proper assessment of the environmental impacts and authorization from relevant authorities, unless for maintenance purposes, in which case all reasonable steps should be taken to limit damage to natural areas. » No driving of vehicles off-road outside of construction areas. » Limit clearing of natural habitat designated as sensitive, especially rocky outcrops, cliffs and riparian habitats, where possible. » Personnel and vehicles should be restricted to access / internal roads and no off-road driving should occur.		
Residual Impacts: There is residual risk on the basis that construction crews are unlikely to remain within the confines of the demarcated construction zone. There is always likely to be "spillage" into surrounding areas, or movement of personnel and/or machinery into areas beyond the footprint of the proposed project.		

Nature: Impact on Integrity of Critical Biodiversity Areas

The impact will occur due to clearing of natural habitat for construction of infrastructure and will result in loss of natural areas within designated CBA1 areas.		
	Without mitigation	**With mitigation**
Extent	Regional (4)	Site (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Very low (0)
Probability	Probable (3)	Very improbable (1)
Significance	**Medium (39)**	**Low (9)**
Status (positive or negative)	Negative	
Reversibility	Partly reversible	
Irreplaceable loss of resources?	Marginal	
Can impacts be mitigated?	Yes	

Mitigation:

» Select a site compound alternative that falls outside of CBA1 areas.

» Locate linear infrastructure outside boundaries of CBA1 areas, except where these are located entirely within existing disturbance and/or transformation.

Residual Impacts:

There is residual risk on the basis that construction crews are unlikely to remain within the confines of the demarcated construction zone. There is always likely to be "spillage" into surrounding areas, or movement of personnel and/or machinery into areas beyond the footprint of the proposed project.

Nature: Loss of individuals of Species of Conservation Concern due to clearing for construction The impact will occur due to clearing of indigenous vegetation for the purposes of construction of infrastructure.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	High (8)	Minor (2)
Probability	Probable (3)	Very improbable (1)
Significance	**Medium (45)**	**Low (9)**
Status (positive or negative)	Negative	
Reversibility	Irreversible	
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	Yes	

Mitigation:

» Undertake a detailed walk-through survey of footprint areas that are within habitats where SCC are likely to occur during a favourable season to locate any individuals of protected plants, as well as for any populations of threatened plant species. This survey must cover the footprint of all approved infrastructure, including internal access roads (final infrastructure layout). The best season is early to late Summer, but dependent on recent rainfall and vegetation growth.

» Where significant populations of SCC are found, shift infrastructure to avoid direct impacts.

» Compile a Plant Rescue Plan to be approved by the appropriate authorities.

» Undertake monitoring to evaluate whether further measures would be required to manage impacts.

» Obtain the necessary permits for specimens or protected plant species that will be lost due to construction of the project.

» For any plants that are transplanted, annual monitoring should take place to assess survival. This should be undertaken for a period of three years after translocation and be undertaken by a qualified botanist. The monitoring programme must be designed prior to translocation of plants and should include control sites (areas not disturbed by the project) to evaluate mortality relative to wild populations.

» No collecting or poaching of any plant species must be permitted on site.

» Loss of protected species of conservation concern must be report to the conservation authorities.

» Personnel must be educated about protection status of species, including distinguishing features, to be able to identify protected species. » Implement strict access control for the site. » Report any illegal collection to conservation authorities. » Personnel and vehicles should be restricted to access / internal roads and no off-road driving should occur.
Residual Impacts: There is some residual risk on the basis that SCC are often difficult to locate in the field and could be overlooked during a walk-through survey. The risk is dependent on the competence and diligence of the botanist undertaking the walk-through survey, and the degree to which resources are limited in support of the walk-down survey.

Nature: Establishment and spread of declared weeds and alien invader The impact will occur due to alien invader plants immigrating into the site, becoming established and spreading, which degrades and displaces indigenous natural habitat.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Site (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Minor (2)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (40)**	**Low (28)**
Status (positive or negative)	Negative	
Reversibility	Partly reversible	
Irreplaceable loss of resources?	Marginal	
Can impacts be mitigated?	Yes	
Mitigation: » Compile and implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control. » Undertake regular monitoring to detect alien invasions early so that they can be controlled. » Implement control measures for declared weeds and alien invader plants.		
Residual Impacts: Due to the high number of alien invader plant species in the country, the problem of local invasion is pervasive. Seasonal climate conditions make it unpredictable which species are likely to spread at any particular time. Any drop in focus on this problem can lead to breakaway invasion.		

Nature: Increased runoff and erosion Increased runoff and erosion due to clearing of vegetation, construction of hard surfaces and compaction of surfaces, leading to impacts on downslope areas.		
	Without mitigation	**With mitigation**
Extent	Site (1)	Sitel (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Medium (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (33)**	**Low (18)**
Status (positive or negative)	Negative	
Reversibility	Partly reversible	
Irreplaceable loss of resources?	Marginal	
Can impacts be mitigated?	Yes	
Mitigation: » Compile and implement a stormwater management plan.		

» Keep gradients of roads adequately low to minimise erosion. » Align roads to avoid steep slopes and avoid the necessity for significant cuts and fills. » Monitor road surfaces for erosion and repair or upgrade, where necessary. » Ensure all possible steps are taken to limit erosion of surfaces, including proper management of storm-water runoff. » Speed limits should be set for all roads on site, as well as access roads to the site. These limits should not exceed 40 km/h, but may be set lower, depending on local circumstances. Strict enforcement of speed limits should occur – install speed control measures, such as speed humps, if necessary. » Maintain adequate buffer zones around hydrological features so that these do not become degraded from runoff and erosion. » Compile and implement a Stormwater Management Plan, which highlights control priorities and areas and provides a programme for long-term control.
Residual Impacts: Extreme rainfall events are likely to render any control measures irrelevant.

Operation Phase Impacts

Nature: Continued loss and/or fragmentation of indigenous natural vegetation due to general operational activities and maintenance		
	Without mitigation	**With mitigation**
Extent	Site (1)	Site (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Low (3)
Probability	Probable (3)	Probable (3)
Significance	**Medium (30)**	**Low (24)**
Status (positive or negative)	Negative	
Reversibility	Partly reversible	
Irreplaceable loss of resources?	Marginal	
Can impacts be mitigated?	Yes	
Mitigation: » Restrict activities to infrastructure locations only and limit disturbance creeping into surrounding areas. » Protect sensitive features and habitats during operational activities. » Implement and monitor Rehabilitation Plan. » Implement Alien Plant Management Plan, including monitoring, to ensure minimal impacts on surrounding areas. » Access to sensitive areas must be enforced. » Undertake monitoring to evaluate whether further measures would be required to manage impacts. » No additional clearing of vegetation should take place during the operational phase without a proper assessment of the environmental impacts and authorization from relevant authorities, unless for maintenance purposes, in which case all reasonable steps should be taken to limit damage to natural areas.		
Residual Impacts: There is residual risk on the basis that maintenance personnel are unlikely to remain within the confines of the demarcated project area. There is always likely to be "spillage" into surrounding areas, or movement of personnel and/or machinery into areas beyond the footprint of the proposed project.		

Nature: Continued establishment and spread of alien invasive plants The impact will occur due to alien invader plants immigrating into the site, becoming established and spreading, which degrades and displaces indigenous natural habitat.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Site (1)
Duration	Long-term	Long-term (4)

Magnitude	Medium (6)	Minor (2)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (48)**	**Low (28)**
Status (positive or negative)	Negative	
Reversibility	Partly reversible	
Irreplaceable loss of resources?	Marginal	
Can impacts be mitigated?	Yes	

Mitigation:

- Compile and implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control.
- Undertake regular monitoring to detect alien invasions early so that they can be controlled.
- Implement control measures for declared weeds and alien invader plants.

Residual Impacts:

Due to the high number of alien invader plant species in the country, the problem of local invasion is pervasive. Seasonal climate conditions make it unpredictable which species are likely to spread at any particular time. Any drop in focus on this problem can lead to breakaway invasion.

Nature: Continued impacts due to runoff and erosion

Increased runoff and erosion due to clearing of vegetation, construction of hard surfaces and compaction of surfaces, leading to impacts on downslope areas.

	Without mitigation	**With mitigation**
Extent	Site (1)	Site (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Medium (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (33)**	**Low (18)**
Status (positive or negative)	Negative	
Reversibility	Partly reversible	
Irreplaceable loss of resources?	Marginal	
Can impacts be mitigated?	Yes	

Mitigation:

- Implement a stormwater management plan.
- Monitor road surfaces for erosion and repair or upgrade, where necessary.
- Install additional flood and/or erosion control measures, where necessary.
- Speed limits should be set for all roads on site, as well as access roads to the site. These limits should not exceed 40 km/h, but may be set lower, depending on local circumstances. Strict enforcement of speed limits should occur – install speed control measures, such as speed humps, if necessary.
- Maintain adequate buffer zones around hydrological features so that these do not become degraded from runoff and erosion.
- Surface runoff and erosion must be properly controlled during the operational phase, and any issues addressed as quickly as possible.

Residual Impacts:

Extreme rainfall events are likely to render any control measures irrelevant.

Decommissioning Phase Impacts

Nature: Continued loss and/or fragmentation of indigenous vegetation due to the removal of infrastructure and need for working sites.

	Without mitigation	**With mitigation**
Extent	Site (1)	Site (1)

Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (3)
Probability	Probable (3)	Probable (3)
Significance	**Medium (30)**	**Low (24)**
Status (positive or negative)	Negative	
Reversibility	Partly reversible	
Irreplaceable loss of resources?	Marginal	
Can impacts be mitigated?	Yes	

Mitigation:

» Restrict activities to infrastructure locations only and limit disturbance creeping into surrounding areas.
» Protect sensitive features and habitats during decommissioning activities.
» Implement and monitor Rehabilitation Plan.
» Implement Alien Plant Management Plan, including monitoring, to ensure minimal impacts on surrounding areas.
» Access to sensitive areas must be enforced.
» Undertake monitoring to evaluate whether further measures would be required to manage impacts.

Residual Impacts:

There is residual risk on the basis that de-construction teams are unlikely to remain within the confines of the demarcated project area. There is always likely to be "spillage" into surrounding areas, or movement of personnel and/or machinery into areas beyond the footprint of the proposed project.

Nature: Continued establishment and spread of alien invasive plants

The impact will occur due to alien invader plants immigrating into the site, becoming established and spreading, which degrades and displaces indigenous natural habitat.

	Without mitigation	**With mitigation**
Extent	Local (2)	Site (1)
Duration	Long term (4)	Long term (4)
Magnitude	Medium (6)	Minor (2)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (48)**	**Low (28)**
Status (positive or negative)	Negative	
Reversibility	Partly reversible	
Irreplaceable loss of resources?	Marginal	
Can impacts be mitigated?	Yes	

Mitigation:

» Compile and implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control.
» Undertake regular monitoring to detect alien invasions early so that they can be controlled.
» Implement control measures for declared weeds and alien invader plants.
» Do NOT use any alien plants during rehabilitation.

Residual Impacts:

Due to the high number of alien invader plant species in the country, the problem of local invasion is pervasive. Seasonal climate conditions make it unpredictable which species are likely to spread at any particular time. Any drop in focus on this problem can lead to breakaway invasion.

Nature: Continued impacts due to runoff and erosion

	Without mitigation	**With mitigation**
Extent	Site (1)	Site (1)
Duration	Long term (4)	Long term (4)
Magnitude	Medium (6)	Low (4)

Probability	Probable (3)	Improbable (2)
Significance	**Medium (33)**	**Low (18)**
Status (positive or negative)	Negative	
Reversibility	Partly reversible	
Irreplaceable loss of resources?	Marginal	
Can impacts be mitigated?	Yes	

Mitigation:

» Implement a stormwater management plan.
» Implement a rehabilitation plan.
» Monitor road surfaces for erosion and repair or upgrade, where necessary.
» Install additional flood and/or erosion control measures, where necessary.
» Ensure all possible steps are taken to limit erosion of surfaces, including proper management of storm-water runoff.
» Speed limits should be set for all roads on site, as well as access roads to the site. These limits should not exceed 40 km/h, but may be set lower, depending on local circumstances. Strict enforcement of speed limits should occur – install speed control measures, such as speed humps, if necessary.
» Maintain adequate buffer zones around hydrological features so that these do not become degraded from runoff and erosion.

Residual Impacts:

Extreme rainfall events are likely to render any control measures irrelevant.

9.3.4 *Comparative Assessment of the Site Compound Alternatives*

Three alternative sites were provided for the site compounds (refer to **Figure 9.1**), one of which is also indicated as the location for the collector substation. An assessment of these is as follows:

Alternative	Sensitivities	Preference
Site compound alternative 1	MEDIUM sensitivity – karroid plains, HIGH sensitivity – drainage, VERY HIGH sensitivity – CBA1	LEAST PREFERRED – avoidance of this location is listed as a mitigation measure to avoid impacts on CBA1 area. However, the site is adjacent to existing homestead and road and is therefore in proximity to existing disturbance, which is also preferable. If it can be re-designed to avoid the CBA1 area then it would be the preferred alternative.
Site compound alternative 2	MEDIUM sensitivity – karroid plains, MEDIUM-HIGH sensitivity – mountain slopes, HIGH sensitivity – drainage	FEASIBLE – close to the existing gravel road, but partially impacts a drainage area.
Site compound alternative 3 / Collector Substation	MEDIUM sensitivity – karroid plains, MEDIUM-HIGH sensitivity – mountain slopes.	PREFERRED – although it is the option furtherest from any existing infrastructure or access roads, which is not ideal.

It is not indicated whether Site compound alternative 3 can be used as the collector substation at the same time, or whether these are two mutually exclusive uses. If the collector substation location is fixed and the site can also be used for the site compound, then this would be the obvious location of the infrastructure.

9.3.5 *Overall Result*

The Ecology Impact Assessment identified five potential negative impacts due to the construction and operation of the proposed wind farm and its associated infrastructure. These include:

» Direct loss of vegetation. For wind energy projects, the main impact on terrestrial ecosystems is due to road construction and not to the turbines themselves. The placement of roads is therefore critical in limiting impacts.
» Impacts on CBA1 areas. There is a CBA1 area in the southern part of the study area that is marginally affected by proposed infrastructure. It can, however, be completely avoided.
» Introduction and/or spread of declared weeds and alien invasive plants in terrestrial habitats. This can lead to additional degradation of natural areas.
» Runoff and erosion due to creation of hard surfaces. This can lead to downslope impacts that can cause additional degradation beyond the direct footprint of proposed infrastructure.
» Loss of individuals of Species of Conservation Concern due to clearing for construction

An assessment of these impacts indicated that they will have a significance of low or medium. If appropriate mitigation measures are put in place, all impacts can be reduced to having low significance, except for loss of habitat, which will remain medium significance after mitigation. On the basis of this assessment, it is the opinion of the specialist that the project should be able to proceed on condition the recommended mitigation measures are put in place to minimise predicted impacts. From an ecological perspective, site compound alternative 3 is preferred, site compound alternative 2 is acceptable and site compound alternative 1 is not preferred.

9.4. Potential Impacts on Aquatic Ecology

The development of the Merino Wind Farm is likely to result in a variety of impacts from an aquatic perspective. 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 Aquatic Impact Assessment

Based on a combination of desktop and in-field delineation, three (3) forms of a watercourses were identified and delineated within the 500m regulated area. These include episodic rivers, drainage lines and dams. No natural wetland systems were identified for the development area. The rivers and drainage lines are both classified as a river HGM type system. The dams are regarded as artificial systems and typically formed / created in the preferential flow paths of the river HGM type. The drainage lines are not characterised by riparian vegetation and grasses, these systems represent bare surfaces with evidence of surface run-off.

The results of the habitat assessment indicate natural (class A) and largely natural (class B) instream and riparian conditions for the catchment respectively. The overall ecological importance and sensitivity for the area was determined to be moderate. The overall ecosystem service benefit for the system is high.

The recommended buffer was calculated to be 15m and 22m for the drainage lines and rivers, respectively, for the construction and operational phases. The buffer zone will not be applicable for proposed infrastructure that traverse the systems, however, for all secondary activities such as laydown yards and storage areas, the buffer zone must be implemented.

9.4.2 Description of Impacts on Aquatic Ecology

<u>Construction Phase</u>

Construction could result in the encroachment into watercourses and result in the loss or degradation of these systems, most of which are functional and provide ecological services. Watercourses are also likely to be traversed by roads and other linear infrastructure which might create a barrier to flow and biotic movement across the systems. These disturbances could also result in the infestation and establishment of alien vegetation would affect the functioning of the systems. During construction, earthworks will expose and mobilise earth materials which could result in sedimentation of the receiving systems. A number of machines, vehicles and equipment will be required for the phase, aided by chemicals and concrete mixes for the project. Leaks, spillages or breakages from any of these could result in contamination of the receiving water resources. Contaminated water resources are likely to have an effect on the associated biota. The following potential impacts are expected during site clearing and preparation:

- » Watercourse disturbance / loss:
  - ∗ Direct disturbance / degradation / loss to soils or vegetation due to the construction of the facility and associated infrastructure.
- » Water runoff from construction site:
  - ∗ Increased erosion and sedimentation; and
  - ∗ Contamination of receiving water resources.

<u>Operational Phase</u>

The operational phase refers to the phase when the construction has been completed and the infrastructure is functional. It is anticipated to increase stormwater runoff due to the hardened surfaces and the crossings will result in an increase in run-off volume and velocities, resulted in altered flow regimes. The changes could result in physical changes to the receiving systems caused by erosion, run-off and also sedimentation, and the functional changes could result in changes to the vegetative structure of the systems. The reporting of surface run-off to the systems could also result in the contamination of the systems, transporting (in addition to sediment) diesel, hydrocarbons and soil from the operational areas. The following potential impacts are expected during the operational phase:

- » Hardened surfaces;
  - ∗ Potential for increased stormwater runoff, leading to increased erosion and sedimentation.
- » Contamination:
  - ∗ Potential for increased contaminants entering the watercourses.

9.4.3 *Impact tables summarising the significance of impacts on aquatic ecology during construction, operation and decommissioning (with and without mitigation)*

Construction Phase Impacts

Nature: Watercourse disturbance / loss Direct disturbance / degradation / loss to soils or vegetation due to the construction of the facility and associated infrastructure, such as crossings		
	Without mitigation	**With mitigation**
Extent	High (4)	Moderate (3)
Duration	Moderate term (3)	Moderate term (3)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium (52)**	**Low (20)**

Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes, avoidance of watercourses is possible.	

Mitigation:

- » Avoid direct impacts to water resources and their associated buffer width (as recommended). This avoidance is not required from watercourse crossings (i.e. roads, pipelines, cables etc), but the number and size of the crossings must be kept to a minimum. Only essential services and equipment are permitted within the crossings and associated buffer during the construction phase.
- » Prioritise construction of the crossings during the dry season period.
- » Clearly demarcate the construction footprint and restrict all construction activities to within the proposed infrastructure area.
- » When clearing vegetation, allow for some vegetation cover as opposed to bare areas.
- » Minimize the disturbance footprint and unnecessary clearing of vegetation outside of this area.
- » Use the shapefiles provided within the EIA process defining the watercourses within the site to signpost the edge of the watercourses closest to site. Place the sign 22m from the edge (this is the buffer zone). Label these areas as environmentally sensitive areas, keep out.
- » Educate staff and relevant contractors on the location and importance of the identified watercourses through toolbox talks and by including them in site inductions and the overall master plan.
- » All activities (including driving) must adhere to the respective buffer areas.
- » Promptly remove / control all AIPs that may emerge during construction (i.e. weedy annuals and other alien forbs).
- » All alien vegetation within the site should be managed in terms of the Regulation GNR.1048 of 25 May 1984 (as amended) issued in terms of the CARA and IAP regulations.
- » Landscape and re-vegetate all denuded areas as soon as possible.
- » Implement a suitable stormwater management plan for the facility. Priority must be the return of clean water to the resources, avoiding scouring or erosion at any discharge locations.

Residual Impacts:

Notable disturbances are expected for the construction phase. However, with correctly placed mounted infrastructure the hydrology of the system will recover to some extent during the operational phase. The residual impact is expected to be low.

Nature: Water runoff from construction site

Increased erosion and sedimentation & contamination of resources (the drainage features and rivers)

	Without mitigation	**With mitigation**
Extent	High (4)	Moderate (3)
Duration	Moderate term (3)	Moderate term (3)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium (52)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	

Mitigation:

- » The contractors used for the construction should have spill kits available onsite prior to construction to ensure that any fuel, oil or hazardous substance spills are cleaned-up and discarded correctly.
- » All construction activities must be restricted to the development footprint area. This includes laydown and storage areas, ablutions, offices etc.

» During construction activities, all rubble generated must be kept in a skip (or similar) and the removed from the site to a licensed facility. » Construction vehicles and machinery must make use of existing access routes as much as possible. » All chemicals and toxicants to be used for the construction must be stored in a bunded area. » All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site at designed areas. » All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping". » Adequate sanitary facilities and ablutions on the servitude must be provided for all personnel throughout the project area. Use of these facilities must be enforced (these facilities must be kept clean so that they are a desired alternative to the surrounding vegetation). » All removed soil and material stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds. » No dumping of material on site may take place. » Implement a suitable stormwater management plan for the facility. Ensure the separation of clean and dirty water. » All waste generated on site during construction must be adequately managed. Separation and recycling of different waste materials should be supported. » No activities are permitted within the watercourses and associated buffer areas unless these are for crossings. » Landscape and re-vegetate all unnecessarily denuded areas as soon as possible.
Residual Impacts: Long term broad scale erosion and sedimentation, and contamination of watercourses. The residual impact is expected to be low.

Operation Phase Impacts

Nature: Hardened surfaces Potential for increased stormwater runoff leading to increased erosion and sedimentation		
	Without mitigation	**With mitigation**
Extent	High (4)	Moderate (3)
Duration	Long term (4)	Moderate term (3)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium (56)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes, with proper management and avoidance, this impact can be mitigated to a low level.	
Mitigation: » Design and implement an effective stormwater management plan. » Promote water infiltration into the landscape. » Release only clean water into the environment. » Stormwater leaving the site should not be concentrated in a single exit drain but spread across multiple drains around the site, each fitted with energy dissipaters (e.g. slabs of concrete with rocks cemented in). » Re-vegetate denuded areas as soon as possible. » Regularly clear drains. » Minimise the extent of concreted / paved / gravel areas. » A covering of soil and grass (regularly cut and maintained) around infrastructure is ideal for infiltration. If not feasible, then gravel is preferable over concrete or paving.		

Residual Impacts: Long-term broad scale erosion and sedimentation.

<table>
<tr><td colspan="3">Nature: Contamination

Potential for increased contaminants entering the systems</td></tr>
<tr><td></td><td>Without mitigation</td><td>With mitigation</td></tr>
<tr><td>Extent</td><td>High (4)</td><td>Moderate (3)</td></tr>
<tr><td>Duration</td><td>Long term (4)</td><td>Moderate term (3)</td></tr>
<tr><td>Magnitude</td><td>Moderate (6)</td><td>Low (4)</td></tr>
<tr><td>Probability</td><td>Highly probable (4)</td><td>Improbable (2)</td></tr>
<tr><td>Significance</td><td>Medium (56)</td><td>Low (20)</td></tr>
<tr><td>Status (positive or negative)</td><td>Negative</td><td>Negative</td></tr>
<tr><td>Reversibility</td><td>Moderate</td><td>High</td></tr>
<tr><td>Irreplaceable loss of resources?</td><td>Yes</td><td>Yes</td></tr>
<tr><td>Can impacts be mitigated?</td><td colspan="2">Yes</td></tr>
<tr><td colspan="3">Mitigation:
» Design and implement an effective stormwater management plan.
» Release only clean water into the environment.
» The contractors used should have spill kits available to ensure that any fuel, oil or hazardous substance spills are cleaned-up and discarded correctly.
» All chemicals and toxicants to be used for the construction must be stored in a bunded area.
» All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site at designed areas.
» All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good “housekeeping”;
» Adequate sanitary facilities and ablutions on the servitude must be provided for all personnel throughout the project area. Use of these facilities must be enforced (these facilities must be kept clean so that they are a desired alternative to the surrounding vegetation).
» All waste generated on site during construction must be adequately managed. Separation and recycling of different waste materials should be supported.</td></tr>
<tr><td colspan="3">Residual Impacts:
Watercourse deterioration over time.</td></tr>
</table>

Decommissioning Phase Impacts

While no specific impacts have been identified for the decommissioning phase, it is considered that the impacts expected for the construction phase and the mitigation measures recommended will also be relevant to the decommissioning phase.

9.4.4 Overall Result

The pre-mitigation impact significance for all considered aspects is expected to be medium. The expected post-mitigation impact significance is expected to be low should all mitigation measures and recommendations be implemented.

It is the opinion of the specialist that no fatal flaws are presented for the proposed project. The project may be considered favourably by the issuing authority, but all mitigation measures and recommendations must be considered for the authorisation.

Watercourses are present within the development area of the Merino Wind Farm as identified in the Aquatic Impact Assessment (**Appendix E**). As a result, a water use authorisation for the project will be required from the DWS for water uses identified in Section 21(c) and 21(i) of the National Water Act (Act 36 of 1998).

9.5. Potential Impacts on Avifauna

The development of the Merino Wind Farm is likely to result in a variety of impacts from an avifaunal perspective. 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 Avifauna Impact Assessment

The South African Bird Atlas Project 2 (SABAP2) data indicates that a total of 165 bird species could potentially occur within the broader area. Of these, 24 species are classified as priority species and 12 of these are South African Red List species. Of the priority species, 17 are likely to occur regularly in the development area, namely, Black Harrier, Black Stork, Blue Crane, Greater Flamingo, Karoo Korhaan, Lanner Falcon, Ludwig's Bustard, Martial Eagle, Secretarybid, Tawny Eagle, Verreaux's Eagle and Cape Vulture.

Drives and Walked Transect counts

The avifauna pre-construction monitoring for the Merino Wind Farm was undertaken over a 12 month period. The sections below provides an overview of the pre-construction monitoring results. An Index of Kilometric Abundance (IKA = birds/km) was calculated for each priority species recorded during transects over all four seasons (refer to **Figure 9.3** and **Figure 9.4**).

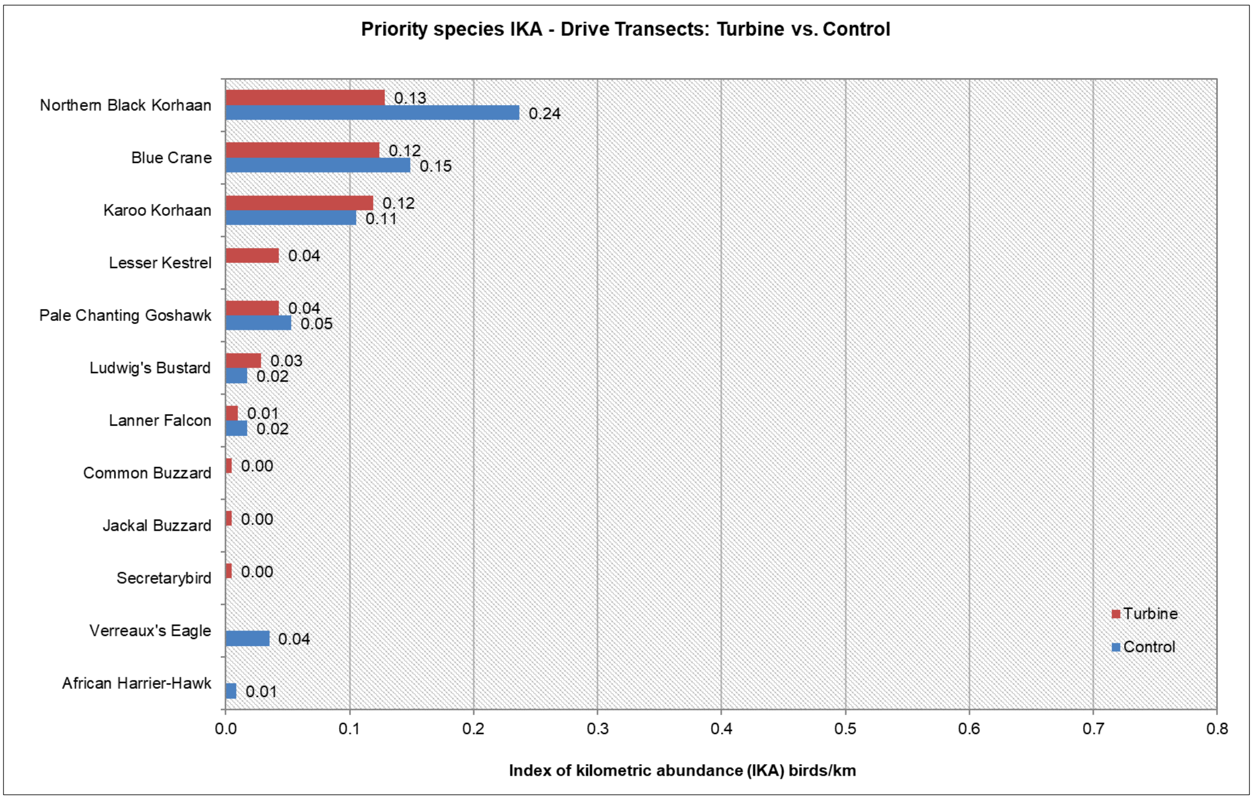


Figure 9.3: Index of kilometric abundance of priority species recorded at the WEFs and control site through drive transect surveys over all four seasons.

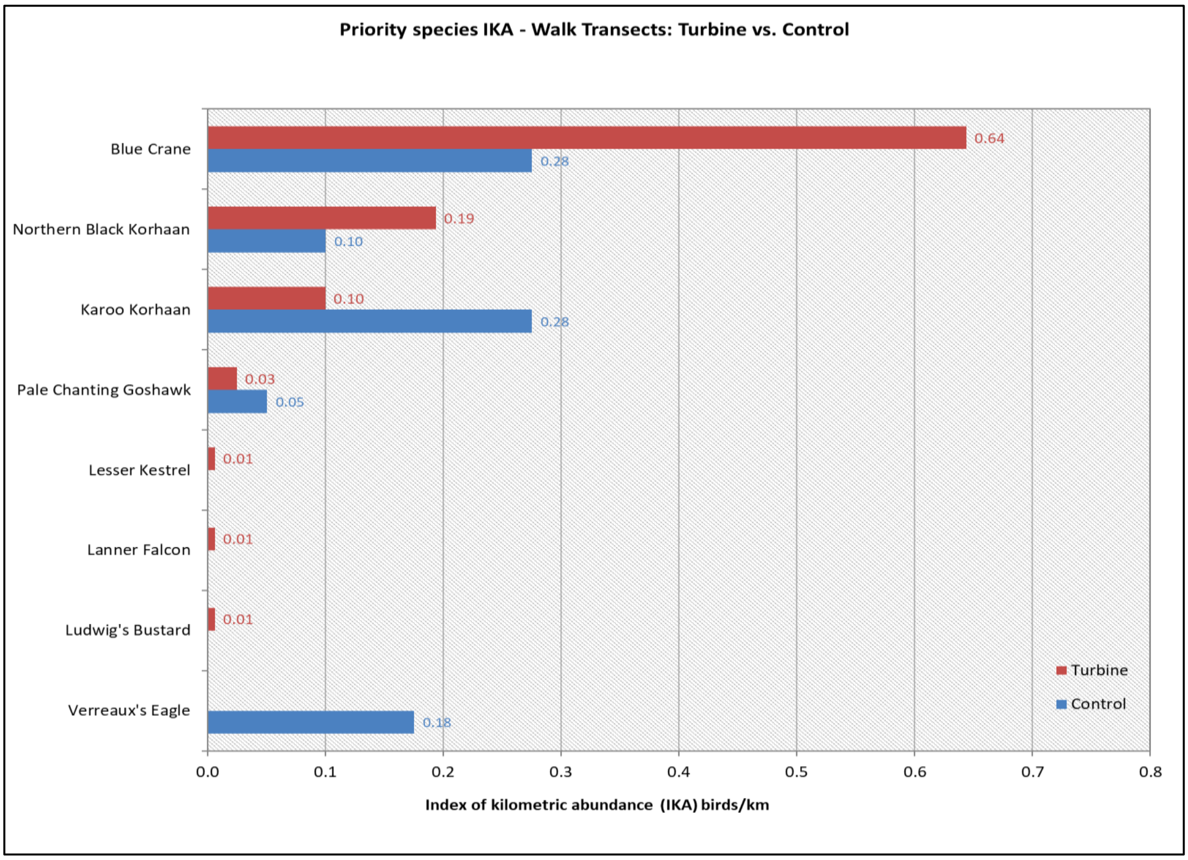


Figure 9.4: Index of kilometric abundance of priority species recorded at the WEFs through walk transect surveys over all four seasons

Site specific collision risk rating

A site-specific collision risk rating for each priority species recorded during Vantage Point (VP) watches at the project site was calculated to give an indication of the likelihood of an individual of the specific species to collide with the turbines at these sites. This was done in order to gain some understanding of which species are likely to be most at risk of collision. The results are presented in **Figure 9.5**.

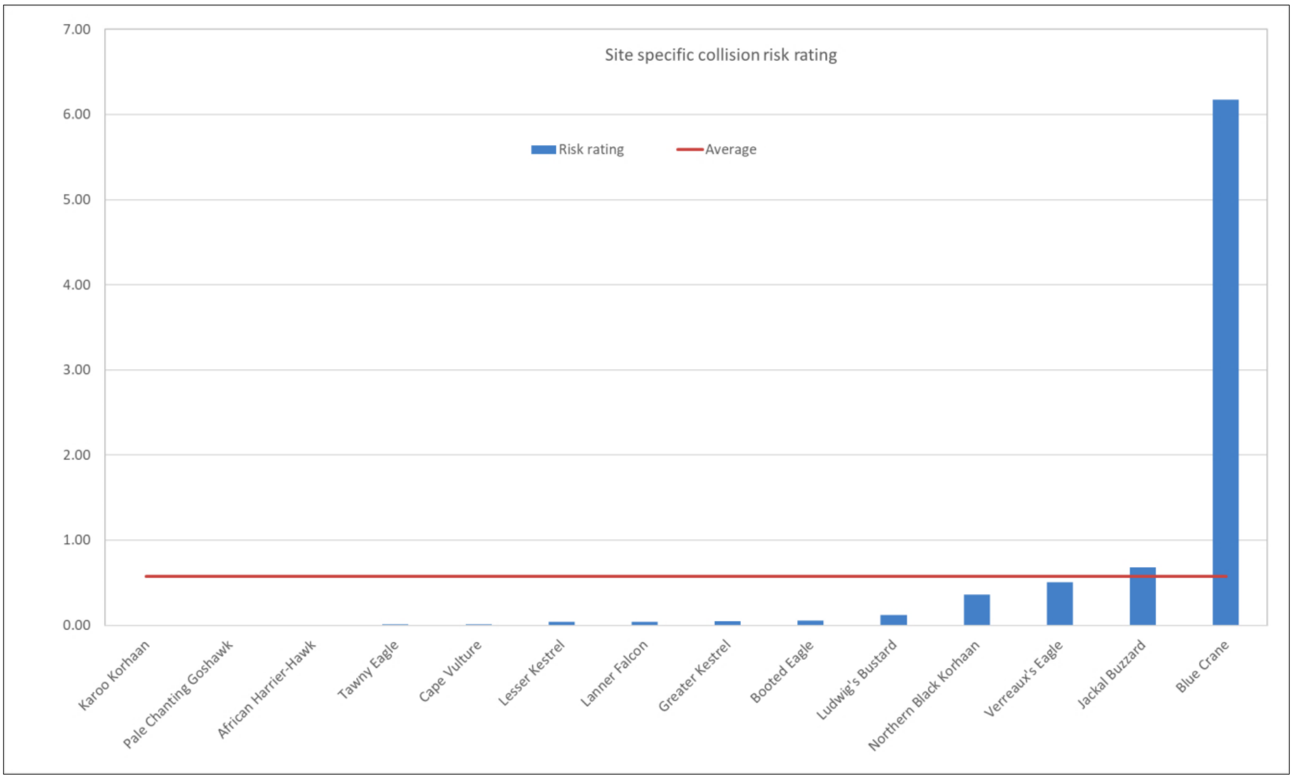


Figure 9.5: Site-specific collision risk rating for priority species

The following specific environmental sensitivities were identified from an avifaunal perspective (refer to **Figure 9.6**):

» **<u>Large dams: 800m turbine No-Go zone</u>**
  Surface water in this semi-arid habitat is crucially important for priority avifauna and many non-priority species. It is important to leave open space with no turbines for birds to access and leave the surface water area unhindered. Blue Cranes are also likely to at times roost in the larger dams and could fly in and out of these areas before dawn / after dusk which further necessitates a sufficient buffer around the dams.

» **<u>Boreholes: 200m turbine No-Go zone</u>**
  Surface water in this semi-arid habitat is crucially important for priority avifauna and many non-priority species. It is important to leave open space with no turbines for birds to access and leave the surface water area unhindered.

» **<u>Verreaux's Eagle nest: 3.7km all infrastructure No-Go zone and 5.2km medium sensitivity zone</u>**
  A 3.7km infrastructure free buffer zone must be implemented around the Verreaux's Eagle (SA status: Vulnerable) nest at -31.425449° 23.702398°. This is to reduce the collision risk. It is recommended that suitable pro-active mitigation be implemented at all turbines within a 5.2 km radius around the Verreaux's Eagle nest during daylight hours, once the wind farm commences with operations, to reduce

the risk of collisions of Verreaux's Eagles with the turbines. Suitable pro-active mitigation measures should be selected prior to commencement of operation, informed by best-available information at the time of implementation.

» **<u>Tawny Eagle nests: 3km all infrastructure No-Go zone</u>**
A 3km infrastructure free buffer zone must be implemented around the Tawny Eagle (SA status: Endangered) nests at (-31.540635°, 23.716886°) and (-31.445988°, 23.583921°). This is to reduce the turbine collision risk.

» **<u>Martial Eagle nests: 5km all infrastructure No-Go zone</u>**
A 5km infrastructure free buffer zone must be implemented around the Martial Eagle (SA status: Endangered) nest at (-31.524550° 23.534279°). This is to reduce the turbine collision risk.

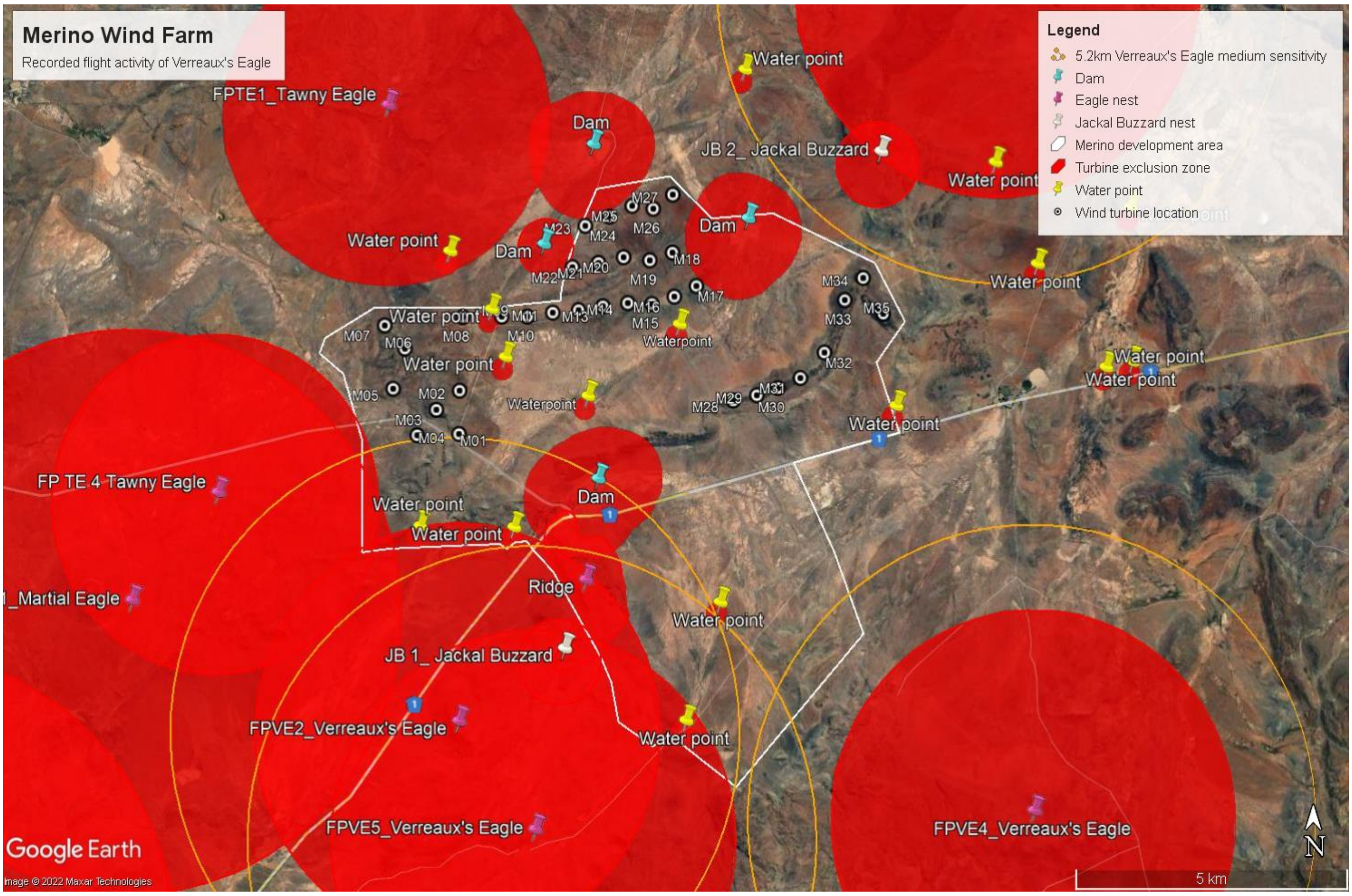


Figure 9.6: Avifauna sensitivities identified for the Merino Wind Farm

9.5.2 Description of Avifaunal Impacts

The effects of a wind farm on birds are highly variable and depend on a wide range of factors, including the specification of the development, the topography of the surrounding land, the habitats affected and the number and species of birds present. With so many variables involved, the impacts of each wind farm must be assessed individually. The principal areas of concern with regard to effects on birds are listed below. Each of these potential effects can interact with each other, either increasing the overall impact on birds or, in some cases, reducing a particular impact (for example where habitat loss or displacement causes a reduction in birds using an area which might then reduce the risk of collision):

» Mortality due to collisions with the wind turbines

» Displacement due to disturbance during construction and operation of the wind farm
» Displacement due to habitat change and loss at the wind farm
» Mortality due to electrocution on the electrical infrastructure
» Collisions with the 33kV overhead lines

9.5.3 *Impact tables summarising the significance of impacts on avifauna during construction, operation and decommissioning (with and without mitigation)*

Construction Phase Impacts

Nature: Displacement of priority species due to disturbance during the construction phase		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Very short (1)	Very short (1)
Magnitude	High (8)	Moderate (6)
Probability	Definite (5)	Definite (5)
Significance	**Medium (50)**	**Medium (40)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To some extent	
Mitigation: » Construction activity should be restricted to the immediate footprint of the infrastructure as far as possible, and in particular to the proposed road network. Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species. » Removal of vegetation must be restricted to a minimum and must be rehabilitated to its former state where possible after construction. » Construction of new roads should only be considered if existing roads cannot be upgraded. » Vehicle and pedestrian access to the site should be controlled and restricted as much as possible to prevent unnecessary disturbance of priority species.		
Residual Impacts: Due to the nature of the construction activities, it is inevitable that temporary displacement of priority species will happen as a result. While this can be mitigated to some extent, the significance of the residual impacts will remain at a medium level.		

Operation Phase Impacts

Nature: Displacement of priority species due to habitat loss in the operation phase		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (33)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To some extent	
Mitigation:		

» Once operational, vehicle and pedestrian access to the site should be controlled and restricted to prevent unnecessary destruction of vegetation.
» Formal live-bird monitoring should be resumed once the turbines have been constructed, as per the most recent edition of the Best Practice Guidelines (Jenkins et al. 2015). The purpose of this would be to establish if displacement of priority species has occurred and to what extent. The exact time when operational monitoring should commence, will depend on the construction schedule, and should commence when the first turbines start operating. The Best Practice Guidelines require that, as an absolute minimum, operational monitoring should be undertaken for the first two (preferably three) years of operation, and then repeated again in year 5, and again every five years thereafter for the operational lifetime of the facility.
» The mitigation measures proposed by the vegetation specialist, including rehabilitation, must be strictly implemented.
» Excavated rocks should be removed, or all infilling for road construction should be compacted and all lose rock piles at the base or periphery of such infilling should be covered and packed down to eliminate all potential crevices and shelter for small mammals such as Rock Hyraxes (the primary source of food for the Verreaux's Eagles).

Residual Impacts:
Due to the nature of the infrastructure, it is highly likely that long term partial displacement of priority species will happen, particularly as a result of the habitat fragmentation caused by the associated road network. The habitat transformation can be limited to some extent through mitigation measures, to keep the significance of the residual impacts at a low level.

Nature: Mortality of priority species due to collisions with the turbines in the operation phase

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (44)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	

Mitigation:
» A 3.7km turbine exclusion zone should be implemented around the Verreaux's Eagle nests listed below, and the construction of turbines from 3.7km up to 5.2km from the nest should be avoided, if possible:
  - FPVE2 (-31.543776° 23.597448°)
  - FPVE4 (-31.540635° 23.716886°)
  - FPVE5 (-31.560946° 23.612253°)
» A 3km No-Go zone should be implemented around the Tawny Eagle nest (FPTE1) (-31.445988° 23.583921°).
» A 5km No-Go zone should be implemented around the Martial Eagle nest (FPME1) (-31.524550° 23.534279°).
» A 750m turbine exclusion zone must be implemented around the following Jackal Buzzard nests:
  - JB1 -31.532193° 23.617943°
  - JB2 -31.453311° 23.679073°
» An 800m turbine exclusion zone should be implemented at the large dams listed below:
  - -31.505297° 23.624400°
  - -31.463982° 23.653370°
  - -31.452242° 23.623465°
» A 500m turbine exclusion zone should be implemented at the medium-sized dam situated at -31.468068° 23.613909°.
» A 200m turbine exclusion zone should be implemented around the following boreholes:

- -31.512977° 23.608149°
- -31.512790° 23.590034°
- -31.524881° 23.648011°
- -31.543646° 23.641418°
- -31.493728° 23.682023°
- -31.492167° 23.622478°
- -31.485982° 23.606518°
- -31.478371° 23.603843°
- -31.493728° 23.682023°

» No turbines must be constructed on the ridge stretching from -31.512735° 23.617398° to -31.531996° 23.618575°.

» Carcass searches must commence to establish mortality rates, as per the most recent edition of the Best Practice Guidelines (Jenkins et al. 2015). The exact time when operational monitoring should commence will depend on the construction schedule, and should commence when the first turbines start operating. The Best Practice Guidelines require that, as an absolute minimum, operational monitoring should be undertaken for the first two (preferably three) years of operation, and then repeated again in year 5, and again every five years thereafter for the operational lifetime of the facility.

» If annual estimated collision rates indicate unsustainable mortality levels of priority species, i.e. if natural background mortality together with the estimated mortality caused by turbine collisions exceeds a critical mortality threshold as determined by the avifaunal specialist in consultation with other experts e.g. BLSA, additional measures will have to be implemented which could include shutdown on demand. This must be undertaken in consultation with a qualified avifauna specialist.

Residual Impacts:

It is not possible to completely eliminate the risk of turbine collisions, but through mitigation measures, it could be reduced to a low level.

Nature: Mortality of priority species due to electrocutions on the overhead MV network (where applicable) and in the substation yard.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	High (8)
Probability	Highly probable (4)	Improbable (1)
Significance	**Medium (52)**	**Low (13)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	

Mitigation:

» Overhead lines should be restricted to an absolute minimum and should only be allowed if underground cabling is unfeasible due to technical constraints.

» The final pole designs must be signed off by the bird specialist to ensure that a bird-friendly design is used, where relevant.

» Bi-monthly inspections of the overhead sections of the MV network must be conducted to look for carcasses under the poles, where relevant.

» With regards to the infrastructure within the substation yard, the hardware is too complex to warrant any mitigation for electrocution at this stage. It is rather recommended that if any impacts are recorded once operational, site specific mitigation be applied reactively and in consultation with a qualified avifauna specialist.

Residual Impacts:

It is possible to almost completely eliminate the risk of electrocutions through the use of bird-friendly designs, although all structures carry some risk of electrocution.

Nature: Mortality of priority species due to collisions with the 33kV OHL		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	Moderate (6)
)Probability	Highly probable (4)	Probable (3)
Significance	**Medium (52)**	**Medium (33)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To a limited extent	To a limited extent
Mitigation: » Overhead lines should be restricted to an absolute minimum and should only be allowed if underground cabling is unfeasible due to technical constraints. » Bird flight diverters should be installed on all 33kV overhead lines on the full span length on the earthwire (according to Eskom guidelines - five metres apart). Light and dark colour devices must be alternated to provide contrast against both dark and light backgrounds respectively. These devices must be installed as soon as the conductors are strung.		
Residual Risks: There will be an ongoing residual risk of collisions with the OHL, but mitigation should reduce the risk by some extent.		

Decommissioning Phase Impacts

Nature: Displacement of priority species due to disturbance during the decommissioning phase		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Very short (1)	Very short (1)
Magnitude	High (8)	Moderate (6)
Probability	Definite (5)	Definite (5)
Significance	**Medium (50)**	**Medium (40)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To some extent	
Mitigation: » Decommissioning activity should be restricted to the immediate footprint of the infrastructure as far as possible, and in particular to the proposed road network. Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species. » Construction of new roads should only be considered if existing roads cannot be utilised / upgraded. » Vehicle and pedestrian access to the site should be controlled and restricted as much as possible to prevent unnecessary disturbance of priority species.		
Residual Impacts: Due to the nature of the decommissioning activities, it is inevitable that temporary displacement of priority species will happen as a result. While this can be mitigated to some extent, the significance of the residual impacts will remain at a medium level.		

9.5.4 Comparative Assessment of the Site Compound Alternatives

The three alternative site compound locations are all situated in Karoo scrub. This habitat is not particularly sensitive, as far as avifauna is concerned, therefore any of the alternative locations will be acceptable. The same goes for the substation.

9.5.5 Overall Result

The proposed Merino Wind Farm will have a medium impact on avifauna which, in most instances, could be reduced to a low impact through appropriate mitigation. **The currently proposed 35 turbine lay-out which was assessed in the Avifauna Impact Assessment Report avoids all the recommended avifaunal turbine exclusion zones and is therefore deemed acceptable**. The development is therefore supported, provided the recommended mitigation measures are strictly applied. Any of the three alternative site compound locations will be acceptable.

9.6. Potential Impacts on Bats

Various potential impacts on bats have been identified to be associated with the development of the Merino Wind Farm. The potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix G for** more details).

9.6.1 Results of the Bat Impact Assessment

Several site visits were made to the Merino Wind Farm between December 2020 and December 2021. Passive bat detection systems were set up on two meteorological masts with microphones at 10m, 50m and 100m (Met Mast 1) and 7m, 70m and 140m (Met Mast 2). Additionally, one short mast bat detection system was also set up, with a microphone at 7m (referred to as ShM1). These systems were set to gather bat activity data every night for 12 months to form part of the long-term pre-construction monitoring and inform the EIA study.

The passive data indicates that the three bat species most likely to be impacted on by the proposed wind farm are *Laephotis* (formerly *Neoromicia*) *capensis, Miniopterus natalensis* and *Tadarida aegyptiaca*. These more 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.

In general, and overall on all microphones *Tadarida aegyptiaca* was most commonly detected. On Met Mast 1 *T. aegyptiaca* had the highest occurrences at 100m, then 7m and lowest occurrences at 50m. On Met Mast 2 this same species had the highest occurrence at 7m and the lowest at 140m. Overall, *N. capensis* was the second most abundant species. The Met Mast 1 displayed the highest overall bat activity.

Average hourly bat passes per month (Figures 4.6 – 4.12) are useful to indicate overall average high activity months and seasons. Gaps in data are considered in average calculations, whereas total bat numbers are influenced by the completeness of a recording schedule. Met Mast 2 displayed the highest average hourly bat activity in December 2020 at 7m height. The months of November, December and January indicated the highest bat activity overall, with January showing particularly high activity.

The yearly median of average hourly bat passes, at 100m on Met Mast 1 is 0.06 bat passes per hour, and at 140m at Met Mast 2 it's 0.03 bat passes per hour. According to MacEwan *et al.* (2020), for the Nama Karoo ecoregion it's considered to be bat activity levels indicating a low to medium risk of bat mortalities.

Due to the extrapolated nature of the national screening tool, further Google Earth satellite imagery and verifications during site visits were used to spatially demarcate areas of the site with high and medium sensitivities relating to bat species ecology and habitat preferences, where high sensitivities and their buffers are no-go zones for turbines and turbine blade overhang (refer to **Table 9.1**). In other words, no turbine blades may intrude into high sensitivity buffers. Medium sensitivities indicate areas of probable increased risk due to seasonal fluctuations in bat activity, but turbines are allowed to be constructed in medium sensitivity areas. **Figure 9.7** depicts the sensitive areas of the site, based on features identified to be important for foraging and roosting of the species that are most likely to occur on site.

Considering the current proposed layout for the Merino Wind Farm, no turbines are intruding onto the high bat sensitivities. The layout respects the bat sensitivity map when applying an 80m blade length.

Table 9.1: Sensitive features identified within the development area for the Merino Wind Farm

High sensitivities and 200m buffers	Valley bottom wetlands.
	Pans and depressions.
	Dams.
	Rocky boulder koppies (tors).
	Exposed rocky cliff edges.
	Drainage lines capable of supporting riparian vegetation.
	Other water bodies and other sensitivities such as manmade structures, buildings, houses, barns and sheds.
Moderate sensitivities and 150m buffers	Alluvial plains and washes.
	Seasonal drainage lines.

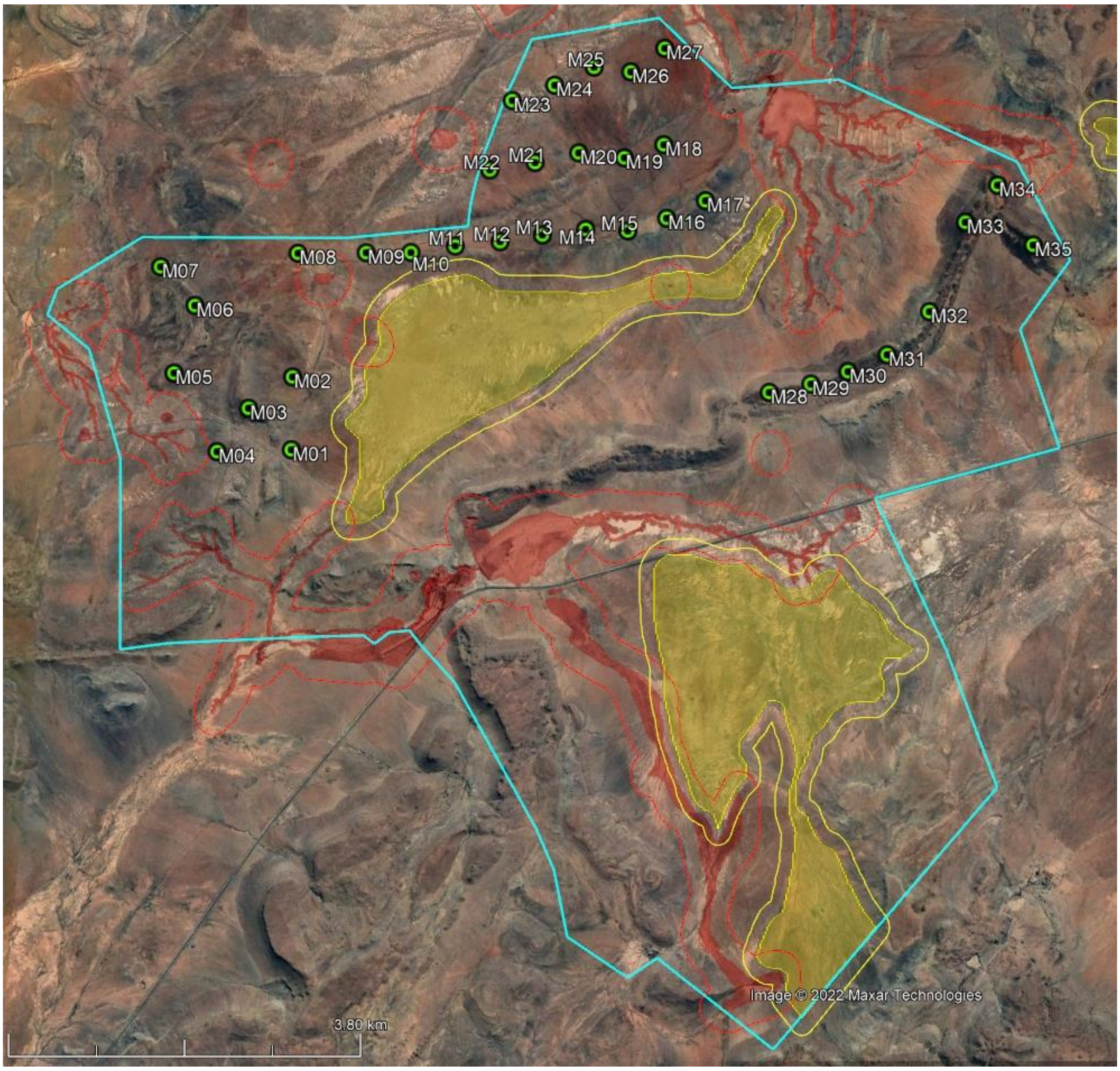


Figure 9.7: The bat sensitivity areas of the proposed Merino Wind Farm. Red shaded = High bat sensitivity; Red line = High bat sensitivity 200m buffer; Yellow shaded = Medium bat sensitivity; Yellow line = Medium sensitivity 150m buffer.

9.6.2 Description of Bat Impacts

Bats play a critical role in many ecosystems and are important indicators of biodiversity and ecosystem health. They provide many essential ecosystem services which increase human well-being such as pollination, seed dispersal and the consumption of important agricultural pests.

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

The potential impacts to bats as a result of construction and operation activities include the following:

» Foraging habitat destruction.
» Bat roost disturbance/destruction.
» Increased bat mortality due to light pollution and moving turbine blades.

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

Construction Phase Impacts

Nature: Loss of bat foraging habitat. Bat foraging habitat will be destroyed due to vegetation clearing during construction.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (1)	Short-term (1)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Definite (5)
Significance	**Medium (30)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Adhere to the bat sensitivity map (refer to Figure 9.7). » Rehabilitate areas disturbed during construction, such as temporary construction camps and laydown yards.		
Residual Impacts: The residual risk is very low since the site will still offer sufficient foraging areas for bats.		

Nature: Bat roost destruction/disturbance. Bat roosts may be destroyed or disturbed by earthworks during construction.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (1)	Short-term (1)
Magnitude	High (8)	High (8)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (30)**	**Low (20)**
Status (positive or negative)	Negative	Negative

Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Adhere to the bat sensitivity map (refer to Figure 9.7).		
Residual Impacts: The residual risk is very low if the sensitivity map is adhered to.		

Operation Phase Impacts

Nature: Increased bat mortality due to light pollution The probability of bat mortalities caused by moving turbine blades may be significantly increased by artificial lighting attracting insects and thereby attracting insect eating bats. Particularly if such lights are placed in close proximity of wind turbines. This applies to insect eating bats that readily forage around lights. Cave dwelling species tend to avoid lights.		
	Without mitigation	**With mitigation**
Extent	Site and adjacent areas (2)	Site and adjacent areas (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	High (8)	High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (56)**	**Low (28)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Adhere to the bat sensitivity map (refer to Figure 9.7). » Use lights with passive motion sensors that only switch on when a person/vehicle is nearby, if possible for safety and security reasons. » All floodlights must be down-hooded to minimise light pollution. » If possible, do not place outside lights near turbines of adjacent WEF's.		
Residual Impacts: Some outside lighting will always be present and poses a low to medium risk for the lifetime of the facility.		

Nature: Bat mortality due to moving turbine blades Moving turbine blades can kill bats by direct impact or barotrauma		
	Without mitigation	**With mitigation**
Extent	Larger area (3)	Larger area (3)
Duration	Long-term (4)	Long-term (4)
Magnitude	High (8)	High (8)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (60)**	**Medium (45)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Adhere to the bat sensitivity map (refer to Figure 9.7).		

» If bat mortalities are found to be unsustainably high during the operational study, a curtailment mitigation schedule may need to be implemented. » Curtail the turbines by means of feathering to render the blades motionless in wind speeds below the mitigation cut-in speed. » Consider the use of acoustic bat deterrents.
Residual Impacts: Even with mitigation some bats will be killed during operation, this is unavoidable but should be minimised as much as possible.

Decommissioning Phase Impacts

No significant impacts are identified for the decommissioning phase.

9.6.4 Overall Result

Based on the bat activity recorded at the Merino Wind Farm, the significance ratings for the majority of the impacts to bats posed by the development are predicted to be medium before mitigation. After mitigation, all impacts are predicted to be low, except for bat mortality due to moving turbines, which is predicted to remain of medium significance after mitigation.

From a bat impact perspective, no reasons have been identified for the Merino Wind Farm development not to proceed to the approval phase. If the proposed Merino Wind Farm is approved, a minimum of 2 years of operational bat mortality monitoring must be conducted from the start of the operation of the facility.

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

Various impacts have been identified with the development of the Merino Wind Farm from an agricultural perspective. The potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix H** for more details).

9.7.1 Results of the Land Use, Soil, and Agriculture Potential Assessment

Various soil forms were identified throughout the development area, namely the Tubatse, Oakleaf and Bethesda soil forms . These soil forms are characterised by an orthic topsoil on top of a neocutanic horizon. The Tubatse and Bethesda soil forms are characterised by a lithic and hard rock horizon underneath the neocutanic horizons respectively with the Oakleaf being characterised by a deep neocutanic horizon.

Eight potential land capability classes are located within the proposed development area (refer to **Figure 9.8**), namely

» Land Capability 1 to 5 (Very Low to Low); and
» Land Capability 6 to 8 (Low/Moderate to Moderate Sensitivity.

The soil forms identified within the development area have been determined to be associated with one land capability, namely LCIII.

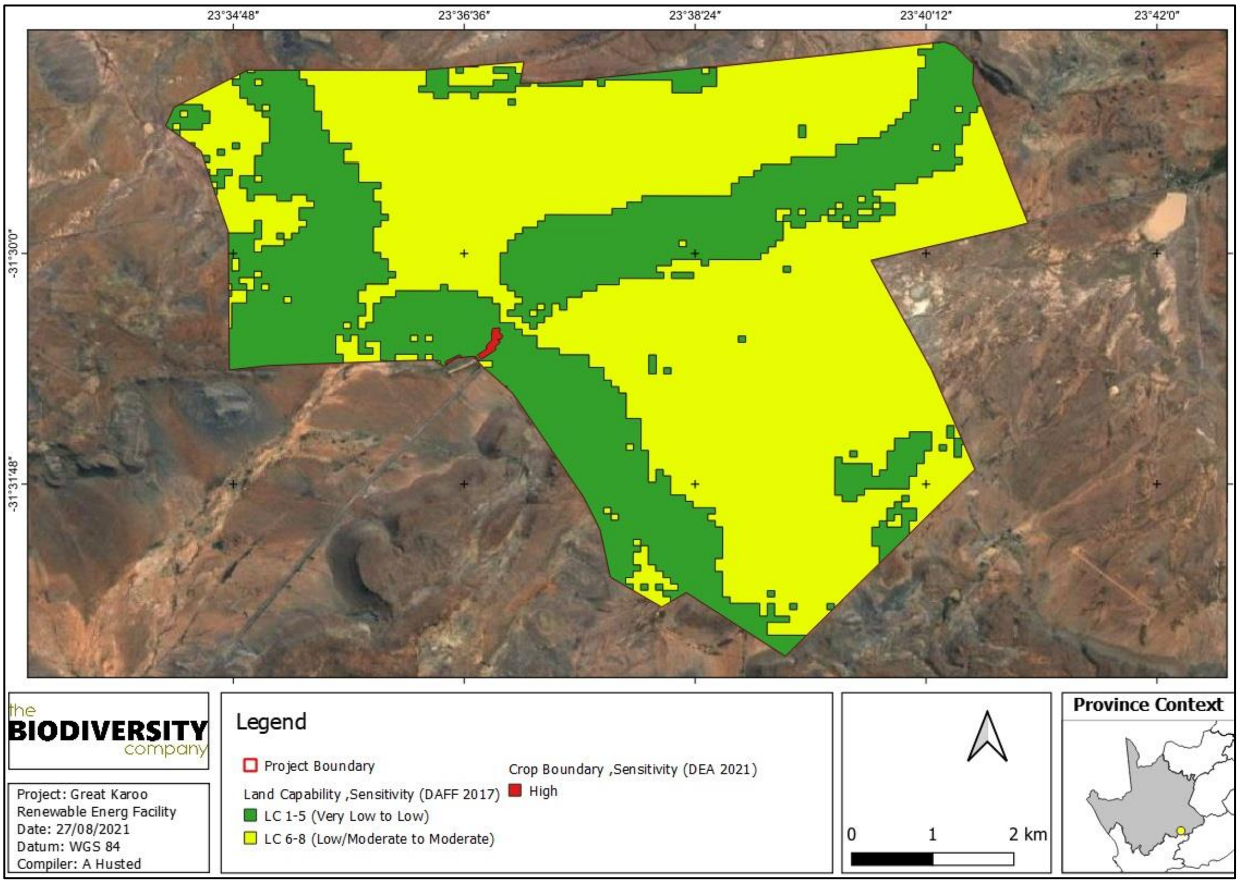


Figure 9.8: Land capability sensitivity of the development area for the Merino Wind Farm

9.7.2 *Description of Impacts on Land Use, Soil, and Agriculture Potential Assessment*

The impact assessment considered the calculated sensitivities associated with the soil resources expected to be impacted upon by the relevant components. This impact assessment purely focused on the impacts expected towards natural resources (in specific, the soil and associated land capability.

9.7.3 *Impact tables summarising the significance of impacts on land use, soil and agricultural potential during the construction, operation and decommissioning phases (with and without mitigation)*

Construction Phase Impacts

Nature: Impact assessment related to the loss of land capability during the construction phase of the proposed wind farm During the construction phase, heavy vehicles (trucks) will be used to transport the wind turbine structures throughout the footprint area with reliance on manual labour for finer refinement. Potential erosion is possible during the construction phase. It is assumed that only the proposed access roads will be used. It is evident from the impact calculations in that "Low" pre- and post-mitigation significance ratings are expected.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Short term (2)	Short term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (12)**	**Low (10)**

Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

- » Prevent any spills from occurring. Machines must be parked within hard park areas and must be checked daily for fluid leaks.
- » Proper invasive plant control must be undertaken quarterly.
- » All excess soil (soil that are stripped and stockpiled to make way for foundations) must be stored, to be used for rehabilitation of eroded areas.
- » Rip all compacted areas outside of the developed areas that have been compacted. This must be done by means of a commercial ripper that has at least two rows of tines. Ripping must take place between 1 and 3 days after seeding and following a rainfall event (seeding must therefore be carried out directly after a rainfall event).

Residual Impacts:

Limited residual impacts will be associated with these activities, assuming that all prescribed mitigation measures are strictly adhered to.

Operation Phase Impacts

Nature: Impact assessment related to the loss of land capability during the operational phase of the proposed wind farm

During the operational phase, very little impacts are foreseen. Maintenance of vegetation as well as the occasional maintenance of wind turbine structures will have to be carried out throughout the life of the project. It is expected that these maintenance practices can be undertaken by means of manual labour while using existing roads. Overland flow dynamics are expected to be affected.

Considering the low magnitude of impacts as well as the low sensitivity of soil resources in the area, very few impacts are expected. Therefore, regardless of the duration of this phase, only "Low" significance ratings are expected.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	**Low (24)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

- » Prevent any spills from occurring. Machines must be parked within hard park areas and must be checked daily for fluid leaks.
- » Proper invasive plant control must be undertaken quarterly.

Residual Impacts:

Limited residual impacts will be associated with these activities, assuming that all prescribed mitigation measures are strictly adhered to.

Decommissioning Phase Impacts

No significant impacts are identified for the decommissioning phase.

9.7.4 Overall Result

Various soil forms were identified within the development area with the most sensitive soils being classified as the Tubatse, Oakleaf and Bethesda soil forms. These soil forms have been determined to be associated with one land capability, namely LCIII. This land capability class was then further refined to a land potential level 6 by comparing land capability of climatic capabilities of the development area.

This land potential level was used to determine the sensitivities of soil resources. Only "Low" sensitivities were determined throughout the project area by means of baseline findings. Considering the low sensitivities associated with land potential resources, it is the specialist's opinion that the proposed activities will have an acceptable impact on soil resources and that the proposed activities should proceed as have been planned.

9.8. Assessment of Impacts on Heritage Resources (including archaeology, palaeontology and cultural landscape)

Potential impacts on heritage resources and the relative significance of the impacts associated with the development of the Merino Wind Farm are summarised below (refer to **Appendix I**).

9.8.1 Results of the Heritage Impact Assessment

Archaeology

Four (4) archaeological and heritage resources were identified during the survey of the development area for the Merino Wind Farm. **Table 9.2** provides a record of some of the archaeological heritage finds.

Table 9.2: Archaeological and heritage resources identified during the field assessment of the development area for the Merino Wind Farm

POINT ID	Period	Description	Co-ordinates		Grading	Mitigation
GK037	Historic	Stone walled ruins x 2	-31.506165	23.611848	IIIB	No-go development buffer of 500m
GK038	Historic	Rondawel farmhouse complex	-31.507875	23.614365	IIIA	No-go development buffer of 1km
GK048	LSA, MSA	Lower, ground, grindstone, greywacke flakes, cores	-31.49589	23.64534	IIIB	No-go development buffer of 50m
GK074	Historic	Stone walled ruin	-31.54013	23.64369	IIIB	No-go development buffer of 500m

Palaeontology

According to the SAHRIS Palaeosensitivity Map (**Figure 9.9**), the area proposed for development is underlain by sediments of very high paleontological sensitivity. According to the extract from the Council for GeoSciences Map 3122 for Victoria West, the development area is underlain by the Abrahamskraal and Teekloof Formations, both of the Adelaide Subgroup of the Beaufort Group of sediments. According to the

SAHRIS Fossil Heritage Browser and the Palaeotechnic Report for the Western Cape (Almond and Pether, 2008), the Beaufort Group sediments are known to preserve diverse terrestrial and freshwater tetrapods of *Tapinocephalus* to *Lystrosaurus* Biozones (amphibians, true reptiles, synapsids – especially therapsids), palaeoniscoid fish, freshwater bivalves, trace fossils (including tetrapod trackways) and sparse vascular plants (*Glossopteris* Flora, including petrified wood).

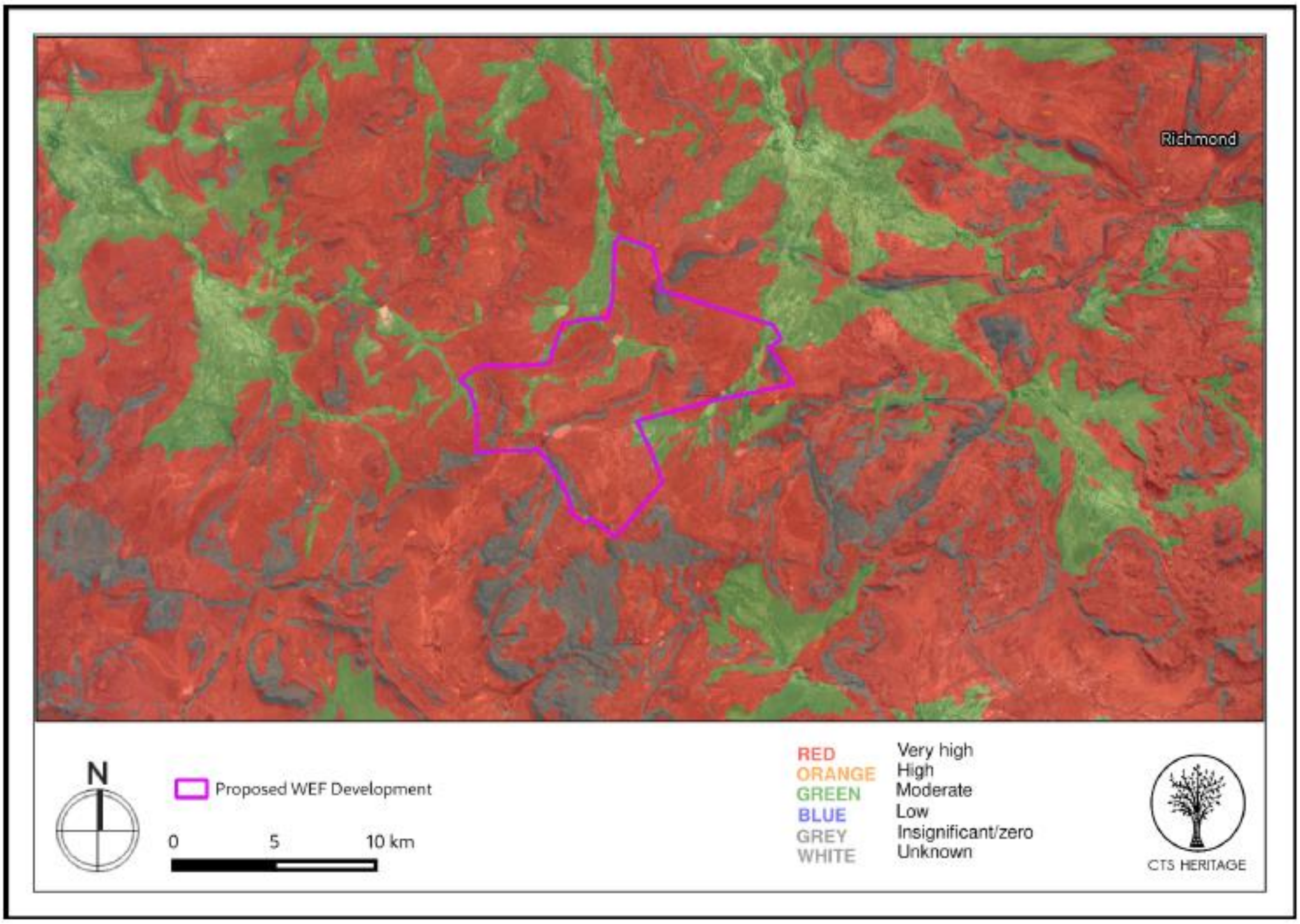


Figure 9.9: Palaeosensitivity map indicating fossil sensitivity underlying the study area, including the development area for the Merino Wind Farm.

Five (5) palaeontological heritage resources were identified during the survey of the development area for the Merino Wind Farm. **Table 9.3** provides a description of the palaeontological finds.

Table 9.3: Palaeontological observations made during the field assessment for the proposed Wind Farm

POINT ID	Project Area	Description	Co-ordinates		Grading	Mitigation
852	**Merino**	Rondavel 85. Stratigraphic level uncertain – possibly Oukloof Member / "Balfour Fm". Possible but equivocal tetrapod burrow cast (c. 25-30 cm wide), straight, inclined, infilled with grey-green sandstone and surrounded by crumbly purple, brown mudrock. Proposed Field Rating IIIC Local Resource. No mitigation recommended.	-31.5303	23.63432	IIIC	NA
854	**Merino**	Rondavel 85. Flaggy slabs of greenish-grey sandstone (stratigraphic provenance unclear)	-31.54013	23.64365	IIIC	NA

POINT ID	Project Area	Description	Co-ordinates		Grading	Mitigation
		associated with ruined farm building showing probable sandstone-infilled mudcracks, wave rippled palaeosurfaces and invertebrate bioturbation and / or plant stem casts. Proposed Field Rating IIIC Local Resource. No mitigation recommended.				
859	**Merino**	Rondavel 85. "Balfour Fm" (Oukloof Member of Teeklof Fm). Distorted / crushed, baked (v. white) skeletal material - possibly a small (c. 5 cm long) skull - embedded within mudflake-rich debris flow deposit. Proposed Field Rating IIIB. Professional palaeontological collection only necessary of specimen lies < 20 from project footprint.	-31.54351898	23.64159099	IIIB	20m no-go buffer
863	**Merino**	Rondavel 85. "Balfour Fm" (Oukloof Member of Teekloof Fm). Surface concentration of coffee-brown ferruginous concretionary material including several blocks containing bone preserved as moulds or silicified. Symmetrical array of low convexity, rounded plates with a radial ornamentation suggests pareiasaur reptile affinity (dermal scutes) – possibly juvenile or dwarf form. Proposed Field Rating IIIB. Professional palaeontological collection only necessary of specimen lies < 20 from project footprint.	-31.53631297	23.66347597	IIIB	20m no-go buffer
884	**Merino**	Rondavel 85. Hoedemaker Member. Thin crevasse splay sandstone exposed in shallow borrow pit with sandstone-infilled mudcracks, microbial mat textures, small-scale invertebrate trace fossils (narrow horizontal burrows of undermat miners), possible vertical burrows or plant stem casts. Proposed Field Rating IIIC Local Resource. No mitigation recommended.	-31.49779201	23.59721803	IIIC	NA

<u>Cultural Landscape</u>

The landscape of the development area has been assessed for cultural heritage significance, and found to have five distinct character areas:

» Historic movement corridors.
» Open plains interrupted by low koppies.
» Elevated areas with steep sided mountain ridges.
» Areas of landscape that have been transformed by significant infrastructural development.
» Remote landscape with wilderness qualities.

Of the five distinct character areas identified in the Cultural Landscape Assessment (Winter, 2021), the development area for the proposed Merino Wind Farm falls within all five areas (refer to **Figure 9.10**).

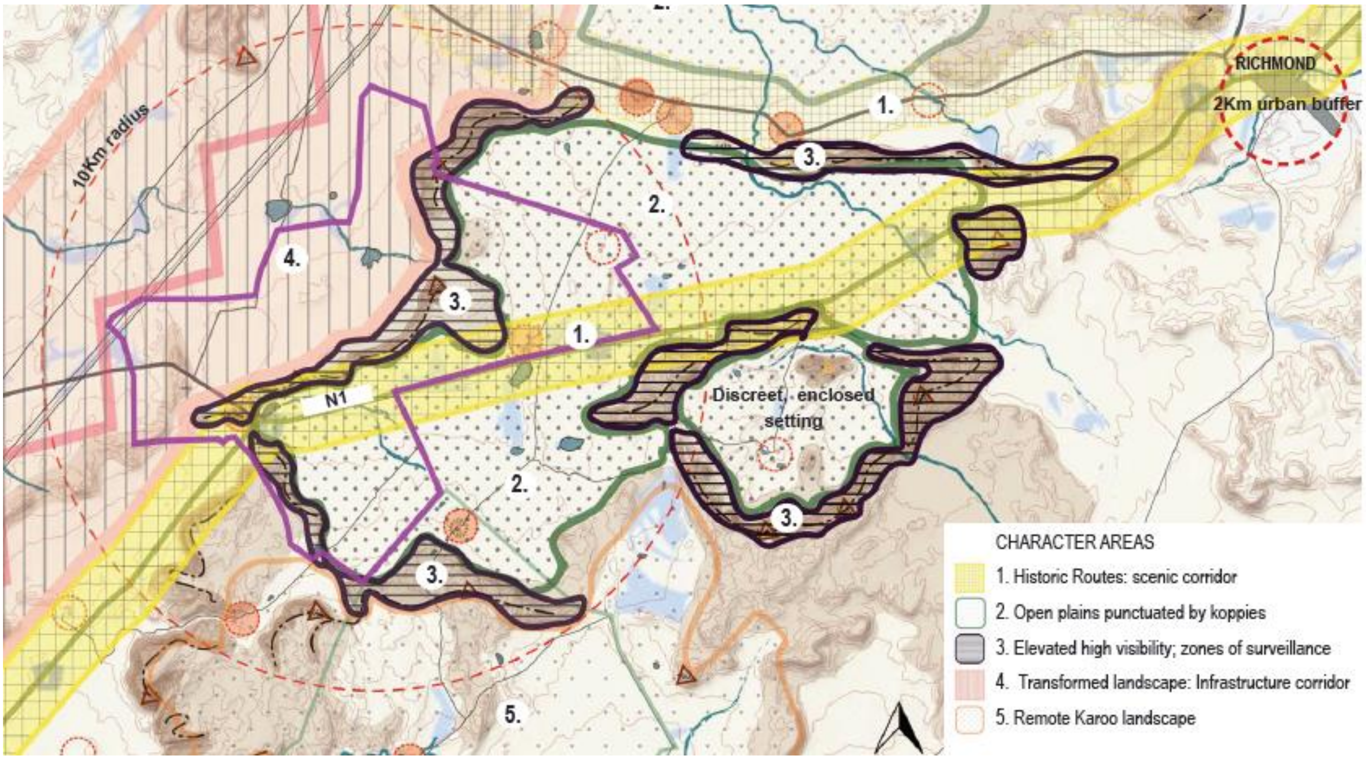


Figure 9.10: Cultural landscape elements identified within the development area for the Merino Wind Farm

The character area analysis provides an assessment of what each area can accommodate from a renewable energy perspective. These are divided into three zones, namely, No go" areas, "Tread lightly" areas suitable to PV only (subject to site specific constraints), and Developable areas suitable for infrastructure (PV and wind turbines). **Figure 9.11** shows the development sensitivities relevant to the proposed development area.

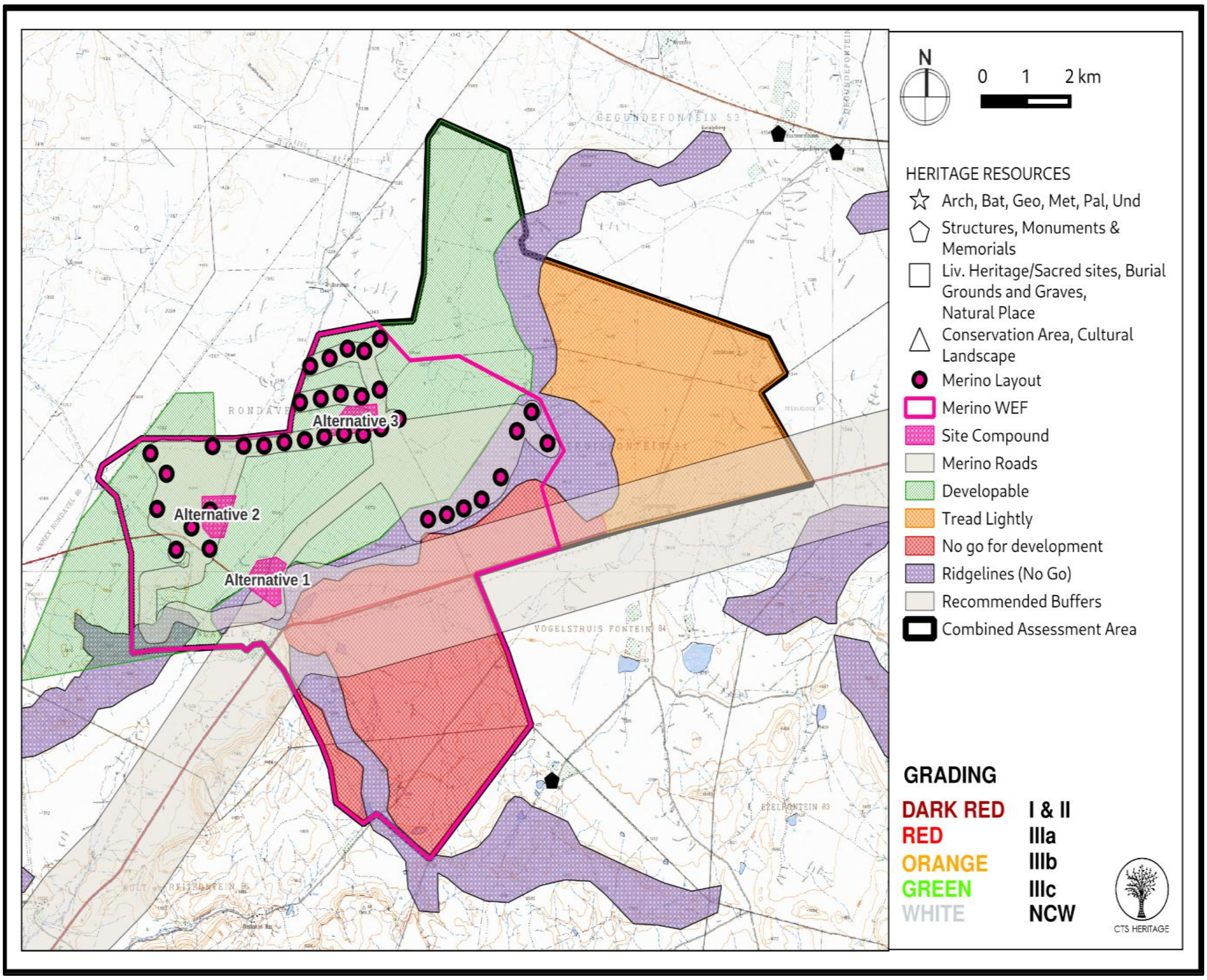


Figure 9.11: Map of ridgelines and sensitive areas within the proposed development area

9.8.2 *Description of the Heritage Impacts*

There are limited impacts anticipated to archaeological and palaeontological heritage from this proposed development. The main impacts expected to occur on the archaeological and palaeontological heritage associated with the development of the Merino Wind Farm will be during the construction phase. No major impacts are expected during the operation or decommissioning phase. Since the broader context of the area proposed for development has cultural significance, it may be impacted by the proposed development.

9.8.3 *Impact tables summarising the significance of impacts on heritage during construction, operation and decommissioning (with and without mitigation)*

Construction and Operation Phase Impacts

Nature: The broader context of the area proposed for development has cultural significance that may be impacted by the proposed development The nature of the impact of the proposed turbines is assessed as high to very high negative, affecting the rural, natural setting within a radius up to 10km, but potentially further. The scale, height and impact to landscape of the concrete turbine foundations, access roads and internal distribution roads of the proposed development of the wind turbines

represents a high negative impact to the cultural landscape. This is only acceptable in the character area of the north west portion of the development site, which is identified as "developable". Development of wind farm turbines should be limited to that sector of the proposed site, which is able to accommodate development of this type.

The proposed positioning of turbines on ridgelines, in proximity to farmsteads, and in locations south of the N1 is not appropriate and should be revised. The development could extend north west, into the transformed landscape area beyond the boundaries of the proposed area for development.

Five of the turbines proposed as part of the Merino Wind Farm development are positioned along a ridgeline located between 1 and 2km from the N1, and positioned adjacent to an area noted as "no-go" for development. The clustering of these turbines along the ridgeline will negatively impact on the nature of this section of the N1 scenic route as a gateway zone between Beaufort West and Richmond.

	Without mitigation	**With mitigation**
Extent	Regional (5)	Regional (5)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Low (4)
Probability	Definite (5)	Improbable (2)
Significance	**High (65)**	**Low (26)**
Status (positive or negative)	Neutral	Neutral
Reversibility	Any impacts to heritage resources that do occur are reversible once the grid connection infrastructure is removed	
Irreplaceable loss of resources?	Unlikely	Unlikely
Can impacts be mitigated?	N/A	

Mitigation:

» One of the turbines located along the ridgeline must be removed to break up the cluster and to minimise the impact to the sense of place (**Figure 9.12**).

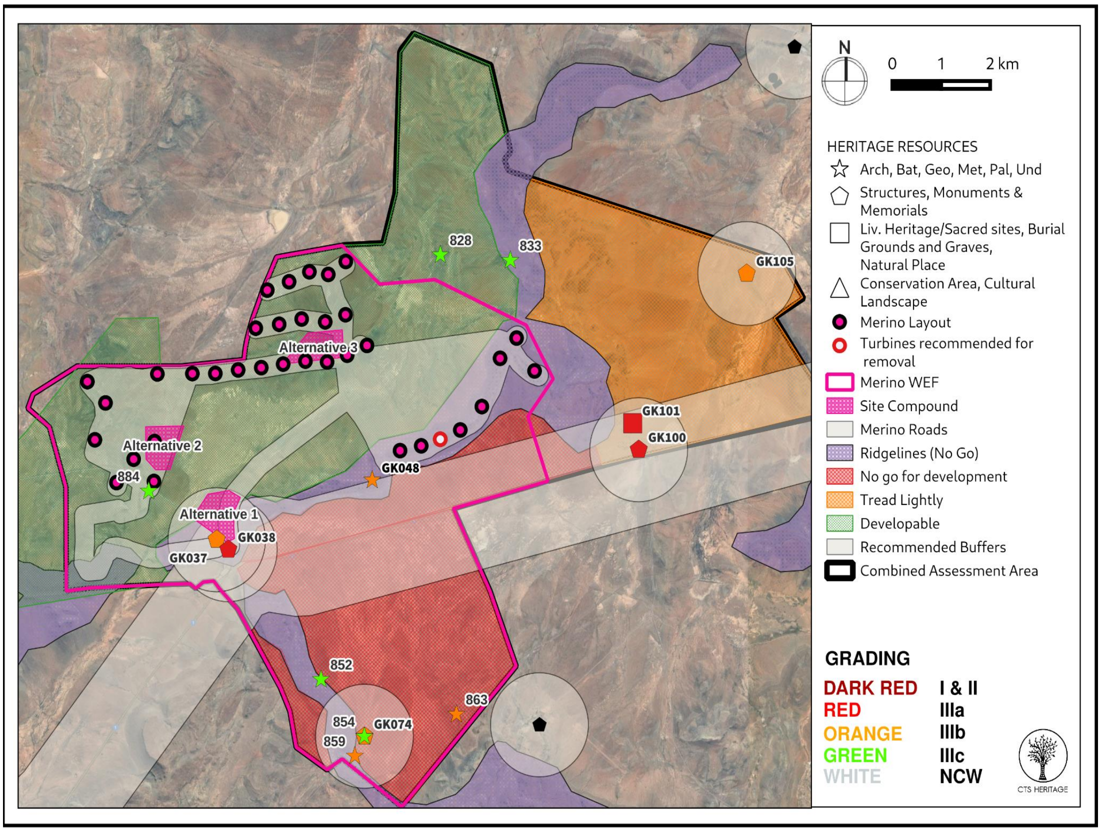


Figure 9.12: Map showing turbine recommended for removal

Residual Impacts:

N/A

Nature: The area proposed for development is known to conserve heritage resources of archaeological significance that may be impacted by the proposed development

The proposed development will not have a substantial negative impact on the heritage resources identified within the proposed development area for the renewable energy facilities and the grid connection. The majority of the lithic material identified is of low significance (not conservation-worthy), and even though the resources may be destroyed during construction, the impact is inconsequential. No mitigation is required for archaeological material recorded in the footprint areas of the proposed development.

Despite the high number of observations of artefacts, these resources are common and representative of similar scatters across widespread areas of the Karoo. Despite the very high numbers of observations made, the archaeological material is ubiquitous across the entire area and in general, the results of this assessment indicate that the archaeological sensitivity of the development area is low.

A total of 54 archaeological observations and 13 structures were identified within the Merino Wind Farm development area. Only one of the identified archaeological resources was determined to be conservation-worthy, Observation GK048 which is described as both MSA and LSA material including lower, ground, grindstone, greywacke flakes and cores and is graded IIIB. This site is located in close proximity to proposed wind turbines, however no impact is anticipated at this stage. To ensure that no impact occurs, it is recommended that a no-go development buffer of 50m is imposed around this site.

Thirteen structures were identified within the Merino Wind Farm development area, the majority of which are modern windmills and dams, and one quarry. None of these were determined to be conservation-worthy.

Three conservation-worthy structures were identified within this development area. Site GK038 records a rondavel farmhouse complex that has historic significance and has been graded IIIA. There is over 1km distance between this site and the nearest proposed wind farm infrastructure and as such, no direct impact is anticipated.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	High (7)	High (7)
Probability	Highly probable (4)	Very improbable (1)
Significance	**Medium (52)**	**Low (13)**
Status (positive or negative)	Neutral	Neutral
Reversibility	Any impacts to heritage resources that do occur are irreversible	
Irreplaceable loss of resources?	Unlikely	Unlikely
Can impacts be mitigated?	Yes	

Mitigation:

» A no-go development buffer of 1km must be implemented around Sites GK037, GK038 and GK074 (Figure 9.12).
» A no-go development buffer of 50m must be implemented around site GK048 (Figure 9.12).
» Should any significant archaeological resources be uncovered during the course of the construction phase, work must cease in the area of the find and SAHRA must be contacted regarding an appropriate way forward.

Residual Impacts:

Should any significant archaeological resources be impacted (however unlikely) residual impacts may occur, including a negative impact due to the loss of potentially scientific cultural resources.

Nature: The area proposed for development is known to conserve heritage resources of palaeontological significance that may be impacted by the proposed development

No palaeontological Very High Sensitivity / No-Go areas have been identified within the project areas. With the exception of three fossil sites of low scientific value, none of the recorded fossil sites overlaps directly with, or lies close to (< 20 m), proposed infrastructure and no modification of the layouts through micro-siting is proposed here on palaeontological grounds.

The anticipated impact significance of the proposed development in terms of palaeontological heritage resources is likely to be VERY LOW due to (1) the very sparse distribution of fossil remains as well as (2) their almost universally poor preservation. Given the very uniform geological, and hence palaeontological, setting throughout the combined project areas, this assessment applies equally to the grid connection projects as well as to the various grid connection corridors under consideration. There is accordingly no preference on palaeontological heritage grounds for any particular grid connection route option. The proposed grid connections are not fatally flawed from a palaeontological heritage viewpoint and there are no objections to their authorisation.

One fossil site (884) is located in close proximity to a proposed road and turbine however this site has low palaeontological significance and has been sufficiently recorded. No further mitigation is recommended for this site. The potential for rare, unrecorded fossil sites of high scientific and/or conservation value cannot be completely excluded, however. These are best handled through a Chance Fossil Finds Protocol as per the recommendations below.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	High (8)	High (8)
Probability	Definite (5)	Very improbable (1)
Significance	**Medium (52)**	**Low (13)**
Status (positive or negative)	Neutral	Neutral
Reversibility	Any impacts to heritage resources that do occur are irreversible	
Irreplaceable loss of resources?	Unlikely	Unlikely
Can impacts be mitigated?	Yes	

Mitigation:

» The Chance Fossil Finds Procedure must be implemented for the duration of construction activities:
- o Once alerted to fossil occurrence(s): alert site foreman, stop work in area immediately (N.B. safety first!), safeguard site with security tape / fence / sand bags if necessary.
- o Record key data while fossil remains are still in situ:
  - ∗ Accurate geographic location – describe and mark on site map / 1: 50 000 map / satellite image / aerial photo.
  - ∗ Context – describe position of fossils within stratigraphy (rock layering), depth below surface.
  - ∗ Photograph fossil(s) in situ with scale, from different angles, including images showing context (e.g. rock layering).
- o If feasible to leave fossils in situ:
  - ∗ Alert Heritage Resources Agency and project palaeontologist (if any) who will advise on any necessary mitigation.
  - ∗ Ensure fossil site remains safeguarded until clearance is given by the Heritage Resources Agency for work to resume.
- o If not feasible to leave fossils in situ (emergency procedure only):
  - ∗ Carefully remove fossils, as far as possible still enclosed within the original sedimentary matrix (e.g. entire block of fossiliferous rock).
  - ∗ Photograph fossils against a plain, level background, with scale.
  - ∗ Carefully wrap fossils in several layers of newspaper / tissue paper / plastic bags.
  - ∗ Safeguard fossils together with locality and collection data (including collector and date) in a box in a safe place for examination by a palaeontologist.
  - ∗ Alert Heritage Resources Agency and project palaeontologist (if any) who will advise on any necessary mitigation.

o If required by Heritage Resources Agency, ensure that a suitably-qualified specialist palaeontologist is appointed as soon as possible by the developer. o Implement any further mitigation measures proposed by the palaeontologist and Heritage Resources Agency.
Residual Impacts: Should any significant palaeontological resources be impacted (however unlikely) residual impacts may occur, including a negative impact due to the loss of potentially scientific cultural resources.

9.8.4 Comparative Assessment of the Site Compound Alternatives

Additional infrastructure in the form of the "Site Compound" is proposed with one alternative (i.e., Site Compound Alternative 1) located within the recommended no-go development areas around Sites GK037 and GK038. This alternative is not preferred due to their impact on the sense of place associated with these significant heritage resources. Site Compound Alternatives 2 and 3 are preferred from a heritage perspective as they do not within any recommended no-go development areas.

9.8.4 Overall Result

The site forms part of an intact cultural landscape representative of the Central Plateau of the Great Karoo possessing heritage value for historical, aesthetic, architectural, social and scientific reasons. The site possesses a number of landscape elements contributing to a composite cultural landscape including topographical features, open plains, water features, historic scenic routes and farmsteads. Furthermore, this proposed development is located outside of a REDZ. The landscape affected by the proposed development has a number of character areas within varying significances and sensitivities to accommodate Renewable Energy infrastructure culminating in the identification of no-go areas, tread-lightly areas and areas more resilient to development, as well as a number of design indicators for placement of Renewable Energy infrastructure.

There are limited impacts anticipated to archaeological and palaeontological heritage from this proposed development and as such, the principle of a renewable energy facility in this location is supported from a heritage perspective provided that the infrastructure is located in areas able to tolerate the impact of the high degree of change from a cultural landscape perspective.

A number of the proposed turbines are located on the ridge-lines which have been identified as no-go for turbine development due to the high negative impact anticipated to the existing Karoo sense of place. In order to mitigate this impact, it is recommended that one proposed turbine from the Merino Wind Farm be removed from the ridgelines. Mitigation measures are indicated in **Figure 9.12**.

Based on the outcomes of this report, it is not anticipated that the proposed development of the Merino Wind Farm and its associated infrastructure will negatively impact on significant heritage resources on condition that the following recommendations are implemented:

» A 1km no-go development buffer is implemented around sites GK037 and GK038 (Figure 9.12).
» One turbine from the proposed Merino WEF layout is removed or moved to a less sensitive area (Figure 9.12).
» Site Compound Alternative 1 is not supported from a heritage perspective.
» Site Compound Alternatives 2 and 3 are preferred from a heritage perspective.
» Due to the potential for impact to significant rock engravings, an archaeological walkdown of roads and turbine placement is recommended once the layout is finalised.

» The attached Chance Fossil Finds Procedure must be implemented for the duration of construction activities.
» Although all possible care has been taken to identify sites of cultural importance during the investigation of the study area, it is always possible that hidden or subsurface sites could be overlooked during the assessment. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils, burials or other categories of heritage resources are found during the proposed development, work must cease in the vicinity of the find and SAHRA must be alerted immediately to determine an appropriate way forward.

9.9. 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 (up to 2000m). 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 J**).

9.9.1 Results of the Noise Impact Assessment

Ambient (background) sound levels were measured over a period of three nights from 9 September to 12 September 2021 in accordance with the South African National Standard SANS 10103:2008 "***The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication***", also considering the protocols defined in GG 43110. Ambient sound levels were measured at three locations in the vicinity of the project focus area. The sound levels were measured using a class-1 Sound Level Meters (SLMs) (refer to **Figure 9.13**). The results of the measurements at each location are as follows:

» At **SGKLTSL01**, there was a large tree within 20m that would increase wind-induced noises during periods with increased winds, with people preparing wood around 30m from the microphone.
» At **SGKLTSL02,** there were a number of families living at the dwellings and voices and sounds from a radio or TV were constantly audible. The noise from the road traffic was clearly audible and generally constant.
» At **SGKLTSL03**, the microphone was located approximately 460m from the N1. There was little significant trees and vegetation close to the microphone. Noises/sounds heard during the onsite investigations included bird sounds, sheep bleating, roosters and road traffic.

Residential areas and potential noise-sensitive developments/receptors/communities (NSRs) were identified using aerial images as well as a physical site visit. This highlighted that there are a number of residential activities in the area that should be considered noise-sensitive. The noise-sensitive developments as identified are indicated in **Figure 9.14.**

Also indicated on this figure are generalized 500m, 1 000m and 2 000m buffer zones. Generally, noises from wind turbines:

- Could be significant within 500 m, with receptors24 staying within 500 m from operational wind turbines subject to noises at a potentially sufficient level to be considered disturbing;
- Are normally limited to a distance of approximately 1,000m from operational wind turbines (subject to WTG layout, as the WTG cumulative contribute to noise levels with 2,000m from WTG). Night-time ambient sound levels could be elevated and the potential noise impact measurable;
- Likely to be audible up to a distance of 2,000m at night; and
- Are of a low concern at distance greater than 2,000m. During certain metrological phenomena the sound of the WTGs may be audible, but the sound level will be low.

It should be noted that each dot may represent a number of different dwellings that are or could be used for residential activities.

This noise impact assessment evaluated the proposed layout for the Merino Wind Farm to calculate the maximum noise rating level contours for the project during the operational phase(refer to **Figure 9.15**).

[24] Depending on the layout as well as the specific sound power emission levels of the selected wind turbine.

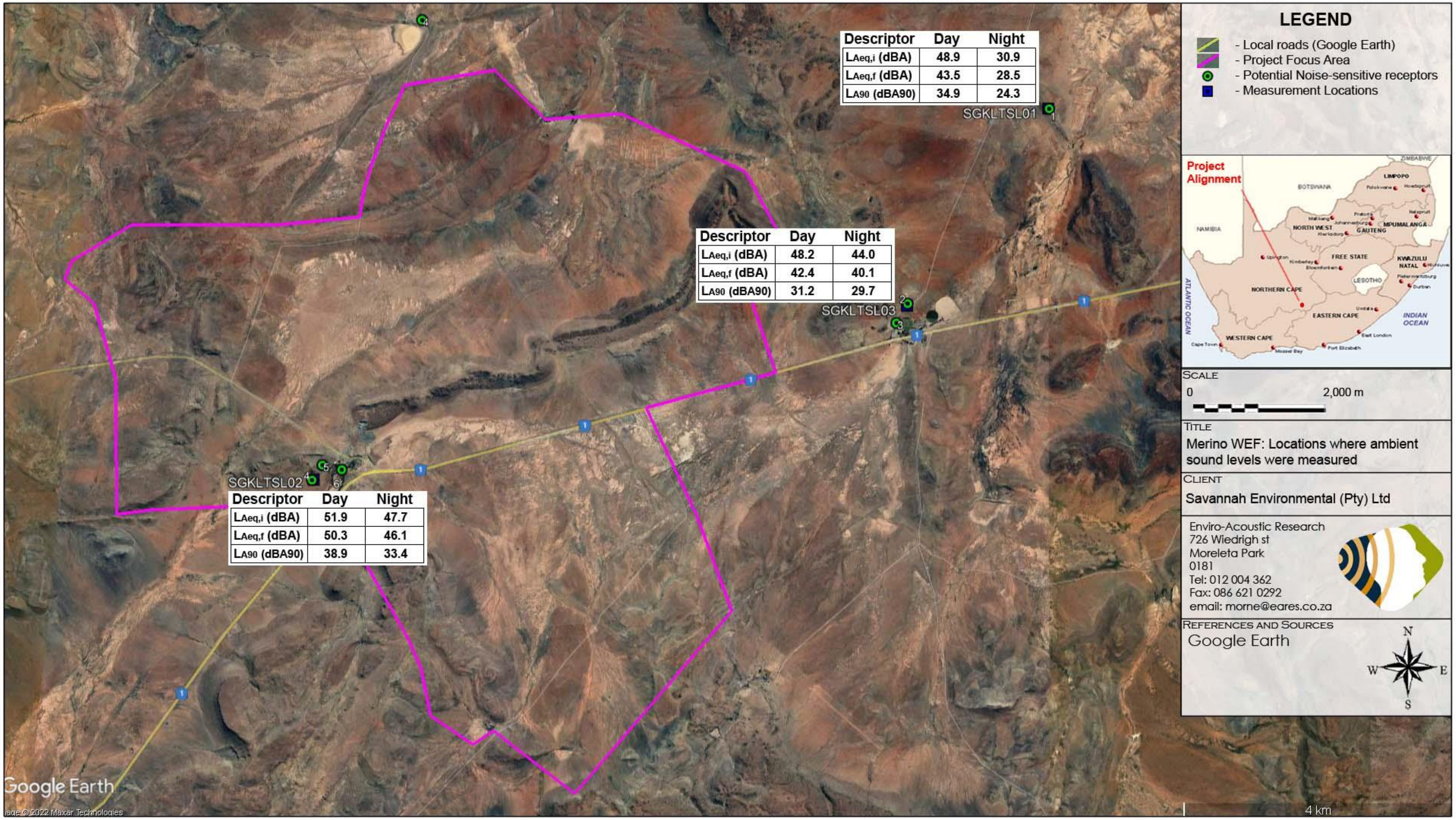


Figure 9.13: Localities where ambient sound levels was measured

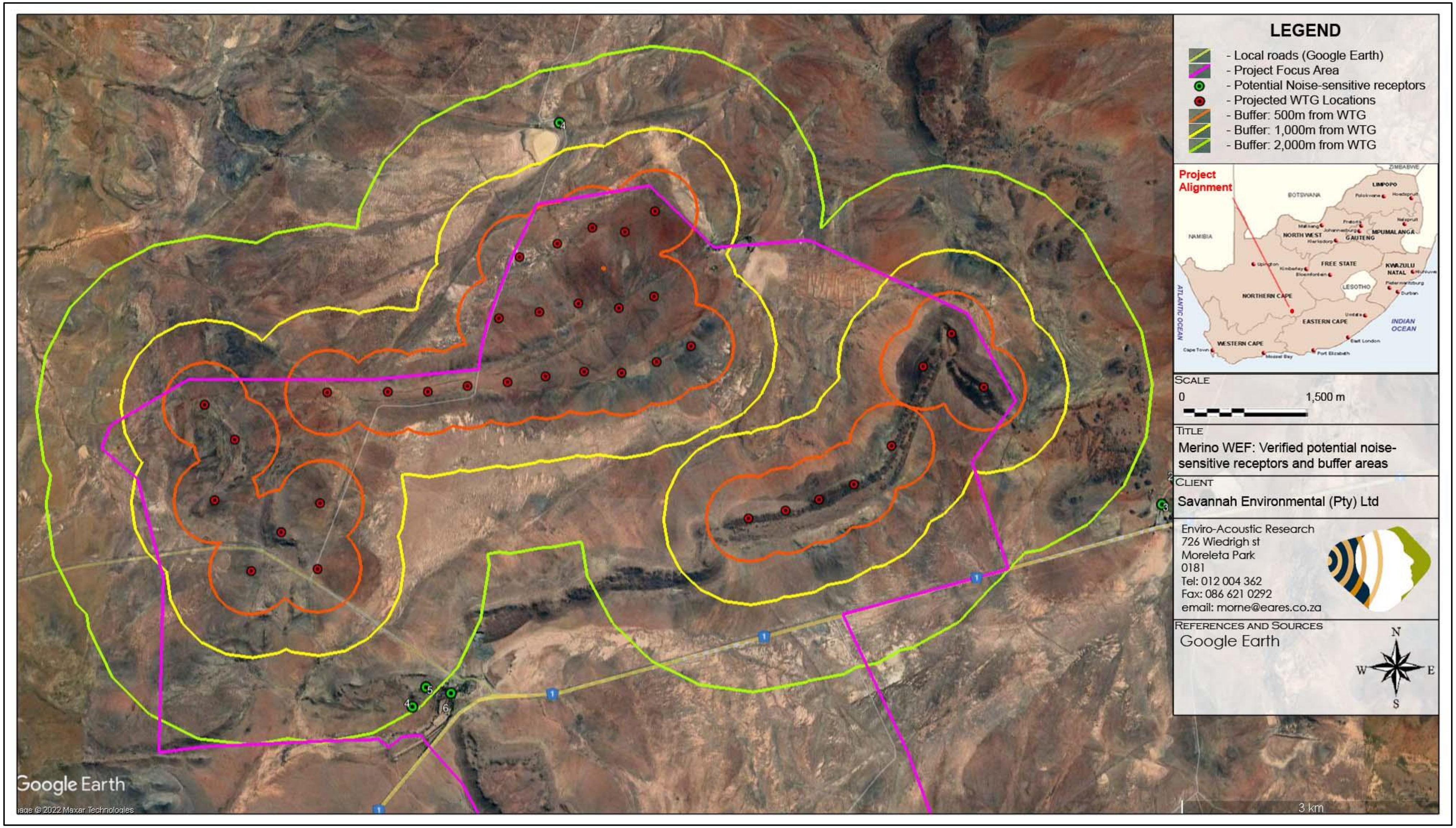


Figure 9.14: Noise-sensitive developments located within the surrounding area and the development area of the Merino Wind Farm

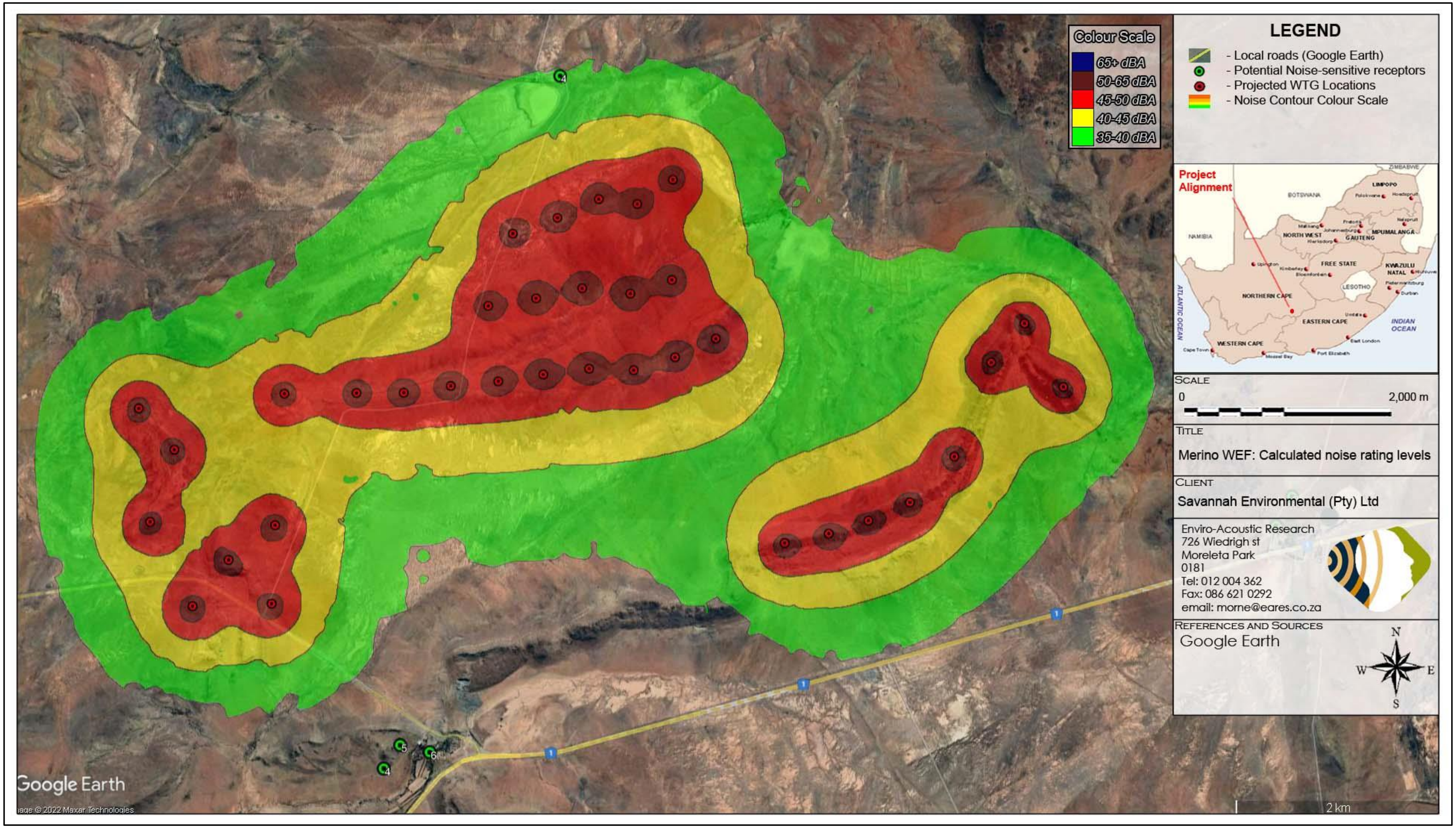


Figure 9.15: Projected noise-levels for the operation of the Merino Wind Farm

9.9.2 *Description of Noise Impacts*

Impacts on Noise Sensitive Developments

Construction Phase

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.

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

Other activities that may generate noise during the construction phase include the use of the concrete batching plant on site, blasting which may be required as part of the civil works to clear obstacles or to prepare foundations, and construction traffic.

Operation Phase

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

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

Decommissioning Phase

The potential for a noise impact to occur during the decommissioning and closure phase will be much lower than that of the construction and/or operational phases. This is because:

» Decommissioning activities normally are limited to the daytime period, due to the lower urgency to complete this phase; and
» Decommissioning activities normally use smaller and less equipment, generating less noise than the typical construction or operational phases.

If required, the noise levels for decommissioning can be compared with the daytime construction phase noise level and the noise impact is similar or less.

Noise Impacts on Animals

A significant amount of research was undertaken during the 1960's and 70's on the effects of aircraft noise on animals. While aircraft noise has a specific characteristic that might not be comparable with industrial noise, the findings should be relevant to most noise sources. A general animal behavioural reaction to aircraft noise is the startle response with the strength and length of the startle response to be dependent on the following:

» which species is exposed;
» whether there is one animal or a group of animals, and
» whether there have been some previous exposures.

Overall, the research suggests that species differ in their response to noise depending on the duration, magnitude, characteristic and source of the noise, as well as how accustomed the animals are to the noise (previous exposure).

Extraneous noises impact on animals as it can increase stress levels and even impact on their hearing. Masking sounds may affect their ability to react to threats, compete and seek mates and reproduce, hunt and forage, communicate and generally to survive.

Unfortunately, there are numerous other factors in the faunal environment that also influence the effects of noise. These include predators, weather, changing prey/food base and ground-based disturbance, especially anthropogenic. This hinders the ability to define the real impact of noise on animals.

The only animal species studied in detail are humans, and studies are still continuing in this regard. These studies also indicate that there is considerable variation between individuals, highlighting the loss of sensitivity to higher frequencies as human's age. Sensitivity also varies with frequency with humans. Considering the variation in the sensitivity to frequencies and between individuals, this is likely similar with all faunal species. Some of these studies are repeated on animals, with behavioural hearing tests being able to define the hearing threshold range for some animals.

Only a few faunal (animal) species have been studied in a bit more detail so far, with the potential noise impact on marine animals most likely the most researched subject, with a few studies that discuss behavioural changes in other faunal species due to increased noises. Few studies indicate definitive levels where noises start to impact on animals, with most based on laboratory level research that subject animals to noise levels that are significantly higher than the noise levels these animals may experience in their environment (excluding the rare case where bats and avifauna fly extremely close to an anthropogenic noise, such as from a moving car or the blades of a wind turbine).

Domesticated Animals
It has been observed that most domesticated animals are generally not bothered by noise, excluding most impulsive noises.

Wildlife
Studies indicated that most animals adapt to noises, and would even return to a site after an initial disturbance, even if the noise is continuous. The more sensitive animals that might be impacted by noise would most likely relocate to a quieter area. Noise impacts are therefore very highly species dependent.

Avifauna
As with other terrestrial faunal species, noise (character of sound or change in level) will impact on avifauna (birds of a particular region and/or habitat). Anthropogenic noises result in physical damage to ears, increased stress, flight or flushing, changes in foraging and other behavioural reactions. Ortega (2012) summarized that additional responses (with ecological similar controls) include the avoidance of noisy areas, changes in reproductive success and changes in vocal communication. However, as with other faunal species, there are no guidelines to assess at which sound pressure level avifaunal will start to exhibit any response.

9.9.3 *Impact tables summarising the significance of impacts on noise during construction, operation and decommissioning (with and without mitigation)*

Construction Phase Impacts

Nature: Construction activities during the day

Various construction activities (development of the hard standing areas, excavation and concreting of foundations and the erection of the wind turbines) taking place simultaneously during the day will increase ambient sound levels due to air-borne noise.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local(2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (1)	Improbable (1)
Significance	**Low (6)**	**Low (6)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	N/A	

Mitigation:
» Significance of the construction noise impact is low for the scenario as conceptualized and additional mitigation measures are not required.

Residual Impacts:
None, based on the low significance

Nature: Construction activities during the night

Various construction activities (likely limited to the pouring of concrete as well as erection of WTG components) taking place at numerous locations simultaneously at night will increase ambient sound levels due to air-borne noise.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (1)	Improbable (1)
Significance	**Low (6)**	**Low (6)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	N/A	
Mitigation: » Significance of the construction noise impact is low for the scenario as conceptualized and additional mitigation measures are not required.		
Residual Impacts: None, based on the low significance		

Nature: Construction (and upgrading) activities relating to the access roads Construction of roads during the day may increase ambient sound levels temporarily. Construction activities closer than 100 m from the identified NSDs could result in noise levels exceeding 55 dBA, higher than the IFC recommended noise limits for residential use. Construction activities closer than 250 m from the identified NSDs could result in noise levels exceeding 45 dBA, higher than the zone sound levels for a rural area.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Temporary (1)	Temporary (1)
Magnitude	Low (4)	Low (4)
Probability	Improbable (1)	Improbable (1)
Significance	**Low (7)**	**Low (7)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	N/A	
Mitigation: » Significance of the construction noise impact is low for the scenario as conceptualized and additional mitigation measures are not required.		
Residual Impacts: None, based on the low significance		

Nature: Daytime construction traffic passing noise sensitive receptors Various construction vehicles passing close to potential noise sensitive receptors may increase ambient sound levels and create disturbing noises.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (1)	Improbable (1)
Significance	**Low (6)**	**Low (6)**

Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	N/A	
Mitigation: » Significance of the construction noise impact is low for the scenario as conceptualized and additional mitigation measures are not required.		
Residual Impacts: None, based on the low significance		

Operation Phase Impacts

Nature: Operational activities at night (wind turbines operating simultaneously at night) Increases in residual noise levels due to air-borne noise from the wind turbines. It is unlikely likely that the noise from the wind turbines will exceed the potential ambient sound levels (using a SPL of 104.8 dBA re 1 pW) and the noise levels from the wind turbines will be less than 45 dBA at all noise sensitive receptors. It should be noted that noises from the wind turbines are likely to be audible at night, but, considering the likely residual noise levels, this is unlikely to be considered a disturbing noise.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (1)	Improbable (1)
Significance	**Low (9)**	**Low (9)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	N/A	
Mitigation: » Significance of the operation noise impact is low for the scenario as conceptualized and additional mitigation measures are not required.		
Residual Impacts: None, based on the low significance		

9.9.4 Overall Result

It was determined that the potential noise impacts, without mitigation, would be:

» of a low significance for the daytime construction activities (hard standing areas, excavation and concreting of foundations and the erection of the wind turbines);
» of a low significance for the night-time construction activities (pouring concrete and erection of WTG components);
» of a low significance for the daytime construction of the access roads;
» of a low significance for the daytime construction traffic passing NSR; and,
» of a low significance for night-time operational activities (noises from WTG).

Considering the low significance of the potential noise impacts (with mitigation, inclusive of cumulative impacts) for the proposed Merino Wind Farm and associated infrastructure, it is recommended that the development be authorised. The proposed layout (i.e., turbine placement) is considered to be acceptable from a noise perspective. No further noise studies or additional noise measurements are recommended or required.

9.10. Assessment of Visual Impacts

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

9.10.1 Results of the Visual Impact Assessment

Potential Visual Exposure

A visibility analysis was undertaken from each of the wind turbine positions (35 in total) at an offset of 170m (approximate hub-height) above ground level. The result of the visibility analysis is displayed on **Figure 9.16**.

From the viewshed analysis, it is evident that the proposed wind farm would have a larger core area of potential visual exposure within a 5km radius of the development site. This is due to the tall wind turbine structures and the predominantly flat topography. However, there are some ridges and hills to the south (Bakenskop ridge), east and west of the proposed wind turbine structures. The shielding effect of these ridges is noticeable on the viewshed analysis map, where the frequency of visual exposure in these areas is reduced. The wind turbine structures, especially the eight turbines located on the Bakenskop ridge, will also be highly exposed to observers travelling along the N1 national road. The Rondawel to Hutchinson secondary road will similarly be exposed to the wind turbines, as it traverses the proposed development site.

Visual exposure will remain high in the medium distance (i.e., between 5 and 10km). The shielding effect of the hills and ridges surrounding the proposed development site does however create a more scattered viewshed pattern. The Hoëkop, Bobbejaankrans and Kamberg hills shield observers to the north-west and north-east of the proposed development site. Observations from the N1 national road and the Hutchinson secondary road is highly likely, especially the eight turbines located on top of the Bakenskop ridge.

In the medium to longer distance (i.e., between 10 and 20km), visual exposure will be somewhat reduced, especially towards the north-west and the south-east. This zone also includes a number of homesteads that may be exposed to the project infrastructure. Visual exposure beyond a 20km radius is significantly reduced, especially in the south-east. The wind turbine structures may however still be visible from a number of homesteads within the study area.

Visual Distance/Observer Proximity to the Wind Farm

The proximity radii are based on the anticipated visual experience of the observer over varying distances. The distances are adjusted upwards for larger wind farms (e.g., more than 50 wind turbines) and downwards for smaller wind farms (e.g., less than 50 turbines).

The proximity radii, based on the dimensions of the proposed development footprint, are indicated **in Figure 9.17**, and include the following:

» 0 - 5km. Short distance view where the WEF would dominate the frame of vision and constitute a very high visual prominence.

- 5 – 10km. Short to medium distance view where the structures would be easily and comfortably visible and constitute a high visual prominence.
- 10 - 20km. Medium to long distance view where the facility would become part of the visual environment but would still be visible and recognisable. This zone constitutes a moderate visual prominence.
- > 20km. Long distance view of the facility where the structures are not expected to be immediately visible and not easily recognisable. This zone constitutes a lower visual prominence for the facility.

Visual Impact Index

The combined results of the visual exposure, viewer incidence/perception and visual distance of the proposed Merino Wind Farm are shown in **Figure 9.18**. Here the weighted impact and the likely areas of impact have been indicated as a visual impact index.

The index indicates that potentially sensitive visual receptors within a 5km radius of the WEF may experience a very high visual impact. The magnitude of visual impact on sensitive visual receptors subsequently subsides with distance to; high within a 5-10km radius (where/if sensitive receptors are present) and moderate within a 10-20km radius (where/if sensitive receptors are present). Receptors beyond 20km are expected to have a low potential visual impact.

Likely areas of potential visual impact and potential sensitive visual receptors located within the study area are shown in **Figure 9.18**.

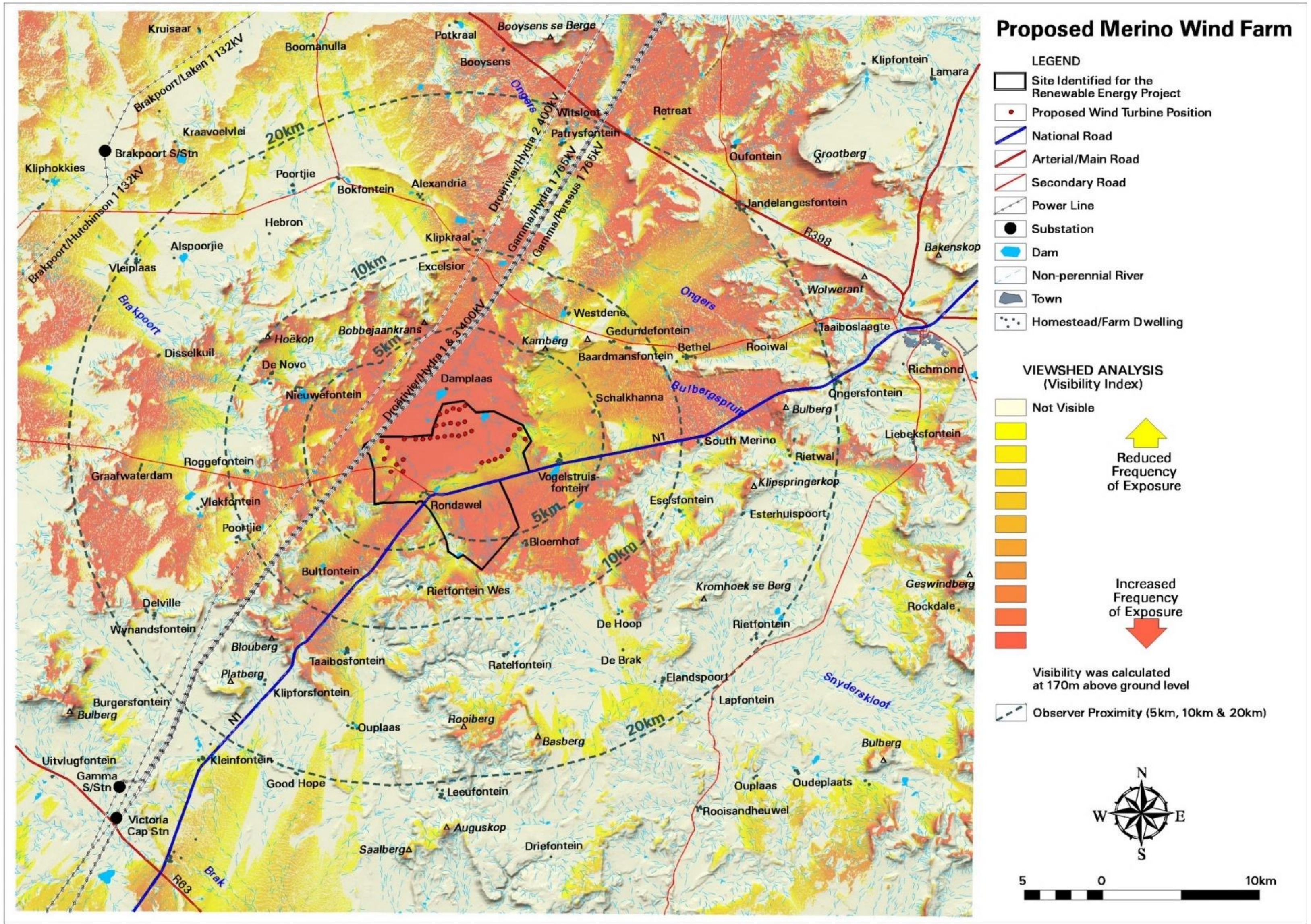


Figure 9.16: Viewshed analysis of the proposed Merino Wind Farm

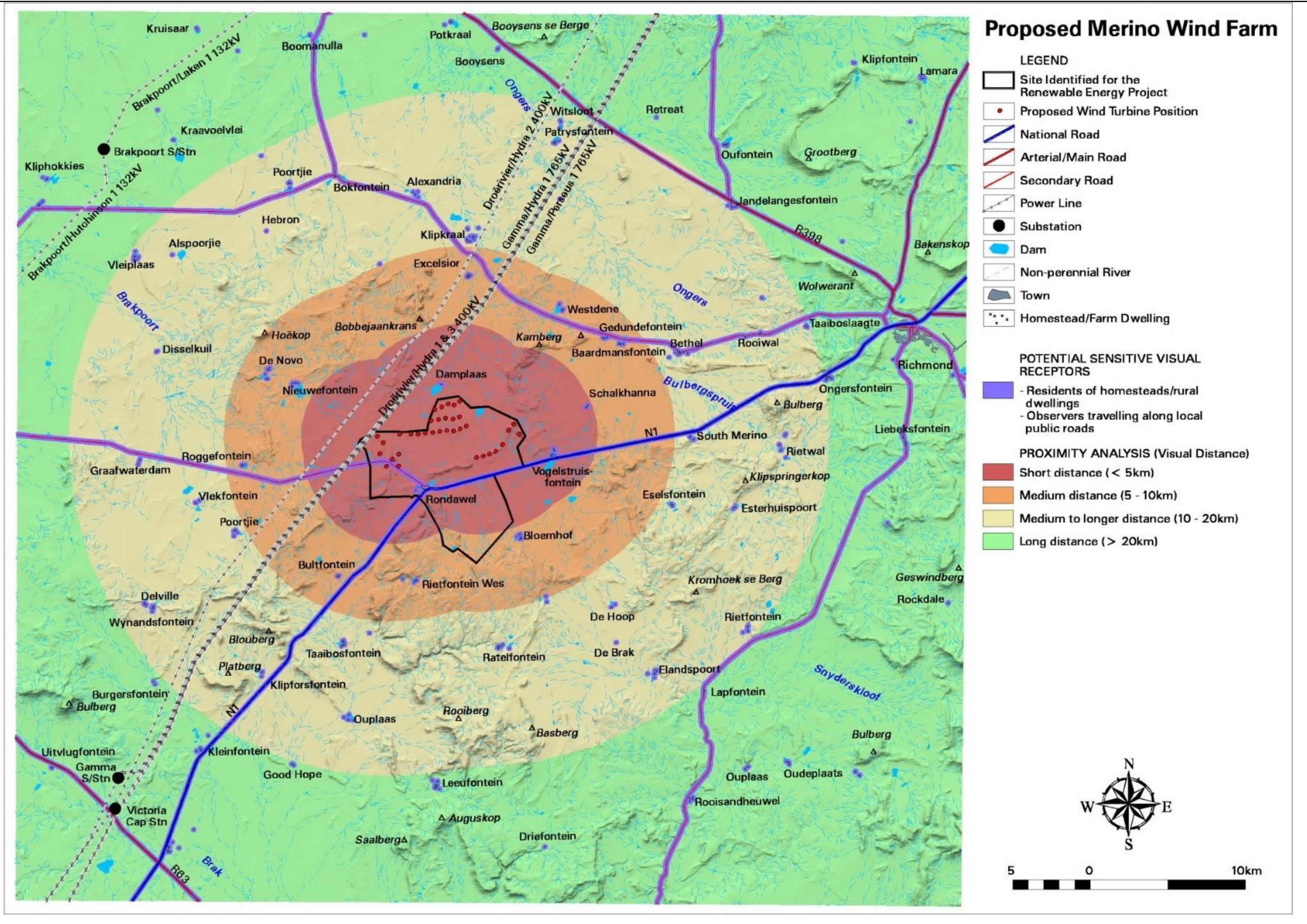


Figure 9.17: Proximity analysis and potential sensitivity visual receptors

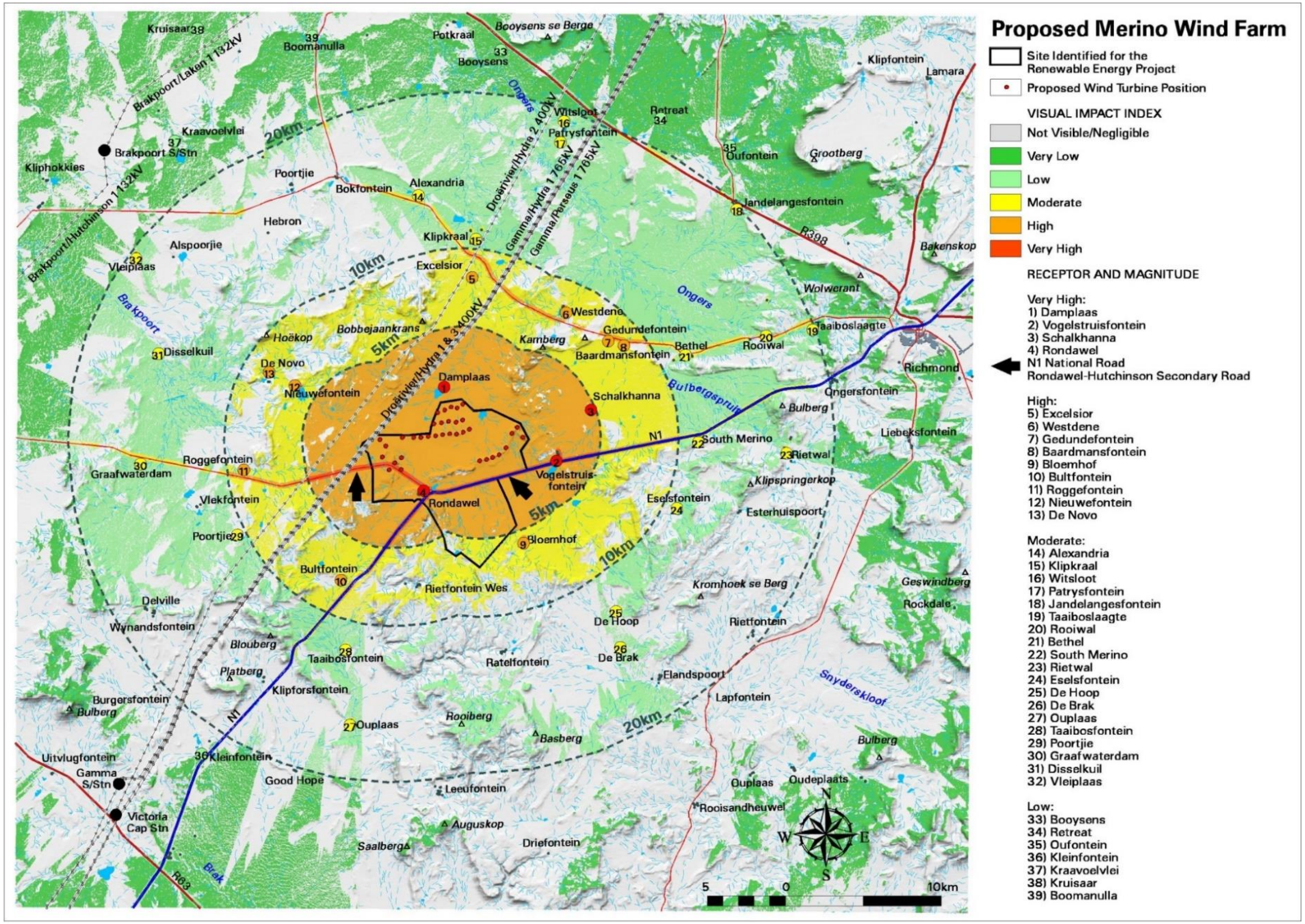


Figure 9.18: Visual impact index and potentially affected sensitive visual receptors.

9.10.2 Description of Visual Impacts

The primary visual impacts associated with the construction and operation of the proposed Merino Wind Farm include:

» *Potential visual impact on construction activities on sensitive visual receptors in close proximity to the proposed wind farm and ancillary infrastructure*: During construction, there may be a noticeable increase in heavy vehicles utilising the roads to the development site that may cause, at the very least, a visual nuisance to other road users and landowners in the area.

» *Potential visual impact on sensitive visual receptors (residents and visitors) located within a 5km radius of the wind turbine structures*: The operation of the Merino Wind Farm is expected to have a high visual impact on observers/visitors residing at homesteads within a 5km radius of the wind turbine structures. This includes Damplaas. It is unclear whether this homestead is occupied as a residence, or whether it is utilised as a storage facility.

» *Potential visual impact on sensitive visual receptors (observers travelling along roads) located within a 5km radius of the wind turbine structures*: The operation of the Merino Wind Farm is expected to have a high visual impact on observers travelling along public roads within a 5km radius of the wind turbine structures. This includes observers travelling along the N1 national road and Rondawel-Hutchinson secondary road. The eight wind turbines located on the Bakonskop ridge are expected to contribute the most to the visual impact, especially when viewed from the N1 national road. Unless the project proponent is willing to remove, or relocate these turbine positions, the impact is expected to remain high.

» *Potential visual impact on sensitive receptors within the region (5 - 10km radius*): The Merino Wind Farm could have a moderate visual impact on residents of (or visitors to) homesteads within a 5 – 10km radius of the wind turbine structures. It should be noted that some receptors however, depending on their aversion to wind energy facilities (especially those located closer to 5km (e.g., 5.5km) from the turbine structures), may experience visual impacts of high significance.

» *Potential visual impact on sensitive receptors within the regional (10 - 20km radius)*: The Merino Wind Farm could have a moderate visual impact on residents of (or visitors to) homesteads within a 10 - 20km radius of the wind turbine structures.

» *Shadow flicker:* Shadow flicker only occurs when the sky is clear, and when the turbine rotor blades are between the sun and the receptor (i.e. when the sun is low). De Gryse in Scenic Landscape Architecture (2006) found that "*most shadow impact is associated with 3-4 times the height of the object*". Based on this research, an 1 000m buffer along the edge of the outer most turbines is identified as the zone within which there is a risk of shadow flicker occurring. There are no places of residence within the 1 000m buffer and the significance of shadow flicker is therefore anticipated to be low to negligible.

» *Lighting impacts:* The area immediately surrounding the proposed facility 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 facility 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. This is especially true due to the strobing effect of the lights, a function specifically designed to attract the observer's attention. The Civil Aviation Authority (CAA) prescribes these warning lights and the potential to mitigate their visual impacts have traditionally been very low other than to restrict the number of lights to turbines that delineate the outer perimeter of the facility. It is the intention of the developer to make use of ground-breaking new technology in the development of strobing lights that only activate when an aircraft is detected nearby may aid in restricting light pollution at night. This will be investigated and implemented by the project proponent, if available and permissible by the CAA.

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, contribute to the increase in sky glow.

This anticipated lighting impact is likely to be of high significance, and may be mitigated to moderate, especially within a 5km radius (and potentially up to a 10km radius) of the wind turbine structures.

» *Ancillary infrastructure:* On-site ancillary infrastructure associated with the WEF includes a 33/132kV substation, Battery Energy Storage System (BESS), underground 33kV cabling between the wind turbines, internal access roads, workshop and office and staff accommodation. No dedicated viewshed analyses have been generated for the ancillary infrastructure, as the range of visual exposure will fall within (and be overshadowed by) that of the turbines. The anticipated visual impact resulting from this infrastructure is likely to be of low significance both before and after mitigation.

» *Potential impact on the sense of place of 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. Visual criteria, specifically the visual character of an area (informed by a combination of aspects such as topography, level of development, vegetation, noteworthy features, cultural / historical features, etc.), play a significant role. 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 significance of the visual impacts on the sense of place within the region (i.e. beyond a 20km radius of the development and within the greater region) is expected to be of low significance.

9.10.3 *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 proposed wind farm.		
	Without mitigation	***With mitigation***
Extent	Very short distance (4)	Very short distance (4)
Duration	Short term (2)	Short term (2)
Magnitude	High (8)	Moderate (6)

Probability	Highly Probable (4)	Probable (3)
Significance	**Moderate (56)**	**Moderate (36)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

Planning:

» Retain and maintain natural vegetation in all areas outside of the development footprint, but within the project site.

Construction:

» Ensure that vegetation is not unnecessarily removed during the construction period.
» Plan the placement of laydown areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) where 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 of 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 rehabilitation works are carried out as required.

Operation Phase Impacts

Nature: Visual impact on observers (residents at homesteads and visitors/tourists) in close proximity (i.e. within 5km) to the wind turbine structures

	Without mitigation	***With mitigation***
Extent	Very short distance (4)	Very short distance (4)
Duration	Long term (4)	Long term (4)
Magnitude	Very high (10)	Very high (10)
Probability	Highly probable (4)	Highly probable (4)
Significance	**High (72)**	**High (72)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practice management measures can be implemented.	

Generic best practise mitigation/management measures:

Planning:

» Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site.

Operations:

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

Decommissioning:

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

Residual impacts:

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

Nature: Visual impact on observers travelling along the roads in close proximity (i.e. within 5km) to the wind turbine structures		
	Without mitigation	***With mitigation***
Extent	Very short distance (4)	Very short distance (4)
Duration	Long term (4)	Long term (4)
Magnitude	Very high (10)	Very high (10)
Probability	Highly probable (4)	Highly probable (4)
Significance	**High (72)**	**High (72)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practice management measures can be implemented.	
Generic best practise mitigation/management measures: Planning: » Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site. Operations: » Maintain the general appearance of the facility as a whole. Decommissioning: » Remove infrastructure not required for the post-decommissioning use. » Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.		
Residual impacts: The visual impact will be removed after decommissioning, provided the wind farm infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.		

Nature: Visual impact on observers travelling along the roads and residents at homesteads within a 5 – 10km radius of the wind turbine structures		
	Without mitigation	***With mitigation***
Extent	Short distance (3)	Short distance (3)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Moderate (60)**	**Moderate (60)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	
Generic best practise mitigation/management measures: Planning: » Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site. Operations: » Maintain the general appearance of the facility as a whole. Decommissioning: » Remove infrastructure not required for the post-decommissioning use. » Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.		
Residual impacts: The visual impact will be removed after decommissioning, provided the wind farm infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.		

Nature: Visual impact on observers travelling along the roads and residents at homesteads within a 10 – 20km radius of the wind turbine structures		
	Without mitigation	***With mitigation***
Extent	Medium to longer distance (2)	Medium to longer distance (2)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	**Moderate (36)**	**Moderate (36)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	
Generic best practise mitigation/management measures: Planning: » Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site. Operations: » Maintain the general appearance of the facility as a whole. Decommissioning: » Remove infrastructure not required for the post-decommissioning use. » Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.		
Residual impacts: The visual impact will be removed after decommissioning, provided the wind farm infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.		

Nature: Visual impact of shadow flicker on sensitive visual receptors in close proximity to the proposed WEF.		
	Without mitigation	***With mitigation***
Extent	Very short distance (4)	Very short distance (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (24)**	**Low (24)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	N.A. due to the low probability of occurrence	
Generic best practise mitigation/management measures: N.A.		
Residual impacts: N.A.		

Nature: Visual impact of lighting at night on sensitive visual receptors.		
	No mitigation	***Mitigation considered***
Extent	Very short distance (4)	Very short distance (4)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	High (8)
Probability	Highly probable (4)	Probable (3)
Significance	**High (64)**	**Moderate (48)**

Status (positive or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

Planning & operation:

- » Implement needs-based night lighting if considered acceptable by the CAA.
- » Limit aircraft warning lights to the turbines on the perimeter according to CAA requirements, thereby reducing the overall impact.
- » 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 the facility and ancillary infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.

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

	Without mitigation	***With mitigation***
Extent	Very short distance (4)	Very short distance (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (24)**	**Low (24)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	

Generic best practise mitigation/management measures:

Planning:

- » Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site.

Operations:

- » Maintain the general appearance of the infrastructure.

Decommissioning:

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

Residual impacts:

The visual impact will be removed after decommissioning, provided the ancillary infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.

Nature: The potential impact on the sense of place of the region.

	Without mitigation	***With mitigation***
Extent	Long distance (1)	Long distance (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)

Probability	Improbable (2)	Improbable (2)
Significance	**Low (18)**	**Low (18)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	
Generic best practise mitigation/management measures: Planning: » Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site. Operations: » Maintain the general appearance of the facility as a whole. Decommissioning: » Remove infrastructure not required for the post-decommissioning use. » Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.		
Residual impacts: The visual impact will be removed after decommissioning, provided the wind farm infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.		

Decommissioning Phase Impacts

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

9.10.4 Overall Result

It is expected that the construction and operation of the proposed Merino Wind Farm and its associated infrastructure, will have a high visual impact on the study area, especially within a 5km (and potentially up to 10km) radius of the proposed facility. The visual impact will differ amongst places, depending on the distance from the facility. Tourists travelling through the region and residents of homesteads will likely experience visual impacts where the wind turbine structures are visible.

Overall, the significance of the visual impacts associated with the proposed Merino Wind Farm is expected to be high as a result of the undeveloped character of the landscape. The facility would be visible within an area that contains certain sensitive visual receptors who could consider visual exposure to this type of infrastructure to be intrusive. Visual receptors include people travelling along the public roads (e.g. the N1 national road), residents of rural homesteads and tourists passing through or holidaying in the region.

In terms of the proposed wind turbine layout, the project proponent needs to adhere to all relevant National, Provincial and Local Government regulations and ordinances, including all prescribed health and safety guidelines. If these are not adhered to, the layout may be deemed non-compliant, and may need to be revised in order to ensure compliance. From a visual perspective, the layout is deemed acceptable and the proposed development is not considered to be fatally flawed.

9.11. Assessment of Social Impacts

Potential social impacts and the relative significance of the impacts associated with the development of the Merino Wind Farm are summarised below (refer to **Appendix L**).

9.11.1 Results of the Social Impact Assessment

The development of renewable energy is strongly supported at a national, provincial, and local level. The development of and investment in renewable energy is supported by the National Development Plan (NDP), New Growth Path Framework and National Infrastructure Plan, which all refer to and support renewable energy. The Pixley Ka Seme District Municipality (PKSDM) Spatial Development Framework and Integrated Development Plan (IDP)and Ubuntu Local Municipality (ULM) IDP also support the development of renewable energy. The development of the proposed wind farm is therefore supported by key policy and planning documents.

9.11.2 Description of Social Impacts

Impacts are expected to occur with the development of the Merino Wind Farm during the construction, operation and decommissioning phases. Both positive and negative impacts are identified and assessed.

Positive impacts during construction includes:
» Creation of employment and business opportunities, and opportunity for skills development and on-site training.

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

Positive impacts during operation includes:
» The establishment of infrastructure to improve energy security and support renewable sector.
» Creation of employment opportunities.
» Benefits to the affected landowners.
» Benefits associated with the socio-economic contributions to community development.

Negative impacts during operation includes:
» Noise impacts associated with the operation of the plant.
» Visual impacts and associated impacts on sense of place.
» Potential impact on property values.
» Potential impact on tourism.

9.11.3 Impact tables summarising the significance of socio-economic impacts during construction, operation and decommissioning (with and without mitigation measures)

Construction Phase Impacts

Nature: Creation of local employment, training, and business opportunities

The construction phase of the Merino Wind Farm will extend over a period of approximately 18-24 months and create in the region of 350 employment opportunities. Based on information provided by the proponent, approximately 75% of the jobs will benefit low-skilled workers, 25% semi-skilled and 5% high skilled. Members from the local communities in the area, specifically Victoria West and Richmond, would be in a position to qualify for most of the low skilled and semi-skilled employment opportunities. Most of these employment opportunities will accrue to Historically Disadvantaged (HD) members of the community. Based on information from similar projects, the total wage bill will be in the region of R 31 million (2021 Rand values). A percentage of the wage bill will be spent in the local economy which will also create opportunities for local businesses in the local towns in the area. Given relatively high local unemployment levels and limited job opportunities in the area, this will represent a significant, if localised, social benefit. However, in the absence of specific commitments from the developer to maximise local employment targets, the potential opportunities for local employment may be reduced. In addition, the low education and skills levels in the area may hamper potential opportunities for local communities. Where feasible, the implementation of a training and skills development programme prior to the commencement of construction would also increase the potential to employ local community members. The number of low skilled and semi-skilled positions taken up by members from the local community will depend on the effective implementation of these enhancement measures by the proponent in consultation with the ULM. Due to the small size of the local towns in the area, the ability to find suitably qualified and educated local workers may however be limited. The capital expenditure associated with the construction phase will be approximately R 2 billion (2021 Rand value). Due the lack of diversification in the local economy, the potential for local companies is likely to be limited. The majority of benefits are therefore likely to accrue to contractors and engineering companies based outside the ULM. Implementing the enhancement measures listed below can create potential opportunities for potentially qualified local companies. The local service sector will also benefit from the construction phase. The potential opportunities would be linked to accommodation, catering, cleaning, transport, and security, etc. associated with the construction workers on the site. The hospitality industry in the area will also benefit from the provision of accommodation and meals for professionals (engineers, quantity surveyors, project managers, product representatives etc.) and other (non-construction) personnel involved on the project. Experience from other construction projects indicates that the potential opportunities are not limited to on-site construction workers but also to consultants and product representatives associated with the project.		
	Without enhancement	**With enhancement**
Extent	Local - Regional (2)	Local - Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (40)**	**Medium (44)**
Status (positive or negative)	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	N/A	No
Can impacts be enhanced?	Yes	
Enhancement: ***Employment*** » Where reasonable and practical, the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area. » Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria. » Before the construction phase commences the proponent should meet with representatives from the ULM to establish the existence of a skills database for the area. If such as database exists it should be made available to the contractors appointed for the construction phase.		

» The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase of the project.
» Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase.
» The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.

Business

» The proponent should liaise with the ULM with regards the establishment of a database of local companies, specifically BBBEE companies, which qualify as potential service providers (e.g., construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work.
» Where possible, the proponent should assist local BBBEE companies to complete and submit the required tender forms and associated information.
» The ULM, in conjunction with the local business sector and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project.

Residual Impacts:

Improved pool of skills and experience in the local area

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

The presence of construction workers poses a potential risk to family structures and social networks. While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on local communities. The most significant negative impact is associated with the disruption of existing family structures and social networks. This risk is linked to potentially risky behaviour, mainly of male construction workers, including:

» An increase in alcohol and drug use.
» An increase in crime levels.
» The loss of girlfriends and/or wives to construction workers.
» An increase in teenage and unwanted pregnancies.
» An increase in prostitution.
» An increase in sexually transmitted diseases (STDs), including HIV.

The proponent has indicated that workers will be accommodated on site.

As indicated above, the objective will be to source as many of the low and semi-skilled workers locally. These workers will be from the local community and form part of the local family and social networks. This will reduce the risk and mitigate the potential impacts on the local community. The potential impact on the local community will therefore be negligible. The balance of semi-skilled and skilled workers will be accommodated in the nearby towns of Victoria West and Richmond.

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

	Without mitigation	**With mitigation**

Extent	Local (2)	Local (1)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (30)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	No in case of HIV and AIDS	
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impacts be mitigated?	Yes to some degree. However, the risk cannot be eliminated	

Mitigation:

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

Residual Impacts:

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

Nature: Potential impacts on family structures, social networks and community services associated with the influx of job seekers

Large construction projects tend to attract people to the area in the hope that they will secure a job, even if it is a temporary job. These job seekers can in turn become "economically stranded" in the area or decide to stay on irrespective of finding a job or not. While the proposed project on its own does not constitute a large construction project, the establishment of a number of renewable energy projects in the area may attract job seekers to the area. As in the case of construction workers employed on the project, the actual presence of job seekers in the area does not in itself constitute a social impact. However, the way in which they conduct themselves can impact on the local community. The main areas of concern associated with the influx of job seekers include:

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

The findings of the SIA indicate that the potential for economically motivated in-migration and subsequent labour stranding is likely to be negligible. This is due to the isolated location of the area and the limited economic and employment opportunities in the nearby towns of Victoria West and Richmond. The risks associated with the influx of job seekers are therefore likely to be low.

	Without mitigation	With mitigation
Extent	Local (2)	Local (1)
Duration	Permanent (5) for job seekers that stay on in the area.	Permanent (5) for job seekers that stay on in the area
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	No	
Irreplaceable loss of resources?	No, in the case of HIV and AIDS	No, in the case of HIV and AIDS
Can impacts be mitigated?	Yes to some degree. However, the risk cannot be eliminated	

Mitigation:

» Ongoing consultation with stakeholders must be undertaken throughout the construction phase.
» The proponent should implement a "locals first" policy, specifically with regard to unskilled and low skilled opportunities.
» The proponent should implement a policy that no employment will be available at the gate.

Residual Impacts:

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

Nature: Potential risk to safety of scholars, farmers and farm workers, livestock and damage to farm infrastructure associated with the presence of construction workers on site

The presence of and movement of construction workers on and off the site poses a potential safety threat to local famers and farm workers in the vicinity of the site. In addition, farm infrastructure, such as fences and gates, may be damaged and stock losses may also result from gates being left open and/or fences being damaged, or stock theft linked either directly or indirectly to the presence of farm workers on the site. The potential risks (safety, livestock, and farm infrastructure) can be effectively mitigated by careful planning and managing the movement of construction on and off the site workers during the construction phase. Mitigation measures to address these risks are outlined below.

Based on feedback from interviews with local landowner's stock theft is currently not a major concern, however, properties vulnerable due to year-round stocking. Potential risk of poaching is largely linked to Ratelfontein which stocks valuable game species.

	Without mitigation	With mitigation
Extent	Regional (3)	Local (2)
Duration	Short term (2)	Short term (2)
Magnitude	Medium (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (33)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes, compensation paid for stock losses and damage to farm infrastructure etc.	

Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

- » The proponent should enter into an agreement with local farmers in the area whereby damages to farm property etc. during the construction phase will be compensated for. The agreement should be signed before the construction phase commences.
- » Traffic movement and construction related activities should be contained within clearly designated areas.
- » Strict traffic speed limits must be enforced.
- » All farm gates must be closed after passing through.
- » Contractors appointed by the proponent should provide daily transport for construction workers to and from the site. This would reduce the potential risk of trespassing on the remainder of the farm and adjacent properties.
- » Ongoing consultation with stakeholders must be undertaken throughout the construction phase.
- » The proponent should hold contractors liable for compensating farmers in full for any stock losses and/or damage to farm infrastructure that can be linked to construction related activities and or workers. This should be contained in the Code of Conduct to be signed between the proponent, the contractors, and neighbouring landowners. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities (see below).
- » The Environmental Management Programme (EMPr) must outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested.
- » Contractors appointed by the proponent must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.
- » Contractors appointed by the proponent must ensure that construction workers found guilty of stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation.
- » No construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.

Residual Impacts:

- » No, provided losses are compensated for

Nature: Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of grass fires

The presence of construction workers and construction-related activities on the site poses an increased risk of grass fires that could, in turn pose, a threat to livestock, crops, wildlife and farm infrastructure. The potential risk of grass fires will be higher during the dry, windy winter months from May to October. In terms of potential mitigation measures the option of constructing a firebreak around the perimeter of the site prior to the commencement of the construction phase should be investigated. In addition, fire-fighting equipment must be provided on site.

	Without mitigation	**With mitigation**
Extent	Regional (4)	Local (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate due to reliance on agriculture for maintaining livelihoods (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (36)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes, compensation paid for stock and crop losses etc.	
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		

- » The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc., during the construction phase will be compensated for. The agreement should be signed before the construction phase commences.
- » Contractor should ensure that open fires on the site for cooking or heating are not allowed except in designated areas.
- » Smoking on site should be confined to designated areas.
- » Contractor should ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high-risk dry, windy winter months.
- » Contractor should provide adequate fire-fighting equipment on-site, including a fire fighting vehicle.
- » Contractor should provide fire-fighting training to selected construction staff.
- » No construction staff, with the exception of security staff, to be accommodated on site overnight.
- » As per the conditions of the Code of Conduct, in the advent of a fire being caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the fire-fighting costs borne by farmers and local authorities.

Residual Impacts:

No, provided losses are compensated for.

Nature: Potential noise, dust and safety impacts associated with construction related activities

Construction related activities, including the movement of heavy construction vehicles of and on the site, has the potential to create dust, noise and safety impacts and damage roads. The impacts will be largely local and can be effectively mitigated.

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

Mitigation:

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

Residual Impacts:

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

Nature: The activities associated with the construction phase, such as establishment of access roads and the construction camp, movement of heavy vehicles and preparation of foundations for the project etc. will damage farmlands and result in a loss of farmlands for grazing.

The activities associated with the construction phase and establishment of the proposed project and associated infrastructure will result in the disturbance and loss of land available for grazing. The impact on farmland associated with the construction phase can be mitigated by minimising the footprint of the construction related activities and ensuring that disturbed areas are fully rehabilitated on completion of the construction phase. Existing internal roads should be used where possible. This this requires careful site planning and management of operations. In the event that new roads are required, these roads should be rehabilitated on the completion of the construction phase. In addition, the landowners will be compensated for the loss of land.

	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Long term (5) (Long term permanent if disturbed areas are not effectively rehabilitated)	Short-term (2) (Short term if damaged areas are rehabilitated)
Magnitude	Medium (6)	Minor (2)
Probability	Probable (3)	Highly probable (4)
Significance	**Medium (36)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes, disturbed areas can be rehabilitated	
Irreplaceable loss of resources?	Yes, loss of farmland. However, disturbed areas can be rehabilitated	
Can impacts be mitigated?	Yes, however loss of farmland cannot be avoided	

Mitigation:

» An Environmental Control Officer (ECO) should be appointed to monitor the construction phase.
» Existing internal roads should be used where possible. In the event that new roads are required, these roads should be rehabilitated on the completion of the construction phase.
» The footprint associated with the construction related activities (access roads, construction camps, workshop etc.) should be minimised.
» All areas disturbed by construction related activities, such as access roads on the site, construction camps etc., should be rehabilitated at the end of the construction phase.
» The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. The specifications for the rehabilitation programme should be included in the EMP.
» The implementation of the Rehabilitation Programme should be monitored by the ECO.

Residual Impacts:

Overall loss of farmland could affect the livelihoods of the affected farmers, their families, and the workers on the farms and their families. However, disturbed areas can be rehabilitated.

Operation Phase Impacts

Nature: Development of infrastructure to improve energy security and support renewable sector

South Africa's energy crisis, which started in 2007 and is ongoing, has resulted in widespread rolling blackouts (referred to as load shedding) due to supply shortfalls. The load shedding has had a significant impact on all sectors of the economy and on investor confidence. The mining and manufacturing sector have been severely impacted and will continue to be impacted until such time as there is a reliable supply to energy. Load shedding in the first six months of 2015 was estimated to have cost South African businesses R13.72 billion in lost revenue with an additional R716 million was spent by businesses on backup generators . A survey of 3 984 small business owners found that 44% said that they had been severely affected by load shedding with 85% stating that it had reduced their revenue, with 40% of small businesses losing 20% or more or revenue during due to load shedding period .

The Green Jobs study (2011) notes that South Africa has one of the most carbon-intensive economies in the world, thus making the greening of the electricity mix a national imperative. The study notes that renewable energy provides an ideal means for reaching emission reduction targets in a relatively easy manner. In addition, and of specific relevance to South Africa renewable energy is not as dependent on water compared to the massive water requirements of conventional power stations, has a limited footprint and therefore does not impact on large tracts of land, poses limited pollution and health risks, specifically when compared to coal and nuclear energy plants.

The Greenpeace Report (powering the future: Renewable Energy Roll-out in South Africa, 2013), also notes that within a broader context of climate change, coal energy does not only have environmental impacts, it also has socio-economic impacts. These include acid mine drainage from abandoned mines in South Africa and the risk this poses on the country's limited water resources.

The overview of the IPPPP (June 2020) indicates that the REIPPPP has attracted R41.8 billion in foreign investment and financing in the seven bid windows (BW1 – BW4, 1S2 and IS2). This is almost double the inward FDI attracted into South Africa during 2015 (R22.6 billion). In terms of local equity shareholding, 52% (R31.5 billion) of the total equity shareholding (R61 billion) was held by South African's across BW1 to BW4, 1S2 and 1S2. This equates to substantially more than the 40% requirement. Foreign equity amounts to R 29.5 billion and contributes 49% to total equity. As far as Broad Based Black Economic Empowerment is concerned, Black South Africans own, on average, 33% of projects that have reached financial close, which is slightly above the 30% target.

On average, black local communities own 9% of projects that have reached financial close. This is well above the 5% target. In addition, an average of 21% shareholding by black people in engineering, procurement, and construction (EPC) contractors has been attained for projects that have reached financial closure. This is higher than 20% target. The shareholding by black people in operating companies of IPPs has averaged 24% (against the targeted 20%) for the 68 projects in operation (i.e. in BW1–4). The target for shareholding by black people in top management has been set at 40%, with an average 67% achieved to date. The target has therefore been significantly exceeded.

The total projected procurement spend for during the construction phase was R73.1 billion, while the proposed operations procurement spend over 20 years operational life is estimated at 76.8 billion. The combined (construction and operations) procurement value is projected as R149.9 billion, of which R81 billion has been spent to date. For construction, of the R70.2 billion already spent to date, R57.7 billion is from the 68 projects which have already been completed. These 68 projects had planned to spend R52.9 billion. The actual procurement construction costs have therefore exceeded the planned costs by 9% for completed projects.
Of the R70.2 billion spent on procurement during construction, R59 billion has reportedly been procured from BBBEE suppliers, achieving 87% of total procured. Actual BBBEE spend during construction for BW1 and BW2 alone was R25.5 billion. The R59 billion spent on BBBEE during construction is 15% more than the R 51.1 billion that had originally been anticipated by all IPPs.

Total procurement spend by IPPs from Qualifying Small Enterprises (QSE) and Exempted Micro Enterprises (EME) has amounted to R24.7 billion (construction and operations) to date, which exceeds commitments by 96% and is 30% of total procurement spend to date (while the required target is 10%). QSE and EME's procurement spend for construction was R 22 billion, which is 4.4 times the targeted spend for construction of R4.9 billion during this procurement phase.

In terms of procurement from women-owned vendors to date, 5% of total construction procurement spend has been from woman-owned vendors (against a targeted 5%), and 6% of operational procurement spend has been realised from woman-owned vendors to date, thereby exceeding the targeted 5%. In terms of construction spend, R 3.2 billion was undertaken by women-owned vendors, which is almost double the R 1.9 billion estimated for the construction of projects that have reached financial close.

The REIPPPP has therefore created significant employment opportunities for black South African citizens and local communities beyond planned targets. This highlights the importance of the programme in terms of employment equity and the creation of more equal societies.

In terms of employment, to date, a total of 52 603 job years have been created for South African citizens, of which 42 355 job years were in construction and 10 248 in operations. 81%, 43% and 49% of total job opportunities created by IPPs to date. However, woman and disabled people could still be significantly empowered as they represent a mere 10% and 0.4% of total jobs created to date, respectively. Nonetheless, the fact that the REIPPPP has raised employment opportunities for black South African citizens and local communities beyond planned targets, indicates the importance of the programme to employment equity and the drive towards more equal societies. These job years should rise further past the planned target as more projects enter the construction phase. The REIPPPP has also ensured that black people in local communities have ownership in the IPP projects that operate in or nearby their vicinities. The establishment of renewable energy facilities therefore not only address environmental issues associated with climate change and consumption of scarce water resources, but also create significant socio-economic opportunities and benefits, specifically for historically disadvantaged, rural communities.

	Without enhancement	**With enhancement**
Extent	Regional (4)	Regional (5)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	High (8)
Probability	Highly probable (4)	Definite (5)
Significance	**High (64)**	**High (85)**
Status (positive or negative)	Positive	Positive
Reversibility	Yes	
Irreplaceable loss of resources?	Yes, impact of climate change on ecosystems	Reduced CO_2 emissions and impact on climate change
Can impacts be enhanced?	Yes (enhanced)	

Enhancement:

» Implement a skills development and training programme aimed at maximizing the number of employment opportunities for local community members.

» Maximise opportunities for local content, procurement, and community shareholding.

Residual Impacts:

Overall reduction in CO_2 emission, reduction in water consumption for energy generation, contribution to establishing an economically viable commercial renewables generation sector in the Northern Cape and South Africa

Nature: Creation of employment and business opportunities associated with the operational phase

The proposed development will create in the region of 20 full time employment opportunities during the operational phase, of which 70% will be unskilled, 25% semi-skilled, and 5% skilled. Based on similar projects the annual operating budget will be in the region of R 24 million (2021 Rand values), including wages.

	Without enhancement	**With enhancement**
Extent	Local (1)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Low (28)**	**Medium (40)**
Status (positive or negative)	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	Yes (enhanced)	

Enhancement:

Employment

» Where reasonable and practical, the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area.

» Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria.

» Before the construction phase commences the proponent should meet with representatives from the ULM to establish the existence of a skills database for the area. If such as database exists it should be made available to the contractors appointed for the construction phase.
» The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase of the project.
» Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase.
» The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.

Business
» The proponent should liaise with the ULM with regards the establishment of a database of local companies, specifically BBBEE companies, which qualify as potential service providers (e.g., construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work.
» Where possible, the proponent should assist local BBBEE companies to complete and submit the required tender forms and associated information.
» The ULM, in conjunction with the local business sector and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project.

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

Nature: The generation of additional income represents a significant benefit for the local affected farmer(s) and reduces the risks to their livelihoods posed by droughts and fluctuating market prices for sheep and farming inputs, such as feed etc.

The proponent will enter into rental agreements with the affected landowners for the use of the land for the establishment of the proposed wind farm. In terms of the rental agreement the affected landowner will be paid an annual amount dependent upon the number of wind turbines located on the property. The additional income will reduce the risk to his livelihoods posed by droughts and fluctuating market prices for sheep and farming inputs, such as fuel, feed etc. Given the low carrying capacity of the veld the additional income represents a significant benefit for the affected landowners.

The benefits are also not only limited to the affected landowners. In this regard the landowners interviewed indicated that farm owners that were scoped out during the EIA phase will still receive some financial compensation.

	Without enhancement	**With enhancement**
Extent	Local (1)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Probable (3)	Definite (5)
Significance	**Low (27)**	**Medium (53)**
Status (positive or negative)	Positive	Positive
Reversibility	Yes	
Can impacts be enhanced?	Yes (enhanced)	

Enhancement:
» Implement agreements with affected landowner.

Residual Impacts:

Support for local agricultural sector and farming

Nature: Benefits associated with support for local community's form SED contributions

The REIPPPP has been designed not only to procure energy but has also been structured to contribute to the broader national development objectives of job creation, social upliftment and broadening of economic ownership. Socio-economic development (SED) contributions are an important focus of the REIPPPP and are aimed at ensuring that local communities benefit directly from the investments attracted into the area. These contributions are linked to Community Trusts and accrue over the project operation life and, in so doing, create an opportunity to generate a steady revenue stream over an extended period. This revenue can be used to fund development initiatives in the area and support the local community. The long-term duration of the revenue stream also allows local municipalities and communities to undertake long term planning for the area. The revenue from the proposed wind farm can be used to support a number of social and economic initiatives in the area, including:

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

The minimum compliance threshold for SED contributions is 1% of the revenue with 1.5% the targeted level over the 20-year project operational life. For the current portfolio of projects, the average commitment level is 2.2%, which is 125% higher than the minimum threshold level. To date (across seven bid windows) a total contribution of R23.1 billion has been committed to SED initiatives. Assuming an even, annual revenue spread, the average contribution per year would be R1.2 billion. Of the total commitment, R18.8 billion is specifically allocated for local communities where the IPPs operate. With every new IPP on the grid, revenues and the respective SED contributions will increase.

As a percentage of revenue, SED obligations become effective only when operations commence, and revenue is generated. Of the 91 IPPs that have reached financial close (BW1–BW41), 68 are operational. The SED contributions associated with these 68 projects has amounted to R 1.2 billion to date.

In terms of ED and SED spend, education, social welfare, and health care initiatives have a SED focus. SED spend on education has been almost double the expenditure on enterprise development. In this regard IPPs have supported 1 123 education institutions with a total of R312 million in contributions, from 2015 to the end of June 2020. A total of 1 142 bursaries, amounting to R183.8 million, have been awarded by 55 IPPs from 2015 until the end of June 2020. The largest portion of the bursaries were awarded to African and Coloured students (97%), with women and girls receiving 56% of total bursaries. The Northern Cape province benefitted most from the bursaries awarded, with 61%, followed by the Eastern Cape (18%) and Western Cape (14%). Enterprise development and social welfare are the focus areas that have received the second highest share of the contributions to date.

The Green Jobs study (2011) found that the case for renewable energy is enhanced by the positive effect on rural or regional development. Renewable energy facilities located in rural areas create an opportunity to benefit the local and regional economy through the creation of jobs and tax revenues.

The establishment of Community Trusts do therefore create significant benefits for local rural communities. However, Community Trusts can also be mismanaged. This is an issue that will need to be addressed when setting up the trust.

	Without enhancement	**With enhancement**
Extent	Local (2)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Moderate (6)

Probability	Probable (3)	Definite (5)
Significance	**Medium (30)**	**High (65)**
Status (positive or negative)	Positive	Positive
Reversibility	Yes	
Can impacts be enhanced?	Yes (enhanced)	

Enhancement:

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

Residual Impacts:

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

Nature: Visual impact associated with the proposed facility and associated infrastructure and the potential impact on the areas rural sense of place.

The proposed wind farm has the potential to impact on the areas existing rural sense of place. Concerns were raised regarding the potential impact on the sense of place associated with some of the turbines associated with the proposed Merino Wind Farm and the impact on the sense of place on Bloemhof and Ratelfontein. As indicated above, Ratelfontein caters for high-end trophy hunters, mainly overseas clients, who are accommodated in six lodges. Bloemhof offers game drives and wives of Ratelfontein guests often stay over on Bloemhof during excursions. The anchoring attraction of both operations is the unspoilt 'expansive Karoo' sense of place currently enjoyed on the relevant properties. None of the properties are currently affected by major service industrial infrastructure, and all are shielded from the N1 by intervening properties. The wind turbines associated with the Merino WEF are all located to the north of the N1. The owners of the Ratelfontein and the Bloemhof Guest Farm, the Pickards, indicated that they are not opposed to turbines located to the north of the N1.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Medium (36)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes, wind farm components and other infrastructure can be removed	
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

- The recommendations contained in the VIA should be implemented. In addition, consideration should be given to confining wind turbines to the north of the N1.

Residual Impacts:

Potential impact on current rural sense of place

Nature: Potential impact of the wind farm on property values

Based on the findings of a literature review for wind farms the potential impact on property values is likely to be low. The literature review did not constitute a property evaluation study, but merely sought on comment on the potential impact of wind farms on property values based on the findings of studies undertaken overseas. In total five articles were identified and reviewed. The most relevant is likely to be the study by Urbis (2016), Review of the Impact of Wind Farms on Property Values, Urbis Pty Ltd (2016), commissioned by the Office of Environment and Heritage, NSW, Australia, which focused on rural properties in Australia.

Based on the outcome of the study the authors were of the opinion that wind farms may not significantly impact rural properties used for agricultural purposes. However, the study found that there is limited available sales data to make a conclusive finding relating to value impacts on residential or lifestyle properties located close to wind farm turbines, noting that wind farms in NSW have been constructed in predominantly rural areas. In conclusion, the authors of the Urbis study found:

» Appropriately located wind farms within rural areas, removed from higher density residential areas, are unlikely to have a measurable negative impact on surrounding land values.
» There is limited available sales data to make a conclusive finding relating to value impacts on residential or lifestyle properties located close to wind farm turbines, noting that wind farms in NSW have been constructed in predominantly rural areas.

Based on the findings of the literature review the potential impact of WEFs on rural property values is likely to be low. The owners of the operations on Bloemhof and Ratelfontein have indicated that they are not opposed to wind turbines located to the north of the N1.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Medium (36)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	Yes	

Enhancement:

» The recommendations contained in the VIA should be implemented. In addition, consideration should be given to confining wind turbines to the north of the N1.

Residual Impacts:

Linked to visual impact on sense of place.

Nature: Potential impact of the wind farm on local tourism

Based on the findings of a literature review for wind farms the potential impact of wind farms on tourism is likely to be low. Three articles were reviewed, namely:

» Atchison, (April 2012). Tourism Impact of Wind Farms: Submitted to Renewables Inquiry Scottish Government. University of Edinburgh.
» Glasgow Caledonian University (2008). The economic impacts of wind farms on Scottish tourism. A report prepared for the Scottish Government.
» Regeneris Consulting (2014). Study into the Potential Economic Impact of Wind Farms and Associated Grid Infrastructure on the Welsh Tourism Sector.

Based on the findings of the literature review, there is limited evidence to suggest that the proposed wind farm would impact on the tourism in the PKSDM and ULM at a local and regional level. The findings also indicate that wind farms do not impact on tourist routes. This was confirmed by the feedback from the local landowners interviewed. The majority of whom raised no concerns about the potential impact on tourism facilities in the area. As indicated above

the owners of the operations on Bloemhof and Ratelfontein have indicated that they are not opposed to wind turbines located to the north of the N1.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Medium (36)**	**Low (24)**
Status (positive or negative)	Negative	Positive
Reversibility	Yes	
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	Yes	
Enhancement: » The recommendations contained in the VIA should be implemented. In addition, consideration should be given to confining wind turbines to the north of the N1.		
Residual Impacts: Linked to visual impact on sense of place		

Decommissioning Phase Impacts

Upon the expiry of the Merino Wind Farm lifespan, the facility would need to be disbanded, although the facility would likely be upgraded in order to maintain and prolong the lifespan of the facility.

If the facility is decommissioned, the land will be rehabilitated in order to return it to pre-project conditions. This also means that all impacts whether positive or negative, which take place during the operational phase will cease to exist. At the same time spending on the disassembly of the components and rehabilitation of land will increase the demand for construction services and other industries, thus stimulating economic activity in the local area, albeit over a temporary period.

9.11.4 Overall Result

The findings of the SIA indicate that the proposed Merino Wind Farm will result in several social and socio-economic benefits, including creation of employment and business opportunities during both the construction and operational phases. The project will also contribute to local economic development though socio-economic development (SED) contributions. In addition, the development will improve energy security and reduce the carbon footprint associated with energy generation. The findings of the SIA also indicate that the potential negative impacts associated with both the construction and operational phases are likely to be Low Negative with mitigation. The potential negative impacts can therefore be effectively mitigated if the recommended mitigation measures are implemented. The establishment of the proposed Merino Wind Farm is therefore supported by the findings of the SIA.

9.12. 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 Merino Wind Farm are summarised below (refer to **Appendix M**).

9.12.1 Results of the Traffic Impact Assessment

It is assumed that if components are imported to South Africa, it will be via the Port of Ngqura, which is located in the Eastern Cape, ~425km from the proposed site. Alternatively, components can be imported via the Port of Saldanha in the Western Cape, which is located ~675km from the proposed site.

The preferred route for abnormal load vehicles will be from the port (i.e., Port of Ngqura), heading north on the R75, passing Wolwefontein and Jansenville, and onto the R63 at Graaff-Reinet. The vehicles will travel on the R63 to the N1, passing Murraysburg, and continue on the N1 to the proposed site.

The proposed access points to the development area are located along the N1, as shown in **Figure 9.19**. Proposed Access Point 1 has a surfaced bellmouth which leads to the existing gravel road to the Hutchinson railway station. Proposed Access Point 2 is an existing gravel farm access road with an unsurfaced bellmouth.

Generally, the road width at the access points needs to be a minimum of 8m and the access roads on site a minimum of 4.5m (preferably 5m). The radius at the access points needs to be large enough to allow for all construction vehicles to turn safely.

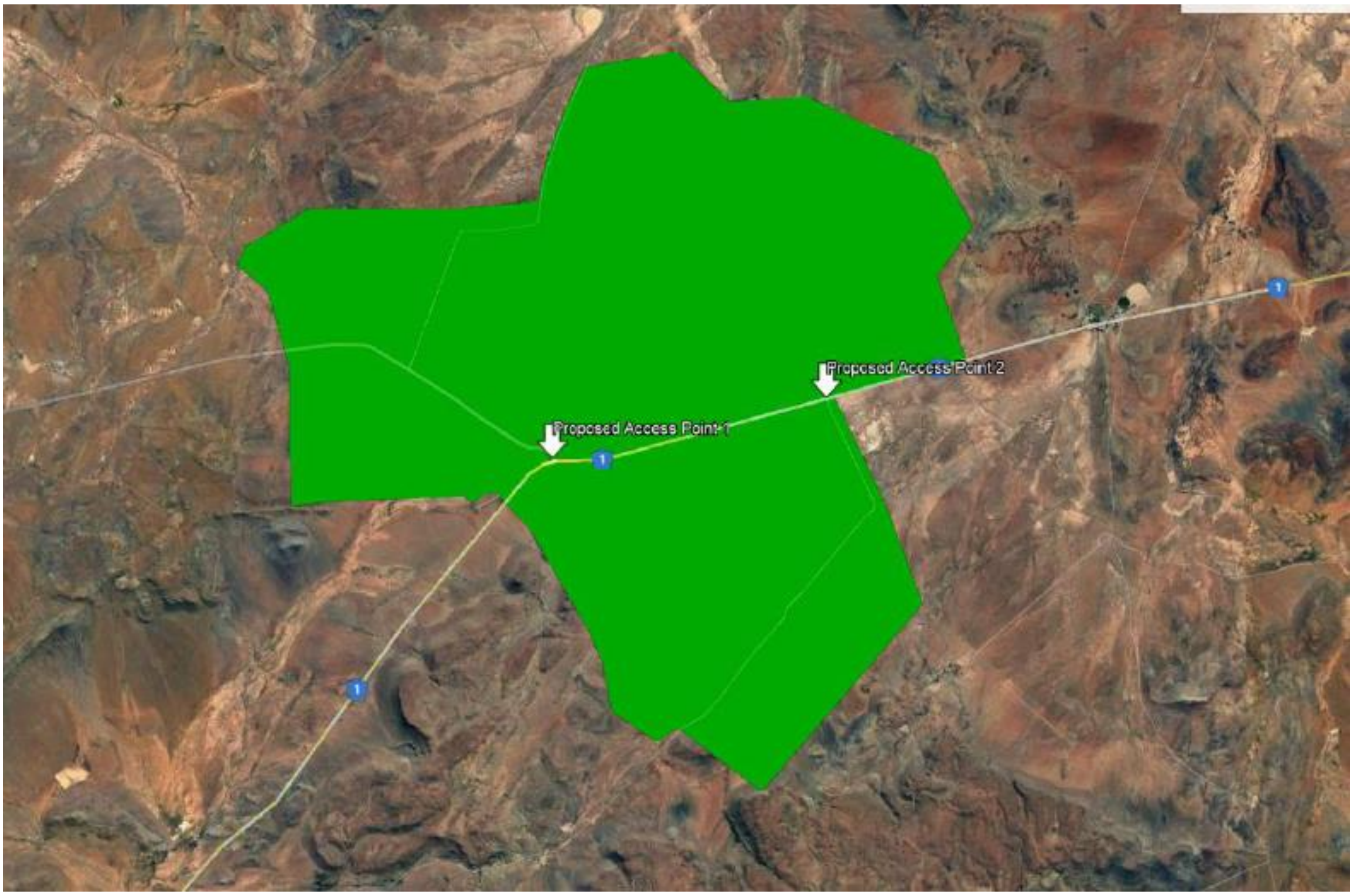


Figure 9.19: Proposed access point to the project site

9.12.2 Description of Traffic Impacts

The potential transport related impacts are described below.

» Construction Phase
 * Construction related traffic

* The construction traffic would also lead to noise and dust pollution.

» Operational Phase
  * During operation, it is expected that staff and security will visit the facility. Approximately twenty (20) full-time employees will be stationed on site. The traffic generated during this phase will be minimal and will not have an impact on the surrounding road network.

» Decommissioning Phase
  * This phase will result in the same impact as the construction phase as similar trips are expected.

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

Construction Phase Impacts

Nature: Traffic congestion due to an increase in traffic caused by the transportation of equipment, material and staff to site.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Short term (2)	Short term (1)
Magnitude	Moderate (6)	Low (2)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (40)**	**Low (15)**
Status (positive or negative)	Negative	Negative
Reversibility	Completely reversible	Completely reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Stagger component delivery to site. » Reduce the construction period. » The use of mobile batch plants and quarries in close proximity to the site. » Staff and general trips should occur outside of peak traffic periods. » Regular maintenance of gravel roads by the Contractor during the construction phase and by Client/Facility Manager during operation phase.		
Residual Impacts: Traffic will return to normal levels after construction is completed.		

Nature: Air quality will be affected by dust pollution The impact will occur due to the increase in construction traffic associated with the transport of equipment, material and staff to site during the construction phase		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Short term (2)	Short term (1)
Magnitude	Moderate (5)	Low (2)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (36)**	**Low (15)**
Status (positive or negative)	Negative	Negative
Reversibility	Completely reversible	Completely reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:
» Dust suppression of gravel roads during the construction phase, as required. » Regular maintenance of gravel roads by the Contractor during the construction phase and by Client/Facility Manager during operation phase.
Residual Impacts:
» Traffic will return to normal levels after construction is completed. » Dust pollution during the construction phase cannot be completely mitigated but mitigation measures will significantly reduce the impact. Dust pollution is limited to the construction period.

Nature: Noise pollution due to traffic in the construction phase

The impact will occur due to the increase in construction traffic associated with the transport of equipment, material and staff to site during the construction phase.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Short term (2)	Short term (1)
Magnitude	Moderate (5)	Low (2)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (36)**	**Low (15)**
Status (positive or negative)	Negative	Negative
Reversibility	Completely reversible	Completely reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

» Stagger component delivery to the site.
» Reduce the construction period.
» The use of mobile batching plants and quarries in close proximity to the project site.
» Staff and general trips should occur outside of peak traffic periods.

Residual Impacts:

» Traffic will return to normal levels after construction is completed.

Noise pollution during the construction phase cannot be completely mitigated but mitigation measures will significantly reduce the impact. Noise pollution is limited to the construction period.

Operation Phase Impacts

The traffic generated during this phase will be minimal and will have not have any impact on the surrounding road network.

Decommissioning Phase Impacts

This phase will have a similar impact as the Construction Phase i.e., traffic congestion, air pollution and noise pollution, as similar trips/movements are expected.

9.12.4 Overall Result

The potential traffic and transport related impacts for the construction, operation and decommissioning phases of the proposed Merino Wind Farm were identified and assessed.

- The main impact on the external road network will be during the construction phase. This phase is temporary in comparison to the operational period. The number of abnormal load vehicles was estimated and found to be able to be accommodated by the road network.
- During operation, it is expected that maintenance and security staff will periodically visit the facility. It is assumed that approximately 30 full-time employees will be stationed on site (subject to change). Based on experience with similar projects, the number of fulltime employees is generally low and consequently, the associated trips are negligible. The traffic generated during this phase will be minimal and will not have an impact on the surrounding road network.
- The traffic generated during the construction phase, although significant, will be temporary and impacts are considered to be negative and of medium significance before and of low significance after mitigation.
- The traffic generated during the decommissioning phase will be less than the construction phase traffic and the impact on the surrounding road network will also be considered negative and of medium significance before and of low significance after mitigation.

9.13. Assessment of the 'Do Nothing' Alternative

The 'do-nothing' alternative (i.e. no-go alternative) is the option of not constructing the Merino. Should this alternative be selected, there would be no environmental impacts on the site or to the surrounding local area due to the construction and operation activities of a wind farm. All baseline information provided in this report relates to the current situation on site and in the surrounding area, and can be considered the no-go alternative. Impacts are limited to the status quo. All negative impacts, specifically related to the development of the wind farm, discussed in this report will not materialise. In addition, positive impacts identified to be associated with the project will be foregone. These are described below.

a) Land use and agriculture

The land capability of the project site indicates that the entire site is considered to be of low sensitivity. Land uses in the area include grazing, veld and plantation. The proposed development footprint of Merino Wind Farm would allow the on-going current grazing and farming activities to continue on areas of the affected properties that will not house wind turbines.

Therefore the current land-use will be retained, while also generating renewable energy from the wind farm. It is detailed in the SIA (**Appendix L**) that the generation of additional income represents a significant benefit for the local affected farmer(s) and reduces the risks to their livelihoods posed by droughts and fluctuating market prices for sheep and farming inputs, such as feed.

The implementation of the 'do-nothing' alternative would leave the land-use restricted to the current livestock grazing and limitations experienced in terms of land capability, losing out on the above-mentioned opportunities. Therefore, from a land-use perspective, the 'do-nothing' alternative is not preferred as this would result in the loss of a viable and compatible land use. Use of the identified site for the development of the proposed wind farm is considered to be a preferred land use as the benefits will outweigh the impacts.

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 area, nuisance impacts (noise and dust during construction), visual impacts and safety and security impacts. The impact is therefore neutral.
- There would however 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.

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 towns of Richmond and Victoria West. 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 loss of new business opportunities.

Employment: The development of the Merino Wind Farm within the Ubuntu 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 Merino Wind Farm will offer numerous opportunities for skills transfer and development. This is relevant for both on-site activities and manufacturing activities. Various renewable energy facilities 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 other renewable energy facilities 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 innovative energy sourcing methods as identified by the Ubuntu Local Municipality as per a draft policy which sets out the criteria which will enable the evaluation of renewable energy generation infrastructure to be developed in a manner that will limit the potential negative impacts thereof will not be met should the Merino Wind Farm not be constructed with the implementation of the 'do nothing' alternative.

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 which has resulted in the need for socio-economic upliftment. The SIA concluded that there would be greater social benefits associated with the project than the do nothing alternative.

Therefore, from a socio-economic perspective, the 'do-nothing' alternative is not preferred due to the loss of socio-economic benefits associated with the project when considering the current socio-economic conditions of the area.

c) Impact on electricity supply and targets regarding renewable energy

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. Although the Merino Wind Farm is only proposed to contribute a contracted capacity of up to 140MW to the grid capacity, this would assist in meeting the electricity demand for the relevant private off-takers 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:

» 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) (2019) provides for the development of 6 000MW of capacity from large scale solar energy facilities by 2030. 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.

9.13.1 Conclusion

The no-go is the continuation of the existing land use, i.e. maintain the status quo. As detailed in the sections above, there would be no environmental impacts on the site or to the surrounding local area due to the construction and operation activities of a wind farm with the implementation of this alternative. All negative impacts, specifically related to the development of the wind farm, discussed in this report will not materialise.

The 'do-nothing' alternative will do little to influence the renewable energy targets set by government. However, as the project site experiences ample wind resource and optimal grid connection opportunities, not developing the Merino Wind Farm would see such an opportunity being lost. In addition, the Northern Cape Province will not benefit from additional generated power being evacuated directly into the Province's grid. 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. 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 Merino Wind Farm. All impacts associated with the project can be mitigated to acceptable levels. If the wind farm facility 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 Merino 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 Merino Wind Farm largely in isolation (from other similar developments).

This chapter assesses the potential for the impacts associated with the project to become more significant when considered in combination with the other operating or proposed wind farm projects within the area.

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

This chapter of the EIA Report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 3: Scope of Assessment and Content of Environmental Impact Assessment Report:

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 Merino Wind Farm are included and assessed within this chapter.

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 confirm if such impacts are relevant to the Merino Wind Farm within the project site being considered for the development. This assessment considers whether the cumulative impact will result in:

- » Unacceptable loss of threatened or protected vegetation types, habitat, or species through clearing, resulting in an impact on the conservation status of such flora, fauna, or ecological functioning.
- » Unacceptable risk to freshwater features through disturbance associated with construction activities and increased runoff and erosion during the operation phase.
- » Unacceptable risk to avifauna through habitat loss, displacement, and collision with wind turbines.
- » Unacceptable loss of high agricultural potential areas presenting a risk to food security and increased soil erosion.
- » Unacceptable loss of heritage resources (including palaeontological and archaeological resources).
- » Unacceptable increase in ambient noise conditions.
- » Complete or whole-scale change in the sense of place and character of an area and unacceptable visual intrusion.
- » Unacceptable impact on traffic and road conditions.
- » Unacceptable negative impact to socio-economic factors and components.

Further to the above, positive cumulative impacts are also expected and will be associated with socio-economic aspects and benefits.

Figure 10.1 indicates the location of the Merino Wind Farm in relation to all other operating and proposed renewable energy facilities located within the surrounding area of the project site. These projects were identified using the DFFE Renewable Energy Database and current knowledge of projects operating and being proposed in the area. For the assessment of cumulative impacts, only developments within a 30km radius from the Merino Wind Farm were considered (**Table 10.1** and **Figure 10.1**), which is in line with the DFFE requirements.

Table 10.1: Renewable energy facilities located within the broader area (within a 30km radius) of the Merino Wind Farm project site

Project Name	Project Status
Brakpoort Solar PV Facility	Authorised
Umsinde Emoyeni Wind Energy Facility	Authorised
Aurora Solar PV Facility	Authorised
Mainstream Renewable Energy Cluster	Authorised
Ishwati Emoyeni Wind Energy Facility	Authorised
Trouberg Wind Energy Facility	Authorised
Modderfontein Wind Energy Facility	Authorised
Nobelsfontein Wind Energy Facility	Authorised
Bietjiesfontein Solar Energy Facility	Authorised
Karoo Renewable Energy Facility	Authorised

In addition to the renewable energy facilities listed above, four new renewable energy facilities (three solar PV facilities and one wind farm) are proposed by Great Karoo Renewable Energy (Pty) Ltd adjacent to the Merino Wind Farm (**Table 10.2**):

Table 10.2: The proposed Great Karoo Cluster of Renewable Energy Facilities

Project Name	Affected property	Contracted Capacity
Kwana Solar PV Facility	Portion 0 of Farm Rondavel 85	100MW
Moriri Solar PV Facility	Portion 0 of Farm Rondavel 85	100MW
Nku Solar PV Facility	Portion 1 of Farm Rondavel 85	100MW
Angora Wind Farm	Portion 11 of Farm Gegundefontein 53 Portion 0 of Farm Vogelstruisfontein 84 Portion 1 of Farm Rondavel 85 Portion 0 of Farm Rondavel 85	140MW

In the case of the Merino Wind Farm, there are fourteen (14)) renewable energy facilities, including the proposed Great Karoo Cluster of renewable energy facilities, located within a 30km radius of the project site (refer to **Figure 10.1** and **Table 10.1**). At the time of writing this EIA Report, facilities listed in **Table 10.2** were still in process of obtaining Environmental Authorisation, and the facilities listed in **Table 10.1** had already received authorisation. There are no operational facilities. The potential for cumulative impacts is summarised in the sections which follow and have been considered within the specialist studies (refer to **Appendices D – M**).

It should be noted that not all renewable energy developments presently under consideration by various IPPs will be built for operation. Not all proposed developments will be granted the relevant permits by the relevant authorities (DFFE, DMRE, 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 private off-taker bids, and a highly competitive process that only selects the best projects.
- Not all proposed projects will be viable because of lower renewable resources on some sites.
- Not all proposed projects 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.
- Not all developers will be successful in securing financial support to advance their projects further.

As there is uncertainty whether all the above-mentioned renewable energy projects will be implemented, it is also difficult to quantitatively assess the potential cumulative impacts. The cumulative impacts of other known renewable energy projects in the broader area and the Merino 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 renewable energy developments throughout South Africa, while the significance of the cumulative impact on visual amenity may only be influenced by renewable energy developments that are in closer proximity to each other, e.g., 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, a summary of the potential for a cumulative impact resulting from several renewable energy developments within a 30km radius of the Merino Wind Farm are explored (refer also to the specialist reports contained in **Appendix D** to **M**). Impacts are assessed accordingly in terms of the proposed project in isolation and the impact considering other projects within the area or the cumulative impact, assuming the implementation of mitigation, as was deemed relevant by the specialist. The approach taken by the various specialists in assessing cumulative impacts is informed by the scale at which the impact is likely to occur.

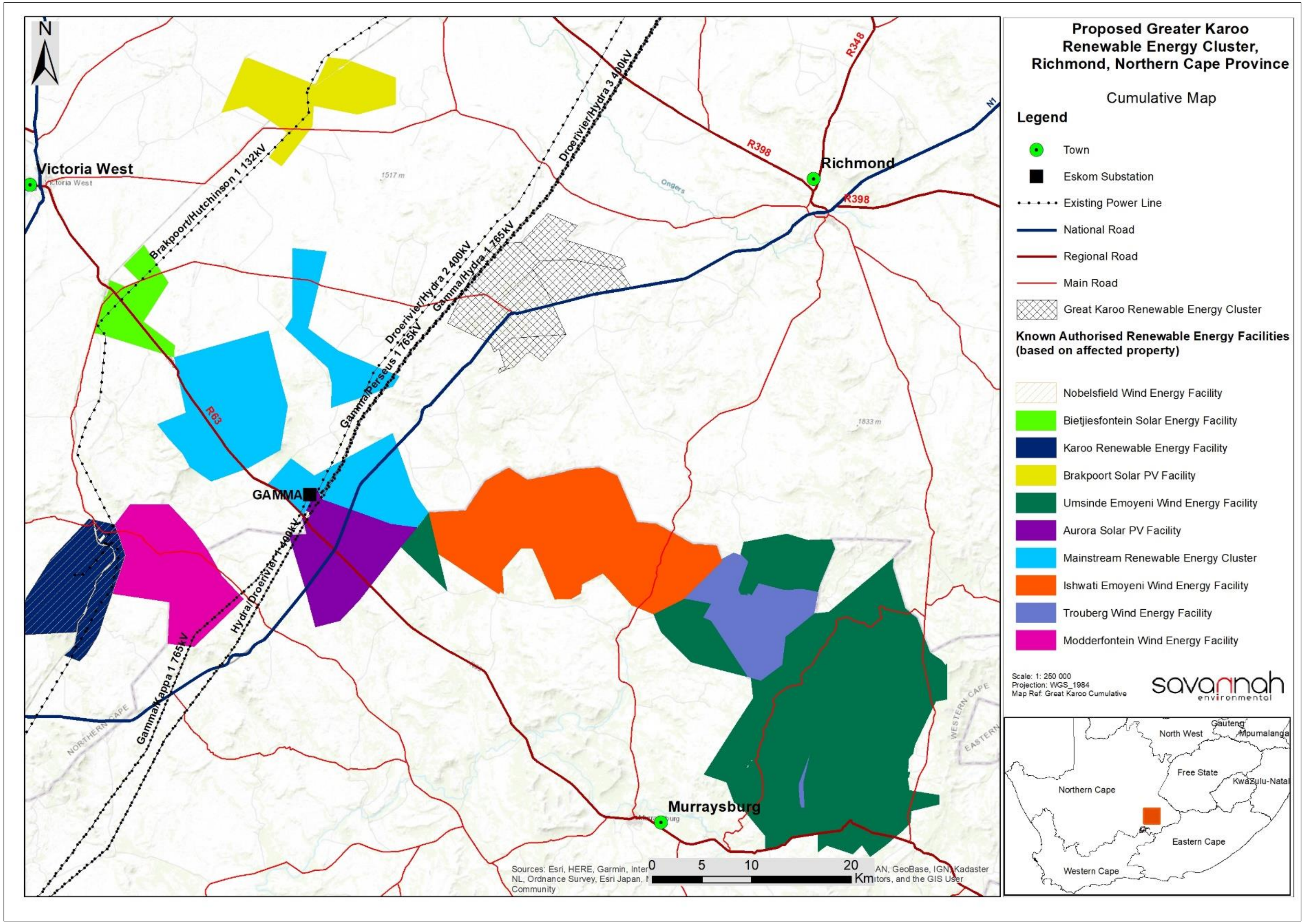


Figure 10.1: Cumulative map illustrating other approved and/or constructed renewable energy facilities located within a 30km radius of the Merino Wind Farm

10.3 Cumulative Impacts on Ecology

Nature: Loss and/or fragmentation of indigenous natural vegetation due to clearing		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site (1)	Local (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Moderate (5)
Probability	Definite (5)	Definite (5)
Significance	**Medium (50)**	**Medium (60)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	No	No
Confidence in findings: High.		
Mitigation: » Restrict impact to development footprint only and limit disturbance creeping into surrounding areas. » As far as possible, locate infrastructure within areas that have been previously disturbed or in areas with lower sensitivity scores. » Avoid sensitive features and habitats when locating infrastructure. » Compile a Rehabilitation Plan. » Compile an Alien Plant Management Plan, including monitoring, to ensure minimal impacts on surrounding areas. » Where possible, access roads should be located along existing farm and district roads. » Access to sensitive areas should be limited during construction. » Undertake monitoring to evaluate whether further measures would be required to manage impacts.		

Nature: Impact on integrity of CBAs		
	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	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Medium (6)
Probability	Probable (3)	Probable (3)
Significance	**Medium (39)**	**Medium (45)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes
Confidence in findings: High.		
Mitigation: » Choose site compound alternatives outside of CBA1 areas. » Locate linear infrastructure outside boundaries of CBA1 areas, except where these are located entirely within existing disturbance and/or transformation.		

Nature: Establishment and spread of alien invasive plants over wide areas		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (2)	Local (2)

Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (48)**	**Medium (48)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes
Confidence in findings: High.		
Mitigation: » Compile and implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control. » Undertake regular monitoring to detect alien invasions early so that they can be controlled. » Implement control measures for alien invader plants and declared weeds.		

Nature: Increased runoff and erosion		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site (1)	Site (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	**Medium (33)**	**Medium (33)**
Status (positive or negative)	Negative	Negative
Reversibility	Partly reversible	Partly reversible
Irreplaceable loss of resources?	Yes, but limited	Yes, but limited
Can impacts be mitigated?	Yes	Yes
Confidence in findings: High.		
Mitigation: » Compile and implement a stormwater management plan. » Keep gradients of roads adequately low to minimise erosion. » Align roads to avoid steep slopes and avoid the necessity for significant cuts and fills. » Monitor road surfaces for erosion and repair or upgrade, where necessary. » Install additional flood and/or erosion control measures, where necessary. » Undertake effective rehabilitation of disturbed areas.		

Nature: Cumulative impacts on SCC from construction clearing due to a number of projects		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (2)	Local (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	High (8)	High (8)
Probability	Probable (3)	Highly probable (4)
Significance	**Medium (45)**	**Medium (60)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes

Confidence in findings: High.
Mitigation: » Undertake a detailed walk-through survey of footprint areas that are within habitats where SCC are likely to occur during a favourable season to locate any individuals of protected plants, as well as for any populations of threatened plant species. This survey must cover the footprint of all approved infrastructure, including internal access roads (final infrastructure layout). The best season is early to late Summer, but dependent on recent rainfall and vegetation growth. » Where significant populations of SCC are found, shift infrastructure to avoid direct impacts. » Compile a Plant Rescue Plan to be approved by the appropriate authorities. » Undertake monitoring to evaluate whether further measures would be required to manage impacts. » Obtain the necessary permits for specimens or protected plant species that will be lost due to construction of the project. » For any plants that are transplanted, annual monitoring should take place to assess survival. This should be undertaken for a period of three years after translocation and be undertaken by a qualified botanist. The monitoring programme must be designed prior to translocation of plants and should include control sites (areas not disturbed by the project) to evaluate mortality relative to wild populations. » No collecting or poaching of any plant species must be permitted on site. » Loss of protected species of conservation concern must be report to the conservation authorities. » Personnel must be educated about protection status of species, including distinguishing features, to be able to identify protected species. » Implement strict access control for the site. » Report any illegal collection to conservation authorities.

10.4 Cumulative Impacts on Aquatic Ecology

Cumulative impacts are assessed in context of the extent of the proposed project area; other developments in the area; and general water resource loss and transformation resulting from other activities in the area.

The expected post-mitigation risk significance for the project in isolation is expected to be low, but in consideration of the larger Great Karoo Renewable Energy Project and also the larger surrounding area, the overall cumulative impact is expected to be medium. This is expected owing to the fact that the larger project extends into two Water Management Areas and three quaternary catchment areas.

Nature: Potential for increased contaminants entering the watercourse		
	Overall impact of the proposed project considered in isolation (post mitigation)	**Cumulative impact of the project and other projects in the area (post mitigation)**
Extent	Local (2)	Regional (4)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	High (8)
Probability	Improbable (2)	Probable (3)
Significance	**Low (24)**	**Medium (48)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Low
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	Yes	
Mitigation: » Design and implement an effective stormwater management plan. » Release only clean water into the environment. » The contractors used should have spill kits available to ensure that any fuel, oil or hazardous substance spills are cleaned-up and discarded correctly.		

» All chemicals and toxicants to be used for the construction must be stored in a bunded area. » All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site at designed areas. » All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping"; » Adequate sanitary facilities and ablutions on the servitude must be provided for all personnel throughout the project area. Use of these facilities must be enforced (these facilities must be kept clean so that they are a desired alternative to the surrounding vegetation). » All waste generated on site during construction must be adequately managed. Separation and recycling of different waste materials should be supported.

10.5 Cumulative Impacts on Avifauna

The total affected land parcel area taken up by authorised renewable energy projects within the 30km radius is approximately 774km². The total land parcel area affected by the Great Karoo Renewable Energy Cluster equates to approximately 299km². The combined land parcel area affected by authorised renewable energy developments within the 30 km radius of similar habitat around the proposed Great Karoo Renewable Energy Cluster, inclusive of the Great Karoo Renewable Energy Cluster, thus equals approximately 1 073km². Of this, the proposed Merino Wind Farm project constitutes ~6% (64.6km²). The cumulative impact of the proposed Merino Wind Farm is thus anticipated to be low after mitigation.

The total area within the 30km radius around the proposed projects equates to about 4 396km² of similar habitat. The total combined size of the land parcels potentially affected by renewable energy projects will equate to ~24% of the available untransformed habitat in the 30km radius. However, the actual physical footprint of the renewable energy facilities will be much smaller than the land parcel areas themselves. Furthermore, each of these projects must still be subject to a competitive bidding process where only the most competitive projects will win a power purchase agreement required for the project to proceed to construction. The cumulative impact of all the proposed renewable energy projects is estimated to be moderate.

Nature: Cumulative impacts in terms of: » Displacement of priority species due to disturbance during construction phase. » Displacement of priority species due to habitat loss in the operation phase. » Mortality of priority species due to collisions with the turbines in the operation phase. » Mortality of priority species due to electrocutions on the overhead MV network and in the substation yard. » Mortality of priority species due to collisions with the 33kV medium voltage overhead lines in the operation phase.		
	Overall impact of the proposed project considered in isolation (post mitigation)	**Cumulative impact of the project and other projects in the area (post mitigation)**
Extent	Low (1)	High (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Medium (39)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes
Mitigation:		

» Construction activity should be restricted to the immediate footprint of the infrastructure as far as possible. » Burying of internal MV cables. » Rehabilitation of disturbed vegetation. » Using bird-friendly structures for the MV poles. » Curtailment of turbines if mortality thresholds are exceeded. » Maximum use of existing roads. » Implementation of operational monitoring to assess mortality levels. » Avoidance of no-go buffers around sensitive areas, including raptor nests. » Marking of overhead lines with Bird Flight Diverters.

10.6 Cumulative Impacts on Bats

There are several other renewable energy facilities within a 30km radius of Merino Wind Farm that have received Environmental Authorisation approval as depicted in **Table 10.1** and shown in **Figure 10.1** above. The table below assesses only the impact of bat mortalities by moving turbine blades, since the approved facilities indicated in **Figure 10.1** are too far from the Merino site to have a cumulative effect on the other identified impacts.

Nature: Moving turbine blades can kill bats by direct impact or barotrauma.		
	Overall impact of the proposed project considered in isolation (post mitigation)	**Cumulative impact of the project and other projects in the area (post mitigation)**
Extent	Long term (4)	Long term (4)
Duration	Larger area (3)	Larger area (3)
Magnitude	High (8)	High (8)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (60)**	**Medium (45)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes
Mitigation: » The facility should adhere to its bat sensitivity map (Figure 9.7, Chapter 9). » If bat mortalities are found to be unsustainably high during the operational study, a curtailment mitigation schedule may need to be implemented. » Curtail the turbines by means of feathering to render the blades motionless in wind speeds below the mitigation cut-in speed. » Consider the use of acoustic bat deterrents.		

10.7 Cumulative Impacts on Land Use, Soil and Agricultural Potential

Cumulative impacts within the proposed wind farm development area and its surroundings have been determined to be low. Soil resources in the area have been affected to some degree by means of erosion, although to a limited degree. Furthermore, no agricultural segregation has taken place in recent history by means of any development.

Nature: Loss of land capability		
	Overall impact of the proposed project considered in isolation (post mitigation)	**Cumulative impact of the project and other projects in the area (post mitigation)**
Extent	Local (1)	Local (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (16)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes
Mitigation: » Prevent any spills from occurring. Machines must be parked within hard park areas and must be checked daily for fluid leaks. » Proper invasive plant control must be undertaken quarterly. » All excess soil (soil that are stripped and stockpiled to make way for foundations) must be stored, continuously rehabilitated to be used for rehabilitation of eroded areas. » Rip all compacted areas outside of the developed areas that have been compacted. This must be done by means of a commercial ripper that has at least two rows of tines. Ripping must take place between 1 and 3 days after seeding and following a rainfall event (seeding must therefore be carried out directly after a rainfall event).		

10.8 Cumulative Impacts on Heritage (including archaeology, palaeontology and cultural landscape)

At this stage, there is the potential for the cumulative impact of proposed renewable energy facilities to negatively impact the cultural landscape due to a change in the landscape character from natural wilderness to semi-industrial. Although this project falls outside of a REDZ, it is noted that it is preferable to have renewable energy facility development clustered in an area such as a REDZ.

To address concerns about the cumulative impact of renewable energy facilities within the greater Karoo region, a cautious approach is required in terms of assessing the desirability of such development from a cultural landscape perspective. The proposed site is located adjacent to an existing infrastructural corridor associated with the national grid, which suggests a level of suitability for renewable energy facilities which can link in with the grid. Notwithstanding the existing infrastructure, the placement of renewable energy facilities, both PV and wind turbines, must take cognisance of the very high visual impact on a relatively intact and representative cultural landscape, and the extremely limited ability to visually screen this infrastructural development, particularly in the case of the wind turbines.

Nature: Cumulative impact to the sense of place		
	Overall impact of the proposed project considered in isolation (post mitigation)	**Cumulative impact of the project and other projects in the area (post mitigation)**
Extent	Local (1)	Local (1)
Duration	Medium-term (3)	Long-term (4)
Magnitude	High (7)	High (7)

Probability	Probable (3)	Probable (3)
Significance	**Medium (33)**	**Medium (36)**
Status (positive or negative)	Negative	Negative
Reversibility	High	Low
Irreplaceable loss of resources?	Possible	Possible
Can impacts be mitigated?	N/A	N/A
Mitigation: » One of the turbines located along the ridgeline proposed as part of the Merino Wind Farm must be removed to break up the cluster and to minimise the impact to the sense of place (**Figure 9.12, Chapter 9**).		

10.9 Cumulative Noise Impacts

There is a very low risk of cumulative noises during the construction phase, as noises from other construction activities (at other renewable facilities) are highly unlikely to result in cumulative construction noise impacts. With no other wind projects located sufficiently close to the proposed project, there are no risks for a potential cumulative noise impact during operation, with the potential significance of the cumulative noise impacts summarised in the table below.

Nature: Wind turbines from various wind farms operating simultaneously at night. Increases in ambient sound levels due to air-borne noise from all the wind turbines in area.		
	Overall impact of the proposed project considered in isolation (post mitigation)	**Cumulative impact of the project and other projects in the area (post mitigation)**
All NSDs	Noise levels less than 45 dBA	Noise levels less than 45 dBA
Extent	Regional (4)	Regional (4)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (1)	Minor (1)
Probability	Improbable (1)	Improbable (1)
Significance	**Low (9)**	**Low (9)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, but not required.	Yes, but not required.
Mitigation: » Significance of noise impact is low for the scenario as conceptualized.		

10.10 Cumulative Visual Impacts

The cumulative visual impact of the proposed Merino, Angora, Ishwati Emoyeni and Victoria West WEFs is expected to be high, especially the potential sequential cumulative visual impact on observers driving along the N1 national road and potentially along other arterial roads within the region.

Nature: The potential cumulative visual impact of wind farms on the visual quality of the landscape.		
	Overall impact of the proposed project considered in isolation (post mitigation)	**Cumulative impact of the project and other projects in the area (post mitigation)**
Extent	Very short distance (4)	Very short distance (4)
Duration	Long term (4)	Long term (4)
Magnitude	Very high (10)	Very high (10)

Probability	Highly probable (4)	Highly probable (4)
Significance	**High (72)**	**High (72)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation measures: N.A.		
Residual impacts: The visual impact will be removed after decommissioning, provided the WEF infrastructure is removed, and the area rehabilitated. Failing this, the visual impact will remain.		

10.11 Cumulative Social Impacts

From a social perspective, the following cumulative impacts have been identified:

» Cumulative impact on sense of place.
» Cumulative impact on local services and accommodation.
» Cumulative impact on local economy.

These are discussed in more detail and assessed below.

Cumulative impact on sense of place

The potential cumulative impacts on the area's sense of place will be largely linked to potential visual impacts. In this regard, the Scottish Natural Heritage (2005) describes a range of potential cumulative landscape impacts associated with wind farms on landscapes. These issues are also likely to be relevant to solar facilities and associated infrastructure, including the proposed WEF. The relevant issues identified by Scottish Natural Heritage study include:

» Combined visibility (whether two or more wind farms will be visible from one location).
» Sequential visibility (e.g., the effect of seeing two or more wind farms along a single journey, e.g., road or walking trail).
» The visual compatibility of different wind farms in the same vicinity.
» Perceived or actual change in land use across a character type or region.
» Loss of a characteristic element (e.g., viewing type or feature) across a character type caused by developments across that character type.

The guidelines also note that cumulative impacts need to be considered in relation to dynamic as well as static viewpoints. The experience of driving along a tourist road, for example, needs to be considered as a dynamic sequence of views and visual impacts, not just as the cumulative impact of several developments on one location. The viewer may only see one renewable energy facility and the associated infrastructure at a time, but if each successive stretch of the road is dominated by views of renewable energy facilities, then that can be argued to be a cumulative visual impact (National Wind Farm Development Guidelines, DRAFT - July 2010).

The potential impact of the proposed wind farm and associated infrastructure on the area's sense of place is likely to be limited. The cumulative impacts are also likely to be low with mitigation.

Nature: Visual impacts associated with the establishment of more than one REF and the potential impact on the area's rural sense of place and character of the landscape.		
	Overall impact of the proposed project considered in isolation (post mitigation)	**Cumulative impact of the project and other projects in the area (post mitigation)**
Extent	Local (1)	Local and regional (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Medium (30)**
Status (positive/negative)	Negative	Negative
Reversibility	Yes. Renewable Energy Facility components and other infrastructure can be removed.	
Loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » The recommendations of the VIA should be implemented.		

Cumulative impact on local services and accommodation

The objective of the developer will be to source as many low and semi-skilled workers for the construction phase from the Ubuntu Local Municipality. This will reduce the pressure on local services and accommodation and the nearby towns of Victoria West and Richmond.

The potential impact should also be viewed within the context of the potential positive cumulative impacts for the local economy associated with the establishment of the proposed facility and associated renewable energy projects in the Ubuntu Local Municipality. These benefits will create opportunities for investment in the ULM, including the opportunity to up-grade and expand existing services and the construction of new houses. Socio-economic development (SED) contributions also represent an important focus of the REIPPPP and is aimed at ensuring that the build programme secures sustainable value for the country and enables local communities to benefit directly from the investments attracted into the area. The proposed WEF is also required to contribute a percentage of projected revenues accrued over the 20-year period to SED. This will provide revenue that can be used by the Ubuntu Local Municipality to invest in up-grading local services where required. In should also be noted that it is the function of national, provincial, and local government to address the needs created by development and provide the required services. The additional demand for services and accommodation created by the establishment of development renewable energy projects should therefore be addressed in the Integrated Development Planning process undertaken by the Ubuntu Local Municipality.

Nature: The establishment of a number of renewable energy facilities and associated projects, such as the proposed WEF, in the Ubuntu Local Municipality has the potential to place pressure on local services, specifically medical, education and accommodation.		
	Overall impact of the proposed project considered in isolation (post mitigation)	**Cumulative impact of the project and other projects in the area (post mitigation)**
Extent	Local (1)	Local and regional (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)

Significance	**Low (27)**	**Medium (30)**[25]
Status (positive/negative)	Negative	Negative
Reversibility	Yes. Renewable Energy Facility components and other infrastructure can be removed.	
Loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » The proponent should liaise with the Ubuntu Local Municipality to address potential impacts on local services.		

Cumulative impact on local economy

In addition to the potential negative impacts, the establishment of renewable energy facilities and associated infrastructure, including the proposed wind farm, will also create several socio-economic opportunities for the Ubuntu Local Municipality. The positive cumulative opportunities include creation of employment, skills development and training opportunities, and downstream business opportunities.

The review of the REIPPPP (June 2020) indicates that the SED contributions associated with 68 operational projects has amounted to R 1.2 billion to date. In terms of Enterprise Development (ED), R 7.2 billion has been committed for BW1 to BW4, 1S2 and 2S2. Assuming an equal distribution of revenue over the 20-year project operational life, enterprise development contributions would be R360 million per annum. Of the total commitment, R5.6 billion is specifically committed directly within the local communities where the IPPs operate, contributing significantly to local enterprise development. Up until the end of June 2020 a total of R 384.2 million had already been made to the local communities located in the vicinity of the 68 operating IPPs. This represents 93% of the total R384.2 million enterprise development contributions made to date). The potential cumulative benefits for the local and regional economy are therefore associated with both the construction and operational phase of renewable energy projects and associated infrastructure and extend over a period of 20-25 years. However, steps must be taken to maximise employment opportunities for members from the local communities in the area and support skills development and training programmes.

Nature: The establishment of renewable energy facilities and associated projects, such as the wind farm, in the Ubuntu Local Municipality will create employment, skills development and training opportunities, creation of downstream business opportunities.		
	Overall impact of the proposed project considered in isolation (post mitigation)	**Cumulative impact of the project and other projects in the area (post mitigation)**
Extent	Local (1)	Local and regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Probable (3)	Highly Probable (4)
Significance	**Low (27)**	**Medium (52)** [26]
Status (positive/negative)	Positive	Positive
Reversibility	Yes. Renewable Energy Facility components and other infrastructure can be removed.	
Loss of resources?	No	No
Can impacts be mitigated?	Yes	

[25] With effective mitigation and planning, the significance will be Low Negative.
[26] With effective enhancement and planning, the significance will be Medium Positive.

Mitigation:
» The proposed establishment of suitably sited renewable energy facilities and associated projects, such as the proposed wind farm, within the Ubuntu Local Municipality and Northern Cape Province should be supported.

10.12 Cumulative Traffic Impacts

To assess the cumulative impact, it was assumed that all renewable energy projects within 30km currently proposed and authorized, would be constructed at the same time. This is the precautionary approach as in reality; these projects would be subject to a highly competitive bidding process. Only a handful of projects would be selected to enter into a power purchase agreement with Eskom, and construction is likely to be staggered depending on project-specific issues.

The construction and decommissioning phases are the only significant traffic generators for renewable energy projects. The duration of these phases is short term (i.e., the impact of the generated traffic on the surrounding road network is temporary and renewable energy facilities, when operational, do not add any significant traffic to the road network). Even if all renewable energy projects within the area are constructed at the same time, 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. The assessments of cumulative impacts are collated in the table below.

Nature: Visual impacts associated with the establishment of more than one REF and the potential impact on the area's rural sense of place and character of the landscape.		
	Overall impact of the proposed project considered in isolation (post mitigation)	**Cumulative impact of the project and other projects in the area (post mitigation)**
Extent	Local (2)	National (5)
Duration	Short-term (1)	Medium (3)
Magnitude	Low (2)	High (8)
Probability	Probable (3)	Improbable (2)
Significance	**Low (15)**	**Medium (32)**
Status (positive/negative)	Negative	Negative
Reversibility	High	
Loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Stagger component delivery to site. » Dust suppression. » Reduce the construction period. » The use of mobile batching plants and quarries near the site would decrease the impact on the surrounding road network by reducing the construction trips and the distance travelled to transport the materials to the site. » Staff and general trips should occur outside of peak traffic periods.		

10.13 Conclusion regarding Cumulative Impacts

Cumulative impacts are expected to occur with the development of the Merino Wind Farm throughout all phases of the project life cycle and within all areas of study considered as part of this EIA report. The main aim for the assessment of cumulative impacts considering the Merino 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 following conclusions can be drawn regarding the cumulative impacts associated with the project:

» There will be no unacceptable loss or impact on ecological aspects (vegetation types, species and ecological processes) due to the development of the Merino Wind Farm and other renewable energy projects within the surrounding area, provided the recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.
» There will be no significant loss of sensitive and significant aquatic features. The cumulative impact is therefore acceptable.
» There will be no unacceptable risk to avifauna with the development of the Merino Wind Farm and other renewable energy projects within the surrounding area, provided the recommended mitigation measures are implemented. This is due to the limited footprint expected to be associated with wind farms in the area. The cumulative impact is therefore acceptable.
» There will be no unacceptable risk to bats in terms of mortality with the development of the Merino Wind Farm and other renewable energy projects within the surrounding area, provided the recommended mitigation measures are implemented. The approved facilities in the area are too far from the Merino site to have a cumulative effect on the other identified impacts The cumulative impact is therefore acceptable.
» There will be no unacceptable loss of land capability due to the development of the Merino Wind Farm and other renewable energy projects within the surrounding areas, provided recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.
» Change to the sense of place and character of the area is expected with the development of wind energy facilities. However, the change is not considered to be a fatal flaw.
» There will be no unacceptable loss of heritage resources associated with the development of the Merino Wind Farm. There will also be no unacceptable impacts to the cultural landscape as a result of the development of the facility provided the one turbine from the facility (refer to **Figure 9.12**, **Chapter 9**) is removed from the ridgelines. The cumulative impact is therefore acceptable.
» No unacceptable social impacts are expected to occur. Only one positive cumulative impact is expected to occur from a social perspective. This impact will be of medium significance. Positive cumulative impacts are expected to be beneficial at a regional level. The cumulative impact is therefore acceptable.
» No unacceptable increase in ambient noise levels is expected to occur with the development of the Merino Wind Farm and other wind farms within the surrounding areas during either construction or operation. The cumulative impact is therefore acceptable.
» No unacceptable traffic impacts are expected to occur. The cumulative impact is therefore acceptable.

All cumulative impacts associated with the Merino Wind Farm will be of a medium or low significance, with impacts of a high significance associated with the visual impacts. A summary of the cumulative impacts is included in **Table 10.3** below.

Table 10.3: Summary of the cumulative impact significance for the Merino Wind Farm

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	Medium	Medium
Aquatic Ecology	Low	Medium
Avifauna	Low	Medium
Bats	Medium	Medium
Land use, soil and agricultural potential	Low	Low
Heritage (including archaeology, palaeontology and sense of place)	Medium	Medium
Noise	Low	Low
Visual	High	High
Socio-Economic	*Positive impacts:* Low *Negative impacts:* Medium or Low (depending on the impact being considered)	*Positive impacts:* Medium *Negative impacts:* Medium or Low (depending on the impact being considered)
Traffic	Low	Medium (assuming all projects in the area are constructed at the same time)

Based on the specialist cumulative assessment and findings, the development of the Merino Wind Farm and its contribution to the overall impact of all renewable energy projects to be developed within a 30km radius, it can be concluded that the Merino Wind Farm cumulative impacts will be of a medium to low significance, with impacts of a high significance mainly relating to visual impacts on the landscape. Therefore, the development of the Merino 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

Great Karoo Renewable Energy (Pty) Ltd is proposing the development a commercial wind farm and associated infrastructure on a site located approximately 35km south-west of Richmond and 80km south-east of Victoria West, within the Ubuntu Local Municipality and the Pixley Ka Seme District Municipality in the Northern Cape Province. The facility will have a contracted capacity of up to 140MW and will be known as the Merino Wind Farm.

A development area considered to be suitable for the development of a wind farm, with an extent of approximately 6 436ha, was identified by the project developer. The development area is the area under assessment in the Environmental Impact Assessment (EIA) process. It is within the identified development area that a footprint has been identified by the developer through consideration of the sensitive environmental features and buffers identified during the Scoping Phase. The development area consists of four (4) affected properties, which include:

» Portion 1 of Farm Rondavel 85
» Portion 0 of Farm Rondavel 85
» Portion 9 of Farm Bult & Rietfontein 96
» Portion 0 of Farm Vogelstruisfontein 84

The development footprint[27] will contain the following infrastructure to enable the wind farm to generate up to 140MW:

» Up to 35 wind turbines with a maximum hub height of up to 170m and tip height of up to 250m.
» Concrete turbine foundations to support the turbine hardstands.
» Inverters and transformers.
» Temporary laydown areas which will accommodate storage and assembly areas.
» Cabling between the turbines, to be laid underground where practical.
» A temporary concrete batching plant.
» 33/132kV onsite facility substation.
» Underground cabling from the onsite substation to the 132kV collector substation.
» Electrical and auxiliary equipment required at the collector substation that serves the wind energy facility, including switchyard/bay, control building, fences, etc.
» Battery Energy Storage System (BESS).
» Access roads and internal distribution roads.

Great Karoo Renewable Energy (Pty) Ltd has confirmed that the development area is particularly suitable for wind energy development from a technical perspective due to the quality of the prevailing wind resource, access to the electricity grid, compatibility with the current land use and land availability. The wind resource of the development area has been confirmed through the consideration of the datasets, involving wind presence and wind speed, as well as meteorological information and geographical factors taken from measurements on site.

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[27]The development footprint is the result of detailed design by the developer which the consideration of sensitive environmental features which are required to be avoided by the wind farm infrastructure.

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), for the undertaking of an Impact Assessment Report

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

Requirement	Relevant Section
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 Merino 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 development footprint on the approved site as contemplated in the accepted scoping report 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 Merino Wind Farm has been included as **section 11.5**. An Environmental Sensitivity and Layout map of the Merino Wind Farm has been included as **Figure 11.1** which overlays the development footprint (as assessed within the EIA) of the wind farm with the environmental sensitive features located within the development area. A summary of the positive and negative impacts associated with the Merino Wind Farm has been included in **section 11.2**.
3(o) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation.	All conditions required to be included in the Environmental Authorisation of the Merino Wind Farm has been included in **section 11.6**.
3(q) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation.	A reasoned opinion as to whether the Merino Wind Farm should be authorised has been included in **section 11.5**.

11.2 Evaluation of the Merino Wind Farm

The preceding chapters of this report together with the specialist studies contained within **Appendices D-M** provide a detailed assessment of the potential impacts that may result from the development of the Merino 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 development area and development footprint for the Merino Wind Farm. In so doing, it draws on the information gathered as part of the EIA process, the knowledge gained by the environmental specialists and the EAP and presents a combined and informed opinion of the environmental impacts associated with the project.

No environmental fatal flaws or unacceptable impacts 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 bird and bat monitoring, as specified by the specialists.

The potential environmental impacts associated with the Merino Wind Farm assessed through the EIA process include:

» Impacts on terrestrial ecology (flora and fauna).
» Impacts on aquatic ecology.
» Impacts on avifauna.
» Impacts on bats.
» Impacts on land use, 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 social impacts.

The environmental sensitivities identified by the relevant specialists for the project site are illustrated in **Figure 11.1**. The development footprint, as assessed, has been overlain with the relevant environmental sensitivities.

11.2.1 Impacts on Ecology

The study area consists mostly of natural habitat that is used for commercial animal husbandry. The proposal to build the Merino Wind Farm on site will therefore have significant effects on natural habitat. The existing biodiversity on site is, however, relatively limited in terms of uniqueness or potential presence of species of concern, with the possible presence of one Critically Endangered mammal species.

The vegetation on site is not considered to be part of any threatened ecosystem and has not been assessed as being of high conservation value due to rates of transformation. The regional vegetation types that occur on site, i.e., Eastern Upper Karoo and Upper Karoo Hardeveld, are both widespread and have low rates of transformation across their geographical range.

There are three plant species listed as Rare (*Anisodontea malavastroides, Aloe broomii var. tarkaensis* and *Tridentea virescens*) that could potentially occur on site, but these are all widespread species that are naturally rare where they are found. None have been previously recorded on this site. There are also two plant species protected according to National legislation (*Crinum bulbispermum and Harpagophytum procumbens*) that could potentially occur in the geographical area, but these are also very widespread species. The loss of some individuals, if they are found to occur on site, would not affect the conservation status of any of the species. It is, however, unlikely that any of them would be affected.

There are a small number of fauna species of conservation concern that were assessed as having a possibility of occurring on site. The Riverine Rabbit has been previously recorded within the broader project site. At a regional level, the Critical Biodiversity Area (CBA) map for Northern Cape indicates one drainage line, along with a buffer on each side, that is designated as being a CBA1 area. The remaining drainage lines of the study area are indicated as being Ecological Support Areas (ESAs).

Sensitivities that occur specifically within the development area for the Merino Wind Farm that may be vulnerable to damage from the proposed project are as follows:
» Dry stream beds, including the associated riparian habitats and adjacent floodplains (High sensitivity)
» CBA1 (high sensitivity)
» Habitat suitable for Riverine Rabbit (very high sensitivity)

» Ridges (medium to high sensitivity)
» Plains vegetation (medium sensitivity)

The impacts on ecology associated with the Merino Wind Farm are of low or medium significance. If appropriate mitigation measures are put in place, all impacts can be reduced to having low significance, except for loss of habitat, which will remain medium significance after mitigation. The specialist concluded that the project can proceed from an ecological perspective.

11.2.2 Impacts on Aquatic Ecology

Based on a combination of desktop and in-field delineation, three (3) forms of watercourses were identified and delineated within the 500m regulated area. These include episodic rivers, drainage lines and dams. No natural wetland systems were identified for the development area. The rivers and drainage lines are both classified as a river HGM type system. The dams are regarded as artificial systems and typically formed / created in the preferential flow paths of the river HGM type. The drainage lines are not characterised by riparian vegetation and grasses, these systems represent bare surfaces with evidence of surface run-off.

The results of the habitat assessment indicate natural (class A) and largely natural (class B) instream and riparian conditions for the catchment respectively. The overall ecological importance and sensitivity for the area was determined to be moderate. The overall ecosystem service benefit for the system is high.

The recommended buffer was calculated to be 15m and 22m for the drainage lines and rivers, respectively, for the construction and operational phases. The buffer zone will not be applicable for proposed infrastructure that traverse the systems, however, for all secondary activities such as laydown yards and storage areas, the buffer zone must be implemented.

The pre-mitigation impact significance for all considered aspects is expected to be medium. The expected post-mitigation impact significance is expected to be low should all mitigation measures and recommendations be implemented. It is the opinion of the specialist that no fatal flaws are presented for the proposed project. The project may be considered favourably by the issuing authority, but all mitigation measures and recommendations must be considered for the authorisation.

Since there are watercourses present within the development area of the Merino Wind Farm as identified in the Aquatic Impact Assessment (**Appendix E**), a water use authorisation for the project will be required from the DWS for water uses identified in Section 21(c) and 21(i) of the National Water Act (Act 36 of 1998).

11.2.3 Impacts on Avifauna

The South African Bird Atlas Project 2 (SABAP2) data indicates that a total of 165 bird species could potentially occur within the broader area. Of these, 24 species are classified as priority species and 12 of these are South African Red List species. Of the priority species, 17 are likely to occur regularly in the development area, namely, Black Harrier, Black Stork, Blue Crane, Greater Flamingo, Karoo Korhaan, Lanner Falcon, Ludwig's Bustard, Martial Eagle, Secretarybid, Tawny Eagle, Verreaux's Eagle and Cape Vulture.

The following specific environmental sensitivities were identified from an avifaunal perspective:

» **Large dams: 800m turbine No-Go zone**

Surface water in this semi-arid habitat is crucially important for priority avifauna and many non-priority species. It is important to leave open space with no turbines for birds to access and leave the surface water area unhindered. Blue Cranes are also likely to at times roost in the larger dams and could fly in and out of these areas before dawn / after dusk which further necessitates a sufficient buffer around the dams.

» **Boreholes: 200m turbine No-Go zone**
Surface water in this semi-arid habitat is crucially important for priority avifauna and many non-priority species. It is important to leave open space with no turbines for birds to access and leave the surface water area unhindered.

» **Verreaux's Eagle nest: 3.7km all infrastructure No-Go zone and 5.2km medium sensitivity zone**
A 3.7km infrastructure free buffer zone must be implemented around the Verreaux's Eagle (SA status: Vulnerable) nest near the site (at -31.425449° 23.702398°). This is to reduce the collision risk. It is recommended that suitable pro-active mitigation be implemented at all turbines within a 5.2 km radius around the Verreaux's Eagle nest during daylight hours, once the wind farm commences with operations, to reduce the risk of collisions of Verreaux's Eagles with the turbines. Suitable pro-active mitigation measures should be selected prior to commencement of operation, informed by best-available information at the time of implementation.

» **Tawny Eagle nests: 3km all infrastructure No-Go zone**
A 3km infrastructure free buffer zone must be implemented around the Tawny Eagle (SA status: Endangered) nests at (-31.540635°, 23.716886°) and (-31.445988°, 23.583921°). This is to reduce the turbine collision risk.

» **Martial Eagle nests: 5km all infrastructure No-Go zone**
A 5km infrastructure free buffer zone must be implemented around the Martial Eagle (SA status: Endangered) nest (at -31.524550° 23.534279°). This is to reduce the turbine collision risk.

The proposed Merino Wind Farm will have a medium impact on avifauna which, in most instances, could be reduced to a low impact through appropriate mitigation. **The currently proposed 35 turbine lay-out which was assessed in the Avifauna Impact Assessment Report avoids all the recommended avifaunal turbine exclusion zones and is therefore deemed acceptable**. The development is therefore supported, provided the recommended mitigation measures are strictly applied.

11.2.4 Impacts on Bats

Several site visits were made to the Merino Wind Farm between December 2020 and December 2021. The passive data indicates that the three bat species most likely to be impacted on by the proposed wind farm are *Laephotis* (formerly *Neoromicia*) *capensis, Miniopterus natalensis* and *Tadarida aegyptiaca*. These more 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.

Due to the extrapolated nature of the national screening tool, further Google Earth satellite imagery and verifications during site visits were used to spatially demarcate areas of the site with high and medium sensitivities relating to bat species ecology and habitat preferences, where high sensitivities and their buffers are no-go zones for turbines and turbine blade overhang. In other words, no turbine blades may intrude into high sensitivity buffers. Medium sensitivities indicate areas of probable increased risk due to seasonal fluctuations in bat activity, but turbines are allowed to be constructed in medium sensitivity areas. Considering the current proposed layout for the Merino Wind Farm, no turbines are intruding onto the high bat sensitivities. The layout respects the bat sensitivity map when applying an 80m blade length.

Based on the bat activity recorded at the Merino Wind Farm, the significance ratings for the majority of the impacts to bats posed by the development are predicted to be medium before mitigation. After mitigation, all impacts are predicted to be low, except for bat mortality due to moving turbines, which is predicted to remain of medium significance after mitigation.

From a bat impact perspective, no reasons have been identified for the Merino Wind Farm development not to proceed to the approval phase. If the proposed Merino Wind Farm is approved, a minimum of 2 years of operational bat mortality monitoring must be conducted from the start of the operation of the facility.

11.2.5 Impacts on Land Use, Soil and Agricultural Potential

Various soil forms were identified throughout the development area, namely the Tubatse, Oakleaf and Bethesda soil forms. These soil forms are characterised by an orthic topsoil on top of a neocutanic horizon. The Tubatse and Bethesda soil forms are characterised by a lithic and hard rock horizon underneath the neocutanic horizons respectively with the Oakleaf being characterised by a deep neocutanic horizon.

Eight potential land capability classes are located within the proposed development area, namely, Land Capability 1 to 5 (Very Low to Low); and Land Capability 6 to 8 (Low/Moderate to Moderate Sensitivity). The soil forms identified within the development area have been determined to be associated with one land capability, namely LCIII, i.e., Low.

The significance ratings for the impacts of the proposed wind farm on land capability are predicted to be low before and after mitigation. Considering the low sensitivities associated with land potential resources and the low significance of the identified impacts, it is the specialist's opinion that the proposed activities will have an acceptable impact on soil resources and that the proposed activities should proceed as have been planned.

11.2.6 Impacts on Heritage Resources (archaeology, palaeontology and cultural landscape)

During the site survey four (4) archaeological and heritage resources were identified within the development area for the Merino Wind Farm. The development area is underlain by sediments of very high palaeontological significance and five (5) palaeontological heritage resources were identified during the survey of the development area. The landscape of the development area has been assessed for cultural significance, and found to have five distinct character areas, namely, historic movement corridors, open plains interrupted by low koppies, elevated areas with steep sided mountain ridges, areas of landscape that have been transformed by significant infrastructural development, and remote landscape with wilderness qualities. Based on character area analysis undertaken as part of the cultural landscape assessment, areas classified as no-go, tread lightly (subject to site specific constraints), and developable areas were identified within the development area.

There are limited impacts anticipated to archaeological and palaeontological heritage from this proposed development and as such, the principle of a renewable energy facility in this location is supported from a heritage perspective provided that the infrastructure is located in areas able to tolerate the impact of the high degree of change from a cultural landscape perspective.

A number of the proposed turbines are located on the ridge-lines which have been identified as no-go for turbine development due to the high negative impact anticipated to the existing Karoo sense of place. In order to mitigate this impact, it is recommended that one proposed turbine (i.e., M30) from the Merino Wind Farm be removed or relocated from the ridgelines.

Based on the outcomes of this report, it is not anticipated that the proposed development of the Merino Wind Farm and its associated infrastructure will negatively impact on significant heritage resources on condition that the recommended mitigation measures are implemented, including the removal or relocation of the turbine referred to previously.

11.2.7 Noise Impacts

Ambient (background) sound levels were measured over a period of three nights from 9 September to 12 September 2021 in accordance with the South African National Standard SANS 10103:2008. The results of the measurements at each location indicate that ambient sound levels in the area are generally low and typical of a rural noise district during low wind conditions.

Considering measurements collected over the past decade at numerous locations during different seasons, ambient sound levels will likely increase as wind speeds increase. Residential areas and potential noise-sensitive developments/receptors/communities (NSRs) were identified using aerial images as well as a physical site visit.

Considering the low significance of the potential noise impacts (with mitigation, inclusive of cumulative impacts) for the proposed Merino Wind Farm and associated infrastructure, it is recommended that the development be authorised. The proposed layout (i.e., turbine placement) is considered to be acceptable from a noise perspective. No further noise studies or additional noise measurements are recommended or required.

11.2.8 Visual Impacts

A visibility analysis was undertaken from each of the wind turbine positions (35 in total) at an offset of 170m (approximate hub-height) above ground level.

From the viewshed analysis, it is evident that the proposed wind farm would have a larger core area of potential visual exposure within a 5km radius of the development site. This is due to the tall wind turbine structures and the predominantly flat topography. However, there are some ridges and hills to the south (Bakenskop ridge), east and west of the proposed wind turbine structures. The shielding effect of these ridges is noticeable on the viewshed analysis map, where the frequency of visual exposure in these areas is reduced. The wind turbine structures, especially the eight turbines located on the Bakenskop ridge, will also be highly exposed to observers travelling along the N1 national road. The Rondawel to Hutchinson secondary road will similarly be exposed to the wind turbines, as it traverses the proposed development site.

Visual exposure will remain high in the medium distance (i.e., between 5 and 10km). The shielding effect of the hills and ridges surrounding the proposed development site does however create a more scattered viewshed pattern. The Hoëkop, Bobbejaankrans and Kamberg hills shield observers to the north-west and north-east of the proposed development site. Observations from the N1 national road and the Hutchinson secondary road is highly likely, especially the eight turbines located on top of the Bakenskop ridge.

In the medium to longer distance (i.e., between 10 and 20km), visual exposure will be somewhat reduced, especially towards the north-west and the south-east. This zone also includes a number of homesteads that may be exposed to the project infrastructure. Visual exposure beyond a 20km radius is significantly reduced, especially in the south-east. The wind turbine structures may however still be visible from a number of homesteads within the study area.

Overall, the significance of the visual impacts associated with the proposed Merino Wind Farm is expected to be high as a result of the undeveloped character of the landscape. The facility would be visible within an area that contains certain sensitive visual receptors who could consider visual exposure to this type of infrastructure to be intrusive. Visual receptors include people travelling along the public roads (e.g., the N1 national road), residents of rural homesteads and tourists passing through or holidaying in the region.

In terms of the proposed wind turbine layout, the project proponent needs to adhere to all relevant National, Provincial and Local Government regulations and ordinances, including all prescribed health and safety guidelines. If these are not adhered to, the layout may be deemed non-compliant, and may need to be revised in order to ensure compliance. From a visual perspective, the layout is deemed acceptable and the proposed development is not considered to be fatally flawed.

11.2.9 Social Impacts

Impacts are expected to occur with the development of the Merino Wind Farm during the construction, operation and decommissioning phases. Both positive and negative impacts are identified and assessed.

Positive impacts during construction includes:
» Creation of employment and business opportunities, and opportunity for skills development and on-site training.

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

Positive impacts during operation includes:
» The establishment of infrastructure to improve energy security and support renewable sector.
» Creation of employment opportunities.
» Benefits to the affected landowners.
» Benefits associated with the socio-economic contributions to community development.

Negative impacts during operation includes:
» Noise impacts associated with the operation of the plant.
» Visual impacts and associated impacts on sense of place.
» Potential impact on property values.

» Potential impact on tourism.

The findings of the SIA indicate that the proposed Merino Wind Farm will result in several social and socio-economic benefits, including creation of employment and business opportunities during both the construction and operational phases. The project will also contribute to local economic development though socio-economic development (SED) contributions. In addition, the development will improve energy security and reduce the carbon footprint associated with energy generation in South Africa. The findings of the SIA also indicate that the potential negative impacts associated with both the construction and operational phases are likely to be Low Negative with mitigation. The potential negative impacts can therefore be effectively mitigated if the recommended mitigation measures are implemented. The establishment of the proposed Merino Wind Farm is therefore supported by the findings of the SIA.

11.2.10 Traffic Impacts

It is assumed that if components are imported to South Africa, it will be via the Port of Ngqura, which is located in the Eastern Cape, ~425km from the proposed site. Alternatively, components can be imported via the Port of Saldanha in the Western Cape, which is located ~675km from the proposed site.

The preferred route for abnormal load vehicles will be from the port (i.e., Port of Ngqura), heading north on the R75, passing Wolwefontein and Jansenville, and onto the R63 at Graaff-Reinet. The vehicles will travel on the R63 to the N1, passing Murraysburg, and continue on the N1 to the proposed site.

The proposed access points to the development area are located along the N1, as shown in **Figure 9.19**. Proposed Access Point 1 has a surfaced bellmouth which leads to the existing gravel road to the Hutchinson railway station. Proposed Access Point 2 is an existing gravel farm access road with an unsurfaced bellmouth.

Generally, the road width at the access points needs to be a minimum of 8m and the access roads on site a minimum of 4.5m (preferably 5m). The radius at the access points needs to be large enough to allow for all construction vehicles to turn safely.

Overall, the significance of the impacts on traffic associated with the Merino Wind Farm are predicted to be medium before mitigation, and low following the implementation of mitigation measures. The traffic generated during this the operation phase will be minimal and will have not have any impact on the surrounding road network. From a traffic impact perspective, no reasons have been identified for the Merino Wind Farm development not to proceed to the approval phase.

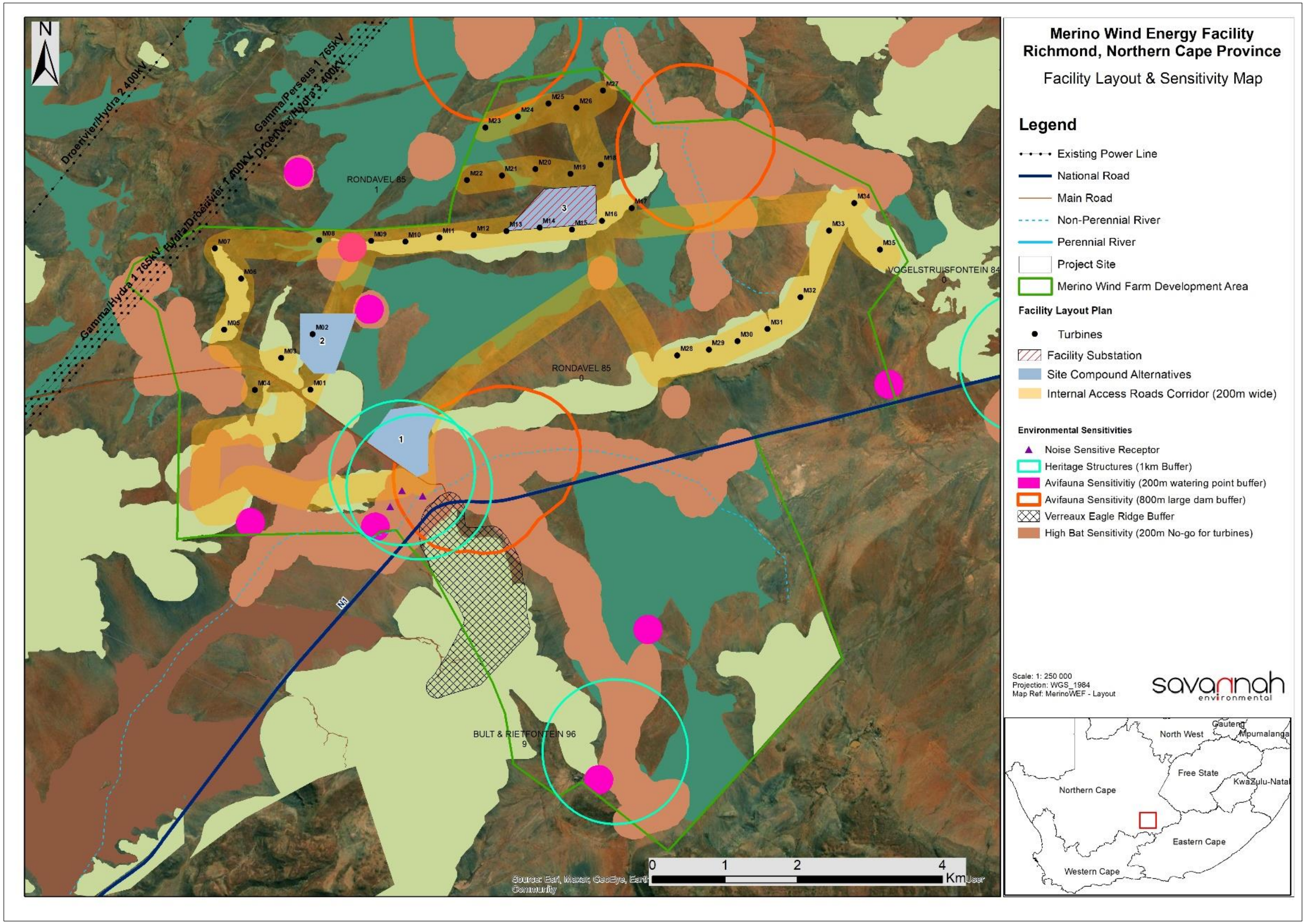

Figure 11.1: The development footprint of the Merino Wind Farm, as assessed within this EIA Report, overlain on the identified sensitive environmental features (**Appendix P**)

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 are several authorised renewable energy projects within a 30km radius of the proposed site, namely:
» Brakpoort Solar PV Facility
» Umsinde Emoyeni Wind Energy Facility
» Aurora Solar PV Facility
» Mainstream Renewable Energy Cluster
» Ishwati Emoyeni Wind Energy Facility
» Trouberg Wind Energy Facility
» Modderfontein Wind Energy Facility
» Nobelsfontein Wind Energy Facility
» Bietjiesfontein Solar Energy Facility
» Karoo Renewable Energy Facility

In addition to the renewable energy facilities listed above, four new renewable energy facilities (three solar PV facilities and one wind farm) are proposed by Great Karoo Renewable Energy (Pty) Ltd adjacent to the Merino Wind Farm, namely:
» Kwana Solar PV Facility
» Moriri Solar PV Facility
» Nku Solar PV Facility
» Angora Wind Farm

All cumulative impacts associated with the Merino Wind Farm will be of a medium or low significance, with impacts of a high significance associated with the visual impacts. A summary of the cumulative impacts is included in **Table 11.1** below.

Table 11.1: Summary of the cumulative impact significance for the Merino Wind Farm

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	Medium	Medium
Aquatic Ecology	Low	Medium
Avifauna	Low	Medium
Bats	Medium	Medium
Land use, soil and agricultural potential	Low	Low
Heritage (including archaeology, palaeontology and sense of place)	Medium	Medium
Noise	Low	Low

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
Visual	High	High
Socio-Economic	*Positive impacts:* Low *Negative impacts:* Medium or Low (depending on the impact being considered)	*Positive impacts:* Medium *Negative impacts:* Medium or Low (depending on the impact being considered)
Traffic	Low	Medium (assuming all projects in the area are constructed at the same time)

Based on the specialist cumulative assessment and findings, the development of the Merino Wind Farm and its contribution to the overall impact of all renewable energy projects to be developed within a 30km radius, it can be concluded that the Merino Wind Farm cumulative impacts will be of a medium to low significance, with impacts of a high significance mainly relating to visual impacts on the landscape. Therefore, the development of the Merino Wind Farm will not result in unacceptable, high cumulative impacts and will not result in a whole-scale change of the environment.

11.3. Facility Layout and Comparative Assessment of the Site Compound Alternatives

The development footprint assessed within this EIA was designed by the project developer in order to respond to and avoid the sensitive environmental and social features located within the development area (**Figure 11.2**). This approach ensured the application of the mitigation hierarchy (i.e., avoid, minimise, mitigate and offset) to the Merino Wind Farm project, which ultimately ensures that the development is appropriate from an environmental perspective and is suitable for development within the development area.

For the majority of specialists, the impacts associated with the Merino Wind Farm facility layout are of low to medium significance post-mitigation and the assessed layout is considered acceptable. Only the heritage specialist identified one turbine (i.e., M30) to be unacceptably placed within the development footprint (**Figure 11.3**)

Three (3) alternative locations for the site compound were assessed in this EIA Report. From the specialist studies undertaken, the following conclusions were made regarding the site compound alternatives:

	Alternative 1	Alternative 2	Alternative 3
Terrestrial Ecology	Least Preferred	Acceptable	Preferred
Avifauna	Acceptable	Acceptable	Acceptable
Heritage	Least Preferred	Acceptable	Acceptable

From the above summary of the specialist findings, it was determined that Alternative 1 is least preferred from an ecological and heritage perspective given its location within CBA1 (very high sensitivity), drainage feature (high sensitivity), karroid plains (medium sensitivity) and within the recommended no-go development areas around sites GK037 and GK038. From an ecological perspective, Alternative 2 is situated within karroid plains, drainage features and mountain slopes (medium-high sensitivity) and Alternative 3 is located within karroid plains and mountain slopes. Both Alternative 2 and 3 are no located within any recommended no-go development areas from a heritage perspective. All three alternatives are situated in Karoo scrub, which is not particularly sensitive as far is avifauna is concerned.

Considering the above findings, it can be concluded that either Alternative 2 or Alternative 3 are considered preferred. It should however be noted that the final preferred option will be informed by the final technical preference.

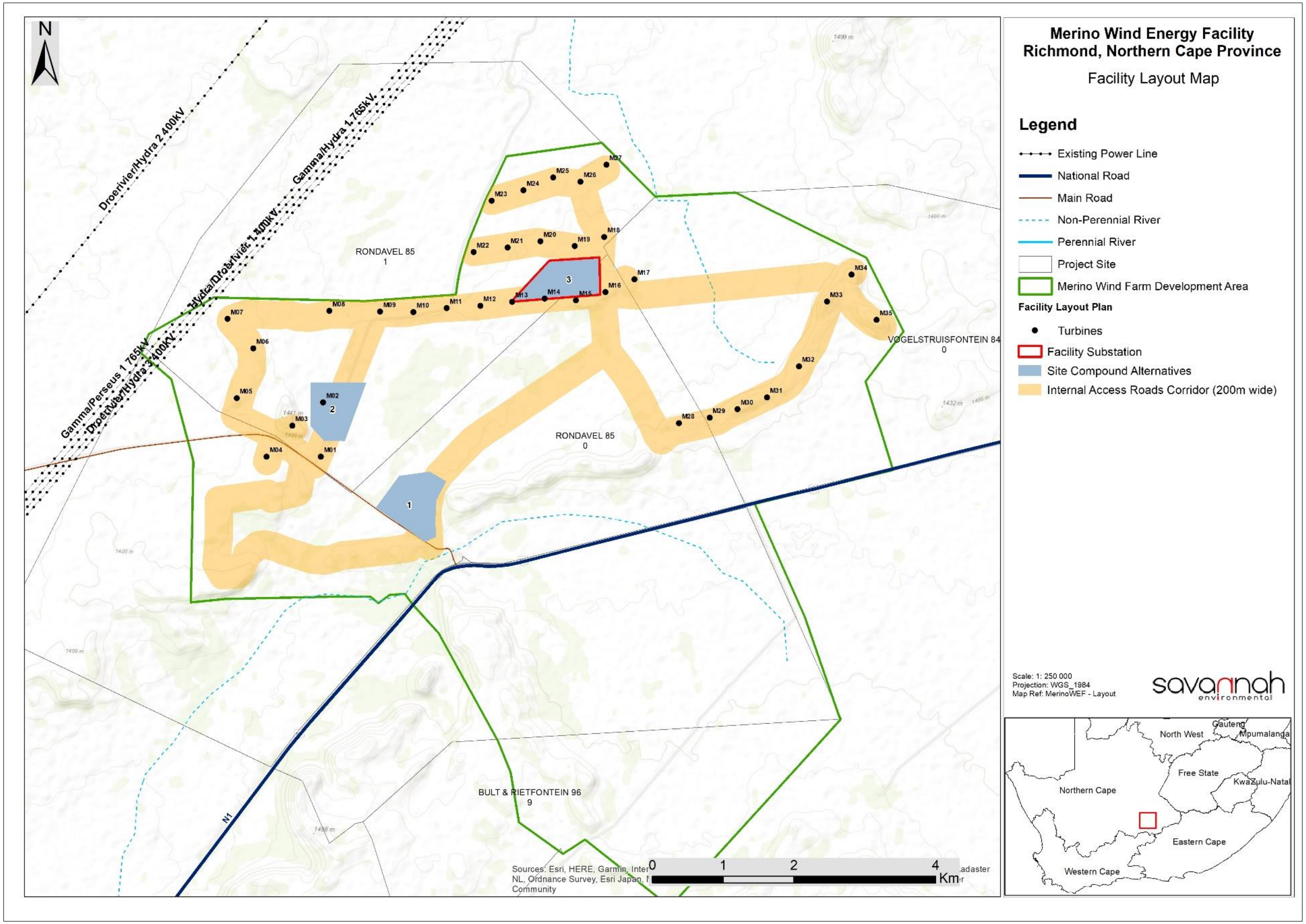

Figure 11.2: Development footprint for the Merino Wind Farm (map included in **Appendix P**)

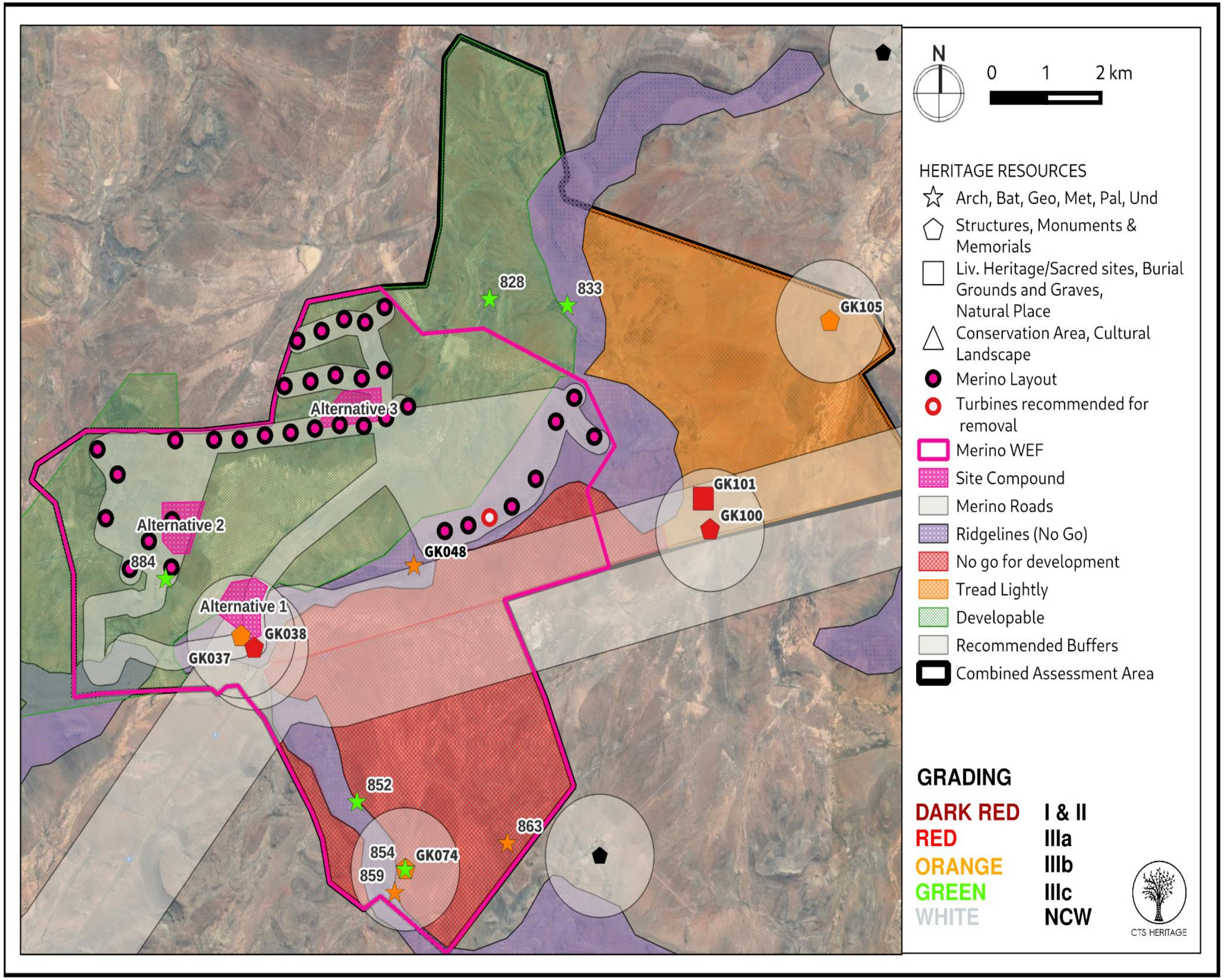

Figure 11.3: Map showing turbine recommended for removal or relocation

11.4. Environmental Costs of the Merino Wind Farm versus Benefits of the Merino 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 EIA Report and the EMPr are implemented and adhered to. No fatal flaws have been identified. These environmental costs could include:

- *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 ecological features, and avifauna and bat sensitive areas considered to be of high sensitivity.
- *Impacts on aquatic resources* - the impacts on freshwater resources have been minimised through the avoidance of the sensitive features by project infrastructure.
- *Visual impacts associated with the wind farm* - The Merino Wind Farm will be visible and mainly of a high significance. 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.
- *Loss of land for agriculture* – The development will remove areas of low to moderate land capability. As the site is used for grazing, activities can continue during operation and impacts in this regard are therefore limited.
- *Impacts on birds and bats* – loss of birds and bats species due to collision with turbines. The impact has been minimised through the avoidance of areas of high sensitivity and is considered to be acceptable with implementation of mitigation.
- *Negative impact to the cultural landscape* - The Merino Wind Farm is proposed within an area that forms part of an intact cultural landscape representative of the Central Plateau of the Great Karoo. The site possesses a number of landscape elements contributing to a composite cultural landscape, including topographical features, open plains, water features, historic scenic routes and farmsteads. The landscape affected by the proposed development has a number of character areas within varying significances and sensitivities to accommodate Renewable Energy infrastructure culminating in the identification of no-go areas, tread-lightly areas and areas more resilient to development, as well as a number of design indicators for placement of Renewable Energy infrastructure. A number of the proposed turbines are located on the ridge-lines which have been identified as no-go for turbine development due to the high negative impact anticipated to the existing Karoo sense of place. The removal of one of these turbines from the layout is expected to reduce the impact to acceptable levels.

Benefits of the Merino Wind Farm include the following:

- The project will result in important economic benefits at the local and regional scale through job creation, income and other associated downstream economic development. These will persist during the pre-construction, construction, operation and decommissioning phases of the project.
- The project provides an opportunity for a new land use on the affected properties which is considered as a more efficient use of the land and provides an opportunity for financial benefits to the current land use.
- 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, in line with national policy regarding energy generation.
- » 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 Merino Wind Farm will contribute to achieving goals for implementation of renewable energy and sustaining a 'green' economy within South Africa.

The benefits of the Merino 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 provided that the one proposed turbine from the Merino Wind Farm is removed from the ridgelines as per the recommendation of the heritage specialist.

11.5. Overall Conclusion (Impact Statement)

The preferred activity was determined by the developer to be the development of a renewable energy facility on site using wind as the preferred technology, due to the availability of a suitable wind resource. A technically viable development footprint was proposed by the developer and assessed as part of the EIA process. The assessment of the development footprint within the development area was undertaken by independent specialists and their findings have informed the results of this EIA Report.

From a review of the relevant policy and planning framework, it was concluded that the project is well aligned with the policy framework, and a clear need for the project is seen from a policy perspective at a local, provincial and National level.

The specialist findings from the EIA studies undertaken have indicated that there are no identified fatal flaws associated with the implementation of the development footprint within the development area. The developer has designed a project development footprint in response to the identified sensitive environmental features and areas present within the development area. 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). Feedback from the heritage specialist has indicated that one proposed turbine from the Merino Wind Farm be removed from the ridgelines (refer to **Figure 11.3**) to ensure a low acceptable impact from a cultural landscape perspective.

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 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.

As detailed in the cost-benefit analysis, the benefits of the Merino 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. From a social perspective, both positive and negative impacts are expected.

Through the assessment of the development footprint within the development area, it can be concluded that the development of the Merino Wind Farm will not result in unacceptable environmental impacts (subject to the implementation of the recommended mitigation measures).

Based on the comparative assessment of the site compound alternatives, it can be concluded that either Alternative 2 or Alternative 3 are considered preferred. It should however be noted that the final preferred option will be informed by the final technical preference.

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 development area, 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 Merino Wind Farm is acceptable within the landscape and can reasonably be authorised subject to the removal or relocation of the one proposed turbine from the Merino Wind Farm located on the ridgelines (i.e., M30) as recommended by the heritage specialist. Considering the findings of the comparative assessment of the site compound location alternatives, it is the reasoned opinion of the EAP that either Alternative 2 or Alternative 3 is acceptable and can be utilised for the establishment of the site compound.

The Merino Wind Farm with a contracted capacity of up to 140MW, located on the project site consisting of four affected properties (Portion 1 of Farm Rondavel 85, Portion 0 of Farm Rondavel 85, Portion 9 of Farm Bult & Rietfontein 96, and Portion 0 of Farm Vogelstruisfontein 84) includes the following infrastructure (to be included within an authorisation issued for the project):

» Up to 35 wind turbines with a maximum hub height of up to 170m and tip height of up to 250m.
» Concrete turbine foundations to support the turbine hardstands.
» Inverters and transformers.
» Temporary laydown areas which will accommodate storage and assembly areas.
» Cabling between the turbines, to be laid underground where practical.
» A temporary concrete batching plant.
» 33/132kV onsite facility substation.
» Underground cabling from the onsite substation to the 132kV collector substation.
» Electrical and auxiliary equipment required at the collector substation that serves the wind energy facility, including switchyard/bay, control building, fences, etc.
» Battery Energy Storage System (BESS).
» Access roads and internal distribution roads.

The following key conditions would be required to be included within an authorisation issued for the Merino Wind Farm:

- » All mitigation measures detailed within this EIA Report, as well as the specialist reports contained within **Appendices D to M** are to be implemented.
- » The EMPr as contained within **Appendix N** and **O** of this EIA 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 Merino Wind Farm is considered key in achieving the appropriate environmental management standards as detailed for this project.
- » Following the final design of the Merino Wind Farm, a revised layout must be submitted to DFFE 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**.
- » Due to the potential for impact to significant rock engravings, an archaeological walkdown of roads and turbine placement is recommended once the layout is finalised.
- » One turbine from the proposed Merino WEF layout is removed or moved to a less sensitive area (**Figure 11.3**).
- » Implement a chance finds procedure for the rescuing of any fossils or heritage resources discovered during construction.
- » Undertake a detailed walk-through survey of footprint areas that are within habitats where SCC are likely to occur during a favourable season to locate any individuals of protected plants, as well as for any populations of threatened plant species. This survey must cover the footprint of all approved infrastructure, including internal access roads (final infrastructure layout). The best season is early to late Summer, but dependent on recent rainfall and vegetation growth.
- » Obtain the necessary permits for specimens or protected plant species that will be lost due to construction of the project.
- » As far as possible, locate infrastructure within areas that have been previously disturbed or in areas with lower sensitivity scores.

A validity period of 10 years of the Environmental Authorisation is requested, should the project obtain approval from DFFE.

CHAPTER 12: REFERENCES

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Heritage Impact Assessment

Heritage Impact Assessments				
Nid	**Report Type**	**Author/s**	**Date**	**Title**
120317	HIA Phase 1	Celeste Booth, Sholeen Shanker	01/12/2012	An archaeological ground-truthing walk-through for the proposed substation and associated overhead power line for the Nobelsfontein Wind Energy Facility situated on a site south of Victoria West on the Farm Nobelsfontein 227, Northern Cape Province
120325	HIA Phase 1	Celeste Booth, Sholeen Shanker	01/12/2012	An archaeological ground-truthing walk-through for the proposed substation and associated overhead power line for the Nobelsfontein Wind Energy Facility situated on a site south of Victoria West on the Farm Nobelsfontein 227, Northern Cape Province
120325	HIA Phase 1	Celeste Booth, Sholeen Shanker	01/12/2012	An archaeological ground-truthing walk-through for the proposed substation and associated overhead power line for the Nobelsfontein Wind Energy Facility situated on a site south of Victoria West on the Farm Nobelsfontein 227, Northern Cape Province
120820	HIA Phase 1	Celeste Booth	01/12/2012	An Archaeological Ground-Truthing Walk-Through For The Nobelsfontein Wind Energy Facility Situated On A Site South Of Victoria West On The Farms Nobelsfontein 227, Annex Nobelsfontein 234, Ezelsfontein 235, And Rietkloofplaaten 239, Northern Cape Province
251290	PIA Desktop	Lloyd Rossouw	01/01/2014	Combined Environmental Environmental Impact Assessment for the proposed Ishwati Emoyeni Wind Energy Facility and Supporting Eskom Transmission and Eskom Distribution Grid Connection Infrastructure near Murraysburg, Western Cape. Chapter 13: Palaeontology Impact Assessment.

251296	AIA Phase 1	Dave Halkett	01/01/2014	Combined Environmental Impact Assessment for the proposed Ishwati Emoyeni Wind Energy Facility and Supporting Eskom Transmission and Eskom Distribution Grid Connection Infrastructure near Murraysburg, Western Cape. Chapeter 13: Archaeology Impact Assessment.
356942	AIA Phase 1	Johan Binneman, Celeste Booth, Natasha Higgitt	01/05/2010	A PHASE 1 ARCHAEOLOGICAL IMPACT ASSESSMENT (AIA) FOR THE PROPOSED SKIETKUIL QUARRIES 1 AND 2 ON THE FARM SKIETKUIL No. 3, VICTORIA WEST, CENTRAL KAROO DISTRICT, WESTERN CAPE PROVINCE
356942	AIA Phase 1	Johan Binneman, Celeste Booth, Natasha Higgitt	01/05/2010	A PHASE 1 ARCHAEOLOGICAL IMPACT ASSESSMENT (AIA) FOR THE PROPOSED SKIETKUIL QUARRIES 1 AND 2 ON THE FARM SKIETKUIL No. 3, VICTORIA WEST, CENTRAL KAROO DISTRICT, WESTERN CAPE PROVINCE
357137	Heritage Impact Assessment Specialist Reports	Timothy Hart	13/10/2015	Heritage Impact Assessment for the proposed Umsinde Emoyeni Wind Energy Facility
360840	Non Impact Assessment Related Reports	Wouter Fourie	05/03/2016	Environmental Impact Assessment of the proposed amendments to the Environmental Authorisation for the Mainstream Renewable Power South Africa Wind Energy Project near Victoria West in the Northern Cape â€“ Specialist Heritage Opinion
360850	HIA Phase 1	Wouter Fourie	04/03/2016	Basic assessment process for Proposed development of supporting infrastructure to the Victoria West Wind Energy Facility, Victoria West
6805	AIA Phase 1	Len van Schalkwyk, Elizabeth Wahl	01/09/2007	Heritage Impact Assessment of Gamma Grassridge Power Line Corridors and Substation, Eastern, Western and Northern Cape Provinces, South Africa
7035	AIA Phase 1	Johan Binneman, Celeste Booth, Natasha Higgitt	05/03/2011	A Phase 1 Archaeological Impact Assessment (AIA) for the proposed Karoo Renewable Energy Facility on a site south of Victoria West, Northern and Western Cape Province on the farms Phaisantkraal 1, Modderfontein 228, Nobelsfontein 227, Annex Nobelsfontein
7036	AIA Desktop	Celeste Booth,	19/11/2010	An Archaeological Desktop Study for the proposed Karoo Renewable Energy Facility on a site south of Victoria West,

		Natasha Higgitt		Northern and Western Cape
8943	PIA Phase 1	Lloyd Rossouw	24/03/2011	Palaeontological desktop assessment of a commercial renewable energy facility site located approximately 34km south of Victoria West in the Western Cape Province (and Northern Cape)

<u>Visual Impact Assessment</u>

Chief Directorate National Geo-Spatial Information, varying dates. 1:50 000 Topographical Maps and Data.
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